Handbook of Environmental Impact Assessment

VOLUME 2

ENVIRONMENTAL IMPACT ASSESSMENT IN PRACTICE: IMPACT AND LIMITATIONS

EDITED BY

JUDITH PETTS

Centre for Environmental Research and Training
The University of Birmingham
(Formerly: Centre for Hazard and Risk Management
Loughborough University)

Blackwell
Science

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Preface

The Handbook of Environmental Impact Assessment has been constructed to provide a 'truly international perspective of the status of environmental impact assessment (EIA), an up-to-date and critical reference' (see Preface to Volume 1). The first volume explored the principles, process and methods of EIA.

This second volume complements and extends the discussion through a focus on the effectiveness of the translation of principles into practice. The volume considers effectiveness at three levels: international, national and the micro- or process-specific level. Part 1 provides a framework for the volume through a consideration of what makes an effective EIA system and the primary requirements for ensuring effectiveness—capacity-building and quality review. Part 2 explores the transnational dimensions of EIA, including the Espoo Convention and the work of the multilateral financial institutions. Part 3 explores the pressures for the adoption of EIA and the resulting established systems in Eastern Europe, East Asia, Africa, Central and South America, North America and the European Union. This international review highlights the adaptive and flexible 'heart' of EIA; however, it also raises questions about the political commitment to EIA, not least in some developing economies who face other non-environmental priorities. The final Part concludes, with part 'how-to-do' guidance and part discussion of required developments, with chapters on policy assessment, plan assessment and sectoral projects—energy, waste, transport, mining and water resources. The latter were selected as globally relevant development sectors which each raise fundamental questions of need and social equity as well as presenting outstanding assessment problems in terms of variable spatial and temporal impacts with a huge complexity of indirect and cumulative effects.

I agreed to take on the project to produce this Handbook because I believe that we must examine and evaluate real systems and practice more closely if we are to identify the actual barriers to, and the realistic opportunities for, the optimization of our decision-making tools. It is clear from the discussions in this volume that key integrative opportunities are still being wasted, not least in relation to: the definition of the environment; the relationship between policies, plans and projects; integration of different decision approaches and methods; and the merging of pre-development with post-development decisions.

This volume completes the Handbook. It is hoped that it will assist legislators, decision makers, economists, developers, industrial managers and consultants in an understanding of the barriers to, and outstanding potential for, EIA as a framework for environmentally sustainable decisions. At times the task to produce such as international perspective on EIA has seemed daunting (even foolish). It has only been possible because of the support I have received from all of the authors, my editorial advisers, my publishers and my office. I reiterate my sincere thanks, expressed in Volume 1, to them all. I also reiterate my request for readers' comments, so that any further editions can be enhanced.

Judith Petts
The University of Birmingham

Part 1
Quality and Effectiveness

This second volume concentrates on environmental impact assessment (EIA) in practice and this first Part introduces the key question—is EIA performing well and how do we judge its effectiveness? Chapter 1, as the introduction to the volume, questions whether EIA has fulfilled its potential or represents a wasted opportunity. Any review of effectiveness must be focused positively on problem solving rather than negatively on finding fault if quality control is to be improved. Therefore, Chapter 2 provides a set of effectiveness evaluation criteria relating to the legal basis, structure and procedures of EIA systems. Chapter 2 tests the performance of eight of the most well-developed EIA systems against these criteria and finds that none score full marks. Several generic problem-solving measures are identified relating to scope, report quality, the integration of EIA into decision making, follow-up, public participation and strategic environmental assessment.

The following two chapters focus on the generic structural components which provide the most significant bases for ensuring effectiveness of implementation. Firstly, the building of the capacity of individuals and organizations to perform functions effectively, efficiently and sustainably, not least through training and networking (Chapter 3). Secondly, a consideration of the methods which are, and should be, employed to ensure that quality in EIA is actually delivered (Chapter 4). The formal review of the EIA report forms the most common quality control measure being adopted in different countries and the chapter provides details of specific review packages. However, key questions must also be raised not only about the continuing need for process review of the 'big-picture' type conducted in Chapter 2, but also about the formal and detailed micro or process-specific review.

1: Introduction to Environmental Impact Assessment in Practice: Fulfilled Potential or Wasted Opportunity?

JUDITH PETTS

1.1 DIFFUSION AND INTERNATIONALIZATION

This second volume addresses the issue of environmental impact assessment (EIA) implementation and practice. There is not a sharp divide between the discussions here and those of Volume 1, primarily because it is difficult—arguably inappropriate—to isolate discussion of principles from practice in relation to a decision-making tool. This volume seeks to develop the discussions of Volume 1 and to examine how EIA has become institutionalized worldwide and how it is, and should be, applied to different activities.

EIA has its roots in the concerns about technology advancement which emerged in the 1960s, the links which were being made between industrial activities and adverse public health effects and the evident failure of traditional decision-making tools (not least the narrowly construed cost–benefit analysis) to assist decisions in the new era of uncertainty about human impacts on the environment. In the USA there was concern that the most significant impacts were being caused by government actions and projects. In 1969, the US National Environmental Policy Act (NEPA) provided a new scope and content to cause–effect analysis in that it provided for the first time for a process to determine, not merely to inform, policy. NEPA was the first legislation to require an assessment of the environmental impact of proposals both for legislation and for other major governmental actions which might affect the quality of the human environment. It is pertinent to note that NEPA predated the 1972 United Nations (UN) Conference in Stockholm where global concerns about the state of the environment emerged, an indicator in its own right of the mould-breaking nature of the Act which has been viewed as having the greatest international impact of any American legislation (Caldwell 1998).

There is no doubt that the influence of NEPA on the development and practice of EIA has been significant, its fundamental concepts diffusing globally over 30 years to over 100 countries. Box 1.1 summarizes information on the date of legislative action in some 60 countries (Chapters 2 and 7–12; see also Htun 1988; Sadler & Verheem 1997). Where not mandated by law, administrative structures and ad hoc procedures have been built within other legislation. Within the USA itself, 15 individual states have their own 'little NEPAs' (Chapters 12 and 14), translating and developing federal priorities and objectives into the local context. International agencies have supported EIA, for example the Organization for Economic Cooperation and Development (1992). The multilateral financial organizations have recognized the need for EIA and instigated procedures to assist in the consideration of development funding (Chapter 6). The importance of dealing with transboundary environmental impacts has been recognized through the UN Economic Commission for Europe's Espoo Convention (1991), to which 29 countries are signatories (Chapter 5).

NEPA itself has faced political marginalization, and there have been attempts to abolish its primary controlling agency, the Council on Environmental Quality (Caldwell 1998). However, public and political concerns about the need to protect environmental quality have been sufficient to ensure its survival. This support has underpinned developments in other countries and

Box 1.1 National primary EIA legislative action*

1969	USA
1970	California
1973	Canada
1974	Columbia; New Zealand; Commonwealth of Australia
1975	Thailand
1976	France; Republic of Ireland; Venezuela
1977	Philippines
1978	Luxemburg
1979	China
1981	South Korea
1982	Israel
1983	Pakistan
1984	Croatia; Japan; South Africa
1986	Congo; State of Western Australia
1987	Indonesia; Malaysia; the Netherlands
1988	Mexico; UK
1990	Algeria; Denmark; Guatemala; Norway; Romania; West Germany
1991	Egypt; Luxemburg; Panama; Sweden; Tunisia; Ukraine
1992	Belarus; Belize; Bulgaria; El Salvador; Estonia; Nigeria; Swaziland; Zimbabwe
1993	Albania; Costa Rica; Honduras; Paraguay; Vietnam
1994	Finland; Ghana; Hungary; Namibia; Nicaragua; Russia; Slovakia; Uganda; Uruguay
1995	Armenia; Bolivia
1996	Guyana
1997	Hong Kong; Japan

*Some countries had ad hoc procedures or administrative arrangements prior to the primary legislation—for example, Germany adopted a cabinet resolution in 1985. Other countries currently have administrative procedures or ad hoc EIA arrangements.

institutions, the rigorous project-by-project evaluation of significant impacts inherent in EIA being seized upon as a solution to many environmental problems (Wood 1995, p. 3).

As EIA has diffused worldwide, so its nature has been elaborated and clarified. In those countries with a longer history of adoption, systems have also been extended and revised in the light of experience. EIA has reformed governmental decision-making, by giving information to the public, enhancing interagency coordination and raising the influence of environmental protection agencies (Ortolano & Shepherd 1995). However, as is evident from Box 1.1, EIA is still a relatively new decision-support tool, many countries having less than 10 years' formal experience, and, while positive achievements can be identified in many of the most well-developed systems, there remain many problems of implementation.

Every EIA system is distinctive. Indeed, a positive characteristic of the underlying simplicity of the EIA process is that it allows for adaptive and flexible implementation to meet particular legislative, administrative, social and political circumstances. Control mechanisms vary, reflecting not only the administrative structures of different countries but also their inherent decision-making characteristics (Ortolano & Shepherd 1995): for example, judicial control processes in North America reflect the legislation-orientated culture of the USA; evaluative approaches (e.g. the Netherlands, Canada, Indonesia, Poland), based on independent commissions which scope and then review the EIA, support clearly stated decision-making hierarchies. The UK culture of decision making by discretion and negotiation is reflected in its rudimentary implementation of European Directive 85/337 (Chapters 2 and 12), leaving EIA attached to, rather than integrated into, decision making.

While NEPA has provided such a strong baseline for international development, key questions have been raised in developing economies as to whether the 'western-style' EIA can or should be translated into national procedures, or whether this results in an approach which is too bureaucratic, mechanistic and voluminous (Biswas & Agarwala 1992; see also Chapters 7–10). What is seen to be most important is a national political culture which supports the implementation and application of EIA and recognizes the commitment, administrative and methodological infrastructure and resources (institutional, technical and financial) required to ensure the achievement of the fundamental objectives. Problems arise in relation to political commitment when economic survival still depends upon the overexploitation of natural resources (Chapters 8 and 10) or when the perceived need to encourage investors forces the minimization of development bureaucracy (Chapter 9). However, even with a supporting political and administrative structure, the quality of any particular EIA relies as much upon the quality of the individuals who undertake it as on the adherence to any particular procedure or application. The 'cook-book' EIA performed by poorly trained practitioners, often behind closed doors to meet a basic legal obligation, and viewed merely as one more hurdle to be vaulted on the way to project implementation, is unlikely to achieve the potential benefits of EIA.

EIA is still evolving both as an art and science. Whilst the early focus was upon the methods of impact prediction, systems in the developed countries in particular are now focused more upon improving the procedures of application, not least addressing the integration of EIA into broader, environmental decision-making processes. In the European Union (EU), for example, EIA as part of siting could be integrated into the pollution control regime through the Integrated Pollution Prevention and Control Directive's suggestion that a single assessment for development planning and operational permitting should be possible (Commission of the European Communities 1996).

Some form of strategic assessment is now recognized as a necessary precursor to project and site-specific development, albeit that formal implementation, not least in most developing and transitional economies, is still awaited. At the time of writing there is an evolving draft European Directive on strategic environmental assessment (SEA) (Commission of the European Communities 1997). Although legal systems which provide for policy environmental assessment are emerging slowly (e.g. in Canada and New Zealand—Chapter 13), concerns have been expressed about an overly simplistic view of how decisions affecting the environment might 'tier down' from policies to plans to projects (Boothroyd 1995; Sadler & Verheem 1996; Chapter 4, Volume 1). Certainly, the SEA discussions in Europe have encountered concerns about cost and a lack of appropriate techniques. However, there are clear arguments that 'something is better than nothing' and practical experience in the UK of partial assessments in relation to plans is encouraging (Thérivel 1998).

However, the most significant questions relate to the heightened expectations of EIA as a key component of sustainable development planning. The sustainable development concept supports both economic development and environmental protection; therefore it is clear that EIA could play a valuable role in informing decisions where an appropriate balance between these two potentially irreconcilable objectives must be addressed (see Chapter 2, Volume 1 for a discussion). This requires attention not only to the much earlier integration of EIA into project design and the consideration of alternatives (as mandated in the USA—Chapter 13) but also to improving methodologies (not least of cumulative affects assessment; see Chapter 18, Volume 1).

Perhaps one of the biggest problems in terms of the application of EIA to sustainable development decisions lies not merely in process deficiencies but in the fact that the ideas and terms of sustainable development are still primarily only in common usage amongst policy elites and have yet to be translated into procedures and practice. This will require, for example, sustainable development criteria which can underpin the predictive and evaluative elements of the EIA process and which derive public support having been formulated themselves by a consensus-building process.

1.2 MEASURING EFFECTIVENESS

The literature on EIA is large. Methodologies have dominated the discussions, reflecting its technocentric roots. Consideration of the political, legislative and procedural development in different countries and institutions, not least through the international effectiveness study (Sadler 1996), and of the application of EIA to specific decisions has not been entirely absent. However, there remains an apparent antipathy to evaluation of practice, not least its actual effects, although to a lesser extent in the USA and Canada than in many other countries. In other words, we still do not understand fully whether EIA is fulfilling potential or wasting opportunity.

This is not peculiar to EIA, it bedevils all decision-making activities. Evaluation can produce uncomfortable results, with consequences for individuals as much as decisions if problems or failures are identified. The process of evaluating effectiveness can be expensive. Legislative systems and procedures are often only open to evaluation if there is significant lobbying or if they are part of the implementation process (as in the case of the implementation of the European Directive). EIA systems themselves have been premised on the principle of prevention through the identification and prediction of impacts. Follow-up is lacking in many systems; therefore the evaluation of the influence of EIA on the action undertaken provides for little understanding of the effectiveness of the process and of mitigation measures (see Chapter 11, Volume 1).

Effectiveness has been defined as something which works as intended and meets the purpose for which it was designed (Sadler 1996, p. 37). Chapter 1 in Volume 1 sets out the objectives of EIA. This volume considers effectiveness at three levels: (i) internationally, in terms of a comparative assessment of the achievement of international environmental objectives; (ii) nationally (or within an organization), in terms of the performance of a system by reference to the policy and institutional functions which EIA is designed to serve; and (iii) at the micro or process-specific level, in terms of the contribution of EIA to the decision being made. Key questions are immediately raised as to who should conduct the evaluation, the transparency and openness of the findings and perhaps most importantly the extent to which revealed deficiencies can be rectified. Evaluation must not be a purely academic exercise, it has to be relevant and of immediate practical value to the parties concerned.

The first requirement of evaluation is an agreed set of criteria of effectiveness. The concept of agreement between all interested parties (political, legal, regulatory, development, public) is considered important and how this can be achieved perhaps presents one of the greatest challenges as we move into the new millennium. As discussed in Chapter 8 , Volume 1, in relation to criteria of the effectiveness of public participation, there is a need to consider both outcome and process objectives as well as short- (e.g. development consent) and long-term (e.g. sustainable development) objectives.

Criteria are presented in this volume to consider the evaluation of EIA systems (Chapter 2). The criteria relate to:

- *clarity* of legal provisions;
- *comprehensiveness* in terms of coverage of significant environmental actions and impacts;
- *transparency* of decision making;
- *openness* in terms of opportunities for public participation and review and understanding of the decision;
- *efficiency* in terms of cost and time;
- *robustness* of assessment and quality of the EIA report.

Evaluation of specific assessments is addressed through formal and informal review regimes (Chapter 4), where quality of process and product (i.e. EIA report) in a specific decision context are important. Here, perhaps even to a greater extent than evaluation of EIA systems, the criteria of quality or effectiveness of different parties become important. EIA can never be a neutral process, it is a 'civic' science (Lee 1993) where perceptions and values and social and economic priorities determine outcomes as much as the data and methods of impact prediction. When considering a process which contributes to sustainable development objectives, key questions relate to whether alternatives are identified and analysed (the heart of the NEPA process—Chapter 11) as opposed to the predetermined alternative being justified, and whether plan and project proposals are actually being altered as a result of the process with provision for understanding the effectiveness of any mitigation put in place. The ultimate question must be: 'Does EIA make a difference to improving environmental quality?' Some countries have had a relatively long history of EIA application but significant environmental problems remain (Chapter 8).

1.3 EXPERIENCE AND PRACTICE

The final part of this Handbook discusses practice in relation to policies, plans and specific types of projects. The objective is to address both the range of current practice and the utility of the EIA process. The book offers substantive illustrations of EIA under conditions of differing institutional arrangements but also points to elements of best practice in the light of developing institutional and social pressures.

EIA literature has often focused more on the generic process and methodologies as opposed to consideration of application to specific issues and projects. EIA has always, of course, been presented as an all-embracing tool which should be able to be applied to any project. This has advantages in terms of allowing everyone to unite under the one banner supporting its use across a large range of development decisions and in promoting broad and general understanding of the process and its requirements. However, it can suggest a commonality of approach, which means that a proponent can simply take the last EIA for their type of project off the shelf and, with a few judicious word changes, present a similar case for their development (Chapter 17). A focus on methodologies of impact assessment, as opposed to the processes of participation, communication, review, etc., encourages such an approach. However, EIA has to be more than just a group of media-specific chapters bound together in a cover (Chapter 7).

At the strategic level, policy assessment is slowly emerging, the inherent complexity and diffuseness of decision-making compounding the problems of attempting to integrate assessment in the traditional sense of project EIA (Chapter 13). At the next level down, the more focused and procedural plan-making process is more widely practised but is seen to be dependent upon the ability of the lead agency to provide an effective coordinating function between the different elements of interest. The well-embedded assessment process in US plan making provides a significant example of the potential of SEA (Chapter 14).

At the project level, the discussion focuses on a number of sectors where development proposals are often contentious: energy, waste, road and rail, mining and water resources. Projects in these sectors often raise fundamental questions of need as well social inequity: issues which are often only allowed to surface in the public domain at the project level. In several of the sectors, other common features are the long timescales of operation, the scope for new impacts to become evident over the life of a specific project and the interrelationship with regulatory regimes which control operations. EIA which is focused on pre-project assessment rather than integrated into the operational phase potentially wastes opportunities for environmental protection to be enhanced (Chapters 15, 17 and 18). Environmental management plans (Chapters 17 and 18) developed during the EIA and with public participation can serve not only to identify required mitigation, but also to provide a strong basis for eventual closure or decommissioning. When integrated into the operational phase, the plan provides for a monitoring link to address the effectiveness of the EIA as well as for appropriate adaptation of operation and implementation of new mitigation measures, as required.

A number of the projects discussed in this final part of the Handbook display variable spatial and temporal impacts, with a huge complexity of indirect and cumulative effects, not least those associated with releases to air and water (waste, road and energy projects, in particular). Where EIA is focused on a single site, rather than integrated into an environmental management regime which envelops the strategic questions of need, the consideration of alternatives, the site-specific assessment and the operational phase, there is less scope to address and mitigate cumulative impacts from different sources.

Many large-scale infrastructure and utilities-related projects have traditionally been the subject of cost–benefit analysis, not least road and rail, energy and water resource projects (Chapters 16, 17 and 19). Significant deficiencies have arisen when, at the strategic planning level, environmental effects have not been given an equal consideration to those of costs, as there is no doubt that in practice EIA does lead to the addition of mitigation and compensation measures to design and implementation (even if limited) and provides a more informed and consistent platform for public participation.

In each of the five sector chapters, public participation is presented not only as a means of improving the scientific and technical process of identifying and assessing significant impacts, but also as a means of dispute resolution, shifting the emphasis from the courts and administrative hearings to achieving acceptable decisions. Chapter 17 discusses a new form of collaborative and cooperative EIAs in this regard.

1.4 CONCLUSIONS: FULFILMENT OR WASTED OPPORTUNITY?

Arguably it is naive to hope that EIA could have fulfilled its NEPA-based promises when so many national systems have only been in place for such a relatively short space of time across such a diverse range of political systems, in countries with differing economic priorities and, more importantly, when the expectations themselves have developed in the midst of the expanding policy and institutional regime in which EIA now sits. There is clear evidence that EIA has ensured that the environment is part of development decisions and that impact mitigation is addressed. Some of the best practice EIAs referred to in this volume provide examples of a process which does improve the openness, comprehensiveness, transparency and robustness of environmental decision-making.

However, effective EIA practice is still profoundly affected by the attitudes and capabilities of those who take, and those who seek to influence, decisions. There is little doubt from the examination of practice that, worldwide, key integrative opportunities are still being wasted. These can be classified in terms of:

- an integrated definition of the environment which recognizes the complex physical and emotional relationship between humans and the environment;
- an integrated approach to decision making which does not isolate projects from the key policies and strategies which affect their implementation;
- the opportunities afforded by EIA as an integrative framework incorporating different decision tools (cost–benefit analysis, life-cycle assessment, etc.), as appropriate;
- the integration of pre-project prediction into operational control and management.

The old adage that action speaks louder than words has never been more appropriate. It is very easy to see great potential in the theory of EIA as a sustainable development tool. Indeed, the ability to do this is important if it is to be 'sold' to the doubters. However, we must examine and evaluate real systems and practice more closely if we are to identify the actual barriers and the realistic (political, social, economic and technical) opportunities for the optimization of the tool.

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2: Comparative Evaluation of Environmental Impact Assessment Systems

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2.1 INTRODUCTION

Environmental impact assessment (EIA) is more than 25 years old. Born in the USA, it was initially ignored and then (in turn) caused great disturbance and antagonism, began to change people's lives for the better, settled down, learned from experience and became respectable. The use of EIA has burgeoned over the last quarter of a century and EIA has now established itself around the world as a vital environmental management tool. Despite its undisputed utility, there is no doubt that EIA practice often leaves much to be desired. A comparison of EIA systems should enable lessons to be drawn from one system which can be applied to others. The purpose of this chapter is to use the findings of an evaluation of eight EIA systems to suggest ways of improving the effectiveness of EIA.

Whilst not all EIA systems specify every step, the cyclical EIA process emanating from the US National Environmental Policy Act 1969 (NEPA) and subsequently diffused around the world can be represented as a series of iterative steps:

- Consideration of alternative means of achieving objectives.
- Designing the selected proposal.
- Determining whether an EIA is necessary in a particular case (screening).
- Deciding on the topics to be covered in the EIA (scoping).
- Preparing the EIA report (i.e. *inter alia*, describing the proposal and the environment affected by it and assessing the magnitude and significance of impacts).
- Reviewing the EIA report to check its adequacy.
- Making a decision on the proposal, using the EIA report and opinions expressed about it.
- Monitoring the impacts of the proposal if it is implemented.

A representation of the EIA process is presented in Fig. 2.1. In addition, most EIA systems require the mitigation of environmental impacts together with consultation and public participation. Many EIA systems also contain provisions for monitoring the system itself, which can assist in taking an informed view of its costs and benefits. Some EIA systems also require a form of strategic environmental assessment (SEA) (i.e. they apply to policies, plans or programmes).

This chapter commences with a summary of the trends in EIA practice which have been manifest since 1970. It then presents a brief description of the EIA systems in the USA, California, the UK, the Netherlands, Canada, the Commonwealth of Australia, Western Australia and New Zealand. A set of evaluation criteria against which the performance of any EIA system can be tested is suggested. The main part of the chapter consists of two sections analysing the performance of the eight EIA systems against the 14 evaluation criteria. The first reviews the overall performance of each EIA system in turn, summarizing their main strengths and weaknesses. The second analyses the performance of all the EIA systems against each criterion by highlighting both general EIA system weaknesses and those of particular EIA systems. The discussion of certain evaluation criteria is supplemented by reference to the performance of aspects of various European EIA systems. Finally, suggestions for improving the effectiveness of EIA are advanced (Wood 1994, 1995).

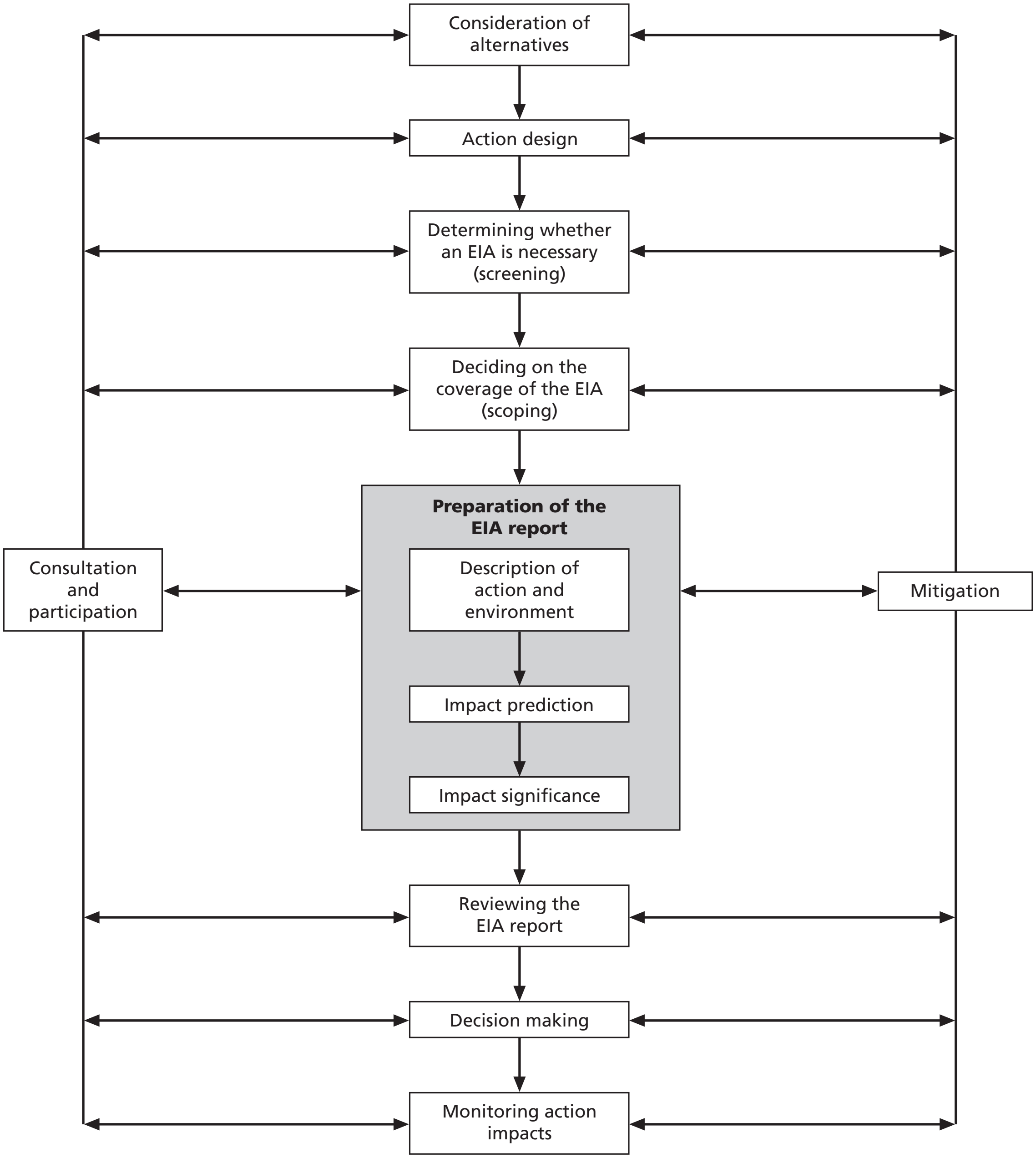

Fig. 2.1 The environmental impact assessment (EIA) process.

2.2 TRENDS IN ENVIRONMENTAL IMPACT ASSESSMENT PRACTICE

As EIA has spread, so has its nature been elaborated and clarified. EIA systems are frequently modified. For example, a recent study of eight European Member States revealed that all of them had taken legislative, procedural or guidance measures to modify (refine) EIA procedures, although not all the measures were classed as 'major' (Wood *et al.* 1996). In practice, while many of these measures could be classified as being designed to ensure the integration of authorization and EIA procedures, very few were simplifying measures. The measures include: provisions to improve screening, scoping, EIA report preparation, decision-making, monitoring and consultation and public participation; guideline preparation; and time limitation. The various measures taken were intended to improve the quality of the EIA practice and some appear to have already done so. Sadler (1996, p. iii) reported that, worldwide, about two-thirds of jurisdictions had either made changes, or were proposing changes, to their EIA systems.

There have been, perhaps, six main themes as EIA has evolved over the years (Wood 1995). These are evident both in the eight EIA systems described above and more generally (Sadler 1996):

1 An early concern with the methodology of impact forecasting and decision-making gave way first to an emphasis on administrative procedures for EIA and then, more recently, to a recognition of the crucial relationship of EIA to its broader decision-making and environmental management context.

2 A tendency to codification and away from discretion. This is evident in the USA graduating from the use of guidelines to regulations and in the enactment of federal Canadian EIA legislation after almost two decades of experience with administrative EIA procedures.

3 The refinement of EIA systems by the adoption of additional elements as experience has been gained. These include procedures for determining the coverage of EIAs (scoping) (first in the USA and then in, for example, Australia) and for monitoring the effects of implemented actions (for example, in California and Western Australia).

4 A concern to increase the quality of EIA by, for example, improving EIA reports, providing more opportunities for consultation and participation and increasing the weight given to EIA in decision-making.

5 A concern to increase the effectiveness of EIA in reducing environmental impacts and/or improving mitigation or compensation measures and to ensure efficiency in terms of its costs in time, money and manpower.

6 A recognition that many variables are already resolved by the time the EIA of projects takes place and thus that some form of EIA of policies, plans and programmes (SEA) is necessary.

2.3 THE ENVIRONMENTAL IMPACT ASSESSMENT SYSTEMS

The USA possesses the original 1970 EIA system and has often been a pointer to the future elsewhere. Many of the problems currently facing, for example, the UK in improving the quality of EIA have, over the years since 1970, been apparent in the USA and attempts have been made to resolve them which are relevant to experience elsewhere. Such pointers include the introduction of scoping in the late 1970s and the formal review of environmental impact statements (EISs) (Mandelker 1995; Canter 1996; Clark & Canter 1996).

The Californian state EIA system is, after the NEPA process, the oldest in the world, becoming operative in 1971. It is much modified from its original form. It applies not only to state permits and developments, but to local permits. Hundreds of environmental impact reports (EIRs) are prepared each year, frequently by consultants retained by local authorities at the developer's expense. In many ways, the Californian EIA system is more directly comparable with that in, for example, the UK than is the federal EIA process, since it is largely locally administered and is closely integrated with the land-use planning system. It differs from the NEPA process, upon which it is modelled, in several important respects (Bass *et al.* 1996).

The UK is the last of the eight jurisdictions to have introduced a formal EIA system, and the only one to have done so with initial reluctance, as a response to the European Directive on EIA (Commission of the European Communities 1985), which has since been strengthened (Commission of the European Communities 1997a). Comparison of the UK's 1988 system with longer-established, more mature, EIA systems provides a valuable insight into the remedies for problems which are already apparent, many of which have been experienced elsewhere. EIA reports for projects approved under planning legislation are evaluated by local planning authorities prior to the grant or refusal of planning permission (Department of the Environment 1989; Glasson *et al*. 1994; Sheate 1996). Similar procedures apply to the minority of projects subject to other EIA regulations.

The Netherlands is generally acknowledged both in Europe and throughout the world as having a sophisticated system of environmental controls, including an EIA system regarded by many observers as the most effective in Europe. The Netherlands, following numerous studies, had already almost put its EIA system in place when the European Directive on EIA was adopted. The influential EIA Commission is formally involved both in scoping and in EIA report evaluation (Commission of the European Communities 1993).

The Canadian federal environmental assessment (EA) system was established in 1973 and has been refined substantially over the years. It provided the model for the Netherlands EIA system and, in particular, for the Dutch use of EIA Commission-administered panels to review EIA reports. The introduction of formal environmental assessment review process (EARP) guidelines in 1984 was followed in 1992 by the Canadian Environmental Assessment Act (CEAA). The provisions of this Act (and several sets of detailed supporting regulations) establish a formal and tightly prescribed second-generation EIA system and have been supported by considerable financial and manpower resources and a substantial research programme (Gibson 1993).

Formal provisions for EIA in the Commonwealth of Australia date from 1974. The requirements of the EIA system are derived, with amendment to avoid frequent recourse to the courts, from NEPA. The Commonwealth procedure has evolved over the years and has been the subject of a remarkable number of evaluations and reviews, especially during the last few years. Nevertheless, like NEPA, the Commonwealth EIA procedure remains largely unchanged with the significant exception of the addition of scoping (Thomas 1996).

The state of Western Australia enacted explicit EIA provisions in 1986. Widely perceived as a comprehensive and effective EIA system, Western Australia's EIA process is of particular comparative interest for three reasons. First, there exists an independent Environmental Protection Authority (EPA) which administers and reports on EIA. Second, the environmental decision is central to the authorization of new proposals: it overrides all other permits. Third, the Western Australian EIA system places very heavy emphasis on environmental monitoring and management once proposals have been implemented. It is probably a testament to the strength of the 1986 EIA system that, in contrast to trends elsewhere, some provisions have been weakened as a result of political pressure following a change of government (Wood & Bailey 1996; see also Chapter 7, Volume 1).

New Zealand first introduced EIA procedures by means of a cabinet minute in 1974, the same year as the Commonwealth of Australia. After very considerable debate, environmental management in New Zealand generally (and EIA in particular) was revolutionized in 1991. One of the aims of this far-reaching reform was 'sustainable management'. EIA is now inextricably interwoven into regional and local authority procedures for determining various types of applications (Bartlett 1997). EIA in New Zealand is thus largely locally administered (as in the UK and in California) and has become almost infinitely flexible in its application (Montz & Dixon 1993).

2.4 SYSTEM EVALUATION CRITERIA

There has been, as yet, no reliable quantification of the effectiveness of EIA. It may be that this is not possible. As the US Council on Environmental Quality (CEQ) (1990, p. 15) has stated:

> Because NEPA was not designed to control specific kinds or sources of pollution, its benefit to society is difficult to quantify. The act was designed primarily to institutionalize in the federal government an anticipatory concern for the quality of the human environment, that is, an attitude,

> a heightened state of environmental awareness that, unlike pollution abatement, is measurable only subjectively and qualitatively.

Bartlett and Baber (1989, pp. 148–9) endorsed the difficulty of empirically examining the effects of EIA on decision-making within organizations: 'for that reason, it may be more desirable to judge the impact of impact assessment on bureaucratic decision-making by examining the attitudes and opinions of those immediately responsible'.

Whilst the difficulties of reaching an objective overall judgement about any EIA system are apparent, there is a need for an evaluative framework for comparing the formal legal procedures, the arrangements for their application and practice in their implementation in EIA systems. This evaluative framework could be provided by analysing the extent to which various principles are met by EIA systems. Such principles might, for example, be based upon NEPA provisions, upon the requirements of the European EIA Directive, or upon the more detailed EIA principles for assessing authorities, for proponents, for the public and for government put forward by the Australian and New Zealand Environment and Conservation Council (1991). Amongst the most rigorous examples of the use of this type of evaluative framework is Gibson's (1993) analysis of the Canadian federal and Ontario EIA systems.

The Canadian Environmental Assessment Research Council (1988, pp. 1–2) advanced the following criteria for evaluating EIA:

> An EIA may be considered *effective* if, for example:
>
> - information generated in the EIA contributed to decision making;
> - predictions of the effectiveness of impact management measures were accurate; and
> - proposed mitigatory and compensatory measures achieved approved management objectives.
>
> *Efficiency* criteria are satisfied if, for example:
>
> - EIA decisions are timely relative to economic and other factors that determine project decisions; and
> - costs of conducting EIA and managing inputs during project implementation can be determined and are reasonable.
>
> *Fairness* criteria are satisfied if, for example:
>
> - all interested parties (stakeholders) have equal opportunity to influence the decision before it is made; and
> - people directly affected by projects have equal access to compensation.

Whilst many of these criteria relate to an individual EIA rather than to EIA systems, they are nevertheless helpful in deriving a set of evaluation criteria for a comparative review.

Sadler (1996, p. ii) suggested that there are:

> four necessary ingredients to the effective application of environmental assessment (EA):
>
> - appropriate timing in initiating the assessment so that the proposal is reviewed early enough to provide scope for development of reasonable alternatives;
> - clear, specific directions in the form of terms of reference or guidelines covering priority issues, timelines, and opportunities for information and input at key decision-making stages;
> - quality information and products fostered by compliance with procedural guidelines and use of 'good practices', and
> - receptivity of decision makers and proponents to the results of the EA, founded on good communication and accountability.

Various alternative approaches for evaluating EIA systems have been advanced (for example, by Hollick 1986). Evaluation criteria are, in effect, shorthand versions of principles for EIA and, carefully articulated, have considerable advantages in terms of brevity and clarity.

The first column of Table 2.1 presents a set of evaluation criteria which are based upon the stages in the EIA process, the aims of EIA and the various evaluation frameworks discussed above. The focus of the criteria is on the requirements and operation of the EIA process. Only the penultimate criterion involves an overall evaluation of the EIA system. For the reasons outlined above, this relies mainly on the opinions of those involved in the EIA process. These criteria can be employed to judge the effectiveness of any EIA system and

Table 2.1 Performance of the EIA systems.

	EIA system performance							
Evaluation criterion	USA	California	UK	The Netherlands	Canada	Australia	Western Australia	New Zealand
1 Is the EIA system based on clear and specific legal provisions?	Yes. National Environmental Policy Act and Regulations clearly define separate EIA system	Yes. CEQA and Guidelines clearly define an EIA process separate from other legal decision-making procedures	Yes. Regulations specifically implement European Directive on EIA. EIA mainly integrated within town and country planning system, administered by LPAs	Yes. EIA Act and decrees specifically provide for clearly defined EIA process integrated into other decision-making procedures	Yes. CEAA and regulations clearly define an EA process largely separate from other decision-making procedures, together with powers of CEA Agency	Yes. Act and Procedures together outline separate EIA system. Considerable legal uncertainty and great discretion in implementation	Yes. Act provides clear, broad, but not detailed, legal basis of separate EIA system	Yes. Act provides clear broad framework for EIA but allows local authorities very considerable discretion in operation
2 Must the relevant environmental impacts of all significant actions be assessed?	Impacts: Yes. Actions: No. Applies only to federal, not state or most private projects: comprehensive coverage of impacts of significant federal actions (including some non-project actions)	Yes. Coverage of both impacts and projects is comprehensive. CEQA applies also to plans and programmes	Impacts: No. Actions: Yes. Comprehensive coverage of projects approved under town and country planning process. Some discretion in impact coverage	Yes. Covers highly significant projects and certain policies, plans and programmes. Indirect and cumulative environmental impacts covered, but not legally specified	No. Artificial limitations on otherwise comprehensive coverage of effects of certain projects possible. Restricted to federal projects and projects requiring federal finance, land or permit	Impacts: Yes. Actions: No. Coverage of impacts potentially comprehensive: includes social, economic and cultural impacts. In practice, coverage of actions confined to certain projects	Yes. EIA system covers nearly all projects and, in principle, other actions	Yes. Act provides for all local authority approved policies, plans and projects to be subject to EIA covering physical environment, social and economic impacts

(*Continued on p. 16*)

Table 2.1 *continued*

Evaluation criterion	EIA system performance							
	USA	California	UK	The Netherlands	Canada	Australia	Western Australia	New Zealand
3 Must evidence of the consideration, by the proponent, of the environmental impacts of reasonable alternative actions be demonstrated in the EIA process?	Yes. Treatment of alternatives required in almost every environmental assessment and lies at 'heart of EIS'	Yes. Full range of alternatives must be evaluated in EIR and a clear justification of choice must be provided	No. No regulatory requirement. Regulations permit consideration of alternatives and guidance advises it. Practice varies	Yes. Alternatives, including the 'no-action' and the environmentally preferable alternatives, must be considered in scoping, the EIA report and the decision	Yes. Treatment of 'alternative means' in comprehensive study, mediation and panel reports but not in screening reports: discretionary provision for 'alternatives to' in all EA reports. Practice varies	Yes. Alternatives must be listed in notice of intention and fully treated in EIA reports. Practice often inadequate	Yes. Formal requirement that alternatives be considered (not always meaningfully, in practice)	Yes. EIA report should contain discussion of alternative locations and methods. Practice often weak
4 Must screening of actions for environmental significance take place?	Yes. Use of categorical exclusions, inclusion criteria and (rarely, in practice) environmental assessments to determine significance of impacts	Yes. Initial study must be prepared and published to determine whether significant impacts are likely based upon guidelines checklist	Yes. Use of lists of projects, indicative criteria and thresholds in screening by LPAs varies	Yes. Lists of activities, thresholds and criteria in EIA Decree allow competent authorities little discretion	Yes. Screening by responsible authority using lists of projects results in 'screening' or comprehensive study. Further screening by Minister can lead to panel review or mediation	No. Provisions for screening and less detailed EIA reports exist but absence of Environment Minister power of direction and of clear criteria lead to uncertainty	Yes. No published criteria but proposal application used to filter nearly all applications and determine type of EIA report	Yes. Local authorities must specify types of and criteria for actions subject to EIA in their policies and plans
5 Must scoping of the environmental impacts of actions take place and specific guidelines be produced?	Yes. Public scoping is used to produce specific guidelines for EISs. Scoping is sometimes used in environmental assessments	Yes. Scoping is mandatory: notice of preparation must be circulated and made available but no requirement to consult public on action-specific guidelines	No. Not a statutory requirement but strongly advised. Frequently takes place but practice varies	Yes. Public scoping process, involving EIA Commission, produces action-specific guidelines for EISs	Unpublished scoping guidelines must be produced for self-directed assessments: action-specific EIS guidelines issued by panels following consultation	Yes. Project-specific scoping guidelines are agreed between proponent and Environment Australia	Yes. Proposal-specific guidelines produced in every case by Environmental Protection Authority. Consultation and participation in scoping varies	No. Scoping is not obligatory, but is very strongly encouraged in the Act. Practice varies

6 Must EIA reports meet prescribed content requirements and do checks to prevent the release of inadequate EIA reports exist?	Yes. Draft EISs are subject to formal checks on required contents prior to publication	Yes. CEQA specifies content of EIR and checks are made by lead agency	Content: Yes. Checks: No. Regulations prescribe content but no formal requirement for proponent to consult or for checks on ES prior to release	EIS is checked against guidelines and EIA Act by competent authority before release for public consultation	Yes. Content prescribed in CEAA and some checks made by federal authorities to limit inadequacy of EA reports (especially EISs)	Yes. EIA reports are checked against project-specific guidelines and vetted by Environment Australia before release	Yes. Checks are made on coverage and content of EIA reports before release	No. Act provides strong guidance as to content but no checks on adequacy of EIA reports before release exist
7 Must EIA reports be publicly reviewed and the proponent respond to the points raised?	Yes. Lead agency must respond to agency and public comments on published draft EIS in final EIS	Yes. Lead agency must respond to all relevant comments on published draft EIR in final EIR	Review: Yes. Response: No. LPA may request further information and proponents usually provide it. Proponents under no duty to respond to comments	EIA Commission reviews the EIS and, where necessary, supplementary information is requested by competent authority	Yes. Discretionary public review of screening reports, public review of comprehensive study reports and extensive public review, with proponent response, of EISs	Yes. Proponent responds in final EIS to relevant points raised on published draft EIS	Yes. Proponent must publicly respond to agency and public comment on EIA report	Yes. Local authority power to commission independent review of public EIA report at developer's expense and to demand more information for notified projects
8 Must the findings of the EIA report and the review be a central determinant of the decision on the action?	No. Explanation of decision and disclosure of environmental effects mandatory. In practice, EIS often influences decision	No. Statement of overriding considerations must be written if project approved, as often happens, with unavoidable significant environmental impacts	No. Environmental information is a material consideration but not necessarily a central determinant. Practice varies	Yes. Explanation of way environmental impacts considered in decision is mandatory. In practice, EIA generally does influence decision	No. Conclusions of self-directed assessment report determine decision: reasons must be given when responsible authority disagrees with recommendations of public review report	No. EIS, suggestions and recommendations must be taken into account but need not determine decision	Yes. Environment Minister's decision is based centrally on EIA and has primacy	No. Act makes EIA central to decision but, in practice, EIA is often not given appropriate weight

(*Continued on p. 18*)

Table 2.1 *continued*

Evaluation criterion	EIA system performance							
	USA	California	UK	The Netherlands	Canada	Australia	Western Australia	New Zealand
9 Must monitoring of action impacts be undertaken and is it linked to the earlier stages of the EIA process?	No. Monitoring essentially discretionary but some requirements where mitigation measures specified in record of decision. Practice often weak	Partially. Monitoring and reporting programmes required where project involves mitigation measures. Practice varies	No. No provision for monitoring. Uncoordinated implementation monitoring takes place under planning and other legislation unrelated to earlier stages in EIA process	Partially. Specific requirements relating to monitoring and comparison with EIS. However, in practice these are often not observed	Partially. Extensive provision for monitoring action effects in CEAA but no mechanism for ensuring full compliance	No. Discretionary provisions exist but, in practice, are seldom employed	Yes. Preparation of environmental management programmes links monitoring to EIA report	No. Duty of local authorities to monitor impacts of projects in Act often not complied with
10 Must the mitigation of action impacts be considered at the various stages of the EIA process?	Yes. Formal requirement to incorporate mitigation measures in record of decision. Effectiveness of implementation varies, but is improving	Yes. Mitigation and its implementation are central to EIA process. Practice varies	ES must cover mitigation and LPAs impose conditions upon permissions to mitigate impacts. Practice varies at various stages in EIA process	Yes. Mitigation is subsumed in treatment of alternatives but is not separately required. Practice often satisfactory	Yes. Mitigation and its implementation are central considerations in EA process. Practice often satisfactory	Yes. Mitigation measures are explicitly provided for at various stages in EIA process. Practice varies	Yes. Mitigation takes place throughout EIA process, from proposal application to environmental management programme	Yes. Mitigation of environmental impacts is one of main purposes of Act. Practice varies at various stages in EIA process
11 Must consultation and participation take place prior to, and following, EIA report publication?	Yes. Consultation and participation takes place at several stages in EIS preparation	Yes. Public participation and consultation take place at various stages in preparing EIRs	Partially. Some voluntary consultation and participation takes place prior to ES and must be undertaken following ES release	Yes. Formal requirements for consultation and public participation in both scoping and review	Partially. Participation and consultation mandatory throughout panel reviews, required following comprehensive studies and discretionary in screenings	Partially. No formal requirement for public participation prior to EIA report, but generally occurs. Agency consultation takes place throughout EIA process	Yes. Several opportunities for consultation and participation, supported by appeal provisions	Partially. Duty to consult following EIA report publication, local council strongly recommended to require developer to consult earlier

12 Must the EIA system be monitored and, if necessary, be amended to incorporate feedback from experience?	Yes. Council on Environmental Quality is charged with general oversight of EIA implementation. Numerous reviews undertaken and amendments made	No. Little system monitoring but frequent amendments made to CEQA	No. No formal general requirement to monitor but some records published. EIA system review undertaken, and changes made to improve operation	Yes. EIA Commission prepares annual report and comprehensive quinquennial EIA system review is undertaken	Yes. CEAA contains five-year review requirement and public registry facilitates monitoring of EA system	No. No formal requirement for monitoring or periodic review but reviews undertaken. Records of EIA reports maintained	Yes. Monitoring takes place and frequent modification made to EIA system. Quinquennial review requirement	No. Duty to monitor operation of Act as a whole but not to collect data, review or amend EIA system
13 Are the financial costs and time requirements of the EIA systems acceptable to those involved and are they believed to be outweighed by discernible environmental benefits?	Virtually unanimous view by proponents, consultees and the public that benefits of EIA exceed its substantial time and other costs	Yes. Costs and time requirements high but outweighed (for most participants) by improved project mitigation measures	Yes. Consensus (but not unanimity) as to utility of EA in improving project mitigation measures	Yes. Virtually unanimous belief that benefits of EIA outweigh its financial and time costs	Yes. Costs and (especially) time requirements of panel reviews under previous EA system often high but significant mitigation has occurred; benefits of initial assessment less clear. Net benefits of new EIA system should be greater	Yes. Complaints about uncertainty and delays generally outweighed by belief that EIA delivers real environmental benefits	Yes. Clear consensus as to benefits of EIA but criticism of time requirements	Yes. Virtual unanimity of view that benefits of EIA system outweigh costs but considerable unfamiliarity remains
14 Does the EIA system apply to significant programmes, plans and policies, as well as to projects?	Yes. Act provides clear legal provisions for SEA. SEA practice developing steadily; several hundred programmatic EISs prepared	Yes. 1971 Act interpreted to include provisions for SEA. SEA practice developing steadily (several hundred land use plan EIRs prepared)	No. No formal requirement for SEA. Guidance on environmental appraisal of both central government policy and local land use plans exists. Some practice	Yes. Decree defines 'proposal' to include certain policies, plans and programmes. Growing SEA practice	No. Non-legislated SEA process applies to Cabinet and other proposals. SEA research and guidance commissioned but little SEA practice	No. 1974 Act provides SEA powers but no SEA reports prepared. Commitment to undertake SEA of policies and programmes in future	Yes. 1986 Act provides clear legal provisions for SEA. Practice developing, with a few SEA reports prepared	Yes. 1991 Act requires SEA of certain regional and local policies and plans. Some guidance. Practice developing but varies

CEAA, Canadian Environmental Assessment Act; CEQA, California Environmental Quality Act; EA, environmental assessment; EIR, environmental impact report; EIS, environmental impact statement; EPG, Environmental Protection Group; ES, environmental statement; LPAs, local planning authorities; SEA, strategic environmental assessment.

to enable an international comparison between EIA systems to be made. Such a comparative review provides the basis for suggesting how the effectiveness of EIA can be improved, a goal which is attracting considerable interest (Sadler 1996).

2.5 PERFORMANCE OF THE ENVIRONMENTAL IMPACT ASSESSMENT SYSTEMS

Table 2.1 presents a précis of the overall performance of the eight EIA systems against the evaluation criteria. This section of the chapter briefly reviews the main features of each EIA system.

2.5.1 The USA

The US EIA system meets 11 of the 14 evaluation criteria and partially meets another. The main shortcomings of the system relate to its coverage (which is confined to federal actions), to lack of centrality to decision-making (notwithstanding the requirement to publish a 'record of decision') and to the mitigation and monitoring of impacts. Other weaknesses relate to the lack of oversight of 'environmental assessments', to lengthy descriptive and derivative environmental impact statements (which neglect the treatment of cumulative impacts) and to the court-driven procedural nature of the system. Because the system is operated by federal agencies, the general level of expertise is high but there is still a perceived need for training and guidance (Clark 1993). The roles of the CEQ, of the Environmental Protection Agency and of public interest groups in maintaining and refining the system and in ensuring that federal agencies perform are pivotal (Clark & Canter 1996).

Broadening the coverage of NEPA to cover state or local, rather than federal, actions would provoke a constitutional outcry. However, increasing the centrality of EIA to the decision-making process could be achieved by amending NEPA to require that an action could only be taken if all feasible mitigation measures were included in the proposal (Blumm 1990). Further improvements would include strengthening SEA, public participation, agency consultation, interdisciplinarity and adaptive environmental management and ensuring that EISs and environmental assessments are made shorter and more readable and thus accessible to decision makers (Council on Environmental Quality 1997b).

2.5.2 California

The Californian EIA system meets most of the evaluation criteria. Despite its many successes the frequently modified California Environmental Quality Act (CEQA) has a number of weaknesses:

- Lack of centrality to decision-making on projects.
- Over-long and descriptive EIRs.
- Weaknesses in project monitoring.
- Marked absence of EIA system monitoring and system evaluation.
- EIA system overly bureaucratic and slow, driven by legal defensibility.

The problems of lengthy and sometimes somewhat irrelevant EIRs have been overcome to some extent by modifications to the guidelines and by the use of experienced consultants. The principal system deficiencies probably lie in the lack of training in EIA and in the lack of knowledge of detailed procedures exhibited by many of the local government officials appointed to oversee the EIA process. There is still scope for speeding up the assessment process and for improving the relevance of EIRs. The role of citizens' groups in monitoring the process and ensuring that EIRs are of adequate quality is crucial.

Improvements in the training of and in guidance to local government officials could reduce the overly bureaucratic approach to EIA. Learning from previous experience would be much improved in California if better EIA system monitoring were carried out, perhaps following the example of the federal CEQ. Certainly, more resources are needed to manage and monitor the Californian EIA system effectively.

2.5.3 The UK

The UK's EIA system fully meets four and partially meets another four of the 14 evaluation criteria employed in this comparative review. It performs worst of all the eight EIA systems.

The UK is probably a fairly typical first generation EIA system, with screening, environmental statement (ES) publication and public participation provisions integrated into existing town and country planning decision-making processes, but without scoping, early participation, unpenalized rights to further information, true centrality of EIA to the decision, third party appeal or monitoring provisions. Obviously, experience of EIA is being gathered by local planning authorities (LPAs), developers and consultants as time elapses and the diffusion of good practice takes place, especially in regard to ESs (Lee & Brown 1992; Glasson *et al.* 1996).

The shortcomings of the UK EIA system relate to: (i) impact coverage; (ii) the consideration of alternatives in design; (iii) scoping; (iv) the proponent's response to public comments; (v) the use made of EA in decision-making; (vi) project monitoring; (vii) consultation and participation; (viii) formal system monitoring; and (ix) SEA (see also Glasson *et al*. 1994; Sheate 1996). They are a reflection of the UK's implementation almost to the letter of the somewhat rudimentary compromise requirements of the European Directive (Wathern 1988). In these and other aspects of the EA process practice varies very considerably, from the exemplary to the unprofessional.

Despite improvements in practice over time, continuing shortcomings mean that the aims of EA, i.e. better quality project planning and better quality decision-making, are not being universally achieved. Some of these shortcomings should be overcome by measures to implement the revision to the European directive on EIA (Commission of the European Communities 1997a). These include strengthening the treatment of alternatives, clarifying and publicizing screening criteria, providing for optional scoping and for the making public of reasons for decisions and of mitigation measures (Department of the Environment, Transport and the Regions 1997).

However, if practice subsequently fails to improve sufficiently, then the EA system itself will need to be strengthened, as has happened over the years in the more mature EIA systems discussed in this chapter, which now satisfy far more evaluation criteria than does the UK's.

2.5.4 The Netherlands

The Dutch EIA system meets almost every one of the evaluation criteria utilized in this review. The only criterion which is not met relates to monitoring and even here the legal provisions meet the criteria: it is practice which falls short. On the other hand, the mitigation of environmental impacts is not separately specified in the law but there appears to be no inherent weakness in the treatment of mitigation in the EIA system. Mitigation is subsumed under the very extensive coverage of alternatives in the Dutch EIA system and, in particular, in the environmentally preferable alternative. However, since Article 5(2) of the European EIA Directive requires the EIA report to include 'a description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects' (Commission of the European Communities 1985), it is somewhat surprising that the omission of mention of mitigation measures in the Dutch EIA legislation persists.

Significant omissions in the implementation of the monitoring and auditing provisions of the Environmental Management Act 1994 exist. It would assist the operation of the EIA system, and the knowledge base for EIA, if these provisions were strengthened. This would improve the feedback of knowledge into the EIA system, where weaknesses in utilizing previous experience are apparent. This is, perhaps, symptomatic of the failure, in some instances, fully to integrate the results of the EIA into the proponent's own planning and project development at a sufficiently early stage genuinely to influence project design. It may also reflect the willingness of the competent authorities to leave too much of the operation of the EIA process to the increasingly influential EIA Commission and not to make EIA truly central to their decisions.

Improvements in the effectiveness of the Dutch EIA system have taken place as a result of recent changes to procedures, including broadening the types and numbers of activities subject to EIA. However, while the Evaluation Committee on EIA found that 'EIA is an instrument which functions reasonably well' (Evaluation Committee on the Environmental Management Act 1996, p. 8), it concluded that the procedure was lengthy, often required excessive volumes of information and sometimes had little effect on decisions.

2.5.5 Canada

The Canadian system delineated by the recent CEAA meets many of the evaluation criteria used in this review. The main weaknesses of this second generation federal EA system are:

- limitations of coverage to federal actions;
- interjurisdictional limitations on the coverage of environmental effects;
- marked distinction between likely effectiveness of screening and panel review procedures;
- lack of means for ensuring that EA centrally influences decisions;
- lack of effective mechanism for ensuring compliance with mitigation and monitoring requirements;
- lack of formal SEA requirement.

Gibson (1992) also identified deficiencies relating to alternatives, coverage of socio-economic and cultural impacts and screening and felt that CEAA was too discretionary. Under the previous EIA process, panel reviews have generally been seen as providing an excellent means of cooperatively identifying and mitigating the environmental effects of a handful of projects. Screening, on the other hand, has been seen as a largely clandestine and ineffective means of assessing the effects of the vast majority of projects. The panel review has been an elaborate 'ice castle' constructed on an assessment iceberg, nine-tenths of which has been submerged in cold, impenetrable waters.

There are varying views on the extent to which CEAA will lead to improvements in EA practice in Canada. On the one hand, the problems of lack of environmental political clout at federal Cabinet level and of disagreement with the provinces about the extent of federal jurisdiction in environmental matters remain. On the other hand, CEAA contains provisions for bilateral agreements and for determining when comprehensive studies will be undertaken. These allow more intervention by the Minister of the Environment and expose much more of the EA system to public scrutiny than the previous EIA system. The CEAA provisions provide a much firmer foundation for the construction of an effective EA system than those they replace, notwithstanding their weaknesses. Much will depend on the efforts and resourcefulness of the Canadian Environmental Assessment Agency and on the growing influence and expertise of environmental professionals within the responsible authorities and proponent organizations. Above all, however, the strength of the CEAA system depends upon the bedrock of public environmental concern and vigilance.

2.5.6 Commonwealth of Australia

This EIA system fully meets half the evaluation criteria and partially meets another two. The main weaknesses relate to coverage, screening, decision-making, monitoring, public participation, system monitoring and SEA. Apart from these, several criticisms have been made of the legal basis of the system, scoping, review, uncertainty (principally caused by the use of discretion, duplication of rules between the Commonwealth and the states, changes of rules, etc.) and delay (Bureau of Industry Economics 1990; Australian and New Zealand Environment and Conservation Council 1991).

Although there are no firm proposals to strengthen the legal basis of the EIA system, a large number of suggestions for overcoming the identified weaknesses has been advanced. In particular, the enforcement of time limits (Bureau of Industry Economics 1990), the use of government project coordination units (Kinhill and Phillips Fox 1991) and the use of a national approach to EIA (see, for example, Australian and New Zealand Environment and Conservation Council 1991), especially in relation to screening (Australian and New Zealand Environment and Conservation Council 1996), have all been proposed.

In response to these latter suggestions, the 1992 Intergovernmental Agreement on the Environment (Commonwealth Environment Protection Agency 1992) stated that time schedules for all stages of Commonwealth and state EIA processes would be set for proposals and that the Commonwealth would accredit state EIA systems, thus removing much of the remaining need for joint working on EIA. The comprehensive public reviews of the Commonwealth EIA system which have taken place could well have resulted in measures to resolve many of these shortcomings (Environment Protection Agency 1994). Although some agreement has been reached on screening (Australian and New Zealand Environment and Conservation Council 1996), the crucial measure—increasing the centrality of EIA to decision-making—would require both public and political will, as well as strengthening of the Environment Protection (Impact of Proposals) Act. The latter appears to be unlikely, following a reduction in the staffing and status accorded to EIA as a result of the change of government in 1996.

2.5.7 Western Australia

There is no doubt that the much-refined second-generation Western Australian system codified in the Environmental Protection Act 1986 contains the vast majority of the characteristics of an effective EIA system. It is the only EIA system of the eight to meet all the review criteria. The difficulty of defining unambiguous and absolute criteria of EIA effectiveness is illustrated by the fact that the Western Australia EIA system still has several weaknesses. The principal weaknesses relate to lack of formal treatment of alternatives and lack of formal provision for a written proposal application. Other shortcomings include: unsatisfactory quality of some EIA reports; lack of oral representations and of fair appeal procedures; delays in decision-making; and lack of coordination with land-use planning decisions. Various measures have been implemented to overcome many of these deficiencies and others are proposed (Department of Environmental Protection 1997).

For some participants in the development process, the predominance of EIA in the decision-making process and the independence of the EPA have also been weaknesses of the Western Australian EIA system. Although EPA was careful to exercise its powers judiciously, there have been great pressures for change, not least from land-use planners, who have found it hard to adjust to EPA's EIA powers, and from developers, who have resented what they perceived to be burdensome environmental regulation. The weakening of EPA's independence and powers, especially in relation to planning projects, in 1993 and 1996, following a change of government in Western Australia, and against the advice of the Independent Advisory Committee (1992), is perhaps a reflection of the strengths of the Western Australian EIA system. These, nevertheless, remain very significant (Wood 1997).

It is apparent that the primacy of the environmental decision *does* make a difference when it is linked strongly to measures for implementing the conditions laid down in approvals. EPA has stated that the 1986 Act, by codifying the EIA process and ensuring that the environmental considerations did not merely influence a decision made elsewhere but determined the Minister's decision and enormously increased the bargaining position of EPA in negotiations with developers. Continuing public and political support for EPA is essential if the EIA system is to continue to perform well.

If the primacy of the environmental decision is unlikely to be replicated frequently, other aspects of the Western Australian EIA system, including the numerous public participation and appeal provisions, the strong links to action monitoring and the annual report on the EIA system, provide models worthy of adoption and adaptation elsewhere.

2.5.8 New Zealand

The New Zealand EIA system fails to meet several of the evaluation criteria. There are some weaknesses in scoping, in EIA report preparation, in the centrality of EIA to the decision, in monitoring, in public participation and in EIA system monitoring. These shortcomings are hardly surprising. The highly sophisticated Resource Management Act of 1991 is one of the first attempts in the world to integrate EIA into environmental policy in order to achieve sustainable management (Bartlett 1997). It is, perhaps, all the more surprising that New Zealand should have relied quite so completely on local discretion in its Mark II EIA system. Whilst the temptation to devolve responsibilities has proved irresistible to a reformist central government (Memon 1993), the implementation gap is potentially enormous.

New Zealand is famous for 'do it yourself' activities. However, to leave local authorities with tiny professional staffs and little or no experience of EIA individually to evolve screening, scoping, review and decision-making procedures seems courageous. Not surprisingly, problems in EIA practice have become evident (Parliamentary Commissioner for the Environment 1995), since planners faced a huge task in coping with EIA (and other aspects of the Resource Management Act requiring significant professional reorientation) (Montz & Dixon 1993; Morgan 1993).

A number of suggestions have been made to overcome the shortcomings identified (Dixon 1993; Morgan 1993). Training and encouragement to adapt are particularly necessary in overcoming the resistance of traditional land-use planners to the new EIA procedures, which require reorientation of practice from control of use to control of effects. Growing experience, further guidance and the diffusion of knowledge through New Zealand's small professional network will undoubtedly help to realize the potential of the innovative EIA system (Parliamentary Commissioner for the Environment 1995).

2.6 PERFORMANCE OF THE ENVIRONMENTAL IMPACT ASSESSMENT SYSTEMS AGAINST EACH CRITERION

Table 2.2 summarizes the performance of the eight EIA systems against each of the evaluation criteria. A number of observations can be made by an examination of each stage in the EIA process (Wood 1995).

2.6.1 Legal basis

All eight systems meet the legal basis criterion. The most detailed legislation is to be found in the Netherlands and Canada, where sets of regulations relating to particular aspects of the EIA process have been issued to support the very specific EIA acts. Specialized EIA agencies also exist in the Netherlands and Canada to provide advice and guidance on EIA, both in general and in specific cases. Six of the eight EIA systems involve procedures which are quite separate from other authorization systems. In the UK and New Zealand, on the other hand, EIA procedures (while legally identifiable) are firmly integrated into other types of consent procedure. It is not surprising that the legal requirements for EIA in these two countries are expressed much more briefly than in the acts and regulations specifying the EIA systems in the other six jurisdictions. However, given that there is no central body responsible for EIA in these countries (as there is in the Netherlands, Canada, the Commonwealth of Australia and Western Australia) and that there is a much more limited possibility of appeal to the courts than in the USA and California, it is apparent that there is likely to be rather more discretion in their EIA systems than in the other six. Worldwide, most EIA systems possess an adequate legal basis (Sadler 1996).

2.6.2 Impact coverage

The coverage of impacts and projects in the EIA systems in California, the Netherlands, Western Australia and New Zealand is, at least in principle, comprehensive. However, those in the USA, the UK and the Commonwealth of Australia only partially meet the coverage criterion and that in Canada does not do so. It is no coincidence that the USA, Canada and Australia are federal countries, the reason for the failure of their systems to cover all significant projects being largely constitutional. The jurisdiction of the federal government only extends to certain projects—the remainder are subject to state or local control, as in the comprehensive Californian and Western Australian EIA systems. Even so, many major public and private projects are covered.

This jurisdictional boundary problem is also the reason why the treatment of certain impacts is limited in Canada. Equally, the UK EIA system leaves some discretion to the proponent and the LPA in the coverage of, for example, cumulative, indirect, economic and social impacts. In practice, the coverage of impacts on the physical environment in EIA reports in both countries tends to be reasonably comprehensive. More generally, the coverage of EIA systems usually includes public and private sector projects and a

Table 2.2 Summary of the performance of the eight EIA systems against each of the evaluation criteria.

Evaluation criterion	Criterion met within jurisdiction							
	USA	California	UK	The Netherlands	Canada	Australia	Western Australia	New Zealand
1 Legal basis	✓	✓	✓	✓	✓	✓	✓	✓
2 Coverage	?	✓	?	✓	✗	?	✓	✓
3 Alternatives in design	✓	✓	✗	✓	✓	✓	✓	✓
4 Screening	✓	✓	✓	✓	✓	✗	✓	✓
5 Scoping	✓	✓	✗	✓	✓	✓	✓	?
6 Content of EIA report	✓	✓	?	✓	✓	✓	✓	✗
7 Review of EIA report	✓	✓	?	✓	✓	✓	✓	✓
8 Decision-making	✗	✗	✗	✓	✗	✗	✓	✗
9 Impact monitoring	✗	?	✗	?	?	✗	✓	✗
10 Mitigation	✓	✓	✓	✓	✓	✓	✓	✓
11 Consultation and participation	✓	✓	?	✓	?	?	✓	?
12 System monitoring	✓	✗	✗	✓	✓	✗	✓	✗
13 Costs and benefits	✓	✓	✓	✓	✓	✓	✓	✓
14 Strategic EA	✓	✓	✗	✓	✗	✗	✓	✓

✓, Yes; ?, partially; ✗, no.

wide range of environmental and other effects (Sadler & Verheem 1997).

2.6.3 Alternatives

The alternatives criterion is met, to a greater or lesser extent, in the USA, California, the Netherlands, Canada, Australia, Western Australia and New Zealand. It is, nevertheless, true that the treatment of alternatives in these jurisdictions often leaves a great deal to be desired. If practice in the USA and California is at the leading edge, practice in the treatment of alternatives in the Australian federal EIA system and in New Zealand is frequently unsatisfactory, and practice in some cases in Canada, the Netherlands and Western Australia has properly been criticized.

The only EIA system which has not always required the treatment of alternatives in EIA reports is that in the UK. The consideration of alternatives has been, in effect, discretionary, although the official guidance strongly advises that alternatives be described in environmental statements (Department of the Environment 1989, 1995). In practice, some UK environmental statements contain adequate discussion of a reasonable range of alternatives to the proposed action, but this has been totally absent from others. Practice should improve with the implementation of the revised EC Directive on EIA, which requires the discussion of the alternatives studied. Worldwide, EIA practice in relation to the treatment of alternatives appears to be generally unsatisfactory (Sadler 1996, p. iii).

2.6.4 Screening

Seven of the eight systems are adjudged to meet the screening criterion. The EIA systems use a variety of approaches, criteria and thresholds for screening. The procedures in the UK (Department of the Environment, Transport and the Regions 1997) and the Netherlands will be tightened as a result of implementing the revised European Commission (EC) Directive on EIA, which significantly strengthens screening requirements Commission of the European Communities 1997a). The reason the Commonwealth of Australia EIA system does not meet this criterion is that screening is undertaken by the proponent government department without real control by the environmental agency. Worldwide, most jurisdictions employ a combination of lists (with or without thresholds) and case-by-case review to identify proposals requiring assessment (Sadler 1996).

It is notable that six of the eight jurisdictions make use of more than one type of EIA document. For example, in the USA the environmental assessment is nominally a screening document but, in practice, serves as an EIA report in its own right for thousands of projects each year. The initial study in California serves a similar purpose. Some of the documents in the two-stage Canadian screening process are not dissimilar. Screening in Australia and Western Australia results in different types of EIA reports and in New Zealand in reports of varying length and complexity. Only the Netherlands and the UK have a single type of EIA report. It is, perhaps, no coincidence that both have strong land-use planning systems under which the environmental impacts of the less significant projects can be assessed.

2.6.5 Scoping

Six of the EIA systems meet the scoping evaluation criterion. Scoping is a formal requirement for full EIA reports in the USA and California. It is a general requirement for EIA reports in the Netherlands, Canada, Australia and Western Australia. Whilst no longer a formal requirement in New Zealand, scoping is very strongly encouraged in the Resource Management Act 1991 and local authorities can set up their own scoping procedures. In each of these jurisdictions, scoping involves the preparation of action-specific guidelines and must incorporate some environmental agency and public participation. Only the UK makes no reference to scoping in its current legal provisions, though scoping is strongly advised. In practice, some scoping in the form of discussion between the proponent and the LPA, frequently takes place. This situation may improve when the UK implements the revised EC Directive on EIA, which encourages, but does not require, scoping, since LPAs will be obliged to respond to developers' requests for a formal opinion on the content of ESs (Department of the Environment, Transport and the Regions 1997).

It is now widely accepted that scoping helps to ensure that the relevant environmental impacts are covered in EIA reports (if not that scoping helps to eliminate irrelevant impacts). It has also been found in the more mature EIA systems that scoping ensures that the various parties can participate early in the EIA process, resulting in more acceptable project design. As Sadler and Verheem (1997, p. 9) state: 'The majority of countries use scoping to identify significant impacts, key issues, and, to a lesser degree, alternatives to a proposal, the affected and interested population groups.'

2.6.6 Content

Whilst, in practice, their performance varies substantially within as well as between jurisdictions, the EIA systems of the USA, California, the Netherlands, Canada, Australia and Western Australia meet the *content* criterion. UK environmental statements must meet the content requirements specified in the planning regulations, but no checks are made to prevent the release of inadequate EIA reports. The EIA system in New Zealand contains no formal provision as to the content of EIA reports, and checks are no longer made on their content prior to release.

It is probably no coincidence that neither the UK nor the Mark II New Zealand EIA systems require compulsory scoping. Scoping guidelines provide a useful set of criteria against which to judge the content of an EIA report and they are frequently utilized in the other six jurisdictions for this purpose prior to release. However, these checks on content probably have more to do with the cooperation which scoping engenders between the proponent and the environmental and decision-making authorities. Such checks sometimes take place informally in both the UK and New Zealand, but the major impediment to the release of inadequate EIA reports in both these countries is probably still the lack of experience of many local authorities.

More generally, most jurisdictions have specific requirements for the content of an EIA report (Sadler & Verheem 1997). It appears that EIA often delivers 'clear information to decision makers on the potential consequences of proposals' but is less successful in making verifiable predictions or in specifying the significance of residual impacts (Sadler 1996, p. iii; see also Morris & Thérivel 1995).

2.6.7 Review

Worldwide, 'specific requirements for undertaking the review of the quality of an EA report are in place in 40% of the jurisdictions surveyed' (Sadler & Verheem 1997, p. 12). Of the systems compared here, only the UK does not fully meet the EIA report review criterion. Even in the UK it is not the public review of EIA reports which is missing but the duty on the proponent to respond formally to the points raised. In practice, the proponent normally provides further information if it is requested by the local planning authority. The three longest established EIA systems (those in the USA, California and Australia) all require the preparation of both draft and final EIA reports. In Western Australia the situation is virtually the same, since the proponent must publicly respond to comments on the EIA report. In practice, the situation in three of the other four jurisdictions does not differ greatly, because in the Netherlands, Canada and New Zealand, the proponent can be asked formally for further information. This supplementary information, which may consist of additional material, an elaboration of existing information or a response to comments, must be provided in all three countries.

Generally, the majority of initial EIA reports in all the jurisdictions appear to require supplementing with additional data following formal or informal review. Apart from the obvious increase in quality of the information provided between the initial EIA report and the final documentation, there seems to be a general trend towards gradual improvement in the quality of EIA reports over time.

This conclusion is supported by the results of a study of EIA report quality in eight European member states. Eight EIA reports from each of Belgium, Denmark, Greece, Ireland and Portugal were selected for review, together with 24 EIA reports from each of Germany, Spain and the UK: a total of 112 EIA report quality assessments. Half the reviews related to EIA reports completed in 1990 or 1991 and half to reports released in 1994, 1995 or 1996. The review mechanism employed was the Lee and Colley (1992) Review Package.

The overall proportion of satisfactory EIA reports sampled improved from 50 to 71% between the two time periods (Fig. 2.2). For six of the countries, an improvement in quality can be seen between the two time periods and the quality remained constant in the other two. In six of the Member States, a high percentage (ranging from 66 to 100%) of the reports in the later period were judged to be of a satisfactory overall quality, whereas this was the case for only two of the Member States in the early period. However, although an increase in quality was observed, the overall quality for the majority of the reports in the Member States in the later period was still only 'just satisfactory', indicating that there remains considerable scope for improvement (Wood *et al.* 1996).

The improvement in the quality of EIA reports indicates that further progress has been made in implementing the provisions of the EIA Directive since 1991 (Commission of the European Communities 1993). A number of factors appeared to be important in determining the quality of EIA reports, often acting in combination:

- Legislation (recent Member State legislation had led to improvements).
- Nature of consultants ('good' consultants produced better EIA reports).
- Experience of participants (greater experience resulted in better quality EIA reports).
- Scoping (public and agency consultation led to better EIA reports).

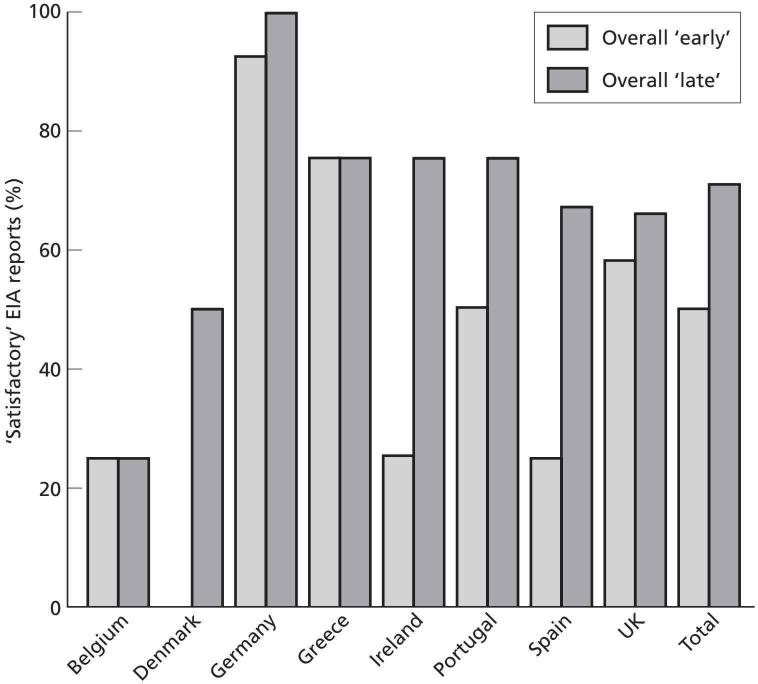

Fig. 2.2 Proportion of satisfactory early and late EIA reports in eight European countries. EIA, environmental impact assessment.

- Length of EIA reports (short EIA reports were often of poor quality).
- Nature of projects (better quality EIA reports were often associated with larger, more expensive, controversial projects).

2.6.8 Decision-making

The decision-making criterion states that the EIA report and the comments upon it must be 'a' (not 'the') central determinant of the decision. EIA was never intended to provide the sole basis for decision-making. However, to meet the criterion, an EIA system needs to demonstrate not only that the decision should be influenced by the EIA (all eight do so) but that, in practice, the EIA report generally actually influences the decision. Only two of the eight EIA systems (those in the Netherlands and Western Australia) meet this interpretation of the criterion.

California has perhaps gone furthest in trying to ensure that decisions are influenced by EIA by requiring a 'statement of over-riding considerations' where significant impacts will result from the approval of an action. However, in practice, it is still possible for decision makers effectively to ignore the EIA, as is the case in the USA, the UK (Wood & Jones 1997; see also Chapter 7, Volume 1), Canada, Australia and New Zealand. In the Netherlands, the recommendations of the highly influential EIA Commission are published and the competent authorities are effectively obliged to accept them (as used to be the case in Canada). In Western Australia, EIA was built into the heart of the decision-making process. It was, perhaps, inevitable that such an unusually restrictive legal requirement should have been weakened in 1993. Internationally, the effect of EIA on decisions is varied, with most jurisdictions reporting that projects subject to EIA are seldom rejected or withdrawn prior to approval (Sadler & Verheem 1997).

2.6.9 Monitoring

Only one of the EIA systems fully meets the impact monitoring evaluation criterion. Monitoring is an acknowledged weakness of the US EIA system. There is no provision for monitoring in the UK EIA system, although some independent monitoring of impacts takes place under separate legislative provisions. The New Zealand Resource Management Act imposes a general duty upon local authorities to monitor project impacts but this is infrequently undertaken (Parliamentary Commissioner for the Environment 1996). The same is largely true of the discretionary monitoring provisions in the Commonwealth of Australia EIA system.

The Netherlands EIA system contains several impact monitoring and auditing provisions but, in practice, these are often not implemented and it has been recommended that they be weakened (Evaluation Committee on the Environmental Management Act 1996). The same lack of implementation applies in Canada, where the CEAA also contains extensive impact monitoring requirements. The Californian EIA system requires monitoring where mitigation measures are agreed. However, because of weaknesses in implementation, these three EIA systems can be adjudged only partially to meet the evaluation criterion. The preparation of environmental management programmes frequently (but not always) links monitoring directly to the EIA report in Western Australia. There is, however, no impact auditing. Worldwide, monitoring and auditing of impacts are areas of systemic weakness (Sadler & Verheem 1997, p. 12).

2.6.10 Mitigation

Each of the eight EIA systems meets the mitigation criterion. However, the nature and degree of impact mitigation measures sought in the EIA systems vary and the emphasis on the implementation of mitigation measures also differs both between and within jurisdictions. It is probable that, as concern over the sustainability of development grows, more emphasis will be placed on the avoidance of impacts by the consideration of alternative approaches, as in the Dutch EIA system.

In a recent study, a detailed analysis of EIA-induced modifications to six UK projects, six German projects and six Spanish projects was undertaken to endeavour to identify the factors influencing impact mitigation (Wood *et al.* 1996). Several modifications to the sample of projects occurred as a result of the EIA process: 2.2 per project in the UK and Spain and 3.7 per project in Germany. It therefore appears that the EIA process is having a notable effect on the number of project modifications taking place in these three countries. Generally, it would be expected that, if the EIA system is functioning as intended, modifications would be made early in the EIA process (i.e. prior to submission). In this study, most modifications were made at the presubmission stage of the EIA process in the UK and Germany, whereas most Spanish modifications occurred at the decision-making stage (Fig. 2.3). There was no apparent trend over time in the number of modifications or in the significance of modifications. In Germany and Spain the majority of modifications related to reducing impacts on fauna and flora, whereas in the UK the majority were concerned with landscape and visual impacts.

There was no clear relationship between the number of modifications and EIA report quality in the three countries. Similarly, no relationship could be established between either the experience of the participants in the EIA process or the size of the project and the number of modifications. The consultees were more influential than the public in proposing modification measures in the UK and Germany but the reverse was true in Spain (probably reflecting the inexperience of the Spanish consultees in the EIA process). More generally, EIA is regarded by many practitioners around the world as being successful in identifying appropriate mitigation measures (Sadler 1996, p. iii).

2.6.11 Participation

All eight of the EIA systems meet the requirement that there must be consultation and participation following the release of the EIA report, but four do not make consultation and participation prior to the publication of the EIA report mandatory. The weakest requirements for pre-EIA report participation are those in the UK. However, under the proposals to implement the revised EC Directive, the public are to be notified about screening

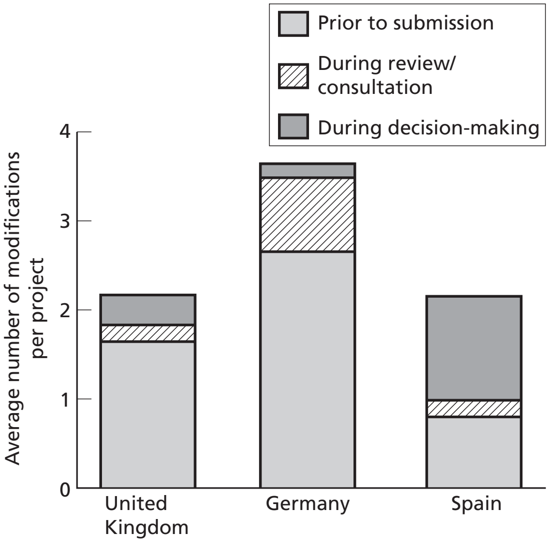

Fig. 2.3 EIA-induced project modifications in the UK, Germany and Spain.

decisions made by LPAs (the vast majority) and may, as a consequence, be able to influence the content of ESs informally. In New Zealand the local authorities have the power to demand that consultation and participation take place prior to submission of EIA reports for notified projects, while in Australia the existence of a scoping stage effectively ensures public participation, even though this is not mandatory. In Canada, although full participation takes place during panel reviews, there is no mandatory requirement for public involvement in the preparation of other EIA reports.

In the USA and California, there is full provision for early participation and consultation in the preparation of the main EIA report (the EIS and the EIR, respectively) but provisions relating to public involvement in the preparation of environmental assessments in the USA are often not observed, and do not exist in relation to Californian initial studies. Public participation and consultation are most strongly embedded in the EIA systems in the Netherlands and in Western Australia. However, participation provisions could be strengthened in many of the EIA systems. This also appears to be true more generally (Sadler 1996, p. 82).

2.6.12 System monitoring

The EIA systems in the USA, the Netherlands, Canada and Western Australia all meet the EIA system monitoring criterion. It is probably no coincidence that the EIA systems which are monitored all possess a single body with overall responsibility for EIA and have a legal duty to review or oversee the EIA system. Of the four, only the US EIA system does not possess a legally imposed quinquennial review requirement, though it does demand an annual report on the operation of the system.

It is the major task of the CEQ to oversee the US EIA system. The Western Australian EPA and both the Canadian Environmental Assessment Agency and the Dutch EIA Commission (which are solely concerned with EIA) possess adequate staff resources to undertake EIA system monitoring. Environment Australia is not under a legal obligation to review the EIA system. The Californian, UK and New Zealand requirements do not include a formal duty to review or monitor the EIA systems and the jurisdictions do not allocate sufficient resources to the central bodies responsible for EIA to permit effective system monitoring to take place.

2.6.13 System benefits

It is, perhaps, a testament to the inherent effectiveness and efficiency of EIA that, despite the marked differences in each of the eight EIA systems, there should be a virtual unanimity of view that the benefits of all eight EIA systems outweigh their costs. It is noticeable that complaints about delays in project approvals as a result of EIA are most vociferous in the USA, California, Canada, Australia and Western Australia. These are, of course, the jurisdictions with the most formalized EIA systems and those which require proponents to undertake the greatest number of EIA steps. However, while complaints about delay are probably least in the UK and New Zealand EIA systems, they do occur in these jurisdictions and in the Netherlands. It is clear that delay rather than cost is the major criticism in most EIA systems. Delay is the main reason why some members of the development industry in, particularly, California and Western Australia do not share the general view about the net benefits of EIA.

Internationally, most EIA reports cost less than \$100 000 and are processed in less than 18 months (Sadler & Verheem 1997, p. 14). Whilst most jurisdictions are seeking to improve the cost-effectiveness of their systems, EIA is seen as contributing directly to sustainability by leading to the withdrawal of environmentally unsound proposals and to the mitigation of environmental impacts (Sadler 1996, p. ii). The indirect benefits of EIA are also regarded as significant. EIA:

> is a learning process, providing important benefits beyond informing decision makers, such as the promotion of greater awareness of environmental and social concerns, upgrading of professional capabilities, and promoting public involvement in decision making (Sadler 1996, p. iii).

2.6.14 Strategic environmental assessment

The USA (see Chapter 14, this volume), California, the Netherlands and New Zealand all require some form of SEA. The Western Australian SEA provisions are to be strengthened to include strategic programmes (Department of Environmental Protection 1997). However, the UK, Canada and the Commonwealth of Australia do not meet the SEA criterion, despite some SEA practice in the first two countries and legal provisions permitting SEA in Australia. More generally, SEA appears to be applied to plans and programmes (rather than to policies) in a significant proportion of jurisdictions (Sadler & Verheem 1997, p. 4). It is clear that SEA practice is developing around the world (Thérivel & Partidário 1996). Within the European Union, the publication of the proposed Directive on the SEA of plans and programmes is bound to stimulate Member State research and practice (Commission of the European communities 1997b).

It would be possible to modify the evaluation criteria utilized in this review of the various stages of the EIA process for projects in various jurisdictions to the environmental assessment of policies, plans and programmes. Clearly, because the practice of SEA is probably some 15–20 years behind EIA practice, the SEA process evaluation criteria would need to be less stringent than for EIA. It appears that almost all the points made in relation to the EIA process in this chapter would apply, to a greater or lesser extent, to the SEA process. In particular, the influence of SEA on decision-making and mitigation is lower than that of EIA (which itself leaves much to be desired) (Thérivel & Partidário 1996; see also Chapter 14, Volume 1). The increasing emphasis on cumulative and indirect impacts (Council on Environmental Quality 1997a) and on the sustainability of development make further progress on SEA, and the sharing of experience to date, imperative.

2.7 CONCLUSIONS: IMPROVING THE EFFECTIVENESS OF ENVIRONMENTAL IMPACT ASSESSMENT

It is apparent that certain general shortcomings in the current state of EIA practice can be observed. These may be summarized as weaknesses in:

- coverage;
- EIA report quality;
- integrating EIA into decision-making;
- impact monitoring and enforcement;
- mitigation;
- public participation;
- system monitoring;
- SEA.

Equally, whilst specific measures can be used to strengthen different EIA systems by introducing or bolstering appropriate procedural requirements, there are several actions which are of more general application (see also Sadler 1996):

1 Requiring that scoping takes place where it is not already mandatory (to ensure that relevant impacts are covered and to encourage early recognition of the need for impact mitigation).

2 Adoption of a formal EIA report review (quality control) mechanism (to strengthen the quality of EIA reports).

3 Making greater use of EIA generally, and the evaluation of significant impacts in EIA reports in particular, in decision-making (to mitigate negative impacts effectively and efficiently).

4 Providing for impact monitoring (to ensure that mitigation measures are implemented).

5 Providing for impact auditing (to learn from previous EIA experience and thus improve the extent of mitigation of impacts).
6 Strengthening provisions for consultation and public participation (to increase the number of proposed modifications).
7 Requiring system monitoring and providing national EIA report and environmental information collections and databases (to diffuse good EIA practice, to increase the accuracy of predictions).
8 Introducing SEA where it is not already a requirement (to ensure that environmental impacts are considered very early in the planning process).

There also continues to be a need, in each EIA system, for three other elements to strengthen practice: guidance, training and research.

The existence of published guidance on the EIA systems as a whole is clearly useful to those responsible for preparing EIA reports, to those reviewing them and making decisions, to those consulted and to the public. Such guidance provides a valuable aid in undertaking any stage of the EIA process. Whilst the practitioners most closely involved do not tend to need general guidance unless changes to EIA procedures are introduced, there are always those new to EIA or some aspect of the process who do require such assistance. Guidance materials can include manuals, leaflets, computer programs and videotapes. The provision of guidance of this type tends to vary from system to system, just as the provision of more detailed guidance on the different stages of the EIA process varies, but it could be strengthened to assist in overcoming the weaknesses identified above.

The provision of EIA training for EIA project managers and technical specialists and for others involved in the EIA process is an effective method of increasing the standard of practice even in mature EIA systems (see discussion in Chapter 3, this volume). Whilst EIA training need not be provided only by the responsible agency, encouragement of and participation in such training by the agency is clearly desirable. A variety of different training methods are appropriate in most EIA systems: courses, manuals, guides, case studies, videotapes, computer programs, etc. The involvement of responsible authorities in EIA training tends to vary from jurisdiction to jurisdiction but the need for further training remains.

There is a continuing need for research on various aspects of EIA, both general and specific. Generally, research is needed on: the treatment of alternatives; scoping; evaluation of significance; forecasting (especially in relation to cumulative impacts); review methods; integration of EIA in decision-making; monitoring; mitigation and compensation measures and their implementation; public participation; system monitoring; and SEA. Such research needs to be concerned with both substantive (methodological) and procedural issues. Although research on EIA methods is likely to be of most application across EIA systems, the results of procedural research tends also to be widely disseminated since there is a widely perceived need to gain knowledge and insights. Clearly, each EIA system is likely to have its own specific research needs in addition to those identified here.

Several of the EIA systems evaluated in this chapter have progressed from Mark I to Mark II versions (for example, the Canadian and New Zealand systems). The steps outlined above should enable progress to be made towards Mark III versions. However, the weakening of the Western Australian EIA system serves as a reminder that even effective EIA systems need the support of the wider public and their political representatives. It is therefore necessary not only to improve EIA systems, but to ensure that they receive real public and political endorsement.

There are pressing demands for the achievement of sustainability goals and to meet the requirements of Agenda 21. As Sadler (1996, p. 35) has stated, there is a need for a 'second-generation' EIA process which places EIA firmly in the context of other policy and environmental instruments. Mark III EIA systems incorporating effective SEA would fit this context admirably. These systems could be employed to achieve more ambitious goals, such as 'no net environmental deterioration' or 'net environmental gain'. If the public and the politicians will the ends, it is hoped that this comparative evaluation of EIA systems has demonstrated that EIA can help to provide the means.

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3: Capacity Building

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3.1 INTRODUCTION

Capacity building, or capacity development, which it will be argued is a more appropriate term, is a vast and complex topic. Indeed, many of the chapters in these two volumes, either directly or implicitly, consider various aspects of the capacity of a country, organization or individual to contribute to an effective environmental impact assessment (EIA) system.

Initially, the chapter explores some of the terms and concepts of capacity building. Whilst the focus is on EIA, its role must be considered in the wider context of capacity building concerning the environment in general and specifically the contribution of EIA towards achieving more sustainable forms of development (see also discussion in Chapter 2, Volume 1).

Whilst there is no overall agreement on what constitute the key components of capacity development, there is a broad consensus that five elements are basic if it is to be effective: (i) training and education; (ii) organizations and their management; (iii) networks and linkages between organizations; (iv) the public sector environment; and (v) the economic, cultural and political milieu in which organizations operate.

Given the broad scope of capacity development this chapter will of necessity be selective. Most emphasis will be placed upon training and education in EIA and their current and potential contribution to capacity development. Specific themes explored include training constraints, needs and demand, provision, target groups and their requirements and the content of EIA training programmes. As well as considering broad concepts, practical issues concerning effective capacity development, in both developed and developing countries, are included.

The next themes explored are EIA information requirements and networking and their contribution to capacity development. Monitoring, still one of the weakest elements in the EIA process (see Chapter 11, Volume 1) and how it now needs to be applied to capacity development initiatives to measure their effectiveness and utility, is briefly considered. The chapter concludes by reviewing current ideas on capacity development in the environment generally and their implications for capacity building in EIA.

3.2 CAPACITY BUILDING AND CAPACITY DEVELOPMENT

The development of capacity in both developed and developing countries has arisen out of a desire to achieve more sustainable economic and social forms of development. Development agencies are now attempting to design and deliver projects whose benefits can be maintained and built upon by the recipient without a continuing or seemingly open-ended dependency on donor support (Austin 1994).

Capacity can be defined as the ability of individuals and organizations to perform functions effectively, efficiently and sustainably (Hilderbrand & Grindle 1994). The term capacity development is now increasingly preferred to capacity building as it better conveys the point that it is a dynamic process building upon an existing capacity base (OECD 1993). Human resources and the way in which they are utilized are central to capacity development, as is the overall context within which organizations undertake their functions.

Institutional strengthening is concerned with improving existing institutions whilst institutional development involves changing the institutional structure to gain improvements. Hilderbrand and Grindle (1994) consider institutional development overlaps with capacity development but does not include the overall environment in which the organizations operate and interact. Capacity development is therefore concerned with the micro- and macroeconomic factors that determine how institutions translate their capacities into actual performance. Capacity development involves not only training and the appointment of additional staff but also requires that skilled people be used effectively, are motivated to perform tasks and are retained within the organizations needing their skills. This latter point is now becoming very important as it has been the experience of many trainers in the UK that those trained in EIA in the public sector often move to more lucrative positions in the private sector having completed their training.

Thus, there are five major components of capacity (Hilderbrand & Grindle 1994):

- Training and education—a well-trained human resource base is required for effective performance of EIAs.
- Organizations and their management—organizational structures, processes and management systems must be effective to ensure that the best use is made of the existing skills base and that staff are retained and motivated.
- Network and linkages among organizations—this covers the network of organizations and institutions that facilitate or constrain the EIA process. Networks include informal and formal interactions between both public and private sector organizations and increasingly links to external organizations.
- Public sector environment—the policy and institutional environment of the public sector can either constrain or facilitate the performance of EIAs. It includes laws, regulations and policies affecting the civil service, budgetary support, definition of responsibilities among ministries or agencies and the nature of the policy environment that supports or impedes the performance of functions.
- Overall context—the economic, cultural and political milieu in which organizations operate, and the extent to which conditions in this broader environment facilitate or constrain the functional capacity of organizations.

This framework is intended as a tool not only to assess capacity problems and constraints, but also to identify capacity gaps and opportunities. Strategies for capacity development must consider all of these levels even though an initiative only focuses on developing one level.

There is now a broad consensus that a 'capable government' which can perform functions effectively is a precondition for development. The success of capacity development depends on helping to create such governments but this requires political commitment to the process. Thus, most capacity development support remains focused on the public sector (Austin 1994; Hilderbrand & Grindle 1994). Private enterprise and non-governmental organizations (NGOs) may play a significant role in social, economic and political life but it is governments that are ultimately responsible for creating the framework for development. This requires that within the public sector there is capacity to identify problems and formulate and implement appropriate policies, respond flexibly to public needs and demands and foster participation in debate and decision-making. Governments must be responsive, transparent and accountable. Without a conducive environment, both external and domestic resources devoted to capacity development may be wasted (see discussion in Chapters 7–10, this volume, for examples).

Capacity assessment is essential in the formulation of coherent and effective strategies for capacity development. The initial step is to identify the key functions that are to be the focus of the capacity development strategy, in this case EIAs. Capacity development should be seen as a national process in which the role of donors is secondary and subordinate to national efforts (Austin 1994). National political commitment to the strategy is the key to capacity development, as institutional reforms will inevitably conflict with those that have vested interests and power bases in the present structure. The process will require the involvement of and dialogue with national actors and stakeholders and a wide range of governmental organizations and NGOs. The participation of both governmental organizations and NGOs in the formulation process is essential because of the need for a dialogue and concensus building and because strategies for capacity development must involve a balance between public sector capacity and the capacity of NGOs. All capacity development strategies should be multi-layered and select a realistic time horizon for implementation (Hilderbrand & Grindle 1994).

Reviews show that donors have had little success with capacity development and institutional strengthening (Austin 1994; Hilderbrand & Grindle 1994). This is one of the most complex and difficult areas of development. A major conclusion of many evaluations is that greater attention needs to be paid to the broader environment and the overall public sector context, to see how far they constrain or facilitate capacity development.

3.3 CAPACITY DEVELOPMENT AND TRAINING

As the United Nations Environment Programme's (UNEP) EIA *Training Resource Manual* states, 'Capacity building is the long-term, voluntary process of increasing the ability of a country to identify and solve its own problems and risks, and to maximize opportunities' (United Nations Environment Programme 1996). It is argued that countries should be moving as far as possible towards self-sufficiency in EIA. Where outside experts need to be engaged, the opportunity should be taken to transfer expertise to local personnel. A country's efforts to build EIA capacity will be most effective when carried out in a strategic and planned way, rather than relying upon the assessment of individual projects.

Capacity building can be carried out by developing and implementing educational and training programmes. It also requires a long-term commitment to the strengthening of educational and research institutions. Training can be conducted at many different levels and over different periods of time to meet a variety of needs. Long-term programmes can be used to train university graduates as EIA practitioners, whereas short-term training courses can be used to raise awareness of the process or train people in specific EIA techniques.

Although the necessity of environmental education and training is no longer questioned, there is still a large gap in many countries between policy and action. There are many reasons for this, but most important is the lack of financial, political and social motives which encourage training. Countries must use whatever tools are available to achieve their economic, social and environmental goals and a key tool is EIA.

The EIA *Training Resource Manual* suggests that a complete capacity-building programme will need to provide a range of aids that can be used to encourage skill development and knowledge transfer. These can include:

- developing a library of environmental assessment (EA) reports;
- maintaining a database of information collected during an EIA;
- establishing a network of practitioners with experience in EIA or technical analysis;
- collecting examples of good practice;
- producing an EA newsletter;
- holding environmental art contests;
- establishing environmental awards in the workplace;
- inviting guest speakers on environmental issues;
- holding an environment 'day' or 'week';
- producing desk aids, such as a yearly calendar, based on environmental themes;
- developing corporate policies or guidelines on the environment;
- designing corporate environmental posters;
- developing corporate environmental programmes;
- establishing environmental stewardship activities.

Whilst one might question the relevance of some of these proposed aids, they are indicative of the increasing realization that capacity development in EIA must focus on the broader context of environmental awareness and environmental management.

3.4 CONSTRAINTS ON TRAINING

There are many constraints on the ability of developed and, particularly, developing countries to implement sound environmental management and EA strategies. A number of general and specific constraints relate directly to training.

There is no general and universal definition of EIA. Whilst there may be a general consensus as to what it is attempting to achieve—i.e. predicting the environmental effects of adopting a particular plan, programme or project—mechanisms to achieve this vary from country to country (as discussed in Chapters 2 & 7–12, this volume). For this reason, there are dangers in making general recommendations on training requirements to achieve capacity development, given the differences that exist in institutional arrangements, legal and procedural requirements and levels of scientific knowledge.

A key issue is whether EIA training should be an activity in its own right or an integral part of more general training in environmental management. Also, should training in EA be linked to an understanding of other evaluation techniques, such as risk assessment, cost–benefit analysis and planning evaluation techniques (planning balance sheets, goals achievement matrices)?

The question arises as to whether a distinctive group of people should be trained in EA and thus establish a new professional group. With some exceptions, it is suggested that in most developing countries many of the people concerned with EIA will have other professional duties. It would therefore seem wrong to consider EIA training as being primarily designed to establish a new professional cadre.

There are considerable dangers in training initiatives in EIA if those who develop expertise are not allowed satisfactorily to perform their duties. Two specific areas of concern that affect capacity development should be noted. First, there is a need for sufficient scientific knowledge, including an adequate database, so that those producing and reviewing EIAs can conduct their job in a scientific manner. Secondly, a legal/procedural framework to coordinate EIA will be required which, as well as looking impressive on paper, is properly implemented. Many of the difficulties and, indeed, much of the frustration expressed by those working on EIA in developing countries relate to these two constraints.

As a predictive tool and procedural mechanism, EIA requires a multidisciplinary approach. It is clear that, whilst in many developed and developing countries lip service is paid to the need for such an approach, it is difficult to achieve. Reasons include institutional conflicts between government departments and, with regard to training, the strict demarcations that exist between faculties and departments in many universities and training institutes.

3.5 ENVIRONMENTAL IMPACT ASSESSMENT TRAINING: NEEDS AND DEMAND IN A CLIMATE OF CHANGE

It is impossible to state with any degree of accuracy current and future demands for EIA training. This applies to developed countries but particularly to developing countries. It is equally difficult to indicate the current supply of training. The only figures that exist relate to general training on environmental topics, and the accuracy and therefore relevance of these to EIA training are problematic. For example, up to one-fifth of UNEP's budget since 1973 has been spent on education and training, in which over 25 000 technicians, educators and decision makers have participated. Much of this training is very specialized with, for example, over 2000 scientists having been trained in environmental monitoring. Much of this training falls under the joint United Nations Educational, Scientific and Cultural Organization (UNESCO)/UNEP International Environmental Education Programme (IEEP), which promotes general environmental education at national, regional and global levels.

The question of need is also extremely difficult to forecast. A study by the East West Environment and Policy Institute suggests that approximately 10 000 professionals in tropical developing countries must be equipped with environmental skills within the next 10 years. The percentage required for EIA is not stated. A survey for the European Commission estimated that when the Directive on environmental assessment became mandatory in July 1988 there was a need for approximately 2000 people (decision makers, EIA project managers, technical specialists, review body members and environmental interest groups) to be trained, to a lesser or greater extent, in various aspects of EIA.

In 1993, Manchester University's EIA Centre published a European Community training feasibility study (Lee & Jones 1993). Box 3.1 illustrates selected results of this survey, showing the approximate numbers of people in different target groups requiring training and the percentage of each group whose needs were not being met. The most striking feature is the large demand for training in many European countries, which is clearly not being met for all target groups.

Whilst other figures can be quoted, there can be no doubt that there is a real need for training in many aspects of EIA but that this need is greatest in developing countries. There is also evidence to suggest that both the political and economic atmosphere may now be more conducive in encouraging training programmes. This point is stressed because it would appear necessary for governments to cooperate and collaborate more strongly than at present with the various bi- and multilateral agencies now funding major environmental initiatives. Many of these organizations state that training will increasingly become an integral component of future actions. At the international level, recommendations by the Brundtland Commission; the World Industry Conference on Environmental Management; policy statements by the President of the World Bank; and the proposals of a World Health Organization (WHO) working party on the Health and Safety Component of EIA, Agenda 21 at the Rio Summit; and the Commission for Sustainable Development, all explicitly state that greater resources should be allocated to fostering environmental awareness, evaluating the environmental components of proposed projects and environmental policy formulation. It is imperative that training be an integral part of such initiatives.

It is also important to note that there is evidence in many developed countries now entering the post-industrial phase, that one of the greatest areas of growth, measured both in investment and employment terms, is in pollution control activities and related environmental technologies. An increasing pool of manpower is now available in developed countries. It would seem important to consider how this expertise might be utilized more positively in EIA training and related initiatives and how governments, multinational companies and bilateral organizations could use the knowledge of these experienced people.

3.6 TRAINING PROVISION

Given that there is a clear need to formulate and develop training initiatives in EIA in developing countries, three closely related issues must be considered. These are: (i) the target groups who would most benefit from training; (ii) the types and levels of training required to achieve the many objectives of an EA process; and (iii) general principles concerning the content of training programmes. Although there is some overlap between these three topics, they are treated separately.

3.6.1 Target groups

Whilst there are dangers in making generalizations about the target groups who will require training, given that EIA varies from one developing country to another, it is possible to identify certain distinctive groups who will normally be involved. These are:

Decision makers/control authorities

This group comprises of those who control and operate an EIA system in a country. Normally they will have power to indicate which projects (whether proposed by aid agencies, multinational developers or public and private developers within a country) should be subject to an EIA (screening) and what it should cover (scoping). They comprise those who may impose legislation to operate an EIA process (political decision makers) and those who are authorised to implement it by law and statutes, and provide technical advice and assistance (government administrators in central and local government), as well as

Box 3.1 Nature of the EIA training required in European Union countries, approximate numbers in need of training and estimated proportion of training needs not being satisfactorily met (Source: after Lee & Jones 1993)

Member State (total no.)	Elected representatives, business leaders	Senior administrators	Project managers	Technical specialists	Members of review bodies	NGOs	Students
Italy (15 000)	General awareness 450 (using estimate of 1000 EIAs p.a.) 90%	General awareness 750 (using estimate of 1000 EIAs p.a.) 90%	Project management 1500 (using estimate of 1000 EIAs p.a.) 90%	Technical training 6300 (using estimate of 1000 EIAs p.a.) 60%	General awareness 1500 (using estimate of 1000 EIAs p.a.) 90%	General awareness 750 (using estimate of 1000 EIAs p.a.) 90%	Technical training 3750 (using estimate of 1000 EIAs p.a.) 90%
The Netherlands (5600)	General awareness 3000 100%	General awareness and project management 250 0%	General awareness, project management and quality training 500 33%	Technical training and quality training 1200 50%	Technical training and quality training 400 50%	General awareness and technical training 250 —	General awareness and technical training 0%
Portugal (580)	—	General awareness 30 100%	—	Technical training and project management 250 80%	General awareness and technical training 100 90%	General awareness and technical training 100 100%	Technical training and project management 100 70%

(*Continued*)

Box 3.1 *continued*

Member State (total no.)	Elected representatives, business leaders	Senior administrators	Project managers	Technical specialists	Members of review bodies	NGOs	Students
Spain (3430)	General awareness	General awareness and project management	Project management and some general awareness	Technical and some general awareness	Technical and some project management	General awareness	—
	350 80%	500 80%	400 70%	1000 60%	180 50%	1000 90%	
UK (4500)	General awareness	General awareness	Project management, also general awareness and technical training where necessary	General awareness and technical training	Not applicable	General awareness and some technical training	General awareness and some technical training
	600 75%	600 75%	400 75%	2400 75%		500 75%	Several 1000 75%

NGOs, non-governmental organizations.

review authorities in countries where these exist or are planned.

Development proponents

This group comprises a wide and diverse range of proponents who are responsible for plans, programmes and projects which are, or will increasingly be, subject to EIA. Often these are public and private developers and in general are proponents of specific projects, with the concept of applying EIA to plans and policies now slowly developing. The issue of externally financed projects clearly has important implications. The question of the type of EIA that should be undertaken by bi- and multilateral aid agencies, and the conflicts that this may lead to with regard to national legislation, will also need to be considered, as it has important training implications.

This group comprises many different actors who to a lesser or greater extent will require some form of training in EA. At one level are managers and administrators who will require to be made aware of the scope, utility and potential economic benefits of EIA. Another group comprises those who may conduct all or part of the EIA. Given the complexity of producing an assessment, where management and scientific skills have to be carefully combined in a multidisciplinary team, the type of training required will vary greatly. This will be very different from the training of the specialist where emphasis must be placed on how detailed studies, such as air, noise, water, health, visual and ecological assessments, can be integrated into a comprehensive EA.

Other control authorities

This group comprises officials in control authorities who, although not responsible for a country's EIA system, may contribute to its effective operation. It will cover government officials responsible for pollution control, land-use planning and conservation policies and scientists with special knowledge of detailed aspects of EIA. The training of this group will be less intensive than for control authorities and project proponents.

Professional advisers and training institutions

This target group comprises several different parties. First, there are consultant companies in developing countries who are now assisting project proponents and control authorities in certain EIA tasks. Evidence suggests that many of these comprise engineering and economic consulting companies who are diversifying into or, as some might state, cynically 'cashing in' on EIA! The second group comprises research institutes and academic institutions who are now playing a greater role in the EIA process by providing advice and technical support to either proponents or control/review authorities. Academic institutions also have a potentially key role to play in developing training programmes both at the undergraduate and postgraduate level and also in providing short course training. This target group can be described as one where the need is to 'train the trainers' so that the concept of 'sustainable training' is developed. This will help not only to reduce the current reliance on training programmes in developed countries, which is expensive, but will also help to reduce the number of 'external' trainers 'imported' from developed countries.

Environmental interest groups and the public

In developed countries the concept of public participation is now firmly established as an integral part of the EIA process. Whilst a contentious issue in many developing countries, there is strong evidence to suggest that greater participation is now occurring and will increase as a result of new legal requirements and pressure from the World Bank, Global Environmental Facility (GEF) and the United Nations Development Programme. Therefore, it will be necessary to provide training for groups that include: (i) the business community; (ii) environmental groups and societies, including relevant NGOs; (iii) the media (television, radio and press); (iv) the public, including those who may be affected by project proposals; and (v) all levels in schools (not specifically in EIA but in environmental studies generally).

3.7 TARGET GROUPS' TRAINING REQUIREMENTS

It is now accepted that the range of activities required to operate an effective EIA process are many and varied. Therefore, the target groups will have different training requirements. It is possible, however, to make certain generalizations about the distinctive types of training that would satisfy the various target groups. These are:

3.7.1 General awareness training

Training in this category will be predominantly for politicians, senior administrators, senior management in industry and business and senior scientists. It should aim to provide a basic rationale of the utility of EIA and an indication of the broad legal, procedural and methodological mechanisms. It should emphasize the basic concept that EIA is not an activity designed to block economic growth, but a tool to ensure that economic benefits are maximized, adverse environmental, social and health impacts minimized and mitigated and that sustainable development is achieved. Training should be designed to ensure that decision makers and senior administrators are aware of the management processes required to achieve sound EA; detailed knowledge of methods will not be required but an understanding of the utility of methods, as a scientific approach to project assessment, should be emphasized.

3.7.2 Project management training

Whilst training of groups in the first category is designed to create an 'environment of understanding' so that assessments are undertaken in a supportive institutional framework, training in this category is for those who will be responsible for the execution of assessments. It must be emphasized that the form of this training will largely depend, not only upon existing knowledge, but also on previous experience. Training therefore will need to be considered at one level as a 'refresher' course and updating of recent advances in the subject, whilst for others it should assume no knowledge and therefore be basic and start from first principles. Within this category various types of training will be required:

1 *Project managers*—management skills relating to project control, finance and coordination of specific technical inputs will be required. Whilst this type of person may be described as a generalist, he/she will require a comprehensive knowledge of environmental procedures and methods.

2 *Technical experts*—given than an EA normally requires that special types of assessment, such as the prediction of noise, air or water impacts, be undertaken, training for this group, which may comprise scientists from control authorities, consultants, project proponents, research institutes and academics, must attempt to show how specialized scientific studies should be incorporated into an overall EA. Training therefore needs to focus on more technical aspects of EA, with the emphasis on the 'science' of EIA. Training will need to focus on methods (baseline data and surveys, predictive and evaluation methods, monitoring and postaudit studies), with less emphasis on legal and administrative aspects.

3 *Review experts*—evidence from many developing, and indeed many developed countries, indicates that one of the weakest features of the EIA process is project review. Whilst in a number of developed countries an independent review panel exists to advise, assist and review assessments produced by a project proponent, in developing countries the review is normally undertaken by a government agency. As a target group, those who review EIAs are critical to the whole success of the process. Their training requirements will need to cover both the general understanding of the totality of the EIA process and a detailed knowledge of assessment and review methods. The ability to know when to consult specialized experts on individual impact predictions and interpretations presented in an EIA also needs to be included in training programmes.

3.8 TYPES OF TRAINING

Given distinctive target groups requiring various forms of training, it is now necessary to consider the types of training that exist, how they might be strengthened to improve capacity, whether new initiatives are necessary and the form that these might take.

3.8.1 Undergraduate level training

There is little evidence to suggest that EIA training currently exists at first degree levels in institutions of higher education in either developed or developing countries. In certain degree courses, such as engineering, environmental health, botany, geography, geology, etc., material is covered which is relevant as background knowledge for EIA. This is also the case in a number of multidisciplinary subjects, such as environmental science and town planning. It is suggested that it is not appropriate to introduce distinctive first degree courses in EA, for there are considerable benefits if EIA experts are initially trained in a specific scientific discipline. However, the introduction of the concept of EIA in single and multidisciplinary subjects should be encouraged to stimulate knowledge, and interest in, the concept. It is from undergraduates that many of the future EIA experts will be drawn. One mechanism is to hold 'recruitment' seminars for undergraduates to encourage them to attend EIA postgraduate courses.

3.8.2 Postgraduate training

It is at this level that positive steps must be taken to develop specific EIA training. In a number of developed countries, notably the USA, Canada, the Netherlands and the UK, EA is now included as part of training in land-use planning and environmental management degrees, and a number of one-year full-time courses in EIA have been introduced. This is also slowly taking place in a number of developing countries, in particular in the Far East.

From a global perspective, two major initiatives are now evolving to develop EIA training and capacity building. First, a number of training centres have been identified in selected developing countries by organizations such as the World Bank, and distinctive EIA courses have been established. Supported with staff and financed by bi- and multilateral aid agencies they are now seen as centres of excellence in EIA. Students are being selected from various cogent disciplines and a cadre formed of training experts to develop the various management and technical aspects of EA. Second, 'awareness training' is being introduced into specialized postgraduate courses which interface with EIA. This includes: science-based courses, such as geology, soil science, pollution and technology control, waste management, ecology and health engineering, multidisciplinary courses, such as land use and transportation planning, and social science courses, such as economics and sociology.

3.8.3 Short course training

As there is a clear need to supply the demand for experts in EIA as soon as possible, it would appear that short courses are the only practical solution, given the time it will take to instigate training programmes at institutions of higher education. Short courses should be geared to all target groups and should cover both general awareness training and specialized components of the EIA process. Whilst, in general, these courses should operate at the national level, there is a case for more specialized courses being conducted on an appropriate regional basis.

General awareness training should be targeted at senior decision makers and administrators. Given their seniority and availability, these courses should be of 1 or 2 days duration. There is considerable merit if this target group participates at the beginning and end of larger and more specialized courses, so that they are familiar with the general context of the skills being developed by their specialist staff. The short courses for decision makers should cover aspects of policy, management of EIA and its economic benefits.

Short courses for technical experts in the other target groups will need to take a variety of forms. The following topics would appear to be most appropriate but will need to be tailored to either the sectoral priorities of a given country or reflect distinctive institutional procedures which may exist:

- *EIA procedures*: geared to those who will operate the EA system, with emphasis on legal aspects and implementation.
- *EIA methods*: this type of course should emphasize: (i) the utility and application of EA methods; and (ii) the integration of specific evaluation techniques (air, ecology, noise, pollution) into a structured EA system. This type of course should rely heavily on the use of case studies to indicate the practical utility and application of EA methods.
- *EIA project management*: the management of the EIA process. Skills of management, finance and communication will be required.

Depending upon the level of knowledge of EA in a country, in particular where the concept is new, initially it may be necessary to provide training courses that combine all the three components listed above. After this it will be possible to develop more specialized courses tailored to particular sectors, such as agriculture, forests, industrial development and energy, or specific facets of the EIA process. All of the above courses would require a period of study of from 1 to 3 weeks.

3.8.4 On the job training

The amount of 'on the job' training in developing countries is currently very limited and it is now critical to foster this 'hands on' training. One appropriate mechanism is to encourage proponents of projects, and in particular bilateral and multilateral aid agencies and multinational corporations, to include a systematic environmental training component as a contractual obligation. It is encouraging to note that many bilateral agencies, such as DFID, GTZ and USA Aid are now insisting on this practice as a contractual obligation on project developers. Wherever possible, those on short course training, or postgraduate studies, should be encouraged to spend a period of time in the project office of those conducting an EIA so as to gain practical experience.

3.8.5 Training the trainers

As a priority action for capacity development there would appear to be a pressing need to train certain members of selected key training institutions in developing countries on the multifarious aspects of EIA. This should apply to those who will be encouraged to add aspects of EA to their training courses, normally at the postgraduate level, but in particular to those mounting specific EIA training programmes. A number of options would appear available:

- Placement of potential trainers at established training centres already teaching environmental management and assessment in developed countries.
- Organizing special training courses, probably on a regional basis, for course organizers and key contributors.
- Short placements in agencies that control the EIA process in both developed and developing countries and also in organizations conducting assessments.

In all three options it will be necessary to tailor the training to the particular requirements of a country, but the major objective must be to give the trainers practical, rather than academic, experience of EA. This must be emphasized, as one of the major criticisms of current EIA training in Europe is that too theoretical an approach is adopted. It is this target group who will most benefit from specialized training courses, seminars and symposia held in developed countries.

3.8.6 Training the public

In many developed countries, environmental awareness has been stimulated as a result of media initiatives, and in particular television. Just as great strides have been made in many developing countries to reduce illiteracy through television, consideration should be given as to how this medium could be used in a structured manner to put over key concepts relating to the environment. One form could be the development of 'distance learning' packages, with training centres and television companies working together, whilst another approach could be to screen the increasing number of documentary films, produced by organizations such as Television Trust for the Environment (TVE), with UNEP backing, on major environmental topics.

3.9 THE CONTENT OF TRAINING PROGRAMMES AND RELATED ISSUES

It is not felt practicable or appropriate at this stage to define an 'ideal' programme for the different components of EIA training at various levels or for specific target groups. This is a specialist task and requires the bringing together of both EIA practitioners and trainers from developed and developing countries. However, a number of general principles that should be considered when formulating training initiatives are proposed.

It must be stated whether training is geared to generalists or specialists and this must be made explicit in the content of training programmes. Both may be desirable given that the institutional structure of EIA in countries varies greatly. Wherever possible training should be practical rather than theoretical. If possible, fieldwork and practical studies should be incorporated. If this is not possible emphasis should be placed on case studies, practical exercises and simulation activities. Training must be geared towards implementation of practical EIA processes.

In general, the greatest training need is to foster an understanding of how to undertake EIAs. Emphasis should be placed, except where courses are specifically geared to an understanding of legal/procedural requirements and environmental management, on both inter- and intra-assessment methods and the assessment of specific impacts. Wherever possible trainers should have practical experience of conducting EAs or be directly involved in the EIA process (legal, procedural, review experience).

Ideally, trainers should be nationals of the country where the training takes place. Initially, it may be necessary to utilize experts from other developing and developed countries who have practical experience of both EIA systems and training. The length of short courses should be tailored to the specific needs of the target group. Awareness courses for senior personnel should probably be of 1 or 2 days' duration, whilst more technical courses would normally need to be from 2 to 3 weeks.

It is interesting to note that many international agencies in the United Nations (UN) system are now starting to formulate training programmes designed for countries in the early phase of EIA development. For example, UNEP, in collaboration with the Environmental Protection Agency, Australia, have produced an *Environmental Impact Assessment Training Resource Manual* (UNEP 1996), which they see as a model approach to developing training capacity. The structure of the *Manual* is as follows:

- Capacity building.
- Training needs analysis.
- Course design, delivery and evaluation.
- Training topics:
  (a) introduction and overview of EIA;
  (b) law, policy and institutional arrangements for EIA systems;
  (c) public involvement;
  (d) screening;
  (e) scoping;
  (f) assessing;
  (g) mitigation and impact management;
  (h) reporting;
  (i) reviewing;
  (j) decision-making;
  (k) monitoring, implementing and auditing;
  (l) project management;
  (m) future directions.

This manual has now been tested in a number of developing countries. Its utility has been evaluated and revisions proposed, but overall it is considered to be a useful training aid to assist in EIA capacity building.

Another priority is the development of various EIA training aids. These include books, information and data on EIA. There is often a paucity of such material and it is suggested that developed countries could provide valuable assistance in helping to establish focal EA information points in selected developing countries to provide such information.

As well as books, there is a need to assemble in developing countries evidence of 'good practice' in EIA. This includes case studies of EA and existing guidelines from developed countries. It is recognized that certain countries, such as the USA, through the Environmental Protection Agency, already donate much information to developing countries. What seems to be required is information which is relevant to these countries and this is one initiative that should be encouraged.

It has been shown from the evaluation of EIA training programmes that one of the most successful training devices is simulation games. Whilst a number exist, they have, predominantly, been produced for use in developed countries. There is a need to develop others designed specifically for the needs of developing countries. Some of the most successful games include a role playing component and again collaboration between aid agencies, environmental departments and trainers in developed and developing countries to produce relevant and appropriate examples would appear to be an important initiative.

3.10 TRAINING OF DEVELOPING COUNTRY PERSONNEL IN DEVELOPED COUNTRIES

Currently a limited number of personnel from developing countries are undertaking some form of training in EIA in developed countries, including Europe and North America. The type of courses varies greatly but include:

- postgraduate or short courses geared to participants from the developed country but which are attended by participants from developing countries;
- specific courses exclusively mounted for developing country participants. The majority of these courses only teach EIA as a component. The length of courses which have been identified range from 3 to 10 months;
- seminars and workshops of from 1 week to 3 months' duration on general or specific aspects of EIA, normally attended by participants from both developed and developing countries.

The issue arises as to the potential benefits and disbenefits of training participants from developing countries in developed countries and whether this is an appropriate approach to capacity development. There are some clear benefits if one analyses the evaluations made by those who have participated in such training. They include:

- provision of training, relevant to the participants' needs, which is not available in their own country;
- an exchange of ideas between participants and academic faculty and organizations from both developed and developing countries;
- an ability to concentrate on training and not be diverted by professional or domestic duties;
- an opportunity to be placed in appropriate departments, agencies, research institutes and organizations to gain practical experience of EIA. This is something which is increasingly encouraged by bilateral aid agencies who sponsor participants on training courses;
- the possibility of gaining access to source materials and utilizing technical equipment relating to assessment which may not yet be available, but have potential, in the trainee's country.

There are also a number of disbenefits, which include:

- the high cost of training, linked to travel;
- the relevance of the training may be diminished given cultural and technical constraints;
- there is no guarantee that those who have access to funding for foreign training are necessarily the most appropriate persons.

To conclude the section on training and capacity building, it is interesting to note the key points on EIA training and education that were discussed in Canberra in 1994 as part of the International Association for Impact Assessment (IAIA) International Study on the Effectiveness of Environmental Assessment (Bailey 1997). Box 3.2 highlights many of the issues already discussed but emphasizes that training to assist capacity development should not be seen in isolation but must be strongly linked to good practice, the appropriateness of training and applied research. For too long EIA training has seen far too great an emphasis placed on theoretical and conceptual approaches and, if it is to make a real contribution to capacity development, it must now be more closely linked to the real world.

3.11 ENVIRONMENTAL IMPACT ASSESSMENT NETWORKS

Information technologies—and networks of EA managers, practitioners, researchers and educators using these technologies—are expected to play an ever-increasing role in improving the management and practice of EIA, supporting

Box 3.2 Key issues in training (Source: after Bailey 1997)

Be clear about 'good EIA practice'
The purpose of EIA training is to promote good EIA practice. Therefore, guidance should be provided on what constitutes good EIA practice in order to clarify the objectives and desirable content of EIA training

Target the right people for training
EIA training programmes and courses should focus on the needs of well-defined target groups and take, when necessary, sufficient account of their varied background

Use appropriate teaching and learning approaches
These should be practical in nature, be learner-active and emphasize problems and conflict-solving situations, as well as technical skills (including the use of information technology)

Use appropriate training methods and aids
Effective use should be made of real-world case studies and simulation exercises, role playing situations, etc.:
- Use of effective trainers
- Trainers should possess practical EIA experience and sound pedagogical skills
- Institutional strengthening
- Consider establishing EIA centres. These centres should provide access to EIA training materials and other relevant documentation, organizing occasional workshops for EIA trainers, undertaking joint training activities, etc.

Development and dissemination of training aids
While a number of training aids have been developed, their supply is still insufficient. The main types of training aids still needed are: guidance for trainers, case studies based on real situations, videos and trainer exchanges

Strengthening links between EIA training and practice of EIA
More effective use should be made of practical experience within EIA training programmes. Greater use should be made of EIA practitioners within training courses. The use of EIA clinics should be explored

Strengthening links between EIA training and EIA applied research
Good quality applied research is necessary for both good EIA training and practice. There is a need to identify and prioritize specific research requirements and develop a strategy for their implementation

capacity building and strengthening EA as a tool to support decision-making.

At the First International Summit on Environmental Assessment, held in June 1994, Canada agreed to prepare a discussion paper on the development of an international EIA network. This section highlights its findings, as it is considered to be most important attempt so far to consider how a network might contribute to capacity development (Shillington & Le Blanc 1995).

The management and practice of EIA is information intensive. Managers require information about the management, application and evaluation of EIA processes—legislation, regulations, guidelines, accountability and other management issues. Similarly, practitioners require current and reliable data on proposed projects, as well as the requirements of particular jurisdictions. Their analysis should be based on the best available environmental data, methods of analysis and knowledge gained from experience.

Traditionally, such information has been obtained in an ad hoc manner through access to databases, reports and documents, through the transfer of information and knowledge between experts (managers, practitioners, researchers, educators) and through contacts made at training courses, workshops and conferences. Concerns have been expressed that this information, has not been widely shared, is out-of-date and does not match the needs of a particular setting or country. In other cases, information is too costly or it is impractical to obtain.

3.11.1 Origins of the network concept

The concept of creating an EIA network to promote the exchange of information and knowledge was raised at the first International Summit on EA, held in Quebec City, Canada, in June 1994. The Summit, sponsored by the Canadian Environmental Assessment Agency (CEAA) in collaboration with the IAIA, brought together senior officials from 25 countries and six international organizations to review progress on the International Study of the Effectiveness of EIA. Summit participants also exchanged information, experiences and views on current issues and emerging trends in the management and application of EIA, and considered practical approaches for strengthening EIA systems and practices. The managers attending the Summit agreed that, if they were to benefit from one another's experiences and knowledge, they needed a mechanism that would provide convenient and ongoing access to key information and allow them to communicate easily with each other.

The concept of an EIA network was one of the three interrelated and mutually reinforcing action items in the Summit's Agenda for Action:

- Endorsing and expanding support for the International Effectiveness Study.
- Designing and establishing an international network for EIA managers.
- Clarifying the concept of EIA capacity building and actively supporting and coordinating capacity building initiatives.

Emerging developments in information technologies suggest that there is a vast potential for the Internet to provide cost-effective means of supporting EIA capacity building efforts worldwide. For example, the use of computers and access to the Internet is expected to grow tremendously in developing countries and in countries in transition, making possible low-cost, convenient and timely access to reliable EIA information and knowledge by those who otherwise may not be able to afford it. Powerful new tools will make it much easier for users to locate information on specific items and events, new software applications will make video-conferencing and remote training easier and cheaper and decision-support tools, such as geographical information systems and expert systems, are expected to become more powerful and widely available (see discussion in Chapter 9, Volume 1).

3.11.2 Benefits to capacity development

A network operated through the Internet offers tremendous potential for countries and international organizations to promote the dissemination of information and knowledge as a means of contributing to EIA capacity building, improving the management of EIA systems and enhancing the effectiveness of practices.

Well-designed and well-maintained Internet sites and newsgroups will allow managers, practitioners and others interested in EIA to access data, publications and other information, and allow people to exchange experiences, knowledge, views, ideas and advice. Use of the Internet could also complement training services and programmes, allowing for greater use of distance-learning approaches.

A network could, for example:

- allow EIA managers and practitioners directly to exchange information, knowledge, experiences and ideas in a highly convenient and cost-effective manner;
- provide convenient and ready access to current publications and documents from domestic and international sources, such as legislation, regulations and guidelines;
- provide convenient access to databases and information holdings of various organizations;
- promote the dissemination and application of EIA training materials;
- promote sharing of the results of research projects;
- build awareness of available information and knowledge amongst EIA managers and practitioners, as well as amongst the general public;
- promote greater coordination amongst managers and practitioners on initiatives and projects of common interest;
- enhance the value of meetings of managers and practitioners by facilitating the preparation and exchange of background information and materials prior to meetings.

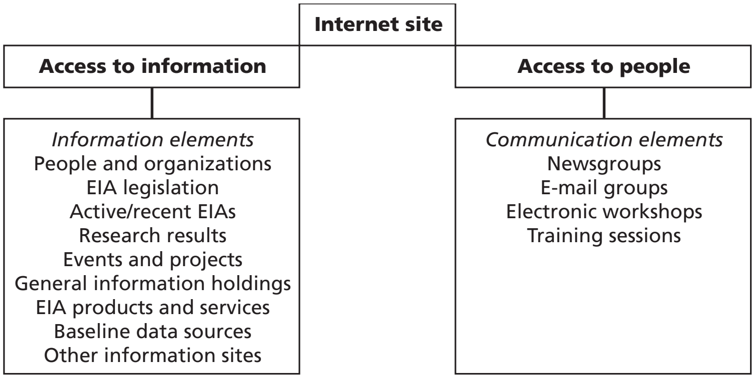

Fig. 3.1 Proposed frameworks: using the Internet to access EIA information and knowledge (source: after Shillington & Le Blanc 1995). EIA, environmental impact assessment.

3.11.3 Proposed framework for an environmental impact assessment network

EIA information in key organizations would be made available through one or more sites on the Internet (more precisely, on the World Wide Web), maintained, for example, by national agencies and international organizations with an interest in EIA. Through these sites, users could directly access available databases and information and make on-line requests for specific items. On-line directories can point users to other relevant information and to appropriate organizations and experts.

The following are the proposed information components that could be made available on an Internet site:

- Key individuals and organizations involved in EIA management, research, training and consulting.
- Copies of EIA legislation, policies and guidelines.
- Information on active and recent EIAs.
- Progress reports of relevant research studies, projects and initiatives.
- Major events of interest to EA managers and practitioners, such as workshops, courses, seminars and conferences.
- Available publications, bibliographies and training modules.
- EIA services and organizations.
- Sources of available baseline data, experts and EIA reports for use in conducting assessments.
- Other relevant sources and sites of EA information.

The structure of the network is shown in Fig. 3.1.

It can be argued that such an approach would be a potentially powerful tool to assist developing countries and countries in transition to gain access to information which they currently lack. The costs of establishing and maintaining such a network are likely to be small, but the network would require that those taking part, such as multi- and bilateral agencies and governments, see the benefits of such an initiative and its potential contribution to capacity development, particularly in developing countries.

3.12 MONITORING THE EFFECTIVENESS OF CAPACITY DEVELOPMENT

It is clear, as indicated by the IAIA effectiveness study and other reviews of the utility of EIA, that monitoring is still a weak element of the process. It would now seem important that, at a time when large sums of money and human resources are being allocated to capacity building and institutional strengthening, steps be taken to monitor its utility and effectiveness. Whilst it is extremely difficult to monitor organizations and their management, interagency cooperation and the effectiveness of the implentation of EIA laws, it is possible to monitor the effectiveness and contribution of training to capacity development.

The following approach has been developed by the Centre for Environmental Management and Planning (CEMP), Aberdeen, UK, in an attempt to elucidate the contribution of its training programmes to capacity building in countries and institutions. It does not attempt to be comprehensive, but is indicative of the kind of analysis which will increasingly be required to evaluate the efficacy of capacity-building measures.

The study used the following indicators of whether capacity development had been enhanced.

- Increased political awareness on environmental issues within the country or agency.
- Environmental policy attitudes changed at the international level.
- Influence on legislation and administrative procedures at national and state levels.
- Institutional strengthening:
  (a) central government;
  (b) local/state government;
  (c) scientific institutions;
  (d) universities;
  (e) training centres.
- Increased awareness/specific actions taken by:
  (a) entrepreneurs/industry;
  (b) NGOs;
  (c) consultants.
- Development of practical management tools (policy advice notes, environmental management/assessment guidelines, general manuals on EIA and sector topics).

The above indicators should be able to establish whether training has brought about change. There are difficulties of direct correlation in assessing the effectiveness of this form of technological transfer. It is in collaboration, whether through 'training of the trainers', providing 'hands on' experience, linking often suspicious partners, i.e. government, industry and NGOs, into common objectives, that the success of training contributions to capacity building should be evaluated.

Evidence of action is listed under the following categories:

- *Direct evidence*—where it is known, from follow-up letters, visits and explicit evidence, that actions can be directly correlated to training programmes.
- *Strong indications*—where feedback from the country strongly indicates that actions have occurred.
- *Informed of actions*—where information is available that changes have occurred or are occurring.
- *Changes underway*—evidence that participants are currently taking initiatives stimulated by their training.
- *Uncertainty of action*—where there is no hard evidence of actions, but some indication of progress.
- *No evidence*—where there is no obvious or immediate evidence of action.

It is a fact that many project managers in bi- and multilateral agencies who have been responsible for attempting to develop EIA capacity in developing countries are still nervous about having their efforts monitored. Without adopting approaches such as those listed above, there is a real danger that much capacity development may well not be as effective as it could be.

3.13 PARTNERSHIPS AND SUSTAINABILITY

The whole issue of capacity development and EIA is now being linked to broader questions concerning the post-Rio agenda. As was recently stated at the Organization for Economic Cooperation and Development (OECD) meeting on *Capacity Development in Environment*, 'It is no exaggeration to speak of a "paradigm shift" to describe the process of fundamental change which is underway in the theory and practice of development cooperation' (Phillips 1997). This shift is signalled, for example, in several important policy papers recently published by the OECD Development Assistance Committee (DAC). The new paradigm is built around the:

> acceptance of a partnership model (in which) development cooperation does not try to do things for developing countries and their people, but with them. It must be seen as a collaborative effort to help them to increase their capacities to do things for themselves. Paternalistic approaches have no place in this framework. In a true partnership, local actors should progressively take the lead while external partners back their efforts to assume greater responsibility for their own development (OECD 1996).

In short, partnerships should lead to locally owned development strategies, based on the development of partners' capacity. The environment is not a sector in itself but affects, and is affected by, all sectors; many environmental issues can be addressed only at the community level because it is often communities who directly use natural resources (forests, fisheries, water, wildlife) and environmental issues are by their nature uncertain and complex. Because of this, the environment presents a unique challenge, and developing countries urgently need to build their own potential to deal with it, if they are to achieve sustainable development.

It is interesting to note that several of the recommendations made as to the new role that donors should play in capacity development equally apply to issues of capacity building in EIA. The six key concepts are as follows:

- *Partnerships*: this is still the central concept in capacity development. A true partnership can only be made between equals. It is apparent that in some cases partners are not treated as equals, e.g. in access to information.
- *Subsidiarity*: this means doing the work at the lowest practical level. For example, decentralization of decisions, going beyond government-to-government cooperation to working with lower tiers of administration and becoming involved in community-based initiatives at the grass-roots level.
- *Financial mechanisms*: new funding mechanisms may be needed to promote capacity development at the national level and within countries. Many of these are already being tried out by donors, but more experimentation is required. The requirement is that donors develop more flexible funding mechanisms.
- *Project cycle, monitoring and evaluation*: the project cycle should be cyclical and not linear; it should also be iterative and flexible. Investing in time, people and money before projects are designed is essential. Monitoring and evaluation should be built in from the outset and be regarded as an integral part of the project management process and largely entrusted to the partner (rather than treated as an externally driven *post hoc* inspection).
- *Skills base*: donors need fewer experts who 'know' and more who can facilitate those within the partner institution who have the knowledge. Skills are therefore needed in facilitation, conflict resolution, negotiation and participatory methodologies. The concept should be of the donor as a 'learning organization'. Donors should do less talking and teaching and more listening and learning.
- *Donor coordination*: the keys to effective coordination are:
  - (a) leadership from the partner country;
  - (b) a cultural willingness on the part of donors to be coordinated, going beyond mere communication to joint activities with other donors;
  - (c) a willingness by donors to think programmatically and, in the longer term, so that there is a reliable framework for coordination;
  - (d) the existence of a strategic framework (e.g. a national sustainable development strategy) in which the donors' contributions can be coordinated.

If we consider some of these concepts and relate them to EIA capacity development, a number of parallel issues arise. Partnerships imply participation and a more level playing field. In many developing countries, and in countries in transition, the EIA process is still severely limited as government agencies and other organizations jealously guard environmental information and do not make it available to those producing environmental impact statements (EISs). Whilst increasingly lip service is paid to greater public involvement in the EIA process, far more effort is required to develop genuine participation (see Chapters 7–10, this volume, for discussion of these problems in practice).

The concept of subsidiarity is also a major issue in capacity development. Many developing countries, and those in eastern and central Europe, have a highly centralized EIA system. Whilst there is clearly a need to improve the capacity and competence of central agencies, there is now a shift in a number of countries towards decentralizing parts of the EIA process to lower tiers of decision-making, e.g. Bulgaria, Poland, Thailand. Currently, knowledge at this level is limited and efforts will need to be made to increase their ability to contribute to the EIA process.

Financial mechanisms to improve EIA performance, both within countries, and in assistance from bi- and multilateral agencies, now need to be

Box 3.3 Frame of reference for initial review of trends and innovations (Source: after Sadler 1994)

Organizing theme	Level and focus of review	Key issues
Capacity building	Needs and demands Training, networking and cooperation Research, development and pilot projects EA skills and competencies for the 21st century International standards	What are the needs of industrial and developing countries, and how do they vary regionally and by country? What is the actual and potential contribution of EA training to professional and institutional strengthening? How might cost-effective networks of international support and cooperation be established? What are the priorities for EA research and development?

EA, environmental assessment.

reconsidered. Far too much external aid, often in the name of capacity development, is in fact no more than the sterile pursuit of fulfilling a project assessment requirement of the donor organization, often using foreign consultants, which rarely leads to an enhanced in-country capacity to develop EIA. Innovation, experimentation and long-term commitments to EIA capacity development are now required. Rather than the many 'one-off' seminars on EIA which are being mounted around the world, there is now a need to develop a more integrated and long-term training strategy. This will require far greater cooperation between bi- and multilateral training providers than at present, but equally a greater commitment by spending Ministries, to work more closely with Environmental Agencies in joint approaches to improve EIA capacity.

The issue of monitoring has already been considered, but the skills base is clearly a topic in developing EIA capacity which must now be addressed. One of the problems is that in many developing countries, and countries in transition, there is an assumption that a good environmental scientist is automatically an EIA expert. In reality, the poor quality of many EAs being produced in these countries bears testimony to inadequate training, inappropriate registration of 'EIA experts' and a lack of knowledge at all levels of the complexity of the EIA process. Until these problems are addressed, the capacity of many developing countries to operate an effective EIA process will be severely restricted.

3.14 CONCLUSIONS

In conclusion, there can be no doubt that, whilst a great deal has been done to increase the effectiveness and capacity of EIA, much work is still required. Box 3.3 identifies the key issues that were listed in the IAIA study on the effectiveness of EIA relating to capacity building (Sadler 1994, 1996). As has been shown in this chapter, there is still much that needs to be done to answer the questions posed. Unless more resources are provided and greater imagination is shown in trying to develop improved capacity in EIA than at present, 'competencies for the 21st century' will not be achieved.

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4: Quality and Quality Control in Environmental Impact Assessment

KARL FULLER

4.1 INTRODUCTION

'Quality', 'good/best practice' and 'effectiveness' are all expressions in common use in environmental impact assessment (EIA). Each will appear frequently throughout this chapter. While not entirely interchangeable, they are all concerned with the goal of ensuring that EIA maximizes its potential as an environmental management tool. Enhancing the quality of information provided to decision makers, opportunities for public involvement, cost-effectiveness and methods of impact analysis are all examples of issues to be addressed to achieve quality in EIA. Ultimately, the quality or effectiveness of EIA is tested by whether it 'makes a difference' (Sadler 1996), i.e. whether EIA results in improved environmental protection. This chapter is concerned with the methods employed to ensure that quality in EIA is delivered. The focus of the chapter is entirely on project EIA, as this is where the greatest experience with quality control mechanisms lies. However, many of the principles discussed can be applied equally to quality control in strategic environmental assessment (SEA).

The single quality or effective EIA system does not exist. Rather, a system should be appropriate to the social, political and economic context in which it has to operate. Nevertheless, it is possible to identify principles which constitute good practice and can act as a template for the enhancement of EIA processes and practice.

4.2 DIMENSIONS OF QUALITY

The primary focus for discussions on quality in EIA has been the quality of the environmental impact statement (EIS). Procedures have been devised to deliver quality EISs in many countries (notably in the Netherlands), principally through instituting a review procedure. Quality of the EIS has also been a focus for research (e.g. Lee & Colley 1990; Glasson *et al.* 1995). The latter study raised the issue of the different perceptions of quality of the various stakeholders in the process. For example, a good EIS for a scheme proponent may be one that contributes to the gaining of consent for a project. For the environmental non-governmental organization (NGO), the exact opposite may be true: a good EIS is one that supplies information that results in the project being refused consent. The perception of the decision maker theoretically should be neutral, but political reality may mean that it alters from one proposed project to the next, depending upon whether they have any preconceived opinion of whether the project should proceed or not. In such circumstance, a good EIS may be one that supports the desired outcome. The above examples all relate to EIA serving one particular interest over another. This is not a reasonable or a desirable demand, but it serves to indicate how few of the participants in the process are neutral and that they are likely to have different demands and expectations.

The EIS is a product of the EIA process and, as such, the quality of the documentation is likely to be closely associated with the quality of the process. As a 'rule of thumb', a poor EIS can result from a good process, but a good EIS will not result from a poor process. Ideally, a good quality process should result in a good EIS. The role of the EIA process has become the focus of more recent research (Lee *et al.* 1994; World Bank 1996). As discussed above, what constitutes a good process

Table 4.1 Key stakeholders' expectations of the EIA process (based on Sippe 1996).

Stakeholder	Key expectations
Proponents	Certainty of outcome Cost effectiveness Minimizing of delays and adherence to timelines
Public	Right to know Right to be informed Right to be heard Right to object
Decision makers	Minimization of delays and adherence to timelines Provision of information appropriate for decision-making Avoidance of unnecessary information Succinct manageable documentation

may also depend upon the perceptions held by the various stakeholders in the process. For the scheme proponent, a good process may be of limited cost, or at least cost efficient, not add to the time taken to plan a project and contribute to a sound project design (Glasson *et al.* 1995). Others may perceive a successful EIA as comprising a full extensive consultation process. Table 4.1 indicates the key expectations of the EIA process of different stakeholders. Understanding quality as it relates to the process is further complicated by the fact that some of the desired characteristics of the different stakeholders may not be complementary. For example, the extensive consultation programme may be the very attribute which causes the cost of an EIA to rise above the expectations of the scheme proponent.

A third facet to EIA quality is an international perspective, which comprises a review of process characteristics of a range of countries (e.g. Wood 1995; and see Chapter 2, this volume). The most notable example, what may be termed an international process review, is the *Study of the Effectiveness of Environmental Assessment* (Sadler 1996). The study sought to identify generic guidance and direction for the future conduct of EIA.

The above discussion has presented a range of perspectives on what constitutes quality in EIA. While tensions may exist between different stakeholder positions, in general the perspectives are not mutually exclusive but require a balance of interests to be achieved. Recent work has attempted to identify the principles that underpin good practice in EIA; most notable is the work undertaken as part of the international effectiveness study and work undertaken for the International Association for Impact Assessment on establishing EIA principles. Boxes 4.1 and 4.2 are reproduced from the effectiveness study and define principles for the design of an effective process and effective practice. These may otherwise be termed 'attributes of quality in EIA'.

While 'making a difference' may be the benchmark by which quality in EIA is judged, there is no single mechanism which can be implemented to ensure achievement of this goal. A series of building blocks must be developed that together contribute to an effective EIA process. These building blocks fall into two related categories:

- *Systemic measures*: features of EIA systems that are designed to deliver quality assurance in the practice and administration of EIA (EIA review is the most prominent example).
- *Foundation measures*: features which promote good practice and underpin the successful application of the systemic approaches (e.g. guidelines, training, professional recognition). They can relate to a specific project/professional sector or a national context or be sufficiently generic to be applied on an international basis.

4.3 QUALITY ASSURANCE IN ENVIRONMENTAL IMPACT ASSESSMENT—THE REVIEW

Procedural steps employed to ensure effective EIA are generally orientated toward ensuring that the quality of the information provided to the decision maker is adequate, i.e. ensuring the basis for informed decision-making is sound. However, other objectives can be identified, for example:

- ensuring only appropriate projects are subject to an assessment;
- ensuring appropriate impacts are addressed by the EIA;

Box 4.1 Principles for design and development of effective EIA processes

1 *Clear mandate and provisions*: vested in law, have specific, enforceable requirements and prescribe the responsibilities and obligations of the proponents and other parties
2 *Explicit goals and objectives*: a clear purpose and dedication to achieving environmental protection and/or sustainable development
3 *Uniform, consistent application*: automatically applied to all proposals and actions with potential environmental effects and consequences
4 *Appropriate level of assessment*: scaled to the degree of environmental significance and extent of public concerns associated with a proposal
5 *Relevant scope of consideration*: examine all pertinent environmental options to and aspects of a proposal, including cumulative effects, interrelated socio-economic, cultural and health factors and sustainability implications
6 *Flexible, problem solving*: adapted to deal with a range of proposals, issues and decision-making situations
7 *Open facilitative procedures*: transparent and readily accessible, with traceable record of assessment decisions and timely opportunities for public involvement and input at key stages
8 *Necessary support and guidance*: requisite level of resources and procedural guidance for conducting assessments in accordance with requirements, principles and standards of good practice
9 *'Best practice' standards*: undertaken with professionalism, objectivity and credibility, as identified by 'best practices' in impact science, public consultation and process administration
10 *Efficient predictable implementation*: applied in a timely manner that fosters certainty, minimizes delay and avoids unnecessary burdens on proponents
11 *Decision oriented*: provide sound, tested practical information that is readily usable in planning and decision-making
12 *Related to condition setting*: explicitly linked to approvals and, as necessary, to specified terms and conditions
13 *Follow-up and feedback in-built mechanisms*: explicit measures for checking on compliance with conditions, monitoring effects, managing impacts and auditing and evaluating performance
14 *Cost-effective outcomes*: promote actions that ensure environmental protection at least cost to society

- ensuring the public have an adequate opportunity to become involved in the process;
- ensuring environmental protection is achieved during implementation.

By far the most common quality control feature of EIA systems is the EIS–EIA review and it is the one which remains the most important. Review has been defined as:

> . . . the step in the EIA process by which it is ensured that environmental information on a proposed action is of sufficient quality and relevance and, in some jurisdictions, in which it is decided what the implications of the information are for decision making (Scholten 1995).

EIA review is the key opportunity to ensure that information on the environmental impacts of an action is adequate before it is used as a basis for decision-making and associated condition setting. An essential component of review is the opportunity for additional information to be requested and for those responsible for preparing the EIA to be under an obligation to provide such information.

The review is also the primary opportunity for the public to become involved in the EIA process and to comment on the extent to which the documentation addresses their concerns and contains adequate and relevant information. The objectives of a review are usually defined in terms of the qualities required of an EIS. Table 4.2 presents three shorthand methods of defining the requirements.

Scholten (1995) has given a more formal definition of the issues that need to be addressed by an EIS and therefore are the focus for review:

- Is the information sufficient? Does it give (in the light of the nature of the activity, the level of decision-making and the environmental issues at stake) all needed information?

Box 4.2 Principles for effective EIA practice

EIA should be applied:
- As a primary instrument for environmental management to ensure that impacts of development are minimized, avoided or rehabilitated
- So that the scope of review is consistent with the nature of the project or activity and commensurate with the likely issues and impacts
- On the basis of well-defined roles, rules and responsibilities for key actors

EIA should be undertaken:
- Throughout the project cycle, beginning as early as feasible in the concept design phase
- With clear reference to the requirements for project authorization and follow-up, including impact management
- Consistent with the application of 'best practicable' science and mitigation technology
- In accordance with established procedures and project specific terms of reference, including timelines
- To provide appropriate opportunities for public involvement of communities, groups and parties directly affected by or with an interest in the project and/or its environmental impacts

EIA should address, wherever necessary or appropriate:
- Other related and relevant factors, including social and health risks and impacts
- Cumulative and long-term, large-scale effects
- Design, locational and technological alternatives to the proposal being assessed
- Sustainability considerations including resources productivity, assimilative capacity and biological diversity

EIA should result in:
- Accurate and appropriate information as to the nature, likely magnitude and significance of potential effects, risks and consequences of a proposed undertaking and alternatives
- The preparation of an impact statement or report that presents this information in a clear, understandable and relevant form for decision-making
- The EIS identifying the confidence limits that can be placed on the predictions and clarifying areas of agreement and disagreement among the parties involved in the process

EIA should provide the basis for:
- Environmentally sound decision-making in which terms and conditions are clearly specified and enforced
- The design, planning and construction of acceptable development projects that meet environmental standards and management objectives
- An appropriate follow-up process with requirements for monitoring, management, audit and evaluation
- Follow-up requirements that are based on the significance of potential effects and on the uncertainties associated with prediction and mitigation
- Learning from experience with a view to making future improvements to design of projects or the application of the environmental assessment process

- Is the information correct in line with current scientific and technical knowledge?
- Is the information relevant? i.e.:
  (a) Does it focus on the issues raised by the parties involved?
  (b) Does it avoid superfluous information?
  (c) Is the information clearly accessible, particularly to decision makers and the public affected?
- In some jurisdictions: are the impacts acceptable from the point of view of the environment? (In some countries the review process is also a decision-making or decision advice instrument).

From the above, it is clear that there is wide agreement on the function of review. A review will usually consist of two distinct parts, which are often run simultaneously and are drawn together toward the end of the review process. These can be termed the technical review and the public review.

The approach to technical review taken by different countries ranges from the informal to the formal. Four procedural models for EIA review are examined here:

Table 4.2 Key issues for EIA review.

The triple A test (Sadler 1996)	Sadler (1996)	Sippe (1996)	Ross (1987)
Appropriateness (coverage of key issues and impacts)	Sufficiency of information provided	Comprehensiveness (addressing key issues for decision-making)	Is the EIS focused on key questions for decision-making?
Adequacy (of impact analysis)	Reliability of analysis and interpretation	Soundness (of methods and interpretation)	Is the EIS scientifically and technically sound?
Actionability (does the report provide the basis for informed decision-making?)	Relevance for decision-making	Understandability (usefulness for decision-making and for public understanding)	Is the EIS clearly and coherently organized and presented so that it can be understood?
		Compliance (impacts should meet acceptable standards)	

- Informal review.
- Formal review within government or the decision-making authority.
- Formal review using an independent authority.
- Informal review by an independent authority.

4.3.1 Informal review

Informal approaches to review are characterized by:

- responsibility for review lying with the decision-making authority;
- a lack of a specific mandate for review within legislation;
- a lack of official guidance as to the methods to be employed;
- variable transparency as to the methods of review employed;
- a lack of review-specific documentation (but results of a review can be contained in another document, for example, decision-making advice).

The review function relies on the responsibility and the expertise of the decision-making authority. The UK is an example of such an approach. Here, the responsibility for review lies with the decision-making authority, but they are under no legal obligation to undertake one. The closest UK regulations come to such a requirement are to oblige the decision-making authority to consider the environmental information (this includes the EIS and any submissions made in relation to it, for example, comments of the public or other consultees). Informal guidance exists on the methods of review available, but there is no requirement or official direction to the decision-making authorities to utilize these methods. The transparency of the methods is reliant on the degree to which the authority wishes to expose its methods and procedures. Some authorities have formalized their approach and come close to establishing a procedure that resembles the formal systems discussed later. For example, the authority may:

- establish a formal internal procedure for handling the review of an EIS;
- identify internal staff with the appropriate knowledge and expertise to undertake the review or appoint an appropriate external organization to undertake the review (e.g. the Institute of Environmental Assessment);
- require a formal review report to be written and refer to this explicitly in any decision-making advice.

Less transparent systems are often dubbed 'black holes', where the EIS is submitted at one end of the process and, after some time has elapsed, a decision on the project is made. The public, and indeed the proponent, have little idea what the role of the EIA has been, whether it has been rigorously analysed or whether it has been put on a shelf and forgotten. Even if the EIS has been subject to an examination, there is often no formal documentation indicating that this has been the case. However, where a number of omissions and inadequacies of an EIS have been identified, additional information would be requested, and this would indicate that some analysis has been undertaken.

Informal procedures are not necessarily lacking in rigour. Decision-making authorities can possess considerable expertise, particularly where they deal with a narrow range of project types. They may well be the most appropriate people in a country to analyse an EIS and feel little need to formalize or enhance the transparency of their process.

4.3.2 Formal review within government or the decision-making authority

Formal approaches to review are characterized by:

- review function specified within the EIA provision;
- separate identity to the decision-making function (often, but not exclusively);
- existence of a standing commission or other body for the purpose of review;
- use of EIA and other technical experts;
- use of formal methods and procedures;
- documented outcome of the review process;
- transparent process, open to public scrutiny.

The review process adopted in Italy is an example of a formal approach within government. The Italian EIA Commission is part of the Ministry of the Environment and consists of a group of approximately 20 experts. Additional expertise can be called upon when necessary. Reviews are undertaken using *Guidelines for Environmental Impact Preparation and for the Formulation of a Judgement on Environmental Compatibility*. These were adopted formally in a Decree by the President of the Council of Ministers in 1988. The review by the Commission leads to a decision on whether the proposal should proceed or not. The review is therefore not only judging the adequacy of the EIS, but is weighing up the merits and disadvantages of the project itself. This is not a unique feature. The decision-making or decision advising function of review can be seen to exist in many other EIA systems including, for example, Canada and Western Australia.

4.3.3 Formal review using an independent authority

The formal review by an independent authority is similar in nature to that within government. However, the establishment of an independent authority shows recognition that governments often have an interest in development proposals. They are frequently the scheme proponent (for example, infrastructure projects) or have a socio-economic/political interest in a private commercial development. The independent authority exists to avoid political interest influencing judgements on the adequacy of an EIS.

The primary example of an independent authority is the EIA Commission in the Netherlands. The role of the Commission is established in law and it is required to review every EIS produced in the country. The Commission functions in a similar way to the Italian Commission. The Commission consists of a technical secretariat which forms an expert panel (usually four to five people) for each EIA which is to be reviewed. The experts are drawn from academia, consultancy and industry. The role of the panel is to review the adequacy of the EIS for decision-making. Advice on whether the information is adequate or whether additional information is required is given to the decision-making authority. They can choose to follow or ignore this advice. However, to ignore it may result in future difficulties should the proposal become subject to an appeal. Importantly, the Commission does not provide any advice on whether the project should proceed or not or whether it is considered to be environmentally acceptable. The findings of the Commission are published. The Commission is also responsible for coordinating the public review and assimilating the views of the public into the final review report.

The Commission did not initially formalize the methods of review, but more recently has begun to develop 'operational criteria'. These are discussed in more detail below (Section 4.3.5).

4.3.4 Informal review by an independent authority

The informal review by an independent authority is not a common feature of EIA systems. In New Zealand, a role for a Parliamentary Commissioner has been established for similar reasons to the political independence of the EIA Commission in the Netherlands. Unlike the Dutch Commission, the Commissioner does not become involved in every EIA. Routinely the function of review rests with the local authorities. However, the Commissioner does have a remit, which includes 'investigation into any matter which in the opinion of the Commissioner has resulted in the environment being adversely affected; investigations into the effectiveness of public authority environmental planning and management; and the provision of advice on remedial action and preventative measures for protecting the environment' (Scholten 1995). This remit has been used as a basis for involvement in EIA review, particularly where the proponent is the government, local authority or a corporation owned by a public authority. Methods of review are not established, but use has been made of independent panels of experts: a procedure well established in other EIA systems.

4.3.5 Environmental impact assessment review—methodological options

The procedural aspects of EIA review in different countries are generally well documented. Less clear are the methods employed by those responsible for review. The expertise of the reviewers appears to be the main basis for the review under all methodologies adopted. There appears to be three options for review methodologies, none of which are mutually exclusive:

- Ad hoc review—based entirely upon the expertise of the reviewer.
- Review based on the scope of the EIA—linked to a formalized scoping provision.
- Review using review criteria.

The ad hoc review is the least systematic of the three, but is not necessarily any less effective as a quality control mechanism. Its strength is based on the expertise of the reviewers and the flexibility to address any issues that appear to be appropriate. This flexibility may identify issues that otherwise would not be identified by more systematic methodologies.

The review based on the scope of the EIA is a feature of reviews undertaken in Canada and the Netherlands. It requires the involvement of the reviewing authority at the scoping stage of the EIA, to ensure that this has been appropriately set. For example, in the Netherlands, the EIA Commission provides terms of reference for every EIA. Similarly, in Canada, projects requiring a 'panel review' have a panel formed at the beginning of the assessment which advises on the scope of the assessment. At the review stage the panel is not constrained in its comments to the content of the scope of the EIA. The remit of the Netherlands EIA Commission's review is determined by the Environmental Management Act (1993). This establishes review guidelines, comprising the requirements of the Act, the scope of the EIA for an individual project and the requirement that an EIS contains no incorrect information (Sielcken *et al.* 1996). Until recently, the first two of the three requirements have formed the main basis of review. Nevertheless, the Commission still had the flexibility to address issues which had arisen since the scope of the EIA had been defined, or had become apparent as a result of the EIA. The main output from this process was a list of the omissions and inadequacies of an EIS. Since 1992, the Commission has adapted its approach to advise on the adequacy of the EIS to be used as a basis for decision-making. In order to support these judgements and to make the review process more systematic and transparent the Commission has established 'operational criteria' (Sielcken *et al.* 1996).

The application of review criteria is becoming the most prominent method of review. Review criteria are essentially a checklist of the requirements of an EIS. However, they are generally written as principles with which the EIS must accord rather than specific technical requirements. For example, the operational criteria established by the EIA Commission include the requirement that 'the description of the proposed activity (the preferred alternative) and its environmental impacts is adequate.'. This criterion has four specific requirements, that:

- the description of environmentally significant aspects of the proposed activity is adequate;
- environmentally sensitive elements which could be affected by the proposed activity are adequately described;
- the important environmental impacts of the proposed activity are adequately described;
- the proposed activity (preferred alternative) and other alternatives described are realistic (Sielcken *et al.* 1996).

Appendix 1 to this chapter contains examples of review criteria from the Netherlands, the UK (Institute of Environmental Assessment) and New Zealand (Morgan & Memon 1993). While they have been developed independently, they can be seen to contain common elements that reflect the essential components of the EIA process, and to contain differences that reflect the institutional and socio-political context of EIA in each country.

Each of the review criteria requires the EIS to provide:

- a clear description of the proposal, particularly those aspects which have the potential to affect the environment;
- a clear description of the impacts of the proposal based upon sound methods and data.

The criteria developed by Morgan and Memon and those used by the Institute of Environmental Assessment have many more elements in common, whereas those used by the EIA Commission concentrate on the consideration of alternatives, an approach which is at the heart of EIA in the Netherlands. The criteria used in New Zealand place a greater emphasis on social impacts and community participation within the process, reflecting the existence of indigenous and rural communities. While other criteria have been developed (e.g. Ross 1987; World Bank 1991), their content is sufficiently similar to those referred to above not to warrant further consideration in this chapter.

The primary benefit of using review criteria is that it provides a systematic rigour to the process. It enhances the possibility that reviews can be replicable. If two people review the same EIS using criteria, the possibility of them identifying the same good points, omissions and inadequacies should be greater. Equally, reviews of two separate EISs for similar projects, but separated by time, should address similar issues. Review criteria also add transparency to the process. Assuming the criteria are published, it provides project proponents and their advisers with some understanding of the standards to be achieved for their EIS to be considered a sound basis for decision-making.

The concerns with review criteria reflect the well-documented criticisms of the application of checklist methods to other parts of the EIA process (e.g. see Chapter 10, Volume 1). The criteria could act as 'blinkers' for the reviewer. Important issues, which may not be addressed adequately by the criteria, may not be identified. The criteria could also lead to EISs being written to meet the letter of the criteria, rather than being flexible enough to address issues important to a specific project. For example, criteria used in the UK rarely refer to potential social impacts, but for some projects this can be an important issue.

The wide publication of review criteria facilitates the use of review as an internal quality control mechanism. Consultants and developers can begin to use the same tools that will be used by the decision makers or those advising them. Identifying flaws within an EIA prior to the submission of the application for consent should have the benefit of minimizing delay, avoiding public exposure of inadequacies and potentially improving relations with the decision-making or assessing authority.

The internal review can be hampered by the lack of objectivity of those who have undertaken the EIA. However, this can be overcome by the use of staff who have no association with the project.

4.3.6 Public review

Most, if not all, EIA systems have provision for public involvement at the review stage of the process. Public involvement and the reasons why it is an important part of the EIA process is dealt with in depth in Chapter 8, Volume 1. The purpose of the discussion here is to examine the role of the public in EIA review. The influence the public can have at the review stage is significantly affected by the timing of their involvement and the nature of the opportunities.

In the majority of EIA systems the public are provided with an opportunity to comment on the EIS prior to a decision being made on the proposal. However, there are exceptions. In the French system, public review can occur after the project has been executed (Commission for the European Communities 1993). The time allowed for the public to comment on an EIS is also an important factor. In the UK, under most of the EIA regulations, the public are allowed 21 days to present submissions on the proposal, including any comments they may have on the EIS. This can be compared with a period of at least 5 weeks allowed for in the Netherlands (Wood 1995). The time allowed at the review stage is particularly important where this is the first opportunity the public have had to become fully informed about the project and its potential environmental impacts. In other systems (e.g. Canada, the USA and the Netherlands), the public review is the culmination of a wider public involvement programme, which is initiated at the scoping stage and sometimes at the screening stage. The learning curve for the public in terms of understanding the project and its impacts is therefore less steep when it comes to the review.

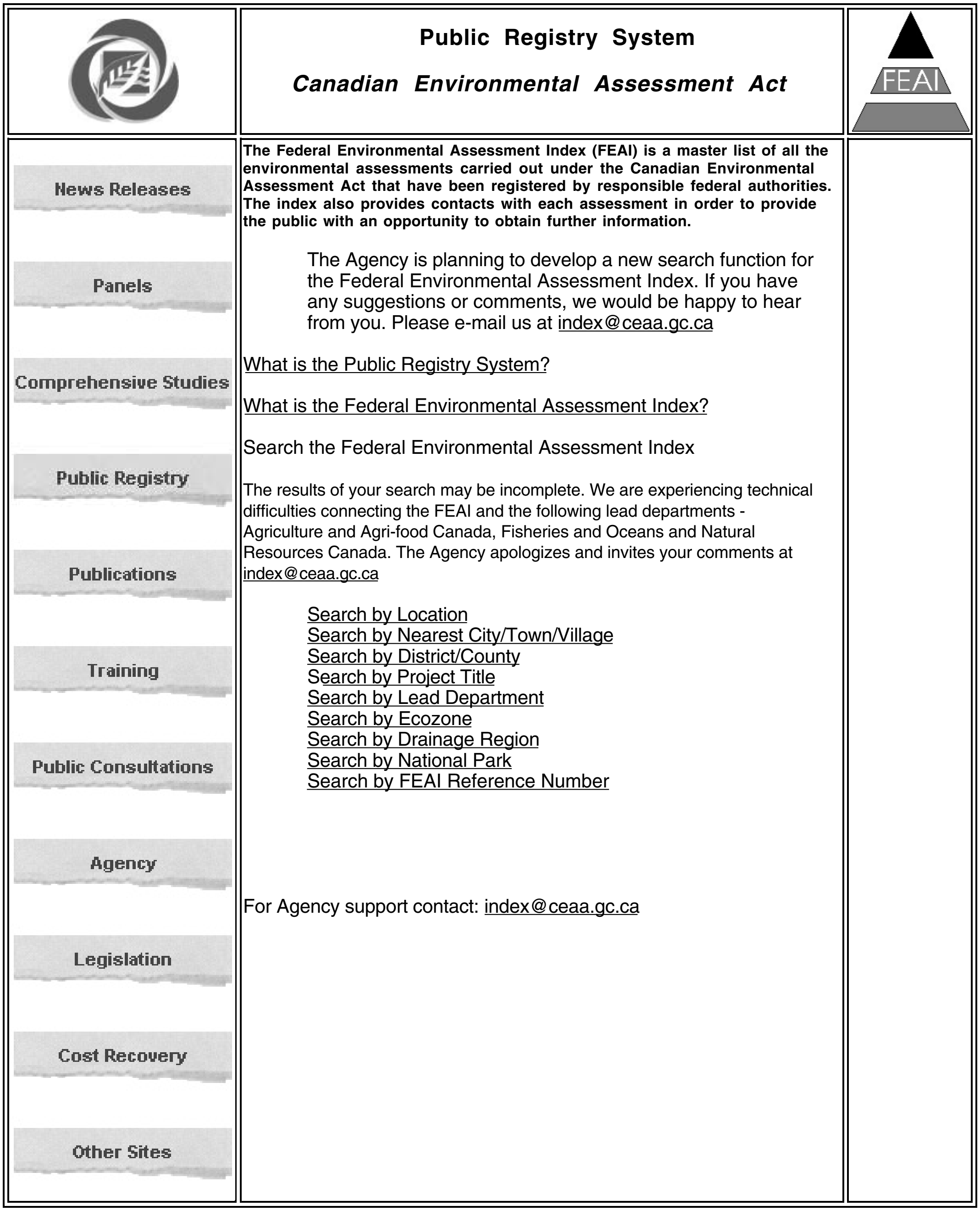
The discussion of involvement, in many of the chapters in this Handbook, indicates how the techniques used can influence the nature of the public input. Opportunities for involvement at the review stage tend to be either passive or proactive. The fundamental attribute of the passive approach is that it relies on the public to 'do all of the work'. The passive approach is characterized by:

- the availability of information (as opposed to provision of information);
- reliance on the public to choose to access that information;
- opportunities to use indirect means to limit access to information;
- reliance on the public to make submissions as opposed to seeking out the public's opinions;
- limited opportunity for dialogue;
- little or no indication of whether or how public involvement has influenced the final decision on a proposal.

An example of the passive approach is the UK. Under the regulations applied to the town and country planning system, the EIS is made available for inspection at the offices of the appropriate local authority and (possibly) a location close to the site of the proposed project. Rarely are copies of the EIS available for inspection in the evenings to suit people's availability. The EIS is also made available for purchase, but the cost of the document can vary from being free to costing several hundred pounds (the most expensive encountered by the Institute of Environmental Assessment had a price of over £700). The cost can, indirectly, severely limit public access to information. The availability of the EIS is notified using inconspicuous adverts in newspapers and notices on the site. In the event that the public wish to comment on the proposal, they are required to make a submission in writing to the local planning authority; there is often no opportunity provided for dialogue unless the proposal goes to a public inquiry. Finally, while the local planning authority is obliged to take into account the environmental information (which can include public comments), there is no obligation to indicate how the public's comments have been taken into consideration when making the decision on the proposal.

The passive approach outlined above does not preclude a more proactive stance being taken by the project proponent and the local planning authority. However, it is a system that lacks transparency and can limit the quality of the opportunities for public involvement.

The passive approach can be compared with the more proactive stance taken by the Canadian and the Dutch EIA systems. Public participation is one of the four purposes of the environmental assessment (EA) process, according to the Canadian Environmental Assessment Act (see also Chapter 11, this volume, for a discussion of the Canadian system). Every EA report has to contain consideration of the comments made by the public. The Minister has to give notice of the availability of reports of panels or mediators and of how copies may be obtained. This would appear to reflect the situation in the UK. However, there are distinct differences in the approach to bringing this information to the attention of the public. Figure 4.1 presents extracts from the Canadian Public Registry System available on the Internet



Public Registry System

Canadian Environmental Assessment Act

FEAI

News Releases
Panels
Comprehensive Studies
Public Registry
Publications
Training
Public Consultations
Agency
Legislation
Cost Recovery
Other Sites

The Federal Environmental Assessment Index (FEAI) is a master list of all the environmental assessments carried out under the Canadian Environmental Assessment Act that have been registered by responsible federal authorities. The index also provides contacts with each assessment in order to provide the public with an opportunity to obtain further information.

The Agency is planning to develop a new search function for the Federal Environmental Assessment Index. If you have any suggestions or comments, we would be happy to hear from you. Please e-mail us at index@ceaa.gc.ca

What is the Public Registry System?

What is the Federal Environmental Assessment Index?

Search the Federal Environmental Assessment Index

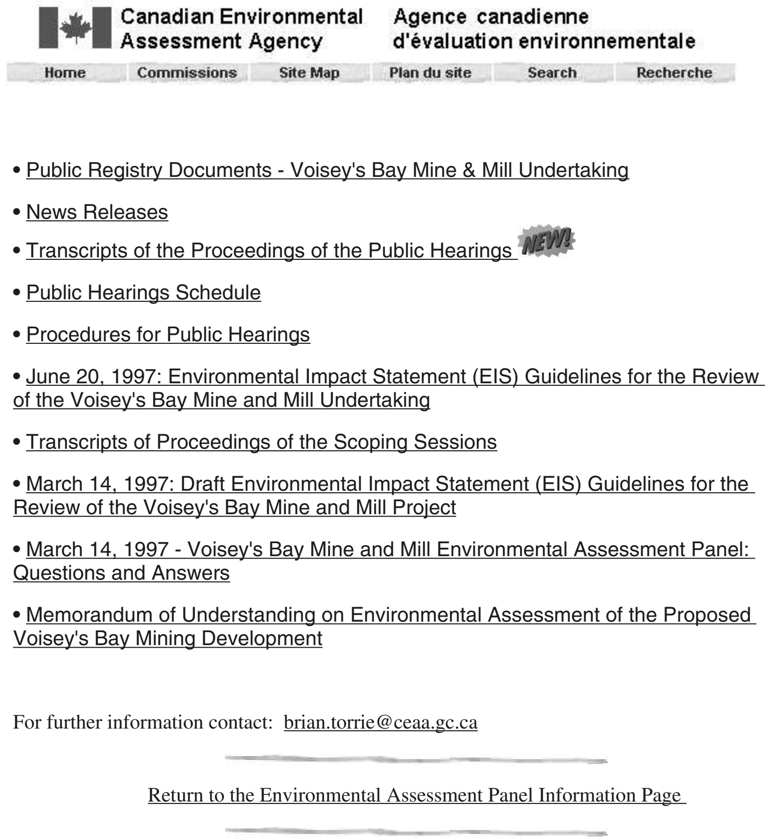
The results of your search may be incomplete. We are experiencing technical difficulties connecting the FEAI and the following lead departments - Agriculture and Agri-food Canada, Fisheries and Oceans and Natural Resources Canada. The Agency apologizes and invites your comments at index@ceaa.gc.ca

Search by Location
Search by Nearest City/Town/Village
Search by District/County
Search by Project Title
Search by Lead Department
Search by Ecozone
Search by Drainage Region
Search by National Park
Search by FEAI Reference Number

For Agency support contact: index@ceaa.gc.ca

(a)

Fig. 4.1(a & b) Extracts from the Canadian Public Registry System available on the Internet. Reproduced with the permission of the Canadian Environmental Assessment Agency (1998). (*Continued*)


Canadian Environmental Assessment Agency | Agence canadienne d'évaluation environnementale

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- Public Registry Documents - Voisey's Bay Mine & Mill Undertaking
- News Releases
- Transcripts of the Proceedings of the Public Hearings NEW!
- Public Hearings Schedule
- Procedures for Public Hearings
- June 20, 1997: Environmental Impact Statement (EIS) Guidelines for the Review of the Voisey's Bay Mine and Mill Undertaking
- Transcripts of Proceedings of the Scoping Sessions
- March 14, 1997: Draft Environmental Impact Statement (EIS) Guidelines for the Review of the Voisey's Bay Mine and Mill Project
- March 14, 1997 - Voisey's Bay Mine and Mill Environmental Assessment Panel: Questions and Answers
- Memorandum of Understanding on Environmental Assessment of the Proposed Voisey's Bay Mining Development

For further information contact: brian.torrie@ceaa.gc.ca

Return to the Environmental Assessment Panel Information Page

(b)

Fig. 4.1 *continued*

(http://www.ceaa.gc.ca) and indicating the range of information available. When a panel is convened under the Canadian system the public have the opportunity to participate in public hearings and therefore an opportunity for dialogue rather than just the presentation of written submissions.

The system in the Netherlands is similar, but also has features that resemble the situation in the UK. For example, the EISs are available for purchase, but some of them are expensive. In addition, they are regarded as being technical documents that are not best suited for public consumption (Wood 1995). Copies of the EIS have to be available for inspection in the evenings as well as during the day. A public hearing is held for each review and the EIA Commission has to accommodate the comments of the public in their advice. As this document is published, the way in which the public comments have been dealt with is therefore open to examination. The openness of the review process in the Netherlands is considered to be one of its main strengths, primarily because it minimizes the potential for abuse of the system (Wood 1995). The value of adopting a transparent approach to the EIA process with respect to quality control is discussed in more detail below.

While both the passive and the proactive approaches during review provide opportunities for public involvement, the role of the public is seen to be more extensive in those countries that adopt features associated with the proactive approach.

4.3.7 A systematic review

Irrespective of the procedural and methodological options available, Scholten (1995) has proposed

Box 4.3 Systematic review process (Based on Scholten 1995; Sadler 1996)

Set the boundaries of the review based on:
Time available
Funds available
The established deadline

Select the review team:
In-house staff versus outside experts

Discern public concerns

Identify review criteria:
Scoping guidelines
General review criteria
Experience with similar projects

Undertake the review:
Identify good points and deficiencies
Determine whether deficiencies are crucial to the decision
Determine how shortcomings should be remedied

Publish the review report

that a systematic approach will enhance the benefits of review. The proposed good practice approach is shown in Box 4.3. Adopting a systematic process:

- establishes a set of actions to be followed by any reviewer;
- can add to the transparency of the process where the procedure is made public;
- can make the review process more defensible;
- helps to orientate the expectations of the review process, e.g. especially where resources are limited.

4.3.8 Limitations of review

EIA review is a significant quality control mechanism, but it does have limitations and these should be recognized. A review is generally reliant on the information presented in the EIS, supplemented with the knowledge of other consultees and the public. However, the role of the review is not to repeat and verify the information contained in an EIS. Therefore, if information is omitted from an EIS, for example, the presence of a rare, sensitive species of significant conservation value, and its presence is not known to other parties, then the review will not be able to address this problem. Confidence in the professionalism of those undertaking the EIA is therefore critical.

A review is frequently undertaken by environmental experts or those associated with decision-making, such as planners. Rarely are technological experts (for example, process engineers) part of the review team. This can cause difficulties where new technology forms part of the proposal. Many of the environmental impacts may rely on the reliability of the technology, but only technological experts may be able to identify such issues.

Review will not resolve all uncertainties associated with the environmental impact of a proposal. At best, it may only be able to point out where such uncertainties exist (for example, resulting from the state of science or resource constraints), and advise that these are addressed where the issues are sufficiently critical and where appropriate methodologies exist. Review can ensure that sufficient information is provided to use as a basis for decision-making, but it does not necessarily make the decision any easier to take.

4.4 QUALITY CONTROL USING OTHER SYSTEMIC APPROACHES

While EIA review is the most important quality control mechanism in the EIA process, others can be applied at other stages within the process. Four specific opportunities are:

- screening;
- scoping;
- impact assessment;
- mitigation and follow up.

The procedural and methodological options in relation to each of these are discussed in detail in Chapters 10 and 11, Volume 1. Screening and scoping provide the opportunity to establish a template for an effective EIA. Screening can ensure that EIA is applied appropriately. This not only ensures that projects with potentially significant impacts are assessed, but also that

EIA is not inappropriately applied and therefore enhances its cost effectiveness. Scoping provides an opportunity to establish the requirements of an EIA at an early stage. Undertaken effectively it should minimize the difficulties encountered at the review stage of the process. As noted above, the scope of a project can provide the basis for the review (as in the Netherlands). The involvement of an independent authority (decision-making authority or EIA Commission) and the public at the scoping stage enables a whole process approach to be taken. In effect, it allows the public and the independent authority to set the agenda for the assessment, rather than commenting on an EIS toward the end of the process. It provides for a proactive rather than a reactive position to be taken by the assessing authority and the public.

While the scoping stage sets the agenda for the EIA, quality outputs will only be achieved if those undertaking the assessment are well briefed, have clear objectives and are competent. Quality control during the preparation of an EIS is not the responsibility of an external agency, but is the responsibility of the practitioners. The role of the project manager and the relations with the scheme proponent are critical.

The project manager may be responsible for (adapted from Bingham 1992):

- selecting the EIA team;
- resolving conflicts within the EIA team;
- maintaining the EIA on budget;
- selecting the timing and nature of public involvement;
- acting as a first line of quality control on outputs from members of the team;
- coordinating the assessment of impacts which have an interdisciplinary facet;
- assimilating a range of information presented in a number of formats and writing styles so as to be suitable for communication to the non-specialist;
- re-designing or influencing the re-design of aspects of the project;
- reporting and communicating the findings in a coherent manner.

Each of these functions will influence the quality of the EIS, the extent to which the EIA process meets the expectations of the different stakeholders and the extent to which it is effective in avoiding or reducing the environmental impacts of the project. The latter factor is also influenced by the relationship of the scheme proponent to the EIA team. Tomlinson (1997) suggests that the relationship of the EIA team to the project planners can fall into one of three categories:

- *Hands off approach*: independent EIA of a completed design with an ability to suggest broad mitigation measures as recommendations, but with no certainty of implementation.
- *Semi-integrated approach*: arm's-length EIA of the evolving project design process, but with periodic exchanges with the project design team likely to lead to bolt-on mitigation measures.
- *Integrated design approach*: a single design and environmental assessment team reducing the need for bolt-on mitigation measures.

The latter is seen as the preferable approach. It is well documented that an EIA should begin as early as possible in the project planning. This enables the EIA to influence the design and potentially the location of the project. Ideally, using this approach many of the potential environmental problems can be designed out. However, such influences can only be brought to bear where the project proponent 'buys in' to the EIA process as a beneficial design tool. This 'buy in' may require encouragement and persuasion by the EIA team, and particularly the project manager. The attitude of the project proponent and the stance taken by the assessor are both critical to the effectiveness of the EIA.

Perhaps the biggest challenge in instituting effective EIA is that of building the link between the EIS, the decision and the implementation of the project. An effective follow-up mechanism is regarded as the key to ensuring that environmental impacts are managed in practice. The role of monitoring and post-auditing is addressed in Chapter 11, Volume 1. However, for decision makers to be assured that the fine words contained in an EIS will be implemented on the ground, a mechanism is required that links the documentation to follow-up. Traditionally the implementation of mitigation measures and other follow-up activities would be achieved through condition setting associated with a consent procedure. However, the scope of conditions is often legally constrained and negotiated agreements for follow-up can be limited. Condition setting also tends to be a reactive mechanism to issues identified in the EIS, resulting in requirements being grafted on to the project implementation plan rather than being an integral part of the programme. Including an environmental management plan (EMP) in the EIS or establishing a link to a certified environmental management system (EMS) are two emerging methods for satisfying decision makers that appropriate arrangements for managing the environmental impacts of implementation are in place.

An EMP can follow a range of formats, but generally will identify:

- measures to be implemented;
- methods to be used (e.g. frequency of monitoring);
- responsible parties for undertaking the task;
- objectives to be achieved (e.g. no complaints regarding dust generation).

Establishing a link to an accredited EMS is, in some respects, less specific about the actual environmental management tasks to be undertaken, but could potentially have a similar effect to an EMP. The scope of the EIA, by definition, defines the project's significant environmental effects. Certification to an accredited EMS requires a proponent to establish a management system to control and manage these effects. The EMS also requires the setting of objectives and targets, similar to an EMP. A formal link to EMSs has recently been established in the UK by the guidance to the Offshore Petroleum Production and Pipe-lines (Assessment of Environmental Effects) Regulations 1998. The guidance states that:

> Consent may be refused in cases where the project does not make provision for a comprehensive externally verifiable Environmental Management System to be established for the lifetime of the project and for a mechanism for its periodic review in the light of experience and technological advances (Department of Trade and Industry 1998).

This approach has the advantage of requiring the proponent to think strategically about the environmental effects of the project from its inception. An EMS can only be effective if it becomes an integral component of the routine operations of the company.

4.4.1 Quality assurance and environmental acceptability criteria

The discussion of other quality control measures has, thus far, concentrated on specific components of the EIA process. Sippe (1996) argues that the effectiveness of EIA can be enhanced by the adoption of a quality assurance approach to the process as a whole by the administering authority, and by the adoption of 'environmental acceptability criteria' (see also discussion in Chapter 5, Volume 1 on criteria of significant impacts).

The concept of quality assurance is based on the assumption that a quality assured process will result in a quality outcome. Quality assurance requires the documentation of procedures, including timing, and the assignment of responsibility for particular tasks. It also includes the concept of review and the improvement of the management system. Primary and secondary benefits of a quality assurance approach are identified in Table 4.3.

Specific benefits of a quality assurance system in the Western Australian EIA process are listed, as follows:

- A rigorous and systematic examination of the process has eliminated unnecessary steps and eliminated duplication.
- The responsibility and statutory basis for each step has been defined.
- The expectations for the quality of the product leaving each step has been clearly defined.
- The application of formal EIA is systematic and based upon transparent decision-making.
- There is greater assurance against environmental issues appearing late in the process and creating uncertainty for proponents.
- A more systematic approach is ensuring that each environmental issue is either judged insignificant or the proposal is modified or there is a condition or commitment addressing the issue.

The adoption of environmental acceptability criteria relates to making the review and decision-making aspects of the process as transparent as

Table 4.3 Quality assurance and process enhancement (source: after Sippe 1996).

Primary effectiveness enhancement	Secondary effectiveness enhancement
Consistency of application of EIA	Increased certainty of application for proponents and the public Designated opportunities for public involvement in quality standards
Consistency of outcomes of EIA	Increased certainty for proponents of advice given Increased certainty for public of how environmental issues are addressed
Efficiency of process	Control of timelines Best use of government resources
Designation of responsibilities	Deficiencies readily identifiable and consequently more easily rectified (continuous improvement)

possible to achieve greater certainty of outcome. Environmental acceptability criteria can comprise:

- standards (not to be exceeded);
- guidelines (which should be adhered to);
- policies;
- precedents;
- positions;
- strategies;
- codes of practice;
- protocols.

Publication of the criteria allows proponents to know the basis of the assessing authority's advice to the decision maker and to plan projects to meet these criteria. The public, similarly, understand the basis for the decisions and know what to expect from the system. In addition, the assessing authority's task is easier as it can evaluate whether a proposal meets the criteria, as opposed to searching for relevant criteria or making ad hoc judgements. Many EIA systems use such criteria on a routine basis; often they are borrowed from their original purpose and used in an EIA context (e.g. the British Standard relating to noise in residential and industrial areas, BS 4142; British Standards Institution 1990). The establishment of environmental acceptability criteria is a formalization of the use of such tools in an EIA context. Sippe points out that for EIA to contribute to sustainable development 'quality of life' criteria should also be developed (Sippe 1997).

4.5 QUALITY ASSURANCE IN ENVIRONMENTAL IMPACT ASSESSMENT—FOUNDATION MEASURES

Direct effects on quality are best achieved by the application of systemic approaches. Nevertheless, to be successfully applied systemic approaches need to be supported by other measures which promote and enhance good practice. This section considers the following:

- Guidelines.
- Capacity building.
- Training.
- Learning exchange.
- Professional recognition.
- Process review.

4.5.1 Guidelines

A sufficient range of guidelines on EIA now exist to warrant the production of *A Directory of Impact Assessment Guidelines* (Roe *et al.* 1995). Guidelines are generally non-binding documents, but, if derived from the appropriate source and if the content is credible and acceptable to all stakeholders, they can have a considerable influence on the effectiveness of the process. Analysis of the guidelines available suggests they fall into one or more of four categories:

1 Country specific—often procedural.
2 Sector specific—relating to a particular type of project or to a project sector.
3 Impact specific—guidance on methods for assessing a type of impact, e.g. impacts on water quality or ecology.
4 Ecosystem specific—guidance relating to the sensitivities of particular ecosystems, e.g. mangrove.

The proliferation of guidelines reflects the methodological and administrative uncertainties associated with EIA and the inherent requirement for the various stakeholders to operate within spheres with which they are not familiar. For example, bureaucrats and administrators, project proponents and the public all need to develop some understanding of environmental and social science; assessors need to have some under standing of engineering, industrial or agricultural processes and be able to operate within the bureaucratic realm. As EIA borrows many of its tools and techniques from other areas of environmental science, guidelines are required to clarify which are or are not applicable to EIA. Finally, guidelines set the standard to which EIA should be undertaken and provide a set of ground rules to define the various stakeholders' expectations of the process. This is the same principle discussed with regard to the establishment of environmental acceptability criteria.

Despite the abundance of guidelines, experience shows that they are rarely implemented. For example, of the EISs (largely UK-based) encountered by the Institute of Environmental Assessment an estimated 80% make reference to *Guidelines for Landscape and Visual Impact Assessment*; however, experience from review suggests that the proportion that implement the guidelines as set down are considerably less. Suggested reasons for the lack of thorough implementation are:

- resource constraints (time, finance and manpower);
- a lack of audit of practice against the requirements of the guidelines by the practitioner;
- anticipation that the competent authority will not audit the practice against the requirements of the guidelines and will be reassured simply by reference to them.

Additional general reasons for the lack of implementation of guidelines can include:

- guidelines may not be sufficiently practical (Roe *et al*. 1995);
- guidelines may not be sufficiently well written to be understood easily (Roe *et al*. 1995);
- presentation format may not be appropriate for day to day use (for example, a ring-bound manual may be more practical than a textbook format).

To be used in practice guidelines should be:

- *focused*—on an issue which can be addressed comprehensively;
- *understandable*—guidelines should be understandable to all participants in the process, not just the specialists;
- *pragmatic*—guidelines based on theoretical science or techniques or which do not acknowledge the constraints or realities of practice will not be used;
- *flexible*—mechanistic guidelines that allow no room for professional judgement or cannot be easily adapted for application to particular problems are unlikely to be used;
- *adoptable*—guidelines which rely on skills, tools or resources which are in short supply and/or are expensive are unlikely to be taken up by practitioners.

4.5.2 Capacity building, training, and learning exchange

Capacity building is covered in detail in Chapter 3, this volume. It is clear that effective EIA systems are reliant on the ability of individuals and institutions to implement them. Education and training of administrators and practitioners and the availability of adequate financial and physical resources are all critical to the effectiveness of EIA. However, there is a need to recognize that training and learning should be ongoing activities. EIA is a dynamic field in which new techniques are developed or borrowed from other disciplines, new methods are employed, advances in scientific and social analysis improve the accuracy of predictions, and legal and institutional arrangements change. In addition, lessons from experience can improve what has been described as a 'best guess science'. Training and capacity building are issues which, while not satisfactorily resolved in practice, do receive some attention. Less focus is given to the creation of resources and networks that allow for continual updating on what is 'good practice' or 'state of the art'. For example, there are few repositories or data sources where practitioners can examine previous best-practice cases to build on the experience for their own EIAs. Much of the material eventually makes it way into guidelines, but this results in a time lag of at least 1–2 years. The rapid growth of the Internet would suggest that there is an opportunity for such an international resource.

4.5.3 Professional recognition

Effective EIA requires good information presented in an appropriate manner. This can only be achieved if the task of gathering that information and making the prediction is undertaken by a competent professional. Similarly, reviewers and decision makers must have appropriate training and understanding to be able to identify flaws in an EIS and to make best use of the completed EIS. The requirement to identify competent professionals, particularly in an increasingly competitive market has raised the issue of professional recognition. Few schemes are orientated toward the recognition of the individual, although such schemes are under consideration in different parts of the world. Nevertheless, there has yet to be a substantial indication of demand for such a scheme. In addition to a lack of clear evidence that professional recognition of environmental impact assessors is required, the development of schemes to recognize the status of the individual are hampered by a number of complexities:

- The multidisciplinary nature of EIA means that any scheme may have to have complex entry requirements.
- For many practitioners EIA is not an all day, everyday activity. The measurement of experience could therefore be problematic.
- Only in a few countries (for example, the UK) are EIA courses part of the mainstream of qualifications offered by higher education institutions. Entry based on an EIA qualification (as for other professional disciplines) could therefore be highly restrictive and counterproductive.

Nevertheless, a scheme of professional recognition would aid the identification of appropriate individuals to undertake an EIA. In particular, it may help to prevent the practice of consultants straying out of their immediate area of expertise. With reference to the need for training and learning to be a continual activity, any scheme should include requirements for continual professional development. In addition, a scheme should recognize the value of experience, in a field where education and training is only a starting point. Recognition of the individual would also begin to place EIA practitioners at a similar level to other professionals working in related fields, for example, planners and engineers. As EIA is a discipline which is designed to put the environmental impacts of a development project on the decision-making agenda, along with economic and engineering considerations, then the placement of the EIA practitioner on a similar professional level to the other disciplines can only be beneficial.

While schemes for the professional recognition of the individual are few and far between, schemes which register the competencies of consultancies undertaking EIA are more commonplace. In some countries (e.g. China), EIAs can only be undertaken by approved consultants (see also discussion relating to Eastern Europe and South America in Chapters 7 and 10, this volume, respectively). However, the criteria used for the registration of the practices are not clear.

In the UK, a scheme operated by the Institute of Environmental Assessment registers practices on the basis of a review of an EIS produced by the company. As review is recognized as the key quality control mechanism, it is deemed to be an appropriate basis on which to judge the capability of a practice. Registrants are required to renew their membership on a 3-yearly basis and therefore the Register is constantly updated. As of June 1998 there were 28 registered assessor companies.

In most countries the environmental profession is relatively young and immature. As a result it is a profession that is relatively easy to enter. Professional recognition is increasingly becoming an issue for those who are established in the profession and can perform to an adequate standard. There is a desire for their knowledge and experience to be recognized above the inexperienced or the inappropriately qualified or experienced. Professional recognition would, by definition, create some barriers to entry into the profession, but should begin to promote the undertaking of EIAs by appropriately qualified and experienced practitioners.

4.5.4 Process review

A range of quality control measures have been discussed which are applied as part of the EIA system or underpin EIA practice. It is difficult to analyse any one of these mechanisms in isolation and evaluate its contribution to the effectiveness of

EIA. Nevertheless, quality control can only be effective if periodically the nature of the EIA process is examined to determine which features are working well and which require strengthening. This is known as EIA process review. There are few examples of comprehensive process reviews, but notable ones are:

- the *International Study of the Effectiveness of Environmental Assessment* (Sadler 1996);
- *Environmental Impact Assessment: A Comparative Review*—a study by Professor Christopher Wood evaluating the effectiveness of EIA in six countries and two states (Wood 1995; see also Chapter 2, this volume);
- review of the World Bank's experience of EIA (World Bank 1996);
- review of the implementation of the EIA Directive by Member States of the European Community (Commission of the European Communities 1993);
- second review of EIA in the Netherlands (ten Heuvelhof & Nauta 1996).

It should be noted that the first two were independent evaluations undertaken to further the development of EIA as an environmental management tool and a tool to be used to promote sustainability. They can be classed as 'international process reviews'. The last three studies relate to a particular institutional context and were undertaken to identify whether and how EIA systems should be adjusted to strengthen their effectiveness. This examination of process review will focus on the first three studies referred to above.

In order to design the process review, it is necessary to first clearly define the objectives of the study, including anticipated outcomes. Box 4.4 provides examples of the objectives of the international effectiveness study and the World Bank review. The establishment of the objectives helps to determine the information to be gathered and the methods to do this and to be used for evaluation.

Box 4.4 Effectiveness study (Based on Sadler 1996)

- Review current issues, emerging trends and future directions of EIA
- Examine the contribution of EIA to decision-making
- Document what works well with existing approaches
- Recommend cost effective measures for improving EIA, with specific reference to the challenge of sustainable development (World Bank 1996)
- Provide an overview of the Bank's institutional responses to the demands of the Bank's EIA requirements, including internal and borrower capacity building efforts
- Take stock of progress in producing EIA reports of good quality—particularly in the critical areas of impact identification and assessment, public consultation, analysis of alternatives and mitigation, monitoring and management planning
- Assess the effectiveness of the current pre-approval process in relation to the project cycle with an emphasis on Bank internal functions and processes
- Examine implementation experience in projects subject to full EIA, with the goal of gauging the effects of the EIA process on project execution and identifying the critical variables determining the degree of effectiveness
- Focus on areas of EIA work that represent special challenges: Category B projects; sectoral and regional EIA; and EIA work in financial intermediary, privatization and guarantee operations
- In all of the above areas, present conclusions and recommendations for further action

Process reviews are generally qualitative in nature. This is a function of the information being gathered. Process reviews require information on how the process is operating in practice and on the opinions of the various stakeholders. Information on legislative provisions and statistics on EIA activity have a role to play, but only in terms of setting the context for the performance of the process. Methods employed are therefore based on interviews, questionnaires and gathering of other opinions and information contained in other published material. Much of the information that a process review requires is not documented. For example, the influence of an EIA on the decision made concerning a specific project is unlikely to be documented. The only way to understand the influence of the EIA would be to talk to the decision makers or their advisers.

Evaluation of the information gathered can be undertaken by a simple analysis of the responses received from participants or can be compared and rated against predetermined criteria. The latter is the approach taken by Wood (1995) in his evaluation of eight EIA systems. These are highlighted in Chapter 2 of this volume. An alternative set of criteria, proposed in the effectiveness study for 'microprocess review' (EIA system specific), is given in Appendix 2 to this chapter. Sadler identifies the key questions as being:

- Were the provisions and principles applied?
- What did the EIA contribute to decision-making?
- Were the terms and conditions implemented?
- What were the benefits to the environment?

Systemic approaches to quality control provide the means to maintain and incrementally improve the effectiveness of EIA. Process review provides the opportunity for making substantial advances by being the catalyst for significant improvements to EIA systems. The 'big picture' analysis enables strengths, weaknesses and trends to be identified and can provide a basis for the setting of a strategic direction to the nature of the EIA system in the future.

4.6 CONCLUSIONS

Quality control is becoming an increasingly important feature within EIA systems for the following reasons:

- The continued exceedence of environmental capacities means that it is imperative that environmental controls are effective in controlling future pressures.
- The increased acceptance of the market place as the main influence on commerce and trade requires effective instruments where this trend could undermine environmental protection.
- Cost efficiencies could create a downward pressure on the quality of EIA practice unless they are met with effective quality control measures.
- The downsizing of governments may reduce their ability to audit the environmental performance of projects; mechanisms which can be implemented at the project planning stage to ensure continual environmental management throughout the life of a project are required.
- The increased power of multinational companies may require the standards of environmental controls from one country to another to be set on a more level playing field (Sadler 1996).

The principal quality control function within any EIA system is, and will remain, EIA review. It provides the ultimate sanction of delaying or potentially refusing consent for a project until adequate information on the environmental effects is provided and adequate measures for minimizing them are designed. Good-practice principles for review are well established and appear to be applicable to most jurisdictions. However, there is a need for these to be more widely adopted. Whilst most EIA systems appear to include a review function, the effectiveness of it as a quality control mechanism, not least in providing the ultimate sanctions of delay, appears to be variable.

Quality control at the review stage of the EIA process has received considerable attention. While, to some degree, this is appropriate, it has also been to the cost of implementing other quality control measures elsewhere in the process. Scoping, while widely recognized as 'good practice', requires more formalization in many systems to establish:

- the involvement of the authority responsible for the review of the EIS, who should preferably be the party which takes the lead and directs the scope;
- a role for the public to ensure that their concerns are addressed by an EIA;
- the level of detail to which impacts should be assessed;
- the methods to be used to assess the impacts.

The establishment of environmental acceptability criteria can bring some certainty into the EIA process. This approach is already apparent in many 'good practice' EIAs, where the significance criteria are established at the scoping stage and the EIA assists in designing a project that can perform successfully against as many of the criteria as possible.

Particularly important is the establishment of quality control criteria that ensure environmental protection on paper (in the EIS) makes a difference on the ground. This is also one of the key conclusions regarding project EIA from the international effectiveness study. Historically, the EIA literature and practitioners have identified a need for monitoring and auditing. However, effort is perhaps better focused on making innovations such as EMPs and EMSs, work to meet the commitments made in the EIS. Monitoring and auditing are inevitable components of both of these tools, but applied to appropriate targets and undertaken in an appropriate manner. Focusing on EMPs and EMSs places the emphasis on continual environmental management of the project rather than on monitoring and auditing for its own sake. They are measures more consistent with the notion of ensuring that EIA makes a difference 'on the ground'.

Effective EIA requires the support of a range of factors which contribute to enabling practitioners to meet the quality standards set within EIA systems. The range of guidelines available and the provision of training are two obvious examples. Key areas for development in the future are:

- establishing the professional recognition of EIA practitioners, to ensure that work is only undertaken by competent individuals;
- taking advantage of modern communications to establish networks and databanks to facilitate the rapid update of good practice approaches, methods and techniques. While these will not replace the role of guidelines, which are regarded as more definitive sources, they will help to fill the time lag between advances in practice and these becoming established in guidance.

The focus of quality control has been on measures that are applied as part of the EIA system to improve the effectiveness of the process with regard to a specific EIA. The innovation of process review provides an opportunity to examine the effectiveness of EIA and establish a basis for instituting changes that result in significant improvements in effectiveness. Studies such as those undertaken by Wood (1995) and Sadler (1996) are undoubtedly beneficial in establishing, on an international basis, what works well and what requires improvement. In addition, they can serve to highlight models that can be adapted for other institutional, social, political and economic contexts. However, process reviews that are part of an institutional arrangement for a particular EIA system are much more likely to result in improvements to that system. Some institutions have established regular process reviews (for example, the European Union and the World Bank). Other institutions could benefit from adopting this as another one of their key quality control mechanisms.

A range of criteria and perspectives on quality in EIA can be developed, but the key test of quality is whether EIA results in improved environmental protection.

APPENDIX 1

INSTITUTE OF ENVIRONMENTAL ASSESSMENT REVIEW CRITERIA

(Sources: Commission for the European Communities 1985; Lee & Colley 1990)

Introduction

The Review Criteria and Review Grades have been developed from original work by Lee and Colley (1990) and are based on the legislative requirements of European Commission (EC) Directive 85/337/EEC on environmental assessment.*

1.0 Description of the development, the local environment and the baseline conditions

1.1 Description of the development

The purpose and objectives of the development should be explained. The description of the development should include the physical characteristics, scale and design, as well as quantities of material needed during construction and operation. The operating experience of the operator and the process and examples of appropriate plant should also be given.

* Commission of the European Communities (1985) Directive on the assessment of the effects of certain public and private projects on the environment (85/337/EEC). *Official Journal of the European Communities* **175**, Brussels.

1.2 Site description

The area of land affected by the development should be clearly shown on a map and the different land uses of this area clearly demarcated. The affected site should be defined broadly enough to include any potential effects occurring away from the construction site (e.g. dispersal of pollutants, traffic, changes in channel capacity of watercourses as a result of increased surface run off, etc.).

1.3 Residuals

The types and quantities of waste matter, energy and residual materials and the rate at which these will be produced should be estimated. The methods used to make these estimations should be clearly described, and the proposed methods of treatment for the waste and residual materials should be identified. Waste should be quantified wherever possible.

1.4 Baseline conditions

A description of the environment as it is currently and as it could be expected to develop if the project were not to proceed. Some baseline data can be gathered from existing data sources, but some will need gathering and the methods used to obtain the information should be clearly identified. Baseline data should be gathered in such a way that the importance of the particular area to be affected can be placed into the context of the region or surroundings and that the effect of the proposed changes can be predicted.

2.0 Identification and evaluation of key impacts

2.1 Identification of impacts and method statement

The methodology used to define the project specification should be clearly outlined in a Method Statement. This statement should include details of consultation for the preparation of the scoping report, discussions with expert bodies (e.g. Planning Authority, Environment Agencies, Joint Nature Conservation Committee, English Nature, Countryside Commission or Scottish Natural Heritage, etc.) and the public and reference to panels of experts, guidelines, checklists, matrices, previous best practice examples of environmental assessments on similar projects (whichever are appropriate). Consideration should be given to impacts which may be positive or negative, cumulative, short- or long-term, permanent or temporary, direct or indirect. The logic used to identify the key impacts for investigation and for the rejection of others should be clearly explained. The impacts of the development on human beings, flora and fauna, soil, water, air, climate, landscape, material assets, cultural heritage, or their interaction, should be considered. The Method Statement should also describe the relationships between the promoter, the planning, engineering and design teams and those responsible for the environmental statement (ES).

2.2 Prediction of impact magnitude

The size of each impact should be determined as the predicted deviation from the baseline conditions, during the construction phase and during normal operating conditions and in the event of an accident when the proposed development involves materials that could be harmful to the environment (including people). The information and data used to estimate the magnitude of the main impacts should be clearly described and any gaps in the required data identified. The methods used to predict impact magnitude should be described and should be appropriate to the size and importance of the projected disturbance. Where possible, estimates of impacts should be recorded in measurable quantities with ranges and/or confidence limits as appropriate. Qualitative descriptions where necessary should be as fully defined as possible (e.g. 'insignificant means not perceptible from more than 100 m distance').

2.3 Assessment of impact significance

The significance of all those impacts which remain after mitigation should be assessed using the appropriate national and international quality standards where available. Where no such standards exist, the assumptions and value systems used to assess significance should be justified and the existence of opposing or contrary opinions acknowledged.

3.0 Alternatives and mitigation

3.1 Alternatives

Alternative sites should have been considered where these are practicable and available to be developed. The main environmental advantages and disadvantages of these should be discussed in outline, and the reasons for the final choice given. Where available, alternative processes, designs and operating conditions should have been considered at an early stage of project planning and the environmental implications of these outlined.

3.2 Mitigation

All significant adverse impacts should be considered for mitigation and specific mitigation measures put forward where practicable. Mitigation methods considered should include modification of the project, compensation and the provision of alternative facilities, as well as pollution control. It should be clear to what extent the mitigation methods will be effective. Where the effectiveness is uncertain or depends on assumptions about operating procedures, climatic conditions, etc., data should be introduced to justify the acceptance of these assumptions.

3.3 Commitment to mitigation

Clear details of when and how the mitigation measures will be carried out should be given. When uncertainty over impact magnitude and/or effectiveness of mitigation over time exists, monitoring programmes should be proposed to enable subsequent adjustment of mitigation measures as necessary.

4.0 Communication of results

4.1 Presentation

The report should be laid out clearly with the minimum amount of technical terms. An index, glossary and full references should be given and the information presented so as to be comprehensible to the non-specialist.

4.2 Balance

The environmental statement should be an independent objective assessment of environmental impacts, not a best-case statement for the development. Negative impacts should be given equal prominence with positive impacts and adverse impacts should not be disguised by euphemisms or platitudes. Prominence and emphasis should be given to predict large negative or positive impacts.

4.3 Non-technical summary

There should be a non-technical summary outlining the main conclusions and how they were reached. The summary should be comprehensive, containing at least a brief description of the project and the environment, an account of the main mitigating measures to be undertaken by the developer and a description of any remaining or residual impacts. A brief explanation of the methods by which these data were obtained and an indication of the confidence which can be placed in them should also be included.

Institute review grades

A Excellent, no tasks left incomplete.
B Good, only minor omissions and inadequacies.
C Satisfactory despite omissions and inadequacies.
D Parts well attempted, but must as a whole be considered unsatisfactory because of omissions and/or inadequacies.
E Poor, significant omissions or inadequacies.
F Very poor, most tasks left incomplete.
N/A Not applicable. The review topic is not applicable or relevant in the context of this statement.

THE NETHERLANDS ENVIRONMENTAL IMPACT ASSESSMENT COMMISSION OPERATIONAL CRITERIA

Criterion 1. The description of the proposed activity (the preferred alternative) and its environmental impacts is adequate.
(a) The description of environmentally significant aspects of the proposed activity is adequate.
(b) Environmentally sensitive elements which could be affected by the proposed activity are adequately described.
(c) The important environmental impacts of the proposed activity are adequately described.
(d) The proposed activity (preferred alternative) and other alternatives described are realistic.

Criterion 2. The description of the alternative most favourable to the environment (AMFE) and its environmental impacts is adequate.
(a) The description of environmentally significant aspects of the AMFE is adequate.
(b) Environmentally sensitive elements which could be affected by the AMFE are adequately described.
(c) The important environmental impacts of the AMFE are adequately described.
(d) The AMFE adequately covers all relevant preventative measures to protect the environment.
(e) The choice of the AMFE from the alternatives described in the EIS is correct.
(f) Of all the alternatives in the EIS, at least one qualifies as the AMFE.
(g) The alternative proposed as most favourable to the environment is realistic.

Criterion 3. The description of the other alternatives and their environmental impacts is adequate.
(a) The alternatives put forward in the guidelines have been adequately described in the EIS.
(b) The environmentally more attractive alternatives are adequately described in the EIS.

Criterion 4. The comparison of alternatives is adequate.
(a) The comparison of alternatives and the resulting rankings are verifiable.
(b) A correct comparison of alternatives does not yield results significantly different to those supplied in the EIS.

Other criteria have been devised but have yet to be used in practice.

Criterion 5. The project's objectives are not so narrow that more environmentally favourable alternatives are by definition ruled out.

Criterion 6. The EIS contains sufficient information on the gaps in knowledge.

Criterion 7. Despite any changes to the situation, the EIS contains sufficient information to allow a decision to be taken.

CHECKLIST FOR EVALUATING NEW ZEALAND REPORTS
(Morgan & Memon 1993)

1 If a brief framework for the EIA was agreed upon by the proponent and the consent granting authority, has the impact assessment team followed the agreed format in a satisfactory way?
2 Did the impact assessors consult the local communities and have they, in their study, shown evidence of having taken note of the community attitudes and feelings?
3 Is the nature of the proposed project clearly described? In particular, are the key processes likely to interact with the environment identified and explained?
4 Is there evidence of a rational coordinated approach to reviewing the potential effects of the proposed project on the environment?
5 Are there obvious gaps in the coverage of the study? Are social impacts included? Are long-term as well as short-term effects considered? Are indirect as well as direct effects considered?
6 Have the assessors made predictions about the possible impacts? Are the predictions based on sound methods and data? Do they indicate the probability of an impact occurring and its likely severity and magnitude? Do they identify beneficial effects as well as adverse effects?
7 To what extent have cumulative impacts been addressed? (That is, potential impacts from the

proposed project, which might be small in themselves, but which might add to existing impacts from activities already operating in the local area and thereby bring about unacceptable environmental consequences.)

8 Have the impact assessors examined environmental impacts that might arise as a result of abnormal operating conditions (such as implications of accidental fires or particular natural hazards)?

9 Have the impact assessors handled the information about predictions in a reasonably balanced and objective manner? Do they attempt to impose their own assessment of the social (or political) significance of the possible effects?

10 What steps have been taken to determine the views of the affected communities (at the local, regional or national scale) concerning the social significance of the predicted impacts?

11 What suggestions are made for mitigating adverse predicted effects? Have the predicted impacts been clearly stated, separate from the proposed mitigation measures? Have the consequences for the environment of implementing the mitigation measures been clearly stated?

12 What form of monitoring programme is proposed, and are the key indicator variables identified for future monitoring?

13 Has the impact assessment team produced a summary document, outlining the potential effects, both beneficial and adverse, on the environment? Can members of the local community understand the information? Is the material presented in a neutral way, without apparent favour to the proposal? Is technical information easily available to those people or organizations wishing to follow up on specific points?

APPENDIX 2

CHECKLIST FOR REVIEW OF ENVIRONMENTAL ASSESSMENT PROCESS EFFECTIVENESS

(Sources: Sadler 1987, 1990; Canadian Environmental Assessment Research Council 1988; Davies & Sadler 1990; Colley & Raymond 1994; Sippe 1994; Hildén & Laitinen 1995; Wood 1995)

The checklist is broken down into four parts. Each one can be completed as a separate exercise or as part of a comprehensive process-wide or proposal-specific review. Some adaptation to circumstances will be needed. Not all questions may be relevant, and for in-depth review supplementary ones will certainly need to be added. Finally, there are two levels of detail at which the evaluation may be undertaken:

1 Marking whether the item is present or not with comments as required.

2 Grading the level of appropriateness of component or performance of our activity as per the rating scales used in each sector.

Step 1 Appropriateness of institutional controls

The following rating scale may be used to answer the following questions in detail:

A Excellent (comprehensive and sufficient).
B Good (minor gaps and inadequacies).
C Satisfactory (some gaps and inadequacies).
D Poor (significant gaps and inadequacies).
E Very poor (fundamental flaws and weaknesses).
F No opinion (insufficient basis/experience on which to judge.

Is the EA process based on, or did it include:

(a) Clear legal provisions?
(b) Explicit requirement to cover all environmentally?
(c) Significant proposals?
(d) Broad definition of environmental/coverage of factors?
(e) Opportunities for public involvement:
 (i) At specified stages only?
 (ii) Throughout the process?
(f) Procedures for independent, expert review of EAs:
 (i) By interagency committee?
 (ii) By spending commission or equivalent body?
 (iii) By ad hoc panel, board or tribunal?
(g) Guidance on application of procedures, including:
 (i) Proposal-specific terms of reference?
 (ii) Agreed timelines for completion?
(h) Visible linkage to decision-making (e.g. approval, permitting, etc., based on submission of report):

(i) Specification of terms and conditions for implementation?
(ii) With provision for follow-up (e.g. monitoring)?
(iii) That are legally enforceable?

Step 2 Adequacy of operational performance for main stages and components of environmental assessment

The following rating scale may be used to answer the questions in detail:
A Excellent (thoroughly and competently performed).
B Good (minor omissions and deficiencies).
C Satisfactory (some omissions and deficiencies).
D Poor (significant omissions and deficiencies).
E Very poor (fundamental flaws and weaknesses).
F No opinion (insufficient basis/experience on which to judge).

Main stages: were the following activities completed fully and successfully:

(a) Screening—proposal classified correctly as to level and requirement for assessment?
(b) Scoping—process completed and resulted in initial closure? i.e.:
(i) Priority issues and relevant impacts identified?
(ii) Key actors involved?
(iii) Reasonable alternatives established?
(iv) Terms of reference/study guidelines prepared?
(c) Impact analysis—process completed in scope and depth necessary?, including:
(i) Affected environment (baseline) conditions described?
(ii) Estimation and prediction of main impact categories?, including: indirect and cumulative effects; other relevant factors?
(iii) Suitable database and methodologies used?
(d) Mitigation—necessary measures or environmental management plan identified?, including:
(i) Follow-up and monitoring arrangements if strategies are untried or impacts uncertain?
(ii) Specification of contingency plans or non-standardized operating responses?
(e) Significance—residual effects evaluated as to potential severity?, including reference to:
(i) Their scope, duration and irreversibility?
(ii) Relative importance to dependent communities or ecological functions?
(iii) Possible compensation or offset mechanisms (also 2d above)?
(f) EIS/EA report—information included is consistent with the process followed, and is:
(i) Complete—informed decision can be made?
(ii) Suitable—right type of information included?
(iii) Understandable—easily apprehended by decision maker?
(iv) Reliable—meets established professional and disciplinary standards?
(v) Defensible—risks and impact are qualified as to proposal uncertainties?
(vi) Actionable—provides clear basis for choice and condition setting?
(g) Review of quality—undertaken to the degree and the level necessary?, including:
(i) Use of suitable methodology?
(ii) Subject to public review and expert comment?

Key components: were the following components undertaken fully and successfully:

(Note: this analysis may be completed for the process as a whole or included as part of a step-by-step examination of 2(a–g) above.)
(h) Technical studies:
(i) Rigorously conducted, consistent with the nature and complexity of the issues: at all stages; at some stages?
(ii) Work conformed to prevailing standards of good science and EA practice: at all stages; at some stages?
(iii) Resulted in the preparation of high calibre, defensible basis for assessment: at all stages; at some stages?
(i) Public involvement:
(i) Opportunities were responsive to the people involved having regard to:
Likely extent of environmental impact and social dislocation?
Degree of public concern/conflict that was evident?
The traditions of the affected population?
(ii) Approaches and techniques used were relevant to issues and constituencies involved:

In all cases?
In some cases?
(iii) Resulted in views and concerns of affected and interested parties being clearly identified:
And incorporated?
Into all key documentation?
Into final EIS report only?
(j) Process administration:
(i) Applied in accordance with established principles and basic provisions?
At all stages?
At some stages?
(ii) Process managed efficiently, i.e. without undue delay or cost to proponents and others with:
Timelines and schedules negotiated up front?
Completion in accordance with these?
(iii) Oversight of activities was consistent and impartial, e.g. recognizing need for fairness to minority and other groups?

Step 3 Relevance of decision-making

The following rating scale may be used to answer the questions in detail.
1 Very influential.
2 Moderately influential.
3 Marginally influential.
4 Not influential.

Did the EA process evidentially† result in the following:

(a) At the preapproval stage—proposal was modified or changed for the better environmentally on the basis of EA? e.g. by:
(i) Alteration of the initial concept?
(ii) Selection of alternative approach?
Technological?
Locational?
Redesign?
(iii) Other presubmission decisions by the proponent? e.g. to:
Provide offsets, such as setting aside natural areas?
Negotiate impact compensation package with affected communities?
Other?
(b) At the formal approval stage—information from the EA process provided an end basis for approval(s) and condition setting? e.g. as:
(i) Documented in the EIS (see 2f)?
(ii) As supported by the adequacy of:
Technical studies (see 2h)?
Public involvement (see 2i)?
Process administration (see 2j)?
(c) Influence on decision-making, specifically where the conclusions/advice and recommendations in the EIS/EA report:
(i) Fully or substantially followed?
(ii) Partially or moderately followed?
(iii) Ignored or marginally followed?
(d) If the EIS/EA report was partially or marginally influential on approval and condition setting, what were the reasons? e.g.:
(i) As described by the analysis of input to decision-making?
(ii) Due to intrusion of other factors and circumstances? Please specify.
Note: What is the evidence for the interpretation? Comparison of EIS report content with:
1 Record of decision?
2 Interviews with participants?
3 Other?
(e) Identification of follow-up requirements? including:
(i) Supervision or surveillance of compliance?
(ii) Impact monitoring?
(iii) Environmental management plan?
(iv) Environmental or impact audit?
(v) Post-project analysis or other research or studies?
(f) Terms and conditions implemented?
(i) Fully?
(ii) Partly?
(iii) Inadequately or not at all?
(g) If terms and conditions were not fully implemented, what were the reasons?, e.g.:
(i) Unforeseen impacts and/or ineffectiveness of mitigation measures necessitated changes?
(ii) Other events and circumstances intervened?

† As documented by records of decision or as reported by a cross-section of participants.

Step 4 Overall results of all effectiveness

Based on evidence from monitoring, auditing and other sources, what were the overall results of the EA process?

(a) Impacts were as predicted or forecast:‡
- (i) In most cases (>66%) with minor inaccuracies?
- (ii) In fewer cases (<33%) with major inaccuracies?

(b) Mitigation measures or management plans worked as intended:‡
- (i) In most cases (>66%) with no minor problem?
- (ii) In fewer cases (<33%) with major problems?

(c) Environmental objectives, criteria or standards met by the project/plan as implemented:‡
- (i) As confirmed by compliance or effects monitoring?
- (ii) As evidenced by other sources of information?

(d) Impacts were avoided, mitigated or reasonably compensated:‡
- (i) In most cases (>66%) with no unacceptable loss or damage?
- (ii) In fewer cases (<33%) with unacceptable loss or damage?

(e) Other environmental and community benefits were realized as described?
- (i) In most cases (>66%) with other minor difficulties encountered?
- (ii) In fewer cases (<33%) with major difficulties examined?

(f) The EA process was within the usual 1% cost range in relation to the overall capital investment in proposal development:
- (i) Yes?
- (ii) No (specify why)?

(g) On balance, the EA process was effective judged against the basic yardsticks:
- (i) Substantive—terms of reference and basic objectives were achieved:
  - As documented by inputs to decision-making?
  - As demonstrated by environmental and community benefits (impact avoidance)?
- (ii) Procedural—the process conformed to established or accepted principles, provisions and procedures? i.e.:
  - As shown by appropriate institutional controls?
  - As evidenced by successful completion of main stages and components?
- (iii) Transactive—results and environmental gains were achieved cost-effectively?, e.g.
  - At least cost as shown by appropriate methodology?
  - At reasonable cost as estimated by informed judgement?

‡Note: for many judgements in this section, reviewers will need to customize 'band widths' (e.g. 2a–e) and incorporate EA audit frameworks and protocols.

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Part 2
Environmental Impact Assessment at the International Level

Although Chapter 2, Volume 1, explored specific environmental impact assessment (EIA) systems, it is important also to consider the transnational and multilateral dimensions of EIA. Transboundary environmental impacts provide one of the most challenging assessment issues, not only in relation to the development and application of appropriate prediction and evaluation methods, but more fundamentally to the need for legal and procedural systems which can ensure that the interrelationships between economic activities and their regional and global impacts are firstly recognized and then assessed. Chapter 5 provides a description of the United Nations Economic Commission for Europe (ECE) Espoo Convention, which is understood to be an innovative international legal instrument for addressing transboundary environmental impacts in the sustainable development context. The chapter discusses the Convention's requirements and the obligations it places upon signatory countries

The second chapter (Chapter 6) in this Part looks at the adoption and practice of EIA amongst the multilateral financial institutions. The international theme is maintained through the chapter's coverage of eight institutions which provide for the financing of projects across the world. Each of the institutions examined has adopted distinct procedures reflecting specific roles, responsibilities and organizational structure. Whilst acknowledged as providing decision support, to date the traditional analysis of specific impacts has dominated, with discussions of alternatives and cumulative impacts remaining weak. The chapter compares the operation of the different institutional systems following the components of the EIA process, identifies successes and failures in applying EIA to investment projects and makes recommendations for improvement. The discussion provides a grounding for the next Part of this volume, through an understanding of the impact of the multilateral financial institutions on the implementation and effectiveness of EIA in developing and transitional economies.

5: The Convention on Environmental Impact Assessment in a Transboundary Context

WIEK SCHRAGE

5.1 INTRODUCTION

It is well understood that environmental impact assessment (EIA) is an important instrument for implementing and strengthening sustainable development. It combines the precautionary principle with the principle of preventing environmental damage and arranges for public participation. EIA has become the major tool for an integrated approach to the protection of the environment, since it requires a comprehensive assessment of the impacts of an activity on the environment, contrary to the traditional sectoral approach. Moreover, it considers alternatives to the proposed activity and brings facts and information on environmental impacts to the attention of the decision makers and the public. EIA is already used as an effective instrument for improving the quality of the environment at the national level.

It is understood that the United Nations Economic Commission for Europe (ECE) Convention on Environmental Impact Assessment in a Transboundary Context (after this called the EIA Convention) will lead to environmentally sound and sustainable development by providing information on the interrelationship between economic activities and their environmental consequences, in particular in a transboundary context. The EIA Convention, elaborated under the auspices of the ECE, was adopted at Espoo (Finland) on 25 February 1991. It was signed by 29 countries (Albania, Austria, Belarus, Belgium, Bulgaria, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxemburg, the Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Spain, Sweden, Ukraine, the UK and the USA) and by the European Community. By November 1997, 22 countries (Albania, Armenia, Austria, Bulgaria, Canada, Croatia, Denmark, Finland, Greece, Hungary, Italy, Liechtenstein Luxemburg, the Netherlands, Norway, Poland, Republic of Moldova, Slovenia, Spain, Sweden, Switzerland and the UK) and the European Community had deposited their relevant instrument with the Secretary-General of the United Nations. In accordance with Article 18 of the Convention, it entered into force on 10 September 1997.

This Convention is the first multilateral treaty to specify the procedural rights and duties of Parties with regard to transboundary impacts of proposed activities and to provide procedures, in a transboundary context, for the consideration of environmental impacts in decision-making. The EIA Convention stipulates the obligations of Parties to assess the environmental impacts at an early stage of planning. The EIA Convention prescribes measures and procedures to prevent, control or reduce any significant adverse effect on the environment, particularly any transboundary effect, likely to be caused by a proposed activity or any major change to an existing activity. The EIA Convention stipulates that an EIA procedure as provided for in this Convention has to be undertaken for a proposed activity planned by one Party which is likely to have a significant transboundary impact within an area under the jurisdiction of another Party. Activities which could have a significant impact on the environment are covered by the EIA Convention in its Appendix I (see Box 5.1).

The EIA Convention includes a preamble, 20 articles and seven appendices. The preamble

Box 5.1 List of activities

1 Crude oil refineries (excluding undertakings manufacturing only lubricants from crude oil) and installations for the gasification and liquefaction of 500 t or more of coal or bituminous shale per day
2 Thermal power stations and other combustion installations with a heat output of 300 MW or more and nuclear power stations and other nuclear reactors (except research installations for the production and conversion of fissionable and fertile materials, whose maximum power does not exceed 1 kW continuous thermal load)
3 Installations solely designed for the production or enrichment of nuclear fuels, for the reprocessing of irradiated nuclear fuels or for the storage, disposal and processing of radioactive waste
4 Major installations for the initial smelting of cast-iron and steel and for the production of non-ferrous metals
5 Installations for the extraction of asbestos and for the processing and transformation of asbestos and products containing asbestos: for asbestos–cement products, with an annual production of more than 20 000 t finished products; for friction material, with an annual production of more than 50 t finished products; and, for other asbestos, utilization of more than 200 t per year
6 Integrated chemical installations
7 Construction of motorways, express roads* and lines for long-distance railway traffic and of airports with a basic runway length of 2100 m or more
8 Large-diameter oil and gas pipelines
9 Trading ports and also inland waterways and ports for inland-waterway traffic which permit the passage of vessels of over 1350 t
10 Waste-disposal installations for the incineration, chemical treatment or landfill of toxic and dangerous wastes
11 Large dams and reservoirs
12 Groundwater abstraction activities in cases where the annual volume of water to be abstracted amounts to 10 million m^3 or more
13 Pulp and paper manufacturing of 200 air-dried metric tonnes or more per day
14 Major mining, on-site extraction and processing of metal ores or coal
15 Offshore hydrocarbon production
16 Major storage facilities for petroleum, petrochemical and chemical products
17 Deforestation of large areas

*For the purposes of this Convention: 'motorway' means a road specially designed and built for motor traffic, which does not serve properties bordering on it, and which: (a) is provided, except at special points or temporarily, with separate carriageways for the two directions of traffic, separated from each other by a dividing strip not intended for traffic or, exceptionally, by other means; (b) does not cross at level with any road, railway or tramway track, or footpath; and (c) is specially signposted as a motorway. 'Express road' means a road reserved for motor traffic accessible only from interchanges or controlled junctions and on which, in particular, stopping and parking are prohibited on the running carriageway(s).

sets out the underlying principles of the EIA Convention, such as the interrelationship between economic activities and their environmental consequences, the need to ensure environmentally sound and sustainable development and the need to give explicit consideration to environmental factors at an early stage in the decision-making process and to use EIA as a necessary tool to improve the quality of the information presented to decision makers. The preamble also stresses the need for and importance of developing anticipatory policies and of preventing, mitigating and monitoring significant adverse transboundary impact.

Governments were aware of the fact that the decision-making process tended to separate environment and economic development aspects. This separation influenced not only the decision-making process, but also the action of all groups, including government, industry, business and individuals. The decision-making process can be reshaped only by adjusting the national legal and administrative framework. To this end, economic/sectoral policies, strategies, plans and legal instruments should be reviewed to ensure the progressive integration of environmental considerations in the decision-making of all economic sectors. To design and implement an efficient decision-making system that takes into account both environment and economics, an adequate institutional setting is required. This setting should aim at translating the close link between the environment and economics from theory into practice. This interlock between the two areas should be addressed at all levels, be they national, local or sectoral.

Accordingly, in preparing the EIA Convention, Governments wanted to integrate environmental and development decision-making processes, with the aim that the sustainable development process should be systematically monitored and evaluated, and the state of the environment and natural resources regularly reviewed, ensuring the transparency of and accountability for the environmental implications of economic and sectoral policies. The implementation of the Convention lays an important foundation in that respect.

5.2 DEFINITIONS

Article 1 of the Convention contains the definitions. The definition of 'proposed activity' comprises not only new or planned activities but also 'any major change to an activity'. The EIA Convention does not define what a major change is and the decision of whether the EIA Convention should be applied in a specific situation will therefore be based partly on judgement. The basic criteria for that judgement could be that the existing activity subject to a major change is included in Appendix I to the EIA Convention and that the authorization from a competent authority is required for that change. Examples of major changes may include:

- the construction of additional production capacities in offshore hydrocarbon production;
- large-scale employment of new technology in an existing activity;
- rerouting of motorways, express roads or airport runways, changing the direction of take-off and landing.

Consideration would have to be given to a change in investments and production (volume and/or type), physical structure or emissions. Cases where the major change would represent an increase of the same magnitude as the threshold specified in Appendix I to this Convention might be examined first. Particular consideration should also be given to cases where the proposed changes would bring existing activities up to such thresholds. For example, where for groundwater abstraction activities the annual volume of water to be abstracted will be brought up to 10 million m^3 or more. Although Article 1 (vi) defines EIA as a national procedure for evaluating the likely impact of a proposed activity on the environment, it can be concluded that the EIA Convention includes international standards, for instance for the content of EIA documentation as well as procedures for public participation. The EIA Convention describes an 'impact' as any effect caused by a proposed activity on the environment, including human health and safety, flora, fauna, soil, air, water, climate, landscape and historical monuments or other physical structures or the interaction among these factors. It also includes effects on cultural heritage or socio-economic conditions resulting from alterations to those factors. It seems that some countries lack experience with the latter part of this definition, as these types of effects have only recently been introduced in relevant legislation. The definition of 'transboundary impact' explicitly excludes impacts of a global nature and therefore concentrates on transboundary impacts of a local or subregional character in the ECE region.

The reference to 'air', 'human health and safety' and 'water' in the definition of impact and the description of the content of the EIA documentation as included in Appendix II could lead to the conclusion that a so-called risk assessment has to be undertaken for a proposed activity. Accordingly, Article 4, paragraph 4, of the ECE Convention on the Transboundary Effects of Industrial Accidents (Helsinki 1992) explicitly states that:

> When a hazardous activity is subject to
> an environmental impact assessment in
> accordance with the Convention on
> Environmental Impact Assessment in a
> Transboundary Context and that assessment

> includes an evaluation of the transboundary effects of industrial accidents from the hazardous activity performed in conformity with the terms of this Convention, the final decision taken for the purposes of the Convention on Environmental Impact Assessment in a Transboundary Context shall fulfil the relevant requirements of this Convention.

It is worth noting that the relevant European Union Directives, 85/337/EEC and 97/11/EC, do not specifically cover human health and safety, although it is recognized that these issues often raise public concern.

5.3 FIELD OF APPLICATION

Normally, countries which have ratified the Convention must apply its provisions when two requirements are met. According to Article 2, a Party has to take the necessary legal, administrative or other measures to implement the provisions of this Convention, such as the establishment of an EIA procedure that permits public participation and the preparation of the EIA documentation according to Appendix II, for proposed activities (i) listed in Appendix I to the EIA Convention and (ii) which are likely to cause a significant adverse transboundary impact.

5.3.1 Proposed activities listed in Appendix I

Many activities listed in Appendix I to the EIA Convention are fairly well defined. However, the words 'major', 'integrated' and 'large' are also used to set a threshold for several activities. This suggests that the EIA Convention applies only to a subset of all possible units of activities under consideration. More specific thresholds for 'major', 'integrated' and 'large' could be found by examining the frequency distribution of activities relative to their size (measured in appropriate units). Difficulties in determining thresholds may arise from the differences in environmental, social and economic conditions in a geographical area under consideration. For example, a 'small' industry in an industrialized area may be a 'large' one in the Arctic area. Despite many difficulties, specific thresholds would serve as useful initial guidance. It must be decided whether an activity is referred to in the list of proposed activities in Appendix I to the EIA Convention before the significance of the likely transboundary impact can be considered.

5.3.2 Significant impact

The consideration of the 'significance' of an adverse transboundary impact will always be part of the decision to apply the EIA Convention. Criteria on the significance of any impact should be set in a general decision-making framework. In some cases, it may be possible to establish generally acceptable criteria on significance. Mostly, however, the conclusion that an adverse transboundary impact is likely to be significant would be based on a comprehensive consideration of the characteristics of the activity and its possible impact. An element of judgement would always be present.

At the national level, various approaches to determining the significance of an impact have been developed in ECE countries (see Chapter 5, Volume 1, for discussion of significance). They are described in the ECE publication *Policies and Systems of Environmental Impact Assessment* (United Nations Economic Commission for Europe 1991). Within a country, detailed criteria can be applied, taking into account the national EIA legislation, administrative practices and environmental conditions. In some countries, particular criteria have been used to compile lists of activities subject to an EIA at the national level. These so-called positive lists are usually more extensive that the one included in Appendix I to the EIA Convention. The advantage of establishing and applying lists of activities considered a priori to have a significant adverse impact is that both authorities and proponents know when an EIA has to be carried out.

According to Article 3 of the EIA Convention, the identification of likely transboundary impacts and the determination of significance for transmitting the notification to the affected country could be set in a general framework, which would give a structured starting point for further discussions between the competent authorities in the country of origin, the proponent and the affected country. The key element in such a framework is the format for the listing and identification of impacts. The advantage would be that a common format listing the impact clarifies the considerations of the competent authority and its discussion with the proponent after it has received information on a proposed activity. When the competent authority in the country of origin has identified possible transboundary impacts, it continues to evaluate their significance. This evaluation will often take the form of a dialogue between the proponent and the competent authority. The scale or characteristics of the impacts are the basis for determining their significance.

Case studies on transboundary impacts (United Nations Economic Commission for Europe 1996) show that it may be difficult to obtain even tentative quantitative information on the characteristics of the likely impacts at this stage. Therefore, the competent authority of the country of origin may also consider the general characteristics of a proposed activity. The information to be submitted to the affected country in the notification in accordance with Article 3 of the EIA Convention could include a description of the impacts and indicate which impacts are considered possibly significant. In all cases of likely transboundary impacts, a central consideration will be the likely area of impact relative to the border. This consideration covers two aspects:

1 The border between the country of origin and the affected country. The key points of interest are the areas where the greatest impacts are expected in the affected country.

2 A specified area of likely impact in the affected country.

The competent authority in the country of origin must decide on the likely area of impact and on the criteria by which it is delimited. Reference should be made to relevant environmental standards and threshold values. These values should be derived from national laws or regulations, international agreements or experience. The area of impact is seldom unambiguously defined, because the type of emission or other factors determine the spatial distribution of the impact. In practice, the affected country may have different standards, thresholds or experiences for determining the area of impact. This could result in different perceptions in the affected country and in the country of origin regarding the significance of the impacts. The exchange of environmental information may provide details for determining the possible area of impact for specific types of activities. The harmonization of standards and threshold values between Parties to the EIA Convention is likely to alleviate this problem. It is generally understood that a notification should be transmitted whenever there is a possibility, no matter how uncertain, that an impact may be significant. This additional information on the characteristics of the impacts and uncertainties should also form part of the notification. It should be understood that the abovementioned standards and thresholds are related to most of the impacts as defined by the Convention. However, other impacts, such as socio-economic impacts, are normally not subject to standards or thresholds.

According to Article 2, paragraph 5, it is also possible to apply the EIA Convention to activities not included in Appendix I. If the concerned Parties agree that one or more activities (not listed in Appendix I) are likely to cause a significant adverse transboundary impact, they should be treated as if they were listed. General guidance for identifying criteria to determine significant adverse impacts is included in Appendix III (see Box 5.2) and, although these criteria are clearly linked to activities not listed in Appendix I, they might be expected to help settle the question of 'significance'. By mutual agreement, countries can do this by using one of the following possibilities:

- Countries could try to draw up a common catalogue of additional activities not listed in Appendix I and treat them in the same way as Appendix I activities.
- Countries should try to develop further detailed criteria for such additional activities, making use of Appendix III to the Convention.
- Countries could agree that the Convention applies to all activities under the EIA procedure of the country of origin. As the national lists of activities usually differ, the problem of the principle of reciprocity arises. Countries will usually only be prepared to carry out a 'transboundary

Box 5.2 General criteria to assist in the determination of the environment significance of activities not listed in Appendix I

- In considering proposed activities to which Article 2, paragraph 5, applies, the concerned Parties may consider whether the activities are likely to have a significant adverse transboundary impact, in particular by virtue of one or more of the following criteria:
  (a) *Size*: proposed activities which are large for the type of the activity
  (b) *Location*: proposed activities which are located in or close to an area of special environmental sensitivity or importance (such as wetlands, designated under the Ramsar Convention, national parks, nature reserves, sites of special scientific interest or sites of archaeological, cultural or historical importance); also, proposed activities in locations where the characteristics of proposed development would be likely to have significant effects on the population
  (c) *Effects*: proposed activities with particularly complex and potentially adverse effects, including those giving rise to serious effects on humans or on valued species or organisms, those which threaten the existing or potential use of an affected area and those causing additional loading which cannot be sustained by the carrying capacity of the environment
- The concerned Parties shall consider for this purpose proposed activities which are located close to an international frontier, as well as more remote proposed activities which could give rise to significant transboundary effects far removed from the site of development

EIA' if the other country will, under similar circumstances, do the same.

- Countries could decide on a case-by-case basis that the Convention applies to an activity not listed in Appendix I.

An example of the subregional work for the application of Article 2, paragraph 5, of the Convention is the work done by the Arctic countries under the Arctic Environmental Protection Strategy. In this context, several meetings have been held which made it clear that the Arctic countries consider the Convention the basis for cooperation in the Arctic area. The Convention, and in particular its Appendix I, has been reviewed in order to elaborate more stringent measures for the application of EIA in a transboundary context. This work has resulted in the Guidelines for EIA in the Arctic.

Article 2, paragraph 7 of the EIA Convention requires Parties to undertake EIA following the provisions of this Convention at the project level and calls upon Parties to endeavour to apply the principles of EIA to policies, plans and programmes. Although the wording of this article clearly indicates that a Party is not obliged to apply EIA to policies, plans and programmes, some countries introduced legislation a number of years ago to arrange for the application of EIA to decisions at the plan level, for instance for energy, waste management, water supply and land use. Policies, plans and programmes adopted at all levels of government may have significant environmental impacts, either directly or indirectly. To take these impacts fully into account, such policies, plans and programmes should be subject to EIA (see also Chapters 4 and 19, Volume 1). It is increasingly recognized that principles of EIA at the project level could be applicable to the assessment of relevant policies, plans and programmes. It is equally important that the responsibility for protecting the environment be acknowledged and accepted at all levels of government. The application of EIA principles to policies, plans and programmes is widely considered as a way of substantially strengthening environmental management (United Nations Economic Commission for Europe 1992).

5.4 PROCEDURE

If a project is listed in Appendix I and likely to have a considerable adverse effect abroad, the Convention's procedure must be followed (for a simplified flow chart, see Fig. 5.1). It starts with

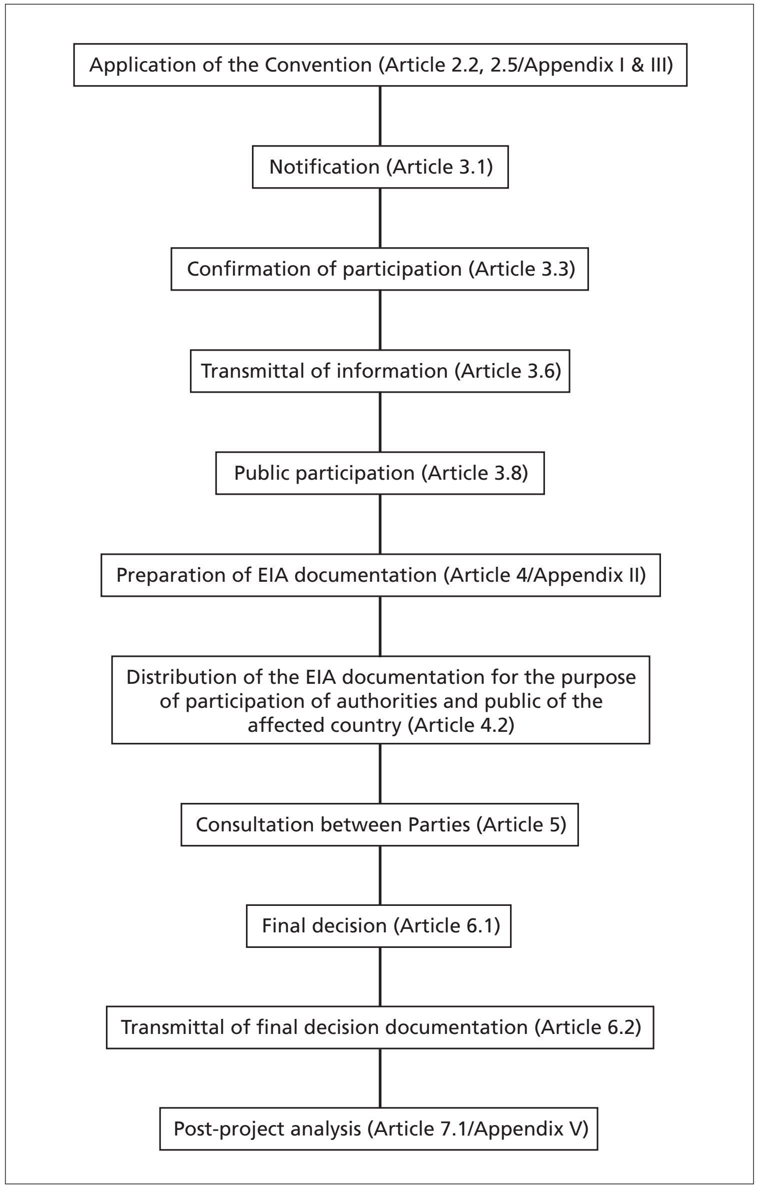

Fig. 5.1 Flow chart: environmental impact assessment (EIA) convention, main procedural steps.

the Party of origin notifying any other Party that it thinks will be affected as soon as possible and in any case no later than when it informs its own public about the project. This early notification will give the affected Party time to consider its position and say whether or not it wishes to take part in the EIA procedure, according to Article 3, paragraph 3. The earlier the notification is given, the more useful it will be. However, its timing also depends upon when the project is brought to the attention of the authorities in the Party of origin. Each country has different procedures for this, especially regarding scoping.

Various articles of the Convention require the country of origin to transmit information to the affected country and vice versa. In accordance with Article 3 of the Convention, a list of points of contact has been prepared. If no point of contact has been designated, the notification should be transmitted to the Ministry for Foreign Affairs of the affected Party. The Convention does not say how the exchange of information under Articles 2–7 should take place. Since legal and administrative systems vary considerably from country to country and are not always known in detail on the other side of the border, governments have decided to create specific contact points. These specific contact points could, for example, be the respective authorities carrying out the EIA in order to have direct contact with these authorities.

Contact points can assume various responsibilities and functions. They are usually the first contact for the Party of origin to which it sends the notification and in most cases it will also be the contact point which will respond to the notification. The contact point may have the following functions:

- *Mail-box function*: the contact point submits all the information it receives from the country of origin to the respective authorities, which then take action.
- *Coordinating function*: the contact point distributes the information to the respective authorities and the public of the affected country, collects their comments and reactions and submits them to the country of origin.
- *Initiating function*: the contact point is responsible merely for the first formal contact between the Parties and submits a list of authorities in the affected country to be directly addressed by the authorities of the country of origin.

For an effective application of the Convention it could be useful to designate, in addition to the national contact points, contact points at the local or subregional level. Of course, the procedure is simpler if there is only one contact point.

However, some countries (e.g. federations) may find it easier to have several such institutions (e.g. one in each federal State or one in each province). In such cases it may be difficult for the other country to find out which of the contact points is competent in a given case. On a bilateral or multilateral basis a solution can be found. For example, such a problem can be avoided if the other country can choose the specific contact point to which it sends its information and which will then transmit the information to the relevant contact point(s). Another solution could be to contact the national government level and ask which contact point will have to be informed in a specific case.

The wording of Article 3, paragraph 1, of the EIA Convention should, in principle, pose no problem for countries that have introduced a national scoping procedure as part of the EIA procedure, which includes the mandatory participation of the public. These countries must notify affected countries no later than when informing their own public in the scoping procedure. Where other countries have introduced a scoping procedure without public participation, there will be an opportunity, following a notification under Article 3, paragraph 1, for the affected Party to help in the scoping procedure by making comments. It will generally be beneficial for the Party of origin to involve the affected Party in that procedure to clarify the issues at stake. Therefore Parties of origin that have a scoping procedure without public participation should notify an affected Party during that scoping procedure. In countries where no formal scoping procedure is required, it may not always be possible to notify an affected Party at the time most expedient for the purposes of Article 3. In these countries, proponents of activities are not required to inform the authorities about their plans before preparing the EIA information required under domestic provisions.

Where no scoping procedure exists, the Party of origin should notify any Party that it deems an affected Party as soon as the authorities are informed about the proposed activity. There could be cases where the Party of origin finds that a proposed activity is likely to cause a significant adverse transboundary impact only after informing its own public. In such situations, which are contrary to the provisions included in Article 3, paragraph 1, of the EIA Convention, the Party of origin should notify the affected Party immediately. Furthermore, the Party of origin should recognize that its EIA procedure may be delayed to accommodate the interests of the affected Party, pursuant to the provisions and procedure of the EIA Convention.

Article 3 furthermore requires the affected Party to respond to the Party of origin and to indicate whether it intends to participate in the EIA procedure. As this Convention in particular deals with transboundary impacts, the potentially affected environment should also be considered when preparing the EIA documentation and this article therefore provides the affected Party with the opportunity to transmit relevant information in this respect to the Party of origin. The purpose of this provision is to help the Party of origin to prepare the EIA documentation. The information shall be furnished 'promptly'. The definition of the term 'promptly' in this context depends on the specific circumstances of the proposed activity in question. However, a number of criteria can be given on which this specification should be based. These include:

- the nature, size and location of the proposed activity;
- the extent of the area in question;
- the environmental status of this area;
- existing information systems;
- the type and stage of the licensing process for the activity;
- information access and ways and means of information transmittal, etc.

Article 3, paragraph 6, does not require the affected Party to carry out lengthy research, but only to provide the Party of origin with 'reasonably obtainable information'.

The Convention sets a standard for the minimum requirements for the content of the EIA documentation to be submitted to the competent authority. These requirements are referred to in Appendix II (see Box 5.3) of the Convention and include elements such as the elaboration of alternatives, including the no-action alternative, a description of mitigation measures and predictive methods, an identification of gaps in knowledge and uncertainties and an outline of monitoring and management programmes and any plans for postproject analysis, which seems to be similar to the relevant European Commission (EC) Directive. When the EIA documentation has been prepared it is transmitted to the competent authority of the Party of origin, which has to transmit the documentation to the affected Party. The documentation is to be used for further consultations between the concerned Parties.

Article 5 of the Convention provides that, after the completion of the EIA documentation, the Party of origin shall enter into consultations with the affected Party. It is not stated, however, at which level such consultations shall take place. In general, official consultations are usually at the highest level because they take place between States. Who finally takes part in such consulta-

Box 5.3 Content of the environmental impact assessment documentation

Information to be included in the environmental impact assessment documentation shall, as a minimum, contain, in accordance with Article 4:

(a) A description of the proposed activity and its purpose

(b) A description, where appropriate, of reasonable alternatives (for example, locational or technological) to the proposed activity and also the no-action alternative

(c) A description of the environment likely to be significantly affected by the proposed activity and its alternatives

(d) A description of the potential environmental impact of the proposed activity and its alternatives and an estimation of its significance

(e) A description of mitigation measures to keep adverse environmental impact to a minimum

(f) An explicit indication of predictive methods and underlying assumptions as well as the relevant environmental data used

(g) An identification of gaps in knowledge and uncertainties encountered in compiling the required information

(h) Where appropriate, an outline for monitoring and management programmes and any plans for postproject analysis

(i) A nontechnical summary including a visual presentation as appropriate (maps, graphs, etc.)

tions is for the respective States to decide, but could include representatives of the proponent, the Ministry of the Environment, the Ministry of Foreign Affairs and the decision-making authority. It seems likely that both the country asking for consultation and the responding country will suggest issues for discussion (e.g. monitoring, post-project analysis). In accordance with the provisions of the Convention, the consultations must take place before the final decision, so that the outcome of the consultations is taken into account. Article 5 provides that, at the beginning of the consultations, a reasonable timeframe should be set for the duration of the consultations. A possible way could be to try to agree on a case-by-case basis on the timeframe within which the consultations should be finished. If there is no agreement on a reasonable timeframe, a provision could be included in the arrangement stating that after a certain time (for example, 6–8 weeks) consultations end automatically, regardless of whether there is a satisfactory outcome. After that the EIA procedure continues and the decision can be taken.

In many cases it may be useful and even essential to meet more often and to exchange information at an expert level. The Parties should be able to ask for such an expert exchange whenever there is a need for it, which is likely to include the exchange of information about the potentially affected environment. Another possibility is to meet at the level of an existing joint body. Article 6 provides that, in the final decision, due account has to be taken of the outcome of the EIA, the EIA documentation, the comments received and the outcome of the consultations. The EIA Convention does not specify the consequences of failing to take due account of these issues, which seems to indicate that the affected Party has no right of veto in the decision to implement the proposed activity. However, the Party of origin would be in a difficult position if all the available facts indicate that a significant adverse transboundary environmental impact is likely and it does not take account of this in the final decision. Some countries, such as Austria, also have legal remedies to appeal against the final decision with respect to a proposed activity, although it is not clear whether such national remedies are also open to the affected Party or to the public of the affected Party. In this respect it should be mentioned that Article 2, paragraph 6 provides that the Party of origin shall ensure that the opportunity provided to the public of the affected Party is equivalent to that provided to the public of the Party of origin.

The EIA Convention includes provisions aimed at establishing mechanisms to prevent dispute. Article 3 stipulates that if a country considers that it would be affected by a significant adverse transboundary impact of a proposed activity, and no notification has taken place, the concerned countries shall, at the request of the affected country, exchange sufficient information for holding discussions. If those countries agree that there is likely to be a significant adverse transboundary impact, the provisions of this Convention will apply accordingly. If those countries cannot agree, any such country may submit the issue to an inquiry commission, according to the provisions of Appendix IV to the EIA Convention, to advise the concerned Parties on the likelihood of a significant adverse transboundary impact. The 1992 ECE Convention on Transboundary Effects of Industrial Accidents (Helsinki 1992) (ECE/ENHS/NONE/2) contains a similar procedure in relation to the identification of hazardous activities capable of causing transboundary effects.

5.5 PUBLIC PARTICIPATION

The EIA Convention contains three references to public participation. Article 2, paragraph 6, includes a general reference to this issue and Articles 3 and 4 mention more specific parts in the EIA procedure where the public has the right to participate. Article 3, paragraph 8, requires the concerned Parties to ensure that the public in the areas likely to be affected is informed, and provided with possibilities for making comments on, or objections to, the proposed activity and for these to be referred to the competent authority of the Party of origin. Similarly, under Article 4, paragraph 2, the concerned Parties must arrange for distribution of the EIA documentation to the authorities and the public in the areas likely to be affected and for the submission of comments to the competent authority of the Party of origin. In either case the following questions should be answered:

1 whether the concerned Parties are to carry out those tasks jointly; or, if not;

2 which Party is responsible for which tasks in this context.

In this regard, the rights and obligations of each Party under international law must be borne in mind. It is clear, for instance, that the Party of origin will be able to conduct hearings in another country only with that country's consent. Unless the concerned Parties agree otherwise, the tasks should be divided between them and each should undertake those tasks that it is best able to carry out. So, according to Article 3, paragraph 8, the Party of origin provides information on the project, while the affected Party decides how this information is to be distributed (e.g. press, posters). The Parties carry out their tasks in accordance with their own practice.

Although public hearings are not explicitly mentioned in the Convention, several countries use hearings as a form of public participation. The question then arises as to whether the public hearing should be held in the Party of origin or in the affected Party. Under bilateral or multilateral arrangements the Party of origin could hold a public hearing in the territory of the affected Party. Alternatively, it could be preferable to organize the public hearing in the Party of origin, providing the participants from abroad, where necessary, with the services of an interpreter. However, it should be realized that the convening of public hearings related to transboundary EIAs may give rise to practical problems, as participants are expected to travel and the language issue could also hamper their participation and this will also lead to additional costs for the organizer of these hearings. In some countries, affected individuals of the affected Party are given the right to appeal against the decision. This information could be given either in the publication announcing the public hearing, in a special information brochure or in the decision.

5.6 EFFECT ON INTERNATIONAL LAW

The drawing-up and signing of the Convention has influenced and will continue to influence other international instruments, such as conventions and ministerial declarations. Article 4, paragraph 4 of the ECE Convention on the Transboundary Effects of Industrial Accidents (Helsinki 1992) (ECE/ENHS/NONE/2) indicates that when a hazardous activity is subject to an EIA in accordance with the EIA Convention and that assessment includes an evaluation of the transboundary effects of industrial accidents from the hazardous activity which is performed in conformity with the terms of the Industrial Accidents Convention, the final decision taken for the purposes of the EIA Convention shall fulfil the relevant requirements of the Industrial Accidents Convention. The ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki 1992) (ECE/ENHS/NONE/1) also makes reference to EIA in a transboundary context, as do provisions in other conventions, such as Article 7 of the Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki 1992). The EIA Convention is also recognized in, for example, the Final Declaration of the Ministerial Meeting of the Oslo and Paris Commissions (September 1992), the Ministerial Declaration on Cooperation in the Barents Euro-Arctic Region (January 1993) and the Nuuk Declaration on Environment and Development in the Arctic (September 1993).

5.7 INTERIM IMPLEMENTATION

In their Resolution on Environmental Impact Assessment in a Transboundary Context (ECE/ENVWA/19), the Signatories to the EIA Convention decided to strive for its entry into force as soon as possible and to seek to implement it to the maximum extent possible, pending its entry into force. Meetings of the Signatories to the EIA Convention, open to all ECE member countries, were held and these meetings reviewed the actions taken by Signatories to implement the EIA Convention pending its entry into force, considered legal, administrative and methodological aspects of its practical application, discussed ways and means of strengthening the capability of future Parties, particularly countries with economies in transition, to comply with the obligations under this Convention and established a work programme. Draft rules of procedures for the Meeting of the Parties have been prepared. ECE member countries are making the necessary arrangements to implement the provisions of the EIA Convention at the subregional level, in particular through bilateral and multilateral agreements or other arrangements of relevance to this Convention.

A number of existing bilateral and multilateral agreements are being used to implement the Convention. For example, in Hungary, bilateral agreements on transboundary waters with neighbouring countries relate to activities that might have an adverse impact on the quality and quantity of these waters and include provisions for the submission of information on such impacts. The bilateral agreement between Hungary and Ukraine on environmental cooperation provides for cooperation in the field of EIA in relation to proposed activities that may have an adverse environmental transboundary impact. In Finland, in many cases, the relevant cooperation regarding EIA in a transboundary context is done through joint bodies. The mandate of these joint bodies and the means of cooperation are defined in agreements. Finland is a Party to such joint bodies or otherwise regularly cooperates with other countries, according to several agreements.

In some agreements there are provisions on the right of Parties to obtain information on a planned project and participate in the relevant planning and permit procedures. Also, new agreements are being elaborated for this purpose and other cooperative arrangements are being made. For instance, in the Netherlands, initiatives were taken to start bilateral discussions with Belgium and Germany. Examples of experiences with transboundary EIA include the application of the Convention between Croatia and Hungary, Hungary and Slovakia and the Netherlands and Germany. In Finland, the first notification according to the Convention was sent to Sweden in late autumn 1994. The notification included information on plans to build the Vuotos artificial lake (i.e. large dam and reservoir) in Lapland (Schrage 1997). It is likely that the building of the reservoir will have an adverse impact on the water quality in the Bothnian Bay, which is also on Swedish territory. According to some other agreements and arrangements, Finland and neighbouring countries have cooperated concerning permission procedures for the planned projects. Cooperation usually consists of transmitting information and negotiation between relevant authorities.

The above-mentioned examples indicate that ECE member countries have been applying the provisions of the EIA Convention pending its entry into force in cases where significant transboundary impacts were likely. New regulations have been introduced or existing regulations modified at national level to arrange for the EIA process, in particular in a transboundary context. A number of countries have decided to amend existing EIA legislation by inserting the relevant provisions of the Convention, while in other countries specific legislation related to EIA in a transboundary context has been elaborated.

5.8 CONCLUSIONS

The EIA Convention is understood to be an innovative international legal instrument for achieving sustainable development and for preventing, reducing and controlling transboundary environmental impacts. The importance of this legal instrument as an efficient tool to promote active, direct and action-orientated international cooperation at the regional level is growing, in view of the increasing membership of the ECE. The EIA Convention will halt the growing potential for transboundary environmental problems, caused by the creation of new national frontiers, if it is rapidly and efficiently implemented and complied with by as many member countries as possible, in particular by the countries in transition. It should eliminate the former dividing line between east and west and integrate countries with economies in transition into a pan-European legal and economic space. Although the implementation of the provisions of the Convention will be far from easy, the obligations will help to solve possible conflicts between Parties of origin and Affected Parties. It also reflects new trends in international environmental law, which allow all those who are likely to be affected by an environmental impact to be involved in the decision-making process.

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6: Environmental Impact Assessment and Multilateral Financial Institutions

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6.1 INTRODUCTION

The purpose of this chapter is, firstly, to provide an overview of the procedures and processes for environmental impact assessment (EIA), with special emphasis on five multilateral financial institutions (MFIs). These institutions are the World Bank, the African Development Bank (AfDB), the Asian Development Bank (AsDB), the European Bank for Reconstruction and Development (EBRD) and the Inter-American Development Bank. In addition, the approaches and procedures of the European Investment Bank (EIB), International Finance Corporation (IFC) and the Caribbean Development Bank are briefly described (see Boxes 6.1–6.3).

Secondly, it describes the experiences of the Banks in actually implementing their EIA procedures over time. This includes several brief case studies of projects financed by the World Bank, the AsDB and the EBRD. Lastly, the chapter attempts to identify the major 'successes' and 'failures' in applying EIA to investment projects and to make recommendations for improvement.

The structure and information in the chapter builds upon, and updates, an unpublished background paper, entitled 'Overview of multilateral financial institution procedures for environmental assessment', which was prepared by the Environment Department of the World Bank for a technical workshop held in Washington, DC, in 1993. The present chapter is based on information available in the spring and summer of 1997. The procedures of the five Banks are presented in Table 6.1 and the text draws from that table. EIA as a requirement for MFI project preparation is evolving in all the institutions surveyed. Procedures are regularly being revised and fine tuned as experience and information improve. The information presented here therefore should be used as background reference only (Caribbean Development Bank 1993, 1995; Asian Development Bank 1995; Inter-American Development Bank 1995). Readers interested in specific application of procedures and policies should verify current practice directly with the corresponding MFI.

6.2 THE PURPOSE OF ENVIRONMENTAL IMPACT ASSESSMENT REQUIREMENTS AND PROCEDURES

A comprehensive evaluation of the experience to date with EIA across the major MFIs does not exist, but assessments undertaken by individual institutions suggest that major benefits have been gained from implementing EIA requirements and procedures. One of the most recent and comprehensive reviews undertaken by an MFI is *The Impact of Environmental Assessment—the World Bank's Experience—Second Environmental Assessment Review*, covering the World Bank's experience with EIA from 1992 through 1995 (World Bank 1997). There is a broad consensus among environmental staff in the five Banks that EIA has been a useful instrument for improving the environmental soundness of investment operations.

The five MFIs reviewed in this chapter, along with many other development aid agencies, adopted distinct EIA procedures between 1989 and 1992. The first to initiate formal environmental procedures was the World Bank, with the adoption of Operational Directive (OD) 4.0 in 1989.

Box 6.1 Approaches and procedures of the Caribbean Development Bank

The Caribbean Development Bank (CDB) has used EIA procedures as the principal means to ensure that its projects are environmentally sound. CDB has in place similar environment operational procedures as the World Bank and other multilateral institutions. However, most of CDB's borrowing member countries (BMCs) have only just begun incorporating environmental considerations in their development agenda. Consequently, the institutional and legislative framework necessary to support the EIA process is either relatively new, weak or absent

CDB has attempted to use its leverage as a development financial institution to assist its BMCs to improve their institutional capability for environmental management, through the provision of training courses on EIA methodology and technical assistance (TA) grants in the following areas:

- Strengthening of institutions with responsibilities for various aspects of environmental and natural resource management. These have included assistance to improve operational procedures to incorporate environmental considerations in institutions directly responsible for granting development permits, assistance in the preparation of sector plans or national environmental action plans
- Environmental studies to provide baseline environmental data to support specific capital development projects. These may include TA loans or grants to carry out environmental studies, baseline environmental data collection

CDB has not yet carried out a formal evaluation of the effectiveness of its environmental assessment procedures. However, it would be fair to say the following:

- Environmental considerations are now an integral aspect of CDB's investment projects and this has in many instances positively influenced project design
- CDB's assistance and those of other multilateral and development institutions has led to significant changes and general improvements in both the institutional and legislative framework for environmental and natural resources management in its BMCs
- CDB uses its influence in its BMCs to encourage them to develop and incorporate and integrate environmental considerations in overall macro-economic planning to achieve a more sustainable development path
- BMCs still require a lot of assistance to improve capacities for environmental management, and in the Caribbean one of the critical areas requiring assistance is that of baseline environmental information, which will assist in improving the quality of EIAs, as well as providing a basis for long-term monitoring programmes
- In its internal operations, CDB pays closer attention to the effective supervision of those projects classified as environmentally sensitive and determines the most cost-effective method of improving their supervision

The purpose of the procedures in each of the MFIs was generally the same: to improve project selection, design and implementation and to minimize adverse environmental impacts. Preparation of EIA reports (or environmental assessment (EA) reports) is a borrower responsibility, but the Banks determine what type of EIA, if any, is required for each project they support. The World Bank uses the term 'EA' rather than 'EIA'. Consequently, the term 'EA report' is used to refer to the full environmental study which it requires. The term 'EIA report' is used to refer to the full environmental study required by the AfDB, AsDB, EBRD and IBD for projects with significant potential impacts. Standard outputs of the EIA process are recommendations: (i) on environmental soundness/feasibility of projects; (ii) for changes in project design; (iii) for mitigative measures needed to minimize adverse impacts; (iv) for measures which can bring about additional environmental benefits to the project; and (v) for proper environmental management during implementation of the project. For example, the AfDB (African Development Bank 1990, para. 4.1.1) states that:

The Key to the AfDB Group's approach to

Box 6.2 Approaches and procedures of the European Investment Bank (EIB)

The EIA process plays an important, practical role in the EIB, similar to that in other MFIs, within the context of the Bank's general approach to environmental appraisal. Verification that an EIA has been successfully carried out when required by law is part of the Bank's environmental due diligence, but the EIA also serves a more fundamental purpose in helping to evaluate the acceptability of a project from an environmental point of view. In the Bank, the overall environmental impact of a project is summarized in what is called an 'environmental fiche', which is prepared for all projects where there are significant environmental effects. Among the specific functions of the EIA are the following:

- To help screen project alternatives
- To identify the environmental impact of a project and appropriate mitigation measures
- To yield data for incorporation in the economic cost–benefit analysis
- To provide information on the extent, form and outcome of public consultation

The Bank does not undertake EIA-related work itself; nor does it assume responsibility for providing public access to the documents produced. All work associated with an EIA, including publication of the results, is the responsibility of the Project Sponsor. Within the European Union (EU), which accounts for about 90% of Bank lending, the requirements concerning EIA—when an EIA should be carried out, what information it should contain, etc.—are set down in Directive EU 85/337 which has recently been updated by Directive EU 97/11. Along with national law, the EU classification (Annex I and II) also guides the Bank on the need for an EIA outside the Community, especially in the Association Agreement countries of Central and Eastern Europe, but each project is considered case-by-case according to its size, nature and location. Outside the Community, the Bank is generally more pro-active than within, to the extent that it will promote an EIA where this is necessary for project development. It may even be involved in drawing up the terms of reference, as well as in financing the study phase, using either its own funds, e.g. in the Mediterranean region under the METAP programme, or those of the European Commission, e.g. in the ACP countries under the Lomé Convention

Responsibility for environmental matters lies with the EIB's Projects Directorate, composed of experienced engineers and economists, who are encouraged to develop their skills in the EIA field

The experience of the professional staff of the Bank involved confirms the usefulness of EIA as an appraisal process; they also believe that changes in the EU EIA legal framework are in the right direction, including the need to consider alternatives and for more guidance from the competent authorities on scoping

> environmental management and sustainable development will be the use of procedures to assess the environmental impacts of Bank lending programs and projects. These procedures will enable the integration of environmental safeguards in projects. Environmental considerations, wherever essential, will become an integral part of loan agreements and bidding documents.

Concerning the conceptual underpinnings for EIA, some institutions place more emphasis, in principle, on very early programmatic assessment of basic alternatives (including site, technology and policy options), but in practice this has not produced significant operational differences in outcome. For example, the World Bank's EA policy puts considerable emphasis on the need to start the environmental review early enough to allow for serious consideration of basic alternatives, but this policy commonly has had a practical outcome similar to other EIA procedures more focused on site-specific impact analysis and mitigation measures for a given investment.

In practice, therefore, the two concepts have not produced widely different results. Most of the EIAs produced so far have tended toward the more traditional impact analysis and been weak on basic alternatives discussions. The main reason for this is that, generally speaking, a Bank's entry point into the borrower's project planning process

Box 6.3 Approaches and procedures of the International Finance Corporation (IFC)

The International Finance Corporation (IFC) is the private sector financing arm of the World Bank Group. Because it works solely with the private sector in developing countries, its clientele and its project cycle are very different from those of the more 'traditional' business carried out by the World Bank. Nevertheless, as a member of the World Bank Group, IFC is subject to the World Bank's broad policies and guidelines regarding environment and health and safety (EH&S). IFC's Environment Division is responsible for reviewing prospective investments and the existing investment portfolio for compliance with World Bank EH&S policies and guidelines. This review must be carried out in the context of local laws and regulations, as well as the IFC project cycle (International Finance Corporation 1993)

In terms of EIA, IFC carries out the same screening procedure as the World Bank (Category A, B, C, etc.). However, the only method of investment by IFC is in private-sector activities in developing countries through lending or taking equity as part of project capitalization. The role of IFC in development assistance is significantly different from that commonly taken by the International Bank for Reconstraction and Development (IBRD) in its typical role of providing development assistance through the public sector. IBRD staff, for example, will often work with government counterparts in reviewing sector needs and requirements, developing a project's concept and design or assisting in strengthening public institutions. Thus, IBRD staff will often be involved in project development and implementation from the earliest stage, and be actively involved in policy issues. In contrast, IFC's role in development assistance is more narrowly defined, and one that broadly resembles the more traditional role of project finance and investment. This often means that, like the EBRD, the type of environmental appraisal it carries out on its projects are environmental audits rather than environmental impact assessments

(and particularly if the borrower is from the private sector) tends to be after the borrower's own identification process, at a point when major decisions about types of investments and siting have often already been made and the preparation process is relatively limited to implementation issues. The main exception is with programmatic loans where sub-projects are still to be defined after Board approval, a situation shared by all five Banks reviewed here. Programmatic loans are made in various sectors, e.g. roads, irrigation, etc., whereby a framework for the preparation and implementation of numerous similar sub-projects is established.

It should be noted that efforts are being made to move the EIA planning process more upstream. The World Bank, for example, is using regional and sectoral EAs as tools for integrating environmental concerns into policy and programme planning at a time when basic alternatives can be more fully considered. To date, few regional EAs (REAs) have been prepared but there is a trend towards making more use of this instrument. The main reason for the limited use to date is probably that both the banks and their borrowers tend to take a sector-by-sector, rather than a spatial, approach to planning. While it is still too early to fully assess the effectiveness of REA, early results are positive and appear similar to those of sectoral EAs. REA provides an opportunity for a comprehensive look at geographically defined areas, such as watersheds, coastal zones or urban areas. One of the few examples of an REA carried out on an approved project is that carried out by the World Bank on the Paraguay Natural Resources Management Project. EBRD's recently revised Environmental Procedures make provision for strategic environmental assessments (SEAs), pointing out that 'the main benefits of SEA is that it allows for a consideration of more far-ranging and cumulative impacts and broader types of alternatives than that provided by a project-specific EIA' (European Bank for Reconstruction and Development 1996).

The Inter-American Development Bank is seeking to strengthen procedures for systematic dialogue with its borrowers on environmental issues during the programming cycle and before

Table 6.1 Project cycle and EIA process.

World Bank	European Bank for Reconstruction and Development (EBRD)	Inter-American Development Bank (IDB)	Asian Development Bank (AsDB)	African Development Bank (AfDB)
Identification Environmental screening: after consulting with the RESU, the task team prepares the EDS, which documents key environmental issues, project category, type of environmental work needed and a preliminary EA schedule. The same information goes into the PCD/PID and clears the EDS. The RESU reviews the PCD/PID and clears the EDS	*Identification* Operation leader requests environmental information from project sponsor EAU determines possible need for IEE, screening category and specific information requirements Screening documented in ESM, which is part of documentation for the initial (project) review by the operations committee	*Identification* Project team prepares the ESIB which is submitted to the CESI prior to presentation of Profile II to the loan committee CESI reviews and discusses ESIB and issues minutes in two parts: (i) indicating whether ESIB was approved and noting findings; and (ii) describing the 'environmental quality and social impact issues, mitigation measures and EIA or environmental analysis and proposal actions'	*Identification* Environmental screening: OESD requests information and classifies project in consultation with project staff; environmental screening and review sheets issued to project staff with the essential screening information (category, type of report and report action) Field reconnaissance: OESD prepares summary report to establish IEE and/or EIA work programme for the project (including mission requirements)	*Project identification* Environmental screening: by means of an IEE checklist; carried out by staff of ESPD and based on information gathered by loan and project officers. Joint meetings between concerned departments and the environment unit can be conducted to review and agree on classifications Preparation of project brief initiated, with result of screening included as 'environmental issues'
Preparation Scoping: The bank discusses with the borrower the scope of the EA and assists the borrower, as necessary, in preparing TORs for the EA. Normally a field visit for this purpose is conducted by a bank environmental specialist (category A) EA preparation: bank financial assistance may be requested and given Advisable for bank staff to attend borrowers' EA review meetings (category A) During preparation, EDS (and environmental information in PCD/PID) is updated periodically, as project design develops The EA report must be received in time prior to appraisal mission departure The EA report is also made available at the	*Preparation* Scoping only for 'A'-level projects, with field visit by EAU staff, as appropriate, and preparation of EIA TORs Environmental investigations: EIA, environmental analysis, environmental audit or other types of analysis commissioned by sponsor Following receipt of results of environmental investigations, environmental review by environmental staff, who prepare ERM for all projects, with recommendations on environmental mitigation and enhancement, including need to build covenants into loan or subscription agreements	*Preparation* Project team leader informs potential borrower of environmental requirements; drafts review TORs; assists the borrower in hiring of consultants; and mobilizes in-house expertise when necessary EIA is commissioned by the borrower Project team ensures that the EIA (and any other studies) is completed to the bank's reference, agreed upon by the bank and the borrower	*Fact finding and preparation* IEE preparation, including fact-finding mission; review of IEE by OESD; TORs for EIA work prepared, if found required by OESD; if not, IEE represents the complete EIA EIA preparation by borrower. Loan fact-finding mission analyses the results of (draft) EIA, often with OESD assistance; additional issues raised and discussed; results and recommendations presented in project brief; OESD attendance recommended in management review meetings Report completion (including SEIA or SIEE) and technical review by OENV; if necessary, OENV suggests additional work SEIA/EIA or SIEE/IEE released to the Board (upon borrower permission)	*Project preparation* Project/loans offices, assisted by environmental specialists, do scoping and finalize project brief EIA (category HI) TORs prepared (usually by project officers), based on a general format, ESPD consults with project preparation and feasibility teams to ensure adequacy of TORs EIA preparation: responsibility of borrower/consultant; input provided by ESPD, if needed; project officers and ESPD evaluate EIA results

(*Continued*)

Table 6.1 *continued*

World Bank	European Bank for Reconstruction and Development (EBRD)	Inter-American Development Bank (IDB)	Asian Development Bank (AsDB)	African Development Bank (AfDB)
PIC prior to appraisal and the EA executive summary is submitted to Board of Directors. RESU reviews EA and draft project documentation before appraisal authorization and may recommend postponement of mission or other measures if EA is not found adequate The task team prepares summary version of EA as annex to PAD, which replaces the earlier PAD, and summarizes findings and recommendations in main text of PAD, noting any proposed conditionally; RESU reviews and comments on these outputs *Appraisal* Appraisal mission reviews procedural and substantive elements of EA with the borrower, resolves issues, assesses adequacy of institutions, ensures that mitigation plan is adequately budgeted, determines if EA recommendations are properly reflected in project design and economic analysis	*Approval* Final review: recommendations of ERM incorporated by OL in the executive summary and the draft Board documentation of the project Final review by operations committee, which discusses any environmental issues arising from the environmental review. EAU may recommend that projects be rejected at any stage on environmental grounds Investment proposal is revised after final review, prior to Board approval	*Appraisal* Project team evaluates the EIA and other relevant information and prepares the ESIR prior to presentation of the project to the loan committee. The ESIR contains a summary of the EIA and the 'environmental and social feasibility statement', which contains the conclusion and rationale as to the feasibility of the operation, as well as specific measures and/or contractual provisions recommended for inclusion in the operation to ensure that environmental quality conditions are met CESI reviews and, if necessary, discusses the ESIR and issues minutes setting forth its findings and recommendations	*Preappraisal and appraisal* Appraisal mission staff consults OESD prior to the appraisal mission; where necessary, OESD staff participates in mission OESD assessment prepared, based on EIA, for the appraisal report and the report and recommendation to the President (RRP) Significant changes from the SEIA previously circulated to the Board highlighted in appraisal report Arrangements reached on environmental measures incorporated as proposed loan covenants in the memorandum of understanding; costs and sources of financing of these measures determined Staff review committee meeting on project, with environmental specialist attendance ('ES' projects)	*Appraisal* Appraisal mission: environmental specialists may be included Appraisal report always contains environmental statement, based on the environmental screening decision For HI and MI projects: project officers incorporate suggested mitigatory measures/ alternative designs for limiting negative environmental impacts in appraisal report, including economic analysis of impacts for the various alternative courses of action. ESPD advises on and reviews the appraisal report
Negotiations Environmental conditionality, actions, criteria, convenants incorporated into loan agreement, as appropriate. Normally the EA's environmental management plan is explicitly referenced in loan agreement. Care is made to ensure that environmental	*Negotiations* Incorporation of any environmental covenants into agreements, as agreed during the review and approval process EAU involved as needed, besides OL and the OGC (legal office)	*Negotiations* Project team meets with borrower to negotiate the loan contract, including environmental measures, on the basis of the proposed covenants and conditions in the ESIR	*Negotiations* Environmental measures incorporated as appropriate, in loan agreement or minutes of loan negotiations as covenants, based on those proposed in the memorandum of understanding	*Negotiations* Agreement reached on loan conditions; environmental specialist may participate in loan discussion if environmental conditions are proposed to be included

(*Continued on p. 104*)

Table 6.1 *continued*

World Bank	European Bank for Reconstruction and Development (EBRD)	Inter-American Development Bank (IDB)	Asian Development Bank (AsDB)	African Development Bank (AfDB)
safeguards are transferred into bidding documentation. Should environmentally important changes be made in the project design during the course of appraisal and negotiations, the RESU is consulted to ensure that appropriate actions/safeguards are taken to comply with bank environmental policies		Substantive changes from covenants and conditions proposed in the ESIR must be cleared by CESI	Environmental specialist may form part of negotiation team	Environmental considerations are part of loan agreements and bidding documents, 'wherever essential'
Board approval The findings of the EA process are presented to the Board in standard project documentation	*Board approval* The findings of the EIA process are presented to the Board in standard project documentation	*Board approval* The findings of the EIA process are presented to the Board in standard project documentation	*Board approval* The findings of the EIA process are presented to the Board in standard project documentation	*Board approval* The findings of the EIA process are presented to the Board in standard project documentation
Implementation EA recommendations—particularly the environmental management plan—provide the basis for environmental supervision. Compliance with environmental commitments, status of mitigatory measures, findings of environmental monitoring and feedback from local communitites and NGOs are part of borrower reporting requirements and project supervision. If major issues, special supervision missions with adequate environmental expertise are programmed and budgeted in advance, where possible	*Implementation* Monitoring reports submitted by sponsor. In case of noncompliance, operation leader, in consultation with environmental staff, recommends appropriate actions. System of penalties can be imposed: freezing of disbursements, notification to authorities and other financial agencies EAU may undertake site visits As part of the Bank's internal monitoring review process, an environmental performance classification is included as part of monitoring reports	*Implementation* Project team and country office specialists are responsible for monitoring compliance with environmental covenants in contracts and reporting through project progress and monitoring reports (PPMRs)	*Implementation and supervision* Environmental supervision: OESD lists projects requiring environmental supervision; periodic country project review missions (CPRMs) determine and report progress on environmental mitigation and other measures agreed upon earlier; mission encouraged to consult with OESD; environmental specialists may join CPRMs or conduct independent environmental audits	*Project implementation and supervision* Quarterly monitoring reports examined by environmental specialists Field supervision by project officer, with consultation with ESPD as appropriate, to monitor the effective implementation of measures recommended in the impact study Execution of rehabilitation measures, if needed (e.g. modifications in the environmental monitoring plan)

(*Continued*)

Table 6.1 *continued*

World Bank	European Bank for Reconstruction and Development (EBRD)	Inter-American Development Bank (IDB)	Asian Development Bank (AsDB)	African Development Bank (AfDB)
Completion and evaluation PCR evaluates environmental impacts and effectiveness of mitigatory and institutional measures Operation evaluation of the project, including, as appropriate, environmental aspects	*Postcompletion* All environmental covenants are identified for monitoring purposes by OAU, who require EAU sign-off as evidence of compliance as monitoring reports are received OPERs prepared on selected projects by Project Evaluation Department. EAU can comment on OPERs prior to finalization	*Evaluation* In accordance with the CESI guidelines and criteria set forth in the ESIR, the project completion report must address environmental quality and social impact issues and recommendations	*Completion and postevaluation* Environmental project evaluation included in PCR/PPAR, should include assessment of the degree to which project satisfied environmental requirements and objectives; OESD prepares 'postproject appraisal'; annual reports on implementation progress Environmental specialist may assist in post-evaluation missions	*Postevaluation* Project finalization: completion report, input from ESPD as appropriate; evaluation office assesses environmental performance of all MI and HI projects and examines the need for environmental audit; support from ESPD recommended
Abbreviations EDS, environmental data sheet; NGOs, non-govermental organizations; PAD, project appraisal document; PCD, project concept document; PCR, project completion report; PID, project information document; RESU, regional environmental sector unit; TORs, terms of reference.	EAU, environmental appraisal unit; ERM, environmental review memorandum; ESM, environmental screening memorandum; IEE, initial environmental examination; OAU, operations administration unit; OGC, Office of the General Council; OL, operations leader; TORs, terms of reference.	CESI, Committee on Environment and Social Impact; ESIB, environmental and social impact brief; ESIR, environmental and social impact report; LC, Loan Committee; TORs, terms of reference.	CPRM, country project review mission; IEE, initial environmental examination; OESD, Office of the Environment and Social Development; PB project brief; PCR, project completion report; PPAR, postproject appraisal report; SEIA, summary EIA; SIEE, summary IEE; TORs, terms of reference.	ESPD, Environment and Social Policy Division; HI, high impact; IEE, initial environmental examination; MI, moderate impact; PB, project brief; TORs, terms of reference.

project-specific identification. Preinvestment loans (i.e. loans in support of project preparation), which are used by the Bank when borrowers lack funding to prepare projects, facilitate early consideration of project alternatives and a more focused EIA process downstream in the project cycle. In addition to preinvestment loans, the Bank is also developing country environmental strategies as part of the strategic planning and country programming process. These strategies will outline the Bank's approach to environmental issues; enrich the policy dialogue with the countries concerned; and facilitate the consideration and approval of the environmental aspects of specific operations (Inter-American Development Bank 1995). AsDB seeks to integrate environmental concerns early in programme and project planning through the use of environmental components in country operational strategy studies. AsDB also prepares environmental sector reports and provides other forms of input for country assistance plans. The World Bank also uses country environmental action plan and strategy papers for this purpose.

6.3 SCREENING

6.3.1 Environmental screening categories

The EIA process in all the MFIs examined here begins officially with the 'screening' of investment projects into categories. Nearly all have adopted a three- or four-level classification system for doing this. The categories serve to classify projects according to their potential environmental impacts. The classification of a project into a certain category indicates to the project officers, borrower and other interested parties (e.g. donor governments, co-financiers, non-governmental organization (NGOs)) the extent, magnitude and significance of environmental issues and the corresponding level of EA and review required to address them.

Four of the five Banks reviewed in this chapter are currently operating with three main screening categories to signify the degree of potential negative environmental impact (see Table 6.1). These categories can be labelled generically as:

- high impact (HI): full environmental appraisal (EIA or EA) required;
- moderate impact (MI): limited or partial environmental appraisal required;
- low impact (LI): no environmental appraisal required.

In the revision of its Procedural Regulations in 1996, the Inter-American Development Bank established a new system which eliminated formal environmental categories. The objective of the new procedures is to direct attention during screening more on project characteristics and magnitude or importance of potential impacts from which the corresponding analysis, review and evaluation requirements would flow, rather than relying on only three or four categories for determining the analysis. All projects are still subject to review and analysis corresponding to their anticipated environmental impact. However, in its new procedures, the Bank incorporates the screening of projects into the preparation of an Environmental and Social Impact Brief (ESIB), which establishes the EA requirements for preparing the operation and identifies the environmental quality and social impact issues that must be resolved to ensure that the operation is viable and eligible for Bank support. In addition, it seeks to identify actions for EA early in the project preparation phase. The Brief also includes a description of the legal and institutional framework regarding EA in the country, particularly that which applies to the proposed project.

In parallel with conventional EIA screening, EBRD also classifies projects to determine the need for an environmental audit. The attention given to environmental audits reflects EBRD's basic private-sector orientation and the large amount of its investments related to the rehabilitation of existing industrial installations. It also takes account of the particularly severe issues associated with past operations in central and eastern Europe and the former Soviet Union, which are addressed through environmental audits. EBRD also has developed procedures for exercising environmental due diligence on financial intermediary (FI) projects. The EIA procedures of the World Bank and AsDB also give specialized screening guidance on FI loans, while, for the AfDB, the same requirements apply as in the case of regular investment projects. In the Inter-American Development Bank, FI guidance is adapted to existing institutional arrangements on a case-by-case basis.

The AsDB and the EBRD, in addition to the three categories described above, also make provision for carrying out an initial environmental examination (IEE). The definition and purpose of an IEE at the two institutions is, however, slightly different. At the AsDB, the project staff carry out an IEE for all environmentally significant projects which the Bank assists in project preparation. If necessary, an environmental specialist assists staff in its preparation. On the return of a fact-finding mission, the IEE report is reviewed and, if that review determines that the impacts associated with the project are, indeed, significant, terms of reference (TORs) for an EIA will be prepared. If, however, the IEE confirms that there are no significant adverse environmental impacts requiring detailed EIA, the IEE document represents the complete EIA report.

At the EBRD, the screening of projects is carried out by the Environmental Appraisal Unit (EAU) and recorded in an environmental screening memorandum (ESM). When EAU has received insufficient information from the operations team on a project to allow it to screen it into either Category A, requiring an EIA, or Category B, requiring an EA, it screens it as neither, requiring instead an IEE. The IEE is normally carried out by a member of EAU on the basis of a site visit and discussions with the operators of any facility, with environmental regulators and with the locally affected population and local interest groups. The results of the IEE are used to determine whether to screen the project in Category A or B. The IEE report, however, is not a substitute for either an EIA or an EA.

All the Banks provide guidance for their staffs on appropriate classification. For example, illustrative lists of project types are a common approach for guidance. The EA sourcebook of the World Bank offers generic guidance on screening and is used informally by all of the MFIs as a background reference when screening projects (World Bank 1991a–c).

All five MFIs provide generic screening criteria regarding dimensions such as project type, scale and location, and magnitude of impacts. They also provide sector-specific guidance. In addition, the World Bank, EBRD, AfDB and AsDB have developed illustrative lists of project types. These lists are largely similar, although EBRD has a stronger emphasis on industrial project types, reflecting its lending portfolio.

Generally speaking, 'environmental sensitivity' is the main issue when screening for project location. For example, in the AfDB, if a project that would normally be MI, e.g. small-scale irrigation, is to be implemented in an area with mangrove swamps, it automatically moves up into the HI category. Similarly, the EBRD's Environmental Procedures point out that:

> EIAs may also be required on operations which are planned to be carried out in sensitive locations even if the operation category does not appear in the list for A-level operations. These sensitive areas include National Parks and other conservation areas of national or regional importance, such as wetlands and areas of archaeological significance, areas prone to erosion and/or desertification, and areas of importance to ethnic groups.

EBRD and the World Bank explicitly mention countries' legal requirements on EIA as a separate criterion, while the other Banks take this into consideration more implicitly. Other criteria seem similar in meaning although different terms may be used. For example, the World Bank's concern with the reversibility and complexity of impacts appears to be similar to the AfDB's 'mitigability' criteria.

6.3.2 Timing

The procedures of the five banks for environmental screening are summarized in Table 6.1. All five Banks have a project cycle which begins with 'identification'. At this initial stage, the Banks collect and review information about a proposed project and prepare a summary of features, objectives, feasibility, costs and issues that need to be addressed during project preparation.

The five MFIs carry out environmental screening at roughly the same early identification stage in the project planning process and allow flexibility to: (i) delay the screening decision for a short period if enough information is not readily available; or (ii) change the initial decision at later stages if proposed project features are altered or new information surfaces on potential impacts. The World Bank has a 'T' (to be determined) category, which can be maintained until the end of the identification stage. Reclassification can occur up to appraisal. AfDB has a system which allows for initial classification 'I/II', with a final category determined when more information is provided and/or following a scoping mission. AsDB also uses a dual categorization (e.g. A/B or B/C) where information is insufficient. Dual categories can be maintained until enough information is available. For example, the result of the IEE can lead to final determination of category or reclassification. Overall, procedural variations are minor. In the case of EBRD's procedures there is an extra dimension as to whether the project needs environmental auditing. (The requirement for environmental audits reflects EBRD's emphasis on investments in the private sector and particularly industry. In this regard, it is much more akin to the IFC, the private sector financing arm of the World Bank Group, than the four other MFIs covered in this chapter.)

6.3.3 Recording screening decisions

All the Banks produce a record of their screening outputs. The World Bank records screening on an 'environmental data sheet' prepared by project staff, while EBRD utilizes an ESM (see Box 6.4). These formats are similar, generally of one to two pages, showing the selected screening category, the major project components, the environmental issues, proposed actions and rationale or justification for the chosen category. EBRD's dual-track approach means that two screening decisions are included in the ESM: one regarding EIA requirements and one on the need for environmental auditing.

AsDB also records screening on a data sheet ('Categorization of New Projects'), containing the category, the type of report required (IEE and/or EIA) and report action (if the summary report is for separate Board circulation or only as part of the Report and Recommendation of the President). In addition to this, the AsDB issues 'environmental screening and review' sheets to the project staff. All these data can now be accessed on line from a computer-based environmental and social monitoring information system (ESMIS). The EBRD has instituted a similar system known as the environmental monitoring information tracking system (EMITS). Finally, the AsDB's Office of the Environment and Social Development (OESD) issues a report (*Preliminary and Secondary Environmental and Social Review of Loan and Technical Assistance Projects*) where the data sheets are compiled. AfDB records screening decisions in an 'Environmental Issues' section of the 'Project Brief.'

At the Inter-American Development Bank, the main screening output is the ESIB. The latter, once approved by the Bank's Committee on Environment and Social Impact, establishes the EIA requirements for preparing the operation and identifies the environmental quality and social impact issues that must be resolved to ensure that the operation is viable and eligible for Bank support. The subsequent EIA process refines

Box 6.4 European Bank for Reconstruction and Development ESM proforma

Confidential

Environmental screening memorandum
- Investment operation
- Operation title:
- Operation team:
- Initial environmental examination needed?

Yes/No

Environmental screening category

1 Brief description of the operation
2 Preliminary environmental information
3 Environmental issues apparent at screening (e.g. regulatory compliance, risks and liabilities, global and regional environmental impacts, such as biodiversity and climate change)
4 Environmental opportunities apparent at screening (e.g. energy efficiency improvements, clean production)
5 Reason for screening into the chosen category:
- Assessment
- Audit

6 Public consultation requirements
7 Other issues
8 Actions

Signature:
Date:
Environmental specialist

Signature:
Date:
Environmental specialist

and elaborates this analysis and defines appropriate measures in more detail. The EA/EIA requirements are integrated into the project's 'Profile II'—the document submitted to the Loan Committee which triggers the preparation phase.

6.3.4 Roles

In the World Bank, project staff initially propose the EA category, which is subsequently reviewed and approved, if there is agreement, by the corresponding regional environmental unit. The data sheets are 'living documents', in the sense that project information and the corresponding screening category may change during project preparation, for example, following scoping. This process is shaped by consultations between project staff and the appropriate regional environmental division. Changes must be approved by the regional environmental unit. The environmental data sheets are formally reviewed and updated at least on a quarterly basis.

In the AsDB, the OESD categorizes the project in consultation with project department staff, on the basis of information available in the Bank. The Chief of the Office approves the environmental category. In cases where the category is changed, the Chief or his/her designate must approve the change. The Office also prepares the screening report mentioned above.

In the AfDB, the environmental unit also performs the initial environmental examination and classifies projects on the basis of project briefs provided by the operations departments. In case of disagreement on the initial environmental examination, joint meetings between the environmental unit and the relevant operational departments are held to make the final decision.

In the EBRD, the screening categories are also selected by the environmental specialists in the EAU, on the basis of initial information provided by project sponsors (borrowers) and operations teams. The EAU also prepares the ESM, which incorporates the screening classification and describes the environmental investigations and undertakings required. (EBRD has developed three types of ESM of which only one—that used to screen investment operations—provides screening categories. The other two, used for intermediated financing and technical cooperation, do not.) The screening category can by changed by the environmental specialists as more information on the project becomes available.

It is project teams in the Inter-American Development Bank which have the central role in screening projects (although screening categories *per se* are not assigned), through the preparation of the ESIB. The latter must, however, be approved by the Committee on Environment and Social Impact, whose members include the Division Chiefs of the Environment and Natural Resource Divisions of the Bank's Regional Operations Departments, designated Division Chiefs from the Strategic Planning Department, the External Relations Department and the Legal Department, the Chief of the Environment Division, the Chief of the Indigenous Peoples and Community Development Unit and the Chief of the Women in Development Unit.

6.4 THE PROJECT CYCLE

The five Banks reviewed here have project cycles that generally share the same steps: identification, preparation, appraisal, negotiations and Board approval, implementation and supervision and postproject evaluation (see Table 6.1). Each of these project phases has significance for the institution's EIA requirements, either in matters of decision-making or review and monitoring, which is why EIA procedures have been adopted to coincide with it. It is worthwhile to review key points in the project cycle from the perspective of EIA procedures to understand better the variations and similarities.

6.4.1 Project identification

This is the first phase of the project cycle which generally proceeds against the background of country economic and sector work. Project identification may come from several sources, including missions from the various Banks as well as other institutions. In the case of the AfDB, AsDB and Inter-American Development Bank, as well as the World Bank, this is often from United Nations agencies. In the case of the EBRD, the European Union often plays a role in project identification for public sector projects. For a public sector development project to be formally identified as a priority investment for any of the Banks, it must have the provisional support of both the borrowing country and the respective Bank to ensure that its objectives are shared by both.

This phase may last several weeks or months. For the purposes of EIA procedures, there seems to be a common emphasis at this stage on identifying main environmental issues, even though terminology may vary, as may the various written outputs. For all the Banks, this phase involves Bank staff decisions on screening and scoping of environmental issues. Whereas scoping is usually carried out in an informal manner by the AsDB, AfDB and Inter-American Development Bank, the procedures of the World Bank and the EBRD give more specific guidance. EBRD's Environmental Procedures, for example, point out that the scoping process:

> will involve contact by the Project Sponsor with representatives of the locally affected public and with government agencies, as well as with other organizations. Issues may be discussed at a scoping meeting to which the Project Sponsors will invite selected representatives of such organizations as environmental authorities and municipalities, government departments and NGOs, as well as local groups.

Specialists in EBRD's EAU generally prepare project-specific 'scoping guidelines' for the project sponsors of operations screened in Category A.

It is clear that project identification for all Banks is important for determining the scope of EIAs. Depending on the point at which a Bank enters the identification phase, an idea may be either relatively advanced, leaving little room for alternatives analysis, or may be only a concept, in which case there may be considerable scope for consideration of alternatives in environmental terms. In most cases, however, many decisions related to the project's site have already been made by project sponsors. This is particularly true for private sector projects and, by extension, for an institution such as the EBRD, 70% of whose lending is to the private sector.

6.4.2 Project preparation

For all five Banks, project preparation begins when there is mutual agreement on project objectives between the borrower and the Bank. During preparation, the idea of the project is converted into a detailed proposal that considers all aspects of the project: technical, economic, financial, environmental, social and institutional. Where the identification stage identified potential environmental issues, this stage involves analysis and assessment of those issues, depending on their severity and pursuant to classification decisions taken at identification, and integration of environmental findings into overall project preparation. This is the stage, in other words, where the EA or EIA is actually carried out.

For all the five MFIs, EIA or EA preparation is the responsibility of the borrower with the MFIs taking a review and clearance role. There is, however, some variation in terms of: (i) timing, or when EA or EIA work is initiated; (ii) the type of environmental assessment done by the Banks apart from or in addition to EA/EIA work of the borrowers; and (iii) procedures for review and clearance of EA or EIA reports. Generally speaking, Banks strive to avoid duplicating EIAs which have been carried out previously to meet national requirements. Where these have been prepared, they are reviewed to determine if they meet the Bank's requirements and, to the extent they do not, supplementary studies are prepared.

For AsDB, project preparation starts—in environmental terms—with the IEE, which is initiated in parallel with the processing of the project preparatory technical assistance and carried out by the Bank's own project staff or, in certain cases, the borrower. The IEE serves as an independent, early assessment of environmental impacts and issues at the proposed project site and explores options for mitigation and management. A specified format is described in AsDB's procedures, involving project description, description of the area affected, screening of potential impacts and mitigation measures, institutional requirements, findings and recommendations and conclusions. On the basis of the IEE findings, the AsDB determines the need for further study and, where the potential negative impacts are considered significant, this generally results in a requirement that the borrower produce a formal EIA. Despite the IEE requirement, which could suggest that initiation of EIA studies would have to move downstream, the AsDB's EIA is still an integral part of the feasibility studies for a project.

For the World Bank, EBRD, Inter-American Development Bank and AfDB, scoping and preparation and clearance of EA or EIA TORs represent the environmental initiation of project preparation (see Table 6.1). In the World Bank, a full EA report is required to be prepared by the borrower where potential impacts are significant, in accordance with agreed TORs. Similarly, a full EIA report is required by the AfDB, AsDB, Inter-American Development Bank and EBRD.

The five Banks show similarity in terms of required sections of a full EA or EIA report. The main substantive variation is with respect to cost–benefit analysis, which is prepared for some projects only by AsDB. However, all the other Banks stress the importance of economic analysis of environmental impacts and assessment of costs and benefits of alternatives and mitigation measures. As a rule, however, borrowers are required to document the way in which they plan to deal with public concerns. In this regard, there is some variation in the documentation requirements on public consultation. The AsDB requires a separate section in the report on the process and outcome of consultations, while the World Bank and EBRD require that records of meetings and public consultation be included as an annex to the EA/EIA report. The World Bank, Inter-American Development Bank and AfDB expect EA and EIA reports, respectively, to reflect the outcomes of consultation, with or without a separate chapter on the topic. For operations involving transboundary impacts, EBRD's Procedures state the requirements outlined in the Espoo Convention (see Chapter 5, this volume) must be followed. Finally, the AfDB does not explicitly require a separate mitigation plan in the EIA report. However, the report needs to spell out recommended measures, and a discussion of mitigative measures must be adopted in the borrower's overall project plan.

In some Banks, additional specialized information is sought. For example, the EBRD has special requirements for FI operations and environmental audits.

For projects with moderate impacts (MI), staff work is typically required at this stage to assess and review the issues. The AsDB and EBRD have the most elaborate reporting requirements for these MI projects. The World Bank and EBRD may, in some cases, call for a separate analysis of certain selected issues, either by the Bank or the borrower. This analysis could range from an EIA to a review of the borrower's environmental permits and standards. EBRD's procedures require, for example, that:

> operations be structured to meet national and existing European Union environmental standards or, where European Union standards do not exist, national and World Bank standards. If these standards cannot be met at the time of Board approval, operations will include a programme for achieving compliance with national and European or national and World Bank standards. In addition, the bank will make recommendations and encourage project sponsors to bring their existing operations at the project site into compliance with good international practice and standards within a reasonable timeframe.

It is difficult to determine how effective such considerations have been. Only through explicit monitoring requirements can Banks ensure that compliance with relevant environmental standards is actually taking place and in most MFIs such requirements have only recently begun to be introduced.

For the AsDB, the IEE would typically suffice as an environmental analysis for projects with only MI. AfDB expects the borrowers to develop mitigation measures or incorporate design changes in the context of feasibility studies for projects with moderate impact, while its staff incorporate these measures in Bank project documents.

6.4.3 Project appraisal

After project preparation has been completed by the borrower, with assistance from the Banks as needed, each of the five Banks undertakes a full-scale project appraisal. This is a comprehensive review of all aspects of the proposal, conducted by Bank staff, often with the help of consultants. Appraisal is another key decision point for environmental purposes where major issues have been identified. For the World Bank, for example, the full EA report for a Category A project must be officially submitted by the borrower to the Bank before departure of the 'appraisal mission' by Bank staff. This is so that any outstanding issues can be further assessed by the mission during its time in-country. Staff would not undertake any field studies themselves as part of an appraisal mission. If there are major outstanding environmental issues or the required EA report has not been delivered, the mission may be postponed or reclassified as a preappraisal mission.

The environmental staff for all five institutions have an important review role at this stage (see Table 6.1). In the AsDB, the OESD does a technical review and may suggest additional studies if necessary. Environmental specialists in the EAU at the EBRD also review EIA reports and prepare an environmental review memorandum (ERM). If EAU has insufficient information to conduct a thorough environmental review, it will recommend in the memorandum that the review at hand be considered an interim one and that the operation be resubmitted to the Bank's Operations Committee for final review, once sufficient environmental information is available to EAU. At the Inter-American Development Bank the Project Team reviews the EIA and summarizes its analysis in the environmental and social impact report (ESIR). The ESIR, which must be approved by the Committee on Social and Environment Impact, establishes the environmental and social impact management conditions that must be included in each operation and identifies the incentive, enforcement and monitoring mechanisms to be employed to ensure their implementation. AfDB's environmental staff review incoming EIA reports after the project officer has assessed the study taking into account the TORs agreed upon with the consultant. The World Bank Regional Environmental Sector Units' staff may recommend additional measures if an EA is not satisfactory, and formal Regional Environmental Sector Units' clearance is needed prior to authorization for negotiations.

Upon clearance of the EIA, the AsDB's OESD prepares an independent assessment, which is incorporated into the appraisal report produced by staff. Significant differences between this assessment and the EIA are specifically noted. In the World Bank, the project task manager is responsible for preparing an EA Annex to the appraisal report for Category A projects and for summarizing findings of the EA process for all categories in the main text. The Regional Environment Sector Units review and comment on these sections. In the EBRD, the ERM forms the basis for integration of EIA findings in the Bank's project documents submitted for Board approval.

The AfDB requires that the appraisal for HI and MI projects should suggest mitigating measures and alternative designs and include an economic analysis of environmental and social impacts for the various alternative courses of action. This Bank's Environmental Policy Paper emphasizes the use of economic analysis at this stage—'wherever found essential'—by recommending that environmental costs and benefits be included in regular cost–benefit analysis; that alternative approaches to a project objective be analysed to resolve problems of valuation and quantification of environmental services or objectives with no traditional market value; and that a sufficiently long time horizon be employed to consider environmental benefits in economic analysis of forestry and other projects, also taking the benefits and costs to future generations into account.

Environmental staff of all five Banks have an important role in the review of incoming reports, incorporation of findings in project documents and final clearance. However, some variation exists among the Banks in terms of degree of involvement. For example, the World Bank's Regional Environmental Sector Units do not prepare environmental sections of project documents. Instead, they review these sections and give formal clearance prior to negotiations. In the

AsDB, the designated environment specialist assists in preparing the EIA-derived sections of the Bank's project documentation and this section is cleared by the Office of the Environment. The EBRD's ERM, prepared by environmental specialists in the EAU, serves as an important intermediary step between the EIA report and the official project documentation. As at the World Bank, the environmental section of such documents is the responsibility of the operation's team. The operation's leader, however, must obtain EAU's approval of the wording of this section. In the case of the Inter-American Development Bank, environmental clearance for negotiations is not done unilaterally by the environmental unit but through the Committee on Environment and Social Impact, with the participation of appropriate environmental management.

6.4.4 Negotiations and Board approval

Generally speaking, formal loan negotiations begin between the Bank and the borrower, after an appraisal report has been issued. Both sides must agree on the conditions necessary to ensure the project's success, including detailed schedules for implementation, how any environmental requirements fit into this schedule, what mitigation and monitoring plans will be required for major environmental issues and the responsible institutions for any environmental conditions. These conditions may or may not be referenced in loan agreements, depending on whether they are sufficiently material to the overall project success.

All Banks keep open the possibility of having environmental covenants included in loan agreements to the extent needed. Some have put in place standard conditions; for example, the EBRD and AsDB have standard conditions that apply to all loan agreements. In addition, special loan covenants usually covering, but not limited to, the implementation of agreed environmental mitigation measures may also be included. In the EBRD, the most frequently used environmental covenants have been incorporated in the Banks' standard formats for loan/subscription agreements. These relate to such topics as regulatory compliance, emergency response notification, implementation of environmental action plans, reporting requirements, etc.

In addition to the common acceptance across the Banks that environmental covenants may be included in loan documents, there also is some common ground concerning the environmental information required by each Board in advance of discussion. Whilst not formally binding in international law, as a matter of practice each Bank seeks to comply with the spirit of the domestic legislation of the USA, a major shareholder in each Bank, which requires environmental information on projects well in advance of Board consideration.

Where projects require a full EIA report, that document is commonly the most convenient means of passing information to the Board. Where projects do not require a full EIA, the Banks' procedures produce different results. For those Banks which do not require a formal report because the environmental impacts of the project are moderate, environmental data sheets or other forms of summary decisions, as reflected in staff appraisal reports, may be made available.

At the EBRD, environmental conditions related to a project are often incorporated in an environmental action plan. Its purpose is to obtain agreement concerning key environmental and health and safety performance criteria, corrective actions and improvement programmes and to define monitoring and reporting requirements. Normally, the action plan forms part of the legal documents of the Bank's investment.

6.4.5 Project implementation and supervision

After the loan is approved and becomes effective, project implementation funds are made available. Implementation of the project, including environmental conditions, is the responsibility of the borrower. The Banks have the responsibility to supervise implementation and the environmental and procurement process to ensure that corresponding procedures and requirements are met. The Banks generally also require periodic reports from the borrower that discuss compliance, including any environmental mitigation measures.

The AsDB uses the standard environmental provisions, in addition to project-specific convenants stemming from EIA recommendations, as a basis for supervision. Its environment unit is responsible for identifying projects requiring special environmental supervision, by way of an annual review. In addition, the OESD routinely reviews the borrower's compliance with recommended mitigation measures during implementation and postevaluation.

For the other Banks, environmental staff are also involved in identifying projects which require special supervision, some of which may be noted in an implementation plan as part of the loan agreement. The Inter-American Development Bank supervision criteria are drawn from EIA recommendations and loan covenants. As is the case with other provisions, the project team and country office specialists are responsible for monitoring compliance. For the World Bank, EBRD and AfDB, supervision work is generally carried out by project staff, supported by environmental specialists (staff or consultants) as needed.

EBRD's environmental specialists (or environmental consultants), with the agreement of the operation's leader, may undertake site visits on a routine or occasional basis. The Bank's resident offices can assist in obtaining information on such issues as regulatory compliance and the implementation of environmental action plans.

In the World Bank, a special environmental supervision mission or periodic missions may be carried out, if circumstances so require, and this feature is frequently identified in final documents tied to an implementation plan. Supervision efforts of all MFIs are based heavily on loan covenants and EIA recommendations for mitigation, environmental management and monitoring. The World Bank, in response to internal reviews of project performance, is developing new performance indicators for supervision and monitoring and these will include environmental indicators.

6.5 PUBLIC CONSULTATION

All five MFIs consult the public during the EIA process carried out on their operations. The specific requirements differ somewhat from Bank to Bank regarding the timing of consultation, the type and amount of environmental information disclosed and the types of parties which are consulted. At the World Bank:

> consultation with affected communities is recognized in OD 4.01 as the key to the identification of environmental impacts as well as to the design of mitigation measures. OD 4.01 strongly recommends consultation with affected groups and local NGOs during at least two stages of the EA process: (i) shortly after the EA category has been assigned—at the scoping stage, and (ii) once a draft EA has been prepared. Consultation during the preparation stage is also generally encouraged, particularly for projects that affect people's livelihood and culture and projects that are community-based by their very nature. In projects with major social components, such as those requiring involuntary resettlement or affecting indigenous people, the consultation process should involve active public participation in the EA and project development process and the social and environmental issues should be closely linked (World Bank 1997, p. 34).

EBRD's and the Inter-American Development Bank's requirements for public consultation, spelled out in both their Policies on Disclosure of Information and Environmental Procedures, are quite specific and echo the approach taken by the World Bank (on public sector projects) and the IFC (on private sector projects.) Consultation begins with notification of 'A' level projects following initial review by the Bank's operation committee. The project sponsor is requested to provide the affected public and interested NGOs with notification about the nature of the operation for which financing is sought from EBRD. The way that notification is undertaken depends on local political, legal and cultural practice. Scoping is the first stage at which the public is consulted.

Following the completion of environmental investigations, the public needs to be provided with adequate information on the environmental aspects of the operation to enable them to provide the project sponsor with comments on the proposals. To facilitate this, the project sponsor must make the EIA and an executive summary (in the local language) publicly available, in accordance with relevant national legislation, and allow sufficient time for public comment prior to the Bank's Final Review of an operation and its consideration by the Board. For private sector operations there is a minimum of 60 days between the release of the EIA and the date of Board consideration. For public sector operations this period is a minimum of 110 days.

6.6 EXPERIENCE

As EIA procedures are still relatively new in the five Banks and the project cycle is generally lengthy, there has been little opportunity for evaluation of completed projects for which an EIA or EA was prepared. Project completion and evaluation reports generally are the responsibility of project and evaluations staff and, unless project conditions include environmental elements, supervision and monitoring reports from which these evaluations draw may not reflect environmental issues. However, AsDB's OESD routinely evaluates compliance with mitigation measures recommended in EIAs, in addition to the normal project completion and postevaluation work of project staff.

At the EBRD, for the year of 'project completion' (normally coinciding with the end of the Bank's disbursement phase, i.e. the time during which the money is actually paid out), the operation's leader prepares an expanded annual monitoring report, which includes an environmental performance criterion. Operation performance evaluation reports (OPERs) are prepared on selected operations by the Project Evaluation Department. EAU can comment on the reports during their preparation. In future, the reports will include an environmental rating which is made up of two components: (i) the environmental performance of the sponsor and of the Bank; and (ii) the actual extent of environmental change (positive or negative) resulting from the Bank's operation.

The AfDB's Evaluation Unit is considering preparation of independent environmental audits, with the technical assistance of its environmental staff. Such audits should not be confused with the site-specific environmental audits used routinely by the EBRD during the preparation of some projects with ongoing operations. AfDB also evaluates the environmental performance of all HI and MI projects, and may undertake special environmental auditing as part of operations auditing.

Initiatives have been taken to monitor implementation of EIA requirements for projects in progress. In the World Bank, the Environment Department undertook a first annual EA review in 1992, which focused on Category A projects, with EA Summaries submitted to the Board, and evaluated the compliance of the EA reports with the EA operational directive. The second review (World Bank 1997) expands the first and covers the World Bank's experience with EA from July 1992 through fiscal year 1995. Before turning to the findings of that Review, many of which would apply to each of the Banks described here, three short case studies are presented related to EIAs carried out on World Bank, AsDB and EBRD investments.

6.6.1 World Bank: Paraguay—natural resources management project

The primary objective of the project is to promote environmentally sustainable development and natural resource management in the agriculture sector in a major part of the Paraña watershed in Paraguay. There was a huge influx of people to this area in the 1980s and early 1990s, resulting in high rates of deforestation (12.5% per year), soil erosion, water contamination and a deterioration of living conditions among local indigenous people. Administrative capacity in the area is inadequate, especially for proper environmental management, and adequate incentives and regulations to promote sound land use are lacking.

The project was prepared in a 'bottom-up' fashion, with strong emphasis on local public participation. The various components emerged through discussions of a number of alternatives with local farmers. The project, as it is currently being implemented, promotes: (i) an integrated approach to agricultural development and natural resources protection, using rainfall catchment areas as the basic planning units; (ii) decentralization of the Ministry of Agriculture; (iii) intensive training of producers and their families in the areas of organization, resource use and marketing;

and (iv) rehabilitation and realignment of existing roads to reduce soil erosion problems and improve safety.

The project was given a Category A classification because of the existing environmental problems in the region, as well as concern over the impacts of the roads component. However, as it was clear that the project was being designed to improve environmental management, it was agreed that the EA, like the project, should be regional in nature and should seek to assess: (i) whether the various project components would have the positive environmental impacts that were claimed; (ii) whether something more or different could be done to maximize and broaden such impacts; (iii) whether mitigation of 'residual' negative impacts could be improved or such impacts avoided altogether; and (iv) whether the proposed institutional (management and monitoring) and policy measures were adequate and, if not, how they might be improved.

The EA was carried out by local consultants and fully met the Bank's requirements. The project incorporated almost all the EA recommendations, including important strategic changes in relation to road rehabilitation and the alignment of new roads, as well as institutional measures. Significant quantities of environmental and social baseline data were gathered by the consultants, including data which had not previously been available. One particularly important design change was the demarcation of new indigenous protected areas as a result of consultation serving the protection of the Tupi Guarani Indians.

6.6.2 Asian Development Bank: Nepal: Kali Gandaki hydroelectric project

This operation concerns a 144 MW, run-of-the-river hydroelectric project in the Mahabharat Lekh portion of the lesser Himalayas between Pokhara and Butwal in Nepal. A 44 m high dam will be constructed at Mirmi just after the confluence of the Andhi Khola and Kali Gandaki rivers to divert part of the river flows into a 5.9 km tunnel. The tunnel will convey the water to Beltari where a 144 MW power station will be located. The project will have some storage behind the diversion dam, sufficient to operate the full 144 MW capacity for 6 hours a day even during the dry season. The small reservoir created by the dam will be 5.3 km long, with a total area of 65 ha. The project will also include a 132 kV transmission line running from the power station to substations in Pokhara and Butwal. A 28.5 km access road will run from the Sidhartha Highway to the dam and reservoir site with a spur road to the power-plant site.

The project is needed to meet the growing requirement for electric power in Nepal. The lack of dependable power adversely affects Nepal's gross national product and economic growth. Only about 14% of Nepal's population has access to electricity, with the Kathmandu area receiving a disproportionate share. The Project will eliminate shorter-term load shedding and brownouts, allow further economic development and provide electricity to segments of the population currently without power.

The EIA for this project was carried out by an interdisciplinary team of scientists who conducted a series of studies from 1991 through 1994. These included reconnaissance site visits, biological and socio-economic surveys and a fish sampling programme, as well as studies on geology, slope stability, hydrology and sediments related to the project design process. The team consisted of an anthropologist, ecologist, archaeologist, fishery and wildlife ecologist, watershed management expert/forester, botanist and social scientist/economist.

The major environmental impacts addressed in the EIA included:

- reduction in water flow along a 50 km river stretch as a result of water diversion through the headrace tunnel;
- blockage of fish migration because of the dam and the resulting reduction in subsistence and commercial fisheries harvest;
- increased erosion and landslides because of land disturbance (especially related to the access road construction), and linked effects to the ecological and socio-economic environments;
- loss of forestry resources directly, because of clearing operations at the project sites (including the access road and transmission lines), and indirectly, because of increased local demand for firewood, and loss of sal and khair, two tree species of

local and regional importance, which are of particular concern;

- overall habitat loss and disturbance of areas used by 'species of concern' (e.g. river otter, python) and other more commonly occurring species, resulting in temporary, and possibly medium- to long-term, reduction in species that inhabit the area.

A number of mitigation measures were identified and included in the project design to address these (and other) issues. They included:

- the release of a compensatory flow of at least 4 m per s during the dry season;
- a capture-and-trucking programme to provide fish passage past the dam and a grate to minimize entrapment;
- a fish hatchery programme;
- establishment of a protected area (e.g. nature reserve) to compensate for localized losses of flora and fauna.

The cost of environmental mitigation measures amounted to $5.3 million during construction and $100 000 annually during operations.

The EIA involved an extensive public consultation programme. Public meetings were attended by several thousand people. Residents generally showed their satisfaction with the project. Issues and concerns raised in the public meetings were incorporated in the project impacts to be investigated and addressed in proposed project mitigation.

Without effective mitigation, the impacts of the project could be significant, particularly on the poorest families, forests, wildlife and aquatic resources. However, the adverse impacts are mitigable to acceptable levels and, with the proposed measures, the project could produce sustained economic changes and improve the lives of many of the local people of the region.

6.6.3 European Bank for Reconstruction and Development: Kazakstan—Aktau port reconstruction project

The port of Aktau on the Caspian Sea is the only commercial trading port in Kazakstan. It dates from the 1960s, and has since been subject to various improvement and expansion programmes, most recently in the late 1980s with the construction of the oil terminal. Consequently, many of its existing design features fall short of present-day environmental standards that would be applied to ports. The reconstruction project offered an opportunity for making good many of these current inadequacies. As with all major developments, however, it also has the potential to cause some adverse environmental impacts.

The project was designed to respond to the key objective of protecting the port of Aktau from the rising level of the Caspian Sea and improve port operations, specifically through civil works and cargo-handling equipment. As the originally envisioned civil works were limited to the reconstruction of the existing quay wall, the raising of dry cargo berths and the refurbishing of cargo areas, the project was screened in Category B/0, requiring an environmental analysis. The screening was carried out by the EAU on the basis of written information which had been made available and was not based on the results of a site visit by the Unit, although the consultants who carried out the analysis had visited the port.

The analysis, carried out in late 1994 as part of an overall feasibility study, outlined the relevant national environmental legislation pertaining to the project and described the existing environmental conditions in the port. It also identified a number of environmental impacts associated with both the construction and operational phases of the project, including water quality, fisheries ecology, air quality, noise and waste management. The environmental analysis proposed mitigation measures to address these impacts, including appropriate clauses in engineering works contracts for governing waste disposal, construction materials, air quality and noise during construction. Appropriate con ditions were subsequently included in tender documents.

In terms of port operations, the analysis made a number of recommendations regarding surface water drainage and waste reception facilities (including sewage, solid waste, oily waste and ballast water), which were later incorporated in the project design, as well as hazardous material handling and an oil spill contingency plan, which were incorporated in an environmental, health and safety action plan.

The original environmental analysis did not address the environmental issues associated with the port's breakwater and causeway, which supports oil pipelines and two oil cargo berths, as reconstruction of these facilities is outside the scope of the project. However, as they represent a potential threat to both the successful implementation of the dry cargo berth reconstruction and the preservation of the environmental quality of the port area, a further environmental study was commissioned to carry out a risk assessment of the breakwater and causeway. As a result of that study, the scope of the project was changed to include rehabilitation works on the causeway and the relocation of the pipes on it to address the potential risk of oil damage. The study also identified the amount and type of facilities needed at the port to deal with waste management and oil spills to MARPOL (the international convention for the prevention of pollution of the sea) standards. Provision for these was included in the civil works contract (International Maritime Organization 1991).

The project included a technical cooperation component which addressed environmental issues by providing for the development of an environmental, health and safety action plan. This Plan complies with EBRD's revised (1966) *Environmental Procedures*, as well as Kazak legal requirements. It covers environmental concerns arising during the proposed construction works (i.e. raising of the dry dock and rehabilitation of the breakwater and causeway), as well as those emanating from current and projected future port operations.

World Bank Technical Paper no. 126 (*Environmental Considerations for Port and Harbour Developments*) was used as an *aide-mémoire* to assist in the identification of impacts and selection of appropriate environmental management and control measures based upon experiences with other ports.

6.7 QUALITY

As pointed out above, the only MFI which has undertaken a systematic review of the EIAs it has carried out is the World Bank. The Review, published in 1997, looked at World Bank experience from July 1992 through to fiscal year 1995. Within that time frame, 10% of its approved projects had been screened in Category A, 41% in Category B and 49% in Category C. Corresponding figures for the AsDB (between 1991 and 1996) were 20% in Category A, 57% in Category B and 23% in Category C. For the EBRD (1991–1996), the figures were 5% in Category A, 51% in Category B and 44% in Category C. The discrepancy in the figures among these three Banks does not, in the first instance at least, represent a difference in the degree of diligence or strictness applied to screening, but rather the difference in the types of investment portfolios represented by the three Banks. The EBRD, for example, finances far fewer 'greenfield', 'stand-alone' projects, typically screened in Category A, than the World Bank and AsDB.

In its Review, the World Bank evaluated both the *quality* of EIA work in key areas, such as identification and assessment of impacts and analysis of alternatives, as well as the *effectiveness* of its current EIA process.

Regarding quality, the Bank concluded that, although it had improved over the years, there were a number of areas in need of further improvement. The weakest aspect of EIA work continues to be public consultation and analysis of alternatives. Though not specifically identified by other MFIs, the same conclusion would probably apply to them as well. There appears to be a number of reasons for this. One is the non-inclusion of the analysis of alternatives or public consultation in the requirements of borrowing countries. Another is that the design, size or route components of a project have already been identified before the project is presented to the Bank. This is particularly true regarding private sector lending and investment. However, even when the possibility for a comparison of alternatives exists, it can be hampered by a lack of information and knowledge needed to prepare a substantial and in-depth analysis.

6.8 EFFECTIVENESS

All the Banks reviewed here have made progress over the last several years in better integrating their EIA processes into the overall project preparation cycles in their institutions. An area which has become particularly important in this regard is that of screening. Although there is no unanimity among Banks as to the best way to implement a screening procedure, they would all agree that it is a crucial step in the overall EIA process. Despite its importance and the success with which screening procedures have been implemented, the need to decide on a particular screening classification sometimes draws attention away from the actual environmental issues and impacts associated with a particular project. This was one of the reasons which led the Inter-American Development Bank to abandon its numerical screening classification in favour of the more 'in-depth,' analytical approach encapsulated in its new requirement for ESIBs.

However, even those Banks which have retained a numerical screening classification have made refinements to it. The EBRD, for example, in revising its environmental procedures at the end of 1966, incorporated the new requirement of carrying out an IEE in cases where insufficient information is available at the time of screening to make a decision on classification. The introduction of this IEE element was based in large part on EBRD's own experience in implementing its original procedures, as evidenced in the Kazakstan case study described above.

The effectiveness of EIA in project preparation is difficult to determine. The World Bank found that:

> sectoral EAs and EAs with a careful analysis of alternatives generally have the strongest influence on project design. The principal influence of the more typical, project-specific EAs is through the mitigation, monitoring and management plans (World Bank 1997, p. xv).

Although most other Banks would probably agree with this conclusion, it is the World Bank, rather than the regional development banks covered in this review, which, through its policy based lending, has had the most experience with carrying out sectoral EIAs (EAs).

Perhaps the most important finding of the World Bank's Review of its experience relates to the question of EIA effectiveness in project implementation. The World Bank found that, when it comes to implementation, its supervision of projects:

> is generally insufficient to determine environmental performance and may limit the Bank's ability to detect and address environment-related problems in a timely fashion as projects evolve. Knowledge of the actual environmental impacts and performance of mitigation, monitoring and management plans is often incomplete (World Bank 1997, p. xv).

This situation is, of course, not unique to MFIs and would also apply to EIAs carried out in national contexts, as is pointed out in other chapters of this Handbook.

6.9 CONCLUSIONS

As stated in the introduction to this chapter, the information presented here is based on currently (publicly) available information on EIA in five MFIs. The author was unable to carry out 'research in the field' or to conduct extensive interviews with Bank staff involved in the EIA process. As such, this chapter should be viewed primarily as a description of the present 'state-of-the-art' in carrying out EIA in the context of project planning. However, even if more 'targeted research results' were available, it would probably be difficult to draw any firm, overall conclusions about EIA and MFIs, for the simple reason that each of the Banks examined here is unique in terms of its mandate, sphere of operations and geographical area of concentration. As such, each Bank's 'approach' to EIA is also unique.

Nonetheless, it is possible to draw some conclusions about the 'way in which EIA is working' in these institutions, even if it is of a general nature and based as much on the author's personal experience as on an analysis of the 'literature'.

First, it would be safe to say that the need for EIA has now been recognized throughout the 'MFI community'. Procedures for its implementation have been established and, over time, tailored to individual Bank polices and operations. More importantly, it would appear that Bank operations teams and project sponsors (i.e. borrowers) have also accepted the need for and usefulness of EIA. Disagreements between operational and environmental staff, for example, on how projects should be classified, are rare. The need to incorporate EIA findings in project design has been accepted.

Secondly, although the quality of EIAs being prepared is improving, the emphasis on application has been at the 'project preparation' level. For environmental concerns to become truly integrated into investment decision-making, it will be necessary to move EIA both 'upstream' and 'downstream'. That is to say, more attention will need to be given to strategic (or sectoral) EIA which examines the environmental implications of development policies, plans and programmes, as well as to the actual implementation of environmental management plans associated with projects on the ground. Institutions such as the World Bank, which are involved in 'policy based lending' and finance large structural adjustment schemes, are particularly well-placed to introduce SEA in their activities.

Thirdly, it is probably safe to say (and as supported throughout this Handbook) that the quality and usefulness of any particular EIA is more dependent on the quality of the individuals who prepare it than on the adherence to a particular procedure or the application of a particular set of methodologies or approaches. This, by extension, means that the practice of EIA will improve as greater use is made of well-qualified, local environmental expertise in its preparation, and implementation, together with increased consultation with affected parties and other interested groups, as well as NGOs, throughout the EIA process.

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Part 3
International Experience

This third Part develops the theme introduced in Part 1, by providing more detail of international practice and experience by means of six 'regionally focused' chapters: Eastern Europe (Chapter 7); East Asia (Chapter 8); Africa (Chapter 9); Central and South America (Chapter 10); North America (Chapter 11) and the European Union (Chapter 12).

Exhaustive country-specific coverage in terms of regulation and its implementation is not possible both in the space available and, most significantly, because information is often unavailable. The decision to pay more attention to transitional and developing countries is in recognition of the smaller available literature relating to these, undoubtedly a reflection in part that, until relatively recently, greater attention has been paid to environmental problems in developed economies.

Each chapter in this Part is designed to assist understanding of the political, social, economic and environmental pressures which have favoured legislative action and the factors which have led to effective implementation as well as those hindering progress. The authors all have had direct involvement in EIA in the regions they discuss.

Each chapter provides for discussion around the elements of the EIA process (as in Chapter 2, Part 1). Chapters 11 and 12 provide greater attention to the legislative basis of the EIA regulations and requirements, primarily because the European and North American systems are referred to widely and it is easy to lose sight of the detail which has provided a framework for legislative development in other countries.

In both developed and developing economies EIA is often well established, although its potential benefits still await full realization. Significant similarities in terms of remaining deficiencies are revealed in each of the chapters, i.e. the need for EIA follow-up; the paucity of public participation, particularly in many developing and transitional economies; the need for local capacity building; and the need for constant attention to system enhancement, in line with environmental, economic and social pressures. However, it is clear that in many developing countries, in particular, there is still a need for political support, the lack of which will have significant adverse implications for the adoption of EIA as a support to the sustainability framework.

7: Environmental Impact Assessment in Central and Eastern Europe

URSZULA A. RZESZOT

> The more one knows about the east of Europe the less meaning the term 'eastern Europe' gets. (Mostert 1995)

7.1 INTRODUCTION

Environmental impact assessment (EIA) is an increasingly popular environmental management tool in the countries of Central and Eastern Europe. The development of this tool in the region dates back to the late 1970s and early 1980s: for example, the Polish Water Law of 1974 required EIA for all intended water use and the first EIA regulations in Croatia were introduced in 1984. Naturally, every EIA system is unique because it is closely linked to the legal, administrative, economic, political and cultural circumstances in a given country. This chapter points out some of the similarities and the differences between the EIA legislation and practice in the region. A short characterization of the economic and environmental situation of the region provides a background for the development of EIA. An overview of the legislation is provided and the factors which influenced development are discussed, as well as some examples of the solutions adopted in practice and the main problems encountered.

7.2 CHARACTERISTICS OF THE REGION

The term 'Central and Eastern Europe' may be defined in many ways depending on the approach adopted (geographical, historical, political, etc.). The most common understanding of the term is that of 'countries in transition', i.e. countries with economies in transition from the centrally planned to the market system. The transition, triggered by economy and politics, is a trait common to all of the states, though the point of departure differs in terms of time and economic situation for different countries. Despite this common trait the area called 'Central and Eastern Europe' is far from homogeneous and any generalized statement about the region may reasonably be contested. Some of the characteristics of the region are presented in Box 7.1. As may be seen, it is difficult to present an 'average' picture and any attempt to present a common statement concerning an issue in the whole region would inevitably be of the most general type. One of the few common characteristics is the dynamics of change. This factor alone makes it very difficult to obtain a clear picture of the current situation. For example, new EIA legislation is being prepared in many countries: Poland, the Czech Republic, Estonia, Latvia, Ukraine and Romania. In Poland the current legislation is the second version of EIA regulations and there are major differences between the 1990 and 1994/1995 regulations and the new EIA legislation expected to be passed by parliament soon.

The region is of considerable importance in size: in 1988, at the end of the socialist era, the countries of the Eastern bloc accounted for 26% of the inhabited land surface and 32% of the population of the world (Dobosiewicz & Olszewski 1994). The era of central planning influenced in a number of ways both the state of the environment and environmental awareness. It resulted in the dominance of heavy industry and reduction of private ownership of the means of production. However, the situation varied from country to

Box 7.1 Common traits and differences within the region (Sources: Eurostat 1995; GUS 1996; World Resources 1996–97)

Nearly 30 countries, in Europe and Asia, including: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Estonia, Georgia, Hungary, Kazakstan, Kyrgyzstan, Latvia, Lithuania, Macedonia, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan and Yugoslavia

Area

- From 20 000 km² (Slovenia) to 17 075 400 km² (Russian Federation)
- A total area of over 23 million km²

Population

- From 1.5 million (Estonia) to 148 million (Russian Federation)
- A total population of over 400 million

Gross domestic product (GDP)

- GDP per capita (US$): from 211 (Albania) to 6182 (Slovenia)

Economic history

- 40–70 (former USSR) years of centrally planned economy
- Mostly former member countries of the Council for Mutual Economic Assistance
- Varied ratio of public/private ownership prior to 1990
- Limited public participation in decision-making prior to 1990
- Political and economic crisis at the beginning of 1990s
- Reorientation towards market economy

Environmental problems

- In many regions economy based on heavy industry, resource- and energy-consuming
- Environmental issues subordinated to political goals (e.g. achieving a set level of production output)
- Environmental issues were one of the first areas opened up for public participation, with the opportunity to express concern and criticism of government decisions
- Lack of enforceable environmental legislation (either no environmental legislation or weak implementation measures)
- During the transition period problems with suiting the enforcement measures to the changing political and economic reality (e.g. changes in administrative levels at which various permissions are issued; inflation rate rendering the fees and fines system ineffective)

country: for example, the USSR had an almost exclusively state-owned means of economic production, whereas in Poland the agricultural sector remained predominantly private and small private enterprises have operated throughout the post-war history.

As a result of central planning industry was usually grouped in 'industrial areas' where severe environmental pollution has taken a heavy toll. On the other hand, this approach has also resulted in the preservation of areas where the environment may still be considered pristine in comparison to the western parts of Europe, where industry was more dispersed.

Public participation in decision-making was often limited, as a result of the argument that the authority represented the interests of the people. The practice varied considerably, not only from state to state, but even from province to province, because the problem was often not a lack of legal potential but of legal obligation to involve the public and the result of a tradition of hermetic decision-making in the working practices of a particular office of an authority.

An important aspect, often not taken into account when discussing environmental issues in the region, is the fact that in many countries environmental opposition was frequently the first form of legal opposition. Most of the politicians who came into power in the 1990s had had some connection with different 'green' movements, producing a favourable climate for developments in environmental legislation.

7.3 BACKGROUND TO ENVIRONMENTAL IMPACT ASSESSMENT LEGISLATION

In current EIA legislation three general origins and trends may be identified:

1 The influence of the centrally planned economy and decision-making.

2 The influence of the environmental legislation of the former USSR, and in particular the State Environmental Review (state ecological expertise, SER) and the Assessment of Environmental Impacts (OVOS).

3 The influence of 'western-style' EIA.

In most cases these influences intermingle, either in the concepts defining the legislation or in the practice. The countries which were already drafting their own legislation on EIA during the time that the concept of SER was evolving in the USSR (e.g. Poland, Hungary, former Czechoslovakia) were naturally not influenced by it. In most of the former USSR republics the model initially adopted was that of SER and OVOS. At present, with the gradual evolution of OVOS towards EIA and the increasing political pressure in some of the countries in transition to comply with the requirements of the European Directive, the trends seem to blend.

7.3.1 The influence of central planning on environmental impact assessment systems

When discussing the inheritance of the centrally planned economy, one has to bear in mind that most of the former socialist countries had environmental legislation based upon a constitutional statement that one of the fundamental functions of the state was to secure proper living conditions for its citizens, including environmental protection and the use of natural resources for present and future generations (Starzewska 1988). Plans played an important role in environmental protection: both economic plans for different sectors and land-use plans for regions, where environmental issues were usually considered (European Bank for Reconstruction and Development 1994), although they did not always influence the decision-making. However, the environmental legislation was often declarative, with procedures for enforcement and implementation introduced by various ministries in administrative rules and regulations (Ter-Nikoghosian 1995). Environmental protection was subordinated to the interests of industry, agriculture, transport and the centralized economic system in general (Vircavs 1995). As a result environmental considerations were often overridden by other considerations (e.g. of an economic or political nature) in decision-making and constrained by the predominant state ownership of the means of production.

The starting point for most environmental laws in Central Europe was nature conservation (e.g. the 1949 Nature Conservation Law in Poland) aimed at preserving a site intact and preventing or eliminating economic activity at the location. In the 1950s the importance of the interaction between environmental and social and economic factors was recognized and acts, followed by standards, concerning the protection of various environmental components (air, water, soil, etc.) and the rational use of natural resources emerged. The late 1970s and early 1980s saw a tendency to create comprehensive environmental protection systems, although difficulties were caused by the need to overcome the dominant media-orientated approach of the previous decades. This evolution of the legislation has paved the way for the introduction of EIA and the system-orientated preventative approach to environmental issues that EIA is a part of. According to Starzewska (1988), the adoption of EIA in the socialist countries of Eastern Europe seems the logical extension of the evolution of measures aimed at nature conservation and environmental protection:

> As the consequences of environmental degradation resulting from rapid industrialization become apparent the adoption of EIA seems inevitable . . . Increasing consciousness of the need for an integrated approach to development and the environment and in particular for EIA is reflected in the recent dynamic evolution of environmental legislation.

In Poland, for example, the initial development of a formal EIA process can be traced back to the 1974 Water Law, which allowed authorities to require an environmental appraisal before a water consent was granted. The Land-Use Act of 1984 made environmental assessment (EA) obligatory for a certain category of projects (listed), but EIA still did not play a significant role in development control. Neither developers nor authorities knew how to undertake an EIA and there were no regulations or guidelines as to the content of the environmental impact statement (EIS) and no procedures for quality control (Jendrośka & Sommer 1994; Jendrośka & Wójcik 1995). EIA was first formally introduced in 1990 and subsequently considerably modified by a package of new legislation which was enacted in 1994 and 1995.

Factors other than the evolution of legislation also played an important role: for example, in Hungary the initial development of a formal EIA procedure is linked to the debate on the Gabcikovo–Nagymaros barrage system.

7.3.2 The concepts of state environmental review and the assessment of environmental impacts

The SER was initially a way of including expert opinion concerning environmental issues or an environmental appraisal of projects into a centralized planning system. The legal framework for the SER was prepared, as it happens, at the same time as the European EIA Directive (summer 1985) and implemented only slightly later. A government agency was created to prepare SERs for projects, plans and programmes and the legal obligation to carry out SER for projects was introduced in 1989.

The introduction of SER was a major step in the approach to environmental management, but it cannot be considered to be fully compliant with the requirements of an EIA procedure, i.e. in terms of screening, consideration of alternatives and public participation. Because of the lack of screening criteria the SER was applied to a very large number of cases—over 80 000 in 1994—by a limited personnel of the federal or provincial administration. In practice this resulted in limiting the SER to checking only the extent to which a project complied with environmental norms and standards (Cherp 1995).

The concept of assessment of environmental impact (OVOS) is closer to EIA; however, until 1994 it remained an ‘informal regulation’, circulating in the form of guidelines and instructions issued at the ministerial level. Under current regulations the OVOS covers the major requirements of the EIA system: initial screening (a list and the potential for authorities to initiate OVOS for other developments); identification of likely environmental impacts; consultation and public participation and consideration in decision-making. However, unlike SER, which has become a part of the development process, the OVOS is still not fully integrated into the development cycle and therefore has a more limited practical application (Cherp 1995).

7.3.3 The influence of the 'western style' environmental impact assessment

The 'western style' EIA was introduced into the region through:
1 research projects and training funded by international or foreign agencies;
2 the work carried out under the Espoo Convention (see Chapter 5, this volume) and the Expert Group on EIA, which operated under the auspices of the United Nations Economic Commission for Europe (UNECE) before the Convention was elaborated;
3 the need for harmonization with European Union (EU) legislation (see Chapter 12, this volume);
4 the requirement for an EA inscribed in banking regulations, modelled on the requirements imposed by multinational banks (see Chapter 6, this volume).

These different channels often affected different actors. High-level decision makers and politicians are involved in the negotiations concerning harmonization with the EU legislation and the ratification of the Espoo Convention, which creates a political climate favourable to the changes and improvements in legislation and administrative procedures. The banking regulations have an 'educational influence' on the developers and research projects help to spread the know-how amongst academics and consultants, resulting in the creation or adaptation of EIA tools suited to local conditions.

In many of the countries of the region the introduction of EIA was strengthened by foreign aid projects, such as the United Nations (UN) Development Programme/World Health Organization project in the 1980s in Poland or the EC PHARE (European Commission Poland and Hungary Assistance for Restructuring their Economies) Programmes in Bulgaria and Slovakia. The projects resulted in the development of increasing groups of local specialists and experts prior to the formal introduction of EIA. According to many this is the necessary, although perhaps not sufficient, requirement for the creation of an effective EIA system: the combined knowledge of both EIA theory and local conditions.

In Slovenia, prior to explicit formal regulations, a number of important projects underwent an EIA procedure when major Slovenian banks introduced a requirement for impact assessment of planned activities on the environment as a part of the loan request. The requesting of EIA by banks, foreign or national, was often an important incentive in other countries as well. In Poland, where there is no legal obligation for public participation in the EIA process, the 'banking' EIA, which did require public participation, had a considerable influence on investors, making them aware not only of the need for public participation but also of the problems involved.

The role of the UNECE convention in introducing EIA in the region has to be underlined. In many countries it was the means of drawing the attention of politicians and high-level decision makers to EIA. For some of the countries it provided much needed methodological advice and understanding of the functioning of the western-style EIA system, making it possible to model solutions on those found to be effective elsewhere, as well as avoiding the mistakes of others. In other cases it was the means of introducing environmental requirements into the investment procedure. It is perhaps worthwhile recalling that the first, and for a year the only, country to ratify the Espoo Convention was Albania.

Currently, in those countries of the region where harmonization with the requirements of the EU is a high political priority (the Czech Republic, Hungary, Poland, Slovakia, Slovenia), legislation is often modified to fit the requirements of the 85/337/EEC and 97/11/EC Directives (Commission of the European Communities 1985, 1997).

7.3.4 Current environmental impact assessment legislation

The differences in background conditions influenced both the timing and the means of EIA introduction. An overview of the existing EIA legal regulations is presented in Box 7.2. The

Box 7.2 EIA regulation in selected countries of the region (Sources: Ministry of the Environment of the Slovak Republic & Centre for EIA at the Faculty of Natural Sciences 1995; EIA Centre 1996; Kristoffersen & Tesli 1996; UNECE 1996)

Country	Date and type of legislation referring to EIA	
Albania	1993	Environmental Act (a chapter on EIA)
Armenia	1995	Framework EIA Act
Belarus	1992	Law on the Protection of the Environment (an article on EIA)
	1993	Law on State Environmental Review
Bulgaria	1991	Environmental Protection Act
	1992	Regulation on EIA
Croatia	1980	Law on Physical Planning
	1984	Regulation on EIS
Czech Republic	1992	Act on Environment
	1992	Act on Environmental Impact Assessment
	1992	Decree on Certificates of Professional Competence for EIA
Estonia	1992	Order on Environmental Impact Assessment
	1994	Order on the Methodological Guidelines for Implementing Environmental Impact Assessment
Hungary	1992	Decree on Electricity and Thermal Energy Generating
	1993	Decree for Provisional Regulation on the Assessment of Environmental Impacts of Certain Activities
	1995	Environmental Protection Act (a chapter on EIA)
	1995	Decree on Environmental Impact Assessment
Latvia	1990	Law on State Ecological Expertise
	1991	Law on Environmental Protection
Lithuania	1992	Law on Environmental Protection
	1993	Law on Protected Areas
	1995	Regulation on Project Documentation
Moldova	1993	Environmental Protection Law
	1996	Instruction on State Ecological Review
	1996	Environmental Review and Assessment Law
Poland	1980	Environmental Protection Act
	1994	Spatial Planning Act
	1995	Executive Order on Environmental Impact Assessment
	1995	Executive Order on EIA of Toll Motorways
	1995	Executive Order on EIA of Local Land-use Plans
Romania	1990	Executive Order on Environmental Impact Assessment
	1995	Environmental Law
	1996	Executive Order on Permitting Procedure

(*Continued*)

Box 7.2 *continued*

Country	Date and type of legislation referring to EIA	
Russia	1992	Environmental Protection Act
	1993	Decision on State Ecological Expertise
	1994	Decision on Environmental Impact Assessment (status of law from 1995)
Slovakia	1992	Environment Act
	1994	Environmental Impact Assessment Act
	1995	Decree on EIA Licensed Experts
Slovenia	1993	Environmental Protection Act
Ukraine	1991	Environmental Protection Act
	1995	Law on Environmental Expertise

regulations are variable in the extent to which EIA is required. The information is presented merely to illustrate the development of the EIA legislation in the region. It will not be analysed further, as the differences in the approaches chosen and the administrative procedures followed for obtaining siting and building permissions, as well as the way in which they interact with EIA, differ considerably from country to country.

7.4 ENVIRONMENTAL IMPACT ASSESSMENT PRACTICE

One of the lessons drawn from the era of central planning is that legislation alone is not enough to protect the environment. Therefore, the main discussion in this chapter will focus on the achievements and problems of practical implementation of EIA in the region.

The region is by no means uniform and it is difficult to point out the main practical problems common to all the countries, whilst a thorough comparative review of EIA in the region is far beyond the scope of this work. The opinions presented are therefore simply the reflection of the way the author currently perceives some of the issues.

7.4.1 Terminology and definitions

A real problem, both in terms of internal regulations as well as international communication and research on EIA, is the question of definitions and terminology. The controversies surrounding the classification of the term 'state ecological expertise' (SER) may serve as an example. Some consider the term 'ecological expertise' as meaning a tool in environmental management, used in the procedure of obtaining the necessary planning and building permits and yet not equal to EIA (e.g. Cherp 1995). Others argue that it is in fact a term equivalent to EIA, even whilst admitting that some important issues, such as evaluation of alternatives and mitigation measures, are not included and that public participation is very limited (Vircavs 1995). The issue is further complicated by the modifications to the tool in different states after the disintegration of the USSR—at present, the term 'ecological expertise' does have a different practical coverage in different countries. For example, at the initial stage of the introduction of ecological expertise in Latvia, the predominant view was that the main function of this tool is to refuse consent for a project (Vircavs 1995).

Another illustration of the same problem is the current discussion in Poland as to whether or not the 'prognosis of the environmental consequences of the local land-use plan' is in fact a form of strategic environmental assessment (SEA). The interpretation of the relevant legal acts and the understanding of the term SEA are different in different centres involved in the discussion. The main problem is therefore the definition of the terms, rather than their translation.

In the countries of Central Europe which are now faced with the need to harmonize their national legislation with EU requirements a clear definition of EIA and EIS is urgently required, if only to enable the assessment of the compliance of the definitions in national legislation with those contained in the EU Directive. In these and other countries of the region, a similar incentive is also the entry into force of the UNECE Espoo Convention.

The issue of definition is linked with another problem: the distinction between EIA as a process and the EIS as a document. In some countries (e.g. Poland), at the initial stage of introduction of EIA, the legislation gave only the definition of the EIS, while in practice the same term was used for both EIA and EIS. This approach, coupled with the inheritance of the centrally planned system, where a number of documents had to be assembled and presented in order to obtain a siting permit, resulted in treating EIA as limited to the EIS: exclusively a document and not a process. Even though the general awareness and understanding of EIA is increasing, occasionally developers and local authority representatives still consider EIA as simply the formal requirement to present a document containing an expert opinion about the environmental impacts of the proposed development, even limited to the statement of compliance with existing environmental standards. Such an approach may also be due to the fact that project-level EIA is part of a licensing procedure—traditionally document-focused in all political systems.

The issue of distinguishing between EIA and EIS has practical consequences for the EIA procedure: for example, where EIA is largely perceived as limited to EIS there is often no scoping stage, and the legislation states the minimum content requirements for the EIS. For example, in Poland screening and scoping has a purely formal and not a procedural character (Jendrośka & Wójcik 1995). This approach can in turn lead to over-regulation: in Poland there is no scoping procedure and the legislation sets out nine types of EIA, each with a different content and used in a different administrative licensing procedure.

7.4.2 Screening

In most of the countries of the region, the legislation establishes lists of activities for which EIA is mandatory. Lists of projects with a mandatory EIA requirement in various countries of the region may be found (e.g. European Bank for Reconstruction and Development 1994; UNECE 1996). Lists exist in Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Russian Federation, Slovakia and Ukraine. Referring to these lists, it is necessary to take into consideration subsequent changes in legislation. In countries where two lists exist, the concept generally follows either that of the EU Directive, with developments on one of the lists undergoing compulsory EIA and on the other being subject to EIA only under certain conditions, or with the developments on both lists being subject to compulsory assessment, subject to decisions by different levels of administration (either the Minister or provincial authorities: e.g. the Czech Republic, Poland). The conditions for carrying out EIA for developments from the 'second' list include both location criteria (e.g. location in nature protection areas—Hungary) and the division of competencies between different levels of public administration or a mixture of the two (e.g. the second list developments are subject to EIA depending on the decision of the competent authority, taking into account criteria concerning the site and the development, in Armenia, Bulgaria, Estonia, Slovakia). In Slovenia, EIA is closely linked with procedures of environmental vulnerability and environmental burden studies. In Lithuania, screening is done taking into account both the type of development and the type of environment potentially affected, but, as the EIA is required according to various regulations, the procedure is rather complicated. In Romania, screening is performed by the environmental authority, which may require a preliminary EIS to be presented, taking into account both the type of development and the potentially affected environment.

A slightly different approach was adopted in Ukraine, where a negative and a positive list is in operation (a list of developments which do not require EIA and a list of those that do)—

experience to be gained by the application of both lists will indicate which approach is preferable.

In most countries legislation is flexible in allowing the Minister for Environment or even the provincial environmental authority to require an EIS for non-listed developments. In some countries (e.g. Latvia), EIA is required for all foreign investment projects.

The problems being caused by the application of screening lists are common to experience elsewhere: on the one hand, the lists have to be strict in order to ensure that all developments which may potentially have a significant environmental impact are subject to EIA; on the other hand, they have to be sufficiently flexible to adapt to changing circumstances and provide for a case-by-case decision.

The lack of threshold criteria on long and complex lists of projects subject to mandatory EIA makes screening difficult and hard to administer (Kristoffersen & Tesli 1996). Where there is room for interpretation, the decision whether or not to carry out an EIA rests with the administration. The exclusion of projects with potentially significant environmental impacts happens relatively rarely, both because provisions exist which allow unlisted projects to be called in for an EIA and because as a rule the administration prefers to err on the side of caution. What often happens is that a large number of small projects (e.g. individual housing) are subject to EIA. This results in the alienation of small-scale developers as inflexible regulations on the EIS content make compliance time-consuming and costly out of proportion to the complexity of their development. There is the danger of erosion of the law: regulations commonly perceived as impractical are no longer being followed. This phenomenon, not unknown in other parts of the world, is occurring also in the countries in transition, where the socially acceptable, although unofficial, model of a positive citizen does not necessarily involve the requirement to follow all regulations laid down by the state. With a large number of cases having to be handled by a limited staff resource the quality control performed by the environmental authority is often superficial.

7.4.3 Scoping

Where a two-stage EIA procedure exists (e.g. Hungary, Slovakia) scoping is usually based on the findings of the preliminary environmental study (the first stage of EIA). In other countries (e.g. the Czech Republic, Poland), the EIA legislation rigidly defines the scope of the EIS in terms of its content. Dusik (1995) points out that such an approach causes many practical problems: the requirements are not always consistent and data provided in the different parts of the EIS are difficult to follow and often overlap. The absence of scoping accentuates the problem by preventing the consultants involved in EIS preparation from focusing on issues perceived as significant in a given case, for example by the local population. Attempts to organize scoping meetings are often opposed by the developer who perceives them as a non-standard procedure, influencing the time and cost of EIS preparation.

On the other hand, local decision makers faced with a tool they are often unfamiliar with, being required to make decisions which for decades had been the 'reserve' of decision makers at the central or regional level and acting under the pressure of time allowed for administrative decisions, often make either too general or too superficial demands. In an attempt to 'simplify' or 'streamline' the EIA procedure, scoping is often omitted and the EIS contains a large amount of unimportant information as a result of authorities demanding unnecessary data (Radnai 1995).

However, in many countries scoping is a mandatory step in the EIA procedure. For example, in Romania, the scoping must be performed by the environmental authority; in Slovakia, the alternatives to be analysed are scoped and the structure of the EIS is set out, including the extent of impact analysis, methods to be used and the programme of public participation (Drdos & Pavlickova 1995); in Bulgaria, where special attention is given to public participation, the scoping document has to contain a list of concerned parties.

7.4.4 Licensing of consultants

In Armenia, Bulgaria, the Czech Republic, Estonia, Poland, Romania, Slovakia and Slovenia, legislation requires EIA to be carried out by a licensed expert or at least supervised or reviewed by one. This requirement was often introduced during the early years of operation of the EIA procedure as a quality control measure.

In some cases it was considered best to make the office of the local environmental authority responsible for preparing the EIS: such is the case in Latvia, where only the staff of the Regional Environmental Boards and members of the Board of State Environmental Expertise may prepare the State EIA Reports, which are considered final documents. Any other materials, findings or proposals are non-binding and may only serve as background material for the EIA. The group of usually 6–10 experts working on a given project is called the expert commission. The membership of an expert commission is approved by the Minister (Vircavs 1996). A similar arrangement, with the staff of the Ministry for Environment preparing the EIA, is functioning in Lithuania (Kristoffersen & Tesli 1996). However, this approach results in the EIA being carried out and the decision taken by the same body.

In most of the other countries the licence to prepare an EIS is granted by the Minister of Environmental Protection to individuals who have demonstrated their expertise and experience in the field and often involves an authorized body's examination. The licence may be granted to institutions as well as individuals (e.g. Poland, Romania, Slovakia). The licence mostly covers the right to prepare an EIS but in some cases also to review it. For example, in Armenia, licensed experts review documentation prepared by the developer or consultants hired by the developer and prepare an expert opinion on the EIA documentation for the authorized body (Ter-Nikoghosian 1995). In the Czech Republic a similar provision exists, with the expert review of all EIA documentation (EA and EA Expert Opinion) a compulsory step of the procedure. This review is prepared by an accredited (licensed) EIA expert who has not taken part in the preparation of the document reviewed. A licence may be given for life (the Czech Republic, Poland) or for a limited period of time (e.g. 3 years in Estonia, 2 years in Romania).

In Slovakia, the Ministry of Environmental Protection is responsible for creating, managing and publishing a list of individuals and institutions authorized as EIA experts. The experts carry out EISs and act as team managers, reviewers, advisers, etc. (Drdos & Pavlickova 1995). It is the authority and not the developer who commissions the licensed expert, on a case-by-case basis. In Poland and Romania, the licensed expert is chosen by the developer, usually from a short list prepared for them at their request by the local authority.

The Polish list of experts, also managed by the Minister of Environmental Protection, created in 1990, was open for new registrations until 1993 when it was closed, largely due to overcrowding and resulting problems with the management of the list. This has resulted in a situation where only experts who were placed on the list during 1990–1993 may perform EIA. Not surprisingly, two pressure groups have been created: one concerned to reduce competition and therefore arguing for the list to be kept closed the other concerned to either reopen the list or abolish it altogether, pointing out that the resources consumed by the running of the list might be better used in the quality control of the EIA process.

In Slovenia, a special Environmental Impact Evaluation Group of researchers and experts has been set up to prepare EIAs at the highest expert level (Vucer 1995).

7.4.5 Environmental impact statement preparation

The lack of background data is a major problem in the preparation of the EIS. It is very rare to be able to obtain long-term data on the on-site values of various environmental indices. In countries where EIA is perceived only as a document and not a process the baseline survey is often not given enough emphasis. This problem also has its consequences at the post-auditing stage if there is no baseline against which to evaluate impacts. Data may have been collected but, with the huge administrative reorganization which has occurred (institutions dissolved, renamed, relocated, etc.), it is sometimes difficult to trace the source. With the implementation of the market economy the holders of information sometimes charge for the data which can be a problem. This issue is linked with the problem of the general availability of environmental information with consequent effects on public participation.

A different problem is caused by the inheritance of many years of the sectoral or media-orientated approach to the environment and relatively less experience in the systems approach and interdisciplinary team effort. This results in EIS often being a set of various sectoral studies bound in one cover. The results of a survey of EISs received by provincial authorities in Poland during 1990–1995 (carried out during a Nordic–Baltic–Polish cooperation project) confirm that the best prepared sections related to 'sectoral' topics (geology, air pollution, etc.), whilst issues requiring a cross-sectoral approach (impacts on forest ecosystems, tourism, landscape qualities, etc.) or relating to those impacts which until recently have been outside the interests of 'environmental professionals' (health, culture) were of a lower quality. This view is to a large extent confirmed by the opinions of members of the EIA Commission (Jendrośka & Wójcik 1995; Kassenberg & Wójcik 1996).

The coverage of the EIS is either set out in the legislation in a very precise and inflexible manner (where there is no procedural scoping) or developed in detail during the scoping stage, in accordance with the general guidance provided at the first stage of EIA. Based on the Polish experience, even where there is no scoping and the legislative requirements rigidly define the minimum EIS content, in practice the coverage of EISs varies for the same type of development, as the consultants can implement their own understanding of best practice.

Formal requirements as to the issues to be covered by the EIS vary. Issues such as social and economic impacts, health risk assessment, cultural heritage, the consequences of industrial accidents, etc. are not always compulsory—although the integration of the social and economic effects is required by the Slovak, Slovenian Romanian and Hungarian regulations.

Practice in terms of time taken to prepare EISs varies from less than 1 month (the average in Estonia) to over a year in the case of complex projects. A similar variance may be observed in size: from a few pages to multiple volumes.

It is difficult to estimate the number of EISs prepared, as in many cases there is neither a central nor a provincial depository or register and there often are no separate records of EISs kept. In the countries which have a two-stage procedure with initial and final EISs the two stages may be considered separate EISs or a single one. Some examples of the number of EISs prepared are given in Box 7.3. They are estimates made by various authors for different purposes and, when comparing them, this fact, together with the difference

Box 7.3 Estimation of the number of projects for which EIA has been carried out (Sources: Ministry of the Environment of the Slovak Republic & Centre for EIA at the Faculty of Natural Sciences 1995; Kristoffersen & Tesli 1996)

Country	Period	Number
Bulgaria	1993–1994	1400
Czech Republic	1992–1995	200
Estonia	1994	84
	First quarter of 1995	26
Hungary	1993–1995	250
Latvia	1994–1995	7
Poland	1990–1994	3200–5100
	First half of 1995	730–1420
Romania	1990–1997	2500–3000*
Russia	1991–1992	106 000
	1993–1994	168 000
Slovakia	1994–1995	129
Slovenia	Up to 1995	740

* According to estimate by V. Visan, personal communication.

in size and intensity of development of the countries, has to be taken into account.

7.4.6 Public participation

Although public participation is certainly one of the concepts of EIA where much remains to be done, things are improving quite rapidly. Most of the countries have the potential for extensive public involvement. However, as with EIS preparation, it is the practice rather than the legislation which is the main problem.

In Slovenia, the authority responsible for the decision is also responsible for the public presentation of the draft licence or permission and must publicly announce its decision (Vucer 1995). In Latvia, where the EIA is carried out by the staff of the environmental authority, it is the responsibility of the developer to discuss the project and its potential impacts with representatives of non-governmental organizations (NGOs) and local residents. As this arrangement is not perceived as satisfactory (the developer usually only complies with the formal requirement, giving limited information), sometimes representatives of the public (one or two persons) are included on the staff of the expert commission preparing the project. In Russia, the law on environmental review includes provisions for public participation, although primarily this is one-way consultation, based on informing the public and giving them the opportunity to come forward with proposals for a public review of the planned development. In Poland, public participation potential exists but, with no obligation or responsibility upon either the developer or the authority, practice remains weak. Even at the level of the ministerial EIA Commission, the representatives of the concerned public have only passive rights. It is sometimes argued that the ministerial EIA Commission in itself may be considered as representing the rights of the public. However, although some of the members of the commission are members of NGOs, this assumption does not seem to be justified.

Hungarian legislation provides for a public review of the EIS to be held with a 30-day period for submission of comments at the preliminary stage as well as a public hearing at the final stage. The organization of the hearing is the responsibility of the regional environmental authority (Radnai 1995). In the Czech Republic, public comments on EIA documentation and public review of expert opinion are both compulsory. However, the first opportunity for submitting comments is often poorly advertised and, in practice, the hearing after the preparation of the expert opinion (which includes drafting the decision) is the last opportunity for the public to voice their concerns. This causes many problems since often issues raised by the public have not been addressed in the EIS (e.g. consideration of alternatives or mitigation measures indicated by citizen groups, etc.). Lack of 'EIA awareness' among NGOs and lack of experience of the authority as to the means of providing the public with information about the availability of EIA-related documents are factors influencing this problem (Dusik 1995).

Provisions for public participation in Bulgaria and Slovakia are very broad, guaranteeing public participation in the whole of the EIA process, with initial information to the public being given prior to the screening stage, and with subsequent opportunities and time for public hearings and the gathering of comments. In Bulgaria, the public discussion of EIS takes place at both the preliminary and final EIA stages. The public hearings take place in the communities affected and public opinion is taken into account during the review and approval of the EIS (Zgourovska 1995). The Bulgarian law also has special provision for joint public hearings for cases where two or more planned projects are interrelated in terms of location or effect. In Slovakia, the affected municipality together with the proponent is responsible for organization of the public participation. There is no legal limitation or definition of the public (therefore individual citizens are included), but special provisions and rights are given to civic initiatives and associations (Drdos & Pavlickova 1995). In Romania, the regulation provides that the review and approval of the EIS is subject to a public debate, which is organized by the local authority and the developer, who bears the costs involved.

All of the actors (developer, consultant, local authority, NGOs, members of the public) are still learning their proper place in the EIA process. Information exchange with the public is often one-sided and feedback not always analysed. The competent authority lacks the skills and the traditions of involving the public. The NGOs are not taking full advantage of the possibilities open to them and the average citizen is not always aware of their rights: for example, in Poland, the Czech Republic and Slovakia, groups of citizens have the full rights of a concerned party in the administrative procedure (they have to be informed in advance of the steps taken, may challenge the decision in court, etc.).

In the introduction to this chapter, the fact that environmental opposition was strong in the late 1980s was pointed out as an advantage. However, there were also resulting disadvantages. For example, in Polish practice it has resulted in the establishment of a 'no-negotiations', 'win-or-lose' approach, in which the 'good' green environmentalists are opposing the 'bad' developer and 'almost-just-as-bad' state administration. Such attitudes are decreasing but may still be observed.

Closely linked to public participation is the availability of information—not only to the public but also to the developer and consultant, which is an issue often not provided for in legislation. An exception is Bulgaria, where the law places an obligation on every person or institution undertaking activities financed by the state budget to provide the information acquired during such studies to the developer upon his/her request, if it is necessary for the preparation of the EIS.

7.4.7 Quality control

Even in countries where the EIA procedure is not formally defined in regulations or where there is no legal provision for quality control, some form of review exists. The licensing of EIA consultants is one of the most obvious quality control measures. However, since experience has shown that this factor alone is not sufficient, additional quality checks are used. Quality control is in most cases limited to the control of the EIS document rather than the process and often concentrates merely on comparing the submitted document with the legal requirements.

In Slovakia, quality control methodology and criteria are set out in guidelines (Drdos & Pavlickova 1995). In Armenia and the Czech Republic, licensed experts review the EIS and prepare an expert opinion on EIA documentation, with the proviso that the expert consultants and the expert reviewers should be independent of each other. In the Czech Republic, where the expert opinion contains a recommendation to the authority about the decision, the issue has arisen as to whether a single person can have sufficient professional competency to judge all of the areas addressed in the EIS. The idea of granting the reviewers a separate licence is now being considered (Dusik 1995).

In Estonia, where no legal provisions for quality control exist, an adapted version of the Lee and Colley Review Package (Lee & Colley 1992) is being used by the local and national authority (Jalakas 1995; Petersen 1996). In Hungary, quality control is a compulsory procedural step at both the preparatory and detailed stage of EIA.There is no obligatory method of quality control but the Ministry for Environment has issued guidelines for regional authorities, which include matrices and checklists. Work is underway on a computerized decision-support system which would include impact matrices for each of the activities listed in the EIA regulation (Radnai 1995).

In Poland, an EIA Commission at the ministerial level (established in 1990) gives advice to the Minister of Environmental Protection and a review of the EIS submitted to the Minister is its main responsibility. The members of the Commission are nominated by the Minister for a period of 4 years and include both academics and practitioners (over 70 people). The work of the Commission is carried out in panels, created from standing groups focused on various issues (e.g. motorways), advising the Minister on the quality of the EIS as well as on the general environmental acceptability of the project. The Commission does not use any particular review tool or method. The Minister usually follows the advice given by the Commission, although it is not formally binding upon him/her. The existence of the Commission is not a legal requirement—it is based on a ministerial decision. Similar Commissions operate in some of the provinces, giving advice to provincial governors (*Voivodes*). In Romania, an EIA Commission operates at the central level and in each of the 40 counties.

Referring back to the problem of terms and definitions, a different understanding of the term EIA Commission may be seen in Latvia, where the EIA Commission (expert commission) prepares both the EIS itself and the decision: the State EA Report, which is a binding legal document (Vircavs 1995). The quality of documentation submitted is considered to be relatively low, owing to the expert commission being forced to deal with a large number of tasks for which it is under-resourced (Benders *et al.* 1996).

In Russia, the conclusions of the SER prepared by the expert commission are only evaluated as to compliance with regulations.

7.4.8 Role of environmental impact assessment in decision-making

EIA is usually defined in international literature as a tool to aid, but not to make, decisions. In some of the countries of Central and Eastern Europe the understanding is different and the EIS is expected to contain the draft decision. In some cases, as in Latvia, the EIS is the final document containing the decision. In the Latvian and Lithuanian model, where the decision makers prepare the EIS (or 'ecological expertise'—a final document, legally binding), the EIA is very closely linked with decision-making. The lack of 'distribution of powers', with the same body preparing, presenting and approving EIA, is a problem. In other cases, as for example in Poland, there is a visible tendency on the part of the local authorities to shift a part of the decision-making responsibility to the EIA consultants, urging them to include a draft decision in the conclusions of the EIS. However, in most countries EIA plays its predestined role as an advisory document. In the Slovak and Slovenian procedure the final record resulting from the EIA process is not binding upon the licensing authority but detailed reasons have to be given if the latter decides to go against the advice given by the environmental authority. In Romania, the EIS plays an important role in decision making but should not contain explicit suggestions regarding the permitting decision. In Russia, the decisions are mostly determined by economic interests and, as appropriate cost–benefit analysis of environmental impacts is not always carried out, the environmental consequences of a decision are not always considered in decision-making (Golubeva *et al.* 1995).

The timeframe for decision-making varies: in some cases, no specific time limits are set and the general rule applicable to all administrative procedures applies (e.g. Poland—30 days). Others set a definite timeframe, one of the longest being in the Hungarian regulations, which allow 90 days for the environmental authority to make its decision at each of the two stages of the procedure and 30 days for consultation with the statutory consultees: a total of 210 days (Radnai 1995). In Romania, there is no time limit for either the EIA procedure or the decision to be taken but a 30-day limit is set for the decision to be challenged by any interested party.

Research by Kassenberg and Wójcik in Poland within the scope of the Nordic–Baltic–Polish cooperation project demonstrates that EISs were often prepared several times over for the same investment project, at various stages of the procedure, with little or no reference made to the previous work carried out (this is one of the consequences of considering EIA as limited to EIS and not as a process). According to the findings of the study, the recommendations contained in the EIS were implemented fully in 21%, significantly in 50%, partially in 26% and negligibly in 3% of cases (Kassenberg & Wójcik 1996). This suggests a considerable impact of EIA on decision-making. A similar study conducted in Estonia found that the decision maker considered the results of EIA in 65% of cases, with the EIA procedure followed in 59% of cases. The respondents (representatives of the decision authorities) were not aware whether the procedure was followed or not in 27% of the cases, and the EIS guidelines were used in approximately half the cases (Peterson 1996). This indicates that to the decision makers the formal existence of the document is of paramount importance, the question of procedural correctness and methodological quality being secondary.

Nevertheless, the conclusions of the EIA study do play an important role in the preparation of the environmental authority's decision. In some countries, for example, Hungary and Poland, the agreement of the environmental authority is necessary in order to obtain a licence to initiate the project: the regulations belong to the 'veto' category—the licence may not be given if the opinion of the environmental authority is negative. The Bulgarian regulations contain a statement to the effect that an EIA procedure may not be completed successfully for projects that are proven to be noncompliant with limit values for any pollutant or are not equipped with the necessary environmental protection equipment (Fulop 1995). In Slovenia, in the case of planned projects exceeding emission limit values the EIS is obliged to include the analysis of alternatives for location, use of raw materials, energy and technology.

7.4.9 Monitoring and post-auditing

In many of the countries in the region (e.g. the Czech Republic, Poland, Russia), the EIA procedure ends with the submission of the EIS documentation to the decision maker. Monitoring and post-project analysis depend upon the terms and conditions included in the decision. Only those measures which are indicated in the permit are legally binding and enforceable. This type of approach is typical in particular for those countries where EIS is rigidly defined and the process itself weak.

In the countries where the EIA is perceived and legislated as a process the situation is different. In Slovakia, post-monitoring is initiated before the implementation of the project, in order to provide a comparative basis and is carried out in accordance with the monitoring programme included in the EIS.

In some countries (Poland, Hungary, Romania), a so-called EIA for existing developments may be carried out, which acts either as an audit (if no EIA was carried out at the time of siting—e.g. in the case of pre-privatization) or post-auditing analysis (if an EIA was carried out at the siting stage—i.e. for developments realized after the introduction of EIA legislation). In Bulgaria, the Minister of the Environment has a discretionary power to order repetitive EIAs of major projects at intervals of not less than 5 years.

7.5 STRATEGIC ENVIRONMENTAL ASSESSMENT

In many countries (Bulgaria, the Czech Republic, Latvia, Poland, Romania, Slovakia, Slovenia), the approval of an environmentally competent authority is a necessary step in the procedure of formulating land-use plans. A key issue is whether the EA of land-use plans is in fact a strategic EIA. The main problem is whether the term 'strategic' may be applied to large-scale developments or only to those developments where a decision involving a strategy is taken.

In Bulgaria, the National Development Plan is considered as a project subject to EIA. In the Czech Republic, the EIA Act regulates the assessment of policies, plans and programmes prepared and approved at the national level, and in particular for government policies prepared in the fields of energy, transport, agriculture, waste treatment, mining and recreation, as well as water management plans and land-use plans. The procedure laid down for SEA is simplified compared with EIA for developments, with limited public participation and quality review (Dusik 1995). The Estonian EIA Act requires the assessment of the compliance of programmes and planning documents with environmental protection requirements and principles of sustainable development and stresses the necessity of EIA for strategic concepts, programmes and plans and for developments involving exploitation of natural resources (Peterson 1996). In Latvia, all physical planning projects (general plans) and branch development programmes must obtain the expert opinion required under the law on SER. Under the Armenian EIA Act, strategic development concepts, policies and programmes undergo an EA procedure. In Moldova, guidelines are prepared in order to make EIA a part of the process of preparing government decisions, plans and programmes.

In Poland, the EA of land-use plans follows a separate EIA process and has, unlike EIA for development projects, a clearly set out compulsory public participation procedure. In Romania, the EIA of land-use plans is also a separate procedure, aimed at identifying major impacts and the necessary corrective measures. In Slovenia, the adoption of national and local physical planning documents and sectoral natural resource management plans requires a licence from the Minister of Environmental Protection, which is granted on the basis of an environmental impact study (Vucer 1995). In Slovakia, a number of important sectoral policies were prepared and approved before the EIA Act requiring SEA was implemented. Introductory guidelines on SEA for policies were developed and published in 1995 by the Environmental Ministry, but few policies have as yet been assessed.

Regardless of the formal obligation to carry out SEA for higher-level decisions, decisions of a strategic nature usually undergo a type of review of environmental consequences at the stage of their preparation. In some countries with strong NGOs and groups of environmental professionals, draft government decisions sometimes undergo a formal or informal EA by outside reviewers. An example may be the assessment of government policies carried out by an NGO institute in Poland which was mailed to every member of the Parliament and consequently had an influence on the final decision. In several cases in Hungary, sectoral ministries commissioned environmental consultant firms to conduct an EIS of policy concepts: for example, in consequence of a government resolution, a regional water management plan was subject to an SEA.

The planning experience of the centrally planned era, existing general environmental expertise and the increasing popularity of EIA provide a strong support for the future of SEA in Central and Eastern Europe.

7.6 TRAINING, NETWORKING AND EXCHANGE OF INFORMATION

Training has always been an important part of EIA in the region—indeed in many countries the introduction of EIA was preceded by, and linked with, extensive training courses, often run by foreign centres. At present it seems that the need for training is still high but the profile has changed. Practice has demonstrated that, while experts (licensed experts) have a good command of their specific disciplines, they often have less knowledge of EIA methodology (Jalakas 1995; Kassenberg & Wójcik 1996; Peterson 1996). Specific, targeted training is needed, in particular for experts with considerable experience in their field but who still perceive EIA as another form of expert opinion. The general problem is that it is very difficult to give up the traditional approach focused on environmental media and emissions. The training which would now prove to be most useful has to be suited to the intricacies of the legal and administrative system of each country—demonstrating the practical applicability of the information and know-how offered.

The need for training of a general nature still persists; for example, in Poland there are 2465 municipalities, now endowed with the rights of local decision maker—it is therefore easy to see that the demand for general EIA courses will remain high, even if only aimed at preparing one person in each of the municipalities (Kassenberg & Wójcik 1996). EIA courses and seminars are very popular and a number of centres organize them on a regular basis, but there is still a need to increase the training of EIA consultants and local government decision makers and to prepare guidelines and information materials about EIA (Jendrośka & Wójcik 1995).

In Central and Eastern European countries governmental guidelines, even informal and non-binding, are usually implemented by the administration: in fact during the previous era most administrative procedures were rigidly constrained by specific guidelines and many administrative staff still expect guidelines for every procedure. In most of the countries some form of more or less general guidelines exists and now the more targeted, methodological issues are being developed. Major consultancies often use some form of guidelines for EIA procedure meant for in-house use only.

There is a need for training and guidelines for EIA experts to be targeted at the areas of weakness, such as public participation and quality control. With a view to the changing reality in the region, the ideal guidelines should be easy to develop and amend in time. Training needs to foster a change of attitude so that:

1 experts recognize that EIA is not just a scientific exercise;

2 the authorities understand the difference between EIS and EIA;

3 legislators are encouraged to develop a transparent legal system;

4 the public is convinced of the advantages of early public participation and the possibilities created by EIA.

The availability of EIA literature is improving, ranging from translations of foreign books and manuals, books and booklets by local authors to materials prepared for training courses, journals devoted to EIA and articles in the environmental press. An ongoing PHARE project in Hungary will establish an EIA library and documentation centre in each regional authority, in the Ministry for Environment and in the National Environmental Library—all final EISs will be available to the public on microfiche (Radnai 1995). The public availability of EISs is still a problem in many countries. This is caused, on the one hand, by the intention to safeguard the professional confidentiality of any data the developer has made available for the EIS study and, on the other hand, through concerns about competition, with consultants unwilling to demonstrate to others their approach and methods. This also makes it difficult to obtain EISs for review purposes.

The international exchange of information within the region remains mostly based on informal networking (of an almost social character) and occasional meetings, within the framework of various international projects and workshops. This arrangement was better suited to the initial period of EIA evolution in the region, when the circle of those interested and involved in EIA was relatively small. Now, with the growing interest in EIA and increasing practical experience, there is a need for a 'clearing house' type of information centre which would help to avoid unintentional overlap and duplication. Research of a broader nature is still faced with the problem of availability of information, although improvement is visible (e.g. Committee on the Challenges of Modern Society 1993, 1994, 1995, 1996; EIA Centre 1996; Kristoffersen & Tesli 1996). A site where at least the basic information about the current legislation and practice in the different countries and major ongoing research projects could be available would play an important role in the evolution of EIA in the region. The Transboundary Environmental Impact Assessment Centres, which are being organized under the auspices of the UNECE Espoo Convention, might also play this role.

An increasing number of international meetings and roundtables centred on issues of EIA in the region are being held under the auspices of different organizations and grouping different participants (e.g. Wroclaw 1992: International Roundtable on Environmental Impact Assessment and Public Participation in Environmental Decision-making; Bratislava 1995: International Roundtable on Practical Implementation of EIA in Central and Eastern Europe). Participants from the region are actively taking part in many EIA meetings, panels and conferences, sharing experience with colleagues from outside the region. Such meetings provide not only a most needed forum for discussion of common problems, but also often result in publication of proceedings and comparative studies, which are one of the few sources of information about EIA in the region. Such forums for discussion would prove more advantageous if the participants were aware of the results of other meetings—again the need for an information 'clearing house' is evident. An opportunity already used, although perhaps not to its full potential, lies with the development of Internet sites in the region and the increasing popularity of the Internet itself—a cost-effective and fast means of networking and sharing information.

7.7 CONCLUSIONS

Considering EIA development in Central and Eastern Europe, it is important to take into account the background conditions: environmental, economic and political. At the time EIA was introduced most of the countries:

1 faced a severe economic crisis caused by the first years of transition;

2 had inherited serious environmental problems;

3 were undergoing dramatic political changes, which resulted in the redrafting of legislation and changes in administrative structures and procedures.

Adopting EIA legislation and taking steps to implement it demonstrate a commitment to EIA as a sustainable development tool. The introduction of EIA is of special importance in countries where the private sector was limited or nonexistent prior to the transition period and the administration at the local level was not used to dealing with a large number of diverse siting or building applications. During the early stages of transition the danger of overriding environmental considerations was real and the introduction of EIA therefore most timely.

Where the legal, administrative and educational arrangements concerning EIA took place simultaneously, EIA was sometimes perceived as slowing down decision-making (Radnai 1995). However, it was also a way of opening up a traditionally closed system of administrative decision making and promoting cooperation between the different institutions and actors involved in the process, acting as a means of improving environmental awareness.

EIA is still a new tool and, as the actors are gaining experience, it is constantly being changed, and hopefully improved, both in terms of legislation and practice. Currently, most countries face the need for targeted training and guidelines, focusing on methodological issues and areas of weaknesses and enhancing cooperation between the EIA actors. Where EIA has been introduced by a number of different regulations the process is often lacking in transparency.

There is a real need for a broadly scoped study of the performance and effectiveness of EIA in the region. Such a review would necessarily be based on a large number of case studies and the poor availability of EISs in many countries could prove a problem.

An information 'clearing house' on EIA would be beneficial. It would also help the countries in transition to share the problems facing them—such as the need to comply with the requirements of the EC directives and at the same time constantly improve a working EIA system suited to their environmental, economic and cultural background.

The majority of problems with EIA implementation are similar to those in other European countries. The general conclusions drawn from the review conducted on the tenth anniversary of the adoption of Directive 85/337/EEC might have been written about the whole of the European region:

> Although considerable progress has been made, a number of important deficiencies remain. The measures proposed to remedy those include regulatory improvements and a variety of initiatives to strengthen EA practice, including proposals for more effective quality controls, assessment guidance, training, research and institution strengthening (Lee 1995).

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8: Environmental Impact Assessment in East Asia

CLIVE BRIFFETT

8.1 INTRODUCTION

East Asia comprises a wide range of countries at various stages of development. Over the last 25 years many of these have developed at a rate that far exceeds changes previously experienced in other regions of the world. Such rapid developments have inevitably given rise to a large number of environmental impacts. The worst effects of these are easily recognizable. Most of the capital cities of this region, for example, are already grinding to a halt with traffic problems and suffering from the pressures of inadequate infrastructure and facilities. Their ability to cope with the rising populations' demands for potable water, efficient sanitation, clean air and fresh food is limited. Responses to these demands have varied, depending upon the state of the economy, the level of education, size of the population and the administrative and technical capacity of the workforce. Above all, the governmental stability, legal enforcement capacity and political will to recognize and deal with environmental issues are critical components in determining the quality of life that has been attained.

The processes of environmental impact assessment (EIA) give rise to numerous problems that may be either universal; regional, for example relating to developing nations only; specific to a particular country or state; or localized to individual projects. Whilst those considered in this chapter derive mainly from East Asian experiences, other adjoining nations are also referred to where considered relevant. It is suggested that conventional EIA is not appropriate for planning and appraising projects in developing countries because it is too rigid, too expensive, too methodically ambitious and not integrated into the planning process (Gardner 1992). The methodologies used have also been noted as being too academic, bureaucratic, mechanistic and voluminous (Biswas & Agarwala 1992). Efforts made in implementing various research recommendations, practice guidelines and EIA mitigating measures have therefore been generally weak. These observations would suggest that more appropriate and simplified procedures should be devised to accord with the level of local expertise available and the degree of commitment prevailing. For example, the acceptance of certain impacts, such as air and noise, may be warranted in developing countries to accelerate economic development and, once this is achieved, more controls can be introduced at a later date (Wilbanks *et al.* 1993).

Much research and investigation into environmental problems has focused on developed countries, whilst those facing developing nations may in some cases be substantially different. In East Asia, there is a mix of countries at all stages of development. The extent of these problems is significant and has been responsible for a large gap occurring between EIA theory and practice. Such a gap is most recognizable in those countries which have had EIA legislation for some years but where the environment has continued to decline in quality. The Philippines (EIA legislation—1977) and Thailand (EIA legislation—1978) are good cases in point. For example, it was determined that out of 1000 impact statements in both these countries not a single project was denied clearance for environmental reasons (Werner 1992).

The scale of the problems is fairly extensive and extremely variable in detail from one country to the next. However, in general terms, environmental problems have been related to questions of ecologically sustainable developments, including resource use, the maintenance of productive ecosystems and biodiversity and human physical and social health (Brown *et al.* 1991, p. 3). Problems arising in EIAs are therefore closely related and are not simple to categorize due to their interactive and overlapping effects. The range of topics discussed here includes political, legal, institutional, procedural, social/cultural impacts, and capacity building.

The purpose of this chapter is to analyse the nature, extent and implications of EIA problems arising in the East Asia region and to suggest means to solve them. Due to the diverse and dynamic nature of EIA work it is not possible to recommend ideal, model solutions and attempts are therefore made to identify particular approaches; to select alternative strategies or to develop new criteria. A major question arising is 'should an alternative to EIA be devised for use in the countries of East Asia or can EIA be modified to suit?' This chapter addresses this question by first reviewing the environmental issues being faced in the region, secondly assessing the nature of the problems arising and thirdly identifying the means of improving EIA effectiveness.

8.2 CHARACTERISTICS OF THE REGION

East Asia comprises an extensive region located between the Pacific Ocean and the Indian Ocean, as indicated in Fig. 8.1. Centred around the South China Sea it incorporates two well-defined geographical areas known as south-east Asia and north-east Asia. As shown, the entire area extends from Indonesia in the south to Japan in the north and from Myanmar (Burma) in the west to the Philippines in the east. Each country has reached different stages of economic development, but those now considered to have virtually acquired developed status comprise Hong Kong, Japan and Singapore. Others where growth, and thus development, has been rapid in recent years comprise China, Malaysia, South Korea, Taiwan and Thailand. A small number of the remainder, such as Vietnam, Myanmar, Cambodia, Laos and Indonesia, are still relatively undeveloped.

8.3 STATUS OF ENVIRONMENTAL IMPACT ASSESSMENT

The following selected country reviews highlight a number of relevant issues relating to EIA recognition, adoption, implementation and monitoring. Table 8.1 provides an overview of the current status of EIA in East Asia, by identifying the progress made (discussed later in the chapter). In some cases, such as North Korea and Mongolia, information is not available. In others, because of the rapid fluidity of the situation, some information may become out of date in a short time. The other proviso, common to many other countries, is that, whilst some may be meeting many of the EIA legislative requirements on paper, there is often a rather different story in practice. The Philippines and Thailand and possibly Indonesia are good cases in point.

In Table 8.1 classifications are indicated under legislation and practice to provide a means of comparison between the current status of each EIA system.

8.4 ENVIRONMENTAL IMPACT ASSESSMENT LEGISLATION

In East Asia, EIA legislation is extremely variable. Some countries, such as Thailand and the Philippines, have had EIA legislation in place since the late 1970s (much earlier than many European countries). Others, such as Hong Kong and Japan, have only recently introduced formal legislation. Some countries still have no mandatory EIA legislation, including Singapore, Vietnam and Cambodia. However, EIA is practised in all countries of the region through the requirements of the multinational financial institutions (see also Chapter 6, this volume). It is believed that environmental studies of most of the larger infrastructure development works have probably been influenced more by these outside agencies than any East Asian government would wish to admit. International concern for environmental issues, expressed through world conferences and regional interactive committees, with associated treaties

Fig. 8.1 Map of East Asia. (Kalimantan, previously known as Borneo; Myanmar, previously known as Burma.)

and conventions, has also made a major contribution. Improved awareness through the world media and a related increase in environmental educational programmes are features likely to continue to be highly influential in changing the attitudes and values of future generations towards the environment.

In cases where there is full legislation through an Act of Parliament, the year of introduction is indicated on Table 8.1. Where EIA is conducted under certain administrative procedures listed under other acts, such as those dealing with pollution sources or drainage schemes that are concessionary, an 'AP' classification is given. In other cases, where EIA may be undertaken for certain projects to conform with outside funding agency

Table 8.1 Status of EIA in East Asia.

		EIA legislation				EIA practice								
Country	EIA authority	Date	L	AP	A	Sg	Sr	Sc	Pr	Mi	Mo	CIA	Pp	EMP
Brunei Darussalam	Environment Unit, Ministry of Development	—			✓	✗	✗	✗	✓	✓	✗	✗	✗	✗
Cambodia	Council for the Development of Cambodia	—			✓	✗	✗	✗	✓	✓	✗	✗	✗	✗
China	National Environment Protection Agency	1981		✓		✗	✓	✗	✓	✓	✗	✗	✗	✗
Hong Kong	Environmental Protection Department	1997	✓			✓	✓	✗	✓	✓	✓	✗	✓	✗
Indonesia	Environmental Management Agency	1987	✓			✓	✓	✓	✓	✓	✓	✗	✗	✓
Japan	Environment Agency/Prefectures	1997	✓			✓	✓	✗	✓	✓	✗	✗	✓	✗
Korea (South)	Ministry of Environment	1981	✓			✓	✓	✓	✓	✓	✓	✗	✓	✓
Laos People's Democratic Republic	Science, Technology and Environment Organization	—			✓	✗	✗	✗	✓	✓	✗	✗	✗	✗
Malaysia	Department of Environment	1987	✓			✓	✓	✓	✓	✓	✗	✗	✓	✓
Myanmar	National Commission for Environmental Affairs	—			✓	✗	✗	✗	✓	✓	✗	✗	✗	✗
Philippines	Department of Environment and Natural Resources	1977	✓			✓	✓	✗	✓	✓	✓	✗	✓	✓
Singapore	Urban Redevelopment Authority	—			✓	✗	✗	✗	✓	✓	✗	✗	✗	✗
Taiwan	Environmental Protection Administration	1987		✓		✗	✓	✗	✓	✓	✗	✗	✓	✗
Thailand	Office of the National Environment Board	1978	✓			✓	✓	✗	✓	✓	✗	✗	✓	✓
Vietnam	Ministry of Science, Technology and Environment	1993	✓			✗	✓	✗	✓	✓	✗	✗	✗	✗

A, Ad hoc; AP, administrative procedures; L, legislation; CIA, cumulative impact assessment; EMP, environmental management plan; Mi, mitigation; Mo, compulsory monitoring; Pp, public participation; Pr, prediction; Sc, mandatory scoping; Sg, sectoral guidelines; Sr, screening list; ✓, adopted practice; ✗, not regularly used; —, not introduced yet.

requirements or where a government affirms the need for public protection reasons, the classification is 'ad hoc'. The striking exception to the general rule that those countries which are more developed are most likely to have EIA legislation in place is Singapore. Here the need for EIA is questioned on the basis that it will create too may obstacles and hindrances to the rapid development progress which is desired. Furthermore, the need for a framework law drawing together all legislation relating to environmental management, EIA and pollution control has also been muted by many countries in the region (United Nations Environment Programme 1996, p. 7).

8.5 ENVIRONMENTAL IMPACT ASSESSMENT PRACTICE

Sectoral guidelines have been developing rapidly in the region and are generally produced for the most commonly occurring development activities. For example, in Malaysia there are currently guidelines for golf courses, coastal resorts, the petrochemical industry and industrial estate developments (Department of Environment 1994). In Indonesia, guidelines have been issued by many of the sectoral ministries (Gilpin 1995, p. 134). In some countries the absence of such guidelines has been defined as a significant problem: for example, a need for cement factory guidelines in Vietnam. Other developing nations, such as Brunei and Laos are using World Bank guidelines in the interim, preceding the establishment of detailed national guidelines (United Nations Environment Programme 1996, p. 13). Environmental guidelines for selected infrastructure projects, agriculture and industrial developments are also available from the Asian Development Bank (Asian Development Bank 1993).

In cases where legislation exists screening lists are available, but these take different forms. For example, in Indonesia criteria for determining whether a project has a significant impact on the environment are provided. 'Significant impact' is defined as a function of the number of people affected and the area of impact, the duration and intensity of the impact, cumulative effects and the potential for reversibility. In other cases, the more familiar listing system with thresholds is employed as in European countries. In some cases this has been open to abuse, as in Malaysia (see Section 8.15.2). In Korea the list is very basic, simply identifying types of developments without any reference to size, area sensitivity and other factors. In Taiwan the different types of projects are dealt with by various ministries under a broad-based allocation (Landsdown 1991, p. 18).

Whilst EIA practice in many countries utilizes scoping techniques, it is often not a mandatory requirement under legislation, except in Korea, Indonesia and Malaysia. In the last case the two-tier system requires submission of a preliminary assessment to identify significant defects which should be subjected to more detailed assessment. A scoping exercise is required which includes the need to complete a matrix pro forma based on Leopold *et al.* (1971). If a full assessment review is then required, those impacts assessed as significant would be more comprehensively investigated. The Indonesian system is not quite so rigorous, but requires an initial document provided by the developer with the scope of the full study set by a Government-appointed commission (Coles 1992, p. 11). In Korea, a draft environmental impact statement (EIS) is prepared and subjected to public scrutiny through the local Mayor's office. This process provides for the mandatory scoping of potential impacts. A further technical and expert review occurs before a final EIS is prepared and submitted (Kim & Murabayashi 1992).

Whilst all countries are identified as predicting impacts, it is known that this process is poorly done, not least with many impacts having not been monitored previously on other similar developments. As prediction is partly a process of assessing resilience and determining carrying capacity, the nature of the development project and the baseline site conditions must be known precisely. Odum (1975) identified the difficulties of defining carrying capacities as one of the greatest impediments to effective regional planning and ecosystem management. In such specialist areas as ecological effects, air pollution impacts, soil erosion and disturbances to wildlife and habitats, effects are often extremely variable and highly sensitive to development works. In traditional building practice little environmental protection, control, or care and sensitivity is exercised. On more vulnerable sites with fragile environments impacts can often be much greater than anticipated. Predictions are generally dealt with rather superficially, lacking quantitative assessments or qualitative analysis. In Malaysia, for example, an assessment of effectiveness revealed that prediction was poor, especially in quantitative terms (Harun 1989, p. 35).

Mitigation is a means of adjusting the project proposals to reduce, minimize or avoid impacts, and as such is practised in all countries as it offers a means of getting approval, often without making major changes. The types of mitigation in East Asia probably relate less to visual effects than elsewhere. In some countries it may be thought desirable to expose large structures and infrastructure in order to impress visitors and reinforce the point that a country is making progress and achieving high economic growth. In other cases, as described for Korea and also applicable in Taiwan, Vietnam, Laos and Myanmar, the need to mitigate against loss of forest or wetlands may not be held in high esteem. It is generally considered that displaced animals will be able to find other habitats (Kim & Murabayashi 1992, p. 305).

Monitoring may take many different forms and be exercised at different stages of the development process. In cases where compulsory monitoring is indicated on Table 8.1, it does not necessarily refer to all EIAs, rather that monitoring is regularly requested. This is either to ensure construction impacts are kept within the agreed limits or to ensure that impacts after completion do not exceed predictions. In the case of Hong Kong, a system of construction monitoring in which the government itself is involved is often instituted for large infrastructure projects. Emergency systems are installed to ensure sufficient warnings are given to deal with any dangerous impacts during construction. In the Philippines and Thailand longer term monitoring is employed after completion but control is limited.

As indicated in Table 8.1, cumulative impact assessments (CIA) are not adopted as a general rule, although external western-based consultants have confirmed that, where information is available in the region, they will assess these. Unfortunately, this is often not the case and responses such as 'we do not have CIA' are not uncommon. It appears that most governments are satisfied with ensuring that understanding the impacts of particular sites is sufficient, without needing any reference to other adjoining sites.

The extent of public participation is generally poor. Even for those countries in which it is practised its influence on decision-making is fairly low. In cases where the public comprises well-informed, organized, competent and respected non-government organizations (NGOs), successes may be achieved. The Malaysian Penang Hill example and the proposed golf course development in the Central Catchment in Singapore are good examples (Nature Society 1992). Where they are well-publicized, public responses can gain good support. In cases where the system allows only for individual responses to the government authority in written form, as in Japan, then the influence is likely to be small. Where objections consist of NIMBY (not in my backyard) characteristics then effects may be minimal.

Surprisingly, the need to see this entire EIA procedure as an integrated management exercise has not gained much favour. If something is to be learnt from collecting data, making predictions, proposing mitigation measures and monitoring procedures, then a management plan would seem a basic requirement. In Indonesia and Malaysia, such plans are requested, but their effectiveness is in some doubt. Such a plan demands careful consideration at the initial EIA submission stage and requires long-term follow up. None of those countries listed as requiring such plans have as yet demonstrated such action. The increasing interest of many countries in the region for environmental management systems (EMS) under International Organization for Standardization (ISO) 14000 could possibly become a means to achieving this end (Asia Pacific Economic Cooperation 1997). There still has to be a clearer relationship established between project management and ongoing property management systems.

The following sections consider in more detail the requirements and practice in specific countries. Hong Kong, Japan and Singapore are considered as 'developed nations'. Brunei Darussalam, Malaysia and Thailand are considered as 'rapidly developing nations'. Finally, Indonesia and the Philippines are considered as 'undeveloped nations'.

8.6 HONG KONG

Due to the *laissez-faire* policy of the colonial government and the dynamic and entrepreneurial spirit of the predominantly Chinese population, Hong Kong's economic growth has been rapid. However, the quest to make money and the effects of population growth have resulted in some of the worst pollution experienced in the region. Recognition of the serious nature of this pollution reached a climax in 1988 when sewage, beach water quality, air pollution and chemical waste discharges were highlighted by the media as major environmental disasters. Many beaches had to be closed due to red tide algal growth, brightly coloured and black effluent from textile factories poured along open drains and the water quality in the harbour was found to be seriously polluted (Business International 1992). Diesel vehicles account for more than 40% of the fine dust and 60% of nitrogen oxide in the air, and pollution from this source is likely to increase by up to 65% by the year 2000. Only 10% of sewage is fully treated before discharge and at least 50% receives no treatment at all. Municipal waste per day has doubled since 1989, partly because of increases in construction waste and landfill sites are already overstretched in capacity (Environmental Protection Department 1994, Appendix C, p. 3).

Despite the undoubted lack of space, some 40% of the land area is designated as Country Park, fulfilling a recreational and water catchment function. Adjoining the Chinese border is an area of protected wetland of particular importance for migratory birdlife called the Mai Po Marshes. This area has international recognition as a Ramsar site (see case study in Box 8.1).

In the last 10 years serious attempts have been made to deal with Hong Kong's pollution, which is causing adverse effects to air, water and soil. The comprehensive and closely integrated programme for the protection of the environment comprises four elements: environmental plann-ing, legislation, facilities and services and consultation and monitoring activities. The Environmental Impact Assessment Ordinance was enacted in January 1997 and scheduled for implementation early 1998 (Au 1997). This will give teeth to the work of the Environmental Protection Department, established as long ago as 1977. EIA requirements have, however, been implemented reasonably effectively over the past 10 years using regulatory measures. These include enforcement of lease condition procedures as all land in Hong Kong was leased by the Crown. Implementation of monitoring systems is currently being conducted for all major private and public developments. However, the effect of mitigating measures or reducing those impacts arising from past developments not subject to environmental control does not appear to be significant (Planning, Environment and Lands Branch 1993).

With the changing political situation as Hong Kong has become part of China (1997), it is not clear how existing arrangements will be changed by the new regime. It is anticipated, however, that, now EIA has become a mandatory statutory requirement, it will be here to stay.

8.7 JAPAN

In the 1960s and 1970s Japan experienced a number of serious environmental pollution disasters that led to citizens organizing confrontations against government authorities. The cadmium poisoning in Toyama, mercury poisoning in Niigata and pollution-related asthma in Yokkaichi were instrumental in forcing polluters to compensate victims (Gilpin 1995, p. 135). An Environment Agency was established in 1972 to ensure the effective implementation of the legislation. From 1975, however, there was a gradual weakening of the existing pollution control system (Barratt & Thérivel 1989). This was due to increasing pressures by industry to achieve high economic growth.

In 1984, after 8 years of negotiations and revisions, the Environment Agency abandoned its efforts to introduce EIA into the legislative programme. A Cabinet decision 'On the implementation of EIA' offered a comprehensive framework for EIA processes to cover various types of projects (Environment Impact Assessment Systems Studies Commission 1996, pp. 36–58). The Cabinet decision is not enforceable and is essentially a form of administrative guidance (Barratt & Thérivel 1989, p. 217).

By July 1995, 50 out of the 59 prefectures (local districts) had implemented their own EIA processes. Eleven types of projects require EIA. Many of these relate to large infrastructure works, such as roads, railways, docks and airports. Others are defined by size: for example, reclamation exceeding 50 ha; residential and industrial developments over 100 ha; and dams with more than 200 ha of water area. By 1994, 279 EIAs had

Box 8.1 Case study: Hong Kong. Deep Bay–Mai Po Marshes Nature Reserve—cumulative ecological impacts

Mai Po is an area of coastal wetlands of mudflats and mangroves with an extensive inland water habitats of bunded fish and prawn ponds. This site covers 115 km^2 and comprises the largest estuarine area of Hong Kong. It is located at the north-west corner of the New Territories and abuts the mainland Chinese border. Between 1941 and 1946 this area of mangrove of 'no economic value' was reclaimed for the creation of shallow prawn ponds, known locally as *gei weis*. Since 1983, the World Wide Fund for Nature (WWF) has managed the Mai Po Marshes to maintain and possibly increase the diversity of natural wildlife and to promote the use of the area for educational purposes (Melville *et al.* 1987). Since management plans have been implemented many of the smaller ponds have been opened up into larger areas and relevelled as scrapes to attract wading birds. Over 80 species of waterfowl are now attracted to Mai Po. An educational centre and other trail and hide facilities are provided for the many visitors. Its importance in world terms is confirmed by its recent designation as a Ramsar site that identifies wetlands of international significance

The catchment area and waters of Deep Bay are under increasingly intense development pressure. The bay itself is the estuary of the Shenzhen River and, although its name suggests otherwise, it is quite shallow with an average depth of 3 m and is thus more vulnerable to water pollution. The airshed surrounding Deep Bay is encircled by low hills, leading to poor dispersion of air pollutants (Government of Hong Kong 1991). Amongst the many threats to Deep Bay are water pollution from industrial discharges and thermal pollution from power stations. New housing areas create run off and waste disposal problems and marine reclamation and dredging activities increase siltation. Currently, extensive pig, agricultural and human waste from the Yuen Long area is also causing some concern

The recent straightening, deepening and widening of the Shenzhen River, which forms the boundary between China and Hong Kong and discharges directly to Deep Bay, could also have some major ecological effects, such as increased levels of suspended solids and nutrients.

The political pressure to proceed with this development, to make the river navigable for ships and to reduce potential flooding in the Shenzhen Municipality, has, however, overridden many of the objections made. The 1997 Chinese takeover of Hong Kong also has an influence, resulting in a more concessionary attitude being adopted by the Hong Kong Government

Another proposal to create a waste disposal tip into coastal lagoons south of Nim Wan near the mouth of Deep Bay has already commenced and is likely to become one of the largest disposal tips in the world. The surrounding banks have been designed to prevent leachate containing heavy metals from entering Deep Bay. When filled in 35 years' time, this tip will have accepted 65 million tons of refuse (Mott 1987). Pulverized fuel ash from the Castle Peak Power Station is also being dumped in this area. The dangers here are obvious if the containment of leachate is not successful in the long term. If site control standards are not adhered to then the pollution could be carried into the inner areas of Deep Bay. Other environmental problems associated with the tip have been evaluated and include odour, gas and differential settlement (Environmental Protection Department 1989)

To date there are a number of EIAs conducted in the Deep Bay area, but there is no concerted attempt to look at the combined impacts and assess cumulative effects. For example, there is a need to obtain accurate hydrological data to allow more than simple modelling of water movements in the bay during the dry season (Li & Shing 1987)

Bearing in mind the number of projects to be initiated in the next few years, it is very worrying that the combined effects are not being assessed

In summary the effectiveness of EIAs for Mai Po have been influenced by the following factors:

- Many of the development proposals in the past have not been subject to EIAs and pollution

(*Continued*)

Box 8.1 *continued*

control has been weak. Without a retrospective requirement to conduct EIA, especially for developments that comprise extensions to existing ones, protection will not be adequate

- Because of the increasing development pressures in this area, it is necessary for a strategic plan to be prepared to include environmental impacts in the identification and allocation of land uses and plot densities
- Individual project-based EIAs do not contribute to the overall assessment of a deteriorating environment caused by numerous diverse impacts. As Deep Bay is a large area of shallow water likely to be affected by many different developments then cumulative impact studies are essential
- Specialist data produced in EIAs should be reviewed by appropriate experts, as such information can be impressively presented but be inaccurate and misleading. For example, there have been many cases where lists of species inserted in ecological reports have been borrowed from other studies

been conducted. Golf courses and other recreational developments account for the largest number, followed by various land development and road construction projects. It is suggested that EIA implementation is low in relation to the gross domestic product, population and size, compared to other countries.

The Cabinet decision identified seven generic areas of pollution (air, water, noise, vibration, odour subsidence and soil contamination) to be assessed in EIAs. In addition, five nature conservation items were listed (flora, fauna, topological and geological features, aesthetic quality and recreational quality). The Basic Environmental Law, enacted in 1993, uses a unified approach to consider both pollution and nature conservation. In Japan, the project proponent is required to prepare the EIA; however, third party evaluation is also undertaken. The two main aims of EIA are to quantify the development effects on the environment and to mitigate impacts so as to avoid a 'significant hindrance'. The latter includes nature conservation aspects notoriously difficult to quantify. The requirements include a need to define mitigating measures, with the emphasis being upon conservation measures and prevention and minimization of adverse impacts.

Public participation is also provided for through the soliciting of opinions from local residents in the affected area. There are, however, only seven prefectures in which everyone is invited to comment on the development proposals and, even then, comments are limited to the draft environmental statement only. Whilst the legislation does not provide for monitoring, this is conducted on some major projects and is defined as postproject studies.

In March 1997, an Environmental Assessment Bill was submitted to the Diet for approval. New procedures included scoping with public participation, screening for designated medium-sized projects and the introduction of greater transparency in the review process. It is anticipated that no problems will arise with the adoption of this legislation (Kurasaka 1997).

8.8 SINGAPORE

There is no mandatory requirement for EIA in Singapore at the present time, although the government claims that all major developments are subjected to environmental scrutiny in the normal planning process. In only three cases to date has a comprehensive EIA been requested and in one of these, relating to a golf course in the central water catchment nature reserve, the proposal was shelved (Nature Society, Singapore 1992).

Singapore established a Pollution Control Unit in 1970 and a Ministry of the Environment in 1972. These were combined in 1986. This authority has been very effective in controlling potential pollution sources and sets standards equal to, and in many cases better than, most other countries in the region. The use of advanced technical expertise and resources has been effective for employing the latest environmental technology. The strong government policy control, generally compliant population and efficient implementation and enforcement activities are major components in the success. Overreliance and dependence on government to lead the way, however, has created some problems, especially relating to ecological protection and ecosystem maintenance. The strong emphasis on economic growth has not been compromised with ecological benefits and many of the valuable natural resources are being lost.

In recent years, increasing environmental awareness amongst the Singapore population and growing concern of the middle class for more transparent government have created new initiatives in the planning system for environmental protection. There have also been calls to introduce EIA for all major developments, by the public (Briffett 1990; Koh & Lye 1996), government agencies (Koh 1992) and even the Ministry of the Environment (1992, p. 13).

The Urban Redevelopment Authority (URA) has responded by organizing strategic planning exhibitions, forums, seminars and discussions to obtain public feedback. Regional planning development guide plans also incorporate private consultants working with government agencies. In the project domain, however, there is still little opportunity to preview development proposals and all feedback is restricted to government agencies. A recent statement from the Ministry of the Environment confirms that some coordinating legislation is being prepared for environmental matters, but the requirement for a mandatory EIA system is not as yet proposed (*Straits Times*, 1996).

In recent years the extensive development activity on this small island, designed to meet the needs of an increasing human population, has understandably created some environmental problems. Whilst adequate provision of potable water, sewage treatment and waste collection and disposal has been achieved, there are still problems of air pollution, soil erosion and loss of biodiversity. Pollution derives from industrial concerns, that include a number of major oil refineries and waste incinerators, and from motor traffic. Soil erosion effects derive from virgin land development activities. Much of the original primary rain forest has been lost to logging and development clearance operations in the past. Although small areas of primary and secondary forest remain they represent less than 3% of the total land area. Coastal mangroves and mudflats have also been reduced to minimal size and most inland rivers are dammed to create much needed water storage reservoirs. The former agricultural areas and fish and prawn ponds have almost all disappeared and have been partially replaced by recent developments, including high technology aqua- and agro-tech farms.

Wildlife resources have been depleted severely by past developments and there are no large mammals remaining. Some 330 species of birds are included in the present checklist; however, many of these are endangered and comprise migrant species. Despite this there is still considerable biodiversity and, although much of this is severely threatened (Turner 1994), efforts to conserve as many as possible of the remaining habitats are being proposed (Briffett 1993).

8.9 BRUNEI DARUSSALAM

Brunei enjoys less socio-economic problems and ecological degradation than any other country in East Asia, due to its high income-earning capacity deriving from oil. There has been minimal exploitation of inland natural resources as most of the oil and gas extraction is offshore. Half of the forest areas are designated as reserves or parks, which include conservation and protected forests, recreational forests and a national park. There is no export of timber and the annual log production extracted for local use was halved to approximately 100 000 m^3 in 1990. There is a high level of biodiversity in the tropical rain forest with, for example, over 2000 species of trees. Many of the animals are protected due to the prohibition of firearms and the aversion of local Muslims to eating wild pig, monkey and other species.

Marine resources are not particularly threatened by pollution, although some oil spills have occurred and clean-up exercises have become necessary. However, fishing rates are stated to be well below the point of maximum sustainable yield. The low level of agricultural development has avoided forest losses experienced in other countries with large rural communities. Problems of erosion, pesticide fertilizer and farm wastes are minimal. The worst excesses of pollution and environmental degradation occur in the capital city, Bandar Seri Begawan. However, recent provision of new infrastructure to cope with the increasing sewage treatment and waste collection needs has assisted in dealing with these problems. The major pollution source is from the high car population resulting in congestion and air pollution and in the discharge of wastes to the sea areas from Kampung Ayer one of the largest floating water villages in the world. The discharge of hydrocarbons from oil production have also contributed to some river pollution and periodic oil well blow-outs discharge soot and dust to the atmosphere.

The Negara Brunei Darussalam Master Plan was produced in 1986 and comprised a report on physical planning. In 1989 a Landscape and Environmental Section was created, which, in 1993, was redesignated as a separate Environmental Unit in the Ministry of Development. Its remit was to coordinate and promote environmental policies. There is also a National Committee on the Environment, comprising heads of government departments, which is currently preparing a National Environmental Strategy to implement Agenda 21, deriving from the Rio de Janeiro Conference 1992. Draft proposals for this strategy indicate that such problems as soil erosion and siltation, solid waste, sewage and water contamination, noise and air pollution from motor vehicles are being addressed.

There is at present no specific EIA legislation, although some types of assessment have been voluntarily carried out for major projects and have formed part of project feasibility studies. Environmental considerations are also incorporated in the development process. Laws such as the Town and Country Planning (Development Control) Act, the Land Code, the Municipal Board Act and the Petroleum Act all require project proponents to take the environmental impact of their projects into consideration (Chua 1997, pp. 19–39). The need for monitoring and control and for the introduction of EIAs for all major developments has been mooted and there is a recognition of the need for public awareness and involvement in environmental issues (Eaton 1994, p. 20). In the 6th National Development Plan 1991–95, the need for EIA was first proposed to attain the stated development plan goal of ‘maintaining a clean and healthy environment’. The most recent 7th Plan (1996–2001) includes provision for the implementation of new EIA legislation, policies and procedures that identify the necessary staffing, training and expertise. It is envisaged that there should be no problem in the Brunei Government financing these arrangements.

8.10 MALAYSIA

Urbanization, particularly in the Klang Valley, where Kuala Lumpur, the capital city, is located, has been rapid and the resultant air and water pollution is currently threatening the health and livelihood of inhabitants. This situation deteriorated considerably in 1994 due to the extensive haze problems arising from extensive forest fires in Indonesia (*Straits Times* 1994a, 1997). Much of the west coast areas, south to Johor and north to Palau Pinang, are also being rapidly developed and this is causing a considerable strain on the inadequate infrastructure.

The natural environment is particularly rich in diversity and fairly extensive in area. Deforestation losses through logging, clearance for agriculture, including plantations, shifting cultivation and the legal resettling of landless farmers on forest lands have been very high in recent years, with annual averages rising from 230 000 ha per year (1976–80) to 480 000 in 1989 (Business International 1992, p. 161). Much of the clearance is controlled by the individual state governments with politicians owning logging companies. There is also a considerable amount of illegal logging. Since 1989, central government has attempted to exercise greater control over deforestation, in recognition of the previously high rates being likely to exceed sustainability yields.

EIA legislation was introduced in 1987 by amendment of Section 34A of the Environmental Quality Act 1974. The main government agency dealing with EIA is the Department of the Environment, reporting directly to the Ministry of Science, Technology and Industry. The scope of EIA includes a list of detailed prescribed activities for which a preliminary submission should be made identifying the impacts and general characteristics of the proposed development. A review panel will decide whether a detailed assessment is required and defines the scope and extent of the application. The significance of whether the application comprises a preliminary assessment or a detailed assessment is that the former does not require a public participation process (Anon. 1997). As most submissions are of the former then public participation opportunities are somewhat limited.

By the end of 1994, 1444 reports had been submitted, 50% relating to resource based developments, including resort, infrastructure, housing and quarry activities (Tan 1996). There are 19 categories of development that require EIA, which has therefore been recognized and accepted as an important consideration in major developments. The quality of the submissions to date is understandably not high but, with feedback and rejection by the Department of the Environment, proponents have developed improved presentations. The main weaknesses are: poor description of works; lack of adequate baseline data; poor prediction of impacts; and insufficient alternative siting options (Harun 1993). As developments subjected to EIA have now progressed through the construction stages to the operational phases, the need for monitoring is being pursued actively by the Department of the Environment. This is particularly important for those projects covered by detailed EIAs.

8.11 THAILAND

EIA is a mandatory requirement in Thailand, established by the National Environmental Quality Act (NEQA) 1975, as amended in 1978. It was not until 1981, however, that Thailand began to enforce EIA for all major projects. A positive list identifies those projects liable to scrutiny, although others could be included by Cabinet resolution. Thailand's environmental government agency, the Office of the National Environmental Board (ONEB), was created in 1975 and oversees one of the most elaborate EIA procedures in the developing world. The environmental impact evaluation (EIE) comprises two components: (i) an initial environmental examination (IEE) and (ii) an EIS. The former is a screening exercise while the latter involves a detailed review. Even where an EIS is not deemed necessary, mitigation and monitoring measures may be requested.

There are a number of weaknesses in the implementation procedures, notably the non-involvement of the public and concerned agencies in the EIS process, the absence of provisions for public hearing and judicial involvement, the non-independent status of the review committee and the low status of ONEB in the government hierarchy (Phantumvanit & Lamont 1991).

In 1992, the NEQA was revised to improve the effectiveness of the EIA process. The 7th National Economic and Social Development Plan (1992–96) identified one of three principal objectives as to develop human resources, improve quality of life, and enhance the quality of the environment and natural resources. This plan recognizes the need to involve, and place the burden upon, local communities and polluting industries in looking after the environment and sets specific targets to improve environmental quality throughout the country (Suphapodok & Chueyprasit 1993).

Due to its rapid growth and development, Thailand is now facing serious environmental problems: rural and urban. Rural problems emanate from the extensive destruction of the forest resource and include loss of biodiversity, soil erosion, flooding, water shortages and other natural resource related problems. Only 27% of the original forest remains and it is still decreasing at the rate of some 1500 km^2 per year. Coastal mangrove forests have been depleted by 50% since 1960 and many coral reefs and fisheries habitats have been damaged and lost. Urban problems include overcrowding, inadequate and poor quality housing, traffic congestion, water pollution and solid waste and industrial waste disposal. Water quality has declined in urban areas, and traffic congestion and air pollution in Bangkok have reached dangerous levels. A new mass rapid-transport scheme was planned to alleviate congestion and commenced construction in 1994 (*Straits Times* 1994b). Large-scale tourist developments on many of the offshore islands, such as Phuket, have also resulted in major environmental erosion problems.

8.12 INDONESIA

Indonesia still contains 70 million ha of tropical rain forest (10% of the world's total), has the highest number of endemic bird areas (International Council for Bird Preservation 1992), ranks fourth in the world for bird diversity and has 12% of the World's species of mammals (Jepson 1995). Despite the ecological worth of the forests, selective logging continues at the rate of 1.2 million ha annually (Business International 1992, p. 215). Conversion to plantations and agriculture and the spontaneous migration from the overcrowded inner islands have caused many of the losses. Large areas have also been lost in recent years to extensive forest fires both in Kalimantan (Borneo) and Sumatra, which have created major haze and associated pollution problems as far away as Singapore and Malaysia (*Straits Times* 1994a, 1997).

After 25 years of economic development, Indonesia is suffering similar environmental problems to other countries in the region, including water and air pollution, increasing waste and the displacement of rural people by development projects. The pollution control agency—'Bapadel'—was established in 1990. This has achieved some success in controlling pollution through a Clean River Campaign and in initiating other programmes on EIA. Limited resources and a relatively weak institutional framework for environmental protection have, however, hampered and frustrated efforts.

Much of the industrial effluent is discharged to rivers without treatment and, where such rivers function as a water supply to the local community, major health problems have been experienced. There are many non-governmental environmental organizations and several of these successfully persuaded the public to boycott goods produced by certain offending factories to force them into installing treatment systems (Koestoer 1994).

The 6th National Development Plan (1993–1998) focuses on poverty and the environment. EIA legislation was introduced in Indonesia in 1987 under the 'AMDAL' Regulation, which modified the Act no. 4 of 1982 relating to the Basic Provisions for the Management of the Living Environment. Guidelines were issued in 1987 which define the criteria for determining whether a project will have 'a significant impact on the environment', rather than defining the specific type, size and nature of projects, as with the systems in Malaysia and Thailand. The criteria include the number of environmental components affected, the cumulative effects and the reversibility of an impact. The developer submits a brief assessment report, which is assessed by various government departments and environmental experts, who may then request a detailed EIA report. This identifies all impacts and evaluates solutions. If approved, a further environmental management plan is prepared to outline the design and operating requirements for mitigating environmental effects caused by the project. In addition a monitoring plan is required for implementation. Certain existing projects are subject to review, a process known as SEMDAL. The benefits of these innovative features have yet to be realized fully (Turberfield 1994). A major problem lies in the lack of coordination between institutions and the lack of power that can be exercised by the Environmental Management Agency of the Ministry of the Environment, this having no controlling powers, especially in the regions.

Further legislation in 1993 required all companies to produce environmental audit reports on a 5-year cycle. Indonesia has the only system worldwide of compulsory environmental audit (Gilpin 1995; Turberfield 1995).

In 1996, the Indonesian Environmental Management Act was passed to introduce more significant punishment provisions, mainly relating to industrial pollution. This was an 'umbrella' legislation with a broad framework that has articles of enforcement relating to EIA, environmental audits and environmental management plans.

Consultants preparing EIAs must possess an AMDAL certificate from the Ministry of Population and Development confirming their competence. These are only issued to Indonesian nationals (Coles 1992).

8.13 PHILIPPINES

In the 1960s and 1970s, national development policies were guided by a series of economic plans and strong presidential power. By the mid 1970s, deterioration in environmental quality became particularly noticeable, especially in Manila. Today Manila is having to cope with the legacy of mismanagement and a lack of institutional power to provide the necessary infrastructure to cope with the urban problems of industrial and waste pollution, lack of land-use planning and development control and the absence of comprehensive environmental management and protection (Carino 1993).

The Philippines National Environmental Policy, issued in 1977, established a formal EIS system based upon the US model. The National Environmental Protection Council (NEPC), a multiagency government department, however, did not replicate the power and authority entrusted to the US National Environmental Protection Agency (NEPA). The NEPC is a policy-making council and a coordinating and unifying body. EIS would be submitted to the appropriate government department first and then circulated for comment to other departments, including the NEPC. However, in 1978 a new super-agency, the Ministry of Human Settlements (MHS), was established under the control of Mrs Marcos which incorporated NEPC and thus centralized control over the EIA process. The other agencies resisted the consequent loss of power and successfully obstructed attempts of MHS to obtain compliance, as the legal instruments needed to centralize the system were not in place.

The need for harmony between human settlements and the ecological system was identified in the Philippines Development Plan 1978–1982. However, the consequences of population growth, rapid urbanization and industrial activities has in recent years created an alarming level of environmental degradation. On average, families in the Philippines include four children. One-fifth of the forests have reportedly been lost in the last 2 years alone and only 20% of the original forests now remain. In addition to human activities, the Philippines has had a number of natural disasters, including volcanic eruptions, storms and typhoons, earthquakes, landslides and flooding.

In 1982, the necessary legislation for EIA was completed but by then the system had lost much of its credibility. A 1985 assessment of the operation of the EIA system concluded that:

- With the exception of the mining sector, the EIA system has been ineffective in compelling regular submissions of EIS. The NEPC has neither the political power nor the resources needed to induce agencies to comply with the system.
- The control mechanisms are useful in interpreting both the compliance record and the behaviour of individual agencies in the context of specific projects.
- The informal ad hoc system has great potential for becoming institutionalized among development agencies in the Philippines (Abracosa & Ortolano 1987).

There is a considerable gap between policy and practice in the Philippines due to the limited capacity to control and enforce legal provisions. The Department of Environment and Natural Resources concedes that the EIS/EIA system has not worked effectively and needs strengthening (Department of Environment and Natural Resources 1992). Many projects have been found to be unsustainable, whilst others have caused considerable adverse environmental impacts, leading to public opposition. In 1996, new comprehensive EIA guidelines were issued covering all aspects and procedural stages of EIA practice.

8.14 PROBLEMS IN IMPLEMENTING ENVIRONMENTAL IMPACT ASSESSMENT

8.14.1 Political

In the East Asian region the countries experiencing most environmental problems in EIA are those where the political will does not seem to exist to deal with them or the political regime and, particularly, the environmental authority are weak. As suggested by others, the biggest constraint to effective EIA in developing countries is lack of political will (Wood 1995, p. 308). The need for political support is obvious but the question is, how to attain it?

Politicians and other top decision makers need to be persuaded that EIA can be used as a management tool as well as a project control mechanism. Emphasizing the possible economic benefits in addition to the ecological contributions to people's quality of life is effective in this area. In this connection, the promotion of EIA to seek ways in which it can be beneficial, rather than just to reduce the harmful effects of a development, is also a very worthwhile and relevant concept to pursue (Biswas & Agarwala 1992).

Increasing politician awareness through identification of responsibility towards the global environment may be achieved through the external influences of other nations or international organizations. The disbursement of funds and leverage exerted on national governments on behalf of environmental agencies can dramatically elevate the political status of environmental policy makers (Horberry 1985).

Of course there are some dangers arising from external pressures, especially from the so called 'northern westernized' developed countries. Reactions against being told directly and publicly what to do with their own environments are highly emotive issues. Techniques that involve some more subtle approaches suited to cultural backgrounds, comprising less confrontational methods, are usually the most successful. These may include, for example, suggestions to conform to guidelines issued by regional lending agencies, such as those from the Asian Development Bank (Asian Development Bank 1992a), and local peer pressure exerted within international conferences organized by developing countries to agree a treaty. A good example of the latter was the Langkawi Declaration, which Malaysia had the responsibility for organizing and sharing (Langkawi 1989). Those countries that have signed the Rio Declaration and the Biological Diversity Treaty are now required to submit national conservation policies and, in doing so, are more likely to incorporate an EIA philosophy into their legislation (e.g. in Brunei). It has to be recognized, however, that many guidelines produced by aid agencies do not always have sufficient flexibility to cater for different country needs and may require certain modifications appropriate to resource availability.

It is suggested that the success of EIA implementation depends on the position of the responsible agency in the institutional hierarchy. It needs to be embedded into the system of economic and physical planning (Gardner 1992). A technique often used by the legislators is to elevate the status of the environmental agency to the top level in the Prime Minister's Office, Office of the President or the Governors' Boardroom. In each case, environmental issues can be guaranteed to be discussed and heard by influential members of the government. This is effective in autocratic regimes, where instructions from the top are rapidly and effectively implemented. Examples include the 1972 establishment of the Pollution Control Unit in the Prime Minister's Office in Singapore (Kuan 1988); the 1975 creation of the National Environmental Board in Thailand in the Office of the Prime Minister; and the personal intervention of the Hong Kong Governor, Sir Edward Youde, in regard to Mai Po in the early 1980s (Government of Hong Kong 1984, p. 238).

A similar ploy can and is used by NGOs in trying to influence government policy on environmental issues. Making Ministers and particularly Presidents aware on a personal basis can result in fruitful and rapid rewards, as demonstrated in the case of the establishment of the Sungei Buloh bird reserve in Singapore (*Straits Times* 1988). Similar influences have been exerted in Thailand, where Her Royal Highness the Princess Maha Chakri Sirindhom is environmentally aware and both willing and able to influence policy (Cranbrook & Edwards 1994).

A significant constraint to effective EIA in developing countries is economic and political instability (McCormick 1993). Hollick (1986) stated that the ultimate effectiveness of EIA in influencing agency goals in practice may be dependent more on the strength and durability of the political commitment of government than on legal processes. In East Asian countries where war and strife have been prevalent (such as Kampuchea, Vietnam, Laos and Myanmar), little has been achieved in environmental protection and much has been lost in terms of natural resources.

A more recent conclusion to an investigation into EIA effectiveness confirmed that, if environmental concerns are to become an integral part of the policy making and development planning process in developing countries, then further attention by the concerned parties is required to the procedures, techniques, mode of application, institutional arrangements and capacity building programmes of EIA (Campbell 1993). In addition, effective EIA requires a political context which recognizes value in environmental protection and can allow public review of government activities (Jain *et al.* 1977).

The establishment of strategic environmental policies is one way of placing EIA at the top of the political agenda and is a critical prerequisite for effecting successful implementation. The World Bank, for example, recommends the preparation of National Environmental Action Plans (NEAP) and Programmatic EIAs (World Resources Institute 1994). There are two factors of significance in gauging the likelihood of a government providing full support: (i) the need for and subsequent emphasis placed upon development; and (ii) the economic growth orientation of the government. If EIA is perceived to conflict with economic growth and development, thus acquiring a negative image, it is unlikely to be successfully implemented. In consequence environmental concerns may be downgraded or at worst ignored. To encourage development that creates jobs, wealth and an opportunity to raise the population out of a poverty trap is a strong political force that instils the desire for the 'national interest' to prevail. This is particularly noticeable in Indonesia, where excessive pollution has resulted from uncontrolled developments of industrial property in urban areas. In other cases the pursuit of profits and economic wealth has overwhelmed any serious recognition being given to environmental problems: Hong Kong was a good example of this before the 1980s.

The use of strategic environmental assessment (SEA) is also effective in influencing political thinking because it is applied at the level of policies, plans and programmes, as opposed to single development projects, as in the case of EIA (Thérivel 1992; and see Chapters 4 and 19 in Volume 1 and Chapter 13, this volume). Where EIA becomes more integrated into socio-economic and political decision-making at all levels (local, national and global), then it will become better recognized, used and implemented (Centre for Environmental Management and Planning 1994). Guidelines have been published by the Asian Development Bank for integrated regional and environmental development planning. These essentially represent eight case studies that demonstrate the nature, extent and influence that certain environmental regional plans have had (Asian Development Bank 1992a, b).

A critical requirement is to improve the competence and quality of information made available to decision makers through targeted training and public participation (see below). An interesting observation made on the benefits of strategic incorporation of EIA is that the government may use this as a means of avoiding its use at the project level, as suggested in relation to Western Australia (J. Bailey 1994, personal communication). In the case of Singapore there is evidence of this thinking in the development plan processes. These comprise separate regional plans for proposed land uses that are subject to detailed reports, feedback and decision processes.

In evaluating the success of political responses, there is a danger of measuring success based on the number of environmental regulations in place and public relations material. Experience indicates that there is a considerable amount of talk, but also lack of action, due to lack of adequate laws and institutional frameworks.

8.14.2 Legal

Legal considerations relate to: (i) the formulation of legislation; and (ii) implementation and enforcement. In several cases countries have chosen to introduce EIA as an administrative component only to provide more flexibility in operation, increase awareness and to learn from experience before completing and passing formal legislation. In general, reliance on regulations weakens the strength of the EIA system and efforts should be made to legislate once the principle of requiring EIA for development work has been agreed. It is suggested, for example, that the effectiveness of EIA as an environmental management and planning tool depends not on the robustness of methodology but primarily on the legislative, institutional and procedural arrangements which are established (Ebisemiju 1991). It is also argued, however, that legislation can be too rigid and a certain degree of flexibility especially with regard to scoping and screening is justified (Werner 1992, p. 18).

In many countries compliance capacity is a serious problem, either because the institutional frameworks are not in place or the public are unaware, unable or unwilling to meet the requirements. In addition, the use of legislative instruments deriving from developed countries may be problematical, not least because standards are often unenforceable (Panayotou 1992).

The three main legal environmental topics normally addressed are: (i) the conservation of natural resources; (ii) the protection of environmental health; and (iii) the control of environmental pollution. Whilst it is recommended that EIA is integrated into this legal framework (Hunter 1993), conflict and confusion can occur between those systems designed to minimize impacts, such as EIA, and those designed to clean up the consequences of impacts (pollution control). End-of-pipe solutions may imply that avoiding development impacts is not so important, as use of an appropriate technology will solve the problem of impact. In developing countries the cost of importing such technologies and the technical expertise required to utilize and effectively manage them can be extremely limiting. In some countries there is evidence of a lack of knowledgeable, trained personnel to effectively implement state of the art environmental technology.

To a large extent legislation is determined by the cultural and political background, though the attitudes of funding agencies and the concern about the use of EIA are contributory factors. Most environmental agencies in developing countries lack strength and legal authority to enforce compliance (Ebisemiju 1991). There are few legal requirements or administration mechanisms to ensure that the recommendations of an assessment are implemented.

8.14.3 Institutional

Even where underlying EIA legislation and policies are well founded, a failure to spell out procedures clearly and to assign roles and responsibilities can lead to serious mistakes and oversights in administration (World Resources Institute 1994). Increasingly, it has been acknowledged that institutional capacity limitations constitute major obstacles to EIA application in developing countries (Mudge 1993). For example, in 1991 only 19 out of the 121 developing countries had established administrative, institutional and procedural frameworks for implementation of EIA. For example, in Myanmar, Laos, Brunei, Vietnam and Cambodia, the institutions need strengthening (United Nations Environment Programme 1996, p. 13)

In 1985, the World Health Organization (WHO) completed a survey of institutional capacity for the management of pollution in developing countries. None of the 76 less industrialized nations surveyed had any significant institutional capability. Only 10 of the moderately to rapidly industrializing countries (59 in total) had key programme requirements (Halter 1991).

As discussed earlier, there are a number of countries in the East Asian region which, although having incorporated EIA legislation some years ago, are unable to effectively control and enforce it due to a lack of an appropriate institutional framework. This has resulted partly from insufficient funding or inadequate organizational ability but also relates to resistance from established power bases within government ministries and departments. The Philippines is a good case in point. The question of responsibility and control has been tackled in different ways, either creating a centralized environmental protection agency within government to coordinate all environmental legislation or to decentralize responsibility to each appropriate department or state. The essential component in either of these arrangements would seem to be the relation-ships established between environment and sectoral development agencies. Thus, cooperation between the Ministry of the Environment and the Departments of Mines and Fisheries or Ministries responsible for Housing and National Development is critical. Forming relationships between the environmental agency and the sectoral development agency is a priority issue in making EIA work more effectively (Brown & McDonald 1989).

In addition, the ability of each department to undertake its responsibilities is important. Substantial problems are experienced in this regard due to a lack of adequate and sufficiently qualified staff, arising from financial constraints and training inadequacies. It has been suggested that the insufficiency of manpower is a greater constraint than the legislation and institutional capacity of a country. Even in countries with well-established legislation (Thailand, Indonesia and Malaysia) there is a shortage of people with the necessary scientific and EIA training. There are also often inadequate financial and technical resources and inventory and functional relationship data on natural and social environments (Boyle 1993, p. 212). In addition, there are problems where centralized control creates difficulties in enforcing EIA for activities such as resource exploitation, the latter often under state and regional jurisdiction whereas EIA is enforced by federal agencies (Brown & McDonald 1989). The decision to decentralize in Malaysia may lead to other problems of commitment and control. This is partly due to the lack of adequately trained staff within each state but may also result from the strong, local, political aspirations towards economic development. The employment of an environmental officer responsible for overseeing EIA matters within state government departments is a critical requirement for effective implementation. Use of local guidelines for projects in such sectors as mining, agriculture and resort development also provided for proponent cooperation in meeting the institutional requirements (Department of Environment 1994).

8.15 ENVIRONMENTAL IMPACT ASSESSMENT PROCEDURES

8.15.1 Project planning

The effectiveness of EIA depends on how well it is internalized in project planning and decision-making processes (Ebisemiju 1991, p. 28). The integration of EIA into project planning should maximize its effectiveness and also minimize delays in project implementation (Werner 1992, p. 20). Moving beyond EIA to an integrated environmental planning assessment and design is a prerequisite for effective reduction of adverse effects of programmes and projects (Brown 1990, p. 141).

EIA seems to have become progressively more divorced from the planning and decision-making processes it was intended to change. The main involvement and responsibility for EIA lies in the hands of external consultants, who, in many cases, have little or no coordination with the design or project management team. As noted earlier, as the EIA process becomes increasingly sophisticated and scientific in the developed world, it is in danger of becoming more distant and alien from the decision process in the developing world (Campbell 1993, p. 7). In many developing countries, EIA is currently a separate technical exercise from project planning and design. It needs to be viewed as an integral part of the design feasibility process as well as providing a core function within an environmental management plan. Whilst this idea has received considerable support, one drawback that warrants consideration is that of the possible loss of the independence which is achieved by the present system of appointing external environmental consultants. It is suggested that this may be lost if EIA is subsumed into the designers' portfolio. Where existing architects and engineers have limited knowledge and appreciation of the benefits of EIA then its successful implementation is unlikely to be achieved. The need to devise an integrated management system that coordinates design professionals with environmental consultants is important in overcoming these problems.

8.15.2 Screening and scoping

Where EIA legislation provides for specified lists of project types and sizes, there is a possible problem of abuse when the minimum requirements are used to avoid the need to apply EIA. For example, hill developments in Malaysia of less than 50 ha and hotels of less than 80 bedrooms do not require EIA. This has resulted in applications for 49 ha hill sites and 79-room hotels, some of which are added to later by similar applications. In countries (such as Indonesia) where the criteria place more emphasis on the sensitivity of the site and on the reversibility and cumulative effects of the impacts, more appropriate selection occurs.

8.15.3 Baseline studies

Major constraints in collating accurate and adequate data in East Asia relate to the complexity of biodiversity, the lack of knowledgeable specialists and the unavailability of reliable sources. Another problem is the lack of publicly available maps. This has been overcome partly with satellite photographs, although many of these may not be detailed enough. Other constraints relate to the time it takes to collect adequate baseline data. This affects a wide variety of issues ranging across the implementation stages of the project management process, including design, planning, construction and monitoring.

A severe criticism of data collected in developing countries has been that EIAs are merely a collection of unsynthesized, biophysical data irrelevant to the consideration of real alternatives (Roque 1985). This is possibly a little harsh and an overgeneralization; however, there is evidence that, even, where data are collated, much may be irrelevant. Significantly, the data often do not attempt to define the nature of anticipated development impacts or to interrelate to other data included by different specialists contributing to the EIA.

Databases are best drawn from existing recent EIA projects that summarize the experience of previous predictions through monitoring. Incomplete and inaccurate environmental baseline data are major impediments to effective EIA and to sustainable development planning generally (World Resources Institute 1994). There is an urgent need for greater application of geographical information systems (GIS) to database completion and retrieval.

8.15.4 Mitigation, monitoring and auditing

It has frequently been contended that EIA enters the development process too late and is then used to minimize impacts of a predesigned scheme that did not consider strategic environmental issues (Campbell 1993, p. 4). In some countries, EIA begins after the construction commences and is used only to confirm that the environmental consequences of the project are acceptable. Too much reliance is placed on identifying mitigating measures when more effort should be made to redesign or relocate from first principles, i.e. to deal with causes not just symptoms.

EIA should be based on operational experience, as well as estimates of impacts, and could therefore benefit from feedback of postconstruction monitoring (Wilbanks *et al*. 1993, p. 736). The absence of proper monitoring and evaluation is now a major handicap for carrying out reliable environmental assessment. There is a general misconception in East Asia that, once the EIA study is completed, the environmental effects of the project will manage themselves. Indeed, it has been said that the EIA report, once completed, submitted and accepted by the planning authority, is 'thrown in the dustbin' (McBride 1994, personal communication). In a review of Asian countries, Werner (1992) concluded that mitigation measures and their implementation, environmental monitoring and compliance control needed to be strengthened.

8.15.5 Socio-cultural impacts

Socio-cultural factors play a significant role in shaping EIA implementation in East Asia (Boyle 1993, p. 213). Possibly the strongest criticism levelled against the use of westernized EIA systems in East Asia is the inappropriate way it deals with socio-cultural aspects. Where EIA is practised, there is a tendency for those areas of interest that are more quantifiable to be detailed and for the qualitative topics to be ignored or glossed over. This is unfortunate and many serious problems have resulted where local indigenous peoples were not considered in the planning of major infrastructure developments. This may be partly caused by the EIAs being prepared by overseas consultants, who are unaware of or insensitive to local social problems or are not allocated sufficient time during the survey stages. Guidelines often relegate the socio-economic component to that of an appendage (Campbell 1993, p. 5). There is a need for local social scientists and residents in any development area to be consulted at an early stage to minimize serious social problems and the potential for opposition and conflict (sometimes violent).

In the large urbanized cities of East Asia the immediate basic social needs, such as shelter, food and water, present difficult problems because of environmental degradation and need to be recognized in any EIA investigation. In some countries social problems arising from developments have been assumed to be solvable by transmigration. This has been the case in Indonesia, where massive degradation of rural hinterland areas, particularly in places such as Sulewesi and Kalimantan, has resulted from large numbers of migrants being removed from Java and particularly Jakarta. More commonly, social problems occur when people are displaced by developments. In the case of Hong Kong and Singapore, this has been a continuous process over the years, with occupants of kampungs (villages) and squatter huts being moved into public housing flats. In many cases the people have been willing to move in order to enjoy cleaner, healthier and more efficient services and facilities. In other cases, such as the recent gentrification of people from their island home, must have an adverse effect on their social group structure and social and recreational freedom (Hesp 1994). In many of the larger infrastructure projects, particularly dam projects, thousands of people have been displaced and forests lost.

There is plenty of evidence in this chapter to suggest that development pressures and economic growth are forces which introduce greater industrialization and lessen the importance of traditional land-based agrarian society. This has a significant effect on lifestyles. Developments cause social change which is sometimes substantial. EIA must account for both local and national social values (Hunter 1993, p. 4). EIA must encompass the social dimensions as well as the physical and biological dimensions (Brown 1990, p. 136).

Legitimization of NGOs may improve the effectiveness of public response. A better public information system, encouragement of cooperation and identity of attitudes and involvement in decision-making can lead to increased effectiveness, validity and accountability. Where the public were major instigators of the original legislation, social issues are more frequently assessed.

Social impact assessment (SIA), which has been practised in developed countries (see also Chapter 14, Volume 1) for some years, is little known in many developing countries, not least because SIA specialists do not exist. The likelihood of identifying significant impacts is increased by treating impact assessment partly as a social process. The only way to avoid costly and disruptive mistakes is often to involve a wide range of parties and perspectives in the discussion (Wilbanks *et al*. 1993).

8.15.6 Capacity building

It has been suggested that the greatest constraint to attaining the benefits of a good EIA is education (Braun 1987) and that one of the most important factors that could significantly improve the EIA process is good education and training (Biswas & Agarwala 1992; see also Chapters 3 and 7–9, this volume).

The concept of environmental education came into being some 25 years ago and was defined as the processes of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelationships between man, his culture and his biophysical surroundings (International Union for the Conservation of Nature 1970).

Amongst the educational problems requiring attention are the inadequate technical skills of proponents and consultants, the poor quality of managerial expertise of administrators and the insensitivity of contracting operatives. In addition, there is a lack of priority status afforded by the project management professionals and a lack of information and awareness for NGOs and the general public. Education and training for NGOs is needed to enable effective, knowledgeable and professional contributions to be made to the process or dialogue.

Perhaps most important, as alluded to earlier, is the lack of awareness and education of the politicians and decision makers.

Many efforts have been made to improve training and educational facilities, focusing on strengthening networks and leadership. Trials are currently being undertaken in the East Asia region, as elsewhere, with an EIA training resource manual. This is designed to train potential EIA trainers (Abaza & Croal 1997). There is still a significant gap between decision makers and environmentalists, and training workshops designed for politicians on a regional/national basis could be of major benefit. Considerable difficulties arise in educating the most senior decision makers as they often believe they do not need to learn anything new and generally only respond to major environmental disasters, such as the major oil spills, hillside collapse and air pollution from burning forests, which have all occurred recently in the East Asia region.

The need to recognize the integrated effects of environmental education throughout the project management process, from inception to completion and beyond to property management, is important. As suggested earlier, the EIA process must never be regarded as an end in itself but rather as a means to protecting and even enhancing the environment.

Professional standards in training in the home country and local-based training are particularly recommended, especially in methodology. Associations of EIA professionals need to be developed to establish codes of ethics and to improve standards. Currently, the bias identified in environmental consultant reports in Malaysia has led to EIAs becoming apologies for the development rather than an objective assessment of environmental impacts (Leong 1994).

8.16 CONCLUSIONS

EIA in East Asia is largely well established and likely to remain so, even though its benefits have not been fully realized, causing its effectiveness to be seriously impaired. The objectives of EIA management processes—i.e. first and foremost to protect the environment—have not been achieved even in those East Asian countries where it has been implemented for over 20 years. Whilst it could be argued forcibly that increased awareness and education have influenced development participants' behaviour to take a longer-term view, the resultant improvements to the quality of life for both humans and wildlife have been minimal.

As suggested earlier, the important question that arises from this review is whether an alternative to EIA should be devised for use in developing countries? or can EIA be modified to suit? The evidence from practitioners would suggest the latter, as EIA is generally considered to be an acceptable and worthwhile concept without any fundamental deficiencies (Campbell 1993). In another workshop, no views were expressed that EIA should be abandoned, only that it should be made more effective (Brown & McDonald 1989).

The reasons why EIA requires modification are partly to meet the specific needs of East Asian countries but also to achieve the heightened expectations of EIA as a key component of sustainable development planning. This, of course, is a role for which EIA was not originally developed. 'EIA is a 20 year old tool for environmental management which is not living up to its full potential' (Mudge 1993). A previous evaluation of EIA came to similar conclusions:

> So far the constraints of limited resources and limited environmental mandates as well as the inappropriateness of Western impact assessment models and opposition from developers or project proponents has meant that the contribution to environmental protection has been moderate (Horberry 1985).

The modification of EIA for countries in East Asia should incorporate a new scope and criteria and implementation strategies that introduce more positive, integrated, strategic and participative dimensions. At the same time the need for EIA to be more simple, direct, appropriate, locally based and flexible is also desirable for future acceptance and effective implementation. Needless to say, the likelihood of EIA becoming more effective in this region will depend mostly on the attitudes and vision of the most senior political decision makers. The increasing number of environmental disasters which have recently occurred in the region will hopefully provide much more food for thought and generate appropriate action.

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9: Environmental Impact Assessment in Africa

JOHN O. KAKONGE

9.1 INTRODUCTION

This chapter's purpose is to describe briefly the evolution of environmental impact assessment (EIA) in Africa and its present status. It begins with an analysis of the characteristics of the region and goes on to examine some reasons why EIA is not institutionalized in Africa. It describes the framework for the conduct of EIA in African countries, the preparation and methodologies of EIAs, and concludes with case studies and the lessons to be drawn.

The examples and illustration in this chapter are drawn from a wide range of African countries (see Fig. 9.1) and show that much work is needed to institutionalize EIA in Africa. There are positive signs and experiences that can be built on to regularize and expand the use of EIA.

9.2 CHARACTERISTICS OF THE REGION

During the past three decades, the continent of Africa has faced various challenges. These are most pronounced in the agricultural sector which is the source of livelihood for most African people. In many African countries low productivity, high population growth and inclement weather conditions have forced both peasants and farmers to embrace unsustainable practices (Oumar 1996).

McNamara (1991) notes that data on Africa's environment are scarce and unreliable, although media images of drought, famine, destitution and disaster abound, accompanied by accounts of deforestation, soil erosion, desertification, overgrazing, pollution, habitat destruction, elimination of wildlife and loss of biodiversity. The United Nations Development Programme (UNDP) argues that environmental degradation determines living standards for most African people. A wide range of factors has undoubtedly contributed to the present situation, including rapid population growth; widespread poverty; unsustainable agricultural practices; resource depletion; climatic variation; government mismanagement; unrealistic socio-economic policies; political instability; inappropriate and uncoordinated development assistance; depressed international commodity prices; and external indebtedness (United Nations Development Programme 1991).

If current trends are to be arrested and reversed, approaches are called for that give greater attention to forms of environmental management and practice that conserve resources. This will require commitment, concerted action and political will by both national governments and the international community (United Nations Development Programme 1991).

The prospects of growing poverty and further economic decline have forced governments to continue with short-term development policies and remedies. However, the preparations needed for the Earth Summit held in Rio de Janeiro in 1992 enabled African countries to agree on a common position aimed at alleviating their problems (United Nations Environment Programme 1994). This recognized the need to make significant changes in economic, social and environmental policies in African countries, and in the foreign aid, trade and investment policies of industrialized countries.

The new agenda offers several advantages over previous versions, including:

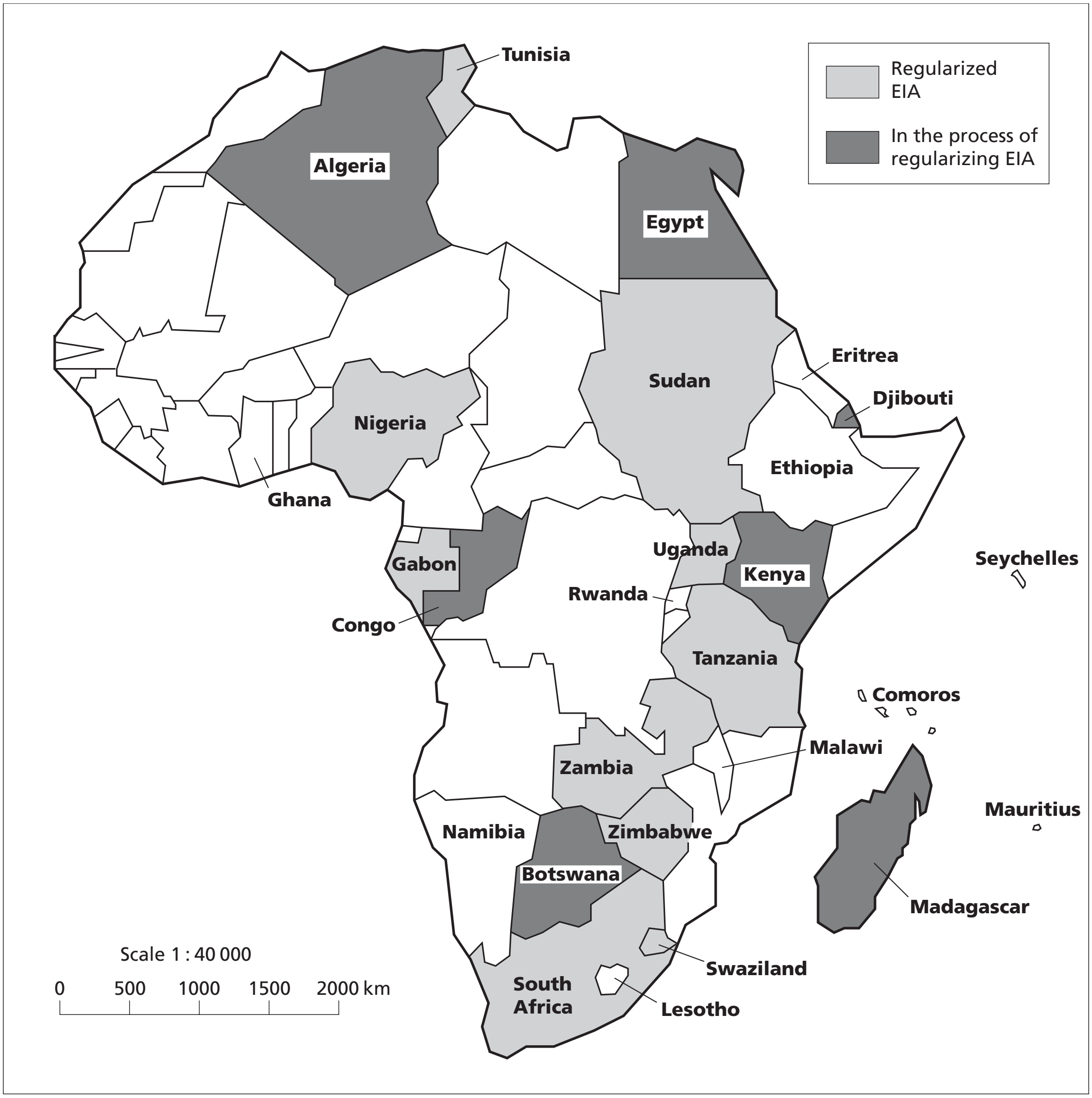

Fig. 9.1 Countries which are in the process of regularizing EIA. Labelled but unshaded countries have regularized or are in the process of regularizing EIA but no further information for these countries is available (see also Table 9.1).

- It takes as development's goals the primary concerns of people, namely water, food, health, education and housing.
- It brings together critical and important actors, such as decision makers in government, industry, academia, etc.
- It encourages anticipatory and preventive approaches and requires that the environment is taken into account during policy formulation, development and decision-making processes.
- In particular, it encourages the institutionalization of the EIA process.

9.3 EVOLUTION OF ENVIRONMENTAL IMPACT ASSESSMENT IN AFRICA

During the 1970s and 1980s, EIAs were prepared in Africa by bilateral donors and multilateral agencies from Britain, Norway, Denmark, USA and France, as well as the African Development Bank (ADB) and the World Bank. Examples abound. In a few cases, African countries began to prepare their own EIAs. For example, in South Africa in 1984, the apartheid government established a committee to develop a strategy to ensure the integration of environmental concerns into the development process. Since then, South Africa has had its own style of EIA known as integrated environmental management (IEM).

Several pan-African meetings and agreements on environment and development made specific recommendations on the use of EIA. A few examples are the African Ministerial Conference on the Environment (AMCEN) in Cairo in 1985, the United Nations Programme of Action for African Economic Recovery and Development (UNPAAERD 1986–90) and the Regional Preparatory Conference for the United Nations Conference on the Environment and Development (UNCED) held in Cairo, 11–16 July 1991.

During the UNCED process, most reports prepared by African states recommended that EIA be integrated into the development process. For example, Egypt's environmental policy covers five main areas, and environmental assessment is one. Egypt's EIA system emphasizes monitoring and environment-related scientific and technological information to help determine problems and the changes taking place in ecological systems. Specifically, the Egyptian 1992 national report for UNCED said:

> Egypt implements a policy compatible with the Egyptian environment when assessing the environmental implications of any development projects, especially in the fields of industry, urban planning and tourism, with a view to attaining a sustainable development founded on sound environmental criteria (Egyptian Environmental Affairs Agency, 1992).

Egypt is not alone. In 1992, Nigeria enacted the EIA Decree Law no. 86 which requires detailed analyses of 19 categories of major development projects. Despite any shortcomings in this Decree, it is in place and will promote sustainable development (Federal Republic of Nigeria 1992).

The Commonwealth Secretariat study (1992) on pre-UNCED activities shows that the number of African Preferential Trade Association (PTA, now known as COMESA) countries developing their own EIA system is increasing: for example, Mauritius now commissions EIAs for government-funded projects.

Since the Earth Summit, many African countries (see Table 9.1) have either formalized or are developing environmental legislation or policy. In Nigeria, Ghana and Eritrea, the guidelines for carrying out EIA have been developed. In Mauritius, Sudan, Seychelles and Kenya, sectoral EIAs are being carried out.

A lack of environmental legislation is one reason for the uneven application of EIA in Africa. Djibouti, Ethiopia, Kenya and Madagascar have yet to enact suitable legislation (Table 9.1), but there are several issues that need dealing with before EIA can be institutionalized. These include clarifying the role of those national institutions involved in environmental issues, revising existing policies to reflect realities, building national capacity in EIA, drawing up EIA guidelines and translating existing policy into laws and regulations (United Nations Environment Programme 1994).

More recently (June 1995), the Ministerial Meeting held in Durban, South Africa, focused on EIA in Africa. The Meeting issued a communiqué giving several suggestions:

- Establishing a database of EIA experts.
- Promoting regular information exchange in EIA.
- Establishing a network of EIA experts within the region.
- Promoting cooperation between developed and developing countries.
- Developing curricula and programmes for all levels of education and training that could include knowledge of the environment and EIA.

Table 9.1 Status of EIA in Africa.

		EIA legislation				EIA practice								
Country	EIA authority	D	L	R	A	Sg	Sr	Sc	Pr	Mi	Mc	CIA	Pp	EMP
Algeria	National Environment Secretariat	'90			✓	✗	✗	✗	—	✗	✗	✗	✗	✗
Botswana	Department of Environment and Human Resources				✓	✗	—	✗	—	✗	—	✗	—	—
Congo	Ministry of Tourism and Environment	'86			✓	✓	✗	✗	✗				✗	
Comoros	Ministry of Agriculture and Environment				✓		—	—	—	—	—	—	—	—
Djibouti	Office of the Prime Minister, Division of Environment				✓	—	—	—	—	—	—	—	—	—
Egypt	Egyptian Environmental Protection Agency	'91	✓		✓	✗	✗	✗	✗	✗	✗	✗	✗	
Eritrea	Agency for the Environment				✓	✗	✗	—	—	✗	—	—	—	—
Ethiopia	National Environment Protection Agency				✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
Ghana	Environmental Protection Agency	'94	✓				✗	✗	✗	✗	✗	✗	✗	✗
Lesotho	National Environment Secretariat				✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
Kenya	Ministry of Environment				✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
Madagascar	National Environment Secretariat	'90	✓			✗	✗	✗	✗	✗	✗	✗	✗	✗
Malawi	Ministry of National Resources				✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
Mauritius	National Environment Commission	'91	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓
Mozambique					✓	—	—	—	—	✓	✓	✓	✓	✓
Namibia	Ministry of Environment and Tourism	'94	✓			✓	✓	✓		✓		✓	✓	
Nigeria	Federal Environment Federation Agency	'92	✓			✓	✓	✓	✗	✗	✗	✓	✗	✓
Rwanda	Ministry of Environment and Tourism				✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
Seychelles	Ministry of Foreign Affairs, Planning and Environment	'94			✓		✗	✗	✗	✗	✗	✗	✗	✗
South Africa	Council for Environment	'84	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
Sudan	Higher Council for Environment						✗	✗	—	✗	—	✗	✗	✗

(*Continued on p. 172*)

Table 9.1 *continued*

		EIA legislation				EIA practice								
Country	EIA authority	D	L	R	A	Sg	Sr	Sc	Pr	Mi	Mc	CIA	Pp	EMP
Swaziland	National Environmental Authority	'92	✓				✗	✗	✗	✗	✗	✗	✗	✗
Tanzania	National Environment Management Council				✓	✓	✗	✗	✗	✗	✗	✗	✓	✗
Tunisia	Ministry of Environment and Tourism	'91	✓		✗	✓	✗	✗	✗	✗	✗	✗	✗	✗
Uganda	Ministry of National Resources	'94			✓	✓	✗	✗	✗	✗	✗	✗	✗	✗
Zambia	Ministry of Environment				✓	✗	✗	✗	✗	✗	✗	✗	✗	✗
Zimbabwe	National and Economic Planning Commission				✓	✓	✗	✗	✗	✗	✗	✗	✗	✗

A, ad hoc; CIA, cumulative impact assessment; EMP, environmental management plan; L, legislation; Mc, mandatory scoping; Mi, mitigation; Pp, public participation; Pr, prediction; R, regulation; Sg, sectoral guidelines; Sr, screening list; ✓, regularly used; ✗, not regularly used; —, not introduced yet.

- Promoting coherence within the EIA procedures adopted by African countries.
- Initiating a Regional Convention on EIA, including activities and events that have transboundary effects.
- Enhancing public awareness and participation, particularly by non-governmental organizations (NGOs) and women's, youth and community level organizations in the development and use of EIA (Communiqué 1995).

Although the priority areas listed cannot be questioned, implementation is slow. The need for a more aggressive approach towards the implementation of these EIA priority areas in Africa cannot be overemphasized.

9.4 REASONS WHY ENVIRONMENTAL IMPACT ASSESSMENT HAS NOT BEEN INSTITUTIONALIZED IN AFRICA

Africa is a large continent with 51 independent states, and there is little information on the reasons why the use of EIA is not more widespread. However, what is available (Kakonge & Imevbore 1993) allows some generalizations to be drawn:

1 *Fear and ignorance*: in many African countries EIA is perceived by politicians as discouraging to private investors, anti-development, a bureaucratic stumbling block to improving the economy and a threat to their personal power. They are thus reluctant to make EIA mandatory.

2 *Incorrect application*: when African countries (Zimbabwe, Kenya and Lesotho) have replicated the American style of EIA without regard to local conditions, it has been ineffective, because, while politicians are interested in creating jobs, business people want to maximize profits (Preston *et al.* 1992).

3 *Cost*: while establishing the cost of EIAs in developed countries and some countries in the developing world has been easy, this has not been the general case in Africa. A criticism of EIA from the African region is that it is very expensive. According to the World Bank (1993), private and external consultants prepared most EIAs in Africa and they cost between \$US30 000 and \$US40 000 per assessment, with an average of \$US150 000 per EIA. The Bank report concludes that this represents some 5–10% of the total costs of project preparation, which is expensive, especially if the money is part of the loan. Biswas and Qu Geping (1987) argue that the cost of an EIA depends on the type of project, its size, the methodologies and techniques used, its timing, the data required, the scope called for and the location and calibre of the experts or consultants.

4 *Human resources*: to carry out an EIA requires qualified and experienced people. In Africa, this is a drawback, since many countries have insufficient indigenous experts to carry out a creditable EIA without outside assistance. The World Bank (1993) concluded that lack of experience in preparing EIA, both in member states and by the Bank's staff, has hindered institutionalization of EIA in sub-Saharan Africa. This infers that EIA is a difficult subject that needs extensive training to build local capacity. As Kakonge (1989) concluded, lack of sufficient experience and expertise in environmental disciplines will result in poorly prepared EIAs, as happened with the early EIAs prepared in the UK (Kakonge 1989; Wathern 1988).

5 *Institutional and legislative aspects*: as Preston *et al.* (1992) argue, importing and applying EIA procedures from advanced countries without bearing in mind the unique conditions of individual countries is unwise. Biswas and Qu Geping (1987) argue that EIA should be commensurate with existing local capacities—technical, administrative and assessment. The argument advocates individualized or case-specific as opposed to standardized procedures. While this makes much sense, it has many limitations, especially when dealing with transboundary EIAs for shared resources, which call for protocols and international agreements (United Nations Environment Programme 1994).

6 *Timing and scheduling of EIA*: one problem of EIA in Africa is timing. Experience shows that some EIAs are done towards the end of the project when they can have no influence on the design. Obviously, EIAs should be prepared during the project feasibility study.

7 *Enforcement of environmental policies*: lack of enforcement of environmental policies is common in Africa because of a lack of qualified staff and funds to carry out the work effectively and because of mismanagement and lack of transparency by government officials. Thus, environmentally unfriendly projects go ahead without proper scrutiny. Even in South Africa, where there is a legal framework, there are still no adequate enforcement/mechanisms to ensure that an EIA is carried out for projects with significant environmental impacts.

8 *Suspicion associated with cancellation of projects*: many governments see the benefits of employment and rapid development outweighing those of protecting the environment by cancelling deficient projects. The argument is also made that, because the advanced countries developed without addressing environmental concerns, Africa should not be forced to make EIA a requirement for projects at the expense of development (Commonwealth Secretariat 1992; Preston *et al.* 1992).

9 *Project approval*: in advanced countries EIA speeds up project planning approval, particularly in situations where lengthy public inquiries can be avoided. However, in many African countries, EIA is piloted by bilateral and multilateral agencies and whether or not projects are environmentally friendly does not affect approval. Also, even without EIA, project approval in Africa is generally very slow. Securing funds takes a long time because of cumbersome approval processes, corrupt practices and unclear chains of command, and this slows or hinders decision-making.

10 *Value and use of EIA*: non-action persists because the value and use of EIA have not been recognized. Many planners do not understand the value of EIA, perhaps because the concept is too demanding and taxing for people without a scientific background. There is a perception that the terminology of environment and EIA is complex and should be left to experts in the field.

9.5 THE CONDUCT OF ENVIRONMENTAL IMPACT ASSESSMENT IN AFRICAN COUNTRIES

A questionnaire sent to all Southern Africa Development Community (SADC) countries in 1994 by its Environmental Land Management Sector (ELMS) in Lesotho produced the responses shown in Table 9.2 relating to the quality of EIA (SADC/ELMS 1994) (note figures = number of responses).

Based on a standardized EIA format, these

Table 9.2 Responses to questionnaire sent to all Southern Africa Development Community (SADC) countries by the SAELMS Environmental Land Management Sector (ELMS) in Lesotho.

	Poor	Inadequate	Adequate	Good	Excellent
Environmental impact assessment by government	—	7	2	—	—
Environmental impact assessment by industry	5	4	—	—	—
Environmental monitoring	2	6	1	—	—

results show that most EIAs were inadequate. Of the nine governments who responded, only two classified EIA as adequate. It would seem that industry does not care about EIA: all industrial EIAs were below standard. This suggests that courses on the preparation of credible EIAs based on prevailing local conditions should be run in Africa for industry, government and NGOs.

In addition, detailed studies done by the Institute of Resource Assessment (IRA) and International Institute for Environment and Development (IIED) (IRA/IIED 1995) on Tanzanian projects produced the following comments:

1 *Quality of terms of reference (TOR)*: often, EIAs are inadequate because of insufficiently detailed and clear TOR. The TOR for an EIA must be of good quality, practical and, for major EIA studies, should be generated during the scoping period so as to ensure focus on important issues.

2 *Screening and scoping*: the Tanzanian experience emphasizes that screening is important, especially for those types of projects likely to require further assessment, and can help avoid or reduce the collection of data irrelevant to impact prediction.

Table 9.3 Tanzanian experience of EIA quality ($n = 16$) (source: after IRA/IIED 1995).

	Poor (%)	Moderate (%)	Comprehensive (%)
Screening and scoping	33	45	27
Statement clarity	19	44	38
Impact prediction	6	69	25
Evaluation of impact significance	31	38	31
Assessment of alternatives	30	44	24
Mitigation	19	50	31
Monitoring	44	44	13
Consultation/participation	60	33	6

Table 9.3 presents an analysis of quality in relation to different elements of 16 EIAs. The analysis in Table 9.3 suggests that, in SADC and Tanzania in particular, there are few people who can claim to have expertise in EIA. The expertise is even more limited when it comes to complex projects. IRA/IIED (1995) notes that EIA studies undertaken in Tanzania have relied heavily on international consultants and expatriate experts. This was the case with the Lesotho Highlands Water Project (LHWP), where the World Bank recruited a team of experts to undertake the EIA for Phase 1B. In the EIA of Phase 1A the important environmental impacts identified were mainly related to engineering aspects, with socio-economic components overlooked (Kakonge 1995). This resulted in protests from national and international NGOs on matters ranging from environmental degradation to compensation and resettlement. On the other hand, the EIA for Phase 1B included unnecessary work on impacts, such as literacy/numeracy, school attendance and adult education (Bourn 1996). It is possible that the consultants failed to do a proper scoping and screening of significant impacts.

One issue that is evident from the Tanzanian and other SADC experiences is the methodologies used for carrying out EIAs. In many countries in Africa, the 'checklist' is widely used because it is simple to use and understand. Whilst it does not require extensive material or manpower resources, Preston *et al.* (1992) argue that the checklist technique is poor for communication and provides no guidance for the interpretation of impacts or justification of specific answers. This is true with Bourn's (1996) analysis of the checklist technique for the LHWP. He argues that, by giving equal ranking to various impacts on their checklist, the consultants preparing the EIA for Phase 1B of the LHWP failed to take into account the level or degree of certainty or severity of these impacts. In a number of cases the existence of listed impacts was questionable.

In South Africa, the overlay mapping system of evaluation is preferred because it does not assume that all factors have equal weight and it gives clear reasons why certain factors are chosen against others (Preston *et al.* 1992). The major advantage of overlay mapping is that the information is presented in a form that is self-explanatory and acceptable to decision makers and other interested parties. In this technique, maps and summary sheets are prepared for each controlling factor including:

- the relevance of the factor to site selection;
- the criteria used to evaluate the controlling factor in terms of suitability for development;
- a brief review of the limitations for development released by this controlling constraint.

In general, some methods of EIA can be useful to practitioners in Africa only after intensive training and experience. Some are complex, confusing and time-consuming. All are costly.

Box 9.1 considers the simplified assessment report approach used in South Africa. This is practical and realistic and could well be adopted or replicated in other regions of Africa.

Box 9.1 A sample simplified assessment report

The South Africa authorities require that a report on assessment should be prepared for record purposes. As listed by Preston *et al.* (1992), the report includes:

- The reasons for the development project
- A description of the nature of the project
- A description of the environmental setting of the project
- A statement on the nature, sources and quality of data used in the study
- Details of the persons involved in the study, their names, qualifications, affiliations and experience
- A summary of the procedure used for the selection of the controlling factors mapped
- A portfolio of maps of controlling factors
- A composite map synthesizing the data from controlling factors
- A review of the location problems shown by the analysis

9.6 DONOR AGENCIES AND ENVIRONMENTAL IMPACT ASSESSMENT

Other than in South Africa, Nigeria and Egypt, donor agencies have carried out most of the EIAs in Africa. According to the World Bank (1993), there were 139 projects in Africa requiring mandatory EIAs between 1990 and 1993, with 59 approved. These projects ranged from those that require less extensive environmental analysis to those that do not require EIA according to the following classifications:

- *Category A*: significant environmental impacts likely (e.g. major hydroelectric or irrigation dam, open surface mine, thermal power station), where a full EIA will be required.
- *Category B*: some environmental impacts likely, for which mitigation is possible (e.g. fish farming, reafforestation) and a limited EIA is adequate.
- *Category C*: negative environmental impacts unlikely (e.g. most education and health projects), and for which an EIA is unnecessary.
- *Category D*: projects for which environmental protection or improvement is the main focus (e.g. protected area management, pollution control), for which separate EIA is unnecessary.

The ADB in 1991 defined the following three classifications for projects they are funding in the African Region (Oumar 1996; see also Chapter 6, this volume):

- *Category I*: projects that require a comprehensive EIA before approval.
- *Category II*: projects that do not normally require comprehensive EIA.
- *Category III*: projects not anticipated to result in adverse environmental impacts.

Some examples of projects subjected to an EIA that has contributed to the alteration of or adjustment to the project design are listed in Box 9.2.

Of the projects funded by ADB, cited by the work of Oumar (1996) two were cancelled as a result of EIA studies. However, for those projects completed, there is no information as to whether the predicted impacts occurred.

The World Bank (1993) identified a number of requirements and experience in an evaluation of EIAs conducted over 1990–3:

1 The local capacity of borrowers needs building through institutional support and in-country training, etc.
2 Actual local capacity should be considered in defining project schedules.
3 Extensive consultation with affected populations and local NGOs is essential for effective assessment.
4 The quality of EIA reports, although mixed, is improving.
5 Project designs are being altered to incorporate EIA findings.
6 Greater priority must be given to training Bank staff in the use of EIA.

Amongst the above points, consultation with local populations is the most problematic. As Kakonge (1996) argues, an assessment by project planners/sponsors to discover the level of education and understanding at the project location needs to be done. Then the project can be presented so that people can decide what benefits, or otherwise, will accrue. This would enable them not only to participate but also to be involved in the decision-making process of the project. As part of consultation, there is a need for transparency of information.

Kakonge (1989) and Wathern (1988) acknowledge that even countries such as the USA and UK suffered a problem with the quality of EIA reports during the 1970s and 1980s. However, with increasing experience, the situation improved. It is hoped that once EIA becomes part of the planning process in many African countries, the same will occur there.

The World Bank's evaluation also recognized that not all experts or staff of agencies know how to prepare EIA reports. If relevant staff were trained in EIA procedures, they could serve as trainers, although, unless properly done, training can be a waste of money and time, both of which are scarce in Africa.

9.7 LESSONS TO BE LEARNED FROM CASE STUDIES

9.7.1 Ownership

All the examples presented in Box 9.2, other than the South African, are donor driven. Other African governments initiate few EIAs. What is important for the EIA process is that ownership will only be national if care of the environment is given priority. After the Rio Summit in 1992, many African countries established ministries, secretariats, authorities, agencies, etc. in charge of the environment. However, their roles are still not clear and their mandates are confusing. Occasionally, they are not well funded and lack legal instruments. Another problem is the lack of openness of society to discuss environmental issues or problems, although this is now done in South Africa. Other, more general, problems are the need to localize EIA processes to respond to local conditions and the widening, rather than closing, gap between decision makers and environmentalists.

As part of strengthening ownership in government-sponsored projects, EIA should be prepared and funded by governments, as in Mauritius, and transparency ensured by engaging an independent review.

9.7.2 Monitoring

What is clear from the cases cited above and other work, such as that done by Kakonge (1989), is that the end results of many EIAs are unsatisfactory. This is often due to a lack of follow-up, the reasons including:

- the impacts are too slight to need follow-up;

Box 9.2 Case studies where EIA resulted in alterations to design

Project	Problems	Changes/recommendations because of EIA
Large-scale irrigation II (Morocco)	Water, sanitation, public health, etc.	Protection of watersheds, water-use planning, soil conservation, public health programmes, etc.
Water supply and urban sewerage project (Tunisia)	Negative impacts of construction and operation of sewage systems, etc.	Good practice guidelines for construction, including directions for removal, reuse and regrading of fill materials along pipeline routes, and measures to avoid erosion and disturbances to surface waters
Cotton subsector in development project (Ghana)	Environmental and health impacts from increased pesticide use and/or misuse	A system to monitor pests and their natural enemies; training in integrated pest management; non-chemical and chemical control of pests; training in monitoring pesticides
Forestry and Environment Project (Gabon)	Stimulation of wildlife poaching, soil erosion and other forms of ecological degradation as a result of improved access	The project design was changed to include standard mitigation measures, such as revegetation, drainage and waste handling
Eastern shores of Lake St Lucia (South Africa)	The EIA was to investigate two possible land-use options for the area—nature conservation and tourism or mining	The EIA predicted both negative and positive impacts would arise from the options. Four impact groups were identified: ● Environmental, including impacts on the terrestrial, wetland, estuarial and marine systems ● Economic and developmental, involving tourism and community and social services ● Archaeological and historical, concerning visitor's perceptions and the sense of place ● Issues related to institutional, policy and statutory frameworks
Alusats Hillside Smelter in Richards Bay (South Africa)	The EIA was to decide the environmental advantages and disadvantages of alternate sites for construction of a smelter	The EIA assessed the impacts and recommended the project subject to: ● Full upgrading of the existing smelter or the reduction in fluoride emissions ● Effective impact mitigation and environmental monitoring ● A reflection of environmental concerns in all phases of the project
Lesotho Highlands Water Project (Lesotho)	The problems included sedimentation, soil erosion, resettlement of displaced persons, public health concerns	The review of the EIA done in 1986 has identified significant impacts relating to resettlement, compensation, siltation, public health, etc.
Urban Development Project (Swaziland)	Poor sewerage treatment, solid waste disposal, etc.	The EIA revealed alternative locations for the water supply, sewerage treatment and solid waste disposal components

- adequate or qualitative data relating to environmental impacts are difficult to obtain and sometimes inconclusive;
- no, or too little, money is allocated for monitoring;
- severe capacity constraints of skilled staff to do the monitoring.

Whenever EIA monitoring has been undertaken, the coverage has been limited. For example, Kakonge (1994), observed that, before 1991, the LHWP EIA monitored only the engineering section and ignored the environment and socio-economic components. To get an objective view of the entire project, all activities must be covered. Monitoring should be an inherent part of the EIA process and should be done routinely. The studies of Biswas and Agarwal (1992) and Yellow River Joint Venture (1992) stipulate that:

- potential environmental impacts, their magnitudes and times of occurrence are impossible to predict reliably without proper monitoring;
- the effectiveness of any EIA is impossible to judge without follow-up monitoring activities.

9.7.3 Environmental impact assessments as supporting documents for planning

All donor-funded EIAs in Africa were prepared as part of the documentation supporting applications for funds. There are inherent weaknesses in this approach. Firstly, there is very little systematic approach to the choices involved in an EIA: the proponent or donor can choose any method they see fit. Moreover, in many countries of Africa, there is nobody to challenge the findings. Secondly, no institutional memory is kept locally if the consultants who prepare the EIA are from outside Africa. No record of the lessons learnt is kept. Thirdly, the EIA documents are sometimes suspect. For example, during the environmental studies for the LHWP, 16 volumes were produced for the public health section alone. Most decision makers do not have the time to read such quantity: 16 volumes is not user-friendly. Finally, the system is not sustained, because it is not a national requirement.

9.7.4 Types of projects subject to environmental impact assessment

The classification of projects requiring EIA is usually donor driven; what is required are local criteria for classifying projects. Kakonge (1997) suggests that these should depend on the size of the project, financial limitations, local expertise, policies, scoping and screening. What the African region perhaps needs is a regional or subregional directive. This could follow the European legal framework, where a directive means accepting binding policy objectives while leaving the means to achieve them to each member state. A regional directive would be ineffective because of the various problems in Africa, but subregional directives for organizations such as the SADC, the Inter-Governmental Authority on Development (IGAD), and the Economic Commission for West African States (ECOWAS) might be possible. A similarity in the directives to that of the European Union would give such advantages as:

- addressing the environmental impacts of shared resources;
- forcing member states to share information on harmful/dangerous projects;
- allowing a country to modify proposals to meet its own local requirements;
- within the sector, easing implementation of the directive's proposals.

9.7.5 Capacity building

A lesson learnt by both the World Bank and the ADB is that a major problem is lack of adequate capacity to prepare a practical EIA. As admitted by Oumar (1996) and the World Bank (1993), the EIAs funded by the two institutions were of mixed quality because of:

- a lack of capacity at the local level to participate effectively in public meetings;
- the scarcity of well-informed NGOs at the grassroots level to speak on the concerns of local people;
- a shortage of local environmental experts and a lack of experienced local environmental consulting firms to help with EIA of projects.

To address capacity building the following need to be considered (see also Chapter 3, this volume):

- The introduction of intensive training from the grassroots to university level to teach EIA methods and aims.
- A partnership with the private sector to help fund some short-term EIA training.
- Government/private sector/donor agencies' sponsorship of seminars/workshops/ conferences focused on EIA.
- Promotion of on-the-job, practically oriented training in EIA.
- Preparation of audiovisual aids and/or diskettes including manuals and guidelines to help individuals or organizations ensure the best EIA practices.
- EIA training similar to that done in China (Biswas & Qu Geping 1987) at various levels.
- Training local technicians in data collection and improving local expertise in social sciences, e.g. sociology and anthropology.

9.7.6 Public participation

As indicated earlier, most EIAs in Africa have, unfortunately, not involved the public. Many reasons have been given why public participation has been ineffective or inadequate, including:

- Lack of awareness of the EIA process.
- The documents are too technical to be easily understood.
- Most of the population is illiterate or semi-literate, thus effectively debarring their participation.
- Because EIA is not a legal requirement in most African countries, public participation is not required.
- Lack of an adequate framework of institutions to allow public participation.

In many African countries the public is perceived as anti-government if they protest against any aspect of a project, no matter whether it is a negative impact. An exception is South Africa where the public have been involved in the process.

Most African societies are divided into major groups of educated and non-educated, urban and rural, and traditional and modern. Using a variety of tools to increase public participation is therefore sensible. The educated, urban and modern groups can use ballot and suggestion boxes, campaigns and written or oral arguments to reject or support projects. Rural and traditional groups can use more of the visual and spoken methods known to be effective. Here, useful tools are field demonstrations and public gatherings, for example *pitsos* in Lesotho and *barazas* in Kenya, chaired by community elders, who are a source of information to be shared and part of the decision-making processes. To enlighten rural groups further, they should translate and simplify jargon-filled EIA documents to produce easily understood versions. In some countries, and in particular Mali, rural radio programmes have been used successfully to distribute information.

Every effort should be made to identify and use planners who understand and speak the local language and to have translators present during discussions. Box 9.3 outlines the components of a sound public participation strategy where the contribution of informed citizens had significant impact on the project location.

Box 9.3 Public participation strategy

A Capetown University study summarized the public participation strategy used during the identification of alternative sites for Alusa's smelter factory as:

- Meeting key people in Richards Bay
- Holding an open day in Richards Bay municipal library, with participation by the local community
- Having discussions with local schools and other interested groups in an attempt to find out and address EIA issues
- Keeping an open telephone line to the factory site to let the local community get information on the projects
- Giving various interviews to the community and its leaders

9.8 INSTITUTIONAL FRAMEWORK

As a Commonwealth Secretariat (1992) study of

PTA countries noted: 'there is no single institutional structure and legal framework for environmental management appropriate for all countries'. This is because institutional structures reflect the priorities of individual countries—the political, economic, social and cultural dimensions—and these evolve over time.

Some schools of thought advocate a centralized structure for EIAs. Others advocate a decentralized one. A centralized system has the advantages of:

- central management of environmental issues;
- central control of EIA;
- clear-cut mandates for environmental protection and enforcement;
- one organization for monitoring and enforcement, which avoids duplication of skills;
- one authority which all parties have to deal with (Commonwealth Secretariat 1992).

Conversely, a decentralized system:

- encourages sectoral ministries to ensure that their programmes and projects are environmentally sustainable by giving them the responsibility and therefore an incentive;
- avoids conflicts of interest.

The author argues that we need a balance between the two and this should include:

- basing environmental experts in both the economic and financial ministries and in appropriate sectoral and line ministries;
- a high-level inter-ministerial environmental council or committee to ensure coordination of various environmental activities;
- enabling legislation to give these institutions authority to effect environmental management action;
- monitoring capabilities, including monitoring procedures, and a data collection and recording system.
- well-trained and motivated staff.

As part of strengthening the institutional framework, there is need for African countries to learn from the experiences of other countries within the South–South Cooperation, to share information and to share costs through joint training programmes and workshops, and by information networking (Commonwealth Secretariat 1992).

As discussed, except in a few examples from the Republic of South Africa and EIAs for the ADB and the World Bank-funded projects in the African region, public participation is disappointing. Protesting against a project may be interpreted as anti-government; local NGOs that should be representing public grievances sometimes lack the capability to speak for local people. There is need for a better structure for public participation.

According to the World Bank (1993) and Oumar (1996), the quality of EIAs is varied. Although there is a mention of improvement, there is no monitoring and audit information available to provide a qualitative measure. Again, except for the few examples from South Africa where routine monitoring is being done, more training is needed to regularize EIA in Africa at various levels. In-depth and practical training on the entire EIA process cannot be overemphasized.

EIA methodologies should be reviewed and realistic ones suggested, bearing in mind local conditions and constraints. Ideally, each country should adopt its own EIA system, as has South Africa. However, EIA cannot be regularized in many countries of Africa until an enforceable legal framework exists. At the subregional level, perhaps a directive could be adopted that would then be useful in addressing problems relating to shared resources.

9.9 REGIONAL COOPERATION

Africa has many boundaries decided by colonial powers with little regard for history, custom or common sense. These boundaries partitioned nations, tribes and geographical locations, cutting across areas with common physical characteristics. They call for a greater degree of cooperation in addressing environmental problems, such as pest control and water pollution and the development of economic infrastructure (roads, railways, hydroelectric power, etc.). Today, this is becoming more widely accepted and efforts are being made to prepare regional EIAs in response to the environmental concerns raised by the exploitation of shared resources.

An example is the LHWP, where an EIA is being completed that covers both Lesotho and the Republic of South Africa. This project is intended to transfer water to South Africa's biggest industrial complex and generate hydroelectric power to meet the national needs of Lesotho. It is funded by both countries and shows a spirit of cooperation between neighbouring states.

Other joint EIAs are needed to monitor levels of water pollution in rivers in Africa, for example the Nile, Niger, Congo and Senegambia, while other areas of joint work should include dams and infrastructure, particularly roads.

Existing environmental legislation differs from one country to another, as does the interpretation and enforcement of the laws: the legal systems of Francophone and Anglophone countries are totally different. There is lack of formal exchange of environmental information from one state to another and a scarcity of information on EIAs, few of which are well enough documented to facilitate information sharing and retrieval. This calls for coordination of EIA activities at country level by governments. However, since donors and funding agencies prepare most EIAs, it is important that they help intergovernmental cooperation.

9.10 CONCLUSIONS

Africa is the one part of the world where EIA has not been regularized across the continent. The choice is whether EIA is important to the region or not. If it is, then vigorous efforts will be needed to persuade all nations involved to recognize the fact by suitable legislation.

To give added impetus to bringing this about, the following might be considered:

- Donor agencies should review their assistance and put pressure on African governments to require EIAs for specific type of projects. As matters stand, EIAs are being prepared that have no relevance to the national planning process. If donors and agencies feel strongly and genuinely that EIA is a prerequisite for sustainable development, their activities should be well coordinated with the national development planning process. Additionally, donors who are interested in carrying out ad hoc EIAs should help African governments to establish proper requirements for EIA.
- African countries should for their part accept that environmental problems are a major challenge for the entire continent. These problems have been highlighted in major regional pan-African meetings where agreements on the environment and development have been signed. The signatories have no excuse not to commit themselves politically to implementing these resolutions.
- EIA cannot be mandatory in Africa unless set within a legal framework. It is only enforceable law that makes people realize that the government is serious. Positive experience from advanced countries of the benefits of EIA for specific types of projects indicates that there is no reason why such a culture should not be replicated in the whole of Africa.
- As indicated earlier, the involvement and participation of the African public in the EIA process leaves much to be desired. To improve this aspect, the agencies concerned should announce their EIAs through the local press and radio to encourage the public to comment. Unfortunately, as noted, publicity is usually left to the government. This raises the question of the value of an EIA without public participation. Again, the South African example is instructive.
- In none of the examples cited did an EIA result in cancellation of the project, although modifications were made. This again questions the primary purpose of ad hoc EIAs. They should be used both for confirmation of good projects and for refusal of those that carry serious negative environmental impacts.
- Because most projects have been donor driven, little capacity to prepare EIAs has been developed. Building local expertise will help the public in Africa to see the importance and benefits of EIA in the development process. This can be done through sharing information among African countries on their experiences with EIA. For example, Mauritius, which has carried out its own EIAs, can probably share its experience with other African countries.

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10: Environmental Impact Assessment in South and Central America

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10.1 INTRODUCTION

This chapter is concerned with the evolution and current state of environmental impact assessment (EIA) systems and practical experience in South and Central America, where all countries are still evolving in development terms. Despite the depletion of natural resources and diversity of environmental problems faced by the countries of the region, environmental management strategies have been adopted only recently, largely in response to international pressures or as a result of external requirements by financial agencies, such as the Inter-American Development Bank (IDB) and the World Bank.

A systematic and complete appraisal of EIA experience in South and Central America is still to be undertaken. However, the development model and economic growth process prevailing in the region may help to explain the main difficulties associated with environmental management of development projects. The degree of democratization in each country may explain the difficulties related to the enforcement of EIA, even in those few countries that have implemented mandatory EIA since the 1970s. Other issues, such as technical skills and administrative capacity to manage decision-making processes based on environmental protection principles, seem to be less important as an explanation of these difficulties. Although the progress of EIA in the region still depends to a certain extent upon practical experience, there is no doubt that the essential requirement for its full adoption as a planning tool and an efficient aid to decision-making is political will and commitment.

The chapter draws upon information made available in recent workshops and papers produced with the support of technical cooperation agencies, in particular the United Nations Environment Programme (UNEP) and the World Conservation Union (UICN), or arising from work for IDB or the World Bank. These documents include, albeit to varying levels of detail, information on the EIA procedures of 20 countries (UNEP 1993; IDB 1995, 1996; ORALC 1995; UICN 1996; World Bank 1996).

This chapter begins with an overview of the economic, political and environmental situation in the region and a brief survey of the legal and institutional frameworks for environmental protection. The external influences upon and the evolution of EIA are discussed. The next sections provide information on the national EIA systems, comparing the different legal, institutional, technical and procedural aspects, and considering EIA implementation and the need to improve its efficiency as an aid to decision-making. The chapter concludes with a perspective on the use of EIA as an aid to sustainable development, and the regional trends in relation to strategic environmental assessment (SEA). Two case studies of EIA in Bolivia and Chile, countries with distinctive characteristics, are included.

10.2 OVERVIEW OF THE REGION

South and Central American countries have gradually evolved to form a dissimilar grouping, reflecting their diverse historical backgrounds, the origins of their settlers and immigrants and their individual political, economic and cultural situation. Box 10.1 provides an overview. They share the same model of development. Precapital-

Box 10.1 Countries in South and Central America

Political history
Most of the 21 countries are former Spanish colonies which gained independence at the beginning of the 19th century, while Brazil was colonized by Portugal until 1882. Independence came only in 1981 to Belize and in 1966 to Guyana, both being previously British colonies. Suriname depended on the Netherlands until 1975, and French Guyana is still an overseas department of France

Area and population
The largest and most populated country is Brazil comprising 8.51 million km^2 and 150 million inhabitants. El Salvador is the smallest, with 20 935 km^2, and Belize the least populated (188 000)

Economy
No country in South or Central America is listed by the World Bank (1992) in the group of high-income nations of the world:

- Low-income countries (GNP per capita less than $US610): Guyana and Honduras
- Lower middle-income countries (GNP per capita from $US610 to $US2465): Argentina, Belize, Bolivia, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Nicaragua, Panama, Paraguay and Peru
- Higher middle-income countries (GNP per capita from $US2465 to $US7620): Brazil, French Guyana, Mexico, Suriname, Uruguay and Venezuela

ist forms of labour division characterize agricultural activities. Industrialization only occurred after the Second World War as a response to the economic needs of western developed countries. Therefore, production has been concentrated in those economic sectors which are of interest to the international market, rather than being related to local consumption needs. This concentration eventually turns these countries into easy prey to international economic forces, in particular during periods of economic crisis (Furtado 1970).

Other common regional characteristics are political instability and inefficient bureaucracy. In the 1970s and 1980s, susceptibility of political leaders and military forces to the influence of conservative classes and international capitalism led many countries to different forms of totalitarian governments and civil conflicts, which can still be observed in Central America. Public administration tends to disregard the needs and concerns of the civilian population, being largely affected by administrative discontinuity and frequent changes of policy directives.

In recent years, South and Central America have tried to emerge from the economic stagnation of the 1980s. Although external debt continues to grow and unemployment is still a major concern, democracy has spread, inflation has been reduced and productivity and per capita income have grown. The private sector's performance has improved and privatization has had a prominent place on political agendas as the solution to public administration deficiencies.

However, environmental degradation persists as an obstacle to promoting sustainable development and enhancing the quality of life. In many countries, large undeveloped areas still exist side-by-side with industrialization. The negative effects of a fast economic expansion have added to the social and environmental problems related to poverty, continually aggravating the existing environmental situation. Approximately one-third of the population is condemned to living below the poverty line. Survival often depends upon the overexploitation of natural resources, and this, together with mining and oil development, has led to depletion of biodiversity and destruction of important ecosystems, such as forests, grassland, wetlands, coral reefs and estuaries. In urban areas, air quality is severely affected by motor vehicles and uncontrolled industrial emissions. Water resources are polluted by urban and industrial wastes and domestic waste is disposed into open dumps, wetlands and watercourses. Pesticides and fertilizers are a common source of soil and water contamination, as well as health problems. In addition, migration from rural to urban areas lacking basic infrastructure and social services is responsible for the slums and shanty towns that can be found in almost all cities of the region, with serious social consequences.

In this context, environmental management programmes have been focused mainly on the rehabilitation of damaged ecosystems and implementation of measures to correct the harmful effects of existing activities, to the detriment of the development and application of preventive management tools, such as EIA. Moreover, the dominant culture of economic growth and employment is enough to justify decisions on development projects, even when important environmental resources are at stake. However, significant environmental improvement work has commenced. For example, a large amount of technical and financial resources has been allocated to pollution control equipment and water and air quality in Mexico and Brazil, and also solid waste management, water and sewage system work and encouragement of sustainable use of natural resources in all countries.

Currently, all South and Central American countries have legal and administrative systems to deal with environmental matters, including EIA, some of them dating from the mid-1970s. A collection of environmental legislation prepared by UNEP Regional Office for Latin America and the Caribbean Region (UNEP/ROLAC) (1994 and 1995) shows that environmental protection is mentioned in the constitution of nine countries. EIA has been included as one of the tools for environmental policy implementation, together with environmental quality and emission standards, permit systems, economic incentives, environmental planning, natural resource management, environmental education, wildlife reserves, environmental protection and conservation areas. Of all these policy tools, EIA has been the most widely discussed and, to a certain extent, implemented. Experience with economic incentives and environmental planning has been limited and restricted to certain areas. Although a number of parks, sanctuaries and nature reserves have been created in recent years, most of them still await a proper management plan and efficient implementation.

In practice, environmental management in the region does not reflect the institutional and legal improvements or the environmental awareness of civil servants, non-governmental organizations (NGOs) and scientific communities. Environmental regulations are poorly enforced on account of the lack of human and financial resources. Although since the Rio 92 Conference environmental issues have become part of the discourse of politicians and industrialists, the need to solve pressing social problems has diverted most governmental attention to other matters. Against this background, the evolution of EIA in the last 10 years can be considered impressive, not least as, until 1986, only six countries had implemented EIA systems (Verocai 1988). At present, all countries in South and Central America have some type of EIA system.

10.3 EVOLUTION OF ENVIRONMENTAL IMPACT ASSESSMENT

International development aid agencies have played a prominent role in both the introduction and the evolution of EIA in South and Central America. In fact, the first environmental assessment performed in the region dates from 1972, when an international consultant was hired to prepare a report on the impacts of a hydroelectric power plant in the north-western region of Brazil, in response to a request from the World Bank. The project, financed by the Bank, was already being implemented, with strong opposition from local environmentalists and scientific groups. In 1975, the World Bank also required an environmental evaluation for financing the Salto Grande river basin development project, involving water resource management for power generation, shared by Argentina and Uruguay. This led the bilateral committee managing the project to carry out a series of studies to mitigate the environmental impacts. By that time, similar examples were evident in other South and Central American countries, but these were mainly cases of post-development assessments and served only to mitigate the most evident impacts, as promoters had already decided upon project implementation.

External pressure to consider environmental aspects in project planning has been followed by financial help and technical assistance for institutional and capacity building. Multilateral and bilateral financing agencies, in close collaboration with international organizations, such as UNEP, the United Nations Development Programme (UNDP) and the Pan American Health Organization (PAHO), have been a powerful influence on the establishment of environmental policies and law and a significant stimulus to the promotion of technical assistance for institutional development programmes on environmental management, most of them with components relating to EIA. Administrative reforms have been motivated with the objective of providing government sectoral institutions with environmental units; creating environmental control agencies; and providing resources for environmental data collection, information systems, training, equipment and technical literature, as well as funds for workshops, conferences and foreign consultancies.

At the end of the 1970s, UNEP sponsored two major projects, both with the main objective of improving the technical capabilities of civil servants: the first in Mexico, to assess the consequences of development in Mexico Valley, and the second in Rio de Janeiro State, Brazil, relating to the development of appropriate approaches for environmental management and EIA. The outcomes of the latter served as the basis of EIA regulations in Brazil. Other examples of the many cooperative activities and studies carried out in the region at that time are the important programmes in Venezuela and Peru (also with external support), which surveyed ecosystems and analysed environmental problems and regional planning, with an emphasis on environmental management.

Despite external pressures, financial assistance and technical cooperation, by 1990, only Colombia, Venezuela, Mexico and Brazil had instituted EIA as an environmental policy tool. Colombia was the first country in South and Central America to establish a formal EIA process. An Act on the Conservation of Environment and Natural Resources, issued in 1974, required the presentation of an environmental impact statement by all public and private agents who intended to promote an activity likely to result in environmental damage. But it was not until 1984 that these requirements began to be enforced by the environmental authorities, on account of the lack of proper regulations. In Venezuela, the General Law on the Environment of 1976 provided for an EIA system. However, its application was limited to certain private projects (mining, oil exploitation, water management projects) and the assessment of a few environmental components (air and water). The first legal provision for EIA in Mexico came in 1980 with the approval of a law on public works. In 1982, an encompassing law on environmental protection extended EIA to private and public projects with significant environmental impacts, although its full application was only achieved after new regulations were passed in 1988. In Brazil, from 1977 to 1986, environmental agencies of several states had been empowered to ask for impact statements as part of the documents required for environmental permit applications, but few such cases have been reported. Although the National Environmental Policy Act of 1981 extended mandatory EIA to the rest of the country, the set of directives required to put it into practice were only approved in January 1986.

Both external and internal factors account for the rather limited development of EIA in South and Central America until the end of the 1980s. External support, although the trigger for the emergence of government and public environmental awareness, had not been sufficient to promote a sound institutional and technical capacity on environmental management and EIA. Internal factors which cannot be easily influenced from abroad include: (i) the lack of political will to internalize EIA into the planning and decision-making processes; (ii) the inertia of public administration that hampered the changes needed to promote suitable interaction between sectoral government authorities and to incorporate environmental issues in project approval and implementation; and (iii) most importantly, the authoritarian character of governments, which resulted in the formal EIA requirements of financing agencies being met, whilst internal discussion on the environmental consequences of development actions already decided upon was avoided.

A new impetus for EIA and environmental management in developing countries which has positively affected the evolution of EIA in South and Central America came with the results of the World Commission on Environment and Development report *Our Common Future* (1987), and culminated in the agreements of the United Nations (UN) Conference on Environment and Development in 1992. This has helped to improve government and investor awareness of the principles of sustainable development and to increase support for institutional capacity building from development aid agencies and international environmental organizations, such as the UICN. On the other hand, in many countries political stability, with the start of the redemocratization process, evidence of economic recovery and the opening-up of international markets, has stimulated new development loans by international banks which had already improved their own environmental procedures. For example, the World Bank published in 1989 the Operational Directive 4.00 that set out the Bank's EIA policy, and in 1991, the *Environmental Assessment Sourcebook*, a broad manual designed to assist those involved in environmental assessment. This provided civil servants in borrowing countries with a large amount of information on the main technical aspects of EIA. By 1996, the environmental portfolios of the World Bank and IDB, the main financial sources for development in the region, covered almost all countries of South and Central America (see Chapter 6, this volume, for a detailed discussion of the funding agencies and EIA).

Bilateral cooperation for environmental management has also been impressive in recent years. EIA capacity building activities of the UK Overseas Development Administration (ODA), Japan International Cooperation Agency (JICA), Canadian International Development Agency (CIDA), Norwegian Agency for Development Cooperation (NORAD) and others have been influential. Two examples are the institutional building programmes by the Danish International Development Agency (DANIDA) in Nicaragua and by the German Agency for Technical Cooperation (GTZ) in Paraná State, Brazil. The DANIDA support programme commenced in 1994, aimed at the establishment and staffing of the National Directorate for the Environment (DNA), in the recently created Ministry of the Environment and Natural Resources of Nicaragua. Components of the first phase (2 years) of the programme included an environmental action plan; the promotion of a national environmental law and respective regulations (including environmental standards) and capacity building in relation to and the creation of an EIA system. This last component was completed in 1995, providing DNA with a trained staff and a procedural and technical basis for the implementation of EIA, including a complete set of guidelines and technical papers prepared by the same staff with the assistance of a consultant.

In Paraná, from 1987 to 1997, GTZ and the state environmental agency developed a programme on the environmental impact of dams. In addition to limnological research and water monitoring activities, a series of technical projects were carried out, related to EIA legal aspects, procedures (screening, scoping, public participation) and methodology (EIA methods, impact prediction techniques, mitigation measures, potential impacts of different development project types, environmental management plans). A comprehensive EIA manual has been produced, published in 1992 and updated in 1994 and 1997 (SUREHMA & GTZ 1994).

The results of this general trend towards EIA implementation in South and Central America are uneven and still far from what can be considered as best practice, as discussed below. At the time of writing, all governments are immersed in administrative reform, which includes changes in the environmental agencies and departments and privatization of public services and infrastructure development (ports, roads, power plants, etc.). There is a movement towards decentralization of environmental control and partnerships with NGOs and private and public users of natural resources. Concerns about the progress of EIA application in the region relate to the uncertainty of the outcomes of these important developments.

10.4 CURRENT STATUS OF ENVIRONMENTAL IMPACT ASSESSMENT

10.4.1 Environmental impact assessment systems

At present, as shown in Table 10.1, most countries in South and Central America have developed institutional structures to deal with environmental management, the most common arrangement being a ministry with responsibilities for the environment and conservation of natural resources (e.g. Brazil, Bolivia, Chile, Guyana, Nicaragua and Venezuela). However, this approach is impeded by a long tradition of sectoralism, as, in many countries, responsibilities for environmental matters have been dispersed among line agencies and ministries, without effective coordination to ensure compatibility of action and sound policy. The creation of environmental commissions at the national level to integrate and coordinate activities performed by sectoral ministries has not always solved this situation, as in the case of Bolivia, Chile, Guyana, Panama and Guatemala.

10.4.2 Centralized and decentralized environmental impact assessment systems

One of the basic differences between EIA systems is the level of government responsible for implementation. In many countries, such as in Nicaragua, Uruguay, Paraguay, Venezuela, Honduras, Belize, Peru and Costa Rica, the management of the system is centralized in the national government. This presents more disadvantages than advantages. The advantages include the potential to maximize human and operational resources and capabilities, which are recognized as scarce in the entire region. The disadvantages are related to the reduced level of public participation and to difficulties relating to the follow-up of project implementation and control in relation to the adoption of mitigation measures and monitoring plans.

An example of a decentralized system is that of Brazil, a federation where each state is responsible for the execution of environmental management programmes, being competent to issue its own environmental standards and EIA procedures, provided that they are in harmony with the national directives. The advantage of this approach is that it favours public participation in the decision-making process, as well as monitoring and follow-up of project implementation. However, it tends to disperse scarce human and operational resources. In Argentina as well, although no EIA legislation has yet been approved at the national level, the provinces of Cordoba and Mendoza have passed and implemented their own EIA procedures. In Buenos Aires and Neuquen provinces, however, EIA has been provided by law but as yet no regulations have been approved.

Another type of EIA institutional arrangement has been adopted in Bolivia, Chile, Venezuela and Colombia. In these countries, regional and local environmental authorities are responsible for implementing EIA. These authorities are representatives of the national government appointed by the president, rather than independent powers. This may limit a full decentralization of the EIA system, as only some steps of the EIA process are managed by the regional or local government, the final decision still depending upon the national environmental authority.

10.4.3 Inter-institutional coordination, sectoralism and centralism

As EIA and the decision-making process require multi-sectoral and multidisciplinary integration, one of the most important aspects to be taken into account in appraising the system is the mechanism for inter-institutional coordination. This is certainly where most EIA systems in South and Central America countries have failed. In many countries, a long tradition of sectoral resource management inhibits the implementation of an integrated approach to environmental protection. Responsibility for a number of environmental issues remains dispersed amongst government agencies in charge of natural resources exploitation, such as industry, agriculture, forestry, mining, energy and water management. When applying environmental regulations, these agencies have to deal with the conflict between pro-

Table 10.1 EIA in South and Central America: institutional aspects.

Country*	Environmental law (date)	National EIA regulations (date)	EIA leading agency
Argentina	—	†	Provincial agencies
Belize	1992	1992	National agency and national commission
Bolivia	1992	1995	National, departmental and local agencies
Brazil	1981	1986	State agencies
Chile	1994	1991–1996	National and departmental commissions, and sectoral agencies
Colombia	1974	1974–1985	National and provincial agencies
Costa Rica	—	1993	National commission
Ecuador	1997	‡	National commission
El Salvador	—	1992	Sectoral agencies; proposed EIA bill assigns this attribution to a national commission
Guatemala	1986	1990	National commission
Guyana	1996	1996	National agency
Honduras	1993	1993	National agency
Mexico	1982	1988	National agency
Nicaragua	1993	1994	National agency with participation of other government sectors
Panama	1994	1991§	National agency
Paraguay	—	1993	National agency
Peru	1990	—	National agency (proposed)
Uruguay	—	1994‖	National agency
Venezuela	1976–1992	1976	National agency

*French Guyana and Suriname are not included. As an overseas department of France, French Guyana follows the French EIA system. Detailed information on EIA practice in Suriname was not available.
† Regulations of the Province of Cordoba date from 1990; those of the Province of Mendoza are from 1994.
‡ Sectoral regulations exist for different matters, since 1989.
§ For mining projects, sectoral regulations have existed since 1991; also, public participation has been a legal requirement since 1991.
‖ Several regulations for nuclear power have existed since 1991; for ports, since 1992.

moting exploitation and conserving natural resources. Most of them are issue oriented, under the jurisdiction of sectoral ministries. Environmental protection and management concerns have only recently been brought on to the political agenda. Therefore, sectoralism has remained in those EIA systems that have been recently established (Chile, Bolivia and Guyana are good examples), in which the main responsibility for preparing terms of reference, reviewing EIA studies and monitoring project implementation is assigned to the lead sectoral agency. In many cases, although environmental units have been created in these agencies, an intrinsic conflict of interest undermines the effectiveness of the EIA process.

Earlier EIA systems, such as those of Venezuela, Brazil and Mexico, were influenced by political centralism: in these cases, all functions being assigned to environmental agencies. This is also a characteristic of systems in Central America (Belize, Honduras, Nicaragua, Costa Rica, Guatemala, Panama and El Salvador). To overcome the deficiencies of institutional and sectoral integration and coordination, some countries have created inter-ministerial commissions, such as the National Commission of Environmental Impact Assessment Studies (CONEIA) in Costa Rica, the National Committee for Environmental Evaluation (CNEMA) in Belize and the National Environmental Commission (CONAMA) in Guatemala. In Nicaragua, where the EIA system has been recently approved, the option was a semicentralized system, the main responsibilities being assigned to the Ministry of Environment and Natural Resources, with the participation of representatives of sectoral environmental units in EIA scoping and review.

10.4.4 Public participation

Public participation is an essential characteristic of the EIA process, which must comprise efficient mechanisms to promote an adequate level of public involvement in decision-making. Although included as mandatory in most legislation, public participation is still deficient in all countries of South and Central America because of the lack of appropriate procedures. Public participation requires the disclosure of EIA reports, studies or equivalent documents containing information about the project and its impacts, a mechanism that has proven to be inadequate. An EIA workshop held in Central America concluded that, not only do EIA studies provide the public with inadequate information about the impacts of a project, but most communities have poor access to them (UICN 1996). Moreover, the low level of literacy is often a factor limiting the understanding and evaluation of the multiple effects of a given project in rural and urban communities.

Specific problems arise when the disclosure of information occurs late in the project planning cycle. In Mexico, for instance, information is accessible only after the decision has been made, and existing provisions allow the project to be halted only if there are legal objections to its implementation.

Another problem is the lack of mechanisms to ensure government's response to public concerns. To overcome this situation some countries have adopted specific procedures to improve communication between the government and the public. For example, in Bolivia, when questions and demands from the public have been formally addressed, the government agency must respond within a maximum of 15 days. However, as yet there has not been a significant improvement to the EIA process.

In a few countries (Belize, Bolivia and Brazil), public hearings have been established as mandatory for the approval of projects submitted to the EIA process, but even here this has not been sufficient to ensure an adequate level of public engagement. The main reason is that the public get involved only at the later stages of the decision-making process, when conflicts are inevitable and little flexibility is left for negotiation on mitigation and compensation measures, such as environmental protection areas, leisure facilities or social services. To be effective, public hearings should be implemented as part of a meaningful process of public participation and negotiation, and not just a bureaucratic step for project approval.

10.4.5 Decision-making

In most countries of the region, EIA is required as a condition of the issuing of environmental permits. This has been recognized as an important improvement when compared with systems that, due to the lack of procedures to impose administrative sanctions on environmental damage, depend largely upon the role of the courts to ensure environmental protection, as well as the implementation of the EIA recommendations. Only Brazil has a comprehensive administrative system to enforce environmental legislation. In the other countries, it is often necessary to appeal to the courts on the basis of the citizen's constitutional rights. For example, in Chile, these procedures were used to halt the construction of an oil station and to impose on a nightclub the obligation to mitigate noise impacts (IDB 1996). Nevertheless, to be effective the environmental permit depends upon the institutional and technical capabilities of the responsible government agencies: if project evaluation and EIA reviews are not consistently performed, decision-making may be impaired.

Another limiting factor is the short time in some countries for EIA review and public participation, resulting in a lack of transparency in decision-making. In Bolivia, Honduras and Costa Rica, for example, the maximum period for EIA review is 30 days and, in Chile, 20 days. Such short time periods are clearly insufficient, considering the length of time needed to promote inter-institutional and multidisciplinary arrangements and perform a good quality EIA review, in particular for complex projects. The situation in the UK gives us a good comparison: the local planning authority has 16 weeks (80 days) in which to make a decision on any application for development where EIA is required.

On the other hand, unlimited time for EIA review and decision-making may result in the loss of credibility of the EIA process, project proponents failing to consider it as a cost-effective tool for sound environmental management. This is the situation in most countries in the region.

10.5 ENVIRONMENTAL IMPACT ASSESSMENT PROCEDURES

Table 10.2 provides a comparative overview of the main procedural aspects: screening, scoping, participation and timetabling. The following sections provide further detail and also address EIA review and monitoring and auditing.

10.5.1 Screening

Many EIA implementation problems in South and Central America arise from deficiencies in screening procedures, one of the most important stages

Table 10.2 EIA in South and Central America: procedural aspects.

Country	Screening	Scoping	Public participation	Administrative timetable
Argentina	Positive list and list of exempt projects	Minimum EIA contents	—	—
Belize	Preliminary assessment	General and project specific TOR	Participation in EIA scoping and decision Public access to EIA	—
Bolivia	Computerized screening procedures	Only the basic content	Public access to EIA report and public hearings	Administrative delays are defined
Brazil	Positive list	Basic EIA contents and project specific TOR	Public access to EIA report and public hearings	Timetable defined in some state regulations
Chile	Positive list	Basic EIA contents; specific TOR for some project types	Public access to EIA summary is established	Administrative delays are defined
Colombia	Positive list	Basic EIA contents; specific TOR for some project types	No public partipation reported	—
Costa Rica	Positive list plus projects defined by sectoral regulation	Project specific and project type specific TOR	Copies of EIA report provided upon written request	Administrative delays are defined

(Continued on p. 192)

Table 10.2 *continued*

Country	Screening	Scoping	Public participation	Administrative timetable
Ecuador	Positive list and additional screening criteria	Minimum scope established and project specific TOR	Public access to EIA; discretionary public consultation and hearing	No administrative delays are defined
El Salvador	Screening criteria proposed in the national EIA bill	Some project type specific TOR.	Mechanisms for public participation proposed in the national EIA bill	Administrative delays proposed in the EIA bill
Guatemala	Positive list in proposed regulations	Minimum EIA contents	Proposed	No administrative delays are defined
Guyana	Positive list	Broad EIA contents	Public access to EIA	Administrative delays are defined
Honduras	Positive list and additional screening criteria	Project specific TOR required	Public disclosure of EIA	Administrative delays are defined
Mexico	Positive list	Basic EIA contents	Public disclosure of the EIA report	Administrative delays are defined
Nicaragua	Positive list	Basic EIA contents and project specific TOR	Public disclosure of EIA	Administrative delays are defined
Panama	Positive list	Broad EIA contents	No public participation is reported	—
Paraguay	Positive list and project scale criteria	Basic EIA contents	Public disclosure of EIA	Administrative delays are defined
Peru	Proposed screening procedures	—	—	—
Uruguay	Positive list	Broad EIA contents	Public disclosure of EIA and discretionary public hearings	Administrative delays are derogatory
Venezuela	Positive list of projects and sensitive areas	Project type specific TOR	Public disclosure of EIA	Not reported

TOR, terms of reference.

of the EIA process. In a number of countries (Belize, Bolivia, Brazil, Chile, Costa Rica, El Salvador, Honduras, Mexico and Nicaragua), EIA regulations provide for a 'positive' (or 'inclusive') list of projects and activities that require an EIA. Screening procedures in Bolivia, Belize, Chile and El Salvador, however, combine the 'positive list' with other criteria (such as project scale and potential impacts) to appraise the proposal and define the category of EIA study which is required: either a full, or an issue-orientated, EIA. Other systems consider neither the project dimension nor the environmental characteristics and ecological sensitivity of the affected area.

These aspects are a particular concern in countries with a centralized EIA system, because projects or activities which are not seen as potentially harmful to the environment in general may have strong negative impacts in sensitive areas.

In Brazil, national EIA directives contain a broad and general 'positive list', with some criteria relating to project scale and the environmental characteristics of the affected area. However, taking into account the size of the country and the diversity of ecosystems, the precise definition of project size and environmentally sensitive areas has been left to the state EIA regulations to establish. For many reasons, including the deficient institutional capacity of some state environmental agencies, only a few states have developed specific EIA regulations. The national EIA directives, although generic and unsuitable for a number of screening situations, have still been directly applied in the majority of Brazilian states.

Some countries in Central America do not require screening. In Guatemala, a national law of 1991 established legal penalties upon both public officers who approve a project likely to damage the environment without requiring an EIA and private investors who implement such a project before submitting an EIA. The result of this has been a large number of EIAs that CONAMA is unable to review. Guidelines and procedures to solve this and other problems due to the lack of EIA regulations were proposed in 1993, although they are still under discussion. A similar situation arises in both Venezuela and Belize.

Imperfect screening is also an important constraint to the effectiveness of EIA. In many countries, EIA studies have been required for activities with no significant impacts, which overburdens the environmental process with excessive work and unnecessary costs. Moreover, when an EIA is required for projects that have only minor impacts and for which standard environmental control measures are widely known, the result is the creation of a type of 'EIA industry', with the production of basically the same report for a number of different but similar projects. This may happen in Brazil, Chile, Guatemala and other countries in the region.

10.5.2 Scoping

The fundamental role of scoping in the EIA process and the benefits derived from a participatory process are clear to most practitioners. The lack of appropriate scoping procedures, however, particularly in South and Central America, is reported as a major reason for poor EIA studies and deficient EIA review (UICN 1996).

Only a few countries have established EIA regulations requiring the formulation of terms of reference specific for each project (Brazil, Belize, Nicaragua and Honduras). Belize, Honduras and Nicaragua also adopt, to an extent, a participatory approach, although not always efficiently enforced, on account of the limited technical and administrative capacity of environmental agencies.

In Mexico and Costa Rica, regulations define that an EIA study must follow appropriate terms of reference developed in accordance with the project type. In all other countries, scoping is limited to the provision of a broad and general list of issues to be considered. These general terms of reference are to be followed for all project types, regardless of scale or location. On many occasions this has resulted in lengthy and superficial studies that address neither the main project impacts nor the environmental protection conditions required during implementation.

In the developing countries of the region in particular, where the EIA legal framework has been established in later years, the environment has been defined broadly, and the holistic approach adopted for EIA requires the consideration of both biophysical and socio-economic impacts. This is more clearly expressed in the regulations relating to the content of EIAs, such as those of Argentina (Provinces of Cordoba and Mendoza), Bolivia, Brazil, Mexico, Guatemala, Honduras, Nicaragua and Panama.

10.5.3 Impact prediction methods

The use of appropriate EIA methods and impact prediction techniques plays a major role in ensuring quality. There is a common opinion that much training is still needed to improve EIA methodology in developing countries. In the 2-

year international study on the effectiveness of environmental assessment, conducted jointly by the Canadian Environmental Assessment Agency (CEAA) and the International Association for Impact Assessment (IAIA), it was found that most EIAs have omissions and deficiencies relating to impact prediction and impact evaluation (Sadler 1996). Although the study was not particularly directed to South and Central American countries, its conclusions do reflect very closely the situation in this region.

A study by Lemons and Porter (1992) compared the use of EIA methods and techniques in developed and developing countries. In developing countries, checklists, expert and non-expert opinion and qualitative modelling were used most often for impact prediction. This explains why, in most EIA studies, indirect and long-term impacts are seldom assessed and estimation of impact magnitude is rarely performed. Incomplete or incorrect data and lack of qualified personnel, financing and computing resources are the chief problems encountered in performing impact assessments, as was reported by most of the country representatives at the workshop on EIA in Central America (UICN 1996). As a result, EIA studies tend to be general rather than issue-orientated, superficial rather than relevant to decision-making, and qualitative, not quantitative.

10.5.4 Register of environmental impact assessment consultants

The preparation of environmental impact studies by private independent consultants is a common practice in the region. In some countries, such as Brazil, Mexico, Guatemala and Panama, this is mandatory. Pressures from NGOs and from governmental agencies have played a major role in the approval of such provisions, with the aim of ensuring impartial project evaluation. However, there has been much discussion of the effectiveness of this measure, in the sense that there will always be an economic dependence between consultants and project proponents. It can be argued that rigorous EIA review procedures are more effective than the mandatory requirement for 'independent' consultants.

Impartiality and technical quality of EIA studies are closely linked. Therefore, in some countries, another legal requirement has been that consultants should be registered. As there is no efficient mechanism to evaluate the technical qualification of these consultants, save the examination of individual résumés, in none of these countries have such registers proven to be sufficient in themselves to ensure better quality studies. The need to train government officers and consultants was reported by all countries represented at the workshop on EIA in Central America (UICN 1996). Although the efficacy of national consultant registers has not yet been evaluated, there was a general concern about their possible misuse to favour some and exclude other skilled professionals or consultancy firms.

10.5.5 Environmental impact assessment review

The quality and transparency of the decision-making process is largely defined by the efficiency of EIA review. In the region, the latter is the responsibility of either the national environmental agency or the sectoral ministries. In a few exceptions, Costa Rica, Belize, El Salvador, Guatemala and Chile, EIA review is performed by a national multisectoral and multidisciplinary group. In every case, however, the lack of technical capability in environmental and sectoral agencies and the inadequacy or absence of terms of reference for EIAs are important limiting factors. As discussed earlier, in many countries, this situation is worsened by the time limits upon the review phase.

10.5.6 Monitoring and auditing

Efficient impact monitoring of projects which have been subject to EIA and auditing of the effectiveness of EIA have not yet been enforced fully in the region. Major macroeconomic reforms and structural adjustment plans have contributed to the down-sizing and weakening of governmental institutions, including those in charge of environmental protection. At present, existing human and operational resources are insufficient to enforce the traditional 'command and control' environmental policies that still prevail in the region. No other policy alternative has yet been implemented. Although this situation is particularly critical in centralized institutional environmental systems, it also affects decentralized administrations, as the lack of human and operational resources is even greater in regional and local institutions. Although there are ways to overcome this constraint by promoting cooperation with universities and NGOs and by self-monitoring, experience is limited.

Insufficient human and operational resources are not the only cause of deficient follow-up and impact monitoring. The poor quality of EIA studies also plays a major role, as it is impossible to implement mitigation measures which are not clearly defined and difficult to monitor impacts that are imprecisely described.

10.5.7 Public participation

Mechanisms for public participation in EIA adopted in most of the countries of the region are similar to those used elsewhere throughout the world. Emphasis has been placed upon the disclosure of EIA reports and public hearings. However, disclosure has been limited by poor information provided to the public on the EIA reports and the short time periods for consultation and public consideration. Access for many community groups may be hampered by financial constraints, for example limiting travel to where a report is available, and the incompatibility of the working hours of the government agencies relative to the free time of community representatives. Barriers imposed by the technical language of the EIA reports are frequently a major drawback, restricting the understanding of the public and the social groups potentially affected by a project, particularly in those countries where native communities have maintained their own languages.

The quality of the information provided in EIA documents may be far below what is needed for a consistent comprehension of the multiple impacts of a project and for coherent decision-making. In many cases, reports do not provide for effective public discussion of project impacts, generally being used to justify implementation rather than to facilitate negotiation.

Public hearings are held only upon request and generally take place in the later decision-making stages, depending to a large extent upon community group and individual initiatives.

10.6 CASE STUDY—BOLIVIA

Owing to the periods of political and economic instability that Bolivia has experienced in the past, environmental considerations have only recently been brought on to the political agenda. In 1988, the government created the Subsecretariat for Renewable Natural Resources and Environment, under the Ministry of Rural Affairs (Ministerio de Assuntos Campesinos y Agropecuarios). In 1990, with the institution of the General Secretariat for the Environment, the development of the National General Environmental Law commenced, with its approval in April 1992. Since then, major changes in the institutional framework for environmental management have been made, the most important being the creation of the Ministry of Sustainable Development and Environment (MDSMA), which inherited the functions of the national environmental agency and of the ex-Ministry of Planning and Coordination.

Although economic growth since 1990 has been encouraging, Bolivia remains one of the poorest countries in the region, with an estimated one-third of the population living in conditions of extreme poverty. Historically, economic development has relied upon the exploitation of natural resources (mainly fossil fuels and forest and mineral resources), not only for the internal market but primarily for exports. In 1993, however, the government decided to increase economic growth in a sustainable manner. Several measures were proposed, such as capitalizing public enterprises, reforming the pension system, enhancing public-sector efficiency and decentralizing public functions, promoting the enforcement of environmental legislation and encouraging private-sector practices to restore and preserve the environment.

10.6.1 The environmental impact assessment system

EIA process regulations were approved in 1995.

They apply to both private and public projects, including governmental plans and programmes, from the beginning of the investment phase.

After undergoing a project screening based on a computerized system that relies on information provided by the proponent both in a standard format and related to a set of predetermined criteria, a project may be classified in terms of one of the following categories, similar to many of the development banks' classifications (see Chapter 6, this volume, for a full description): (i) projects requiring a full and broad EIA; (ii) projects requiring a full EIA on specific issues; (iii) projects requiring only mitigation measures, an action plan, monitoring and follow-up; and (iv) projects not requiring an EIA. Regulations also define the basic contents of the EIA study; administration of the process and the distribution of responsibilities between the municipal, sectoral and national authorities; the creation of a consultants' register; the creation of an environmental permit; provisions regarding transboundary impacts; and mechanisms for public participation.

The EIA approach adopted in Bolivia is characterized by decentralization within the MDSMA, at the national level as well as within the environmental units at departmental and municipal levels. However, government officials at the MDSMA have expressed their concern about the lack of an appropriate institutional framework and of technical capabilities at the departmental and municipal levels. These authorities are not elected but nominated by the President as representatives of the central authority. Therefore, reviews of the EIA studies and environmental permits issued by local and departmental powers must be ratified by MDSMA. In this system, although decentralization exists, there is no autonomy, a situation different from the decentralized systems of Argentina and Brazil. MDSMA is responsible for: (i) developing standards, regulations and procedures; (ii) administering the EIA system and the consultants' Register; (iii) reviewing, approving or refusing EIA studies, and issuing the environmental permit for projects under national jurisdictions; and (iv) approving or refusing reports with regard to the classification of projects (according to each project category) and ratifying environmental permits given by the sectoral or departmental institutions.

These regulations are extremely detailed. Three major positive aspects are the establishment of an administrative timetable, although this is far too short a time to ensure the quality of the decision-making process; the definition of coordination mechanisms between sectoral agencies, through the creation of intersectoral working groups; and the establishment of a major set of criteria for project screening. The Bolivian EIA system has specific provisions similar to the ones existing in the French system, which are aimed at avoiding unnecessary delays in the administrative procedures. When a regulatory timetable is not respected, the proposal is accepted as presented by the proponent, both the developer and the government agency being liable if environmental damage occurs as a result of project implementation. Such a situation, however, has never been reported.

Certain weaknesses concerning the effectiveness of the system should be noted:

- Lack of project-specific terms of reference. International experience shows that general and broad EIA checklists result in long and superficial studies which do not consider the main issues to the extent needed for decision-making, i.e. EIA studies tend to become merely a bureaucratic exercise.
- Lengthy and bureaucratic administrative procedures, involving the need for approval by the national or departmental authority of the municipal and sectoral reports at the screening phase and during the EIA review.
- A short timetable for EIA review (maximum of 30 days for a full EIA and 20 days for an EIA focused on specific issues).
- Lack of specific mechanisms to encourage public participation in the EIA process: the existing legislation relies on the disclosure of the EIA reports as the main mechanism. The effectiveness of this arrangement is jeopardized by inadequate and insufficient information in the EIA studies, as well as by difficulty of public access.
- Potential for manipulation of the consultants' Register to facilitate registration of consultants according to political criteria.

10.6.2 Institutional capabilities for enforcing environmental law

Responsibility for the enforcement of environmental regulations is at the departmental and local levels. However, most of them still lack the appropriate institutional, organizational and human resources. The industrial park in Bolivia is made up of small and medium-sized enterprises; and here economic priorities are used to justify the delay in complying with environmental protection requirements. The traditional 'lobbying power' of large groups of economic interests also threatens the effectiveness of enforcement.

In general, deficient financial resources and technically qualified staff are the main reason for poor impact monitoring and control, which is aggravated by conflicts with old legislation that does not encompass the new post-1993 environmental policy. Although comprehensive quantitative data are not available, an illustration can be given: under the EIA regulations, only 10 professionals were responsible for screening over 700 projects (considered from June 1994 to April 1996) and for issuing the environmental permit when required (only 10% of the screened projects did not require an environmental permit). Only 100 of the 700 have been visited during project implementation. Because environmental regulations were only recently issued and are not yet fully enforced, detailed information is lacking. However, some sectors are permanently under a self-regulation process, which is an appropriate solution for overcoming the lack of capabilities and personnel at the MDSMA.

10.7 CASE STUDY—CHILE

Environmental problems in Chile result from years of development policy implementation with no concern for the environment. As a consequence, environmental degradation is significant, mainly in relation to water quality, natural resource conservation and air quality, the latter a particular issue in the Metropolitan Region of Santiago. The legal framework for environmental management in Chile reflects traditional sectoral policies. Legal provisions concerning different aspects of the environment are dispersed amongst various legal texts under the responsibility of different ministries and institutions, such as the Code of Water, the Code of Health and the Sanitary Code, which were issued in response to emerging problems. In the inventory of the environmental legislation collected and published by the Chilean CONAMA (1992), there are more than 900 sectoral legal provisions. Some were introduced at the beginning of this century (for example, a law on the prohibition on the disposal of solid waste into watercourses, which only became operational in 1995). Others resulted from international agreements signed by Chile, such as those on the preservation and conservation of native natural resources.

Economic policy follows neoliberal free market principles, economic growth being based on exploitation of natural resources and production of raw materials. This policy has successfully improved social conditions. In 1995, unemployment was below 5% (the rate in December 1995 was 4.7%) and the inflation rate dropped to 8.2%, the lowest in 35 years. GDP grew to 8.3% and the trade balance showed a surplus of $US1.38 billion. The government also made a prepayment of $US3 billion on its debt to the IDB and the World Bank. Net reserves reached $US14.8 billion (Silva 1996).

In this context, environmental concerns are perceived as restraining economic growth, the primary priority of both government and population. People in Chile are particularly absorbed in maintaining political stability, and all kinds of conflict are seen as potentially threatening.

This perception has influenced the government's choice of an environment institutional framework in which priority has been given to formal inter-institutional coordination and preserving sectoral responsibilities at the executive level, in order to avoid conflicts among existing ministries. In Chile, the primary competencies in the field of environmental management are assigned to an inter-ministerial coordination board, CONAMA, which has no executive functions, except in regard to EIA implementation. Project execution, inspection and environmental control activities have been assigned to the leading ministerial units, under the coordination of CONAMA.

CONAMA is decentralized through the Regional Commissions for the Environment (COREMA), headed by an *intendente* and formed by provincial governors and ministerial representatives in the region, four councillors elected by CONAMA and the regional director of CONAMA, who also acts as its executive secretary.

10.7.1 The environmental impact assessment system

Discussions and negotiations on the preparation of a legal framework for environmental management took several years. The Environment Act was finally implemented in March 1994. Among the environmental policy instruments, a prominent role has been assigned to EIA, which had been in place on a voluntary basis for several years. The EIA system in Chile is led by CONAMA and at the regional level by the respective COREMA, being applied to both public and private development activities. It comprises two major documents:

1 Environmental impact statement ('declaratoria de impacto ambiental'), to be *voluntarily* presented by the proponent, containing the project description, the applicable legal and regulatory environmental framework and the environmental management, control and monitoring measures that will be undertaken.

2 Environmental impact study, also to be presented by the proponent if the project is likely to have significant impacts on the environment, containing the project description, potential impacts, mitigation measures and management, control and monitoring plans.

Under the EIA regulations, the various sectoral approvals involving environmental aspects have been considered as 'sectoral environmental permits', to be issued only after CONAMA's approval of the environmental impact statement or the full EIA. This system is known as *ventanilla única* (single request system) and is aimed at reducing time and bureaucracy in the project approval process and avoiding the stifling of economic development. Therefore, regulations contain a detailed set of technical and administrative requirements necessary to subsidize each 'sectoral environmental permit' (36 approvals or authorizations may be needed for some project types).

Regulations provide a positive list of projects to be compulsorily submitted to the EIA process. Every project then undergoes a screening process based on detailed technical criteria, before the identification of the document type that will be required: either an environmental impact statement or a full EIA study. Other aspects are also defined by regulations: the minimum contents of the EIA study and of the environmental impact statement; the administrative procedures for project approval; and the mechanisms for public participation. The decision on the project is required to be taken in 120 days for a full EIA and 60 days for an environmental impact statement.

Both the EIA statement and full EIA must be submitted to the corresponding COREMA of the region in which the project is to be built. Where project impacts may affect more than one region, the study or statement must be submitted to CONAMA. To initiate the review process, copies of the documents are forwarded to representatives of the relevant ministries and sectoral agencies in the commission, which then issue a review report within a maximum period of 40 days. The decision on the project is made in a plenary session of the respective commission. If sectoral endorsement is not given within the prescribed time period, the project is considered as approved, in accordance with the commission's report. Once a project is approved, no sectoral permit can be denied on the basis of potential environmental impacts. However, if a project is rejected, no sectoral permit will be issued. After the review process, the respective commission is responsible for forwarding information to the Ministry of Planning (MIDEPLAN) on the environmental aspects highlighted by the EIA, so as to have them considered in the socio-economic project evaluation that is performed as a part of the National Investment System.

Follow-up of the mitigation measures and monitoring plan is the responsibility of the competent sectoral agency.

10.7.2 Environmental insurance contract

With the strong pressure for economic growth, the regulations have provided mechanisms to overcome investment constraints resulting from EIA process delays, through the mechanism of 'environmental insurance'. Of all other South and Central American countries, only Honduras has instituted a similar procedure. To enable construction works to start before the final approval of the EIA, and under the strict responsibility of the proponent, a deposit must be made as an 'insurance bond', the value of which cannot be less than 20% of the total investment. The economic effectiveness of such provision, however, has not as yet been appraised.

10.7.3 Public participation

The Environment Act encourages public participation in the protection and conservation of environmental resources as well as in the EIA process. Public involvement is provided for through three different systems: (i) the development of environmental norms, standards and anti-pollution plans; (ii) the EIA process; and (iii) the citizen's right to bring charges regarding alleged environmental violations (Ortúzar & Vial 1995).

Responsibility to establish mechanisms for ensuring public participation is assigned to the national and departmental environmental commissions. In theory, these mechanisms may comprise one of the following: written opinion by the Social and Economic Council of the affected municipalities; consultation with social organizations; consultation with environmental NGOs; public meetings; and public disclosure of information about the project and its environmental impacts. In practice, information disclosure is the most common, as it is the proponent's responsibility to publish an executive summary of the project and its potential impacts and proposed mitigation measures in the official journal and a newspaper. One copy of the EIA documents is also forwarded to the affected municipalities, and to individuals upon request, at their own expense. A list of projects submitted to EIA is published monthly by CONAMA or COREMA. Collaboration with relevant institutions in developing environmental awareness programmes is part of CONAMA's portfolio. The World Bank's institutional building project, for instance, has allocated approximately $US1 million to initiatives related to the matter, including a data centre in CONAMA to support formal environmental education.

10.7.4 Institutional capabilities for enforcement of environmental regulations

As in most of the region, there are no administrative procedures for application of penalties in cases of violation of the environmental law, a legal process having been used in all reported cases. The Environment Act has not brought significant innovations with regard to the general rules of tort liabilities set forth in the Chilean Civil Code. Despite the creation of environmental damage liability, 'subjective overtone was given, requiring violators to act through negligence or malice, which is identical to the tort liability stipulated in Chile's general legislation' (Ortúzar & Vial 1995). The same authors also state that:

> both the environment liability, which forces the transgressor to repair the damaged environment, and the civil liability, which stipulates monetary indemnification for the affected party, have a 5 year statute of limitations as of the date when the damage became evident.

Therefore, the constitutional right to live in an environment free of pollution has been used in court to halt many activities considered to be harmful to people and the environment. Those cases constitute routine environmental offences that should be dealt with through administrative procedures. Other constitutional rights, such as 'the right to life and to physical integrity', have also been evoked for the same purpose (e.g. in relation to a petrol station, in Valparaiso, as appears on p. 360 of the collection of judicial sentences no. 415, case no. 983–93).

The current EIA system in Chile maintains the sectoral approach to environmental management, thus inhibiting its effectiveness, for the following reasons:

- The EIA process begins at the later stages of project planning, when mitigation measures are not likely to be cost-effective.

- EIA is developed by the corresponding sectoral and issue-orientated institutions, thereby potentially biasing its results. Such an arrangement requires a competent independent multidisciplinary team and interdisciplinary methods for EIA review, which are not available in Chile.
- EIA review is conducted individually by each ministry (through the corresponding department and services) represented in CONAMA and COREMA; only those aspects related to each of the organization's mandates are appraised, which results in a fragmented EIA review.
- Approval of the EIA study involves various sectoral permits at the same time, each one of them only having a partial view of the project.
- Responsibility for the enforcement of the recommendations of the EIA is dispersed amongst the several institutions involved in the permit and authorization processes; moreover, there is a lack of institutional and legal mandate for some environmental aspects, such as landscape degradation, soil erosion, noise and vibration. In practice, there is no enforcement at all, since most of the sectoral agencies are also issue-orientated agencies.

Water resources management is an example of the weak control which the government has over natural resources—the 'rights of use' of water resources are traded on a free-market basis, without consideration of either the ecological, strategic or social role of these resources.

10.8 CONCLUSIONS

In South and Central America, though improvements are still required, EIA has evolved positively over the last two decades. As one of the few policy tools capable of integrating socio-economic and environmental protection values, EIA can play a major role in helping the region to overcome structural poverty problems and achieve sustainable development. In addition, environmental externalities must be integrated into project evaluation in order to assist in the identification of long-term development scenarios and enable a more sustainable and equitable use of natural capital.

On the other hand, the use of EIA as a planning tool for both government and private sectors must be fostered. The region has not yet been wise enough to benefit from the potential of EIA as a process to achieve integration of policies and activities or to promote information sharing, transparency and coherence in decision-making. EIA is still seen as an 'antidevelopment' requirement. One way of changing this negative notion is to promote consistent EIA application at the policy level. This may promote project design in alignment with environmental policies and regulations, thus requiring less adjustments and additional costs. EIA might then be seen more as an effective preventive tool for environmental management than as a 'development constraint'.

At present, experience relating to SEA has to do with a number of sectoral and regional studies promoted by the World Bank and the IDB, as a condition of the approval of loans for major infrastructure development or structural reform programmes. A flood protection project in Argentina, an irrigation development in Chile and a highway planning project in Colombia are reported examples of such studies (World Bank 1993, 1996). A study on the strategic impacts of a pipeline transporting natural gas from Bolivia to Brazil is underway at the time of writing. In Brazil, although some programmatic EIAs have been considered by federal directives (industry and urban development), the São Paulo State environmental council has been the only institution to start a regulatory process, as a tentative means of submitting sectoral government policies, plans and programmes to environmental assessment.

Considering that in many countries of the region democratic institutions and practices are relatively new and the current means of disclosing EIA information have proven to be insufficient to motivate public participation, other mechanisms to encourage public engagement from the early stages of EIA should be proposed. Such mechanisms may include:

- a full and timely advance notification of project proposals and means of consultation on EIA documents;
- mass communication on the opportunities to discuss EIA studies;

- regulations and procedures to ensure that public opinion is taken into account in decision-making;
- written records of decisions;
- project monitoring committees formed by representatives of environmental agencies, NGOs and community groups.

Likewise, the establishment of clear objectives and the definition of appropriate economic and institutional strategies that correspond to the current resources are regarded as foremost requirements. International cooperation must reflect the re-evaluation of certain beliefs and strategies that contributed to the weakening of government institutions in many countries in the region. The World Bank has stated publicly that no sustainable social and economic development can be achieved without a state capable of playing its role as the administrator of the people's goods (World Bank 1996). The state must be able to administer the use of natural assets for the benefit of people in a socially and economically equitable manner. This will certainly require new forms of cooperation between the government and the private sector, with the objective of maximizing the cost-effectiveness of environmental policies and management action plans.

Another requirement in the region is for appropriate mechanisms for enforcing EIA recommendations relating to mitigation measures and monitoring. In most countries, EIA as a condition for the issue of an environmental permit is seldom required at the early stages of project planning or prior to project construction and operation. Coming late in the project development cycle, EIA becomes merely a bureaucratic exercise. In such a situation, project adjustments and mitigation measures are likely to be less cost effective and, as such, difficult to implement. In Uruguay and Chile, EIA is part of the project authorization process by the respective sectoral agency, no priority being given to environmental matters.

In the past, almost all South and Central America countries have experienced political instability and centralized autocratic governments. This ideology still remains in a number of countries, where public participation in the EIA process is deliberately limited on account of the unwillingness to promote democratic discussion and decision-making. For the most part, society is still unaware of EIA, its potential as a policy instrument to enhance sustainable development and the means and rights to participate.

In some countries, such as Brazil, Chile and Venezuela, current political stability is seen as depending more upon economic growth than on social development and equity. Therefore, any constraints to investments are considered as politically threatening. As environmental agencies are part of government administration, this perception also underlies most environmental decisions.

Another peculiarity of these countries is that the level of enforcement does not reflect the legal and institutional framework for environmental management, owing to a lack of political will and the appointment of professionals to key decision-making positions in environmental institutions with no regard for their technical capabilities.

The lack of an adequate environmental database, such as geographical information systems and historical series of monitoring data, as well as poor computer and monitoring technologies, are some of the primary technical constraints affecting EIA ineffectiveness, despite aid from international development agencies. However, other deficiencies also must be noted, i.e. the lack of an integrated set of environmental policy and planning tools and of appropriate environmental and sectoral regulations, including environmental quality standards suited to each country's conditions, and the shortage of human resources with proper skills to manage both technical and administrative EIA procedures.

In most of South and Central America, EIA is still at the early stages of implementation, thus requiring investment in capacity building in relation to both the public sector (EIA managers) and private sectors (consultants and project proponents). As for the government, a major requirement is for the training of environmental officers relating to EIA administrative procedures and also on technical EIA aspects, such as methods and techniques for preparing terms of reference (scoping) and reviewing environmental impact studies. Government administrators, development agency managers and private developers require improved environmental awareness and knowledge of the benefits of EIA. Private consultants in charge of preparing EIA also need to be trained in relation to methods, impact prediction techniques and specific environmental control measures, in order to refine the quality of studies and the benefits of EIA. Training in the assessment of social and economic impacts and the consideration of cumulative effects still requires attention.

'On the job training' is acknowledged by most experts as an effective means of improving technical capacity in developing countries, particularly in South and Central America (UNEP 1993). A number of successful schemes conducted in Brazil, Bolivia, Peru and Nicaragua are examples that could be repeated.

Along with enhancing project EIA practice, capacity building must aim to move EIA 'upstream' in the policy and decision-making process by introducing the use of one or more forms of SEA to policies, sectoral programmes, regional planning, government budgets, country strategies, trade agreements and other high-level decisions.

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11: Environmental Impact Assessment in North America

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11.1 INTRODUCTION

The USA, Canada and Mexico occupy over 8 million^2 miles on the North American continent. They are linked not only by geography, but also by trade and commerce, sharing many cultural ties, particularly along the borders. The North American Free Trade Agreement demonstrates, however, that each country has different approaches to law and policy. The USA, the most populated of the three nations, was the first country in the world to require environmental impact assessment (EIA) as a part of project planning and decision-making. The National Environmental Policy Act of 1969 (NEPA) incorporated the idea of a 'detailed statement'. Since then more than 100 EIA systems around the globe have been developed (Wood 1997). Canada created an Environmental Assessment Review Process through a Cabinet Directive in 1973, and in 1984 this process was set on a more legal basis through an Order in Council. The Canadian Environmental Assessment Act (the Act) was legislated and promulgated in 1995. The Canadian Act enshrined environmental assessment (EA) in federal legislation for the first time. Mexico has a long history of environmental protection in legislation. Mexico's 1917 constitution provides for natural resource conservation. Mexican federal EIA legislation is provided for in the General Law of Ecological Balance and Environmental Protection (Ecology Law) (1988).

As a cooperative effort, the three countries have signed the North American Agreement on Environmental Cooperation, which contains provisions for the assessment of projects likely to cause significant adverse effects crossing the shared boundaries of the countries. All three countries are working to develop recommendations with respect to the notification, assessment and mitigation of the adverse environmental effects of such projects.

This chapter explains the regulatory requirements and describes the elements of the EIA process in each of the three countries. It concludes by addressing interdisciplinary and interagency requirements.

11.2 BACKGROUND

EIA in North America has essentially the same major elements of EIA around the globe: there are screening processes to determine the extent and detail of analysis required; scoping to identify the key issues and impacts to be addressed; development of a reasonable range of alternatives; impact analysis to predict and evaluate the significance of the impacts; identification of mitigation measures which would minimize the adverse impacts; public participation in the impact analysis; and monitoring to determine whether the predictions were accurate and the mitigation effective.

All three countries struggle with different elements to ensure a process that is effective and efficient. The recent findings of the International Study of the Effectiveness of Environmental Assessment (Sadler 1996) are consistent with the experiences in North America. That study found that the public needs to be involved earlier and more effectively; that preparers should begin the analysis at an earlier, more strategic stage; that better environmental baseline data are required to ensure a science-based analysis; and that decision makers must use the analysis to make EIA more effective (Sadler 1996).

11.2.1 Environmental impact assessment in the USA

NEPA declares the USA's environmental policy and goals of protection, maintenance and enhancement of the environment. NEPA was the first law to focus environmental concerns with a comprehensive national policy. NEPA calls for 'productive harmony' between 'man and nature' and presaged today's interest in sustainable development. It is important to understand that NEPA is a declaration of national policy and the EIA portion of the statute is simply an innovative tool to achieve the national environmental goals enunciated by the law.

Title II of NEPA created the Council on Environmental Quality (CEQ) to act as the principal adviser to the President of the USA on environmental policy matters and to integrate environmental, economic and social actions within the agencies of the federal government. NEPA also requires the President to report to Congress on the status, conditions and trends of environmental quality in an annual Environmental Quality Report.

A key role of CEQ is oversight of federal agency implementation of Section 102(2)(C) of NEPA, which requires federal agencies to prepare 'detailed statements', more commonly known as environmental impact statements (EISs), for proposed actions which significantly affect the quality of the human environment. CEQ issued the *Regulations to Implement the Procedural Provisions of the National Environmental Policy Act* in 1978. Those regulations have remained essentially unchanged. The CEQ also issued 40 questions about the CEQ regulations (Council on Environmental Quality 1981, 1986).

NEPA has several basic mandates, as the statute, its legislative history and the NEPA regulations all reflect:

- *Supplemental mandate*—to add to the existing authority of every federal agency the responsibility and power to protect the environment when carrying out other agency functions.
- *Affirmative mandate*—not only to preserve existing environmental quality but also to make decisions that restore and enhance the environment.
- *Procedural mandate*—to use a planning and decision-making process for developing or considering the approval of plans, policies, programmes or projects that give 'appropriate consideration to environmental values and amenities', which occurs mainly through the analysis of environmental impacts and alternatives, including mitigation measures.
- *Substantive mandate*—to recognize that each person should have a healthy environment and a responsibility to contribute to environmental quality and to require all federal agencies 'to the fullest extent possible' to 'interpret and administer all laws' in ways that implement the policy of serving as a trustee of the environment for present and future generations and the other policies set forth in NEPA; in other words, the responsibility to 'act' to protect the environment.
- *Balancing mandate*—to implement the substantive national environmental policy 'to the fullest extent practicable' in a manner that is 'consistent with other essential policy considerations' (Weiner 1997).

In the USA, a less detailed analysis than the EIS is the environmental assessment (EA). About 50 000 of these EAs are prepared annually compared to about 500 draft, final and supplemental EISs (Blang 1993). Tables 11.1 and 11.2 provide further details.

11.2.2 Environmental impact assessment in Canada

EIA in Canada is a shared responsibility between the federal and provincial governments and laterally with emerging new indigenous constitutional entities. Although each has its own process for activities under its jurisdiction, their central process elements are essentially the same (Dupuis, personal communication). The Canadian federal government has established both policy and project regimes; separate processes are in place in Canada's 10 provinces, two territories and four native homelands. The Federal Environmental Assessment Review Office (FEARO) administered the federal environmental process

Table 11.1 Environmental impact assessments: USA (source: Executive Office of the President, Council on Environmental Quality, the 25th Anniversary Report 1997).

Agency	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Agriculture	172	104	102	89	59	65	117	118	75	68	89	138	145	129	156	108
Commerce	54	53	36	25	14	24	10	8	9	3	5	8	13	12	14	11
Defence	1	1	1	1	1	0	0	0	2	0	0	0	0	1	0	4
Air Force	8	3	7	4	6	5	7	8	9	6	11	19	20	19	19	21
Army	40	9	14	3	6	5	5	2	10	8	9	9	21	14	7	13
COE	182	150	186	127	119	116	106	91	76	69	40	48	45	56	37	53
Navy	11	9	10	6	4	9	8	13	9	6	4	19	9	6	13	18
Energy	28	45	21	24	19	14	4	13	11	9	6	11	2	15	13	26
EPA	84	71	96	63	67	42	16	18	19	23	25	31	16	4	12	8
GSA	13	11	13	8	1	0	4	0	1	3	0	4	3	15	6	8
HUD	170	140	140	93	42	13	15	18	6	2	7	5	7	2	1	3
Interior	126	131	107	127	146	115	105	98	110	117	61	68	64	79	71	98
Transportation	277	189	221	183	169	147	126	110	101	96	80	100	87	129	90	125
TVA	9	6	4	0	2	1	0	1	0	0	0	3	0	3	3	1
Other	98	44	76	55	22	21	26	15	17	20	23	18	24	29	23	35
Total	1273	966	1033	808	677	577	549	521	455	430	370	477	456	513	465	532

COE, Corps of Enquiries; EPA, Environmental Protection Agency; GSA, General Services Administration; HUD, Housing and Urban Development; TVA, Tennessee Valley Authority.

Table 11.2 Environmental impact assessments: Canada, 1 April 1995–31 March 1996 (source: CEAA, 1995–96).

Department	Total EAs	Type	Approved	Completed	Further review
Agriculture and Agri-food Canada	426	Screening	424	424	None
Atlantic Canada Opportunitites Agency	322	Screening	318	318	None
Atomic Energy Control Board	17	Screening	14	14	None
Canadian Heritage	523	Screening	404	405	None
Canadian International Development Agency	13	Screening	13	13	None
Correctional Service Canada	22	Screening	—	—	None
Department of Foreign Affairs and International Trade	5	Screening	5	5	None
Environment Canada	539	Screening	516	518	None
Federal Office of Regional Development—Quebec	770	Screening	710	710	None
Fisheries and Oceans	337 6	Screening Comp. study	231 2	231 2	None
Health	3	Screening	1	1	None
Human Resources Canada	41	Screening	39	39	None
Indian and Northern Affairs Canada					
Northern Affairs	304	Screening	260	44	None
North-west Territories	356	Screening	354	354	None
Yukon	557	Screening	538	552	None
Indian and Inuit Affairs	77	Screening	77	77	None
Industry Canada	134	Screening	99	99	None
National Defence	2	Comp. study	—	—	
National Energy Board	83	Screening	65	65	Moved to joint panel 1
National Transportation Agency of Canada	165	Screening	119	119	None
Natural Resources Canada	69	Screening	58	58	None
Public Works and Government Services Canada	75	Screening	58	69	None
Revenue Canada, Customs, Excise and Taxation	2	Screening	—	—	None
Transport Canada	553 2	Screening Comp. study	494	495	None
Western Economic Diversification Canada	131	Screening	98	98	None
Totals	5514	Screening 5504 Comp. study 10	4897	4710	Moved to joint panel 1

until 21 December 1994. The Canadian Environmental Assessment Agency (CEAA, or the Agency) was created on 21 December 1994 to administer the federal EA process, replacing FEARO.

The Agency is independent of the Department of the Environment and reports directly to the Minister of the Environment. The Canadian EA process is decentralized, all federal departments and agencies are subject to the Canadian Environmental Assessment Act (the Act) and must develop their own procedures; they must ensure that EAs are conducted for projects where they have decision-making responsibilities and inform the public of their decisions.

The CEAA has three key roles in administering the EA process:

1 Providing legal, procedural and policy advice to the Minister of the Environment on the Minister's responsibilities under the Act.
2 Providing opportunities for public participation in the federal EA process, notably serving as the secretariat for independent EA panels.
3 Promoting sound EA practices.

The Canadian Environmental Assessment Act (1992) and its implementing regulations are the legal instruments which guide the Agency. The legal instruments are as follows:

1 Bilateral agreements between the federal and provincial governments to coordinate and harmonize EA practice.
2 International agreements containing EA provisions to which Canada is a signatory.
3 Projects outside Canada regulation (POC) vary the Act to provide appropriate procedures for applying the Act to projects outside Canada.
4 Federal coordination regulation intended to coordinate federal authorities' activities regarding EA.
5 Law list—describes all those federal statutory and regulatory project approvals which will require an EA, including federal permits, certificates, licences and authorizations.
6 Exclusion list—describes all undertakings in relation to a physical work for which an EA is not required because experience suggests that they are not likely to cause significant adverse environmental effects (e.g. minor renovations and routine maintenance).
7 Inclusion list—specifies physical activities not in relation to physical works (e.g. ice-breaking in the Arctic) which are subject to EA because of their potential to cause significant environmental effects.
8 Comprehensive study list—describes projects and classes of projects that are likely to have significant adverse environmental effects and therefore require a more in-depth assessment.

11.2.3 Environmental impact assessment in Mexico

The EIA in Mexico lies at the heart of the country's environmental protection policy, and its evaluation and approval are the basis for authorizing public or private works that can cause ecological imbalance or exceed the limits and conditions established in the Mexican regulations and official standards set to protect the environment.

The National Ecology Institute (INE) and the Federal Attorney's Office for Environmental Protection, replaced the existing Secretariat of Urban Development and Ecology in 1992. In 1994, a major reform created an all-new centralized environmental authority, the Environment, Natural Resources and Fisheries Secretariat (SEMARNAP). The INE and the Office for Environmental Protection functions and organizations were transferred to the SEMARNAP under the reform decree. This reorganization was intended to centralize and streamline federal policy-making related to natural resource management and environmental protection, towards the goal of sustainable development.

The SEMARNAP is responsible for a broad spectrum of environmental protection issues, which includes formulating national policy and coordinating environmental protection and restoration; issuing standards for sustainable use of natural resources; and proposing the establishment of Natural Protected Areas.

Mexican federal EIA legislation is provided for in the 1988 General Law of Ecological Balance and Environmental Protection (Ecology Law), and the Ecology Law's Environmental Impact Regulation.

In addition to the federal EIA requirements, all

31 Mexican states have their own environmental legislation. The INE, which functions within the SEMARNAP, reviews and evaluates EIAs within federal jurisdiction.

The EIA Regulation provides for three types of EAs (see Section 11.3 for further discussion):

1 The preventive report.

2 The EIA, in different modes: general, intermediate and specific.

3 A risk study.

Because the EIAs often lack a coherent structure, the INE, with a view to a quicker evaluation, also requires applicants to prepare a summary of their EIA. The INE must publish a notice in the *Ecological Gazette* and provide for public access to the documents once they determine the information in an EIA is complete. Depending upon the circumstances, the INE has 30–120 working days to evaluate and make a decision on an EIA. The INE may accept or reject an EIA, require a more detailed intermediate or specific study or conditionally approve the EIA, imposing specific requirements upon the project in order to prevent or mitigate its detrimental environmental effects. The approval of an EIA does not release the applicant from other state or federal permit obligations. The right to alter project designs provides the INE with considerable power to regulate national development and to ensure that economic growth does not occur at the expense of the environment or human health.

The Office for Environmental Protection, also within SEMARNAP, is responsible for ensuring that the provisions of the Ecology Law, and the EIA Regulation are followed. The Office for Environmental Protection has the power to conduct inspections and audits, suspend projects, impose sanctions and request the revocation of permits for those who violate the Ecology Law and the EIA Regulation.

11.3 DEFINING THE BOUNDARIES OF AN ENVIRONMENTAL IMPACT ASSESSMENT

Screening and scoping are the primary means of defining the boundaries of an EA. In Canada and the USA, screening (Canada) or scoping (USA) is required to ensure that the focus of the study is on matters that are truly significant.

11.3.1 USA

While only federal actions trigger the NEPA process, many private projects are subject to NEPA because they seek federal financing, assistance, or require a federal permit. In the USA, federal agencies determine if a proposal requires analysis of one of three types: (i) categorical exclusion; (ii) EA; or (iii) EIS.

Actions that are categorically excluded are those which an agency has predetermined as inherently not having a significant impact on the environment. They subject these to public review and comment and, once the exclusion is determined, there is no other documentation required by either NEPA or the CEQ regulations. Many agencies have opted to prepare brief memoranda or records to show the rationale for using a categorical exclusion for a particular project.

EAs are intended to be used to determine whether potential effects are significant. After preparation, the agency concludes with either a Finding of No Significant Impact (FONSI) or proceed to prepare a Notice of Intent to prepare an EIS. If an agency already knows that an impact is significant, it can go directly to the EIS level of analysis. In practice, the EA is generally used to document an analysis and identify and incorporate mitigation. When EISs are prepared, they are rarely preceded by an EA (Blaug 1993).

11.3.2 Canada

The Canadian Environmental Assessment Act (The Act) applies when a federal authority has a decision-making responsibility for a private or public project. The Act is triggered when a federal authority is the proponent of the project; provides financial assistance; sells, leases or disposes of any interest in federal lands; issues a licence, permit or other authorization included in the Law List. There are four types of assessments recognized under the Act: screening, comprehensive study, panel review and mediation.

Screenings and comprehensive studies are based on the concept of self-assessment. At either of these stages in the process, a determination is made as to whether a project is likely to cause significant adverse environmental effects. If it will not, the project may proceed as planned, provided there is no significant public concern. However, if there are likely to be significant adverse effects that cannot be justified, the project does not go forward. On the other hand, if it is determined that the project is likely to cause significant adverse effects, if the effects are unknown or if public concerns warrant it, the project goes to a panel or mediation for further assessment. Screenings account for approximately 99% of federal EAs.

Screening is a systematic approach to documenting the environmental effects of a proposed project and determining the need to eliminate or minimize (mitigate) these effects; to modify the project plan; or to recommend further assessment through mediation or a panel review. Screening is conducted by the project's responsible authority and is the most flexible type of assessment, accommodating both simple, routine projects as well as larger projects.

Class screenings are also recognized under the Act to streamline the screening process of some routine projects, such as dredging, culvert installations, highway maintenance or shoreline stabilization in building construction. A class screening report presents the accumulated knowledge of the environmental effects of a given type of project and identifies the known measures to reduce or eliminate the likely adverse environmental effects. In applying a class screening report to a project, however, the responsible authority must still take into account site-specific circumstances and cumulative environmental effects. Under the Act, a responsible authority can apply to the Agency to have a screening report (or reports) declared as a class screening report for future projects. Once approved as such by the Agency, the report can be used in whole or part by any responsible authority as a model in conducting screening of other projects within the same class.

Mediation is a voluntary process that helps interested parties agree on the significance of environmental effects and on the measures needed to lessen or mitigate any adverse environmental effects. Mediation may sometimes occur alongside, or instead of, a panel review. The latter is referred to the Minister of Environment, who appoints panel members to conduct public hearings on a project. A panel or mediator submits recommendations to the Minister who referred the project. The government issues its response to the panel recommendations after review by the Cabinet.

11.3.3 Mexico

In Mexico, the Ecology Law requires an EIA to be presented and approved prior to the commencement of any public or private activity that:

- may cause ecological imbalances;
- exceeds the limits and conditions set forth in the federal regulations and technical ecological standards;
- falls under the mandatory list of activities provided for in the regulation implementing the Ecology Law.

The threshold 'ecological imbalance' is defined as 'the alteration of the interdependent relationship between the natural elements that make up the environment, which may have a negative effect upon the existence, transformation and development of human populations'. There is legal uncertainty as to when an activity may cause ecological imbalances or exceed the limits and conditions set out in federal environmental laws, regulations and technical standards. While an obligation to present an EIA clearly exists, the Ecology Law and its implementing regulations do not provide any legal or administrative mechanisms to determine when the obligation to submit an EIA arises. As in the USA and Canada, the responsibility of presenting an EIA to INE remains with the applicant.

As identified earlier, the Ecology Law and EIA Regulation establish three types of environmental studies. INE evaluates Preventative Reports submitted to determine whether the proposed activity requires an EIA. The applicant can submit a Preventative Report to the INE before the project starts if it considers that the project will not cause ecological impacts or exceed the standards established by the laws, regulations or technical norms adopted by the Federation. The Preventative Report must contain information including the details of the project, work schedule, resources required and residues and emissions that would be generated. Based on this information, the INE will determine whether or not it requires the filing of an EIA and, if so, in what form. If the project proponent does not submit a Preventative Report, it must submit an EIA to the INE, which is usually a general EIA. There are three levels of EIA: general, intermediate and special EIA for economic use of federal natural protected areas.

In addition to the threshold requirements for conducting an EIA, Article 5 of the EIA Regulation provides a list of activities which require the submission of an EIA:

- Federal public works projects.
- Water works.
- General transportation and communication projects.
- Oil and gas pipelines and coal chutes.
- Chemical, petrochemical, steel and paper industries and electricity transmission and generation.
- Exploration, extraction, treatment and refinement of minerals and non-mineral substances reserved to the federal government.
- Federal tourism development projects.
- Hazardous and radioactive waste treatment, storage and disposal facilities.
- Use of forests and tropical forests and species that are difficult to regenerate.

SEMARNAP has issued a decree statement to regulate and protect land use for protected natural areas or zones which have undergone serious ecological damage. Projects proposed for these areas are subject to certain articles of the EIA Regulation. The Ecology Law establishes seven different types of protected natural areas that are administrated by the SEMARNAP. These include biosphere reserves, national parks, natural monuments and protected areas for natural resources and for flora and fauna.

In relation to other activities requiring an EIA, the use of federally protected natural areas for the purposes established in Article 36 of the Regulation on EIA, activities can take place only after an EIA has been presented and approved. The Ecology Law does not regulate non-commercial activities which have an adverse environmental impact in protected natural areas.

Project proponents must submit an EIA to the INE for approval before receiving a permit for development or for profit use of tropical rain forests or rare species. Applicants must also submit a forestry management programme, which includes a rigorous analysis and assessment of potential environmental effects.

The INE has published instructions which give a detailed description of an EIA format in all of its forms. General, intermediate and specific EIAs have similar formats, differing only in the degree of detail required by each one. A general EIA must include information about the applicant, a description of the project, general features of the natural and socio-economic environment, information on soil use regulation fulfilment, potential environmental impacts and mitigation. The intermediate and the specific EIAs follow the same general format but contain more detail and analysis.

The specific EIA also includes a section entitled 'Describing a Possible Scenario for a Modified Environment'. This section analyses not only the socio-economic factors found in an intermediate EIA, but also the changes to nature such as landscapes, climate, air quality, geology in relation to erosion, organic material, drinking water, vegetation and fauna.

The EIA Regulation defines a risk study as an analysis of the risk that an activity or project poses to the ecological balance or the environment, as well as the 'technical measures of security, prevention and correction which can prevent, mitigate, minimize or control adverse effects on the ecological balance, in case of a possible accident during the implementation of the project'. Activities considered high risk include those pertaining to the use or management of toxic substances and the use of in flammable and explosive substances.

According to the EIA Regulation, applicants proposing a high-risk activity should conduct a risk study as well as an EIA. Normally the need for a risk study is determined through the evaluation of the EIA. The INE provides the guidelines for the studies when they are required. These studies differ as to the quantity of detail and analysis required for each one.

11.4 SCOPING

Perhaps the greatest practical genius of the EIA process is the simple, coherent, workable framework of defining the scope of environmental review as three types of actions, alternatives and impacts (Weiner 1997). Scoping has provided a powerful tool for organizing the study and bringing the public into the EIA process. It is the first stage in the environmental review process in Canada and the USA, but is not contemplated under the Ecology Law in Mexico. CEQ regulations state that 'there shall be an early and open process for determining the scope of issues to be addressed'. Specific requirements of scoping are: an open process with public notice; identification of significant and insignificant issues; allocation of EIA preparation assignments; identification of related analysis requirements to avoid duplication of work; and planning for EIA preparation that meshes with the agency's decision-making schedule.

Scoping is often the first contact between proponents of a proposal and the public (see also discussion in Chapter 10, Volume 1):

> Scoping can lay a firm foundation for the rest of the decision-making process. If the EIS can be relied upon to include all the necessary information for formulating policies and making rational choices, the agency will be better able to make a sound and prompt decision. In addition, if it is clear that all reasonable alternatives are being seriously considered, the public will usually be more satisfied with the choice among them (Council on Environmental Quality 1981).

11.4.1 Scoping in Mexico

This concept of scoping *per se* is not found in the Ecology Law or EIA Regulation. However, the INE can determine the scope of an EIA if the interested party submits a Preventative Report. A Preventative Report is a document that can be submitted by the interested party for activities which require an impact assessment (IA), but which the party believes will not affect the environment or violate any laws, regulations or ecological technical standards issued by the federal government. Although submission of a preventive report allows the INE to determine whether or not an IA is required and in what form, the voluntary submission of the report limits its use as a tool to determine the scope of an EIA.

When a Preventative Report is submitted, the INE and the interested party establish the scope of the EIA. There is no requirement for public notification of the Preventative Report and there is no mechanism for the public's participation; the public therefore does not have a role in establishing the scope of the EIA. The INE can and has requested information from government agencies such as the Ministry of Communications and Transport, regarding their projects in order to give the INE the opportunity to evaluate their potential environmental effects before a plan or commitment is finalized.

11.4.2 Scoping in the USA

The CEQ defines the scope as the range of actions, alternatives and impacts to be considered in an EIS. The scope of an individual statement may depend on its relationships to other statements. To determine the scope of EISs, agencies must consider three types of actions, alternatives and impacts. These types include:

- *Actions* (other than unconnected single actions) which may be connected, cumulative or similar. Connected actions are those which are closely related and therefore should be discussed in the same impact statement. Actions are connected if they automatically trigger other actions which may require EISs; cannot or will not proceed unless other actions are taken previously or simultaneously; or are interdependent parts of a larger action and depend on the larger action for their justification. Cumulative actions are those which, when viewed with other proposed actions, have cumulatively significant impacts and should therefore be discussed in the same impact statement. Similar actions are those which, when viewed with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences together, such as common timing or geography. An agency may wish to analyse these actions in the same impact statement. It should do so when the best way to assess adequately the combined impacts of similar actions or reasonable alternatives to such actions is to treat them in a single impact statement.

- *Alternatives* include the no-action alternative; other reasonable courses of action; and mitigation measures (not in the proposed action).
- *Impacts* may be direct, indirect and cumulative.

11.4.3 Scoping in Canada

Scoping of the project involves identifying those components of the proposed development that should be considered part of the project for the purposes of the EA. The scope of the project can be defined as the physical activity or works triggering the Act for which power, duty or function is being exercised; the sum of the physical works; and the undertakings (identified in the Inclusion List Regulations) associated with the physical works.

Under the Act (Section 15[2]), the responsible federal authority can combine two or more triggered projects into the same EA if it determines that the projects are so closely related that they can be considered to form a single project. Relevant criteria are interdependence, linkage and geographical proximity.

The second component of scoping concerns the EA itself. The Act sets out factors to be considered depending upon whether it is a screening, a comprehensive study, a mediation or a panel review. The Act requires that the following factors be considered under all four procedures (Section 16[1]):

1 The environmental effects of the project, including effects of malfunctions or accidents that may occur and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out.

2 The significance of these environmental effects.

3 Public comments received.

4 Technically and economically feasible measures that would mitigate any significant adverse effects, and any other matter relevant to the assessment that the responsible authority may require, such as the need for and alternatives to the project.

In addition, every comprehensive study, mediation and panel review is required to consider (Section 16[2]): the purpose of the project; technically and economically feasible alternative means of carrying out the project, as well as the environmental effects of these; the need for and requirements of any follow-up programme; and the capacity of renewable resources that are likely to be significantly affected by the project to meet present and future needs.

The Act states that the responsible authority shall determine the scope of a number of these factors (Section 16[3]). In particular, the geographical boundaries and time frames of effects will need to be established.

In addition to these requirements, the statutory and jurisdictional basis for federal authority over a project is relevant to the scope of the assessment. The scope of the EA should include factors that any other federal law or regulation requires or permits the responsible authority to consider. Where the responsible authority regulates the project, these factors include those specified in the law creating the regulatory authority. Where the responsible authority is a project proponent or provides financial assistance or the use of federal lands, it may assess factors that it considers relevant which go beyond the statutory requirements. The scope of the assessment may be broadened in these circumstances because the responsible authority's decisions relate to federal government operations or property or matters of exclusive federal jurisdiction. As such, they are not subject to the same jurisdictional constraints that apply to regulatory decisions.

11.5 ALTERNATIVES

The degree to which alternatives are addressed in the EIA process varies between the three countries, though all require identification and analysis of alternatives to a proposed action or project. The depth of analysis and requirements for implementation and subsequent mitigation depend in part on the type of processing appropriate for the project, which in turn is based on its scale and complexity. As projects are subject to more rigorous evaluation, alternatives identification and analysis become more a part of the overall EA.

11.5.1 Mitigation and alternatives in Canada

The Canadian Federal Act and the provincial legislation require consideration of alternatives that are either functionally different to the project or are different methods of implementing the project.

The Act requires that every EA consider 'measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project' (Section 16[1][d]). The need for the project and alternatives to the project (e.g. different ways of achieving the same end) may also be considered (Section 16[1][e]). In addition, every comprehensive study, mediation, and panel review must consider 'alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means' (Section 16[2][b]). Alternative means are methods that are technically similar and variations on the same functional approach to achieving the project's objectives. The Act also requires that the mitigation measures identified as a result of a screening, comprehensive study, mediation or panel are implemented (Sections 20[2] and 37[2]).

11.5.2 Alternatives in the USA

The USA requires the most outright identification and analysis of alternatives; NEPA's central procedural requirement is the search for alternatives to meet the policy goals of the statute. The CEQ regulations call alternatives the 'heart of the NEPA process'. Agencies are not required to consider every conceivable alternative, but environmental analyses must discuss a reasonable range. All reasonable alternatives must be rigorously explored and evaluated. Other alternatives, eliminated from further more detailed study, must also be included, along with a brief discussion of the reasons for eliminating them. The decision maker must consider all alternatives discussed in an EIS, and the environmentally preferred alternative must be identified, though selection of the most environmentally benign alternative is not required.

The EIS must also include the 'no-action' alternative. In some cases, the no-action alternative is no change from the current activity or continuing with the present course of action until it is changed. In other cases, no action involves federal decisions on proposals for projects which, in turn, could result in predictable action by others. 'For example, if denial of permission to build a railway to a facility would lead to construction of a road and increased heavy goods traffic, the EIS would analyze this consequence of the no-action alternative' (Council on Environmental Quality 1986). Where a federal agency is under court order or legislative command to act, the no-action alternative analysis can provide a benchmark from which decision makers can compare the magnitude of environmental effects of the action alternatives.

11.5.3 Mitigation and alternatives in Mexico

As identified earlier, the Ecology Law in Mexico provides for three different forms of EIA. The general and intermediate EIA forms address alternatives only in general terms, requiring the applicant to identify the project's potential environmental impacts and specify the means it will adopt at each stage of the project to mitigate these. The specific form requires a more detailed analysis of alternatives and mitigation methods, and applicants must consider options such as:

- not realizing the project;
- relocating the project;
- adopting modifications to the project;
- postponing the date of the project's realization;
- installing pollution control equipment;
- adding additional equipment or systems;
- taking other action.

General and intermediate EIAs, as is the case with identifying environmental impacts, regulate mitigation and alternatives in general terms. They only require identification of the potential effects of the project and how these effects will be mitigated at each stage of the project. Under the specific EIA, the applicant must specify, for each mitigation method, the degree to which the adverse effect will be abated. The specific EIA requires a detailed analysis of the methods and alternatives for mitigating the effects of a project.

By using existing environmental, technical and legal standards, the interested party must specify how the measures for mitigating the environmental impact will deal with each adverse effect. Project proponents must also provide an estimate of the increase in cost for each mitigation measure specified. In addition, the specific EIA also requires information for abandoning the project, which includes the use of the site, its infrastructure and surrounding areas after the project life. The information must include the estimated useful life of the project or activity, a programme of restoration for the area and plans for using the area once the life of the project ends.

11.6 ENVIRONMENTAL EFFECTS

11.6.1 Canada

The Canadian Act requires that every EA consider the environmental effects of the project and their significance. Environmental effects of malfunctions or accidents that may occur in connection with the project and 'any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out' are to be included. The term 'environmental effects' is defined to include 'any change that the project may cause in the environment' and the consequences of any such change on:

> health and socio-economic conditions, on physical and cultural heritage, on the current use of lands and resources for traditional purposes by aboriginal persons, or on any structure, site or thing that is of historical, archaeological, palaeontological or architectural significant (Section 2[1]).

This term also applies to 'any change to the project that may be caused by the environment'. As defined in the Act, the term 'environment' means:

> the components of the Earth, and includes: (a) land, water and air, including all layers of the atmosphere, (b) all organic and inorganic matter and living organisms, and (c) the interacting natural systems that include components referred to in paragraphs (a) and (b) (Section 2[1]).

Projects subject to an EA under the Act must also consider transboundary effects, since this is included in the definition of environmental effects. Specific sections of the Act include provisions for projects having interprovincial or international transboundary environmental effects or effects on 'lands of federal interest'. Under the transboundary provisions of the Act, the Minister of the Environment has the authority to refer a project directly to a mediator or panel, if the Minister believes that the project may cause significant adverse transboundary effects in cases when the project would otherwise not require an EA. The Act's transboundary provisions do not apply to all the projects having transboundary effects, given that these provisions do not include projects that are subject to a federal regulatory power, duty or function under another statute or regulation and for which the Act would otherwise be triggered.

Under Section 47[1] a project may be referred to mediation or panel review where the Minister 'is of the opinion that the project may cause significant adverse environmental effects occurring . . . outside Canada'. Such a referral shall not be made where the federal government and interested provinces have agreed on an EA (meeting certain conditions) to consider transboundary effects (Section 47[2]). In contrast to the procedures applicable to interprovincial effects (Section 46[3]), there is no provision for petition by members of the public at risk of transboundary harm in the international context.

11.6.2 USA

In the USA, the EIS considers three types of impacts: direct, indirect and cumulative. Each of these types of impacts has short- and long-term implications, which also need to be considered where the consequences are likely to be relevant. Three concepts in the regulations are worth special emphasis.

First, by defining 'effect' and 'impact' as synonymous, the NEPA regulations use the term 'impact' to mean a consequence. In other words, the definition of the term 'effect' was not intended to define which effects are 'environmental'. The term 'effect' must be read with the term 'human environment' to understand which 'environmental impacts' NEPA covers.

Second, the regulations use the term 'indirect' impacts, rather than secondary, to convey the idea of a range or continuum of impacts, from immediate on-site effects to consequences that are deserving of special consideration but are not 'remote or speculative'. Indirect impacts can occur off-site, such as downwind or downstream of a site, or on-site, such as cross-media impacts. Indirect impacts can also occur later in time, whether as a consequence of construction methods, during a project's operation or after a facility's closure.

Third, there is no requirement to label an impact as direct, indirect, cumulative, short-term or long-term. CEQ regulations emphasize that the analysis be organized in whatever fashion will help decision makers and the public think about the impacts, discussing or focusing on the most important environmental impacts and choices (40 CFR 1502.2 and 1502.16) (Weiner 1997).

11.6.3 Mexico

Evaluating the impacts of a project varies according to the depth of the studies, which in turn is related to the type of EIA submitted. For general and intermediate EIAs, the applicants identify environmental impact at different stages of the project and select the methodology which they deem appropriate. The intermediate EIA also requires the applicant to describe the impacts at each stage of the project, indicating their origin, evolution, circumstances and continuing effect on the environment, as well as the identification and detailed description of social and economic changes caused by the development of the project. Also included in an intermediate EIA is a description of the natural characteristics of the project area prior to site preparation and an analysis of the most significant environmental impacts, including the cumulative effects of environmental changes.

The specific EIA requires, on the other hand, a more in-depth description, evaluation and interpretation of project impacts. Similar to the intermediate EIA, the specific form must give a detailed description of the modified environment and its current and future characteristics. These include physical, chemical, biotic, abiotic, socioeconomic, cultural and political. The applicants must identify, measure, evaluate, interpret and compare not only the direct and indirect impacts of the project, but also the short-term, long-term, reversible, irreversible, inevitable, cumulative and residual effects. Applicants must include in their analysis the direct, indirect and cumulative impacts on the project site and the potential impacts once the project is complete and if the project were not completed.

Unlike the general or intermediate EIAs, a specific EIA requires project proponents and/or interested parties to:

1 use two or more of the following techniques for analysing impact—ad hoc suppositions, lists, networks, matrices, cost–benefit analysis, Delphi, direct measurement, expert judgement, indexes and indicators, and to justify the impact identification techniques used;

2 specify and evaluate different project options available, including the economic, social and environmental benefits of each option and its cost and potential effect on the environment, its sustainability and its viability.

11.6.4 Cumulative effects

While Canada, the USA, and Mexico all have requirements at various levels of environmental processing to evaluate the cumulative effects of a project, that analysis remains one of the most difficult and challenging aspects of EIA (see discussion of methods in Chapter 18, Volume 1). The CEQ regulations have required analysis of cumulative effects since their issue in 1978, but the practice has been inconsistent and marginal. As a result, federal agencies in the USA have independently developed procedures and methods to analyse cumulative effects of their actions (Clark 1993). During the last decade, a considerable body of research on cumulative effects and their assessment has been undertaken in Canada. The effort was initiated by the pioneering studies of the Canadian Environmental Assessment Research Council. Subsequently, other studies have redefined the concept of cumulative effects. For example, Ontario is developing a practical 'indicators approach' which uses existing databases and state of the environment reporting to address cumulative effects (Doyle 1994). The CEQ and CEAA have been collaborating since 1993 to develop approaches to assessing cumulative effects. In 1997, CEQ published a handbook on consideration of cumulative effects (Council on Environmental Quality 1997a), and Canada is now close to issuing a similar handbook.

11.7 PUBLIC PARTICIPATION

Project proponents should consider the views of the surrounding community and other affected and/or interested individuals and groups during the planning and decision-making process, not after it. Effective public involvement requires an interactive approach, instead of the effort being only one of information dissemination.

One of the stated purposes of the Canadian Environmental Assessment Act is to ensure that there is an opportunity for the public to participate in the EIA process. The project proponent is responsible for determining whether and how to provide public notice of the action and its EIA. At the screening stage, public participation is at the discretion of the responsible authority. If the action is on the Comprehensive Study List then the responsible party must provide the public with an opportunity to give oral and written comments on the draft report. After completion of the screening report or a comprehensive study report, the responsible authority or the Minister of Environment may decide to refer the project to a mediator or a public review panel.

The Act provides for mediation of one or more issues or of the entire EA. The Act allows any 'interested party' to participate in a mediation. If the mediator cannot achieve consensus among the interested parties, including the proponent, then a review panel completes the EA.

The Minister of Environment sets the terms of reference for a mediation or review panel and appoints independent experts as the members of the panel. The panel conducts public hearings and has the power to require witnesses to attend. A participant funding programme is mandatory under the Act, to assist citizens affected by a project to participate in panel reviews or mediation.

At the time of writing, there have been 56 panel reviews completed since the EA process was established in Canada. These panels tend to be controversial and politically sensitive, and projects that are reviewed by panels usually have the potential to have significant environmental and social effects. Panels are also able to concentrate large quantities of scientific, technical and social information into clear recommendations to the Minister of the Environment. The panel's function ends with the submission of their report to the Minister of the Environment, who then makes the report available to the public. Participants may not always like the conclusions of the panel, but generally agree they have had a fair hearing.

The Act directs responsible authorities to maintain a registry of all the records produced, collected or submitted in relation to the EA of a project, and the Agency is responsible for maintaining a public registry for projects assessed by a mediator or a panel. An updated listing of federal EAs can be accessed through the Federal Environmental Assessment Index, the master index of federal EAs being carried out under the Act. The index contains basic data on 'what', 'when' and 'where' and contacts for obtaining the documents or additional information. It is available on CD-ROM, in paper copy in Canadian public libraries, and can also be accessed on the Internet at http://www.ceaa.gc.ca (see also Chapter 4, this volume).

The extent to which an agency takes into account the views of the surrounding community and other interested members of the public during its planning and decision-making process is also critical to effective and efficient implementation of NEPA. Through implementation of NEPA, the planning and decision-making processes of federal agencies have been opened up for public scrutiny, and in many cases this provides the only opportunity for the public to affect these processes.

Partly as a result of NEPA, public knowledge of and sophistication on environmental issues has significantly increased over the last 25–30 years. So too have public demands for effective and timely involvement in the agency decision-making processes. The success of a NEPA process heavily depends upon whether an agency has systematically reached out to those who will be most affected by a proposal, gathered information and ideas from them and responded to the input by modifying or adding alternatives, throughout the entire course of planning.

Effective public involvement takes effort and time. The desired level of public involvement is not always achieved, and many citizens are frustrated when they are treated as adversaries rather than welcome participants in the NEPA process. Since its enactment, NEPA has increased significantly public information and input into federal agency decision-making. NEPA opened up for public scrutiny the planning and decision-making processes of federal agencies, in many cases providing the only opportunity for the public to affect these processes.

Agencies are required under CEQ regulations to make diligent efforts to involve the public in preparing and implementing their NEPA procedures. The public gets an opportunity to comment on the agencies' procedures as well as the individual EIA. However, not all agencies notify the public about the availability of an EA. Some agencies publish draft EAs and allow varying amounts of time for comments. When an EIS is being prepared, the agency is required to publish a formal Notice of Intent that they are embarking upon a project that can significantly affect the environment. This Notice initiates the public scoping process, and agencies generally hold meetings within the affected communities to seek their views on the kind of issues that should be discussed in the EIS. After a draft EIS has been prepared, the agency files it with the Environmental Protection Agency which officially notifies the public that the draft is available for public review and comment for at least 45 days. Agencies are required to consider these public comments and in the final EIS explain the comments received and their disposition. The agency then files the final EIS with the Environmental Protection Agency (EPA), which notifies the public again so providing an opportunity to review the final document.

Citizen participation in Mexico's EIA process remains limited. Under the Ecology Law, agencies and applicants are required to publish a notice in the *Ecological Gazette* notifying citizens that they can review the EIA at the INE office where it is undergoing evaluation. While projects occur throughout the country, public review is usually in Mexico City. The Ecology Law allows EIA applicants to withhold from public review information affecting industrial property rights if they can show their legal right to withhold the information. Notice of federal EIAs in the *Ecological Gazette* is not always provided in a timely manner. Citizen participation comes at a very late stage of the process, usually at the point of decision-making, which prevents the public from shaping a project before the INE issues a ruling on the EIA. The INE is working to create mechanisms for public participation, but, at the time of writing, these reforms have not been implemented.

Canada provides detailed parameters for public participation in various levels and types of environmental processing. NEPA regulations and guidance on public participation during the EA process is related primarily to preparation of an EIS, with confusion resulting as to what is required, appropriate or allowed in EIA preparation. The only specifics noted are mandated time frames for notices of EIS preparation, comment periods and meetings. Participants in a recent study on the effectiveness of NEPA encouraged

CEQ to provide more guidance on increasing public participation in the EA process (Council on Environmental Quality 1997b).

Public participation trends in Canada include interest groups raising non-project-related issues, more extensive consultation with First Nations, increasing reliance on public participation professionals and increasing use of mediation and alternative dispute-resolution techniques.

11.8 INTERAGENCY REVIEW

The US EPA reviews and rates all draft EISs, issuing a letter that explains the rating and identifies what corrective actions should be taken to cure any defects in the final document. EPA uses the following scale to rate the environmental impacts:

- LO, lack of objections.
- EC, environmental concerns: impact can be avoided or mitigated.
- EO, environmental objections: significant impacts identified; corrective actions may require substantial changes to the proposed action or consideration of another alternative.
- EU, environmentally unsatisfactory: impacts are so severe that the action must not proceed as proposed. If the deficiencies are not corrected in the final EIS, EPA may refer the EIS to CEQ for resolution.

If a proposal is referred to CEQ because it is considered 'environmentally unsatisfactory' and if CEQ accepts the referral under its criteria, there may be more public review and comment on the proposal under CEQ's procedures. After consideration of these proceedings, CEQ then issues 'findings and recommendations' to the head of the agency proposing to take the action, who can accept or reject these. Referrals are rare and have only occurred 26 times in CEQ's 28-year history.

The Mexican INE, part of the SEMARNAP, is responsible for evaluating federal EIAs.

In Canada, the Comprehensive Study Report may be reviewed as needed by expert government agencies, and is reviewed by the responsible authority and the Agency before the Minister makes a decision on the project. Panel reviews and mediation involve Agency review more specifically. Because of the panel's independence from the federal government, they may create project-specific scientific advisory groups or they may hire professional consultants to review the EIS and to advise on scientific subjects.

11.9 MONITORING

Neither post-decision NEPA nor the CEQ regulations require post-decision monitoring, although the CEQ regulations do require a monitoring enforcement programme for any mitigation specified in a FONSI or a Record of Decision. The CEQ regulations suggest that monitoring of impacts is a wise matter, albeit discretionary. Culhane *et al.* (1987) analysed predictions and found that two-thirds of the statements made qualitative projections; a review of the latter found that only one-third were accurate.

The Canadian Environmental Assessment Act has provisions for the design and implementation of follow-up programmes. It is, however, at the discretion of the responsible authority to identify the need for a follow-up programme for projects about which they hold decision-making authority.

Follow-up programmes are defined as programmes to verify the accuracy of the EA of a project and determine the effectiveness of mitigation measures. For comprehensive study, mediation or panel review, the need for and requirements of any follow-up programme must be considered during the assessment. In addition, when a responsible authority decides to provide federal support for a project, the Act authorizes it to design and arrange for the implementation of any follow-up programme that it considers appropriate for the project. When such a programme is designed, the responsible authority is required to advise the public of both the programme and its results.

In Mexico, once the INE approves an EIA, the government's oversight role does not end. If an applicant stops an activity that had been previously approved through the EIA process, the applicant must inform the INE in writing and adopt measures that do not harm the ecological balance or the environment. Although the EIA

Regulation gives the INE certain limited responsibilities, the Federal Attorney's Office for Environmental Protection (PROFEPA) is responsible for enforcing the Ecology Law and the EIA Regulation. PROFEPA also monitors compliance with terms set out in the EIS by receiving information of violations of permit conditions from the INE or from citizens or by making make their own audits. Where warranted, PROFEPA may impose sanctions for noncompliance. Under the EIA Regulation, these sanctions include fines, shutdowns, suspension or revocation of authorizations and administrative arrests.

11.10 RESPONSE TO FINDINGS—ADAPTIVE MANAGEMENT

Both Canada and the USA recognize the inability to predict with certainty many impacts of a proposed project. The NEPA process has been increasingly successful in modifying project proposals to minimize or avoid environmental impacts before they occur. Neither country has formal requirements in place to validate the stated potential impacts and the efficacy and implementation of proposed mitigation measures. These proposed mitigation measures are, in some cases, what allows for project approval and are part of an agency decision statement. As noted in the monitoring discussion, Mexico allows for a more structured adaptive response to variations from reported potential impacts.

An adaptive management approach allows for monitoring the accuracy of impact predictions and flexibility in the process for corrections based on changes in conditions. While NEPA has no formal monitoring requirement, CEQ regulations require monitoring where applicable.

Increasingly in Canada:

- project approvals specify monitoring and reporting requirements for the project construction and operation phases;
- contingency plans are sought when there is uncertainty over impact predictions; and
- public liaison committees are established to provide a forum for exchange of information and resolution of issues (e.g. regarding adjustments to mitigation and compensation arrangements in light of actual experience) (Doyle & Sadler 1996)

In Mexico, if the INE finds environmental consequences that were not predicted in the original EIA, it may require a proponent to prepare additional analyses and can even re-evaluate its earlier authorization of the project.

11.11 LOCAL AND REGIONAL ENVIRONMENTAL IMPACT ASSESSMENT

Canadian institutional arrangements for effective use of EA in planning and decision-making are well developed. All jurisdictions in Canada (see Box 11.1) have EA systems which are characterized by a mix of common and distinctive procedural elements. In addition, various joint EA regimes have been created under federal–provincial agreements, and separate processes are in place in a number of municipalities and in native jurisdictions (Doyle & Sadler 1996).

Fifteen states in the USA and Puerto Rico (see Box 11.2) have adopted EIA legislation and are commonly referred to as 'little NEPAs'. Most states' EIA legislation looks to NEPA and the CEQ regulations for the basic elements of their process. They all contain exclusions for projects that are not environmentally significant and they all require analysis of alternatives; almost none require post-project monitoring. Some

Box 11.1 Canadian jurisdictions with EIA requirements

British Columbia
Alberta
Saskatchewan
Manitoba
Ontario
Quebec
New Brunswick
Nova Scotia
Prince Edward Island
Newfoundland
North-west Territories
Yukon

Box 11.2 States with EIA requirements in the USA

California
Connecticut
District of Columbia
Hawaii
Indiana
Maryland
Massachusetts
Minnesota
Montana
New York
North Carolina
Puerto Rico
South Dakota
Virginia
Washington
Wisconsin

states, however, such as California, Minnesota and Washington, require that the least environmentally damaging alternative be selected—a departure from NEPA and most of the 'little NEPAs'.

All 31 Mexican states have their own environmental impact legislation and environmental state authorities for enforcing those laws. According to the Federal Ecology Law, activities which are not specifically covered by Article 29 of the Environmental Law of the Federal District or Article 5 of the EIA Regulation or those which are not regulated in some way by the federal government are under the environmental regulation of states and municipalities. According to a study on environmental legislation by Juan Gonzalez Marquez of PROFEPA, almost all federal entities claim responsibility for the following areas:

- Public works at the state level.
- Rural roads.
- Industrial parks and zones.
- The rubber industry and its derivatives, brick making, food, textile, tannery, glass, pharmaceutical and cosmetic industries.
- Activities or industries the Federation does not consider high risk.
- Exploration, extraction and physical processing of minerals from natural deposits that are elements of the soil.
- State and private tourist developments.
- Installations for the treatment, storage or disposal of sewage and non-hazardous solid waste.
- Real-estate developments, residential units and new population centres.

11.12 INTERDISCIPLINARY PLACE-BASED APPROACH TO DECISION-MAKING

In Mexico environmental policies are also implemented through National Development Plans. The plans aim to achieve in a systematic and coordinated manner, comprehensive economic, social, political and cultural development. Each Secretariat, including SEMARNAP, develops a Plan in accordance with the National Development Plan.

Experience with the NEPA process in the USA shows that better decisions—those that meet the needs of the community and minimize adverse impacts on the environment—require the integrated perspective that can only be obtained by incorporating expertise and information from many fields. NEPA's interdisciplinary approach helps balance and integrate competing goals by focusing on all the environmental, economic, and social factors affecting a single place. Canada also maintains high-level coordination of multidiscipline groups in addressing and reporting on environmental issues. The INE is an entity of SEMARNAP which has the responsibility for receiving and evaluating EIAs.

11.13 INTERAGENCY AND ENVIRONMENTAL IMPACT ASSESSMENT INTERJURISDICTIONAL COORDINATION

Both Canada and the USA recognize a need to streamline the analysis process and the potential benefits of 'joint efforts' on the part of agencies and departments with an interest in the project. NEPA in fact allows for specific designations as a 'joint' or 'cooperating' agency.

In Canada, there has always been a high level of cooperation between jurisdictions for routine projects. For larger projects, i.e. panel reviews, there have been varying degrees of federal and provincial participation in these reviews, depending upon the level of interest of each jurisdiction. Currently, the federal and provincial governments are negotiating harmonization accords to institutionalize this cooperation. To date, there have been federal–provincial harmonization accords with the federal government and the provincial governments of British Columbia, Alberta and Manitoba.

11.14 STRATEGIC PLANNING

Strategic planning is the extent to which agencies integrate the goals of their country's environmental policies into their internal planning processes at an early stage. The environmental review process is often triggered too late to be fully effective, foreclosing alternatives and strategic choices.

A strategic approach to EA recognizes that decisions are made incrementally and that, more often than not, decisions are made with imperfect information, regardless of the effort and resources spent on gathering data and information. Strategic EA, unlike rote environmental processing brings to decision-making early consideration of the environment, early consultation with the public and a consideration of alternatives before there is an irreversible commitment of resources. A strategic approach ensures that changes in social values, environmental ethics and community concerns are reflected in the longer-term goals, principles and practices of EA.

For a process to lend itself to having a strategic planning aspect uncertainties must be eliminated. In Canada there is a trend towards improved guidance and clarity of direction as evidenced in four of the 10 listed attributes:

- *Attribute 1*: clear purpose and goals.
- *Attribute 2*: incorporates long-term and overall perspective.
- *Attribute 3*: broad scope of application.
- *Attribute 7*: certainty of decision-making.

The EA of policies, programmes and plans is evolving in Canada as an important decision-making tool for promoting sustainable development. Under a 1990 Cabinet directive, federal departments and agencies are required to consider environmental factors in many government policy and programme proposals.

11.15 SUMMARY

EIA has it roots in North America, with the passage of the NEPA in the USA. While there are similarities in the approaches to EIA among the USA, Canada and Mexico, there are clearly different methods of achieving effective implementation.

EIA remains a very young discipline around the world and all countries, including the three on the North American continent, continue to search for ways to make the process more effective and efficient. Canada and the USA recently concluded effectiveness studies of their respective EA programmes, reaching many of the same conclusions. First, while EIA has provided a framework for collaboration, it needs to be better integrated into the decision-making process. Secondly, that governments should make analyses more accessible to the public, and that an early, open and collaborative approach not only furthers the goals of environmental protection and public participation, it also provides an opportunity to achieve greater efficiencies in the process. In addition, Canada led an international study that reported on the effectiveness of EA in Canada and other industrialized and emerging countries (Sadler 1996).

As EIA matures, new models are evolving around the world. Emerging issues in North America resemble the discussions extant around the globe. A place-based approach, often called the ecosystem approach to management in the USA, is promoting a greater collaboration among federal agencies, state agencies and the affected communities within ecosystems. Beginning the EIA at an earlier, more strategic time in planning will yield more alternatives and a greater opportunity to reach sustainable decisions before options are foreclosed.

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12: Environmental Impact Assessment in the European Union

ALAN J. BOND & PETER WATHERN

12.1 INTRODUCTION

The European Union (EU) currently (1998) comprises 15 Member States. Each of these, in becoming a Member of the Union, agrees to abide by the Treaty of Rome, as amended by the Single European Act (1986) and the (Maastricht) Treaty on European Union (1992). Table 12.1 sets out the membership of the EU and indicates when the various countries joined. The EU is by no means a static organization of countries. On the contrary, there are ambitious plans to expand membership, with applications from more countries currently, being considered. In the short term, it is expected that Hungary, Poland, Estonia, the Czech Republic, Slovenia and Cyprus may accede in 2003; in addition, negotiations continue with Bulgaria, Romania, Latvia, Lithuania and Slovakia.

One of the key underlying principles of the EU is to create a level playing field across all Member States by requiring the same standards to be met across the Union. There are two main legislative instruments which can be used to achieve this: (i) the use of Regulations, which have binding force in all Member States and are regularly employed in, for example, setting agricultural prices, where absolute uniformity is the desired objective; and (ii) through Directives, which impose obligations on Member States which they must meet (although they are at liberty to apply more stringent rules within their own borders), using methods of their own choosing, by specified dates. Legislation relating to the environment has mainly been implemented using Directives.

It is worth noting that, under the present mechanism operating in the EU, introduced by the Maastricht Treaty, the procedure for approving environmental legislation involves qualified majority voting, unless there is disagreement between the Council and the European Commission, in which case unanimity is still required. In the past, there was no specific reference in the Treaty of Rome to the environment, and legislation in this field had to be adopted using specific articles which demanded unanimity amongst all Member States; this was the case for the 1985 Environmental Assessment Directive. As a result, past Directives were unlikely to be radical in their outlook, as they required considerable agreement between Member States in order to be adopted. This had two effects. Directives have often represented the minimum standard acceptable to all, 'the so-called' lowest common denominator. However, plenty of scope has been left for Member States to implement more stringent measures if they wish.

The Member States have extremely varied institutional structures and decision-making mechanisms based on centuries of independent development. Therefore, the legal measures differ tremendously even where the required outcomes are identical. Consequently, this chapter has been structured to illustrate this diversity.

The next section provides an overview of the EU and highlights the differences in governmental level at which environmental impact assessment (EIA) legislation is developed in the various countries. In Section 12.3, consideration is given to the constraints on implementation of EIA and the difficulties encountered in adopting the Environmental Assessment Directive (85/337/EEC). This is followed by a description of the varied nature of decision-making in Member States in

Table 12.1 Membership details for European Union countries.

Country	Commencement of membership
Belgium, France, Germany, Italy, Luxemburg, the Netherlands	1957
Denmark, Ireland, UK	1973
Greece	1981
Portugal, Spain	1986
Austria, Finland, Sweden	1995

order to introduce the diversity of approaches taken in implementing the Directive.

Section 12.4 details the EIA obligations imposed by the Directive. This is necessary to provide a context for the description of the procedural approaches adopted by Member States. These examples indicate both practice and process.

Finally, conclusions are drawn concerning the various procedural arrangements and the effectiveness of the different approaches. The Directive has recently been amended and a brief description is given of the changes which Member States will be required to make in order to meet their new obligations by the deadline of 14 March 1999.

12.2 OVERVIEW

12.2.1 The European Union

The EU encompasses 15 countries and has a population of 370 million people. There are many institutions which oversee the Union, but only the major ones involved in the development of European legislation are discussed here: the Parliament, the European Council, the European Commission and the European Court of Justice. In simple terms, the Commission initiates legislation, the Parliament comments on it and the Council can reject or approve it, while the Court of Justice oversees implementation and interpretation.

The Parliament sits in the Palais de Justice in Strasburg and currently has 626 members, directly elected every 5 years within the Member States. The number of members from each State is roughly proportional to its population.

The Council consists of 15 national government representatives which, for the day-to-day running of the EU, are nominally the foreign ministers of the Member States. For more specific matters, the appropriate ministers attend; for example, environment ministers meet to discuss and make decisions on matters related to the environment. The presidency of the Council rotates on a 6-monthly basis. The Council produces the legislation of the EU by voting on proposals developed by the Commission, taking account of opinions of the Parliament.

The Commission comprises 20 Commissioners and 24 Directorates General. The Directorates General have responsibility in specific areas, with Directorate General 11 (DGXI) having responsibility for the environment. The Directorates General produce draft legislation in their specific areas of expertise.

The Court of Justice sits in Luxemburg and comprises 15 judges, assisted by nine advocates-general. This court is the highest in the EU and has jurisdiction over disputes which may arise between the institutions, between Member States, between institutions and Member States and between institutions and private parties.

EIA at the project level within the EU has to meet the obligations imposed by Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment (Commission of the European Communities 1985). The Directive was notified to Member States on 3 July 1985. The provisions of the Directive required all Member States to implement legal procedures to meet their obligations by 3 July 1988. The continuing expansion of the Union, however, complicates this picture, with Spain and Portugal becoming members in 1986 and Austria, Finland and Sweden joining in 1995. As a result, no discussion of failure to meet deadlines is included in this chapter, as special transitional arrangements govern the situation in new Member States.

12.2.2 Level of government at which law-making powers for environmental impact assessment exist

Within Member States, governments have the right to produce legislation which complies only with the minimal provision of the Directive, or can produce more stringent measures and place greater obligations on developers and institutions within their own borders. It is necessary, therefore, to indicate at which level of government EIA procedures are drawn up in each Member State prior to discussing procedural requirements. Most Member States produce legislation at a national level, but a significant number have a greater degree of regional autonomy, with devolved law-making powers. In Belgium, for example, the degree of devolution is perhaps the most advanced. Table 12.2 sets out the level at which EIA regulations are produced.

Table 12.2 Level of government at which EIA procedures are written.

Austria	Legislation produced at the national level
Belgium	Separate laws needed for the three regions of Brussels, Flanders and Wallonia Only nuclear power projects are still dealt with at a national level and need national EIA regulations
Denmark	National level
Finland	National level
France	National level
Germany	Separate laws needed at the national level and for each of the 16 Länder
Greece	National level
Ireland	National level
Italy	Separate laws needed nationally and for each of the regions and provinces
Luxemburg	National level
Netherlands	National level
Portugal	The autonomous regions of Madeira and Azores are required to produce their own legislation—mainland Portugal all comes under the national system
Spain	Separate laws needed at the national level and for each of the 17 autonomous communities
Sweden	National level
UK	Separate regulations are required for England and Wales, Scotland and Northern Ireland

12.3 CONSTRAINTS ON ENVIRONMENTAL IMPACT ASSESSMENT IN THE EUROPEAN UNION

The requirement for unanimity in adopting directives, to a large extent, accounts for the protracted gestation period of the EIA provisions. One output from a research project funded by the European Commission in 1976 was the text of a putative draft directive (Lee & Wood 1976). It was not until 1980, however, that the Commission published the first official draft directive (Commission of the European Communities 1980). This draft only appeared after an indeterminate number of drafts and much deliberation (Wathern 1988). The text that was finally adopted by the Council of Ministers in 1985 again contained substantial modifications to the provisions contained in previous drafts. A comparison of these three documents reveals the influence of individual Member States throughout this 10-year period.

Adoption of the Maastricht Treaty introduced a qualified majority voting scheme for environmental provisions within the EU. Thus, the required unanimity amongst the Council of Ministers that operated when the EIA directive was being negotiated provided some Member States with an opportunity to promote their own priority issues and others to contain measures likely to result in excessive economic or political cost or to forge alliances which carried the chance of future national advantage. In effect, this period was characterized by politics, i.e. it was a time for compromise and negotiated deals between Member States. As a consequence, a number of changes occurred. These included, for example, changes in the types of project that would be subject to EIA, the exemption of projects authorized by act of national parliament and the exclusion of interjurisdictional impacts arising from transboundary pollution. The latter provision will be reinstated when the EU gives effect to the Espoo convention (see Chapter 5, this volume). Even with the directive in place, Member States antagonistic to it had a second opportunity to circumvent its provisions during the design of the procedures adopted nationally. This dual strategy has been described as 'pre-adoption emasculation and post-adoption deflection' (Wathern 1988). For example, it was widely known that, in 1985, the UK government intended to exclude all Annex II projects from EIA requirements, thereby at a stroke restricting the application of the directive's provisions to only nine categories of projects, many of these being large-scale developments for which appraisal would normally be both detailed and intense and easily accommodated within formal EIA procedures.

Directives are a favoured legislative device for environmental provisions within the EU, simply because of their flexibility. First, they constitute minimum provisions, so Member States are free to apply more stringent requirements if they wish. Secondly, the various Member States are characterized by a plethora of legal and administrative styles with respect to environmental regulation. Consequently, detailed procedures can be designed within national frameworks and constraints and still comply with the binding obligations of the directive, rather than having provisions imposed from outside that are not consistent or conflict with the national environmental policy style.

In 1985, some Member States, such as the UK, already had mature, plan-led land-use planning systems which, arguably, provided much of the precautionary approach to development control implicit in the directive. Others had fragmentary systems which extended only to certain development sectors or regulated only certain types of impact, such as potential pollution.

Adoption of the Directive for some countries was a simple process. For example, the UK has general legislative powers that enable ministers to introduce measures to comply with EU provisions without recourse to primary legislation. By contrast, in Italy, new primary legislation is necessary to give effect to almost all EU provisions. For countries with a federal structure, the definition of legal competency with respect to EIA has also been a complicating factor. In addition, prior experience of EIA also varied between Member States. The Netherlands, for example, instituted a programme of nine 'trial' EIAs in 1977, while the UK had seen its first environmental impact statement (EIS) produced, albeit on an informal basis, for the offshore oil and gas industry in 1974 (Sphere Environmental Consultants 1974).

It was fairly simple for some countries to meet their obligations within existing legislation, whilst others could or did not. Thus, in the case of the UK, a whole series of separate statutory instruments, a form of secondary legislation, were introduced under a variety of legislation, ranging from town and country planning to the energy acts, in essence maintaining the status quo. This was possible only because certain aspects of good practice, such as scoping and review of completed EISs, were not mandatory provisions of the directive. Had they been, wholesale change of UK development control practice would have been necessary. Thus, for example, public participation has long existed under town and country planning legislation, but in essence only as a period of public consultation on development proposals, rather than the adequacy of an EIA, after the EIS has been submitted with the planning application. Prior consultation, for example, in the form of a scoping exercise, is not required. However, adoption under different legislation means that there are some inconsistencies in the provisions for different types of project. Thus, under the Water Acts, the regulatory agency must publicize its decision as to whether an EIA is required for a particular flood defence project. Furthermore, the public has the right to appeal this decision. Yet, comparable obligations or rights do not exist for similar projects which fall under town and country planning legislation.

In contrast, the Netherlands adopted a more considered approach and introduced unified and standardized EIA provisions under a new piece of legislation. This incorporated a Commission to oversee the procedure, including the responsibility to draw up terms of reference for each EIA and to review the resultant EIS for adequacy prior to any decision being taken by the competent authority. Furthermore, projects subject to EIA were placed on a wholly mandatory basis.

Successful implementation of the Directive, however, has depended not only upon Member States adopting the appropriate legislative and administrative procedures, but also upon having the necessary skilled personnel available to ensure that the system operates effectively. The availability of adequately trained personnel has been an important constraint on the effective implementation of EIA in the Member States, even where adequate procedures have been in place. This is evident from the large number of very poor EISs produced in the first few years after adoption of the Directive (Commission of the European Communities 1993). In effect, EIA required new ways of operating for decision makers, administrators, project managers, technical specialists, members of non-governmental organizations and lawyers. Not all were fully equipped to undertake the new tasks. Many required training in the new EIA skills.

Lee (1988) estimated that about 2000 people would need to be trained in EIA-related skills in the first year after the adoption of a formal EIA system in a country having a production rate of about 100 EISs per year. This could be expected to decline to about 750–1000 per year for the next 4–5 years, subsequently falling to a replacement rate of about 200–400. Although EIS production rates have varied enormously, the overall demand for trained personnel throughout the EU has been high. 'On the job' and short course training has been provided, but there have also been major innovations in specialist EIA training at postgraduate level, primarily in the UK. Since the first course began at the University of Wales, Aberystwyth, in October 1988, an estimated 750+ students have graduated from this and other courses in the UK alone. However, other Member States have yet to achieve the same level of provision of qualified EIA practitioners.

12.4 THE 1985 ENVIRONMENTAL IMPACT ASSESSMENT DIRECTIVE

The form of the EIA Directive is quite important. It contains a preamble, 14 articles and three annexes. The implications of each of its parts will be considered individually below. Figure 12.1 indicates the obligations which the Directive places on Member States in drawing up their national EIA legislation and shows how each of its components interrelate.

12.4.1 Preamble

The preamble sets out the background to the Directive. It states that the Directive is a measure in line with Community action programmes on the environment. It also states that the Directive is based on both Articles 100 and 235 (of the Treaty of Rome).

Prior to the Single European Act (1986), which introduced consideration of the environment into the Treaty of Rome, both of these articles were used as the basis for producing secondary legislation, such as Directives and Regulations, relating to environmental matters. Article 100 allows secondary legislation to be adopted where functioning of the common market was a consideration (for example, harmonizing exhaust standards for cars). Article 235 is far less precise and allows for action by the EU where the Treaty of Rome has not provided specific powers under another article.

It is made clear that environmental assessment should be introduced for private and public projects likely to have significant effects on the environment. Whilst this goes further than the requirements of the National Environmental Policy Act (1969) of the USA in that private projects are involved, the omission of any requirement to carry out environmental assessment, at a strategic level, of plans, programmes and policies was not the original intention (Wood 1995), but is a feature of producing a form of words acceptable to all Member States. The preamble makes it clear that development consent will require possession of the environmental assessment information where it is appropriate to carry it out. This makes it a requirement that Member States introduce legislation to require an EIS to be in the hands of the decision maker where a project requires EIA. The systems of land-use control which exist across the EU are so varied that it would not be possible to be any more precise than this; it is

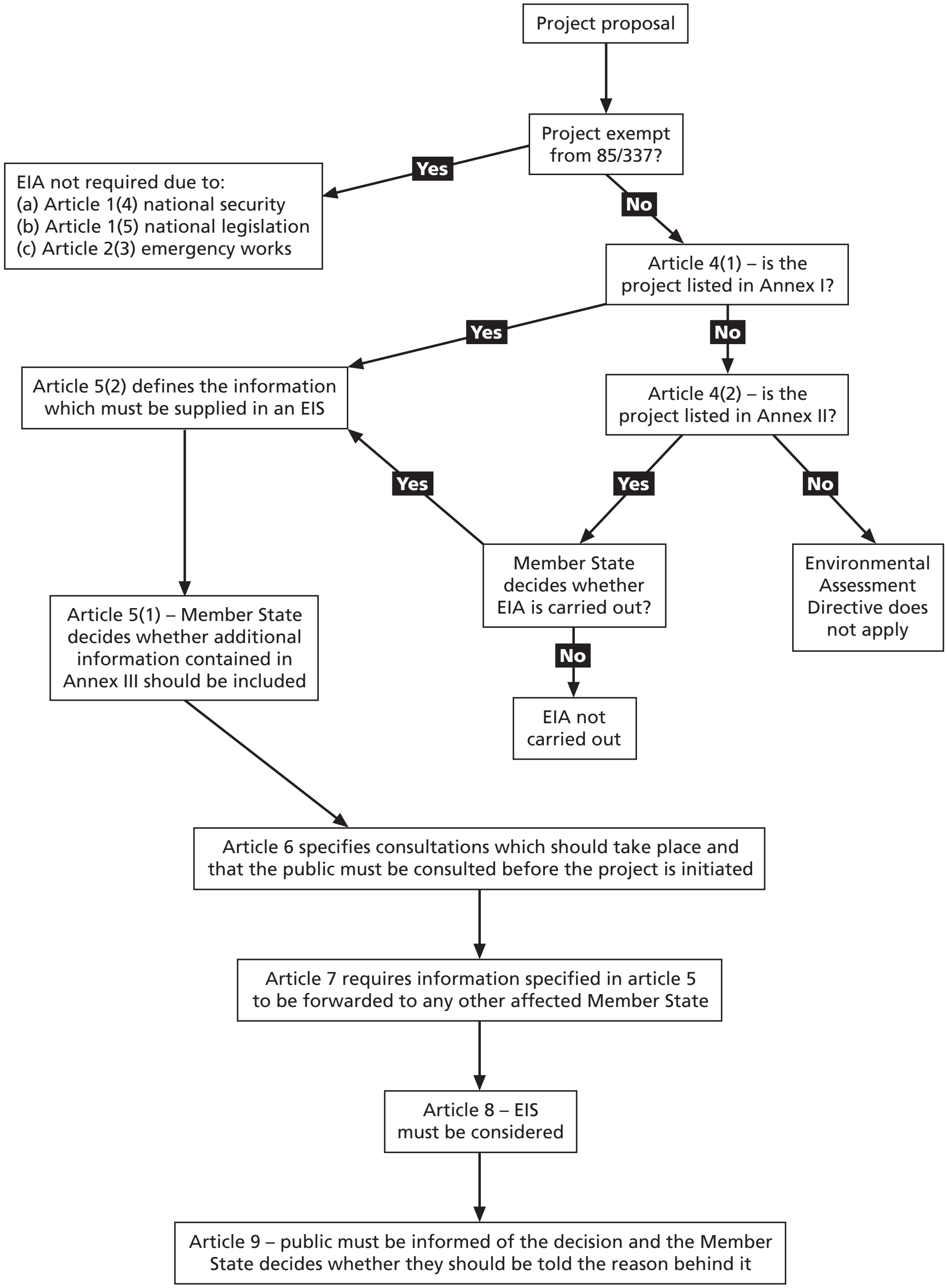

Fig. 12.1 Flow chart showing the EIA obligations imposed on Member States by the Environmental Impact Assessment Directive. EIA, environmental impact assessment; EIS, environmental impact statement.

clear, therefore, why a Directive has been used as the means of implementing EIA rather than Regulation. This point is further reinforced by the fact that there are separate categories of projects: those which always require environmental assessment and those where environmental assessment is only required at the discretion of the Member State. Finally, it is made clear that EIA is necessary to: (i) take account of human health; (ii) lead to a better environment; and (iii) ensure species diversity. Thus, the adoption of the Directive is justified.

The preamble ends by allowing exclusions from its procedures, and goes on to specify the specific cases in the articles where a project is: (i) approved by an act of national legislation (a project which would fit into this category would be the Channel Tunnel in the UK, although an EIA was carried out in this case; the project was approved before 3 July 1988; the required implementation date, and so was not covered by the Directive); (ii) serving national defence purposes; or (iii) is classed as emergency works where there clearly is insufficient time to go through the lengthy process of an environmental assessment—for example, works to prevent flooding. In the latter case, the Directive preamble states that such projects can go ahead without an EIA, but the case must be justified to the European Commission after the event.

12.4.2 Articles

These are the main parts of the Directive and state what must be achieved and implemented.

Article 1

The first part of this article is the important one. It states that EIA will be carried out on both public and private projects. The article goes on to define the terms project, developer and development consent, and indicates that each Member State has to designate bodies to have jurisdiction over the EIA process. Unfortunately, the most important term, significant, is not defined.

Article 2

Member States are required to ensure that EIA is performed on all projects which are likely to have significant effects on the environment. The most important things to consider in deciding this are the size, nature and location of the project. Inclusion of the term *inter alia* indicates that the decision is not made on the basis of these three points alone. Thus, considerable discretion was left with the Member States, to the extent that the European Commission had to take some States to the European Court of Justice in cases where they felt discretion had been misinterpreted to a degree where the legislation did not comply with the obligations of the Directive.

Article 3

This article is concerned with the general scope of the directive and lists a few items which should be considered in an EIA:

- Human beings, fauna and flora.
- Soil, water, air, climate and the landscape.
- The interaction between the factors mentioned in the first and second indents.
- Material assets and the cultural heritage.

Unfortunately, although the inclusion of a list of impacts to be considered goes further than the National Environmental Policy Act (1969) of the USA, the article does not define exactly what is meant by each of the terms, for example, cultural heritage, nor is there any requirement to carry out a formal scoping stage (Glasson *et al.* 1994).

Article 4

This article draws a distinction between projects which shall always be subjected to EIA (listed in Annex I) and those which shall not, depending on their precise size and location (detailed in Annex II). The question of size is also covered here, in that thresholds for certain types of projects, believed to have potential for significant effects, are detailed. Projects listed in Annex II must be subjected to EIA only where the individual Member State considers that its characteristics so require.

This division of projects into a mandatory and a discretionary Annex gave considerable scope for variation of EIA requirements across Europe. Thus, while all Member States have to require EIA for projects in Annex I, their requirements for EIA of projects in Annex II can be very different. However, each Member State is required to decide the criteria which determine whether EIA is necessary for projects in Annex II.

Article 5

Where a project is to be subjected to EIA, the information which must be provided in the report should be based on, but not necessarily include, the requirements given in Annex III. Only certain of the information must be provided as a mandatory requirement and Part 2 of the Article identifies these. Member States are also given discretion as to whether they should insist that the authorities who receive the information (the EIS) make all the information they have available to the developer. When considered along with the discretion already afforded Member States in Articles 2, 3 and 4, it is clear that legislation across the EU will not be standardized and the goal of a 'level playing field' would inevitably require future amendments to the Directive.

Article 6

This article is concerned with participation. First, Member States should make sure that any official bodies which have an interest in the project are given an opportunity to comment. Secondly, members of the public should have the right to see a project application and the associated EIS and should be allowed to comment before a project starts. Thus, it would be within the terms of the Directive to grant consent before giving the public an opportunity to comment on the project. Thirdly, arrangements as to the manner of the public consultation are left to the discretion of Member States, although advice is given such that the arrangements may determine the public concerned; specify the places where information will be available; specify the method for public information provision (such as notices in newspapers); determine the manner of the consultation itself; and fix time limits for information and consultation.

Article 7

This concerns situations where activities in one Member State may have significant effects in another, requiring the EIS information to be passed to the other country at the same time as the public is informed in the origin country. Again, it should be noted that this may be after the project has been authorized.

Article 8

This is a very short article, but crucial. It requires that an EIS has to be considered when the planning application is decided. Without this article, an EIS might be produced but would not have to be read.

Article 9

There is a duty to notify the developer, agencies and the public after a decision on the project has been reached by the authority with delegated responsibility. Although the decision has to be made public, whether the reasons behind it are also revealed is left to the discretion of each Member State.

Article 10

This article provides for non-release of information. Non-disclosure is possible on two counts: (i) where commercial secrecy is necessary to prevent unfair competition; and (ii) when there is a public interest issue, for example, concerning defence projects.

Article 11

The issue of the pooling of information, monitoring and reporting back to the European Commission is dealt with in this article and is a common feature of EU Directives. Thus, a duty is placed on Member States to submit information on implementation to the Commission. The wording is interesting as it applies only to Annex II projects in terms of criteria and/or thresholds adopted. There is no provision for reporting back on experience gained in implementing Annex I, presumably because it is already well set out with thresholds. These reporting procedures are designed to ensure that the Directive is achieving its objectives uniformly across the EU. It also opens the possibility of using the feedback to harmonize practice at a later date. This article builds in a mechanism for review of the Directive after 5 years and, in December 1995, a common position on an amendment was reached, the implications of which are discussed later.

Article 12

Adoption also encompasses the implementation period for the Directive. Each Member State was required to implement the Directive within 3 years of its notification. Reference to the notification date indicates that this was to occur by 3 July 1988. Each Member State is also obliged to explain to the Commission how it has complied.

Article 13

The Directive sets out minimum standards which must be met. These in no way prevent the Member States from adopting more rigorous controls.

12.4.3 Annexes

Annex I includes nine project types, each of which has associated thresholds, for which an EIA must be carried out. There is no discretion for a Member State to interpret either the project types or thresholds, other than to introduce more stringent size criteria if they wish.

Eleven separate classes of development are detailed in Annex II. They relate to: agriculture; extractive industry; energy industry; processing of metals; manufacture of glass; chemical industry; food industry; textile, leather, wood and paper industries; rubber industry; infrastructure projects; and, finally, other projects. In all, a total of 82 different individual project types are listed within these general categories.

Member States are obliged to use their discretion to decide which projects must always require environmental assessment or to produce criteria indicating when an EIA is required. Taking Articles 2 and 4 and Annex II together leads to the conclusion that Member States are given no scope to ignore Annex II projects. Their only discretion is in determining criteria for each of the projects. If whole categories were omitted from a Member State's national legislation, then this would be a breach of their obligation in implementing the Directive.

It is the information detailed in Article 5(2) which has to be included in an EIS. However, project proponents may additionally include any information included in Annex III, either at their discretion or when a Member State government decides that it is required, in part or as a whole.

12.5 ENVIRONMENTAL IMPACT ASSESSMENT PRACTICE IN THE EUROPEAN UNION

12.5.1 Procedural stages

In this discussion of EIA practice, each stage of the overall process is considered with examples indicating how each has been implemented in different countries. The aim is to present examples of the diversity of implementation and to consider both good and bad practice where appropriate. Given space constraints, no attempt is made to be comprehensive, merely illustrative.

Wood (1995; see also Chapter 2, this volume) presented a schematic diagram of the EIA process (Fig. 12.2). A similar figure underpinning the structure and scope of this Handbook is presented and discussed in Chapter 1, Volume 1. The various stages provide the basic structure for the following discussion i.e.:

- Consideration of alternatives.
- Screening.
- Scoping.
- Preparation of the EIA report.
- Reviewing the EIA report.
- Monitoring.
- Mitigation.
- Consultation and participation.

It should be noted that these stages are all reliant,

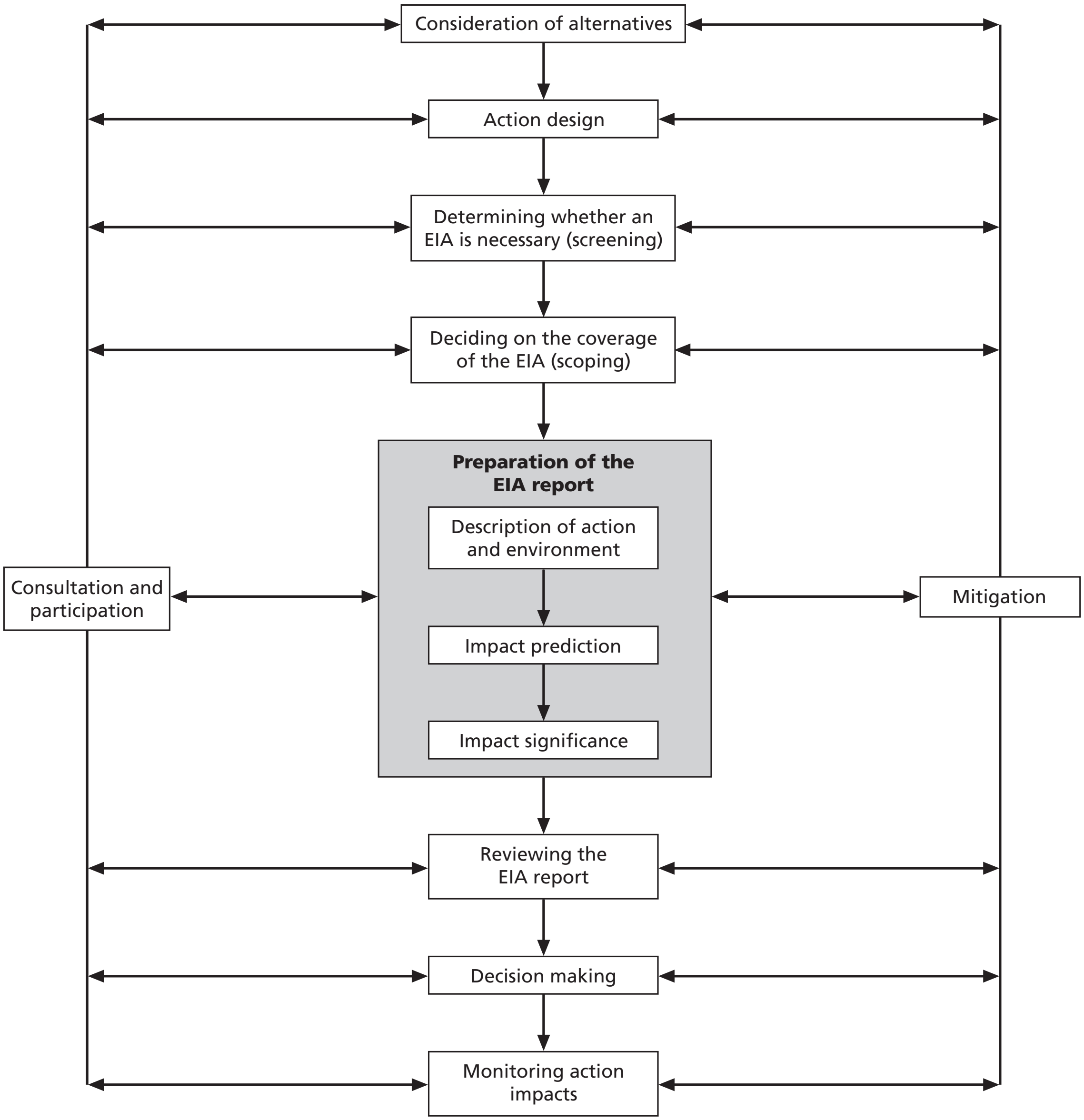

Fig. 12.2 The EIA process (after Wood 1995). EIA, environmental impact assessment.

to some degree, on the specific legislation within individual Member States.

12.5.2 Consideration of alternatives

The mandatory consideration of alternatives is not a feature of Directive 85/337. This does not, however, preclude the right of any Member State to include this requirement in their own implementing legislation. As a result, there are examples of countries which always require a consideration of alternatives, those that do not and others which fit somewhere in the middle, requiring consideration only under specific circumstances. One example of each is discussed below.

An example of a country which has opted for no mandatory consideration of alternatives in all cases is the UK. Here EIA legislation falls mainly within the remit of planning. However, additional legislation was required for projects which are covered by the Directive but which do not fall within planning law. In particular, extra regulations were required to cover trunk roads and motorways; power stations, overhead power lines and long-distance oil and gas pipelines; afforestation; land drainage improvements; ports and harbours; marine salmon farming; and marine dredging for minerals. Government guidance issued in 1989 listed 18 different sets of regulations, with two others in preparation, in order to comply with the Directive across all project types and in the separate regions of England and Wales; Scotland and Northern Ireland (Department of the Environment 1989). This number has since increased, because of amendments made to the existing regulations and the introduction of new regulations to cover EIA of projects omitted from the original 18 (Bond 1997). Glasson *et al.* (1994) report that none of these regulations requires a consideration of alternatives as a mandatory component. In practice, however, there is one exception. Although the regulations governing EIA for roads (statutory instrument [SI] 1241) do not deviate from this position, the *Design Manual for Roads and Bridges* (Department of Transport 1993), which dictates how EIA for roads are conducted, requires alternatives to be considered. Glasson *et al.* (1994) indicated that, at that time, only one-third of EISs considered alternatives, and that the vast majority of these were for linear developments where the choice was between different routes.

In contrast, the Netherlands incorporates legal requirements to consider alternatives in the Environmental Protection Act (1994). It is a requirement under Section 7.10(1)(b) that alternatives to the proposed activity must be described in the EIS. In addition, the environmental consequences of each alternative must be described not only in an EIS but also in the non-technical summary (Wood 1995). Furthermore, Section 7.10(3) of the Environmental Protection Act (1994) requires that, specifically, *'the alternative which makes use of the best means available for protecting the environment'* must be covered in the assessment. The Act also requires a comparison of the environmental impacts of the proposed development and, in common with the situation in the USA under the National Environmental Policy Act (1969), with the 'no action' alternative in complying with the need to describe the future environment in the absence of the development.

In the Netherlands, the EIA process begins with the submission of a notification of intent from the developer. Whilst there is no specific requirement to consider the alternatives at this early stage under the Notification of Intent Regulation 1993, Wood (1995) reports that, in practice, some information on alternatives is almost always provided.

After publication of the Notification of Intent, the Dutch EIA Commission sets up a 'Working Group' which, as its first responsibility, draws up guidelines for the competent authority, who then uses them to compile terms of reference for the developer. Advice for such Working Groups has been produced (Commission for Environmental Impact Assessment 1994) which indicates that due consideration should be given to a description of the activity and the 'reasonable' alternatives to it; existing conditions of the environment and a description of the projected state of the environment, should the proposed activity not be undertaken; and a comparison of alternatives in terms of environmental impacts. It is clear, therefore, that the consideration of alternatives plays a prominent part in both EIA legislation and practice within the Netherlands.

In Portugal, there is no legal requirement to consider alternatives. Whilst this does comply with the Directive's obligations, practice does not appear to be much better. The EIA process is formally initiated once the proposed project, together with the EIS, is presented to the authorities (Partidário, in preparation). This is a stage at which decisions on alternatives have already been made. For example, in the case of the bridge over the Tagus River, three alternatives were originally under consideration, but ultimately an alternative was chosen without an EIA or public consultation having taken place. At this stage, an EIS was written assessing the environmental impacts of the chosen alternative, but it was clear that this option, besides not complying with intended goals, had the worst environmental impact amongst the alternatives considered (De Melo 1996; see also Chapter 16, this volume).

Partidário (in preparation) points out that some exceptions to this practice are emerging. This is especially the case with regard to the road sector, where some proponents are developing separate EISs for different alternatives for a particular project.

12.5.3 Screening

Under Directive 85/337, all projects listed in Annex I must be subjected to EIA. For these, screening is a relatively simple matter and Member States have had few problems in fulfilling their obligations. There are, inevitably, exceptions. For example, the European Commission took the Belgian Government to the European Court of Justice in May 1996 for failing to comply fully with Annex I in not requiring environmental assessment for nuclear power stations in all situations (Anon. 1996). The Court held that Belgium had been in breach of its obligations prior to 1993, when the Government finally introduced legislation to comply with the Directive, 2 years after a final warning from the Commission. At a regional level, the European Commission also took Belgium to court over the Flemish Government's interpretation of 'integrated chemical installations'. Annex I of the Directive requires that these should be subjected to EIA in all cases and the Court held Flanders's interpretation of an 'integrated chemical installation' to be too narrow—despite the fact that no definition is given in the Directive.

The development of screening procedures to cover Annex II projects, however, has proved far more problematic and has led to a number of different screening approaches being developed. The Directive makes it clear that, for projects listed in Annex II, it is at the discretion of the Member State to determine whether the environmental effects are sufficiently significant to warrant EIA being carried out. The obligation is no more specific than this and problems occurred when some chose to omit categories of Annex II projects from their legal procedures. The UK, for example, originally proposed excluding all Annex II projects, but acceded to the Commission's view that this would not be an acceptable interpretation of the discretionary powers afforded to Member States. Legal proceedings were hinted at (Wathern 1988). The argument put forward by the Member States to justify their position was that they had used their discretion in determining that the effects of these excluded projects would not be significant. However, the European Commission did not agree with this viewpoint and has argued that it does not meet the obligations of the Directive where whole classes of Annex II projects are omitted. This matter was settled in the European Court in October 1996 with reference to a Dutch project. The specific issue concerned the reinforcement of dykes for flood defence in relation to the modification of a local zoning plan. The Netherlands had exercised its right to set statutory thresholds for Annex II projects and the modifications in question fell below the threshold. The Court ruled that, although Member States were given discretion to establish thresholds and criteria, it was not unlimited discretion and that it was not acceptable to set thresholds such that all projects of a particular type would be excluded (Anon. 1997).

Perhaps the simplest way of meeting the obligations of Annex II would be to simply insist on EIA for all the projects listed, subject to a threshold value being exceeded. This is the situation that, for example, the UK has been moving towards, with thresholds drafted being set for all projects during 1998.

The screening procedure adopted in Denmark has evolved over time, partly as a result of the government accepting that they had not fully implemented the requirements of the Directive in that the procedures implied that many Annex II projects would never have significant effects on the environment (Elling, in preparation). The current procedures set out by Elling (1995) are reproduced in Box 12.1.

In effect, 30 sub-categories of Annex II projects are subjected to EIA under Danish law, although for some of these thresholds need to be exceeded. The remaining Annex II projects are assumed to

Box 12.1 Screening procedure in Denmark (Adapted from Elling 1995)

- The developer submits the proposed project to the authorities. If the proposal is an Annex I project, it is submitted to the competent authority for EIA. If the project is an Annex II project the authorities indicate to the developer the criteria that determine whether EIA is required
- The developer decides whether the project requires an EIA. If the developer decides, after taking into account these screening criteria, that the project can fulfil the criteria, an EIA is not required and the developer informs the authorities of the basis for this opinion. If the authorities do not agree with the decision they will ask the developer for the appropriate documentation. If the authority is then satisfied the developer is permitted to carry on planning the project
- If, after taking into account screening criteria, the developer decides that an EIA is requested, the proposal and all relevant information are submitted to the competent authority

have insignificant impacts (Elling, in preparation), and therefore do not require EIA, as long as they fulfil the following criteria:

- The project is planned for an area designated for commercial use or for that specific type of project in the local plan.
- Sewage water from the project will be discharged to the municipal water treatment plant or will not jeopardize ecosystem quality objectives designated in the regional plan.
- The project does not cause significant noise nuisance for the surrounding environment and meets prescribed noise standards.
- It does not cause significant air pollution and meets threshold limits.
- The project does not pose any risks of groundwater pollution.

The Danish system therefore uses a combination of thresholds above which EIA is always required and, for the remaining projects, a set of criteria which, if met, avoid the need for EIA. That is, both inclusive and exclusive criteria operate. The main linkages in defining Annex II exclusions are to pollution standards, as projects that comply do not cause unacceptable effects, and conformity with land-use plans as environmental factors are a primary consideration in their formulation.

Clearly, where thresholds are used, the number of EIAs that are produced will be directly proportional to the level set: more will be produced where thresholds are lower. The same result will also arise where the screening guidance issued to competent authorities contains low guideline criteria. Table 12.3 illustrates the practical effect of this phenomenon on the numbers of EISs produced in the then 12 Member States.

Table 12.3 Estimates of the annual number of EISs prepared in each Member State (source: EIA Centre 1995).

Member State	Estimated annual average, 1988–1990 (approx.)	Estimated annual forecast, post-1992
Belgium	43	125
Denmark	6	15–40*
France	5000	5000
Germany	Not available	3000
Greece	Not available	90–2500†
Ireland	49	80
Italy	28	30–1000*
Luxembourg	10	110†
The Netherlands	67	140
Portugal	12	80
Spain	143	1200
UK	189	325

* Larger estimate assumes extension of legislation to additional Annex II category projects.
† Includes considerable numbers of 'mini'-EISs (see text for explanation).

Table 12.3 indicates that France produces the highest number of EISs. Consideration of their screening system explains this effect. In France, some projects require a full EIA, but others with smaller impacts, although still negative, only require a *notice d'impact sur l'environnement*. The projects which are subjected to a full EIA are split into three groups. First are those which always require EIA. Secondly, certain projects only require EIA when a technical threshold is exceeded, for example, hydroelectric plants generating over 500 kW. Finally, EIA is required for certain types of project only when a financial threshold is exceeded; the current threshold is equal to or greater than fr. 12 million. This threshold was only raised from fr. 6 million by decree in 1993. Whilst this has had implications for the numbers of EISs produced, the same decree also added other project categories to the screening list. There is also an exclusion list of projects which do not require EIA. Hence, screening decisions in France are not open to discretion.

Table 12.3 also indicates that Greece has a very high output of EISs. However, this total figure includes a number of so-called 'mini' EISs. This situation arises because the Greek screening procedure categorizes projects into two groups, A and B. For Category B projects, developers complete a questionnaire about the possible impacts of the project. A simple range of answers are presented ('yes', 'maybe' or 'no') and, once completed and submitted, this is considered to be a simple EIS, in effect a 'mini' EIS. The same questionnaire must also be completed as a preliminary stage in producing an EIS for Category A projects.

12.5.4 Scoping

Scoping is the process whereby the focus of the EIA for a particular project is determined. Directive 85/337, however, makes no specific reference to this process, although the minimum contents for EISs are specified. Not surprisingly, there are considerable differences in the scoping requirements of Member States. Some have gone no further than stating minimum requirements in the form of general elements which must appear in the EIS subsequently produced. Others embrace the scoping stage as a critical element in good practice and require detailed guidance to be provided for those carrying out the EIA as to what should be included in the EIS.

For projects in Italy, which are considered at a national level, the minimum scope of an EIA was set out clearly in the Decree of 27 December 1988 (see Table 12.4).

Thus, when produced to these provisions many EISs would invariably contain irrelevant information, whilst others would omit the discussion of key impacts (Commission of the European Communities 1993). Beyond these minimum requirements, Italy had no formal scoping requirements

Table 12.4 Information requirements for an EIS in the Italian national system (source: Bucchi 1993).

Environmental components	Specific aspects to consider
Atmosphere	Air quality; meteorological and climatic features
Water	Surface water and groundwater (fresh, brackish and sea waters), considered as components, environments and natural resources
Soil and subsoil	Superficial and underground strata, considered in their geological, geomorphological and pedological profiles and also as non-renewable resources
Vegetation, flora and fauna	Plant communities and animal associations, highly significant emergencies, protected species and natural equilibrium
Ecosystems	Complexes of components and interacting and interdependent physical, chemical and biological factors, which form unitary and identifiable systems (lakes, rivers, woods, sea, etc.)
Public health	Such as individuals and communities
Noise and vibration	Considered in relation to natural and human environments
Ionizing and non-ionizing radiation	Considered in relation to natural and human environments
Landscape	Morphological and cultural aspects of the landscape, typology and cultural heritage of the human community involved

until 1996, when a new Presidential Decree was signed which allows scoping to be requested both by the proponent and by the competent authority (Schmidt di Friedberg 1996).

In contrast to the situation in Italy, Sweden has developed an informal system which neither specifies minimum requirements for the contents of an EIS nor requires that formal scoping takes place. EIA is implemented through 25 different laws dealing with the authorization of projects, which cover nearly all of the projects listed in Annexes I and II. There is a requirement for an EIS to be submitted with an application for authorization. The content of an EIS, however, is not specified, nor is there any requirement formally to define the scope of the EIA. With respect to roads, for example, the law only requires EIA for the detailed planning phases of such projects. In reality, three or four EISs will be written to deal with the impacts identified at the various stages of road planning and design, namely: initial study; identification of road location; preliminary design; detailed road plan (Liedner 1995). At each stage, the EIA will be scoped and address the issues which are appropriate to the level of the issues raised.

Furthermore, Liedner (1995) reports that most schemes do not progress through all phases, most being abandoned after the first or second phase. Thus, in practice, the Swedish system, at least for roads, seems to lead to comprehensive studies being undertaken throughout the development of a project, despite there being no legal requirement.

In some Member States, scoping involves the production of guidelines which can then be followed by the producer of the EIS. In some cases the same guidelines are also part of the later review process. In Finland, for example, the EIA procedure is initiated when an assessment schedule, which details the investigations which must be undertaken, is presented to the coordination authority (Hildén & Paukkunen, in preparation). The authority then distributes the assessment schedule to other relevant authorities for comment; the public also have an opportunity to comment at this time. The coordination authority formulates an opinion on the assessment schedule and gives this to the developer. However, Hildén and Paukkunen (in preparation) stress that developers do not have to follow this opinion. During formulation of the legislation, it was felt that such an approach would also require the procedures to provide developers with the opportunity for a legal appeal, which would introduce unacceptable delays into the process. Nevertheless, developers who do ignore the opinions given to them clearly risk subsequent delay or rejection in the consent procedure. Hildén *et al.* (1995) indicated that, for one particular development, the scoping document did not specify common timetables to integrate the assessment schedule into the planning process. As a result, delays were experienced.

In Germany, scoping has been included in the EIA Act (Wagner, in preparation). As soon as the competent authority is informed of a planned project by the developer, views between them focus on: the subject of the EIA; the extent of the EIA; methods which should be used in the EIA; and questions of significance. This scoping process is not restricted to the developer and competent authority, but is also open to other authorities, experts and even third parties, who may be called in to discuss the scope of the EIA. As a result of these discussions, the competent authority will inform the developer of the scope of the EIA and of the type and content of documents which must be produced. This, in effect, represents a scoping document, which can be used later in the process to determine whether the coverage of the EIS is adequate. Despite being written into the EIA Act, this scoping process is informal, in that the developer must request it. The rationale behind this informal procedure was a hope that it would be used more extensively and would be more productive than a formal approach. In practice, Wagner (in preparation) reports that there are problems, in that the developers occasionally present incomplete documents to the competent authority but still request a binding commitment about the scope.

Brussels has one of the most formalized and comprehensive scoping systems in the EU. There are two lists of projects which require EIA in Brussels—the A list and the B list. Those on the B list only require a limited impact report, whilst those on the A list require a full EIA (Coomans

1993). Where a full EIA is required, the Brussels Administration for Environmental Management (IBGE) is responsible for drawing up a specification which details the proposed content for the EIS, the rules to be followed in terms of timescales for study and the environmental consultant who will write the EIS. A commission made up of various representatives (urban planning, environment, economic development, district authorities, recognized citizens' associations) then advises on this specification and appoints a steering committee responsible for following up and checking on the EIA (Coomans 1993). Formally, it is this steering committee which specifically: determines the EIS specifications; determines the time to be taken for the study; and accepts or rejects the environmental consultant for the study recommended by IBGE. An essential component of the Brussels system is the requirement that environmental consultants must be registered and appear on an approved list of consultants before they can be selected for such studies.

12.5.5 Preparation of the environmental impact assessment report

This section considers two aspects of the preparation of EISs. The first relates to the producer of the EIS—who actually carries out this task and what kind of quality checks exist. The second relates to whether the EIA system requires the production of only a final EIS, or whether the requirement is for a publicly available draft EIS, which is then amended as a result of comments, as a precursor to a final EIS being submitted to aid decision-making.

The preparation of EIAs is usually the responsibility of the developer. In some cases developers will have sufficient in-house expertise to be able to undertake the task themselves. More commonly, environmental consultants are used. In most cases, the choice of consultant is entirely at the discretion of the developer, although some EIS systems regulate consultants by having a registration system with statements being produced only by registered consultants. Some systems, such as that of Brussels, actually go as far as to specify the consultant who the developer must employ. Despite this variation in relation to the authorship of EISs across the EU, the situation in Denmark is of note, as it is the only system in which the competent authority is charged with writing the EIS. It is also an example of a country which requires the production of both a draft and a final EIS (see Fig. 12.3).

In Denmark, there are four possible legal routes leading to the need for an EIA, two within the remit of planning laws, two outside. Within the sphere of planning, the need for EIA is determined by two criteria: (i) amendments to the regional plan; or (ii) specification in a national planning directive. Outside planning, EIA is required for particular projects in coastal waters (for which the competent authority is the Ministry of Transportation) and for projects adopted by national legislation, for which there is no formal procedure as yet. The most common trigger for EIA is for an amendment to the regional plan, as, for projects within the sphere of planning, this is a controlling factor in decision-making. Consequently, it was felt that the requirements of the Directive could be met by requiring an amendment to the regional plan for projects listed in the Directive. One contributory factor to this decision was the fact that the plan amendment procedure already included the required public participation needed to satisfy the obligations of the Directive. A consequence of this approach is that it is the competent authority which has the responsibility for amending the plan and, thus, for preparing an EIS.

In Denmark, once it is established that an EIA is required for a particular project, the competent authority publicizes the proposed action and requests ideas, proposals and general comments for the preparation of the EIS within a fixed period. The material submitted by the public then has to be taken into account in carrying out the EIA. Next, the competent authority prepares a draft EIS which is made available to the public and to other relevant bodies. The document is also submitted to the Minister of the Environment who has the right to veto. This is an important point because, unless the EIS gains authorization, the project cannot be approved. As soon as the draft EIS has been published, a public participation period of 8 weeks begins during which the competent authority can arrange public hearings, public meetings and other methods of facilitating the exchange of

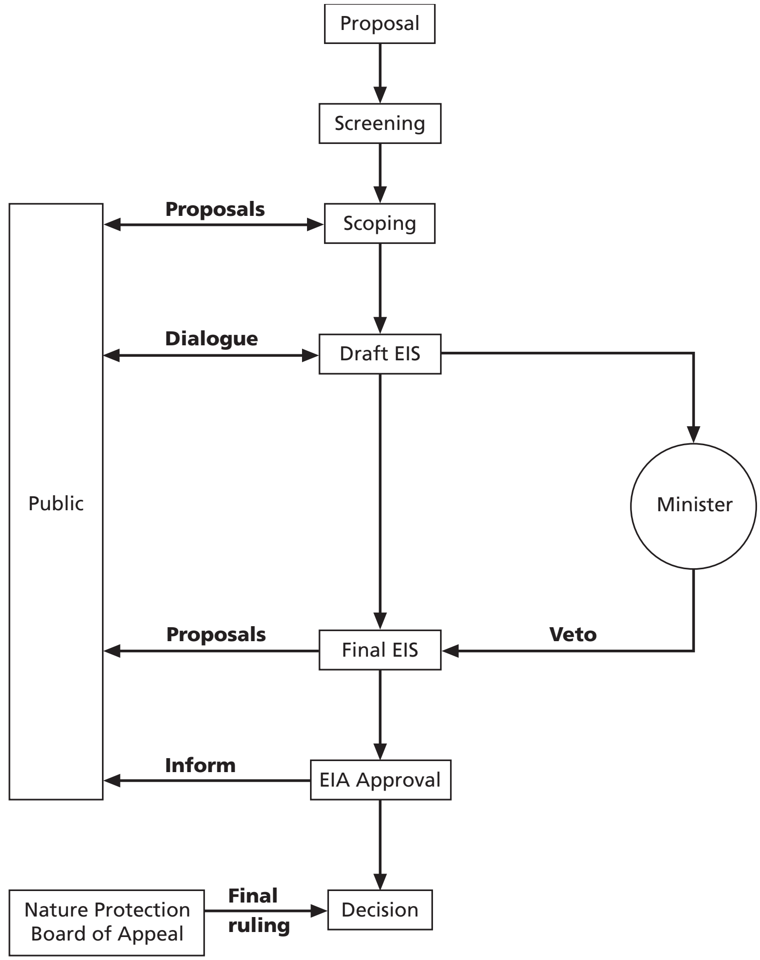

Fig. 12.3 Danish EIA system (after Elling 1995). EIA, environmental impact assessment; EIS, environmental impact statement.

information and ideas. The results of the public participation are taken into account in the preparation of the final EIS which is also made available to the public. If the final EIS is not altered to any extent from the draft, where the public have had an opportunity to express their opinions, the County Council can approve it, publish the approval and set a deadline of not less than 4 weeks for an appeal against its decision. This appeal can only be made on legal grounds concerning adherence to procedure. The appeals are heard by the Nature Protection Board of Appeals whose decisions are final. After approval, or a successful ruling from the Nature Protection Board where appropriate, the County Council can approve the proposed project (Elling 1995).

Both Elling (1995) and Jensen (1995) feel quite strongly that public participation is the weakness in the Danish system. For example, in the case of one particular coal-fired powerplant project, Jensen (1995) considered that citizens were effectively excluded from the process very early on by the technical nature of the debate. As a possible solution, Elling (1995) argues that the priority must be strengthening the opportunities for public debate, rather than any further development of technical aspects of the EIA procedure.

In the Austrian EIA system, a developer submits an EIS along with an application for a permit to develop. The EIS has to summarize alternatives, describe the location, nature and size of the development and describe the affected environment, including effects on human beings, fauna and flora, soil, water, air, climate, biospheres and ecosystems, landscape, material assets and the workplace environment. The interesting feature of the Austrian system is that the competent authorities then have the task of preparing an EIA report based upon it (Davy 1995). The authority sends copies of the EIS and the application to other federal, state and local agencies, who can offer suggestions for persons who may be taken on as experts to write the EIA report. The EIS is also sent to the host community, its adjacent communities and the Federal Minister of the Environment, who each have 4 weeks in which to make comments. Based on comments received, the competent authority composes a draft list of experts to produce the EIA report and a framework of topics and issues which they must consider. The list and the framework are forwarded with the application and EIS to the host community and regional government for comment. After considering comments received, the authority draws up an agenda of issues to be considered by the experts, who then produce their EIA report. The latter is then considered at a public hearing which marks the beginning of the permit process. Davy (1995) comments that the Austrian system establishes an EIA and permit procedure that exceeds the standard required by the Directive and provides for a comprehensive right of standing for citizens.

12.5.6 Reviewing the environmental impact assessment report

Once the EIS has been submitted to the competent authority, it should, ideally, be reviewed to determine the accuracy and completeness of the information which it contains. This is not a requirement of Directive 85/337 but many Member States have seen fit to establish some form of review—whether officially or unofficially. Of course, some countries have chosen not to require formally any form of review under their current legislation—the UK, Ireland, Denmark and France are examples. Italy, on the other hand, has a mandatory review stage as a component of its legislation.

In Italy, the onus is on developers to produce complete and good quality EISs. There exists, however, an EIA Commission which is responsible for checking EISs. The Commission can, if an EIS is considered incomplete or inadequate, require the developer to remedy the deficiencies at their own expense (Bucchi 1993). The Commission is made up of about 20 members selected for a term of 3 years and nominated by the Ministry of the Environment. Bucchi (1993) reports that the Commission has demonstrated independence and objectivity in regard to its treatment of EISs.

Flanders has an authority, AMINAL, with responsibility for environmental matters. One of AMINAL's tasks is formally to review EISs for compliance with legal requirements (Devuyst & Hens, in preparation). Once compliance is achieved, the EIS can be submitted to the regulatory authority for permission to begin the project. AMINAL has the power to seek remedies for deficiencies in an EIS. Devuyst and Hens (in preparation) indicate that there are a few problems with EIS quality and the review process. First, the independence of the experts producing an EIS has been questioned, because they are financially dependent on the project initiator. Secondly, the public are not involved in the review stage. Thirdly, the latter involves AMINAL issuing a conformity code when the document is acceptable, but it is unclear what criteria are used in reaching an opinion and there is no requirement for them to justify their decision.

12.5.7 Monitoring

One of the tasks of an EIS is to predict the impacts of a proposed project on the environment. Whether the predictions turn out to be correct cannot be resolved without some form of monitoring after project implementation. Across the EU, provisions that require monitoring are rare and, where they do exist, are usually not part of the legislation adopted specifically to fulfil the requirements of Directive 85/337, which does not oblige Member States to carry out monitoring (see Chapter 11, Volume 1).

Spain is a country which does require monitoring. The legislation requires that an EIS must contain a Programme of Environmental Vigilance which, under the terms of Royal Decree 1131/1988, will establish a system to guarantee compliance with the protective or corrective proposals and measures which are contained in the EIS.

The same decree also determines that, in the event of project approval, the declaration of impact (a document produced by the competent environmental authority, setting out the conditions to be met in order to ensure adequate protection of the environment and natural resources) will include details as to how activities will be monitored, in accordance with the Programme of Environmental Vigilance (Martinez, in preparation). There is a division of responsibility over monitoring. The competent planning authority is responsible for carrying out the monitoring in compliance with the declaration of impact, while the competent environmental authority retains the right to check that this is being done.

Superficially, this appears to be a good system, in that a statutory provision exists, along with clearly defined responsibilities to monitor and to oversee that monitoring. In practice, however, the competent authority and developer can be one and the same. As a consequence, the Commission of the European Communities (1993) reports that the commitment to monitoring is not strong and is often not carried out.

Greece also has a requirement to carry out monitoring of the effects of a project on the environment, but whether, in practice, this is truly effective is arguable. Legally, monitoring is the responsibility of a central organization—PERPA (Programme for Pollution Control for the Athens Area). Briassoulis and Nivolianitou (in preparation) report that, in practice, because of the large number of EISs submitted, the agency suffers from chronic work overload and administrative burden. It is perhaps for this reason that the Commission of the European Communities (1993) reported that full monitoring of all projects and activities did not happen.

The Netherlands too has a requirement for monitoring, although it is not necessary to indicate the monitoring provisions within an EIS. The Commission for Environmental Impact Assessment (1996) reports that, in theory, there is more than adequate provision for monitoring and auditing in the Dutch EIA system. The Environmental Protection Act has a number of measures related to monitoring. First, the competent authority must monitor the consequences of the implemented action. Second, the proponent must provide the competent authority with monitoring information. Third, the competent authority must prepare a postauditing report (or evaluation) comparing impacts with those predicted in the EIS, publish it and send it to the EIA Commission and the statutory consultees. Finally, detailed regulations relating to monitoring can be made, although none have yet been issued (see Chapter 11, Volume 1, for further discussion of monitoring in the Netherlands).

The Commission for Environmental Impact Assessment (1996) reports that, in practice, monitoring provisions are not proving to be effective. Specifically, no mention is made of monitoring in about one quarter of decisions and very few auditing reports have been published. The Commission considers that the competent authorities are not pressing developers for the necessary information and are not preparing monitoring reports. Nevertheless, both the theory and practice relating to monitoring of project impact extend beyond that in most other EU Member States.

12.5.8 Mitigation

One aspect of EIA in the EU which is consistently well handled is that of describing mitigation measures in EISs. All EU countries have adequate legal provisions requiring mitigation measures to be designed and described in the EIS. This is not unexpected given the explicit requirement with respect to mitigation measures in the Directive from which all Member State legislation derives its minimum provisions.

12.5.9 Consultation and participation

Consultation with, and participation of, the public in the EIA process takes a number of forms across the EU. This section considers two aspects of participation: (i) whether public participation occurs or whether it can be completely absent from a procedure; and (ii) the stage in the EIA process at which the public has a right to participate.

To comply with the obligations of Directive 85/337, it is necessary for the public to have a right of comment on the environmental information used in the decision-making process before the project goes ahead (Article 6). However, in Luxemburg, it has been possible for the public to be excluded completely from the EIA process. Public involvement tends to be restricted to those projects which require a public inquiry, although, for these projects, the opportunities for public participation are good.

Of the four laws which implement the EIA Directive in Luxemburg, that of 9 May 1990, The Control of Dangerous, Dirty and Noxious Installations, known as the Commodo Procedure, is the most important. It specifies that certain types of project, whose existence, operation or implementation could result in danger or inconvenience, including to the environment, require authorization. Projects undergoing this procedure are classified into three classes. All Class 1 and Class 2 projects are subject to a public inquiry. Class 3 are technical installations too small to be incorporated into Class 1 and require an impact notice, a short technical summary, rather than an EIS. No public inquiry is required for Class 3 projects; therefore there is no public involvement. For Class 1 and 2 projects, however, as soon as an application for authorization is received, notices are posted for a 15-day period in the commune where the project is due to be sited and, in the event of the proposed site being within 200 m of its boundary, in neighbouring communes. Notices have to be posted at the town hall and at the site location itself. If the site is in a commune of over 5000 inhabitants, the developer must also publish extracts of the authorization application in at least four daily newspapers. The public have 15 days in which to view the application and the EIS (where one has been produced) and to comment. At the end of this period, either the senior official of the commune or a designated commissioner collects all the comments received and proceeds with a public hearing. Anyone is allowed to attend this hearing and express an opinion. The results of the inquiry are transmitted to the competent authority to allow a decision on the application to be taken (Raum-Degreve & de Hemptinne, in preparation). It is possible that large projects may have several public hearings during the decision-making process. After the decision has been taken, a notice has to be posted in the commune for 40 days at the town hall and the public has access to the decision documents.

For projects seeking authorization under the law of 11 August 1982 on the protection of nature and natural resources, there is no requirement for public involvement. The only exceptions are land consolidation projects, for which public inquiries are compulsory under the law of 25 May 1964. For road schemes where EIA is mandatory, there is also no requirement for public involvement.

Some countries provide several opportunities for public participation throughout the EIA process. Others provide just one. In Ireland and the UK, for example, the public are given an opportunity to comment on the EIS once it is submitted with the planning application. There is no requirement for earlier consultation which would involve the public during the course of the EIA itself.

The EIA procedures in both Finland and Wallonia allow the public more than one opportunity for involvement. In Finland, an assessment schedule (effectively a scoping report) is produced by the developer and this is placed on public display for a minimum of 14 days. A further 30–60 days are allowed for comments to be received. The developer subsequently produces an assessment report, the EIS. The public also has a minimum of 14 days to view this document and 30–60 days in which to comment. These comments are then included in the opinion of the competent authority which is used in decision-making. In Wallonia, it is only public projects which provide the public with two opportunities to comment. For private and public projects in Wallonia, the public have an opportunity to comment after the EIS has been submitted and, where more than 25 people complain, then a public hearing takes place (Devuyst & Hens, in preparation). In the case of public projects alone, the public also have an opportunity to comment at the public hearing held after the experts, who will prepare the EIS, have been selected (Devuyst & Hens, in preparation).

12.6 FUTURE DEVELOPMENTS

In March 1997, Council Directive 97/11/EC amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment was adopted by the European Council (Commission of the European Communities 1997b). This strengthens the existing Directive by extending a number of provisions highlighted as requiring change by the 5-year review of Directive 85/337/EEC (Commission of the European Communities 1993).

This section looks at the changes made to the obligations imposed on the Member States by the amended EIA Directive, shown in flow chart form in Fig. 12.4. Wood (1997) categorizes these changes under the headings of screening, scoping, alternatives, consultation and public participation and decision-making. It is of note that no provisions related to monitoring have been incorporated into the amended directive.

12.6.1 Screening

The number of project types contained within Annex I (for which EIA is mandatory in all Member States) has increased from the nine originally included to 21. In addition, there are eight extra Annex II projects, whilst eight others have been extended (Wood 1997). Furthermore, modifications to Annex II projects are now included in Annex II in their own right. As well as these changes, Member States can now specify whether, in making screening decisions for projects in Annex II, they are going to use thresholds and criteria, whether they will consider each project on a case-by-case basis, or whether they will use a combination of these approaches.

A significant addition is a new Annex III which sets out screening criteria to be used in making decisions or setting thresholds. These are provided under three separate headings: (i) characteristics of projects (e.g. size); (ii) location of projects (for example, the existing land use); and (iii) the characteristics of the potential impact (for example, the probability of the impact).

In terms of public information, competent authorities will be required to make public the reasons why EIA will or will not be requested for each proposal. In practice, this has already led to concern from some UK planners that third parties will have more scope to question decisions in the courts. Whether this fear is justified remains to be seen.

12.6.2 Scoping

When this Directive was in its draft stages (Commission of the European Communities 1994), scoping was a mandatory requirement. However, concerns over the cost to the competent authorities of being involved in scoping for all the projects has led to modifications to the Directive in its adopted version. Thus, competent authorities are simply required to give their opinion on the content of an EIS when a developer requests that they do so. An attempt has been made to place such scoping activities on a comprehensive basis by placing a responsibility on the competent authority to consult authorities likely to be concerned by the project because of their specific environmental responsibilities, thereby enhancing the quality of the advice. Where this scoping advice is requested, the quality of the advice is further enhanced by a requirement being placed on the competent authority to consult authorities with environmental responsibilities likely to be concerned by the project. It is, of course, at the discretion of each Member State to have a mandatory scoping requirement within its borders if wished.

12.6.3 Alternatives

A frequent criticism of Directive 85/337/EEC was that the requirement for inclusion of an outline of alternatives considered to the proposed development in the EIS was discretionary rather than mandatory. The importance of the consideration of alternatives is well argued, for example, in Glasson *et al.* (1994), Wood (1995) and Canter (1996). The amended Directive has rectified this deficiency to a degree in requiring developers to

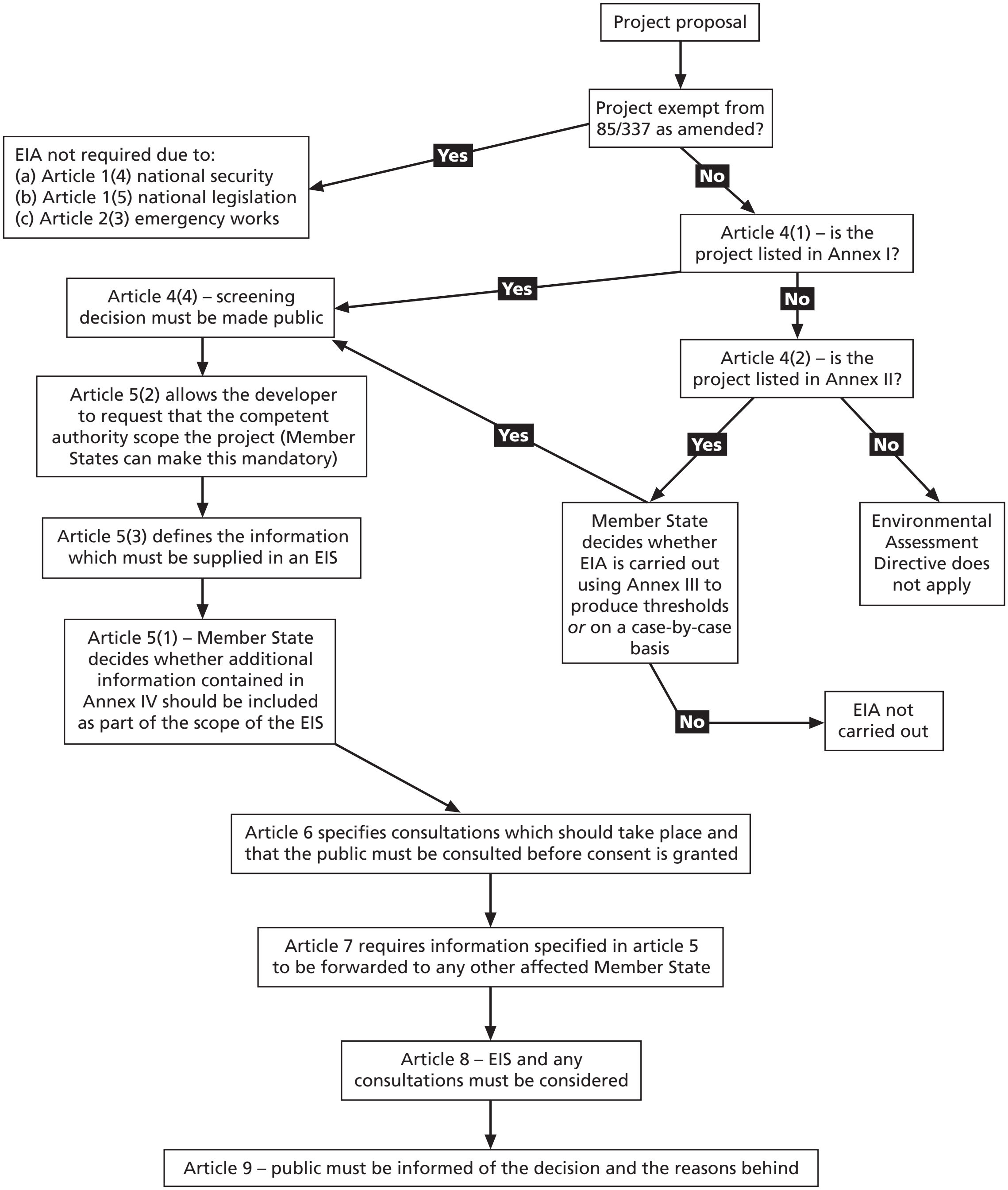

Fig. 12.4 Obligations imposed on Member States by Directive 97/11/EC. EIA, environmental impact assessment; EIS, environmental impact statement.

outline the main alternatives which were considered and also to indicate the reasons for the choice of alternative. However, whilst reporting of the alternatives which have actually been considered is required, it does not compel them to consider alternatives during project planning.

12.6.4 Consultation and participation

Wood (1995) states that: 'consultation and participation are integral to environmental impact assessment: EIA is not EIA without consultation and participation'.

With this in mind, the original obligations imposed by the 1985 Directive did not go far in requiring consultation and participation. The amended Directive goes further, in that it requires that authorities likely to be concerned by the project because of their environmental responsibilities are given an opportunity to give their opinion on the scope of the EIA. Member States are required by the Directive to designate the authorities to be consulted either in general terms or on a case-by-case basis. In addition, public participation has been made much more relevant to the decision-making process. Thus, public comments must now be taken before development consent is given, which considerably tightens the previous requirement that public comments should be sought before project implementation.

12.6.5 Decision-making and monitoring

For the first time, decision-making, and the role of EIA within it, is made explicit. The main changes with respect to decision-making require competent authorities to reveal the basis on which individual decisions are made. Furthermore, the need to take the results of consultations into account in a decision is made explicit. Effectively, this means that the views of the public and of other consultees now have to be considered by the competent authority in reaching their decision. Once a decision has been reached, the competent authority must make the reasons for that decision public as well as the main mitigation measures that will be adopted in implementing the project.

Regrettably, the amended Directive does not mention monitoring.

12.7 CONCLUSIONS

The EIA process, unlike individual procedures, is idealized, and it is fair to state that not all Member States possess all the necessary stages, in either legislative form or in terms of actual practice, to attain this ideal. This chapter has presented examples of good practice for the various stages of the EIA process. If these examples all coexisted in one EIA procedure, then it would have gone some way to reaching that ideal. The reality is different; some Member States are closer to the ideal than others, but none achieve it.

It is clear that legislation adopted to implement the Directive varies considerably in content and obligations across the EU. This is a result of EIA being imposed on Member States using a Directive as opposed to Regulation as the enforcing mechanism. The manner in which Member States strive to achieve the set objectives varies widely and, it could be argued, leads to an unequal balance of resources invested in the process in different Member States. Such a situation is at odds with the philosophy of the EU, which is to harmonize controls so that Member States cannot gain competitive advantage from inadequate application of rules and procedures. A key feature in the drive towards harmonization is the 5-year review, specifically aimed at analysing practice and facilitating amendments which allow Member States to move closer together in terms of practice. The amended Directive (97/11/EC) is the product of the first 5-year review process and is designed to both improve and harmonize practice across the EU. Whether it will be successful remains to be seen, although it is already clear that the move towards thresholds for screening of Annex II projects is going to lead to inconsistencies in the application of EIA procedures across the EU.

It is clear that complete harmonization across the EU is a difficult, if not impossible, task. Legislation introduced to meet imposed policy objectives depends largely on existing institutional frameworks within countries, as well as past practice. In particular, the land-use planning systems vary greatly across the EU, with some countries requiring both planning and environmental permits and others having a single authorization procedure. Clearly, this diversity necessarily leads to differences in implementation, the system in Denmark being an excellent example, where the EIA objective is best implemented, using a means which requires the authorities themselves, rather than the developers, to produce an EIS, in contrast to the system in all other Member States.

Progress has been made in developing a robust and effective EIA framework for the EU. That such progress continues in a system which requires a qualified majority in favour of a text in an enlarging Union, is testament to the value and faith placed in the EIA process by the Member States. Continued improvements in the future are likely to be made, but, against a background of enlargement which will incorporate countries with a great deal to do to comply with existing EU legislation, further progress is therefore likely to be slow.

Comment can be made on the deficiencies which remain in the EIA procedure required by the amended Directive. Whilst it addresses criticisms levelled against its predecessor in some respects, it still falls short of the ideal on a number of counts. Perhaps the most significant of these are as follows:

1 The new requirements for scoping will not be mandatory and, in practice, they may be bypassed with relative ease if particular Member States choose not to insist on this crucial stage. This itself may lead to inconsistencies in the resources applied to the evaluation of environmental effects of similar projects in different Member States.

2 Whilst a discussion of the alternatives considered with respect to the proposed project is a welcome addition to the amended Directive, there is no requirement for alternatives to be considered—only for those which are to be reported. Clearly, this does not strengthen the process itself, but simply increases the information base provided about the process which has taken place.

3 No mention is made of EIS review. Without some form of quality assurance mechanism, the product of the EIA process may fall short of requirements. The problem is that there is no requirement for a system to check the quality of EISs to prove they are adequate for the purpose they have been produced for, that is, to help in decision-making.

In common with many EIA systems across the world, no mention is made of monitoring, without which the effectiveness of the EIA process itself cannot be appraised at a later date.

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Part 4
Sectoral Experience

The final Part of this Handbook seeks to combine the international dimension of Part 3 with the consideration of EIA implementation effectiveness through seven chapters which address application to policy, plans and specific types of projects. The choice of the latter has been based on development activities which are common in most regions of the world and which are often contentious and present methodological difficulties. The aim through these chapters is to combine discussion of good practice with objective consideration of the successes and failures of practice and outstanding issues.

This Part commences with specific consideration of strategic environmental assessment practice, including policy assessment (Chapter 13) and the assessment of land-use plans required by the National Environmental Policy Act and the California Environmental Quality Act (Chapter 14). The reader will be struck by the contrasting level of experience described in these two chapters. Policy environmental assessment has yet to gain a worldwide consensus as to whether it should be supported by legislation or be implemented through administrative guidelines. In contrast, Chapter 14 presents a positive description of the application of environmental impact assessment (EIA) to plans in the USA, which is regarded as generally successful in achieving impact avoidance, public participation and agency accountability.

The five remaining chapters each use the EIA process structure (the nature and scoping of the impacts, baseline surveys and impact prediction and evaluation) to discuss good practice, in relation to waste management projects (Chapter 15); road and rail infrastructure (Chapter 16); energy projects (Chapter 17); mining projects (Chapter 18); and water projects (Chapter 19). Whilst in part providing 'how to do' guidance, this final Part of the Handbook seeks to draw out the political, economic and social issues which all affect the process, including case studies of practice. There is a strong message relating to the integration of strategic with site-specific assessment and decisions and operation to provide a decision continuum for leveraging sustainable development.

13: Policy Environmental Assessment

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13.1 INTRODUCTION

Chapter 1 of this volume outlined the origin of environmental impact assessment (EIA). As Caldwell (1982) argued, EIA was conceived as an action-forcing mechanism to bring about substantive environmental reform throughout the US federal bureaucracy. This process was to occur through the requirement, imposed upon federal agencies, to prepare an environmental impact statement (EIS) for 'legislation and other major federal actions significantly affecting the quality of the human environment' (Section 102[2][c], National Environmental Policy Act of 1969). The reference to legislation in this originating Act is important to the extent that it highlights the need to subject a wide range of proposals to EIA; including policy proposals. Nevertheless, as reviewed by Partidário (Chapter 4, Volume 1) and many others, the principal focus of EIA activity since 1970 has been at the level of individual development projects and, more recently, programmes and plans.

The extension of EIA practice to include the assessment of programmes, plans and policies, and thereby to return to the roots of EIA, has been called for in the prescriptive literature since at least the early 1990s (Wood & Djeddour 1992). The application of EIA to these higher-level proposals has become known as strategic environmental assessment (SEA) (Wood & Djeddour 1992). An early and widely quoted definition of SEA is:

> the formalised, systematic and comprehensive process of evaluating the environmental impacts of a policy, plan, or programme and its alternatives, including the preparation of a written report on the findings of that evaluation, and using the findings in publicly accountable decision making (Thérivel *et al.* 1992, pp. 19–20).

It is interesting to note the use of 'systematic and comprehensive', 'preparation of a written report', and 'using the findings in publicly accountable decision-making' in this definition. These components of Thérivel *et al.*'s definition are redolent of the EIA of development projects. That is, SEA was thought of as the extension of project EIA to the so-called higher levels of decision-making, with the principles, procedures and methods of EIA largely intact (Lee & Walsh 1992), although there was some recognition of the differences that exist between EIA and SEA (Lee & Walsh 1992; Wood & Djeddour 1992). This conception of SEA persists to the present, with Sadler and Verheem's (1996, p. 27) core definition of SEA framed similarly to Thérivel *et al.*'s (1992) definition:

> SEA is a systematic process for evaluating the environmental consequences of proposed policy, plan or programme initiatives in order to ensure they are fully included and appropriately addressed at the earliest appropriate stage of decision-making on par with economic and social considerations.

In writing about the assessment of policy, Boothroyd (1995) described this approach as formalized and positivistic. This was contrasted with what Boothroyd called policy vetting—an informal and heuristic approach to the introduction of environmental concerns into the normal processes of policy analysis and evaluation. Thus, Boothroyd saw policy vetting as distinct from SEA. Other commentators have regarded SEA as a process which should emerge from the extension of EIA to higher-level proposals and also from policy analysis, so as to implement better the goals of sustainability (Thérivel *et al.* 1992, pp. 22–3). As is discussed later in this chapter, these two conceptions are reflected in different models for SEA procedures.

The SEA literature is increasingly recognizing the need to distinguish between the SEA of programmes and plans, on the one hand, and policies on the other. For example, in 1996 Partidário said that 'SEA must be adapted to existing policy and decision-making processes' (Partidário 1996, p. 44). A recent definition of policy SEA is, by virtue of its simplicity compared with the more general definitions already quoted, illuminating in this regard: '[SEA of a proposed policy is] an appraisal of the environmental impacts of a policy which is used in decision-making' (Thérivel 1997, p. 1). Gone are references to systematic, written reports and public accountability.

This position has been expressed well by Thérivel (1997, p. 4):

> policies are very different, they can change rapidly, it is often unclear how they will be implemented, and they may be drawn up in a very short timescale. Any SEA procedures and methods thus need to be simple (i.e. not involve much time and effort), flexible, and able to deal with high levels of uncertainty.

However, a difference has emerged between those who believe that policy environmental assessment (PEA) should be simple and quick (Thérivel 1997) and those who believe that it should be appropriate to the policy context, but also be systematic and comprehensive (Bregha *et al.* 1990). This divergence is considered later.

Experience with PEA is only just emerging. It was as recently as 1993 that Thérivel reported that 'SEAs prepared to date have been carried out exclusively for plans and programmes, rather than policies' (Thérivel 1993, p. 162). By 1996, Thérivel and Partidário's compilation of SEA case studies included two under the heading of 'SEAs of policies' and others that touched upon matters of policy (Thérivel & Partidário 1996). It is hoped that this small growth in experience may signal the beginning of a resolution of the institutional, procedural and methodological issues which have stood in the way of PEA. These issues were articulated by Bregha *et al.* (1990, p. ix) as follows:

- *Scope*: at what policy level should environmental factors be considered?
- *Responsibility*: who should be responsible?
- *Criteria*: what criteria should be applied in the formulation and assessment of policy?
- *Process*: how should the environment be incorporated into decision-making?
- *Monitoring and accountability*: how should success be determined? How can policy makers be held accountable?
- *Public consultation*: what is the place of public consultation in PEA?
- *Science, information and assessment methodologies*: how adequate are currently available information and assessment capabilities?

So far in this chapter the question of appropriate and available methods for PEA has not been raised. In part, this question is tied to the tension between the call for a rational–comprehensive approach to PEA as opposed to a somewhat simpler and quicker approach. The methods suited to each of these approaches will differ. The range of methods proposed in the prescriptive literature are reviewed later in this chapter, with selected methods illustrated through the use of case studies. At this point it is worth noting that the literature appears to be divided on the question of whether appropriate methods exist or not.

This division of opinion may be receding, however, if recent reviews of SEA are a guide. An analysis of SEA and cumulative impact assessment carried out as part of a review of the Commonwealth of Australia's EIA process led to the conclusion that 'strategic environmental assessment[s] are difficult and challenging scientifically; but are able to be initiated now using tools already developed or in process of development' (Court *et al.* 1996, p. 57). This conclusion was reached also by Sadler and Verheem (1996), as part of the International Study of the Effectiveness of Environmental Assessment (Sadler 1996), who found that:

> although some adaptation may be needed, almost all methods and techniques needed for impact identification and analysis in SEA

> are already available, either in project EIA or as instruments in policy analysis and planning (Sadler & Verheem 1996, p. 180).

Interestingly, this conclusion contains within it implicit acknowledgement of the two conceptions of SEA, and PEA in particular, introduced previously: the project-EIA derived and policy vetting.

After an exploration of important terms and concepts in the following section, the remainder of this chapter enlarges upon the introductory treatment of the emergence of PEA in its two conceptions, and then reviews some of the existing procedures adopted in those few jurisdictions that have moved towards implementing a PEA regime. Also included is a discussion of some of the available methods, illustrated by means of case studies. A discussion of future directions and concluding comments complete the chapter.

13.2 POLICY ENVIRONMENTAL ASSESSMENT: TERMS, CONCEPTS AND PRINCIPLES

13.2.1 Terms and concepts

So far, other than the general terms EIA and SEA, only one term has been introduced, i.e. PEA. For the purpose of this chapter we use Thérivel's definition of PEA already quoted, i.e. 'an appraisal of the environmental impacts of a policy which is used in decision-making' (Thérivel 1997, p. 1).

This definition can accommodate both comprehensive and simple approaches. By environmental we mean a broad range of issues; not only bio-physical, but also social, cultural and economic. Less easily dealt with is the meaning to be attached to the word policy, not least because it is used in many and varied contexts. In general, a policy is 'the [g]overnment's objectives and the preferred means for trying to achieve them' (Thérivel *et al.* 1992, p. 37).

Policies can be public or private. In the former case they can be part of a political party's election platform, or they can be adopted by the executive arm of government. Government policies can reflect the interests of the executive as a whole; an example here might be a privatization policy. Other policies express the mandate of individual agencies, such as a water supply agency's policy on water resource allocation or a planning agency's policies with respect to permitted land use. These agency-specific policies may, but do not necessarily, have a statutory basis.

This range of policy types is further complicated by variations in the underlying policy process, the policy's form and its capacity to impact upon the environment. It would be a mistake to talk about a single process; and especially one that conforms to a rational–comprehensive model (Ham & Hill 1984). That is, a model according to which policy making proceeds through a linear sequence of stages—from setting the policy's objectives, the generation and evaluation of policy options against explicit selection criteria, to the choice of one option and its implementation—does not correspond to actual practice (Ham & Hill 1984). Instead, there are very general policies that are subject to the highest level of political debate, other less general policies that are non-routine in character (in the sense of how they are developed), and then routine policies that are made following a 'well-understood and predetermined process' (Bregha *et al.* 1990, p. 3).

One particular issue here is that it may well be inappropriate to look to a single policy decision as a point at which, in the sense of traditional EIA, environmental considerations should be taken into account. Rather, policy making involves more 'a course of action or a web of decisions' (Ham & Hill 1984, p. 12). This concept has been picked up within the SEA literature (Thérivel *et al.* 1992), though not explored fully to date. This range of policy-making processes provides a challenge for PEA. Any procedures and methods developed for use within PEA will need to accommodate a diverse spread of contexts. Furthermore, as pointed out by Ruitenbeek and Cartier (1992), when they discussed the role of environmental assessment in policy analysis, much policy making takes the form of policy reform. That is, making marginal or larger changes to existing policies, rather than starting from scratch.

This observation reinforces the need for the practice of PEA to be sensitive to its particular context: the policy-making norms of the jurisdiction involved, the presence or absence of a routine and understood process and the scale of reform contemplated.

As if this level of complexity were not enough, further thought needs to be given to the form of the policy under assessment. By form we mean the explicitness of the final policy—if final is an appropriate word. As Boothroyd (1995) stressed, it is important that coverage of PEA be extended to include not only explicit but also implicit policies. The existence of implicit policies can be determined through an examination of individual decisions made under their influence. A more complete account of this barrier to broadly applied PEA is provided by Bridgewater (1989). Although relegated to a footnote, the confounding range of policy forms was summarized thus:

> Even those policies which are explicitly stated come in various forms such as white papers, green papers, ministerial statements and speeches, statements or comments in the House or legislature recorded in Hansard, committee reports, press releases or department literature of various sorts. Some policies may be implicit in that they were part of election campaigns or are 'generally accepted' but are not committed to paper in any official form. Furthermore, policies can be vague, general or ambiguous statements which merely indicate a broad general direction or, more rarely, they can be fairly distinct in that they describe what is to be done, how it will be implemented and the timeframe within which the objectives are to be accomplished. In some cases the lack of a policy may cause environmental and resource management problems, e.g. lack of a water pricing policy (Bridgewater 1989, p. 13).

In addition to Bridgewater's elaboration of the varied forms in which a policy may appear, a three-part categorization of policies, according to the nature of their capacity to generate environmental impacts, was offered. Bridgewater's approach is as follows:

- Policies having direct impacts affecting utilization of natural resources or the discharge of wastes.
- Policies having indirect effects on the biophysical environment (as above) or a government's capacity to manage natural resources.
- Policies which act as driving forces behind projects resulting in project EIA.

The linkage between a policy and a consequential project may itself be direct or it may be mediated through an intervening plan and/or programme. The relationship between a policy and subsequent and consequential plans, programmes and/or projects and the environmental assessment of all four proposals has been termed tiering, within the SEA literature (Lee & Walsh 1992; Wood & Djeddour 1992). The nature of tiering is discussed in Chapters 4 and 19, Volume 1; its implications for PEA are considered later in this chapter.

13.2.2 Policy environmental assessment principles

So far the range of policies requiring assessment has been shown to be large in our review of the different types of policy, their formulation processes and the forms and categories of environmental impacts. It therefore appears expedient to avoid the temptation to be prescriptive in the area of PEA, perhaps even more than in EIA more generally, and to focus instead at the level of principles.

The report by Sadler and Verheem (1996), which examined the topic of SEA as part of the International Effectiveness Study, lists 12 principles of SEA. While some of these principles are seemingly of widespread application, their nature reflects an origin in EIA practice. Nevertheless, their terms are general enough to encompass at least an ideal PEA process. In the next section, the emergence of PEA from EIA and from policy analysis and evaluation is reviewed to explore one of the debates still alive within the SEA literature, i.e. whether to pursue a comprehensive or a simpler model for policy environmental assessment.

13.3 THE EMERGENCE OF POLICY ENVIRONMENTAL ASSESSMENT

The emergence of PEA can be understood as a twofold process. First, as the extension of project EIA to include the coverage of programmes and projects, and, in recent times, policies. Second, as an attempt to include sustainability concerns within policy analysis and evaluation. The extension of EIA to the level of proposed policies was motivated by a desire to address some of the recognized limitations of project assessments. The sustainability-led (Thérivel *et al.* 1992) genesis of PEA was intended to enable the implementation of sustainability objectives not only at the policy level, but also at the level of plans, programmes and projects (discussed further in Chapters 2 and 4, Volume 1). A brief review is included here to enable a focus on the policy end of SEA.

13.3.1 Environmental impact assessment as a source for policy environmental assessment

One of the earliest arguments for the introduction of SEA as a complement to EIA was the 1992 paper by Wood and Djeddour. In this paper, the need for SEA was based upon 12 perceived advantages. The close relationship between EIA and SEA is also reflected in early guidance on the procedures to be adopted for SEA. For example, the document *Policy Appraisal and the Environment* (Department of the Environment 1991), prepared to guide central agencies in the UK in a form of PEA, recommended a sequence of steps similar to those commonly met within the project EIA literature.

The rational–comprehensive nature of EIA-sourced PEA is reinforced by its partial reliance on the concept of tiering. The latter is based on two assumptions. First, that there is an identifiable relationship between some or all of policies, plans, programmes and projects in which a higher-level proposal leads to the development of lower-level proposals and where the latter are constrained by the former. Second, it is assumed that the environmental assessment of lower-level proposals need only consider those residual impacts not adequately dealt with during earlier assessments.

Sadler and Verheem (1996, p. 86) concluded that the integration inherent in tiering is not always easy to achieve. Whilst acknowledging the successes in tiering programme and project assessments, they found that the linkage between policy and project levels was weak. This conclusion was reached not only for those SEA systems based upon EIA, but also for those developed for application at the policy level as well. The critique of SEA theory and practice contained within Boothroyd's review of policy assessment (Boothroyd 1995) treats tiering fairly harshly and raises several difficulties in reconciling the concept with reality. To quote:

> Even here [in the case of transport policy], the process may have lots of room for sideways interventions at downstream levels that induce change upstream. Parochial political pressure, national budget constraints, or indeed project EIAs, may change the policy, plan or programme for the existence, location, timing or design of roads. Truncated freeways all over the world testify to this (Boothroyd 1995, p. 102).

That is, the tiering process can be disrupted as we move downwards from policy to project, thereby affecting SEA's capacity to deliver its hoped for benefits in reducing some of the limitations of project EIA. Of more relevance within the present context of PEA is the possibility of the development and assessment of lower-level proposals influencing policy. This amounts to an incremental process, in which policy making, and especially policy reform, as described earlier, occurs through individual project EIAs providing a basis for learning from experience (Bailey 1994). What this means for PEA is that the assessment needs to remain open and able to respond to issues raised through the implementation of related and unrelated projects. It must also be recognized that it is often difficult to engage the public adequately in the assessment of abstract policy proposals and therefore many issues will need to await expression at the project level before effective public involvement can occur (Boothroyd 1995).

These issues surrounding SEA and PEA derived from EIA have been considered in detail by Boothroyd (1995). We discuss this material over the following two subsections.

13.3.2 An environmental addition to policy analysis

In Section 13.1, we introduced the body of opinion that SEA can be conceived as a means to introduce sustainability considerations into policy analysis. In this way, not only should the policies which result from this expanded analysis be in accord with a country's sustainability objectives, but, through a 'trickle-down' process, these objectives should also be reflected in lower-level proposals. Although, given the discussion of tiering immediately above, this hope may be overly optimistic.

The conception of SEA and, in particular, PEA as an expanded form of policy analysis can take two forms. One of these is the extension of traditional cost–benefit analysis to include environmental considerations. An example of this is the approach recommended by the UK Department of the Environment (1991). Boothroyd (1995) characterized this approach as informal, positivistic and vulnerable to some of the limitations which he saw as applicable to the EIA-derived model for SEA and PEA. In contrast to this form of policy analysis, Boothroyd (1995) coined the term policy vetting to describe an informal process in which a policy is checked for its compatibility with environmental requirements. Policy vetting is distinguished from the EIA-derived model by virtue of its informality and its heuristic nature, in which reliance upon quantitative predictions is replaced by a focus on 'the big picture over details; direction of change over quantity of change; systems processes over systems states; and would favour insight over rigour' (Boothroyd 1995, p. 115). In essence, policy vetting involves encouraging agencies to consider environmental impacts at the earliest stage of policy formulation by asking thought-provoking questions (Boothroyd 1995, p. 97).

The approach therefore conforms to the simpler form of PEA advanced in the recent SEA literature. In 1996, Sadler and Verheem observed that '[in] practice, a more discriminating, differentiated process has emerged in which the form of SEA is adapted to the function required' (Sadler & Verheem 1996, p. 80). In the case of policy SEA, Thérivel (1997) saw the process as internal, informal, rapid and qualitative.

It should be stressed that the two broad models for PEA, the EIA-driven and the sustainability-led, can be brought together. This merging is still in its infancy however. One option is to adopt a two-tier SEA (PEA) regime. An example of this type can be found in the Netherlands (Verheem 1992; de Vries 1996). In the Netherlands, an SEA process based upon project EIA is used to review physical plans and sectoral programmes. In addition, an environmental paragraph is required for all policy proposals with potentially significant impacts and that require approval by the Council of Ministers. As reported by Sadler and Verheem (1996, p. 80), the policy test is a flexible, minimal process. It was also reported that the process is governed by three rules concerned with any requirements being practical and simple, with as few procedures as possible, and with the initiating agency being responsible for the process but with discretion on procedure and method. In this way a systematic process is used for programmes and plans, with a simpler policy vetting approach reserved for policies. The environmental paragraph model is reviewed in more detail in the next section as a case study.

A more radical reconciliation of the two models has been proposed by Boothroyd (1995). In his view what is required is, in a sense, a merging of the formality and openness of the EIA-driven approach to PEA with the heuristic quality of policy vetting. To distinguish the result of this combination he used the term policy assessment (PA). In his words, 'PA is defined as the process by which fundamental policy options are continuously identified and assessed in terms of all [of the] highest-level societal goals' (Boothroyd 1995, p. 105). These goals were seen to include not only the familiar development goals of growth and efficiency, but also equity, quality of life and sustainability.

Boothroyd's PA model has three interesting attributes. First, it is intended that the assessment not only address the policy's unintended outcomes (impacts), but also the attainment of its own objectives. Second, it should be applied to all policies, implicit as well as explicit. Third, that it should be used as a design tool applied early and also as a scrutinizing tool applied relatively late in the process providing for public involvement.

When assessing intended outcomes, PA, as an extension of policy analysis, considers:

- Will the policy solve the problem, i.e. meet its objectives?
- Efficiency and;
- Consistency with higher goals.

Unfortunately, little guidance was offered as to how implicit policies might be assessed. The possibility of monitoring (and presumably assessing) day-to-day decisions as an indicator of the existence of an implied policy was noted. The use of annual policy audits was also mentioned leading to the reform of policies as required.

To help address the implementation deficit between the prescription of a PA process and its application, Boothroyd (1995, p. 117) proposed a set of guidelines for policy assessors:

- Clarify the nature of policies being assessed, their context (relation to other policies), objectives and tradeoffs intrinsic to the policy area.
- Identify the nature of systems (mechanical, natural, ecological, cultural, social, human) impacted by the policy being assessed.
- Analyse systemic processes and directions of change impacted.
- Consider critical sustainable development variables—e.g. local and global natural capital, biodiversity, appropriated carrying capacity, social carrying capacity, cultural survival, gender relations, personal and community health, aesthetic pleasure, spiritual development—and their relationships.
- Consider the usual list of EIA impact qualities—duration, intensity, effectiveness, timing, significance, reversibility, mitigability, positiveness or negativeness, etc.

Before moving on to consider a range of residual issues in PEA, it is worth noting some of the less common inclusions in the above guidelines—for example the need to clarify one policy in relation to other policies. The problem of policies being contradictory is a major issue (for example, air quality and transport policies), as separate agencies develop their own policies largely in isolation from each other. One of the advantages of PEA is that it can lead to the better coordination of policy formulation between agencies. An example of progress being made in avoiding incompatible policies within the context of structure-planning is given in Section 13.5.

13.3.3 Some remaining issues

So far in this review our attention has focused on PEA as a guide to the planning and decision-making for proposed policies. The project EIA literature, while focused on project planning, also considers the relationship between EIA and project management (Culhane 1993; Bailey 1997). Whilst little has been written on the equivalent implementation of policies, some commentary is in order.

The implementation of a policy requires that the responsible agency not only has sufficient capability to pursue implementation, but also acts in accordance with the policy's terms. That is the actions of the administering agency need to be predicted (DHV Environment and Infrastructure 1994) or, more realistically, modelled using an appropriate method. One such method involves the use of scenarios, as discussed in Section 13.5.

The implementation of a policy is far from straightforward. Indeed, some would argue that it is partly through the processes of implementation that a policy is made. Since implementation is undertaken at the lower levels of the bureaucracy, the future development of PEA will need to influence these so-called street-level bureaucrats (see the discussion in Ham & Hill 1984, pp. 136–42) and enhance their consideration of environmental issues, at the same time as influencing senior decision makers.

In addition, perhaps more than with any of the other levels of proposal from projects to plans, policies are intended to achieve their objectives through modifying the behaviour of many individuals and small entities. For example, a retrospective SEA of a Canadian crop insurance policy had to include an analysis of the response of individual farmers to the policy signal and also to other signals (markets, technologies) (Campbell 1996). This imposes considerable uncertainties in predicting the effects of a policy, again requiring appropriate methods (scenarios).

Within project EIA, one of the widely acknowledged benefits is the mitigation of the project's potential impacts (Ortolano & Shepherd 1995;

Sadler 1996). In the case of SEA in general it is not immediately obvious how impact mitigation might occur. In particular, policy mitigation cannot be directly based upon the common forms of project mitigation. Compensation in the form of monetary compensation or compensation in kind, in which an environmental attribute lost is replaced elsewhere, appears to be transferable from projects to policies. It should be possible to modify a policy, either its objectives or the means of achieving them, to effect a reduction in unintended and undesired outcomes. The search for a win–win situation, in which the losers from one policy are made the beneficiaries of another, separate but parallel policy, is another possibility. Further work is required here.

13.4 POLICY ENVIRONMENTAL ASSESSMENT: PROCEDURES

So far we have reviewed the prescriptive literature concerned with what could or should occur in the area of PEA. This section begins our review of practice. Unlike other forms of SEA, where the body of available experience is reasonable (see de Boer & Sadler 1996; Sadler & Verheem 1996; Thérivel & Partidário 1996; see also Chapter 14, this volume), in the case of PEA, there is much less material to call on. In her recent survey of SEA of policies in Europe, Thérivel (1997) summarized the regulations and guidelines concerned with PEA. The following countries were found to have some form of PEA in place: Czech Republic, Denmark, Finland, Hungary, Netherlands, Poland, Slovak Republic, and UK, together with the European Union. Some of these have chosen the comprehensive, EIA-driven approach for example, Denmark and the UK. Others have preferred the simpler approach based upon policy analysis, for example, the Netherlands.

Outside Europe there are other PEA systems in place. Some of the most widely described are those of Canada and New Zealand. Mention has already been made of the original breadth of application of the US EIA legislation.

Before reporting upon some of these systems in more detail, one matter merits consideration. Some SEA and PEA systems have been put into place through legislation (see, for example, New Zealand—Box 13.1), while others have the support of administrative orders or guidelines only (see, for example, Denmark—Box 13.2). This is reminiscent of the situation with respect to project EIA. In the present case it appears that there is not as yet an agreement that a clear legislative mandate for SEA and PEA is required. Thus, Sadler and Verheem (1996, p. 78) concluded that: 'experience to date is insufficient to draw specific conclusions regarding the effectiveness of legislative-versus administrative-based systems. In either case, rigid and over-detailed prescription should be avoided. At this stage, flexible and pragmatic institutional arrangements are recommended. These should be:

- Founded on a clear basic provision; and
- Meet key principles from EIA which are relevant to the policies, plans and programmes'.

It may be that the best way to proceed is to start with guidelines only and then, once experience has been gained and procedures and methods experimented with, to move to a legislative regime (Partidário & Thérivel 1996).

13.4.1 Case studies of environmental impact assessment-driven systems

Two case studies are presented. The first is a study of the innovative, integrated approach to SEA and EIA adopted in New Zealand. This approach attempts to tier the assessment of policies, plans and projects. Then follows a study from Denmark where the SEA of Bills have been required by an administrative order since 1993.

13.4.2 Case studies of policy analysis based systems

The two case studies chosen to illustrate the simpler, policy analysis based approach to PEA are the Canadian and Netherlands systems. In the former case (Box 13.3), there is a separate legislative system for the assessment of projects; in the latter case (Box 13.4), there is also a separate legislative system for project EIA and some SEA.

Box 13.1 New Zealand (Sources: Dixon 1994; Dixon & Fookes 1995; May *et al.* 1996; Dixon *et al.* 1997a, b)

The passing of the Resource Management Act (RMA) in 1991 signalled a new approach to EIA in New Zealand. The Act incorporated the principles of EIA within a statutory planning framework. Previously, EIA was dealt with in two ways. First, the Town and Country Planning Acts 1953 and 1977 provided a statutory land-use planning process for assessing development projects. Secondly, the Environmental Protection and Enhancement Procedures 1974 set up a non-mandatory process for assessing the environmental impacts of large-scale developments (as well as more minor proposals). Elements of these statutory and non-statutory processes have been drawn upon in developing an effects-based approach to environmental management under the RMA

Central to this approach is the way assessment of effects forms a key part of the framework of the RMA, the purpose of which is to 'promote the sustainable management of natural and physical resources'. What is significant is that statutory provision for EIA occurs in two ways. At a project level, applicants are required to prepare an assessment of environmental effects when submitting applications for resource consents from councils. Also, at a policy level, there is generic, rather than specific, provision for the assessment of policies and plans. For example, the combination of Section 32 (policy analysis) and Section 35 (environmental outcomes) can be construed as creating the opportunity for PEA. This is accompanied by a strong emphasis in the Act on consultation, and monitoring of the state-of-the-environment, consent compliance and policy effectiveness

The Act is administered primarily by local government. The main instruments for achieving the purposes of the Act are regional policy statements, regional and district plans. Sixteen regional authorities (12 regional councils and four unitary authorities) are responsible for preparing regional policy statements, while 74 district and city councils are required to prepare district plans. Regional policy statements provide an overview of the resource management issues of the region. Regional plans, with the exception of regional coastal plans, are not mandatory but can be prepared on topics considered appropriate by regional councils. District plans deal with land-use planning, noise and subdivision controls. The Act provides for a hierarchy of plans where lower-level plans are not to be inconsistent with higher-level plans. The Act also enables the preparation of national policy statements. To date, only one has been prepared on coastal policy and, in the present political climate, it is unlikely that more will be prepared. Thus, it is impossible to report on PEA without making a reference to plan preparation and implementation

The transition period for implementing the RMA is taking some years but given the reality of time required to prepare new style effects-based plans and to proceed through public processes, this is not surprising. Whilst all 16 regional policy statements have been notified, and most are now operative or close to it, only just over 50 district plans have been notified publicly. It will probably take several more years before all district plans have become operative having completed the submission, hearings and appeal stages of plan preparation

The Act, along with local government restructuring, has provided an intellectually challenging and stimulating framework for a new approach to managing natural and physical resources. At the same time, progress has been constrained by inadequate funding for innovative research, a focus on legal formalism, a shortage of highly skilled professionals and the imposition of unrealistic political deadlines for notification of plans. Most importantly, because of these pressing contextual factors, there has tended to be a focus on consultation and process at the expense of robust analysis and outcomes. There has been criticism of the complexity and length of some of the new effects-based plans and the costs of engaging in the process and compliance. A disappointing, although not unexpected, feature is that the environmental assessment of policies in plans is not generally being made explicit as such by councils (i.e. as separate documents). A provision in the Act (Section 32) requires councils to justify their policy choices. The ways in which

(*Continued on p. 260*)

Box 13.1 *continued*

councils have done this have varied considerably. Whilst some have produced separate reports, often at the end of the process of plan preparation, others have focused on keeping audit trails of decisions made during the course of plan preparation. Thus, it is difficult to determine systematically the extent to which councils are taking opportunities to carry out PEAs

In policy statements and plans, councils are required to identify the significant resource management issues in their district, develop objectives, policies and methods for dealing with the issues and state their intended environmental results

It needs to be noted, however, that there are a variety of approaches in terms of how policy statements and plans are structured. At the regional level, policy statements tend to be issue-orientated. Whilst issues are presented in an effects-based context, they are not always well scoped and integrated. At the district level, plans are demonstrating various approaches and levels of complexity. Whilst some plans rely on traditional tools, such as zoning and listing of activities, others are more effects-based in that they use sieves or overlays to determine effects of activities along with the application of assessment criteria. Specific methods to achieve environmental outcomes range from controls by means of rules through to cooperative approaches, such as codes of practice and education. Many plans are a mixture of the two approaches. Experience shows that, for some urban outcomes, such as amenity values, it can be difficult to avoid using rules. In the larger urban centres, plans tend to be more complex than those prepared under the former regime of the Town and Country Planning Act 1977

Findings from a major research programme which is examining plan making show that there are significant variations in the quality of notified policy statements and plans. Whilst some councils, such as Christchurch City Council, have made strong links in their plan between issues, objectives, policies, methods, anticipated environmental outcomes and indicators for monitoring results of objectives and policies, others do not. Similarly, there can be considerable internal variations within plans in terms of how particular issues are handled. For example, there has been considerable resistance in some rural areas (such as in the Far North District in the North Island and Banks Peninsula District in the South Island) to proposals to protect natural landscapes and areas of significant indigenous vegetation, as required by the Act. Whilst part of this resistance can be attributed to a strong anti-regulation view held by the rural farming sector, it also reflects some inexperience in developing robust policy and rules on environmental topics not previously addressed in plans

Whilst district plans are only beginning to be implemented, it is too soon to determine whether the policy statements and plans are making a difference in terms of environmental outcomes. Monitoring of plans is getting underway slowly, so it will be some years before reliable databases are established against which to assess the effectiveness of environmental objectives and policies in plans and consequently the robustness of PEA. However, by the time the second-generation plans are prepared, monitoring and state-of-the-environment reporting should be in place. Consequently, the next round of policy statements and plans should benefit considerably from the lessons of this first round and look considerably different. Regional policy statements should be more focused on the critical issues in their regions and consequently be more specific in terms of thresholds and standards. The district councils will have had some time to experiment with new methods for achieving environmental outcomes and be able to compare their effectiveness with the use of traditional regulatory controls, such as rules

Box 13.2 Denmark (Sources: Elling 1996, 1997; Johansen 1996; Sadler & Verheem 1996; Thérivel 1997)

An administrative order of the Prime Minister's Office gave effect to PEA on 1 October 1993. By virtue of this order, an environmental assessment must be included in the documentation attached to government bills and other proposals which are to be submitted to Parliament. A threshold test applies limiting assessment to those proposals that are expected to have a significant impact on the environment. In January 1995, a new order extended the range of impacts that must be assessed

The procedures specified are relatively limited, although they can be seen to be modelled on project EIA. The strategy being followed with respect to PEA process development is to start simply and then develop further procedures as required. Responsibility for carrying out the PEA lies with the initiating ministry, under guidance prepared by the Ministry of the Environment. This includes a checklist for screening and scoping based upon 57 points and criteria for the assessment of significance. These 57 points, according to the 1995 administrative order, are grouped into the following classes: surface water; groundwater; air; climate; surface of the earth, soil and percolations; flora and fauna, including habitats and biodiversity; landscapes; other resources; waste; historical buildings; population's health and well-being; and production, handling or transport of hazardous or toxic substances. These classes of environmental impacts are clearly not unlike similar lists developed for project EIA

Some data are available on implementation for the period from 1 October 1993 to 27 May 1994. During this time, 261 bills/government proposals were presented in Parliament, of which:

- 74% did not have any remarks on environmental impacts in the attached documentation
- 13% were screened and found to be unlikely to have significant impacts on the environment (a description of the impacts was included in the documentation)
- 13% were found to have significant impacts on the environment, which were assessed in the attached documentation

For the period 1995–96, the breakdown was 32%, 52% and 16%, respectively. Clearly the extent of implementation has increased markedly, even though a finding that no PEA is required is the usual result. Indeed, for those proposals subject to PEA many were intended to have beneficial environmental impacts in the first place

The extent and quality of the assessments carried out has varied considerably. The length of the assessments have run from a few lines to several pages. In most cases, environmental impacts were described very briefly and in general terms

An example of an assessment of the environmental effects of urban renewal follows:

> 'It is in accordance with the intention of the bill that the positive list, viz. the improvment operations covered by the scheme and laid down in an order, in connection with an extension of the scheme must be subjected to a review with a view to giving it a more marked ecological profile in order to encourage ecological behaviour in implementing private urban renewal
>
> It is thus the intention that an actual 'green positive list' should be drafted in addition to the existing positive list. Considerations will at the same time be included as to the extent to which some of the dwelling categories covered by the scheme must be subject to a narrower specification as to which improvement operations contained in the positive list for which they will be able to obtain support to implement
>
> The bill is assessed as being intended to have a large number of positive effects which can be described qualitatively where there is no empirical experience. The effects can, moreover, be viewed in the immediate and long term, exemplified by the effects on individual residents or properties and the secondary effects of many uniform renewals carried out according to the law and which together can have structural effects. Those too will usually be describable only in qualitative terms

(*Continued on p. 262*)

Box 13.2 *continued*

The environmental effects in connection with urban renewal can thus be multifarious and of both an immediate and longer-term nature

Typical environmental effects, which will nearly always be observed in connection with the commonest urban renewal projects involving installations in dwellings, can be savings in household water, electricity and heat. To these may be added the use of passive solar heating or other renewable energy, alternative water uses, such as the use of rainwater and certain types of waste water, better waste handling, including the reuse of materials and composting. Viewed collectively, these types of environmental effects may therefore be characterized by effects in the form of savings or improved resource utilization

Apart from similar directly observable effects of the bill, there can also, however, be expected to be a number of effects resulting from it, which, on the one hand, stem from the general character resulting from urban renewal while, on the other, secondary or summary effects of many individual renewal projects can be seen

Better accommodation in functional, aesthetic and health terms in itself provides an enhanced quality of life for residents. The health improvements in connection with urban renewal will, to a great extent, be secured by the establishment of the economy measures discussed above. These will not merely be able to improve central heating installations/district heating instead of individual heating installations, such as oil stoves. Moreover, insulation work and façade renovation can result in a reduction in the noise level in residential properties

Establishing district heating in larger properties could affect local air pollution since a number of local air emissions which are very offensive and which pose a risk to health will disappear

Visual improvements in the general character of housing through urban renewal projects will, apart from contributing towards an improved quality of life experienced by the residents, be able to contribute towards the cultural and historical values of the buildings and districts being made noticeable and as a result affect the use of housing both by existing and new residents and by visitors from outside. This can in itself lead to both changes in the composition of residential areas and the preservation of cultural heritage and material values

The secondary or summary effects of the many individual urban renewal projects will naturally depend on the extent to which the law is used. Typically, as a result of individual savings (i.e. savings linked to individual dwellings or properties), a number of structural effects will be perceptible in the form of capacity savings or a lower rate of capacity addition. With individual savings in electricity—if these are made in a sufficiently large number of dwellings and properties—there could, for example, be secondary savings with a lower rate of addition in power station capacity. Similar conditions will be observable with heat savings, although here account must be taken of the cases where heat and electricity production are connected in power stations. For the moment, capacity savings are limited to the surplus production of heat in connection with electricity production. Savings in capacity in connection with the consumption of water may also be anticipated, depending on the existing situation as regards the waterworks in question. Finally, mention may be made of opportunities for structural savings in cleansing capacity installations in connection with direct water savings and indirect savings by way of recycling and recirculation' (Elling 1997, p. 167)

It is interesting to note that this extract was not in fact presented to the decision makers, but was reduced to a few lines only

Box 13.3 Canada (Sources: LeBlanc & Fischer 1996; Sadler & Verheem 1996)

Under a June 1990 Federal Cabinet directive, a PEA is required for all policy (and programme) proposals submitted to Cabinet for its consideration. The process requires that:

1 The potential environmental effects of the proposed policy are taken into account

2 Outlined in memoranda to Cabinet and other documents

3 In addition, a public statement must be prepared to demonstrate that these environmental effects have been integrated into the decision-making process

4 The public are consulted where appropriate

Furthermore, ministers are encouraged to apply this approach to their own decisions, i.e. those not requiring Cabinet consideration. The process is based upon four principles:

- Self-assessment—by the minister responsible
- Separation from project EIA—the PEA process should not be legislated for and may need to use methods other than those employed in EIA, given the nature of the impacts involved (less specific)
- Discretion and flexibility—agencies can develop and use procedures suited to their own needs and circumstances (even as far as with regard to the need to consult with the public)
- Appropriate level of effort—the scope of a PEA should depend upon the magnitude of the potential environmental effects

Experience to date is limited, with some PEAs leading to the mitigation of the effects of a proposed policy and others (conducted as follow-up studies) modifying the implementation of an agreed policy

A review of progress by what is now the Canadian Environmental Assessment Agency drew a range of conclusions:

- Some agencies have not yet applied the process
- Others are unaware of the environmental consequences of their policy proposals or of the relevance of PEA
- Few agencies have directed adequate resources to implement the process
- Little support exists, together with limited awareness of the directive
- Where applied the procedures used vary
- Some agencies do integrate environmental considerations into their policies as part of the design process
- Others only do so once the policy has been formed and either prior to decision-making or afterwards, but prior to implementation
- The nature and length of PEA documentation varies
- The level of public and expert consultation has been limited

Additional comments made in respect of the Canadian process include the need for a clear legislative or policy support, with the process managed by a single agency. Agency accountability, clear and practical guidelines, and the provision of a context through a sustainability policy were also noted as matters requiring attention

13.5 POLICY ENVIRONMENTAL ASSESSMENT: METHODS

In the Introduction (Section 13.1) we considered the question of whether suitable methods for SEA and PEA exist. In this section we move on to examine the range of methods advanced within the prescriptive literature and then review some case studies to illustrate their use.

Reflecting the two origins of PEA, the methods advocated are drawn from experience in EIA practice and policy analysis. Wood and Djeddour (1992) advanced the following methods:

- EIA methods—checklists, matrices, networks for identifying impacts; plus standard methods for determining baselines and predicting impacts.
- Policy analysis (and planning) methods—scenarios and simulations, forecasting, input–output models, land suitability analyses, geographical information systems, systems modelling, multi-criteria analyses, goals achievement matrices, planning balance sheets, cost–benefit analyses, cost minimization techniques, and sensitivity analyses.

Some of these methods may require modification before they can be applied to SEA

Box 13.4 The Netherlands (Sources: Verheem 1992; de Vries 1996; Sadler & Verheem 1996; Thérivel 1997)

The SEA system in the Netherlands is a two-tier system. Plans, programmes and sectoral policies require an SEA under the EIA Act 1987. This Act also provides for project EIA. Not surprisingly, the procedures are essentially those of project assessment. For example, the screening of proposals and later review of the EIA report involve full public input and the independent EIA Commission

This process does not apply to all policy proposals, and since 1995 an environmental paragraph or test has been required for all policies submitted to Cabinet and not otherwise subject to an environmental assessment. The process is applied subject to the threshold of the significance of the potential impacts. This PEA process is established by Cabinet directive and places the responsibility for implementation on the initiating agency. The intent of the process is to give a central role to environmental and sustainability concerns within policy making. Specifically, there are four principles:

1 The process should be introduced in a low-key manner
2 There should be no delays in decision-making because of the use of the paragraph
3 The content of the paragraph should reflect the significant issues
4 Procedural and content requirements will be few to enable the process to be integrated with other processes

An overview function is performed by the Minister for the Environment. Once screening of a proposed policy has occurred to determine if PEA is required, the assessment can vary from a few lines to sufficient length to cover:

- the issues involved, the policy's objectives, expected impacts and any constraints arising from, for example, other policy areas
- alternatives to the preferred policy, including alternative objectives, instruments and/or their implementation
- compatibility with environmental policy goals and legislation

A checklist has been prepared in the form of four questions to be asked when implementing the environmental paragraph requirement. These four questions are brief and to the point. They are as follows:

- What are the effects on energy consumption and mobility?
- What are the effects on the consumption and stocks of raw materials?
- What are the effects on waste and on emissions to air, soil and surface water?
- What are the effects on the use of the physical space available?

The process is supported by a Centre drawn from the areas of justice, the environment and housing. The Centre reviews the quality of the environmental paragraphs before they are tabled in Parliament

Experience between early 1996 and November 1996 is that environmental paragraphs are short (two to four pages long) and qualitative. During that time 49 bills were assessed (10% of the number presented to Parliament), three of which were subsequently withdrawn and eight modified

and PEA. In 1992, experience was still limited and hence any discussion of methods was necessarily general. By 1996, the situation had changed to enable Partidário (1996) to provide some specific examples of methods adopted in particular contexts. Thus, the following were noted:

- Checklists of questions, e.g. Denmark and the Netherlands.
- Assessment of significance against criteria, e.g. Denmark, the Netherlands, UK.
- Compatibility matrices, e.g. the Netherlands, UK.
- Economic methods (cost–benefit analyses, hedonic pricing methods), e.g. UK.
- Scenarios—Canada, USA.
- Expert advice (internal and external)—Canada.
- Help desks (a support service from within an environmental agency)—the Netherlands.

The use of life-cycle analyses has also been advocated (Sadler & Verheem 1996, p. 149).

Box 13.5 Environmental restoration and waste management programme, USA (Sources: DHV Environment and Infrastructure 1994; Webb & Sigal 1996)

Commencing in October 1990, the US Department of Energy undertook a comprehensive programmatic EIA for a nationwide proposal to clean up contaminated land and put in place a waste management programme for some 100 of its facilities spread across the country. The Department moved to prepare a programmatic EIS (PEIS) to cover four broad alternatives:

- The first alternative was framed around ensuring compliance with environmental standards applicable to the subject land
- The second alternative factored in the predicted land use to enable more specific environmental objectives to be derived
- The third alternative attempted to balance the risks to workers along transportation corridors and to populations surrounding the sites
- The fourth alternative combined the second and third

For each alternative a cumulative effects assessment was undertaken, covering risk issues, cost, probability of success, land-use issues, socio-economic, ecological and physical impacts and impacts on artificial resources. To provide a technical foundation for the impact analyses, conceptual engineering designs were completed

In this case an open and comprehensive SEA was pursued, lasting several years and attracting many thousands of public comments. A number of observations regarding the process have been made:

- Some site-specific decisions were made during the PEIS process, and these decisions introduced a new alternative
- Incremental benefits were found to accrue throughout the process as individual decisions were made
- An agency must be committed to the SEA for it to be effective
- Early planning and intra-agency and interagency cooperation are also required
- Qualitative methods, subject to peer review where required, were acceptable
- Multidisciplinary teams are required
- The SEA enabled several Department of Energy programmes to be integrated

The approach used for the PEIS, especially the use of conceptual engineering designs, provides some guidance as to how to overcome the limitation of inadequate detail which can befall SEAs and PEAs. That is, at least some PEAs can have embedded within them model project-level EIAs, for which the data to support impact identification, prediction and management are available. In this way possible specific projects and their environmental impacts can be used to expand the content of the PEA

Some of these methods are clearly more suited to comprehensive EIA-driven models of PEA, such as the use of economic methods and simulations. Others fit in better with the shorter and simpler policy analysis model; in this case examples would be the use of simple checklists, expert advice and help desks.

To further illustrate the methodological dimension to PEA, four case studies are presented. These case studies have been selected because they feature methods of potential value in enhancing the rigour of PEA, irrespective of whether they were used within a policy assessment or another level of SEA. The first of these (Box 13.5) is a programme SEA; however, its use of conceptual designs offers promise to the assessment of policies which have to come to terms with an absence of detailed specifications for the policy and its environmental setting. Then follows another programme SEA (Box 13.6), this time illustrating the use of scenarios as a method with great potential to address the uncertainties of PEA. The third case study (Box 13.7) is drawn from the UK's approach to the assessment of structure plans. An innovative use of matrices to explore the compatibility between policies is presented. This method may well find a significant application within PEA to highlight the (frequent) inconsistencies between government policies, especially between developmental and environmental policies. The act of identifying incompatibilities and inconsistencies may be sufficient

Box 13.6 Waste management programme, the Netherlands (Sources: DHV Environment and Infrastructure 1994; Verheem 1996)

To assist in its preparation of the 1992–2002 waste management programme, the Netherlands Waste Management Council carried out a voluntary SEA (though in full compliance with the legislated process). The waste management programme covered non-hazardous wastes throughout the country. The programmatic SEA was tiered with provincial waste management plans and location-specific project EIAs (a difficult task)

In recognition of the uncertainties inherent in the implementation of long-term programmes, with many stakeholders and decision makers involved, a scenario approach was used. Three scenarios were used: the present situation; the so-called policy scenario in which it was assumed that all environmental targets are met; and the headwind scenario in which the assumptions were less optimistic. In this way the nature and scale of the waste streams requiring management were determined for each scenario and alternatives proposed for their treatment and disposal

The SEA was generally well received, but with some criticisms of the headwind scenario (it was not pessimistic enough), the alternatives considered and the absence of weightings for the environmental indicators used

Beyond this particular case study, scenarios have been advocated as a useful means of dealing with the uncertainties in SEA and PEA. Scenarios can be used in different ways:

- To capture the assumptions regarding independent variables and their qualitative equivalent: for example, rainfall pattern or population growth
- As a deliberately planned series of events seriously contemplated
- As a series of events not seriously contemplated but analysed to provide a comparison against which to evaluate more serious scenarios. Incomplete implementation of a policy's terms can be captured in a scenario, as in the Netherlands case study. In this way some of the complexities of administrative and individual behaviour can be factored in

It should be noted that the first of these uses provides a means of responding to the problem of uncertainty in policy implementation and also the problems of tiering discussed previously. That is, by assuming various degrees of implementation or by not only assuming that lower level proposals will be effectively tiered to policy but also that tiering will (may) be less effective

to bring about appropriate policy modification. Finally, a case study from New Zealand (Box 13.8) is included to demonstrate the use of overlays in developing local environmental policies.

These four case studies are illustrative of potentially useful methods. As already indicated, they were chosen for this reason, even though two were programme SEAs and two plan SEAs. Experience with policy SEA is more limited. However, experience gained in PEA itself is beginning to mount. In Sadler and Verheem (1996, pp. 84–5), PEAs are listed for:

- amendments to the Canadian Western Grain Transportation Act 1983;
- a Danish bill on protection of the coastal zone;
- the North American Free Trade Agreement (a retrospective assessment undertaken by Canada);
- fiscal and physical measures for transport planning in the UK;
- forest management in Australia.

A discussion of these cases can be found in Sadler and Verheem (1996). Because of its interesting use of scenarios, the Australian forest management case is reported upon below (Box 13.9).

To this list can be added the two policy SEA case studies from Thérivel and Partidário's (1996) compilation. One was an assessment of a structural fund application from Ireland to the European Commission (Bradley 1996), the other concerned an assessment of a Canadian crop insurance policy after implementation (Campbell 1996). Another 15 examples are listed by Thérivel (1997), who reviewed two of them in more detail: a policy of subsidizing improvements to rental properties in Denmark and the privatiza-

Box 13.7 Hertfordshire County Council structure plan, UK (Source: Rumble & Thérivel 1996)

The UK Department of the Environment has issued a guidance document for the environmental appraisal of local development plans. This document sets out a three-stage process:

1 Characterizing the environment against 15 criteria divided between global sustainability, natural resources and environmental quality

2 Scoping

3 Appraising the plan using a matrix, including an analysis of whether the plan's objectives and policies are internally compatible and consistent

There are two important features contained in this guidance which, while developed for the purpose of plan assessment, are equally important as guidance for PEA. The explicit appraisal of a plan's objectives and similarly of a policy's objectives is certainly an essential requirement to test for the consistency between these objectives and other higher-level sustainability goals. Furthermore, it is often the case that the development of one policy occurs in sufficient isolation from other policies for incompatibilities to remain hidden. These incompatibilities can subsequently prevent or at least compromise the attainment of one or more of the policy's goals. This problem is most pronounced when governments pay insufficient attention to the consistency between economic and environmental policies. However, it can also occur within a single policy, such as whena regionalization policy aims to provide for decentralized growth together with the preservation of extensive rural hinterlands. Simple matrices can be used to test for problems of this type

This approach was used to assess the Hertfordshire County Council's structure plan, starting in 1993. The plan was assessed using an open and inclusive process and against a suite of previously determined sustainability criteria. The plan relates the sustainability criteria to its objectives, environmental stock criteria and indicators. It was found that externally imposed constraints, e.g. a requirement to improve roads, hindered the planning process. This is important as an illustration of the difficulty in successfully following through from higher-level proposals if they meet resistance at lower levels. That is, tiering needs to be a two-way process

This case study also exemplifies one possible relationship between procedural guidance and the development of appropriate methods. In this case the Department's guidance was produced prior to the development of suitable methods and led to some local authorities being innovative in trialing their own methods. Thus, it seems that SEA and PEA procedures can be used to force the development of appropriate methods: procedural advances need not await methods

tion of Polish agriculture. The other 13 examples are:

- standards for energy efficiency of energy-consuming equipment (Denmark);
- ban on pesticides containing certain active ingredients (Denmark);
- amendments to the Road Safety Act (Denmark);
- agreements on protection of small whales in the Baltic Sea and North Sea and of the European bat (Denmark);
- amendments to the Planning Act and Protection of Nature Act (Denmark);
- second National Structure Scheme on electricity supply (Netherlands);
- privatization of industry (Poland);
- privatization of energy (Poland);
- national transport policy (Poland);
- national water management strategy (Slovak Republic);
- actualization of energy policy 1995–2010 (Slovak Republic);
- drinking water strategy for East Slovakia (Slovak Republic);
- transport policy (Slovenia).

On the basis of this growth in application of SEA to policies, even if only applied retrospectively, it can be concluded that PEA is practicable.

Box 13.8 Waitakere City Council district plan, New Zealand (Sources: Waitakere City Council 1995, 1996; Dixon *et al.* 1997b)

New Zealand's Resource Management Act 1991 requires that district and city councils prepare district plans to guide development in their areas. The overarching purpose of the Act is the promotion of the sustainable management of natural and physical resources. The Act provides a conceptual framework for integrated resource management, of which the assessment of environmental effects forms a central part. As stated earlier, councils are required to identify the significant resource management issues in their district, develop objectives, policies and methods for dealing with the issues and state the intended environmental results. A significant feature of the Act is that it is more prescriptive in terms of processes of consultation than in content. Thus, while the Act provides a framework, it is for the councils to develop plans which fit their local environmental circumstances. A major challenge for district and city councils has been how to incorporate an effects-based approach in the preparation of plans which are required to deal with land-use planning, noise and subdivisions

The Waitakere City Council, located in metropolitan Auckland, has adopted an innovative approach in preparing their district plan. They first developed a green-print, which provided a context for the promotion of Waitakere as an eco-city and the development of the various planning documents, including the district plan. In preparing their district plan, the Council consulted extensively with community groups in developing options for the city's environmental future. Since notification of their plan, the Council has embarked on major restructuring of its organization to achieve its strategic goal of an integrated approach to sustainable development

The district plan identifies the city's significant resource management issues around the specific responsibilities for resource management laid out in Part II of the Resource Management Act. These include the effects on water, native vegetation, fauna habitat, ecosystem stability, outstanding landscapes, amenity values and so on. The policy section in the plan adopts an approach to objectives, policies and methods that is organized around these issues. Issues are expressed in terms of effects and objectives and policies are concerned with avoiding, mitigating or remedying adverse effects. The Council also provides for methods, other than district plan regulation, to deal with identified issues

Waitakere City has some significant natural features. It is dominated to the west by the Waitakere Ranges, which are an extensive recreational asset for the Auckland region, and yet it is also a coastal city, bounded by the Tasman Sea and Waitemata and Manukau harbours, with 150 km of coastline. The mix of the natural and built environment lends itself to the use of an overlay approach in the district plan which recognizes and builds on these features. Accordingly, the city is divided into two management areas: natural areas and human environments. Both layers lie across the whole city. Natural areas are concerned with the management of effects of activities on natural and physical resources and include riparian margins, natural character, protected areas of significant vegetation and habitat and coastal areas. Human environments are defined around the city's landscapes and local areas, including coastal and rural villages, the intensively settled urban areas in the city and other areas, such as the Waitakere Ranges. These management areas replace former zones

In the development of rules, the major activity distinction is between residential activities and nonresidential activities. Although the plan does identify some classes of activity, this is only done where it is the most simple way to manage effects. The plan places an emphasis on dealing with a development proposal from the point of view of isolating individual environmental effects a proposal might have. Each effect is dealt with by a separate rule. The plan avoids focusing on activities when it is the effects of an activity that require management

The plan adopts a holistic and integrated view of the environment in which the integrity of the natural environment is paramount. An example of the high degree of integration is the way in which the plan deals with natural hazards, which are not treated as a separate topic but integrated into the significant resource management issues. For

(*Continued*)

Box 13.8 *continued*

example, the objective relating to water quality does not mention natural hazards, but at the policy level the concern is the effect on water quality of allowing settlement in flood-prone areas. The policy is therefore to locate settlement away from flood-prone areas. Natural hazards in relation to the protection of natural character, outstanding landscapes and outstanding natural features are approached from the point of view that natural processes must be allowed to occur unimpeded by activities and structures. Human health and safety are to be protected by ensuring that activities are to be carried out in a way that does not exacerbate natural hazard events

This case demonstrates that, with sufficient resources to undertake research and analysis, it is possible to develop a plan which manages environmental effects by using methods such as overlays and management areas. While these methods are not new ideas, and management areas are in effect a form of zoning, policies can be developed and assessed in innovative and effective ways. The test lies in the implementation of the policies and their effectiveness in managing environmental effects. As yet, it is too early to determine the success of this approach. However, the Waitakere example is an interesting case to follow, given that the Council has fully committed itself to a policy of sustainable development

Box 13.9 Forest and timber inquiry, Australia (Source: Resource Assessment Commission 1992)

Between 1989 and the early 1990s the Commonwealth of Australia had in place an innovative approach to policy assessment. This approach took the form of public inquiries undertaken by the Resource Assessment Commission under the Resource Assessment Commission Act 1989. This Act provides for the Prime Minister to refer matters to the Commission for their inquiry. Several matters have been so referred, including mining in an area of significant environmental and cultural value, coastal planning and management and the management of Australia's forests and timber industry

The Commission's inquiry process is broadly based, ranging from environmental through social to economic issues, and has been characterized by the use of advanced methods of analysis. Of particular note is the outcome of an inquiry in which the Commission is charged with providing clear advice over a range of policy options, i.e. a scenario approach

In the case of the Forest and Timber Inquiry these scenarios were in part developed by stakeholder groups: the Forestry and Forest Products Industry Council and the Australian Conservation Foundation. This is an interesting merger of scenarios and public involvement. The inquiry included studies of:

- Resource capability, use and tenure
- Present forest management strategies and institutional arrangements
- Wood supply and demand
- Environmental, social and economic trends

The effect of the inquiry on the development of forest policy within Australia is unclear. The fate of the Commission itself is, however, quite clear. While the Act remains in force, the Commission itself no longer exists. Perhaps the Commission's political masters found the public articulation and rational analysis of alternative policy options too sensitive

13.6 CONCLUSIONS

Perhaps the most important, single conclusion which can be drawn from the literature and experience of policy SEA is that offered by Thérivel:

'all the interviewees stressed the need for simple, straightforward methodologies which could be applied rapidly by non-experts. They stressed that SEA of policies is as much about educating decision-makers as

> about improving individual policies. And all of them stressed the need to start carrying out SEAs even if the perfect method, legal system, and/or institutional structure is not (yet) in place' (Thérivel 1997, p. 8).

In the introduction to this chapter, seven issues were listed that had been raised by Bregha *et al.* (1990) as presenting difficulties in PEA. From the material presented here some comments can be offered, framed by the original list.

- *Scope*: at what policy level should environmental factors be considered? PEA should cover as many policy levels as possible and include implicit as well as explicit policies.
- *Responsibility*: who should be responsible? The initiating agency, but with oversight provided from a central environmental body (perhaps independent of government).
- *Criteria*: what criteria should be applied in the formulation and assessment of policy? Further work is required here to bring together the familiar test of environmental significance from project EIA and sustainability concerns. The latter might be found within national environmental and sustainable development strategies.
- *Process*: how should the environment be incorporated into decision-making? Two models have been explored: the comprehensive EIA-driven model and the simpler model based upon policy analysis. It is too early to say how this duality may resolve itself. One option is the positivistic and heuristic PA model of Boothroyd (1995), although we suspect that to reach that point will require the passage of much time and that interim approaches such as those reviewed here (e.g. the Netherlands environmental paragraph) offer a first step or two in the right direction.
- *Monitoring and accountability*: how should success be determined? How can policy makers be held accountable? Again, more work is required here. The emerging role of state-of-the-environment reporting holds promise. There is a need to examine the relationship between policy and outcomes.
- *Public consultation*: what is the place of public consultation in PEA? While a role for the public in SEA is often stressed as crucial, it is also recognized that there are difficulties in this regard, especially in the area of policy SEA. More needs to be done to understand how public involvement can be enhanced without engendering bureaucratic and political resistance, given that the executive arm of government often regards policy as its exclusive domain. Some thought needs to be given to the issue of funding participation of groups.
- *Science, information and assessment methodologies*: how adequate are currently available information and assessment capabilities? While information gaps will remain for some (long) time, it appears that appropriate methods are available or only around the corner. The issue is more one of identifying them and experimenting with their application.

We believe that there is much that the SEA and PEA communities can learn from the theory and practice of policy analysis. An improved understanding of the nature of the policy process, including how closely the concept of tiering can be applied to practice, should enable progress to be made in the development of procedures and methods for PEA. As always, issues of resources, capability and legal processes, will influence advances made in this field. In the short term, we need to draw on what we know, be innovative and adaptive in trialing new approaches, and to share experiences. Unquestionably, this raises issues such as how much priority is given by public and private agencies to understanding and monitoring the environmental effects of their policies and those of others. However, as more attention is focused on policy making and implementation in environmental management at global and local levels, the development of systematic approaches and methods for PEA becomes pressing.

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14: Environmental Impact Assessment of Land-use Plans: Experience under the National Environmental Policy Act and the California Environmental Quality Act

RONALD BASS & ALBERT HERSON

14.1 INTRODUCTION

In the USA, unlike many other nations, government agencies have considerable experience preparing environmental impact assessments (EIAs) of land-use plans. The National Environmental Policy Act (NEPA), enacted in 1969, applies to a variety of federal government activities, including assessment of federal land management plans. Similarly, the California Environmental Quality Act (CEQA), one of 15 state EIA laws modelled after NEPA, applies to land-use plans prepared by state and local agencies in California. Under both NEPA and CEQA, environmental impact assessment has become an integral part of the land-use planning process. This chapter describes land-use planning in the USA and explains how NEPA and state environmental policy acts apply to planning. At the state level, the focus of the chapter is on California because of the state's extensive experience with plan-level EIA. Chapter 4, Volume 1, provides relevant background to the concept and principles of strategic environmental assessment, including plan EIA.

14.2 NATIONAL ENVIRONMENTAL POLICY ACT AND FEDERAL LAND-USE PLANNING

14.2.1 Legal framework of land-use planning at the federal level

More than 700 million acres of land in the USA—almost one-third of the total land area—is in federal ownership, mostly in the west. Although many federal agencies conduct land-use planning, most of this vast area falls under the planning jurisdiction of four major federal land management agencies: the Bureau of Land Management, the US Forest Service, the US Fish and Wildlife Service and the National Park Service. Together, they plan for and manage more than 643 million acres of federal land. Table 14.1 shows the area of responsibility of each of these agencies. Figure 14.1 shows the areas under the responsibility of the US Forest Service and the National Park Service and Fig. 14.2 shows the jurisdiction of the Bureau of Land Management, most of which is in the western states.

Generally, the plans prepared by these agencies are orientated toward management of natural resources. All the plans they prepare are subject to NEPA and most require environmental impact statements (EISs) because of the potential that the plans will result in significant adverse effects on the environment. For example, the plans prepared by the US Forest Service typically allow harvesting of significant amounts of commercial timber. Although some components of these plans are designed to protect natural resources, other elements have the potential to result in significant environmental impacts and therefore are often subject to EISs.

Besides these four major land management agencies, a variety of other federal agencies occasionally engage in land-use planning on a lesser scale. For example, the US Defense Department manages military reservations covering more than 27 million acres. In the past several years, the Congressional decision to close some military bases has required the Departments of the Army, Air Force and Navy to prepare many land-use

Table 14.1 Planning jurisdiction of the four major federal land management agencies in the USA (sources: National Park Service 1997; US Bureau of Land Management 1997; US Fish and Wildlife Service 1997; US Forest Service 1997).

Agency	Acres managed (approx. no. of million)	Type (and number) of planning units
US Bureau of Land Management	270	Resource management districts (59)
US Forest Service	200	National forests (156)
US Fish and Wildlife Service	90	National wildlife refuges (500)
National Park Service	83	National Parks (54) Historic sites (73) Other units (109)

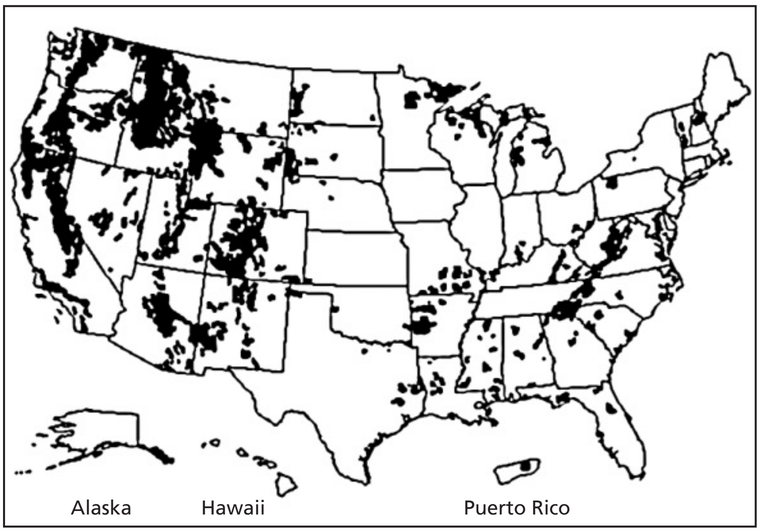

Fig. 14.1 National forests, parks and grasslands under the jurisdiction of the US Forest Service or the National Park Service. With thanks to Tim Messick at Jones and Stokes Associates, Sacramento, California, for the graphical redraw.

plans for the reuse of these bases, all subject to NEPA and requiring preparation of EISs.

14.2.2 Applicability of National Environmental Policy Act

Unlike requirements for EIAs in most other countries that apply only to individual projects, NEPA requires federal agencies to prepare EISs on *all* 'proposals for legislation and other major federal actions significantly affecting the quality of the human environment' (42 US Code 102; 40 Code of Federal Regulations [CFR]1502.3; Council on Environmental Quality 1982). In addition to this very broad legislative mandate, in the regulations implementing NEPA, the President's Council on Environmental Quality (CEQ) has stated specifically that NEPA applies to policies, plans and programmes (40 CFR 1502.4). Because of the language of the statute and the regulations, every federal agency must comply with NEPA before it adopts a land-use plan (Council on Environmental Quality 1986).

The procedural process for preparing an EIS for a land-use plan is essentially the same as the process for preparing an EIS on an individual project (see Chapter 1, Volume 1). Under NEPA, a federal agency normally conducts an initial screening, known as an environmental assessment (EA), to determine if a proposed land-use

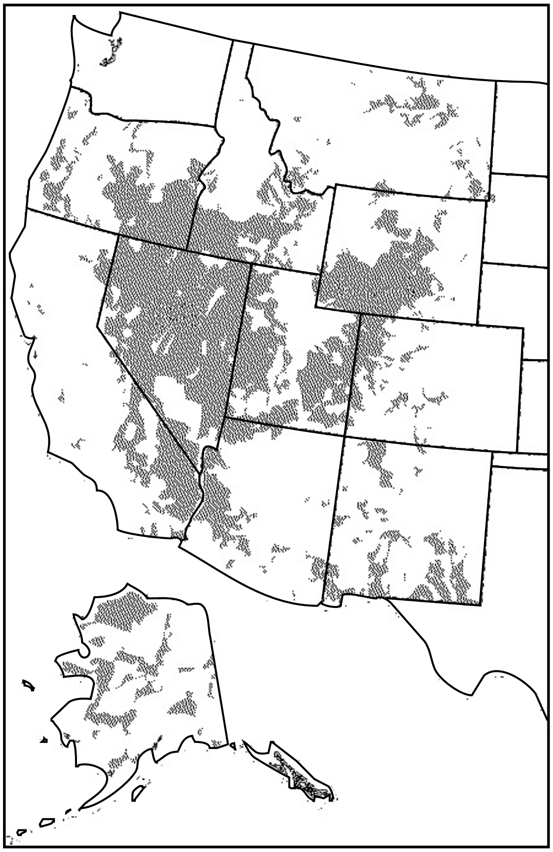

Fig. 14.2 Public lands in the western USA under the jurisdiction of the US Bureau of Land Management. With thanks to Tim Messick at Jones and Stokes Associates, Sacramento, California, for the graphical redraw.

plan has the potential to result in significant effects on the environment. If the EA concludes that the plan may result in significant effects, the agency must prepare an EIS that evaluates the effects of the plan. If, on the other hand, the federal agency concludes that the plan would not result in significant environmental effects, it may prepare a Finding Of No Significant Impact (FONSI) and need not prepare an EIS. In addition to the procedures set forth in the CEQA NEPA regulations, each federal land management agency has its own detailed NEPA procedures to guide it in determining whether to prepare an EIS

Table 14.2 Number of plan-level EISs prepared by US federal agencies in 1994–96 (source: US Environmental Protection Agency, Office of Federal Activities, Environmental Review Tracking System; US Environmental Protection Agency 1997).

Type of plan	1994	1995	1996
National forest management plans	13	24	30
Public land management plans and area plans	17	7	12
National Park management plans and subplans	15	22	28
Wildlife habitat management plans	7	11	12
National wildlife refuge plans	3	3	4
Fishery management plans	10	9	9
Military base reuse plans	25	21	12
Other federal plans	19	11	15
Total plan-level EISs	109	108	122

on a proposed land-use plan and how to prepare an EIA of its plans (Bass & Herson 1993).

14.2.3 Experience of federal agencies with plan-level environmental impact assessment

Federal land-use plans generally cover large areas, have potential for diverse future activities, and therefore often result in significant environmental impacts. Consequently, federal agencies have considerable experience in the preparation of plan-level EISs. Table 14.2 shows the types of federal land-use plans for which EISs have been prepared in the past 3 years. These plan-level EISs represent almost one quarter of all of the EISs prepared by federal agencies under NEPA.

14.3 PROCEDURES AND TYPICAL METHODOLOGIES

Environmental impact statements for land-use plans are subject to the same procedural requirements as EISs for projects. Figure 14.3 shows the required steps in EIS preparation under NEPA.

Although NEPA provides that federal agencies must prepare EISs according to specific procedural steps, neither NEPA nor the NEPA regulations issued by the President's CEQ prescribe any par-

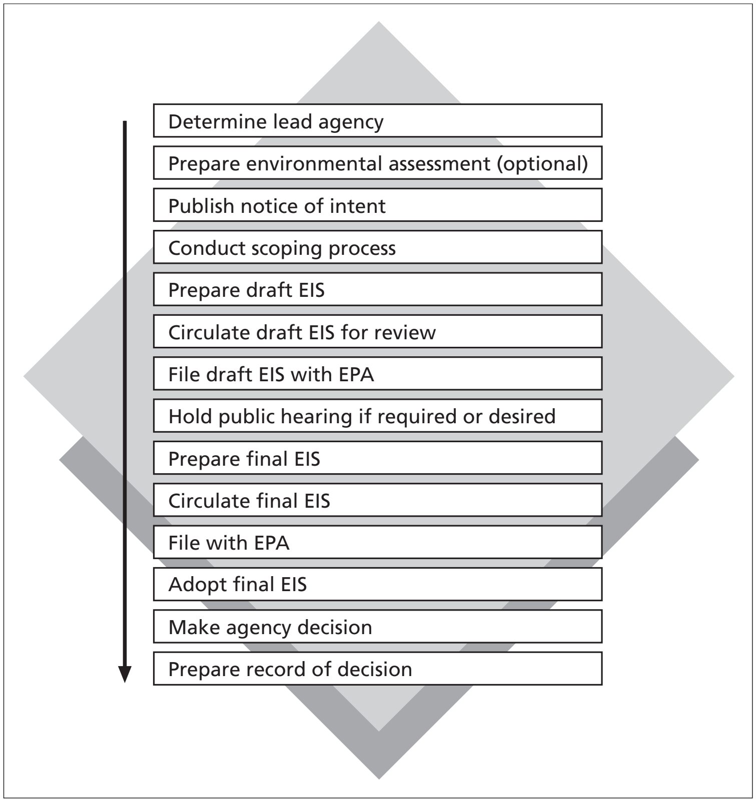

Fig. 14.3 Steps in the EIS preparation process. EIS, environmental impact statement; EPA, Environmental Protection Agency. Source: after Bass & Herson 1993.

ticular methodologies for evaluating the impacts of land-use plans. Because CEQ has issued only general guidance on preparing plan-level EIAs, each federal agency has developed its own methods that are uniquely suited to the issues and resources under its jurisdiction. Despite the wide variety of federal planning programmes, certain commonly recurring techniques are used in most plan-level EIAs prepared under NEPA. These typical methodologies are summarized below.

14.3.1 Determining the scope of the plan-level economic impact statement

During the scoping phase of EIS preparation, the planning agency will typically engage in public outreach to enable concerned citizens and other agencies to determine the range of issues to be included in the plan and the EIS. Under NEPA, 'scoping' is a process that consists of notifying interested parties that an EIS is being prepared and providing them with an opportunity to participate in the process. At a minimum, scoping consists of sending a Notice of Intent to interested parties and the publication of such a notice in the *Federal Register*, the official daily publication of federal agencies in the USA. However, in practice, scoping for a plan-level EIS would generally also consist of many newspaper notices and public meetings in or near the plan area. Scoping typically culminates with a report that summarizes the proposed plan and explains the environmental impacts to be evaluated in the EIS and the methodologies to be used in their evaluation. The Lead Agency also generally identifies the alternatives that will be included in the EIS. CEQ has issued a document entitled *Scoping Guidance* to assist Lead Agencies in conducting their scoping programme (Council on Environmental Quality 1981).

14.3.2 Describing the existing environment

Once a Lead Agency determines the scope of the plan-level EIS, it then commences preparation of the EIS. Generally, the 'Existing Environment' section of the EIS is prepared first. For most federal land-use plans, EISs usually describe the existing resources in the entire plan area. Because of the large areas covered, the 'Existing Environment' sections of most plan-level EISs are described based on historical maps, aerial photography, infrared images and other methods that allow broad geographical areas to be described. Field studies are often conducted to sample and verify the data because conducting field surveys of entire plan areas is generally impractical. The recent trend in EIS preparation is to focus on entire ecosystems. Therefore, it is becoming quite common for the 'Existing Environment' section of an EIS to describe the environment on an ecosystem-by-ecosystem basis.

With more than 25 years of experience complying with NEPA, including the preparation of hundreds of plan-level EISs, most federal agencies have developed extensive databases of environmental resources under their jurisdiction. Thus, when new plans are prepared, the first source of data is typically the agency's prior plans, land surveys and other resource data collections. With the current widespread use of the Internet, these federal databases are becoming easier to access and use in preparation of EISs. The federal land management agencies, in particular, have well-developed inventories of the land under their control. The sources of environmental setting data are too numerous to list here. Those with access to the Internet may find excellent links to government and private databases, including maps and resource inventories, through 'NEPANET', an Internet site maintained by CEQ (Council on Environmental Quality 1997a).

14.3.3 Evaluating impacts and comparing a range of plan alternatives

Under NEPA, the comparison of alternatives is considered the most important aspect of an EIA (40 CFR 1502.14). Thus, EISs for federal land management plans generally contain a range of alternatives, which must be evaluated and compared in a relatively equal level of detail. Although there is no predetermined number that must be evaluated, the alternatives must meet the underlying 'purpose and need' of the Lead Agency. Typically, the purpose and need relate back to the statutory authority under which the agency is conducting its planning. For example, in preparing a plan for a national forest, the US Forest Service is guided by the concept of 'multiple-use'. Thus, each alternative in a typical forest plan might contain differing levels of future land-uses and activities, but still provide for multiple uses.

In evaluating the impacts of plan alternatives in an EIS, federal agencies generally attempt to quantify impacts so that a meaningful comparison of alternatives can be made. In addition to being described in a detailed analysis for each alternative, the impacts are usually presented in a matrix or other comparative format. Figures 14.4 and 14.5 are examples of comparison of alternatives from a federal EIS. (The case study depicted in these figures is discussed below, in Section 14.3.7.)

In an EIS on a plan, impact analysis is interdisciplinary, often focuses on entire ecosystems and generally emphasizes cumulative impacts within and adjacent to the plan area. Because of the emphasis on cumulative impacts, a broad variety of cumulative impact assessment methods can be employed. CEQ has recently published a manual describing many concepts of cumulative impact assessment that are often used at the plan level (Council on Environmental Quality 1997b). Each federal land management agency is responsible for determining the scope, content and methodologies for conducting impact evaluation of particular resources. A typical EIS for a federal resource management plan, such as a forest plan, might evaluate impacts related to the following:

- Timber production.
- Forestry.
- Habitat loss, especially for special-status species.
- Water quality and riparian zones.
- Recreation.
- Wild and scenic rivers.
- Wilderness values.
- Land ownership.

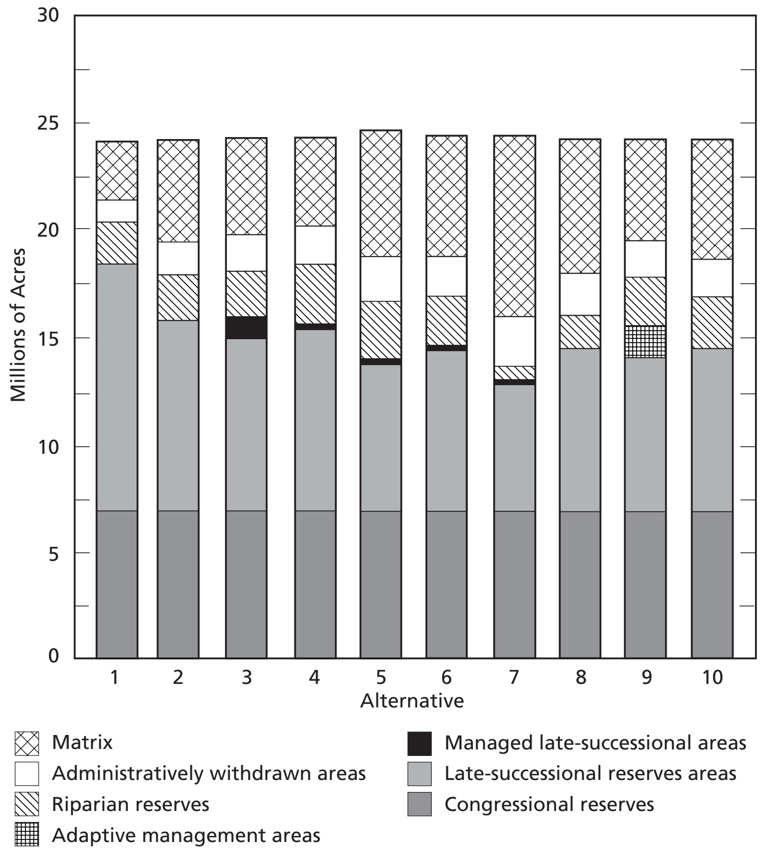

Fig. 14.4 Alternatives in the Northwest Forest Plan SEA. With thanks to Tim Messick at Jones and Stokes Associates, Sacramento, California, for the graphical redraw.

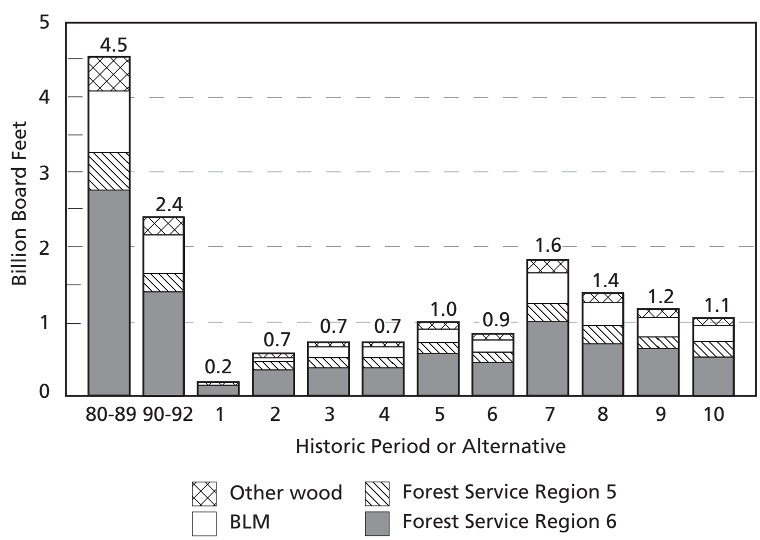

Fig. 14.5 Allowable timber harvest under each alternative. With thanks to Tim Messick at Jones and Stokes Associates, Sacramento, California, for the graphical redraw.

- Visual resources.
- Rural urban interface issues (e.g. wildfire danger, flooding).
- Economic issues.

In a tourist-orientated plan, such as one for a national park, additional issues related to human usage might also be evaluated:

- Trail, campground and facility usage.
- Traffic generation.
- Air pollution (from automobiles).
- Noise (from automobiles).
- Public service and facilities (e.g. water and sewer usage).

Under NEPA, the primary emphasis is on physical environmental effects. However, socioeconomic impacts must also be evaluated if they result from the significant physical impacts. Thus, as the above list indicates, an EIS prepared for a land-use plan would typically include a discussion of the effects of the plan on the local economy. For example, in the EIS prepared for the North-west Forest Plan, discussed below, the impacts on jobs in the timber industry and the effects on the economies of local communities were an important component of the study.

Examples of some specific methods commonly used in plan-level impact assessments are summarized below under the California discussion.

14.3.4 Mitigating impacts at the plan level

Under NEPA (40 CFR 1508.20), mitigation is defined as any activity that:

- avoids an impact;
- minimizes an impact;
- rectifies an impact;
- reduces an impact over time;
- compensates for an impact.

In plan-level EISs, mitigation measures often consist of policy recommendations for reducing impacts. For example, an EIS for a national forest may include policies that prohibit all future timber harvesting within a minimum distance from streams and rivers to protect water quality and riparian habitats. Such a mitigation measure would be feasible, although the exact location of future harvests may not be known.

After a federal agency adopts a land-use plan for which an EIS has been prepared, it typically adopts a Record of Decision, which is a formal decision document that explains the decision and the reasons for adopting a particular plan alternative and any mitigation measures included in the plan. In the Record of Decision, the agency must include a monitoring programme to ensure that individual activities occur consistently with the plan and that plan-required mitigation measures are implemented.

14.3.5 Public involvement and inter-governmental coordination

Public involvement is an important component of an EIS prepared for a federal land management plan (40 CFR 1503.1). The success of NEPA as an environmental disclosure and problem-solving law relies on an open planning and decision-making process. NEPA provides for public involvement at various steps in the environmental review process, and the requirements for public input are typically well integrated into the planning process.

Federal land-use plans typically generate considerable public interest in the communities affected by them. Therefore interest groups (non-governmental organizations (NGOs)), landowners and persons in adjacent communities actively participate in the planning and EIS preparation process. For example, when the US Forest Service and the Bureau of Land Management prepared the EIS for the North-west Forest Plan (discussed below), thousands of comments were received from interested organizations, government agencies and individuals.

As with public involvement, intergovernmental consultation and review of federal land-use plans is an important requirement of NEPA (40 CFR 1503.1). When a land management agency prepares an EIS for a proposed plan, it generally consults with and obtains the views of a broad variety of federal, state and local government agencies that have special expertise in the resources covered by the plan or who would be affected by the plan's adoption.

14.3.6 'Tiering': use of plan-level environmental impact assessment in evaluating subsequent activities

'Tiering' refers to the coverage of general matters in broad EISs, such as those prepared for land-use plans, with subsequent narrower EISs or EAs being prepared for individual actions that fall under the plan (40 CFR 1508.28) (the concept of tiering is discussed in Chapter 13, this volume, and Chapters 4 and 19, Volume 1). A first-tier EIS for a land-use plan typically evaluates impacts over a broad geographical area at a general level of analysis. Subsequent activities that implement the plan are then evaluated in a second-tier EA, which incorporates by reference the general discussion from the first-tier study, while primarily concentrating on the issues specific to the action being evaluated. Table 14.3 illustrates the tiering concept as applied to forest planning.

Under NEPA, federal agencies are encouraged to tier their environmental studies to avoid repetition of issues and to focus on those that are right for the decision at each level of planning. Although tiering has become a widely used tool in federal NEPA compliance, it is not required and there are no specific rules for ensuring that policies developed in one tier are implemented in the next. In practice, however, this is often done.

The use of tiering has also resulted in the need for fewer project-level EISs. If all the significant environmental effects of a plan are evaluated during the first-tier EIS and mitigation measures are developed that can be applied to subsequent activities, then those activities may not require evaluation in a second-tier EIS. Rather, the federal agency evaluating the project may be able to rely on the policies developed in the first tier and then prepare a 'mitigated' FONSI to comply with NEPA at the next tier.

14.3.7 Integration of environmental assessment and planning

CEQ has issued informal advice concerning the preparation of EISs for plans. According to this, an EIS may be combined with the planning process so that EIA and planning are integrated into a single process (Council on Environmental Quality 1986). This can be done either by preparing two separate documents simultaneously with appropriate cross-referencing or by fully merging the EIS into the plan. In the latter situation, however, the required contents of the EIS must be identified.

Table 14.3 Tiering.

Tier	Study area	Type of document	Focus of document
Tier 1	National forest	Forest plan EIS	Jurisdiction-wide affected environment Jurisdiction-wide cumulative impacts Jurisdiction-wide mitigation measures (policies and programmes) ↓
			Incorporation by reference
Tier 2	Watershed	Watershed programme EA	Programme area setting Programme area impacts Programme-level mitigation performance criteria ↓
			Incorporation by reference
Tier 3	Individual harvest	Individual timber harvest or road EIS/EA	Project site setting Project site impacts Project-specific mitigation measures

Fortunately, in most situations, the procedural steps in the environmental review process are easy to integrate into a typical land-use planning process. Figure 14.6 shows how EA and land-use planning can be integrated. In practice, to integrate CEQA and planning successfully, the Lead Agency must develop a well-coordinated work plan and commence the CEQA process early in the planning process.

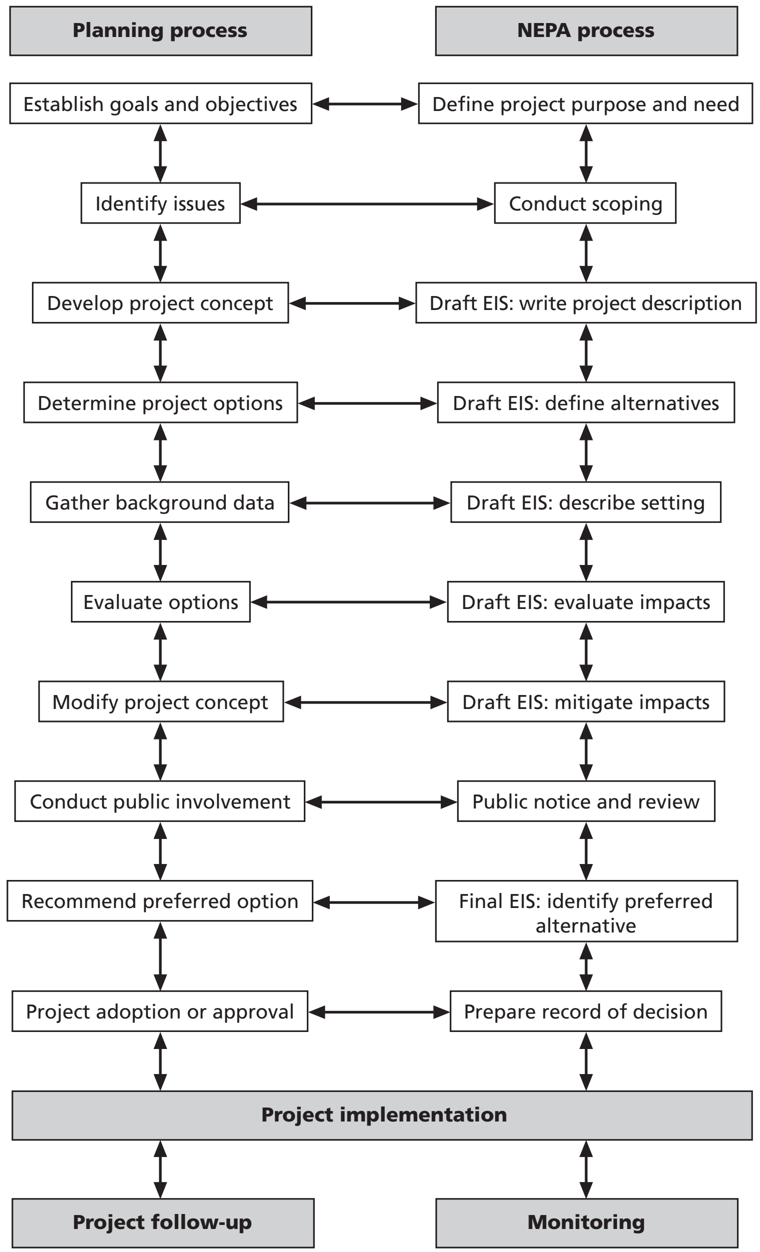

Fig. 14.6 Integration of EIA and land-use planning. EIS, environmental impact statement; NEPA, National Environmental Policy Act.

14.3.8 National Environmental Policy Act case study: the North-west Forest Plan

One of the best recent examples of the application of NEPA for federal land-use management was the *Draft Supplemental Environmental Impact Statement on the Management of Habitat for Late-successional and Old-growth Forest Related Species within the Range of the Northern Spotted Owl*. This EIS, also known as the North-west Forest Plan EIS, examined highly controversial resource management issues and used innovative, state-of-the-art methods of evaluation in a three-state area of the north-west (see Fig. 14.7 and Box 14.1). The EIS has become an important component of a multi-tiered planning process for the forests in the western USA.

Fig. 14.7 The North-west Forest Plan EIS study area encompassed a large area within three western US states: Washington, Oregon and California. With thanks to Tim Messick at Jones and Stokes Associates, Sacramento, California, for the graphical redraw.

14.4 ENVIRONMENTAL IMPACT ASSESSMENT OF PLANS AT THE STATE LEVEL

14.4.1 Introduction to non-federal planning

In the USA, land-use planning for private land is the responsibility of the states and their municipalities. There is no national law requiring land-use planning. However, most states have planning laws that delegate responsibility for land-use planning to cities and counties. Because of the multiplicity of responsibilities, land-use planning requirements differ considerably from state to state and from municipality to municipality.

As with land-use planning, each state decides for itself whether to adopt EIA requirements. NEPA applies only to federal agencies and does not apply to state or local government activities. It does not require state or local governments to prepare EISs. To date, only 15 of the 50 states have elected to adopt a state EIA law modelled after NEPA: Table 14.4 lists these, the relevant legal authority and the agency responsible for the law's implementation (American Planning Association 1997). Additionally, the District of Columbia and Puerto Rico have EIA laws that govern some types of plans.

There are no good explanations, only speculation, about why some states have adopted laws and others have not. In some states, absence may reflect lack of consensus on the importance of protecting environmental quality. However, even some states with a strong interest in environmental protection have chosen methods other than EIA to achieve environmental goals. In Oregon, for example, state legislation establishes environmental goals that must be integrated into all state and local land-use plans, but without preparing a formal EIA.

Box 14.1 Environmental impact statement for the North-west Forest Plan

Lead agencies
- US Forest Service
- US Bureau of Land Management

Geographical area
- Federal timber land in Washington, Oregon and northern California
- 24 260 700 acres

Objectives
- To coordinate management of federal forest lands
- To maintain and restore biological diversity in the range of the northern spotted owl
- To maintain a sustained yield of renewable natural resources, including timber
- To maintain the economies of rural communities

Alternatives
Ten scenarios, each with a different mix of the following land uses, were evaluated in the EIS:
- Congressional reserves (e.g. designated wilderness areas)
- Administrative reserves (e.g. proposed wilderness areas)
- Riparian reserves
- Old-growth forests (primary forests)
- Managed older forests
- Adaptive management areas (areas set aside for innovative management)
- Multiple-use areas (areas designated for commercial timber harvesting)

Methodology of impact assessment
The following is a brief summary of the methods used to evaluate environmental impacts of the various alternatives:
- Evaluation of existing forest plans
- Aerial photography and field surveys to verify existing conditions
- Expert judgement by interdisciplinary resource team
- Classification of habitat areas by ecological importance, including:
  (a) Abundance of habitat type
  (b) Ecosystem value
  (c) Potential for sustainability
- Determination of statistical likelihood of sustainability of each species
- Comparison of alternatives for sustainability

Public involvement
The preparation of the EIS involved extensive public involvement, including the following:
- Plan initiated with presidential 'Forest Summit', at which President Clinton presided and officially kicked off the planning process
- Dozens of scoping meetings in three states
- Scoping notices sent to hundreds of agencies, NGOs, such as environmental groups and community associations, and thousands of individuals
- Draft EIS reviewed by thousands of organizations and individuals
- Dozens of public meetings to discuss draft EIS
- More than 100 000 comments received and considered

What goals have the North-west Forest Plan and EIS achieved?
- Reduced the amount of lawsuits against individual timber operations
- Provided a common understanding of forest issues and problems
- Created greater certainty in timber management
- Resulted in substantial preservation of old-growth forests
- Developed best available data on forest ecosystems
- Resulted in substantial reductions in timber harvesting
- Encouraged tiering of data to forest plans, watershed plans and timber sales
- Increased public involvement in and understanding of forest management

Table 14.4 States with environmental impact assessment laws (source: state EIA offices).

State	Legal reference	Contact office
California	California Environmental Quality Act (Cal. Pub. Res. Code 21 000)	State Clearinghouse Office of Planning and Research
Connecticut	(Conn. Gen. Stat. 22a-1)	Environmental Protection Department
District of Columbia	District of Columbia Environmental Policy Act (DC Code Ann. 6-981)	Environmental Regulation Administration
Georgia	Georgia Environmental Policy Act (Ga. Code Ann. 12-16-1)	Environmental Protection Division
Hawaii	Hawaii Environmental Impact Statement Law (Hawaii Rev. Stat. 343-1)	Land and Natural Resources Department; Conservation and Resource Enhancement Division
Indiana	(Ind. Code Ann. 13-1-10-1)	Department of Environmental Management
Maryland	Maryland Environmental Policy Act (Md. Nat. Res. Code Ann. 1-301)	
Massachusetts	Massachusetts Environmental Policy Act (Mass. Gen. Laws Ann. ch. 30 sec. 61)	Environmental Affairs Executive Office; Environmental Impact Review Section
Minnesota	Minnesota Environmental Policy Act (Minn. Stat. Ann. 116D.01-01)	Minnesota Environmental Quality Board
Montana	Montana Environmental Policy Act (Mont. Code Ann. 75-1-101)	Legislative Environmental Analyst
New York	State Environmental Quality Review Act (NY Envtl. Conserv. Law 8-0101)	Environmental Conservation Department
North Carolina	North Carolina Environmental Policy Act (NC Gen. Stat. 113A-1)	Department of Environment, Health and Natural Resources
South Dakota	(SD Codified Laws Ann. 34A-9-1)	Environment and Natural Resources Department
Virginia	(Va. Code 3.1-18.8)	Environmental Quality Department; Enforcement and Policy Division
Washington	State Environmental Policy Act (Wash. Rev. Code) 43.21C.010	Department of Ecology; Environmental Review Section
Wisconsin	Wisconsin Environmental Policy Act (Wis. Stat. Ann. 1.11)	Department of Natural Resources; Environmental Analysis and Liaison

Most state EIA laws apply the EIS requirement to some land-use plans in addition to individual projects. In the State of Washington, for example, all local government growth management plans require an EIS. In fact, Washington has completely merged its land-use planning law with its EIA requirements (Mandelker 1997).

Despite the existence of laws in 14 other states, this section focuses on California because of its extensive experience at the state and local levels.

14.4.2 Legal framework for land-use planning in California

As with most states in the USA, California does not prepare a state land-use plan. Rather, state planning law establishes the legal requirement for local planning and delegates that responsibility to cities and counties. Under the state planning law, each of California's 456 cities and 58 counties must adopt, and periodically update, a comprehensive, long-term general plan for its physical development. Once adopted, the general plan becomes the official government policy on future development of housing, business, industry, roads, open space and other land uses. Although each general plan must contain seven elements (land use, transportation, housing, conservation, safety, open space and noise), cities and counties have considerable flexibility as to how they address the required topics.

The California Governor's Office of Planning and Research (1987) has prepared advisory guidelines for preparation of local general plans. These guidelines recommend that local agency plans be long term, typically 20 years. Additionally, the general plan guidelines recommend that cities and counties update their plans every 5 years. In practice, however, many agency plans are in effect for considerably longer than 5 years.

Besides general plans, cities and counties are authorized to prepare smaller area plans that control land uses within portions of their communities. These include redevelopment plans for the revitalization of old neighbourhoods, community plans for geographically distinct areas and specific plans for large-scale land development plans.

All the plans prepared by cities and counties are subject to CEQA and usually to preparation of environmental impact reports (EIRs). However, as discussed below, there are situations when an EIR may not be necessary because of tiering.

Cities and counties are not the only agencies in California that prepare land-use plans that are subject to CEQA. Various state agencies prepare resource management plans within their areas of jurisdiction, which are also subject to environmental review requirements. For example, when the California Department of Transportation proposed a statewide plan for vegetation management along state highways, it prepared a Programme EIR that evaluated the impacts of the entire programme (California Department of Transport 1992). Similarly, regional water districts typically prepare EIRs when they adopt water management plans. These EIRs look at alternative management strategies relating to watershed management and water usage.

Besides local government and state sectoral planning, there are many regional agencies and special districts in California that also prepare sectoral plans. These independent legal entities each have jurisdiction over different types of resources (e.g. water districts, sewer districts, flood control districts) and are subject to CEQA in their planning functions. For example, when a water district serving a region of the state prepares a master plan for the storage, distribution and use of water or a watershed protection plan, it would generally be required to prepare an EIR that complies with CEQA.

14.4.3 Applicability of the California Environmental Quality Act to plans

CEQA applies to a very broad range of government activities, including most plans prepared by state, local and regional agencies in California. The detailed procedures for preparing EA documents are described in the State CEQA Guidelines issued by the California Resources Agency (40 California Code of Regulations [Cal. Code. Reg.]15000). According to the State CEQA Guidelines, EIRs prepared for plans are subject to the same content and procedural requirements as project-level EIRs (Bass & Herson 1996).

Under CEQA, when an agency embarks on a planning process, it must conduct an initial study to determine if the proposed plan may have a significant effect on the environment. If such impacts are likely to occur from future activities under the plan, the agency must prepare an EIR. If, however, the agency determines that the proposed plan would not result in significant environmental impacts, it may prepare a negative declaration, which is an abbreviated assessment of the environmental implications of the plan.

Under CEQA, a negative declaration is prepared through a public process, similar to, but shorter than, the process for preparing an EIR. If members of the public disagree with an agency's use of a negative declaration, they may present evidence to show that environmental impacts would occur and may appeal to the courts for a decision. There are numerous examples of negative declarations being successfully challenged in court. However, most of those lawsuits involved individual projects, not land-use plans. Most of the latter require EIRs, rather than negative declarations, because they typically cover broad geographical areas and usually result in a variety of significant environmental impacts.

14.4.4 Types of plan-level environmental impact reports

In California, there are two primary types of plan-level EIRs authorized by CEQA and the State CEQA Guidelines: the Programme EIR and the Master EIR.

The Programme EIR is the most widely used, because it may apply to any type of plan and it has the most flexibility as to its use. According to the Guidelines, a Programme EIR may be prepared for any of the following (14 Cal. Code Reg. 15168):

- Plans (any type).
- Rules and regulations.
- Activities that are linked geographically.
- Activities that are logical parts of a chain of contemplated events.
- Multiple individual activities carried out under the same authority that have similar impacts.

In practice, a Programme EIR is often prepared when the specific type, density, intensity and location of future projects are unknown. Unlike for the Master EIR, there are few rules and standards for preparing a Programme EIR. However, the procedural and content requirements of a Programme EIR are the same for plans as for a project-level EIR.

The Master EIR is similar to a Programme EIR but may only be used for the following types of plans (14 Cal. Code Reg. 15175):

- City and county general plans.
- Multi-project area plans.
- Urban redevelopment plans.
- Transportation plans.
- Military base reuse plans.
- Hunting and fishing regulations.

In these situations, an agency may prepare a Programme or a Master EIR. For example, the City of Modesto prepared a Master EIR for its Comprehensive General Plan update, whereas many local governments would have merely prepared a Programme EIR for such general plans (City of Modesto 1995).

The use of a Master EIR is encouraged when the type, density, intensity and location of at least some anticipated future projects are known with some degree of specificity. In practice, a Master EIR is often used by an agency to evaluate several individual projects in a multi-project EIR. For example, if a city has been presented with permit applications for several different projects at the same time, it may elect to evaluate them in a single Master EIR that evaluates the individual and cumulative impacts of all the projects. For example, the City of Santa Rosa (100 km north of San Francisco) prepared a Master EIR for 11 individual land development projects that were proposed in generally the same area of the city at the same time (Fig. 14.8) (City of Santa Rosa 1993).

In preparing a Master EIR, the agency must evaluate the overall impacts of the plan area and of any anticipated future projects that would fall within its scope. This description must include, at a minimum, information about the types of projects and their likely density, intensity and location. Additionally, it must describe any public improvements or infrastructure that would be necessary to serve the future projects and must evaluate, to the extent possible, their potential impacts. This emphasis on describing and evaluating anticipated future projects is different from a Programme EIR, in which the latter need not be identified. Thus, a Master EIR is truly a hybrid of a Programme EIR and a project-level EIR.

CEQA provides a special form of tiering, once a Master EIR has been prepared. Specifically, the law provides three choices for evaluating individual projects that come within the scope of the Master EIR. In all situations, individual projects must be evaluated using an initial study. First, if the initial study reveals that the individual project has already been described in detail in the Master EIR, then no further environmental impact evaluation is required. The agency must, however, notify the public that the project is covered by the Master EIR. Secondly, if the Initial Study reveals that the project was included in the

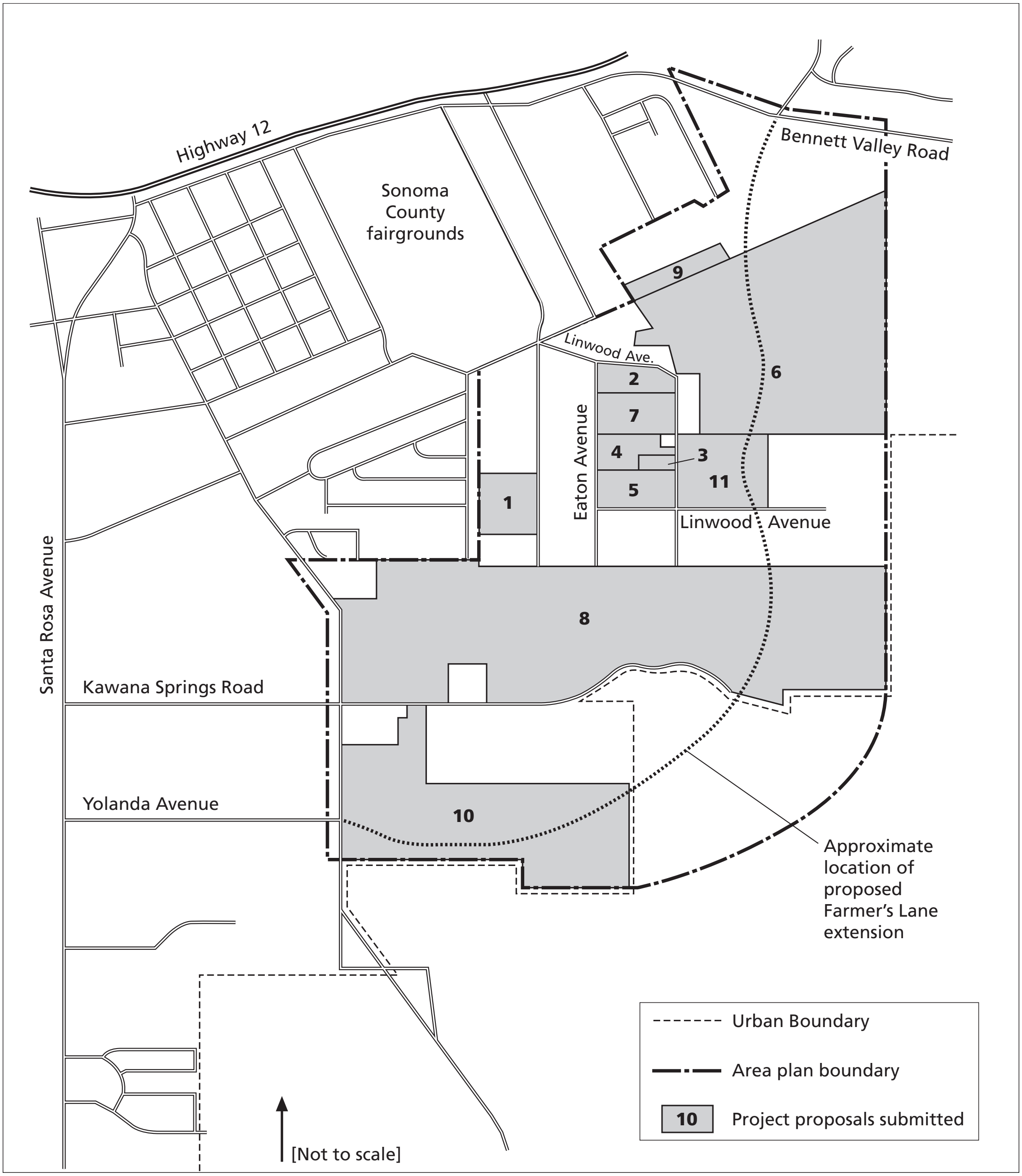

Fig. 14.8 City of Santa Rosa, California, Master EIR.

Master EIR, but that there are project-specific impacts that were not evaluated but can be mitigated, then the agency many prepare a mitigated negative declaration. Thirdly, if the Initial Study reveals that the project has significant impacts that were not evaluated in the Master EIR that cannot be mitigated, then the agency must prepare a focused EIR.

Despite some fine legal distinctions, there are few practical differences between a Programme and a Master EIR. Either may serve as a first-tier document from which smaller area plan-level EIRs or individual project-level EIRs may be tiered. Additionally, in the case of either a Master or a Programme EIR, the lead agency may establish a fee-collection system to recoup the cost of preparing the document from future project applications within the plan area.

14.4.5 California's experience with plan-level environmental impact reports

Plan-level EIRs represent a considerable portion of all EIRs prepared in California. In 1996, for example, of the 401 EIRs received by State Clearinghouse within the Governor's Office of Planning and Research, 101 were prepared for plans. Table 14.5 shows the number and type of plan-level EIRs prepared in 1995–1996.

Most were Programme EIRs. In practice, Master EIRs are not used as often because of the additional procedural requirements and the fact that they are valid for only 5 years. After 5 years, an agency must re-evaluate and recertify a Master EIR. Programme EIRs have fewer specific requirements and are not subject to the 5-year limitation.

14.4.6 Preparing an environmental impact report for a city or county land-use plan

Californian cities and counties have considerable experience evaluating the environmental impacts of land-use plans, and the State CEQA Guidelines specifically encourage the integration of EIRs with such plans. Although neither CEQA nor the State CEQA Guidelines prescribe a standard methodology, local governments have, through experience, developed workable approaches to evaluating the impacts of land-use plans, although the exact future uses are not known at the time the plan is adopted. The steps generally followed in preparing plan-level EIRs are:

- scoping;
- forecasting future conditions;
- estimating changes in human activity;
- identifying and quantification of changes;
- comparison of alternative scenarios;
- mitigation.

Before beginning the analysis of impacts, a Lead Agency must first determine the nature of the impacts to be evaluated in the EIR. The typical method to make this determination is known as the initial study. The initial study generally consists of a checklist of impacts to be compared with the proposed plan. In practice, the initial study is prepared by an agency staff and includes explanation for all of the items on the checklist. Box 14.2 contains a specially tailored initial study checklist that can be used for determining the scope of plan-level environmental documents. To keep the

Table 14.5 Number of plan-level environmental impact reports prepared in California in 1995–96.

Type of plan	1995	1996
City or county plans		
General (comprehensive) plans	23	19
Community plans	19	10
Specific plans	28	10
Urban redevelopment plans	21	18
Airport master plans	3	7
Other local plans	2	6
Regional plans		
Transportation plans	4	3
Park plans	2	
Wildlife habital plans	4	
Solid waste plans	2	2
Water and sewer plans	13	5
Other regional and district plans	2	5
State plans		
University master plans	1	3
State Park and forest plans	2	
Wildlife habitat and hunting plans	13	7
Other State plans		
Total plan-level EIRs	138	101

Box 14.2 Checklist for evaluating the environmental impacts of policies, plans and programmes (Adapted from CEQA guidelines)

	Levels of environmental impact					
	Very bad	Bad	Neutral	Good	Very good	Explanation
Environmental resource						
A Sustainability factors						
1 Would the proposal contribute to the cumulative decline of an important natural resource?						
2 Would the proposal deplete natural resources below a self-sustaining level?						
3 Would the proposal encourage the wasteful use of resources?						
4 Would the proposal promote short-term economic gain at the expense of long-term productivity?						
5 Would the proposal exceed the carrying capacity of a resource or ecosystem?						
B Land-use conflicts						
1 Would the proposal conflict with adopted national, regional or local plans?						
2 Would the proposal conflict with existing national, regional or local environmental policies?						
3 Would the proposal result in incompatible land uses being adjacent to each other?						
4 Would the proposal adversely affect agricultural activities?						
5 Would the proposal disrupt or divide established communities or neighbourhoods?						
C Population, housing and social equity						
1 Would the proposal result in population increases in excess of projections?						
2 Would the proposal induce additional growth or development that is not wanted or planned for?						
3 Would the proposal affect poor or minority communities to a greater extent than the general population?						
4 Would the proposal displace existing housing?						
D Geological problems						
1 Would the proposal result in exposure of people to geological hazards?						
2 Would the proposal encourage erosion?						
3 Would the proposal damage unique geological features?						

(Continued on p. 290)

Box 14.2 *continued*

E Water
1 Would the proposal result in changes in absorption rates, drainage patterns, or runoff?
2 Would the proposal expose people or property to flooding?
3 Would the proposal result in waste discharges into waterways?
4 Would the proposal reduce or contaminate drinking water supplies?
5 Would the proposal impact groundwater?

F Air quality
1 Would the proposal violate established air quality standards?
2 Would the proposal expose people to pollutants?
3 Would the proposal contribute to climatic change?
4 Would the proposal introduce objectionable odours?

G Traffic and transportation
1 Would the proposal increase automobile trips or traffic congestion?
2 Would the proposal result in traffic safety hazards?
3 Would the proposal discourage the use of public transit systems (buses, trams, trains)?
4 Would the proposal discourage pedestrians and bicycles?

H Biological resources
1 Would the proposal impact endangered species?
2 Would the proposal reduce wildlife habitat?
3 Would the proposal affect sensitive areas (e.g. wetlands)?
4 Would the proposal affect wildlife corridors?
5 Would the proposal reduce biodiversity?

I Energy and mineral resources
1 Would the proposal conflict with energy conservation?
2 Would the proposal result in wasteful use of non-renewable resources?
3 Would the proposal deplete important mineral resources?

J Hazardous materials
1 Would the proposal create a risk of explosion or release of toxic substances?
2 Would the proposal encourage the increased use of toxic materials?
3 Would the proposal create a health hazard?
4 Would the proposal encourage the usage of pesticide or herbicides?
5 Would the proposal increase fire risk?

J Noise
1 Would the proposal result in increased noise levels?
2 Would the proposal expose people to severe noise levels?

K Public service and infrastructure
1 Would the proposal have an affect on any of the following essential services or infrastructure:
(a) Fire protection?
(b) Police?
(c) Schools?

(*Continued*)

Box 14.2 *continued*

(d) Parks?
(e) Electricity?
(g) Gas service?
(h) Telephone?
(i) Water supplies?
(j) Waste disposal?

L Recreation
1 Would the proposal affect recreational opportunities?
2 Would the proposal affect national, provincial or local parks?

M Cultural resources
1 Would the proposal affect historical buildings or values?
2 Would the proposal affect archaeological sites?
3 Would the proposal change any unique ethnic, religious or cultural values?

box in reasonable bounds the first parameter (sustainable factors) and its associated questions are set out against the checklist level of environmental impact. The following parameters and questions are merely listed.

The success of any plan-level EIR depends, to a large extent, on the description of the existing conditions in the plan area. Thus the 'environmental setting' section of an EIR is extremely important. To assist Lead Agencies to describe environmental conditions, many state regulatory agencies collect and maintain databases of natural resources. For those without direct access to such agencies, two excellent sources of information are the California Environmental Resources Evaluation System, maintained by the California Resources Agency, and the Information Center for the Environment, maintained by the University of California, Davis. Each of these on-line sources contains hyperlinks to extensive environmental information about California (California Resources Agency 1997; University of California 1997).

After determining the scope of the EIR, a Lead Agency typically evaluates the impacts using methods similar to those described herein. Although CEQA does not require the use of any particular assumptions, the evaluation of impacts in most plan-level EIRs begins with a projection or forecast of plan 'build-out.' Build-out is a uniquely American concept that is similar to the idea of 'worst-case analysis', in that it assumes that the future development contemplated in the plan with be built out to the highest possible densities and intensities allowed by the plan policies. For example, in a 20-year plan, if a 50-acre area of a city is designated for 'high-density' residential development and the plan defines high density as 20 dwelling units to the acre, then the EIR would be based on the assumption that 1000 residential units would be built by year 20. However, the maximum is not necessarily required if economic, environmental or other factors suggest that full build-out would not occur.

For an entire land-use plan, determining build-out typically involves quantifying the number of housing units, the square footage of commercial and industrial space and the nature and extent of public facilities that could exist based on allowable density and intensity of development under the plans. This usually involves answering the following questions:

- What future activities are likely to occur?
- Where are those activities likely to occur?
- When are they likely to occur?

Although future commercial and industrial uses cannot be predicted accurately, meaningful information can be developed based on past trends and the economic development goals of the community. For example, in a resort community, it would be reasonable to assume that some future commercial activities would include hotels, shops and restaurants. In projecting these future uses, the agency can make reasonable assumptions about the numbers of rooms, square feet of commercial space and seating in restaurants, which can then be used in the subsequent steps to predict impacts. There is considerable planning literature in the USA that contains estimates of typical densities and intensities of different types of land uses. For example, the American Planning Association operates the Planning Advisory Service, which has published hundreds of studies on the characteristics of various land uses in local plans (American Planning Association, undated). Similar information is also available from the Urban Land Institute (1997), a research organization concerned with land development in the USA.

The estimation of potential changes in human activity that would result from plan build-out requires quantification of:

- population increases;
- new housing;
- employment;
- location of facilities;
- production of materials;
- movement of goods and people.

Once these elements are determined, quantitative impact evaluation becomes possible. The latter attempts to determine and quantify effects on resources and anticipated pollution levels that are likely to occur from changes in human activities. In conducting such an analysis, the Lead Agency must necessarily attempt reasonable forecasting, but need not engage in sheer speculation.

The evaluation of impacts in a plan-level EIR will differ from plan to plan depending upon the specific issues determined to be relevant during the scoping process. However, for land-use plans, there are typical methods that are often used by environmental analysts and, to the extent feasible, most impacts are evaluated using quantitative methods. Some more common methods are summarized in Table 14.6.

In plan-level EIRs, a range of alternative build-out scenarios is typically developed, often representing very different future outcomes. Although not required by CEQA, plan-level EIRs often evaluate the impacts of each alternative in a relatively equal level of detail. The conclusions of the alternative analysis are generally compared in a matrix format.

Finally, the consideration of mitigation measures generally consists of changes to the plan map or written policies that would apply to future development. For example, the locations of particular land uses on the plan map might be adjusted to avoid sensitive habitats that were not known to exist before the EIR was prepared. Such map designations would generally be accompanied by written policies or performance standards designed to protect the species. For example, a general plan may contain a policy that 'to protect riparian resources, no development shall be allowed within 100 m on either side of a stream or river'. Together, the map designation and written policy would serve to mitigate the impacts on the riparian environment.

14.4.7 Public involvement and intergovernmental coordination

Public involvement is an integral part of land-use planning and programmatic EIA in California. While preparing a plan-level EIR, the lead agency typically involves the public at various stages. Such involvement might include public scoping meetings and consultation with interested NGOs, individuals and agencies. Additionally, there is a requirement that a draft EIR be made available for public review for a 45-day period, with appropriate announcements of its availability in local newspapers. Most lead agencies also conduct a public hearing to take comments on the draft EIR.

Intergovernmental coordination is also an important component of plan-level EIRs. As soon as it decides to prepare an EIR, the Lead Agency must send a notice of preparation to all other agencies that have jurisdiction over the proposed activity. The purpose of this notice is to give other agencies an early opportunity to provide their input to the plan-making process.

Additionally, every plan-level EIR must be distributed through the State Clearinghouse within the Office of Planning and Research. The Clearinghouse circulates copies of the draft EIR to interested state agencies and ensures that their comments are sent to the Lead Agency. Both the

Table 14.6 Typical impact methodologies used for evaluating local land-use plan-level EIRs in California.

Impact area	Methods	Impact area	Methods
Land use	Estimation of plan build-out—quantification of total acres to be urbanized and likely density and intensity of development; qualitative discussion of compatibility of future land uses	Soils, geology and seismic activity	Overlay mapping of urbanizing areas on resource areas; GIS applications when feasible (e.g. seismic, farmland, and soils maps available from the California Department of Conservation)
Traffic	Computer simulation modelling based on build-out (e.g. traffic demand models developed by the Institute of Transportation Engineers and the California Department of Transportation)	Vegetation and wildlife	Order of magnitude estimates of habitat loss based on aerial photography, field surveys, consultation with regulatory agencies; GIS applications when feasible (e.g. data on existing resources available from the US Fish and Wildlife Service and the State Department of Fish and Game)
Air quality	Traffic-related air pollution: computer simulation modelling, based on results of traffic model (e.g. CALINE4 Gaussian Dispersion Model, developed by the California Air Resources Board)	Archaeological and historical resources	Regional mapping, field surveys, consultation with regulatory agencies and local experts; GIS applications when feasible (e.g. data available from the State Historic Preservation Office and regional information clearinghouses)
	Industrial air pollution: estimates of emissions based on industrial emission factors, obtained from California Air Resources Board and Regional Air Quality Districts	Visual quality	Photographic analysis and interpretation of changes in appearance of critical view sheds (e.g. US Forest Service Visual Resource Management System)
Noise	Traffic related noise: computer simulation modelling based on results of traffic model (e.g. Federal Highway Administration Highway Traffic Noise Prediction Model)	Public facilities and services (e.g. water-supply, sewage disposal)	Quantification of usage based on build-out of the plan (e.g. usage factors available from local service providers, such as water and sewer agencies)
	Industrial noise: estimates of future decibel increases based on standardized industrial factors (e.g. emission factors available from the California Department of Health Services, Office of Noise Control)		
Water resources	Calculation of increased runoff and water pollution loading due to total urbanization at build-out; mapping of flood hazard zones in relation to build-out (e.g. hydrological models developed by the US Environmental Protection Agency, the California Department of Water Resources, the California State Water Resources Control Board and local water districts)		

GIS, geographical information system.

notice of preparation and the State Clearinghouse review process are valuable mechanisms to foster intergovernmental coordination.

14.4.8 Monitoring plan implementation and mitigation measures

Under CEQA, every time a state or local agency adopts a plan, it must also adopt a monitoring programme to ensure implementation of the recommended mitigation measures. Monitoring often occurs after plan approval as individual projects are implemented. In those situations, the agency must evaluate the project to ensure that the plan-level mitigation measures have been incorporated. In addition to CEQA's requirement for mitigation monitoring, California's planning law requires that projects be consistent with adopted general plans. Thus, if an environmental policy is included in a land-use plan, it must be implemented at the project level. In practice, however, many policies are so general that their implementation is uncertain.

14.4.9 Case study of a city general plan environmental impact report

Cities and counties prepare the most comprehensive plan-level EIRs on their general plans. An EIR prepared for the city of Fairfield, a suburban com-

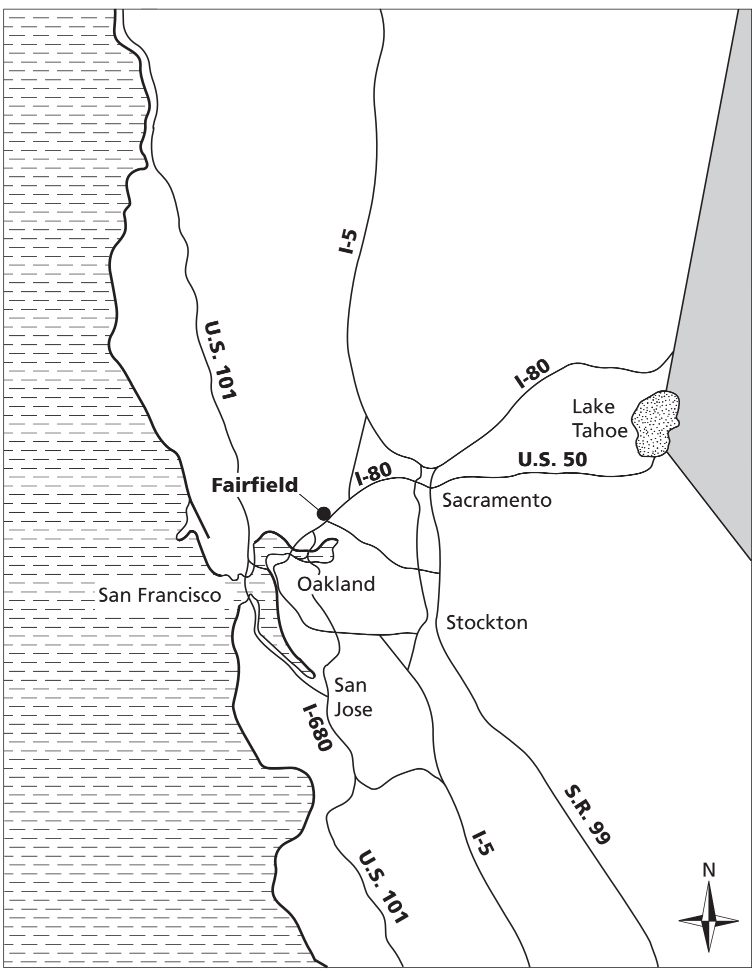

Fig. 14.9 Location of the city of Fairfield.

munity about 40 miles from San Francisco, is a typical example of a comprehensive plan-level EIR (City of Fairfield 1992, 1996). Figure 14.9 shows the location of the city of Fairfield.

Box 14.3 provides an overview of the EIR in terms of objectives, the alternatives considered, impacts assessed and the outcome.

Box 14.3 City of Fairfield: general plan environmental impact report

Lead agency
- City of Fairfield

Geographical area
- Location: 40 miles east of San Francisco
- City boundaries: 24 400 acres
- Plan study area: 78 900 acres
- Population: approximately 85 000

Objectives
To develop a comprehensive plan for the future growth of the city to accommodate a population increase from 85 000 in 1991 to a build-out population of 149 000 in 2020. The elements of the plan include policies relating to the following:
- Land use
- Open space, conservation and recreation
- Urban design
- Health and safety
- Circulation
- Housing
- Economic development
- Public facilities and services

Alternatives
1 Proposed general plan: contains a mix of land uses that accommodates the future growth projections
2 Modified draft general plan: similar to the proposed general plan with more land for residential and less for employment-generating land uses
3 Regional centre alternative: under this alternative, the city would become a regional economic centre. Employment-generating land uses would be emphasized
4 Balanced community alternative: this alternative would result in an economy that is primarily locally orientated with businesses serving local residents
5 Suburban community alternative: this alternative would emphasize dispersed residential development. Greater amounts of farmland would be developed
6 Existing general plan (e.g. 'no-action' alternative): under this alternative, the old plan would guide new development. Less growth would occur and greater environmental protection would be achieved

Impacts assessed and compared across alternatives
- Land use and growth inducement
- Population, housing and employment
- Transportation and circulation
- Noise
- Air quality
- Hydrology and water quality
- Soils and geology
- Biological resources
- Cultural resources (e.g. historic and archaeological)
- Public services and facilities
- Health and safety
- Visual resources

Public involvement
- Two public meetings; one formal hearing on Draft EIR
- Community task force established to oversee planning process
- Comments received from federal, state, local agencies; NGOs; and numerous individuals

Outcome
The city of Fairfield adopted the Proposed General Plan Alternative with minor modifications that included some components from the other alternatives. The General Plan EIR is serving as a first-tier document from which subsequent EIRs on individual projects are prepared

14.4.10 Case study of a water district land management plan environmental impact report

The East Bay Municipal Utility District provides water and sewer service for much of the suburban area east of San Francisco, California. As a part of its activities, the water district manages several water storage reservoirs and the land surrounding them. In 1996, the district prepared a new land-use plan for the management of its watershed and prepared a plan-level EIR to evaluate the impacts of the proposed plan and its alternatives (East Bay Municipal Utility District 1996). Figure 14.10 shows the study area of the East Bay Watershed Master Plan, and Box 14.4 summarizes the main features and outcome of the EIR. In comparing the impacts of alternatives, the East Bay Municipal Utility District used the existing management approach as a baseline and evaluated whether each alternative was better or worse than the existing approach (see Table 14.7).

Box 14.4 East Bay Municipal Utility District: East Bay watershed Master Plan

Lead agency
- East Bay Municipal Utility District—a public utility agency providing water and sewer service in the suburban communities east of San Francisco

Geographical area
- Plan study area: 28 000-acre watershed under the management of the district

Overall objective
- To manage the natural resources with which the District is entrusted to provide high-quality water service for the people of the East Bay (San Francisco area) and to preserve and protect the environment for future generations

Specific objectives
- Protect water quality through sensitive natural resource and recreation management
- Protect natural, cultural and historical resources in the watershed on a long-term basis
- Sustain and restore populations of native plants and animals and their habitats
- Provide for public access to the watershed consistent with the protection of natural resources and water quality
- Maintain an open process with full public involvement
- Provide for public safety of those who use the watershed and side adjacent to it
- Exercise financial responsibility in the development and implementation of land-use policies and minimize the costs to the ratepayers

Alternatives

1 Proposed watershed master plan: emphasis on watershed protection with mixed land uses
2 No-project alternatives: emphasis on existing management approaches remaining in effect
3 Increased water quality alternative: emphasis on limited recreation and commercial activities
4 Increased revenue emphasis: emphasis on maximizing commercial activities
5 Recreational emphasis: emphasis on maximizing recreational facilities and uses

Impacts assessed and compared across alternatives
- Water quality
- Soils and geology
- Vegetation and wildlife
- Historical and archaeological resources
- Fire hazards
- Visual resources
- Recreational use
- Fiscal effects
- Traffic
- Air quality

Outcome

Preparation and public review of the Proposed Watershed Master Plan Environmental Impact Report resulted in the district adopting a balanced plan that will protect and improve water quality while allowing some recreational opportunities and limited commercial ventures

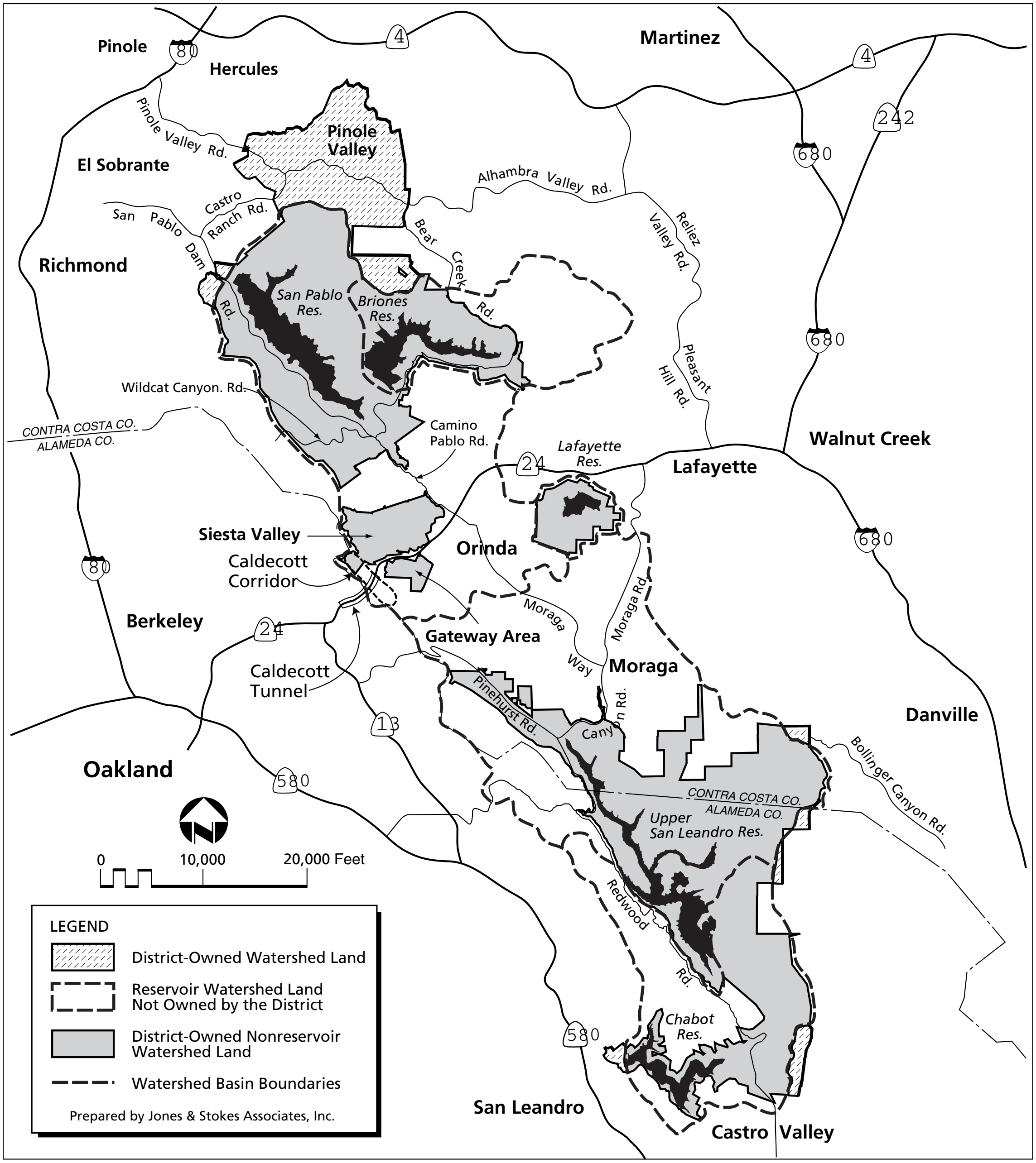

Fig. 14.10 East Bay watershed Master Plan EIR study area. District lands and resources. With thanks to Tim Messick at Jones and Stokes Associates, Sacramento, California, for the graphical redraw.

Table 14.7 East Bay Municipal Utility District: watershed master plan environmental impact report—comparison of alternative management strategies to the existing approach.

	Proposed plan	No action	Water quality emphasis	Revenue emphasis	Recreation emphasis
Water quality	+2	+1	+2	+1	+1
Biodiversity	+2	S	+1	−1	−1
Forestry	+2	S	−2	S	−1
Livestock grazing	−1	S	−2	S	−1
Fire and fuels	+2	S	+2	S	S
Developed trails	S	+2	−2	−1	+1
Environmental education	+1	S	+1	−1	+1
Cultural resources	+1	S	+1	+1	+1
Visual resources	+1	S	S	−2	+1
Land ownership	S	S	+1	+1	S
Private leases	+1	S	+1	+1	S

+2, much better than current practice; +1, better than current practice; S, same as current practice; −1, worse than current practice; −2, much worse than current practice.

14.5 CONCLUSIONS

As the above discussion and case studies demonstrate, there is considerable experience with plan-level EIA in the USA. In summary:

- Federal and state agencies prepare EIAs on a broad variety of plans, and practices vary widely from agency to agency; agencies have considerable flexibility to develop innovative approaches to integrating NEPA with federal land-use planning.
- Impact analysis in plan EIAs is generally comprehensive, interdisciplinary, quantitative and analytical.
- Data resources and methodologies for impact analysis are well developed, with considerable information available in digital form.
- Plan EIAs are well integrated into planning at most levels of government.
- Plan EIAs are generally subject to the same review procedures as those for projects.
- Through the use of tiering, agencies have developed good approaches for avoiding duplication and reusing previously prepared documents.
- Plan EIAs are generally successful in achieving the five primary objectives of EIA: disclosure; impact avoidance; public involvement; intergovernmental coordination; and agency accountability to the public.

In a recent study of NEPA's effectiveness, CEQ found that one of the key elements of successful NEPA compliance is the extent to which agencies integrate NEPA's framework into their internal planning processes at an early stage. A study of CEQA revealed similar findings (Olshansky 1996). Furthermore, CEQ found that the strategic use of NEPA is proving to be a useful mechanism for attaining the goal of sustainable development. In arriving at this conclusion, CEQ cited the North-west Forest Plan as a good example of how such goals may be achieved through the NEPA process (Council on Environmental Quality 1997c). CEQ's views on the importance of plan-level EA are indicative of the current positive outlook on the role that NEPA and state EIA laws, such as CEQA, can play in land-use planning.

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15: Environmental Impact Assessment and Waste Management

GEV EDULJEE

15.1 INTRODUCTION

The past two decades have witnessed a sea change in attitudes to waste. Whilst society recognizes the need for safe and responsible management of wastes, opposition to the siting of waste treatment and disposal facilities has stemmed from the reluctance of host communities to accept potentially higher risks in order to solve the wider problem of waste disposal. The overriding perception has been that waste treatment and disposal plants pose unacceptable risks to humans and the wider environment, and in many instances the development of appropriate waste disposal facilities has lagged far behind the timetable set by national waste management programmes. Increasingly, public and policy attention has focused on the concept of sustainable waste management. Commencing with waste prevention and reduction during the production of goods and the provision of services, sustainable waste management calls for the recovery and reuse of materials so as to conserve raw materials, the use of waste as a source of energy in order to conserve non-renewable natural resources and finally the safe disposal of unavoidable waste.

The systematic application of environmental impact assessment (EIA) procedures to waste management strategies and projects has been a relatively late development. Formative EIA legislation, such as the USA's National Environmental Policy Act (NEPA) and the Canadian Environmental Review and Assessment Process (EARP) focuses on projects funded or initiated by government, and hence EIA experience was gained primarily on infrastructure developments (ports, harbours, roads, airports, etc.), energy schemes, afforestation and agricultural schemes and urban infrastructure developments. As EIA in planning legislation broadened in the 1980s to include a wider range of developments, waste management facilities became increasingly subject to the requirement for a formal EIA.

Relative to major infrastructure developments, waste management projects (not least in the UK) have often been proposed by private sector developers who, by and large, are inexperienced in EIA techniques. Reviews suggest that the professionalism of a waste management EIA increases with the size and the technical content of the project; for instance, the quality of EIAs of small landfills has generally been less satisfactory than those of waste incinerators (Petts 1996). In the UK, EIAs for waste treatment and disposal facilities represent about 25% of EIAs submitted annually to planning authorities (Department of the Environment 1996).

This chapter examines the application of EIA to the waste management cycle, commencing with a summary of waste management operations and their potential environmental impacts. Sections 15.3–15.5 discuss the strategic environmental assessment (SEA) of policies and plans, scoping of impacts and optimization of the siting process. In Sections 15.6–15.8, the EIA process relevant to site-specific facility development is explored, whilst the following sections examine the application of EIA in the regulation of waste management operations and monitoring of operational and postclosure impacts. The chapter ends with a discussion on the future direction of EIA in waste management.

15.2 WASTE MANAGEMENT OPTIONS AND IMPACTS

The waste management industry is characterized by a wide range of unit operations which can be applied singly or in combination to materials across the full spectrum of physical and chemical types. Each waste/process combination will be accompanied by a particular set of potential impacts, the relative importance of which is again dependent on the type of development and its location. An example of the releases from a selection of waste management options applied to industrial wastes is provided in Fig. 15.1. Options available for the management of municipal solid waste (MSW) are listed in Table 15.1.

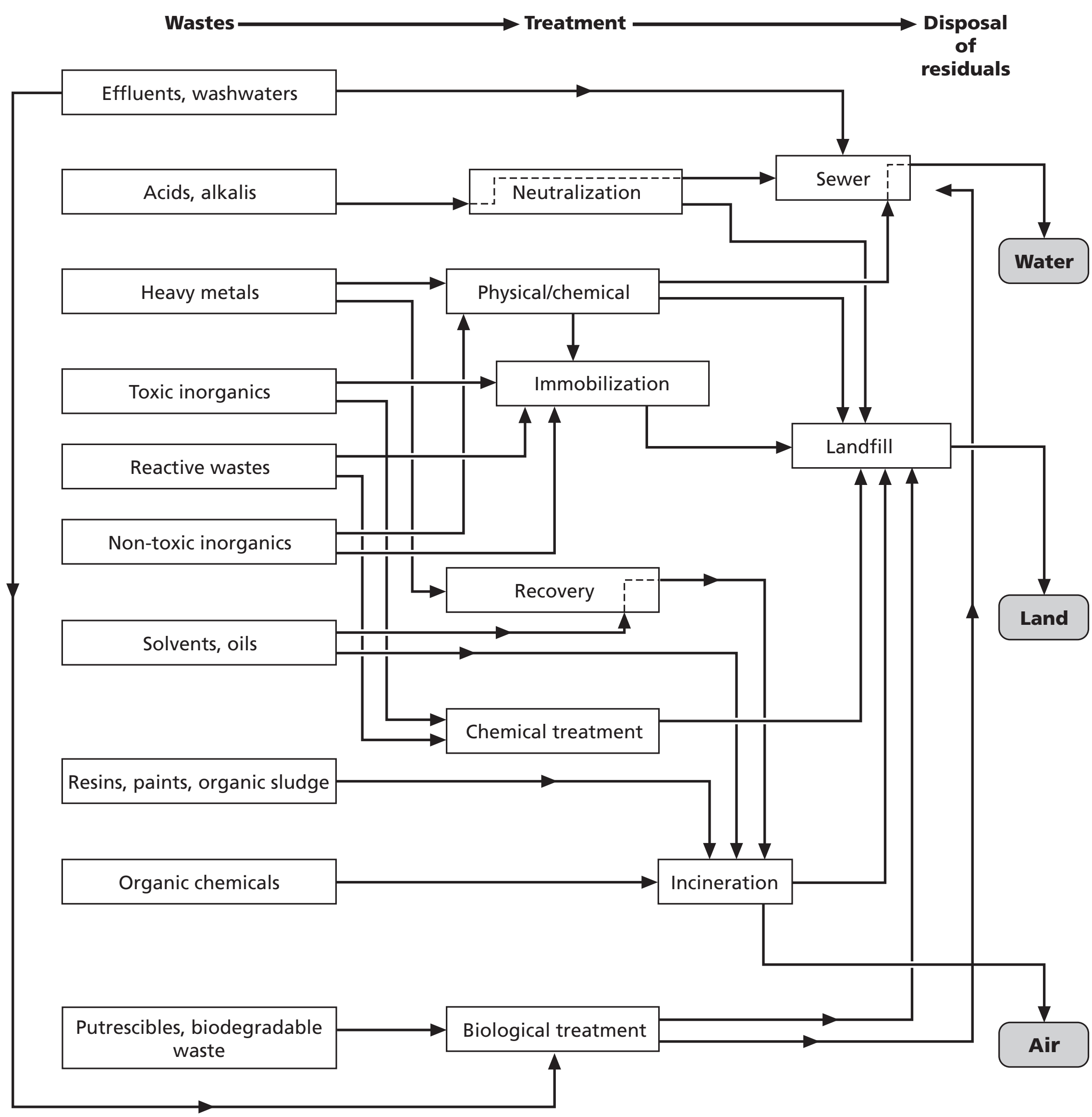


Fig. 15.1 A possible scheme for treatment and disposal of industrial wastes.

Table 15.1 Waste management options for MSW (municipal solid waste).

Waste management option	Acceptable wastes	Remaining waste and residues requiring disposal
Materials recycling	Recyclable materials, primarily paper, glass, ferrous metal, aluminium and plastic	Non-recyclable materials Composite materials Biodegradable wastes Bulky waste* Household hazardous waste†
Waste to energy	All wastes except bulky wastes, although combustible waste, e.g. paper, plastic, wood, etc., is preferred	Incinerator ash (if not recycled) Bulky waste*
Waste-derived fuel	Combustible wastes, e.g. paper, plastic, wood, etc.	Non-combustible materials, e.g. metals, glass, etc. Bulky waste* Household hazardous waste† Inert waste‡
Composting	Biodegradable wastes, e.g. kitchen wastes, garden wastes, paper, etc.	Non-biodegradable materials, e.g. metals, glass, plastics, etc. Bulky waste* Household hazardous waste† Inert waste‡
Anaerobic digestion	Biodegradable wastes, e.g. kitchen wastes, garden wastes, paper, etc.	Digestate (if not recycled) Non-biodegradable materials, e.g. metals, glass, plastics, etc. Bulky waste* Household hazardous waste† Inert waste‡
Landfill	All wastes, subject to relevant national legislative restrictions	None

* 'Bulky waste' consists of large items of any material, commonly domestic appliances and similar large objects.
† 'Household hazardous waste' comprises used oil, paint, household chemicals, batteries, etc.
‡ 'Inert waste' comprises stones, bricks and similar construction/demolition materials.

In addition to the potential environmental impacts of releases on air, water, land and public health, other impacts relating to noise and vibration, visual intrusion, traffic movements and socio-economic effects also need to be considered. In so far as it is possible to generalize in relation to each type of waste management operation, the key impacts associated with generic process options are typically as follows:

- *Thermal processes*: air quality, public health, risk of accidents, effluent/cooling water discharges, traffic impacts.
- *Landfill*: groundwater resources and quality, surface water discharges, fire and explosion associated with landfill gas, noise, traffic impacts, litter, dust, odour.
- *Biological processes*: odour, effluent discharge, dust, litter, noise.
- *Materials recycling, transfer stations, civic amenity sites*: dust, odour, noise, effluent discharge.
- *Physicochemical processes*: effluent discharge, accidental releases, fire and explosion.

The scoping of waste management impacts is addressed in Section 15.4. At this juncture, it is sufficient to note that the relative significance of these impacts may be modified by the type of waste handled at the facility. Thus, in the case of thermal processes, groundwater issues may be of greater concern if the facility is to incinerate chlorinated solvents as opposed to MSW, by virtue of the potential for solvent spillages during handling and transfer.

15.3 STRATEGIC WASTE MANAGEMENT

15.3.1 Issues

For a waste management system to be truly effective, strategic planning at the national and/or regional level must be contiguous with policy direction on the one hand, as well as providing the means of implementation at a site-specific level. The plan must incorporate and implement important policy principles, for example (Commission of the European Communities 1989, 1996):

- Sustainability and resource protection.
- The so-called 'waste management hierarchy', which places options such as minimization, recovery and recycling above waste disposal *per se* and which seeks to move waste management practices up the hierarchy.
- The 'proximity principle', which states that waste should be managed as near to the source of arisings as is practicable.
- Regional self-sufficiency in developing provisions for waste disposal.
- At an operational level, regulation of waste management facilities through the concept of integrated control, which seeks to optimize process selection so as to minimize harm to the environment (see Section 15.9).

Thus, the environmental impacts of waste management options must be minimized in the context of spatial and other constraints, articulated through the proximity principle and regional self-sufficiency. In essence, it is necessary to identify the best practicable environmental option (BPEO), defined as 'the optimum combination of available methods of disposal so as to limit damage to the environment to the greatest extent achievable for a reasonable and acceptable total combined cost to industry and to the public purse' (Royal Commission on Environmental Pollution 1976). In strategic planning at a national level, the BPEO will be determined by comparing the environmental consequences of a number of alternative waste management strategies, comprising different combinations of unit processes (landfill, incineration, composting, etc.), all of which are capable of meeting broad policy objectives, such as those listed above. At a regional level, specific siting considerations can additionally be introduced, along with consideration of the environmental impacts associated with the transport of wastes by road or rail between collection and disposal points. At a site-specific level, the BPEO assessment involves consideration of alternative process options for a particular unit operation. The strategic BPEO will govern the choice of processes at an operational level, and conversely preferred treatment or disposal processes for particular waste streams will influence a waste management strategy. The BPEO at a site-specific level is discussed in Section 15.9 and in Chapter 17, Volume 1. In this chapter, waste management planning at the national, regional and local scale is addressed.

Structural deficiencies in some national waste management regimes can lead to tensions within the system. For example, in the UK the lack of overarching national policy guidelines in the 1980s resulted in a piecemeal approach to strategic planning at the local authority level, with prospective developers often having to defend the need for a particular type of facility or its location during the site-specific planning process, issues which should legitimately have been examined during the preparation of the waste management plan for the particular area (county or district authority). In 1990, the UK Secretary of State for the Environment directed that three separate but contemporaneous planning applications for hazardous waste incinerators in northern England should be scrutinized together in a public inquiry, a decision influenced in part by the fact that granting authorizations to all three facilities would have resulted in gross overcapacity within the region (and possibly the country), jeopardizing the viability of a waste management option which was entirely within the private sector. With respect to MSW, it is interesting to note that the majority of incineration plants in the UK built in the 1960s and 1970s were ordered by the pre-

1974 single-tier local authorities, with a unified responsibility for waste planning, collection and disposal. Two of the three new plants now operating or under construction have been implemented in local authority areas with unified responsibilities. Further local government boundary changes took place in 1997 and 1998 and, in some cases, county councils have been abolished or reduced in size and replaced by single-tier unitary authorities. From the evidence to date, it is likely that some prospective unitary authorities will choose to interpret the proximity principle and regional self-sufficiency in more parochial terms, with corresponding implications for strategic planning.

SEA provides a mechanism by which waste management options can be analysed for their effectiveness in incorporating policy imperatives, whilst at the same time minimizing the overall impact on the environment. By definition, the SEA of waste management options considers national or regional impacts, as opposed to site-specific impacts. SEA has many points of similarity with life-cycle assessment (LCA) (see also the discussion in Volume 1, Chapter 3). In LCA parlance, SEA typically limits the environmental analysis to the inventory stage of the life cycle, i.e. the computation of environmental loads based on the total national or regional quantity of waste to be managed. Examples include the SEA of the Dutch national 10-year programme on waste management (Verheem 1996) and Dutch provincial waste management plans (Huisman 1990), the US Department of Energy's strategies for integrating environmental clean-up and waste management activities (Webb & Sigal 1996) and, more recently, a few regional waste management plans in the UK. These applications are illustrated below.

15.3.2 Examples of national, regional and local strategic environmental assessment in waste management

Verheem (1996) illustrates the application of SEA to the Dutch 10-year management plan for MSW. Four alternative waste management options relevant to a 10-year period were assessed relative to the situation as existed in 1990:

- *Alternative 1*: maintain existing and planned capacity for pre-separation of waste; compost/digest organic fraction; incinerate all combustibles; landfill all non-combustibles.
- *Alternative 2*: continue with current programme for pre-separation; no expansion of incineration capacity; landfill residual waste.
- *Alternative 3*: maximum pre-separation; digestion of organics; incineration of combustibles; landfilling of non-combustible residues.
- *Alternative 4*: maximum pre-separation; digestion of organics; landfilling of residual wastes.

Seven indicators of environmental impact were considered: release of toxic chemicals; acidification; release of odour; climate change (indicated by releases of carbon dioxide and methane); energy consumption; production of residuals; and land-take. The results of the analysis are shown in Table 15.2.

On the basis of the comparison, it was concluded that Alternative 3 was the most environmentally benign, but, since its implementation would require considerable expansion of existing pre-separation and digestion capacity, it was not regarded as feasible in the short term. Alternative 1 was regarded as a compromise between feasibility and environmental impact, since it led to a high energy yield, a positive contribution to carbon dioxide reduction and limited land-take. Set against these positive attributes were poor scores for acidification, release of toxic chemicals and production of residues.

An environmental assessment in the form of an inventory analysis has also been combined with damage functions and economic evaluation. The UK Government undertook research into the external costs and benefits associated with landfill and incineration, in order to assess whether a levy should be applied to landfilling to account for hitherto uncosted environmental and social impacts—'externalities' (Department of the Environment 1993). The study concluded that the externalities for landfill as compared with incineration amounted to £6–£10 per tonne of solid waste. On the basis of the study, the UK introduced a 'landfill tax' in 1996.

The relative environmental merits of incineration versus landfilling have been examined in terms of emissions of greenhouse gases. The

Table 15.2 Summary of environmental effects of alternative waste management options for the Netherlands (from Verheem 1996).

Indicator	Existing situation*	Alternative 1†	Alternative 2‡	Alternative 3§	Alternative 4‖
Release of mercury and cadmium (kg)	5457.0	5696.0	3257.0	4632.0	2463.0
Release of hydrocarbons (kg)	854.0	215.0	362.0	231.0	306.0
Release of dioxins (g)	147.0	4.3	2.2	3.3	1.5
Acidification (meq hydrogen)	222.0	111.0	68.0	99.0	53.0
Odour (odour units)	17.0	43.0	45.0	9.0	9.0
Carbon dioxide and methane (10^3 t)	4349.0	–1525.0	–175.0	–1526.0	–494.0
Energy use (PJ)	6.2	22.0	11.0	20.0	–9.6
Landfill residue (10^3 t)	220.0	402.0	548.0	359.0	896.0
Chemical waste (10^3 t)	118.0	164.0	76.0	165.0	49.0
Recoverable residues (10^3 t)	637.0	1891.0	1316.0	1502.0	1043.0
Land-take (ha)	79.0	28.0	46.0	32.0	50.0

* 1990, emphasis on landfilling.
† 2000, pre-separation; incineration of combustible waste.
‡2000, emphasis on landfilling.
§ 2000, maximum pre-separation; incineration of combustible waste.
‖2000, maximum pre-separation; emphasis on landfilling.

greenhouse effect of landfilling 1 tonne of MSW has been calculated as being equivalent to about 48 m³ of carbon dioxide, as opposed to 8 m³ of carbon dioxide released through incineration, a difference in potency of a factor of six (Porteous & Barrett 1993). The US Environmental Protection Agency (1997) employed a life-cycle inventory approach to analyse the impact of a range of MSW management options on greenhouse gas emissions. The study suggested that the waste management hierarchy (see above), which ranks management options for environmental benefits, was also generally valid from a greenhouse gas perspective. A comparative health risk assessment of air emissions from MSW incinerators and from landfills has been undertaken by Jones (1994) and Bridges and Bridges (1996). Jones (1991) has undertaken a comparative risk assessment of several waste management options, including composting, incineration and recycling.

White *et al.* (1995) conducted a hypothetical analysis of the following regional waste management options, using the LCA technique of inventory analysis:

1 Unsorted collection of household waste, followed by landfilling.
2 Unsorted collection of household waste, followed by incineration.
3 Unsorted collection of household waste, followed by composting.
4 Separate kerbside collection of dry recyclables, incineration of residues.
5 Separate collection and composting of putrescibles, landfilling of residues.

There was a net benefit in energy consumption and a reduction in global warming potential when waste was incinerated rather than landfilled (Scenario 1 versus Scenario 2). In the case of Scenario 3, there was no net reduction in energy consumption relative to direct landfilling of the waste, but this changed to a net benefit if account was taken of the savings resulting from product substitution. In general, Scenarios 2 and 4 (involving incineration) were preferable in terms of net energy consumption compared to the remaining scenarios. Other scenarios and variations thereof can also be assessed. For example, the collection of waste can be supplemented by sorting and recycling of glass, or it can be assumed that the compost generated in Scenario 3 has no market. Note that, unlike the national SEA described above, the regional SEA has incorporated transport considerations into the environmental analysis, by implication fixing the location of individual waste management operations.

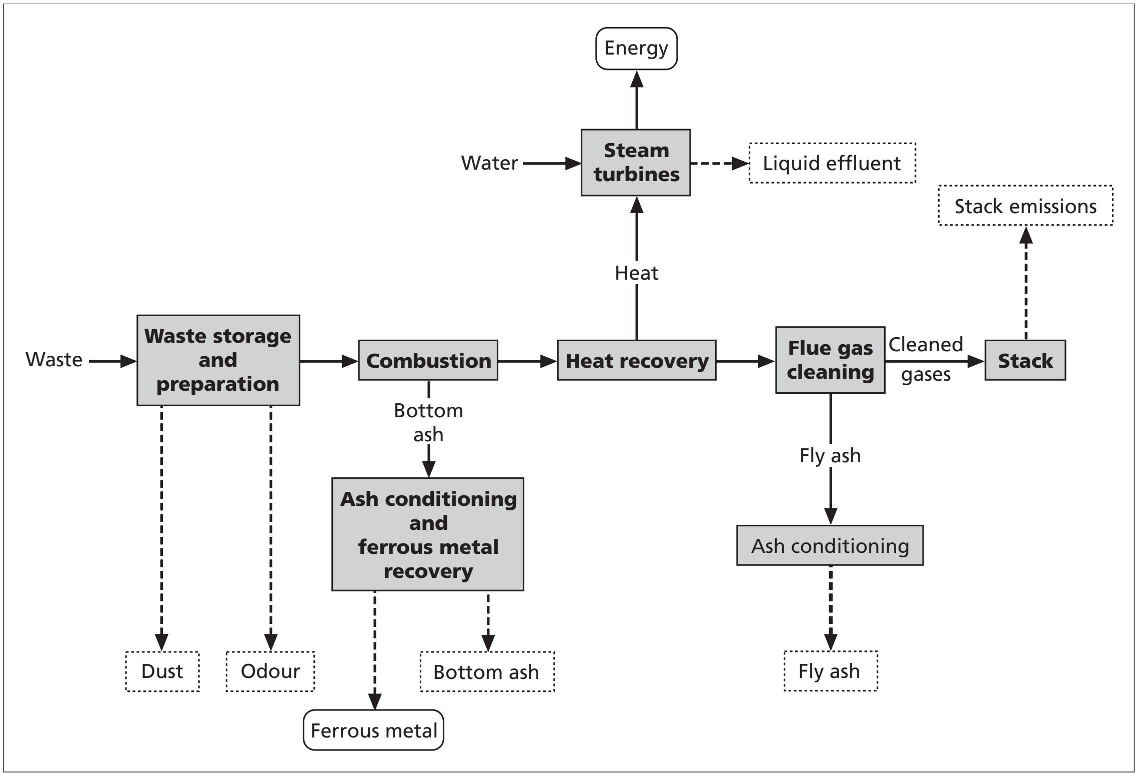
Craighill and Powell (1996) examined two generic regional scenarios for the management of household waste: a 'recycling' scenario, commencing with kerbside collection, followed by sorting of plastics, paper, glass and metals, materials recycling, distribution and use; and a 'waste disposal' scenario in which the waste was collected and then transported to a landfill. The environmental issues addressed included global warming potential, acidification and nutrification of surface water. The analysis of the case study indicated that the recycling system generally performed better than the waste disposal system in terms of environmental effects. In terms of economic valuation, net benefits accrued to recycling of aluminium, steel, paper and glass, whilst the recycling of plastics and polyethylene tetrachloride (PET) was accompanied by net costs. The economic valuation suggested that it was preferable to recycle metals, paper and glass, but that recycling was not the environmentally optimal solution for plastics. The transport stage of the life cycle accounted for a higher proportion of the impacts of the recycling system than the waste disposal system—to ignore congestion costs would favour recycling.

Powell (1996) combined environmental assessment and cost considerations to evaluate six regional management options for household waste, involving mass-burn incineration, incineration of refuse-derived fuel (RDF) and landfilling, with and without recycling. Scoring of environmental impact and resource implications was undertaken with inventory analysis and by relative ranking of indicators such as 'ease of materials recovery' and 'disamenity'. Using a multicriteria optimization procedure, the two scenarios involving incineration of RDF scored best on internal costs. A sensitivity analysis indicated that increasing the importance of environmental criteria relative to cost considerations increased the relative merits of RDF and incineration against landfilling, but when the importance of financial costs was increased above that for environmental impact, landfilling without recycling was the best option. Powell (1996) makes the important point that 'multicriteria evaluation can be considered to be a means of structuring a problem rather than finding the solution to the problem', a reference to the fact that careful analysis of the underlying assumptions, for example on the relative weightings of the various environmental and cost indicators, must be undertaken before a preferred strategy is identified conclusively.

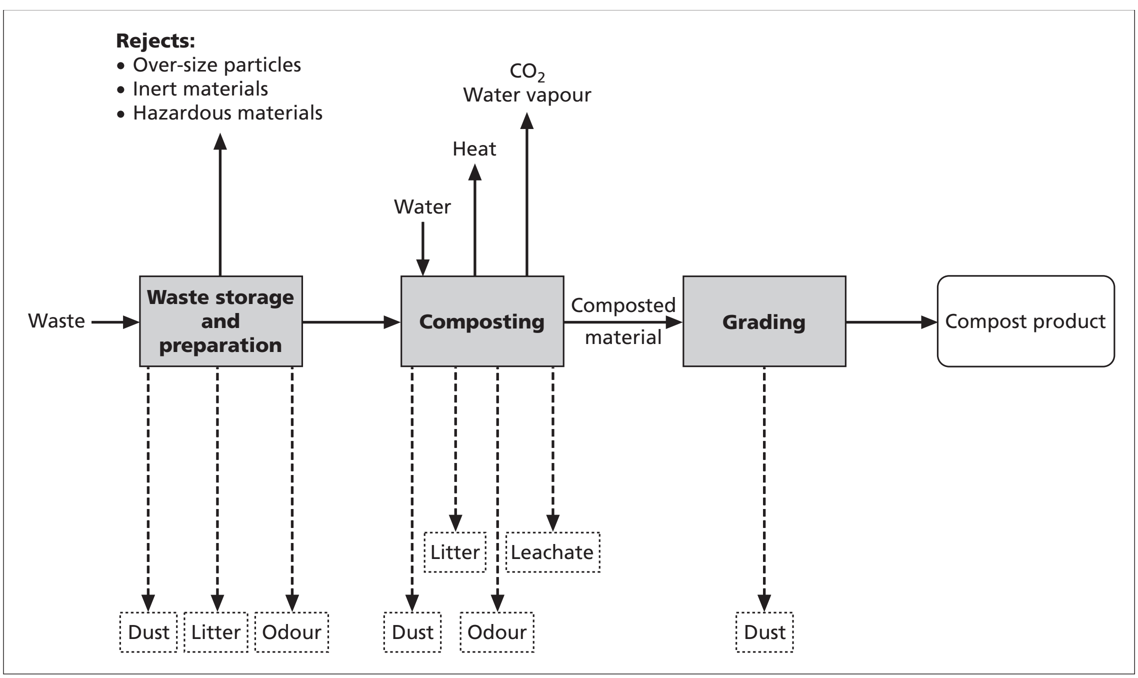
15.4 SCOPING OF IMPACTS

Section 15.2 introduced the range of potential impacts from waste management options. Releases from a selection of processes are identified in Fig. 15.2. An example matrix depicting the significance of these impacts for various waste management options is shown in Table 15.3 (Petts & Eduljee 1994, p. 85).

Although land-use plans would locate waste management facilities in compatible environmental settings, the relative importance of potential impacts of a facility are often site-specific. For example, landfills will generally be located in a rural environment and hence not usually in close proximity to housing, as would a physicochemical treatment plant in a predominantly industrial setting. However, an incinerator, transfer station, materials recycling facility or civic amenity site could be located either in an urban setting or in a rural setting. At each alternative location, the relative importance of potential impacts such as traffic, noise and visual intrusion may differ. The type of waste handled at the facility will also influence the significance of an impact, as noted in Section 15.2. Hence, scoping is a particular issue in waste management EIAs, and failure to identify potential key impacts can result in faulty siting decisions and an inadequate EIA (see below).

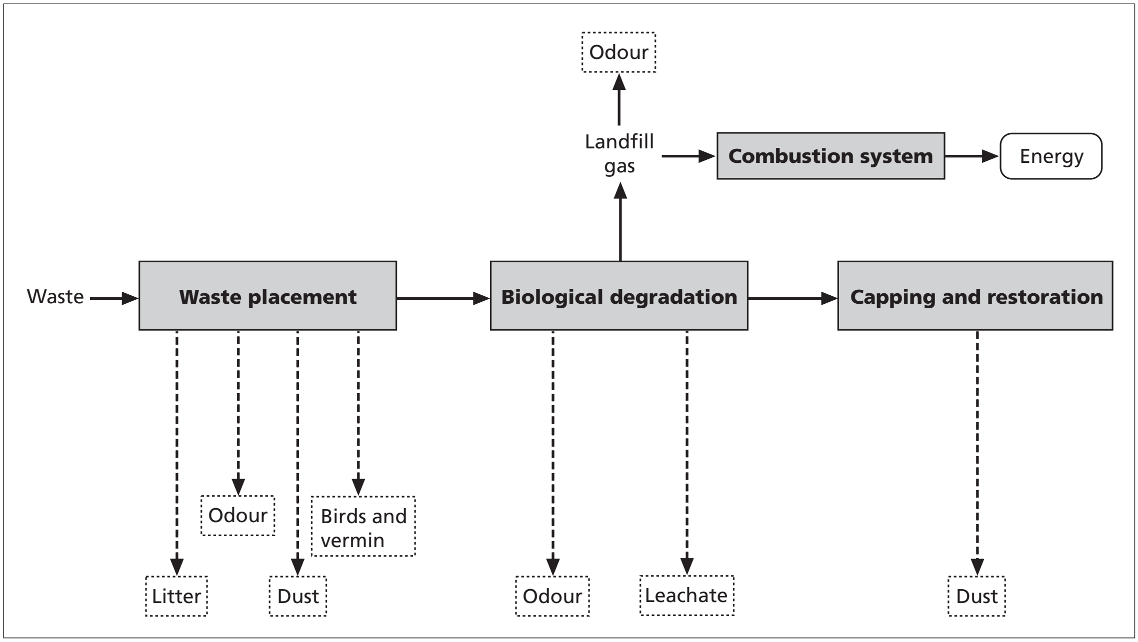


(a)

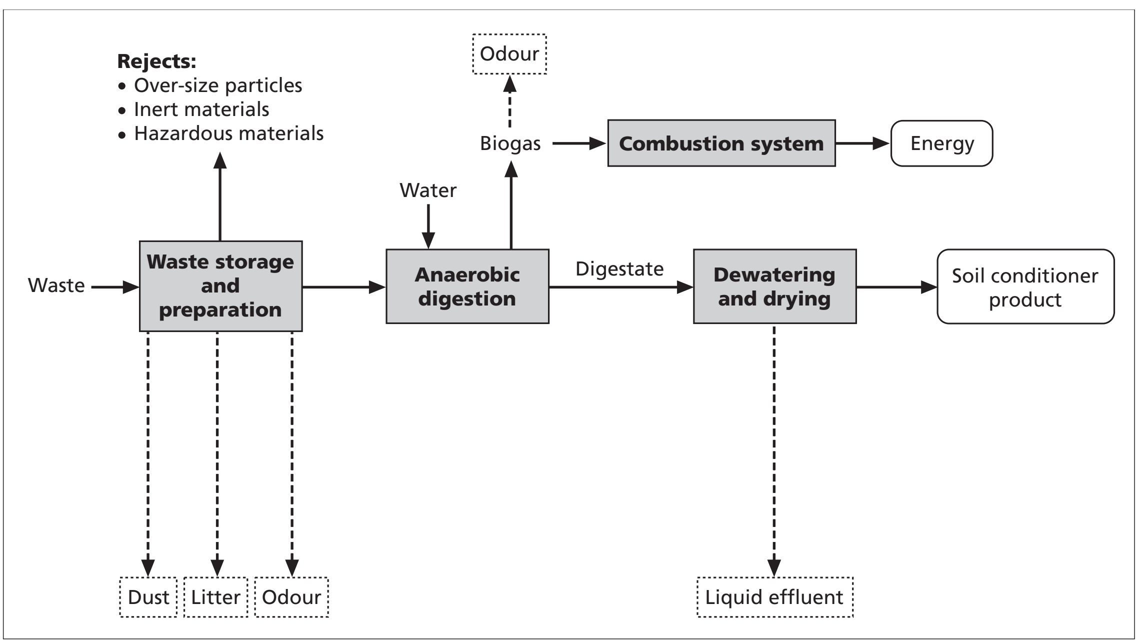


(b)

Fig. 15.2 (a) Illustrative process flow for waste incineration. (b) Illustrative process flow for composting. *(Continued on p. 308)*



(c)



(d)

Fig. 15.2 *continued* (c) Illustrative process flow for landfilling. (d) Illustrative process flow for anaerobic digestion.

Table 15.3 Example matrix showing significance of impacts for different options.

Waste management option	Odour	Health risks: inhalation	Health risks: foodchain	Landfill gas	Leachate	Traffic	Noise	Visual effect	Dust, litter	Accidents
Landfill	XXX	XXX	XXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXX
Land farming	XXXX	X	XXX	—	XX	XXXX	X	XX	X	X
Composting	XX	X	XX	—	XX	XX	XX	XX	X	X
Incineration	XX	XXXX	XXX	—	—	X(X)	XXX	XXXX	X	XXX
Biological treatment	XXX	X	X	—	—	X(X)	X	XX	X	X
Physicochemical treatment	X	XX	X	—	—	X	XX	XX	X	XXX

X–XXXX, increasing significance; —, no or negligible significance.

Scoping of the key issues of concern in EIAs of waste management facilities has tended to be proportional to the extent to which this is a formal requirement in national legislation. In countries such as the Netherlands and Canada, where independent Commissions operate within a legal framework, scoping is explicit, detailed, and a formal requirement of the EIA process (for example, Ontario Waste Management Corporation 1988). Other European countries, such as Italy, Spain, Portugal and Luxemburg, also employ Commissions or panels of experts to assist the competent authority in scoping (Petts & Eduljee 1994; and see Chapter 2, this volume), but examination of representative EIAs for hazardous waste facilities from within Member States of the European Union (EU) has revealed a lack of coherence between the baseline survey and impact prediction and the absence of a clear description and analysis of the wider environment (Colombo *et al.* 1996). This observation also applies to EIAs from countries such as the UK, where scoping has been a more informal process. Colombo *et al.* (1996) propose that EIAs conducted within the EU contain a matrix of environmental factors to specify the impacts to be considered in the impact prediction analysis, together with a justification of their choice. The matrix should cover impacts during the construction, operational and decommissioning phases of the project. The need for more formal scoping is strengthened in the amendment to Council Directive 85/337/EEC (Commission of the European Communities 1997; see Chapter 12, this volume).

15.5 SITE SELECTION

15.5.1 Siting criteria

Site selection in waste management is typically a top-down process, using siting criteria sequentially to screen a large area or a region and eliminate areas that are less suitable for the particular development; to identify within the preferred areas a set of candidate sites; to conduct a more detailed examination of the candidate sites and finally to select a preferred site for the development under consideration. Siting criteria can be categorized as technical, economic, socio–political and environmental. They can be mandatory (written into land-use legislation) or, more typically, discretionary. Technical criteria for waste management processes are generally process specific and address issues such as land requirements, site access, proximity to transportation networks, access to power, water, sewerage, etc. Economic, socio-political and environmental criteria are usually generic and apply equally to most types of waste facilities, although the relative importance of environmental criteria can vary, depending upon the type of waste handled and the treatment or disposal process under consideration. For example, local meteorological conditions are of greater importance in the siting of incinerators than of landfills; for the latter a secure hydrogeological setting is of paramount importance. Other environmental criteria include avoidance of sensitive ecosystems, protection of natural resources, siting relative to surrounding populations, etc. These criteria can be framed in terms of exclusionary or, conversely, preferred siting characteristics, which can be applied firstly to screen out unsuitable areas or sites and then to shortlist candidate sites, which can be examined in greater detail before arriving at the final selection. Table 15.4 provides examples of exclusionary and preferred criteria recommended by the Melbourne and Metropolitan Board of Works (1985) in the siting of waste storage, treatment and disposal facilities.

Site selection criteria have also been developed elsewhere in Australia (Victoria Environmental Protection Authority 1990), in the USA (Maryland Environmental Service 1981; New Jersey Hazardous Waste Facilities Siting Commission 1983; US Environmental Protection Agency 1991; Knox & Schmalz 1997), in Canada (McQuaid-Cook & Simpson 1986; Ontario Waste Management Corporation 1988; Manitoba Hazardous Waste Management Corporation 1988; Bolton & Curtis 1990), by the World Health Organization (Sloan 1993) and, to a more limited extent, in European countries such as the UK, where they have tended to be incorporated within land-use planning guidance (for example, restricting landfill development to suitable hydrogeological settings).

In addition to the criteria listed in Table 15.4, some countries stipulate separation distances or buffer zones between the waste facility and the nearest sensitive receptor, typically a school, hospital or residence (Manitoba Hazardous Waste Management Corporation 1988; US Environmental Protection Agency 1987; Cheremisinoff 1990; Victoria Environmental Protection Authority 1990; Victoria Government 1991). Separation distances range from 200 m between a landfill and a residence (Manitoba, Canada; Victoria, Australia) to 300 m between a transfer station or a composting facility and residential areas and 500 m between facilities treating organic waste and residential areas (Victoria). Hong *et al.* (1996) developed the following algorithm for the estimation of the depth of a 'health protection zone' surrounding sanitary landfills in China:

$$Q/C = 1/A \times [(BL^C + 0.25R^2)^{0.5}]L^D$$

Table 15.4 Examples of exclusionary and preferential criteria for waste storage treatment and disposal facilities (source: Melbourne and Metropolitan Board of Works 1985).

Exclusionary criteria	Preferential criteria
Topography	
Not on slopes greater than 10%	Slopes of less than 5%
Surface soils	
Not within areas where subsidence is evident or areas of unstable soils/geology where movement is a recurring event	Stable gradational soil/rock structure
Atmospheric conditions	
No common exclusionary criteria	Areas where local wind systems are capable of readily dispersing emissions/odours Areas downwind from populated areas or ecologically sensitive areas
Recreational value	
Not within local or regional parkland or areas declared as recreation reserves, camping reserves or sporting reserves	Outside areas with potential as future parklands or reserves
Population density	
Not within intensive and semi-intensive living areas—areas zoned for residential development, township or village development, or rural residential development	Low residential population density Not within intensive labour–industrial areas Areas in small number of ownerships
Water supply	
Not within water supply catchments or in areas with significance as future water catchment or resources	
Not within identified aquifer recharge zones where aquifers are used for irrigation or potable	Low to medium water table Poor quality groundwater

where: Q is the fugitive source strength (kg/h); C is the allowable concentration at the receptor (mg/m^3); L is the health protection zone (m); R is the equivalent radius of the fugitive source (m) and A, B, C and D are empirical coefficients. Thus, for a sanitary landfill receiving 300 t of waste per day, Hong *et al.* (1996) calculate a health protection zone of 400–600 m, which is generally in-line with the recommendations of other regulatory authorities.

Whilst separation distances are effective in reducing off-site impacts arising from ground-level releases that decay exponentially with distance, they are not appropriate for releases that occur at a height and whose maximum impact occurs some distance from the point of release (thermal processes discharging from an elevated stack) or in instances where the beneficial utilization of a potential resource necessitates the development of a waste management facility in close proximity to a user (combined heat and power schemes), or siting of clinical waste incinerators within the grounds of a hospital. Setting a separation distance also has the effect of sterilizing the area around the site, with the attendant problems of planning blight and potential adverse effects on the community (depreciation of property values, etc.).

15.5.2 Techniques and examples

The least sophisticated method of site selection, initially employed by developers of waste management facilities before the need to include environmental considerations was fully appreciated, is to shortlist potential sites from a highly restricted list of candidate sites (for example, drawn from the portfolio of sites in the company's ownership) and to base siting criteria solely on preferred technical and economic considerations. While this approach may optimize site location in terms of criteria such as site geometry, proximity to waste arisings and minimization of transportation costs, it runs the risk of identifying an inappropriate site from the point of view of minimizing environmental impacts and ultimately the risk of failure to obtain authorization to construct the facility (Department of the Environment 1991).

A number of techniques for data integration have been applied in site selection for waste management processes. The intuitive method involves examination of all data as a whole to judge whether the site is acceptable, on the basis that all siting factors are independent. This approach is rarely used in isolation in contemporary siting processes, since it tends to be less transparent, lacking a structured decision-making framework. The stepped-down exclusion method involves sequential application of exclusionary criteria to identify 'not acceptable' areas, followed by the application of preferential criteria so as to identify a preferred site. This approach has been followed by Ontario Waste Management Corporation (1988) and Fingleton *et al.* (1989). In the scaling method, site attributes are scored and the scores combined by weighting siting factors according to their perceived importance; this approach is followed by Koo *et al.* (1989) and by Bolton and Curtis (1990). The stepped-down exclusion and scaling methods can also be used in combination to grade sites both for unsuitability and for positive aspects. In the nuclear field, data integration, using numerical scaling techniques in conjunction with mathematical decision analysis tools, is commonly employed (see, for example, US Department of Energy 1986). These have been applied less frequently in non-nuclear waste management siting decisions. An example of the use of fuzzy set theory in waste management is provided in the siting study of Koo *et al.* (1989), discussed in more detail in Chapter 17, Volume 1. Lin and Kao (1997) describe a geographical information systems (GIS)-based landfill siting model, using spatial analysis techniques, while Wichelns *et al.* (1993) use an optimization model for landfill siting that incorporates community preferences regarding the use of natural resources. Site selection strategies involving public participation include the so-called 'voluntary' approach and market-based solutions involving economic incentives and compensation systems (Armour 1991; Inhaber 1991; Portney 1991; Castle 1993). A fuller discussion of these latter strategies is contained in Kunreuther (1995).

Examples of successful siting decisions based on community involvement include those of the Alberta Special Waste Treatment Centre at Swan

Hills in Canada (McQuaid-Cook & Simpson 1986) and the siting of the Manitoba Hazardous Waste Management Corporation's (MHWMC) treatment facility at Montcalm, Canada (Castle 1993). Taking the Manitoba facility as an example, the siting approach adopted as a priority the identification of a 'willing host community', rather than an ideal physical site *per se* (Castle 1993). Based on one-to-one discussions with community members and the responses to questionnaires, MHWMC identified five candidate municipalities as a potential host site for the treatment facility. Each community formed a local Community Advisory Committee (CAC) (see Chapter 8, Volume 1, for a general discussion) to review the proposals and recommend conditions tied to the acceptance of the facility. In each of the municipalities, MHWMC, in conjunction with the CACs, applied exclusionary and preferred siting criteria to focus the site search on technically suitable locations. Four municipalities were excluded from further consideration, either because of inappropriate ground conditions or because referenda failed to elicit the necessary level of public support. The municipality of Montcalm emerged as a community that supported the presence of the facility, and also with site conditions suitable for the location of a landfill, solvent recovery and physicochemical treatment complex. Community concerns and subsequent amendments to the facility plan were considered by the Montcalm CAC, culminating in a final referendum on whether to accept the hazardous waste facility. In September 1991, two years after commencement of the siting process, the community voted by a three to one majority to host the facility. Attached to the acceptance were a series of conditions relating to the operation of the site, summarized in Table 15.5.

The term 'co-management agreement' is revealing in that it explicitly recognizes the participation of the host community as an equal partner in the management of the facility.

15.6 BASELINE ASSESSMENT

In a review of 28 EIAs for waste treatment and disposal facilities drawn from the European Union,

Table 15.5 Summary of the Montcalm–MHWMC co-management agreement for the Manitoba Environmental Centre (source: Castle 1993).

Issue	Agreement
Project proposal, EIA and licences	Any future expansion or significant change will require community support
Co-management	Two members on the Board of Directors will be nominated by Montcalm Council A plant Co-management Committee and Health and Safety Committee will be established An independent Community Liaison Committee will be appointed by the Council $US50 000 (indexed) will be provided annually by the operator to cover the expenses of the community members and the Committees
Community protection programmes	The Corporation guarantees nearby landowners and farmers financial compensation in the event of a negative effect on property values or crop prices The facility will conduct an environmental monitoring programme
Facility operations	Waste from within Manitoba will be given priority Polychlorinated biphenyl (PCB) wastes will not be stored without the express approval of the Council No change in technology or treatment capacity will take place without the support of the Council
Community benefits	Local employment opportunities will be maximised The facility will operate a household hazardous waste and used oil drop-off at no charge In the event that the facility is sold, the head office shall remain in Montcalm
Arbitration	Any disagreements between the parties shall be submitted to binding arbitration with the agreement of both parties

Colombo *et al.* (1996) identified methodological shortcomings in the treatment of baseline conditions, the key issues being the unstructured nature of the information, lack of relevance to the prediction of impacts and lack of clarity in defining the near-field and far-field boundaries covered by the baseline survey—the latter were often inappropriate for the development. Many of the problems identified relate directly to shortcomings in the earlier scoping phase of EIA preparation, which in turn points to the need for formal guidance, at least within the EU.

For the purpose of this discussion, impacts from waste facility operations can be placed into two categories: (i) extrinsic, i.e. impacts traditionally associated with land-take and land-use planning and common to all developments (ecology, noise, traffic, visual impact, etc.); and (ii) intrinsic, i.e. impacts specific to the type of waste treated and the unit operation under consideration, related to environmental quality, public health and socio-economic issues (Petts & Eduljee 1994). Baseline assessments of the former impacts do not require specific consideration in this chapter, save to note that they are mature EIA disciplines, understood by developers, EIA practioners and planning authorities, and should be addressed with the same robustness as for any other type of development. Baseline conditions associated with these impacts can have a critical bearing on the design and general acceptability of the facility, necessitating, for example, particular attention to design and mitigation measures, such as noise insulation, curtailment of operating hours, the architectural design of the facility or road improvements and traffic routing.

Public concern is especially acute over potential deterioration in environmental quality caused by releases of chemicals to air, water and land and the secondary impacts on public health. Baseline surveys of these primary and secondary impacts pose particular challenges for a number of reasons:

- In spatial terms the potentially affected area can extend well beyond the immediate vicinity of the site. For example, emissions from thermal processes can be deposited over an area extending 1–5 km beyond the site. The leachate plume of a landfill is more confined, but can nevertheless extend a considerable distance downgradient of the site.
- In temporal terms the timescale over which a baseline survey is conducted varies considerably, depending on the environmental medium under consideration. For groundwater surveys, spot samples taken at strategically located sample points are generally sufficient to study the medium, since pollutant transport is confined and slow. For odour or air quality surveys, the nature of the environmental medium is such that an extended survey of the area, with sampling at a number of locations, is often required to characterize transient source strengths and temporal fluctuations in air quality. A baseline survey of air quality can extend over 6–12 months.
- Sampling and analytical requirements can be complex and resource intensive. The chemicals of interest have diverse physicochemical properties and are frequently present in trace quantities, and a number of techniques are often deployed simultaneously to obtain self-consistent data sets across the various pollutants (see Table 15.6).

The choice of indicator will vary according to the waste type and the operation under consideration. In general, the medium into which process discharges are preferentially released is targeted in the baseline survey. Baseline surveys for facilities handling solvents or inorganic chemical wastes by physicochemical or low-temperature processes might include a preliminary soil and groundwater assessment, to confirm that underlying ground conditions provide adequate protection against spillages, and an odour survey (Browning-Ferris Environmental Services 1990). Baseline surveys of soil and groundwater quality can be extended into the operational phase of the facility. For landfills, soil, groundwater and surface water are the environmental media of prime importance, and baseline surveys will therefore ascertain their quality. The survey will also determine whether the hydrogeological setting is suitable for the location of the landfill. Incineration and other thermal processes are dominated by discharges to atmosphere, and therefore existing air quality is a critical component of a baseline survey, along with monitoring of soil and vegetation at the same sampling locations.

Table 15.6 Summary of monitoring activities at 11 locations in the vicinity of proposed energy from waste facilities.

Determinant	Methodology	Averaging period
Air		
NO	Chemiluminescence	On-line
NO_2	Chemiluminescence	On-line
SO_2	UV fluorescence	On-line
CO	NDIR	On-line
PM_{10}	TEOM	On-line
Total VOCs*	FID	On-line
TSP	Hi-vol	Weekly
HCl	Denuder tube	Weekly
Vapour phase Hg	Silver wool method	Weekly
Trace metals†	Hi-vol, ICP/OES‡	Weekly
PAHs	Hi-vol, GCMS§	Weekly
Dioxins	Hi-vol, GCMS§	Weekly
NO_2	Diffusion tubes	Monthly‖
SO_2	Diffusion tubes	Monthly‖
BTEX¶	Diffusion tubes	Monthly‖
Meteorological Measurements		
Wind speed	Anemometer	On-line
Relative humidity	Capacitative humidity sensor	On-line
Wind direction	Wind vane	On-line
Temperature	Thermistor	On-line
Soil and vegetation		
Trace metals† and dioxins	Soil samples to 5 cm soil depth, grass samples taken from top of roots	Spot samples every 2 months

* Measured as non-methane hydrocarbons (NMHCs) and methane.
† As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Sn, T1 and V in the particulate phase.
‡ High volume sampler and anlaysis using inductively coupled plasma/optical emission spectroscopy (ICP/OES).
§ High volume sampler and analysis using gas chromatography mass spectrometry (GCMS).
‖ Monitoring performed continuously at the nine principal sites.
¶ Benzene, toluene, ethylbenzene and xylene.

Baseline assessments for community health or socio-economic impacts are, in methodological terms, highly complex, difficult to establish, costly and ultimately not amenable to ready interpretation (see Section 15.10.1). They are rarely undertaken in the context of EIAs for waste management facilities (Colombo *et al.* 1996). In the case of community health, the quality of the environment in contact with the exposed community (air, water, soil, plants), a more readily measurable entity, is treated as a surrogate. A summary of the socio-economic status of the surrounding region is generally included in a waste facility EIA but as a statement of fact rather than as a basis for further assessment, an exception being the socio-economic analysis in the EIA for the proposed hazardous waste facility at Swan Hills, Canada (Ontario Waste Management Corporation 1988).

Baseline monitoring can often account for the highest proportion of the total EIA budget, and pressure to trim costs can result in poorly designed and executed programmes. The design of a baseline monitoring programme can be complex, especially when air quality is to be measured. Placement of samplers is dictated by the dispersion pattern of plant emissions, predetermined by mathematical modelling. Monitoring of the external environment before construction and after commissioning of incineration plant has become a common requirement of the planning process for such facilities in recent years, explicitly linking preconstruction EIA with monitoring and auditing of facility operations. In the UK, an extensive baseline monitoring programme was undertaken in Hampshire (southern England) as a prelude to the construction and operation of a new generation of MSW incineration facilities serving the county's waste management needs (see Section 15.10). Table 15.6 summarizes the year-long monitoring programme at 11 locations, at a total cost of £250 000.

Other preconstruction baseline surveys reported in the literature are for a waste-to-energy incinerator in Augsburg, Germany (Dörr *et al.* 1996), and for a waste-to-energy facility in Robbins, USA (Wells *et al.* 1997). Swerev *et al.* (1996) summarize the results of dioxin measurements from an intensive environmental monitoring campaign commencing one year prior to the start-up of the plant in Augsburg, Germany (1992–1993), and continuing for 18 months after commissioning (1994–1996). Apart from seasonal fluctuations and a dominant source affecting one of the monitoring stations (both caused by domestic heating units), there were no differences in the overall concentrations and their spatial distribution. The study concluded that dioxin emissions from the plant were not influencing air quality in the Augsburg area.

15.7 IMPACT PREDICTION AND EVALUATION

15.7.1 Spatial and temporal issues

There are a number of characteristics of waste management developments that present challenges in impact assessment. These relate to the spatial and temporal extent of impacts and the complex nature of indirect and cumulative impacts associated with some facility releases. Landfill leachate can impact on the groundwater directly beneath the site (a first order, near field impact) but can also travel downgradient to an off-site abstraction point, where public health might be put at risk (a second order, far field impact). Leachate seepage into surface waters will have a direct impact on water quality and on the aquatic ecosystem, as well as an indirect impact on humans, using the water body as a resource or as an amenity. Incinerator emissions impact directly on air quality, the spatial extent of which is difficult to define, whilst secondary and tertiary impacts relate to public health (directly via inhalation, or indirectly via deposition and transfer through the foodchain). Impacts can be contemporaneous with facility operations (noise emissions or the thermal effect of a cooling water discharge), but can also persist beyond the lifetime of the facility: for example, visual impact; the effects of groundwater pollution; or the effects of environmentally stable chemicals present in incinerator emissions.

The extent to which spatial impacts should be addressed at a sectoral or national level (i.e. in the context of strategic waste management plans and SEA), as opposed to a site-specific level, is also unclear, especially when certain types of releases can potentially affect the environment far beyond the site boundary. An example is the release to atmosphere of landfill gas. Methane, a significant constituent of landfill gas, is a potent greenhouse gas, but an evaluation of its global warming potential is only meaningful when landfills are collectively assessed on a national scale (see Section 15.3.2 and Table 15.2). Other impacts associated with landfill gas releases (explosion risk; odours; health effects) are local, near-field effects, manifested at ground level, and decrease exponentially in intensity with distance from the source. The latter types of impact are legitimately addressed in a site-specific EIA.

Another related spatial issue concerns the impact of residue disposal at a separate location and whether this should be included in the EIA for the facility. Planning consent is often location specific and cannot accommodate an activity external to the site, especially when this may fall within the ambit of a different decision authority. On the other hand, it would be unacceptable for a particular type of development to be permitted if provisions for a vital component of the waste management cycle, namely residue disposal, were unavailable or were to cause environmental damage. This issue can be addressed through the strategic waste management plan by ensuring the availability of suitable residue disposal sites which will in themselves require authorization to construct and operate. The EIA for the primary facility should nevertheless consider the implications for residue disposal and, if appropriate, identify receiving sites, such as a landfill for ash disposal or a sewage treatment works in the case of a liquid effluent, that would be capable of handling these releases safely. Planning consent can be conditional upon the applicant demonstrating a secure disposal route prior to the commencement of facility operations.

15.7.2 Prediction and evaluation

The range of impacts which should be considered within an EIA and the depth to which these should be analysed is also uncertain under some systems. This applies in particular to impacts that are addressed under both the siting and the operational regulatory process (in the UK, releases to air, land and water) and impacts relating to accidental releases. The EIA interface between planning and permitting and the tension that can be created between the two processes is discussed in Section 15.8. With respect to accidental releases, it is argued that a detailed hazard and risk assessment of plant failure and its consequences cannot be undertaken at the planning stage of the project because the necessary process and engineering data have yet to be developed. Nevertheless, for certain types of waste and waste management processes, it is necessary to consider the environmental consequences of accidental releases in order properly to inform land-use decisions and to put in place appropriate mitigation measures. For waste management activities involving plant and equipment, the level of analysis is commensurate with the preliminary nature of the plant design at this early stage of the project and typically involves scoping of potential failure scenarios (mixing of incompatible chemicals, bag plant failure, spillages during waste handling and transfer, tank failure, etc.), followed by a preliminary assessment of the likelihood of such events and their environmental consequences (Ocean Environmental Management Limited 1989; Thames Waste Management Limited 1992). In the UK, planning authorities can make the granting of an authorization conditional upon the submission of a detailed study prior to commissioning of the plant. However, for landfills it is possible to undertake a detailed analysis of liner failure at the conceptual stage of the project (US Environmental Protection Agency 1985; Golder Associates 1996) and in the UK is promoted in official guidance (Department of the Environment 1995).

Given the variety of impacts potentially associated with a waste management operation, impact prediction and evaluation must draw upon a wide range of techniques, from qualitative methods for landscape, visual and socio-economic impacts, to methods where impacts are quantified and evaluated against numerical criteria (noise, air and water quality, health risk). As was noted in Section 15.6, prediction and evaluation of ecological impacts, impacts associated with traffic movements to and from the site, noise emissions and visual intrusion are mature disciplines, and guidance is available under most systems of EIA in the form of national quality standards (e.g. British Standards (BS) 4142, 5228 and 7445 on noise measurement and control) or guidelines developed by professional organizations (for example, Institute of Environmental Assessment's (1993a, b) guidelines for traffic and ecological impacts). Whilst the review of Colombo *et al.* (1996), referred to in Section 15.5, identified general failures of methodology in these areas within waste management EIAs, these shortcomings stem from inexperience in EIA practice (see Section 15.1), remedied through training and professional, formal reviews of EIAs.

Prediction and evaluation of impacts on human health are among the most controversial and difficult in waste management EIAs. Chapter 17, Volume 1, discusses the complexity of first- and higher-order impacts following releases of chemicals from the stack of an incinerator (see particularly Fig. 17.2, Volume 1). Each stage of the assessment is characterized by uncertainties arising from variations in the source term (i.e. variations in waste composition or in release conditions), natural variability in ambient conditions, differences in individual activity patterns and the ability of models adequately to mirror the fate and transport of chemicals in the environment.

The past decade has seen the rapid development of risk assessment as a tool for the prediction and evaluation of impacts on humans and the general environment arising from waste management activities (see Chapter 17, Volume 1). Techniques have been developed to predict the fate and transport of chemicals through the environment and to evaluate direct (inhalation) and indirect (ingestion and dermal contact) impacts arising from incinerator emissions (US Environmental Protection Agency 1987, 1989, 1994; Travis *et al.* 1988; Hattemer-Frey & Travis 1991; Her Majesty's Inspectorate of Pollution 1996; Eduljee & Gair 1997), releases from landfills (Golder Associates 1996; Eduljee 1998) and impacts associated with contaminated land (Ferguson & Denner 1993; Goldsborough & Smit 1995). Propagation of uncertainty through the modelling process is studied by sensitivity analysis (US Environmental Protection Agency 1994) or by probabilistic Monte Carlo techniques (McKone 1991; Ferguson

& Denner 1993; Finley *et al.* 1994; McKone 1994; Cullen 1995; Keenan *et al.* 1995; Golder Associates 1996). Further discussion is contained in Chapter 17, Volume 1.

In addition to the impact which an individual facility might have on the surrounding environment, the cumulative impact of the facility together with existing and other planned facilities is of concern, especially in relation to the management of regional air quality. In the UK, a number of recent EIAs for MSW-fired energy-from-waste plants have included consideration of cumulative impacts. For example, the EIA for the proposed Thameside energy-from-waste power station at Bexley, London, included an analysis of cumulative impacts with modelling of releases of chemicals to the atmosphere, thermal discharges into the receiving estuary via cooling water discharge, noise emissions, traffic and visual intrusion (PowerGen 1995). For air quality, dispersion modelling was undertaken for emissions of nitrogen oxides, sulphur dioxide and particulates less than $10\,\mu$ (PM_{10}) from the proposed power station, and in combination with four other proposed local sources. The contribution from existing sources was assumed to have been accounted for in the baseline air quality survey. Predicted annual average, hourly average and 98th percentile ambient air ground-level concentrations were compared against background air quality and relevant air quality standards. Because background air quality for the acid gases exceeded air quality standards at certain times of the year, a further analysis of respiratory impacts was performed by deriving dose–response curves from which the effect of an incremental concentration of these chemicals could be assessed.

15.8 MITIGATION

The most effective mitigation measures in waste management are preventive, i.e. a combination of prudent siting and the inclusion of appropriate abatement and control systems in the design of the plant. Site selection can be regarded as the primary mitigation measure, minimizing the potential impact of the project on humans and the wider environment by drawing on the protection afforded by the natural features and the land-use setting of the preferred site. Siting a facility such that potential environmental damage and population exposure are minimized is the single most effective measure, since the likelihood of an accident or other unforeseen event can never be discounted. Furthermore, changes in site management may result in adverse changes in operational practices, leading to failure of the plant or an increase in routine emissions. However, as discussed in Section 15.5, exclusionary siting criteria should not be regarded as absolute; rather, they are guidelines that, when applied in an iterative manner to a range of potential sites along with other environmental and geographical criteria, serve to maximize protection of the environment.

Integration of design measures and siting considerations in waste management is best illustrated in the case of landfills. The need to protect water resources is paramount, since damage to groundwater compromises public health and in addition is costly to remediate. Therefore, landfills are particularly carefully sited, and in many cases regulators impose an absolute veto on development in certain sensitive or important groundwater zones or catchments. Even where siting is permitted, mandatory design features include a landfill liner to prevent the ingress of leachate into the underlying soil, a leachate collection system to minimize the head of liquid within the landfill and a gas collection and treatment system in the case of biodegradable waste. The operation of a landfill is effectively a continuum of mitigation measures, with covering of emplaced waste on a daily basis and progressive restoration of operational cells such that ingress of rainwater is minimized, culminating in a final cap and contouring of the site. Mitigation is carried through into the postclosure stage by the continued use of landfill gas and leachate collection systems, supported by site monitoring over long periods (30 years). In the case of thermal treatment processes, design measures would address both controlled and uncontrolled emissions. Incorporation of air pollution control equipment on combustion units is established practice across the whole of the waste management industry. Control measures aimed at minimizing fugitive releases would include the enclosure of waste handling areas, extraction and scrubbing of air in the workplace prior to release to the surrounding environment, extraction and scrubbing of gases released during chemical reactions, prompt replacement of covers on drums after sampling of the contents, etc.

A selection of locational, design and management features that would typically be deployed as mitigation measures on waste management projects is listed in Table 15.7; these are in addition to measures such as landscaping, noise insulation and traffic management.

Table 15.7 provides site-specific mitigation measures. The latter can also be applied in a strategic sense, as illustrated by the World Bank's sectoral guidelines on environmental assessment for solid waste collection and disposal systems in developing countries (World Bank 1991). For example, to avoid worker hazard on landfills where medical wastes have not been previously handled, separate collection of medical wastes, using dedicated vehicles and a separate disposal area at a landfill, can be arranged. Thus, mitigation measures can be built into waste management strategies during the concept stage and taken through into the implementation stage when specific facilities are operational. Mitigation during strategy development can also address institutional issues, such as training of enforcement officers and providing incentives to stimulate a market for recycled products.

15.9 ENVIRONMENTAL IMPACT ASSESSMENT AND POLLUTION CONTROL

15.9.1 Pollution control regimes

Waste management processes are regulated in a variety of ways, at both national and local level. For example, in the USA, primary control is vested in the national (federal) government, which devolves that control to State Governments if the latter have the capacity to undertake this function. National standards are set down for licensing facilities, giving little scope for regional variations. In Germany, primary control is at federal level, but with states having more discretion than in the USA: federal guidelines for the treatment and disposal of wastes are not binding on the states. In the UK, emissions to air, water and land from so-called 'prescribed' waste management processes (primarily, at the time of writing, incinerators of greater than 1 tonne per hour capacity) have been regulated through the regime of integrated pollution control (IPC) by the Environment Agency (in England and Wales) and the Scottish Environment Protection Agency (SEPA) (in Scotland), whereas the regulation of noise pollution from the same site has hitherto been a local authority function. Local authorities are also responsible for the regulation of certain other waste management processes if they fall below a throughput threshold (less than 1 tonne per hour capacity) or if they are non-prescribed processes. Conventionally, a 'process' is described as an operation which converts input material (in this case, waste) into a product (in waste management, an inert product or a beneficial product, such as waste derived fuel). Hence, the waste management processes in the UK which have been regulated under this regime have tended to be those which utilize plant and equipment similar to those encountered in industrial processes. In general, all thermal processes have fallen into this category, and authorizations to operate are obtained from the Environment Agency or SEPA, on submission of an application supported by an assessment of the environmental consequences of releases to air, water and land. Other countries, such as France, Spain and Italy, also divide waste facility regulation between local and national agencies.

Under IPC, pollution of air, water and land resulting from emissions of 'prescribed' and other substances is regulated within a single framework by the application of two principles set down in the UK's Environmental Protection Act 1990:

- The waste management process which is selected for a particular waste stream must represent the BPEO.
- It must be demonstrated that process, technology, plant and operating and management regimes have been selected by application of best available techniques not entailing excessive cost (BATNEEC) to prevent, minimize or render harmless substances which might cause harm if released into any environmental medium.

Table 15.7 Examples of mitigation measures deployed on waste management projects.

Waste management option	Examples of locational criteria	Examples of design features	Examples of management options
Transfer stations, civic amenity sites and materials recycling facilities	Not in predominantly residential areas to mitigate against noise and odour nuisance Geographically central to sources of waste to minimize traffic movements	Covered/enclosed operational areas Ventilation and air filtration systems Strip curtains or netting to prevent litter Contoured, impermeable flooring to manage surface runoff	Limitations on operational hours to minimize noise nuisance Traffic control to avoid queuing of vehicles on the public highway Minimize waiting time of putrescible waste at facility to reduce potential for odours
Landfilling	Not in residential areas, to minimize traffic, noise, odour and litter impacts Not over sensitive or important aquifers or in wetlands	Liner(s) to prevent migration of leachate beneath landfill Landfill gas control system to prevent build-up of gas, explosions and odour nuisance Leachate collection and treatment system	Landfilling in cells to minimize surface area exposed to precipitation Daily application of clean cover material to prevent litter and breeding of vermin Spraying site roads with water to prevent dispersion of dust Covering of refuse vehicles while on the public highway
Incineration of MSW (municipal solid waste)	Not in airsheds susceptible to inversions or channelling In proximity to potential energy users to maximize beneficial use of CHP	Pollution abatement system meeting the required emission standards Enclosed waste reception areas and negative pressure in operational areas to minimize engress of odours Automatic fire prevention systems	Screening and testing of incoming waste to prevent entry of undesirable materials Monitoring of emissions and of the ambient environment Training and maintenance programmes to maintain integrity of facility operations
Solvent recovery and physicochemical treatment	Not on sites underlain by important aquifers or by highly permeable soils Not on sites surrounded by industries sensitive to odours and taints, such as food processing	Enclosed operations with air filtration and odour control system Impermeable site apron to prevent soil contamination Sealed site drainage system with controlled discharge Fire prevention measures	Screening and testing of incoming waste for compatibility prior to processing Installation of a wheelwash facility to prevent tracking of waste on to the highway Exclusion of certain types of waste (e.g. malodorous mercaptans) from the facility Loading/unloading in enclosed area
Biological treatment	Not in areas adjacent to residential development Close to potential markets for energy or product (e.g. compost)	Enclosed/covered operations to minimize noise and odour Impermeable base, graded drainage system and controlled discharge	Maintain aerobic conditions during composting by regulating aeration Convert biogas into energy for gas control and optimization of facility energy requirements

The terms BPEO and BATNEEC as applied in a site-specific context are discussed elsewhere (Slater 1995). An environmental assessment procedure has been developed by the Environment Agency to assist in the selection of the BPEO (Environment Agency 1997); an example of its use is provided in Chapter 17, Volume 1. Although the procedure uses much the same information to assess environmental impacts as in an EIA for land-use planning purposes (albeit in the limited sense of releases to air, water and land), the planning and permitting regimes have tended to remain separate and distinct, and there is typically little synergy between a waste management EIA prepared under Directive 85/337/EEC and an environmental assessment prepared for an IPC permit. This has resulted in an uneasy relationship between planners and licensers (see above) and to considerable confusion during the course of the mandatory public consultations which apply separately to the planning and the permitting processes.

15.9.2 Integration of planning and permitting

Whilst a compelling case can be made for an integrated system of land-use planning (i.e. scrutinizing the waste management project prior to its development) and permitting (i.e. post-implementational regulation of the project), this is as yet an unfulfilled goal in the majority of countries. For example, in the UK, planning policy guidance rightly points to the undesirability of unnecessary overlap between the planning and permitting regimes, but also fails to recognize that the environmental effects considered by the competent permitting authority are precisely those which are relevant to land-use considerations. Consequently, EIAs prepared under the land-use Directive 85/337/EEC have tended to stop short of addressing the detailed design, operational and control features of the development, on the assumption that these issues are more properly the domain of permitting, whereas planning authorities argue that without this information it is not possible to determine with any confidence whether the development as proposed is capable of meeting a standard of operation commensurate with adequate environmental protection. Furthermore, public concerns about the effectiveness of the regulatory regime have been evident in planning discussions. In the USA and in European countries such as Belgium and Luxemburg, EIA is an integral component of permitting and licensing, whilst in the Netherlands land-use considerations and licensing are considered in parallel.

The recent extension of the concept of IPC by the European Commission has far reaching implications for waste management permitting in the EU. Council Directive 96/61/EC on Integrated Pollution Prevention and Control (IPPC) applies to 'installations' rather than 'processes' and will, for the first time, draw landfills, chemical treatment plants and a number of other waste treatment and disposal processes into the integrated permitting regime (Commission of the European Communities 1996). Furthermore, with emissions of noise included in the integrated permitting system, the role of Local Authorities in countries such as the UK will need to be clarified. More importantly from a procedural point of view, Article 6 of the IPPC Directive allows material produced as part of an EIA under Directive 85/337/EEC to be included in an application for authorization under IPPC, whilst Article 9 requires information obtained during the EIA process to be taken into consideration in IPPC permitting. Thus, a single EIA may satisfy the requirements of both the planning and permitting regimes.

These provisions will assist in greater integration of the planning and permitting systems in the EU, reducing duplication of effort on the part of the relevant authorities as well as the developer or operator and also providing a framework within which a single EIA fulfilling both regimes can be prepared. The benefits of an integrated approach are being recognized by national agencies. For example, in the UK the Environmental Analysis Cooperative (EAC), a body set up by the Environment Agency to investigate and recommend environmental assessment tools in collaboration with industry, is developing a framework for a guidance document to assist operators to compile, assess and present information needed for both land-use planning applications and IPC/IPPC permits as an integral part of project planning and design (EAC 1997).

It is also clear that, from an EIA perspective, land-use planning and permitting should be interactive, complementary and seamless. The Tanner Act, enacted in California in 1986, attempts to achieve this goal, streamlining the planning and permitting process by designating a single agency as the focal point for all State institutions involved in the process. The Tanner Act also includes a mandatory consultation and checking procedure by the appointment of a Local Assessment Committee, comprising seven members, of whom three represent the community, two represent industry and two represent environmental interests. The application of this legislation in the siting of a liquid hazardous waste incinerator is described by Craig (1992). Other countries have yet to emulate this approach through legal statute.

15.10 OPERATION AND POSTCLOSURE

15.10.1 Impact measurement

Monitoring of releases at source, combined with monitoring of the environment external to the site, provides a means of management control that bridges the link between the EIA and the baseline for the project and the operational and postclosure impact of the facility. Surveillance of facility operations can be supported by a complaints register, maintained by site management and the regulatory body, which can be analysed on a regular basis to assess in qualitative terms the impact the facility is having on the surrounding community (Eduljee 1995).

Whilst, in theory, any potential impact considered in the EIA should be verifiable during operation, in practice this is dependent on the type of impact considered. For example, social and economic impacts are difficult to verify, save perhaps in campaign-type studies that provide a snapshot of the effect a waste facility may be having on the surrounding environment (e.g. community health impacts, the effect on property values, inward investment into the region, etc.). These studies are fraught with socio-economic and lifestyle-related confounding factors and are rarely conclusive (Zeiss 1991; Hirshfeld *et al.* 1992). Insofar as the effect of emissions of chemicals and of noise is concerned, allowable, 'not to be exceeded', emission levels at source are often set with the incremental impacts in mind, the objective being to ensure that the environmental consequences of controlled releases are effectively *de minimis* in regulatory terms. In the USA, certain emissions to the atmosphere from an incinerator can be set using a risk-based approach, with the incremental allowable environmental consequence (the increased lifetime risk of cancer) typically set at a level of 1 in 1 million (1×10^6). Therefore, the environmental impact of a well-operated incinerator designed to achieve such emission standards is unlikely to be measurable against the background concentration of chemicals in the surrounding environment.

This last point also makes other types of impacts difficult to measure in the environment. For example, health risk assessment typically estimates incremental health effects relative to a baseline. The magnitude of these incremental effects caused by the presence of a waste facility will depend upon the quantities of the chemicals of concern released from the facility relative to the quantities already present in the ambient environment and to which the public are simultaneously exposed. As facility releases have decreased in response to tighter regulation, it has become progressively more difficult to measure the contribution of modern waste management facilities to the general environmental burden because the background overwhelms and masks the increment. Given this limitation, health risk assessors have to rely on mathematical modelling in order to quantify the unmeasurable, often constructing 'worst case' exposure scenarios, but nevertheless adopting a working hypothesis that these hypothetically amplified incremental risks are only 'acceptable' if they fall below a *de minimis* level such as 1 in 1 million (see Chapter 17, Volume 1). Baseline and/or background health effects are in themselves generally impractical to measure, nor do epidemiological studies generally have the power to detect statistically significant effects in the relatively small samples of populations that live in the vicinity of waste sites (Marsh & Caplan 1987).

15.10.2 Monitoring systems and example studies

Notwithstanding these difficulties, on-site and off-site monitoring is now a standard requirement in waste management operating permits. As the EIA is conducted on the assumption that certain mitigation measures will be incorporated into the design, operation and management of the facility, these form the basis of on-site monitoring. Because chemical concentrations and other emission levels are always greater at source compared to an off-site location, analytical and measurement challenges are reduced. Thus, an operating permit for an incinerator could include a mandatory programme for monitoring of stack gases to ensure compliance with the design emission limits, noise levels and odours at the boundary of the site, the quality of the site effluent discharge, etc., whilst a landfill could require monitoring of leachate quality, dust and noise levels at the boundary, a landfill gas surveillance system, etc. Solvent recovery and biological treatment facilities could be required to monitor for odour and effluent quality. Verification that the site meets the stipulated design and operational criteria provides de facto confirmation that off-site environmental impacts will also conform to the predictions in the EIA. On-site monitoring is generally combined with surveillance of the off-site environment—for example, air quality, groundwater quality, noise levels, etc.—relative to a baseline or background survey. Even when the predicted incremental levels are below the sensitivity of current measurement techniques (see above), the very absence of a measurable effect over and above the baseline or background environment is in itself valuable information for the site operator, the regulator and the public.

Impacts which fall outside the scope of a regulatory authority's remit can be monitored and enforced through other means—for example, as conditions attached to a planning permit or in the form of a legally binding covenant between the operator and the regulator. Confining facility traffic to designated routes is one such obligation: other types of issues that could be addressed in a covenant can be noted in Table 15.5.

Public involvement in waste management decision-making processes frequently extends to the designing and supervision of on-site and off-site monitoring programmes. Particularly sensitive receptors, such as schools, hospitals and residential properties, can be selected as the location for monitoring sites, after consultations with the local community. Clearly, the results of such monitoring have to be openly available for scrutiny by the public—in one case the readout from routine monitoring of stack emissions is transmitted via a modem link to the offices of the local authority (Atkins 1996). Public liaison committees can examine on an ongoing basis the performance of the facility and the results of environmental monitoring programmes. A complaints procedure is often instituted alongside these measures to respond to concerns and incidents that might result from facility operations. In the case of facility development in Hampshire (see Section 15.6), a 'contact group' convened by the developer will assist in scoping the EIA, review the draft environmental statement, act as a liaison group during construction and commissioning and subsequently act as a monitoring group during the operation of the facility.

Waste management facilities are amongst the most closely scrutinized of industrial operations, and regulatory authorities hold large databases of monitoring information. However, relatively little of this type of monitoring has been reported in the open scientific literature. A few examples of studies are listed in Table 15.8.

Landfills are perhaps the most common type of waste facility that have routinely been subjected to extensive monitoring from precommissioning to postclosure. Examples of ongoing monitoring of groundwater quality directly beneath and downgradient of solid and industrial waste landfills are provided by the UK Department of the Environment (1994a, b). Groundwater has been monitored over the lifetime of the sites, i.e. from the early 1970s to the early 1990s.

15.11 CONCLUSIONS AND FUTURE DEVELOPMENTS

Regulators and practitioners have recognized failures at both ends of the waste management spectrum: first, the failure of strategic planning to deliver integrated policies and plans at the

Table 15.8 A selection of studies examining the impact of waste managment operations.

Reference	Waste operation	Study design	Results
Zmirou *et al.* (1984)	Incinerator	Retrospective comparison of the consumption of medicines for respiratory problems among residents living near a municipal waste incinerator; matching with controls	Significant decrease in consumption of medicines with increasing distance from plant. Operations at the incinerator were tightened as a result of the study
Grisham (1986)	Landfills and contaminated sites	Expert panel reviewed available data on health effects from active or closed sites	No evidence of direct causal evidence of health effects, though monitoring should continue
Marsh and Caplan (1987)	Landfills, contaminated sites and incinerators	A review of 14 sites in the USA at which health studies have been conducted	Physical and biochemical changes were noted in some cases, suggesting possible links with the sites
Berlincioni and di Domenico (1987)	Incinerator	Dioxins were measured in emissions from a municipal waste incinerator and in offsite soil samples, over a period of 5 years	The results over 1979–1985 indicated elevated concentrations of dioxins in soil. A subsequent health risk assessment resulted in closure of the plant
Hutton *et al.* (1988)	Incinerator	Measurement of levels of cadmium and lead in samples of dust, soil and vegetation upwind and downwind of a municipal waste incinerator	Results indicated that there was neither a marked nor an extensive contamination by these metals in the downwind area. Dust cadmium levels decreased with distance from the incinerator and deposition levels were also higher in the downwind direction
Gatrell and Lovett (1990)	Incinerator	Spatial analysis of incidences of cancer of the larynx in the vicinity of a chemical waste incinerator	The study concluded that a cluster of cases within 2 km of the facility warranted further investigation. This assertion was disproved by Elliot *et al.* (1992a, b)
Elliot *et al.* (1992a, b)	Incinerators	Statistical analysis of incidences of cancer of the lung and larynx in the vicinity of 10 waste oil and solvent incinerators	No evidence of association between these cancers and proximity to the incinerators, including the study of Gatrell and Lovett (1990), using a more discriminatory statistical analysis
Nishikawa *et al.* (1993)	Incinerator	Concentrations of five volatile organic compounds in ambient air were measured during the combustion of dry cleaning materials	Results suggested negligible impact of incinerator emissions on the surrounding environment
Blanchet *et al.* (1993)	Incinerator	Baseline health risk assessment prior to the construction of a mass burn facility, followed up 1 year after commencement of operations	The operational risk, using measured plant data, confirmed that the facility was operating below the 10^6 criterion for total carcinogenic risk and with an ample margin of safety in respect of total non-carcinogenic risk

(*Continued on p. 324*)

Reference	Waste operation	Study design	Results
Ball *et al.* (1994)	Incinerator	Comprehensive sampling of air, soil, herbage and food items for dioxins and PCBs in the vicinity of a chemical waste incinerator	The results indicated the potential for near-field contamination due to dispersal of ash from the site. Beyond 250 m from the site, the environmental levels were within general background range
Pleus and Kelly (1994)	Incinerators	Review of five case studies involving hazardous waste incineration, often cited as demonstrating	The studies contained serious methodological deficiencies, which invalidated the alleged adverse adverse health effect effect
Eduljee (1995)	Physicochemical treatment	Examination of complaints record over a 5-year period relating to noise, dust and odours	Records elicited systematic nature of some complaints and bias towards a small number of frequent complainants
Eitzer (1995)	Incinerator	Measurement of dioxins in bovine milk samples taken from farms near a municipal waste incinerator, before and 1 year after commencement of operations	No significant differences were observed between dioxin concentrations in pre- and post-operational samples
Deml *et al.* (1996)	Incinerator	Measurement of dioxins in human blood and milk from persons living in the vicinity of a municipal waste incinerator	No significant difference between dioxin concentrations in the study sample relative to the background
Biggeri *et al.* (1996)	Incinerator	Case-control study of lung cancer in the vicinity of a foundry, shipyard, incinerator and city centre	Excess risk was highly correlated to distance from city centre and from incinerator
Hamar *et al.* (1996)	Incinerators	Volatile organic compounds measured in the blood of persons living in the vicinity of an industrial complex which includes hazardous waste incinerators	There was no association between residing in the study area and elevated blood VOC levels
Swerev *et al.* (1996)	Incinerator	Dioxin measurements in ambient air commencing 1 year prior to the start-up of a municipal waste incinerator and continuing for 18 months after commissioning	The study concluded that dioxin emissions from the plant were not influencing air quality in the area
Durda *et al.* (1997)	Landfill	Measurement of ambient air quality in the vicinity of a hazardous waste landfill, followed by an ecological risk assessment	No significant difference in the magnitude of ecological risks for any ecological receptor compared with either baseline condition or current operation

PCBs, polychlorinated biphenyls; VOC, volatile organic compound.

national and regional level addressing sustainability and siting issues in their entirety; and, second, the poor quality of many of the submissions supporting proposed facility developments at the local level. This chapter has examined the role of EIA as a management tool in the formulation of integrated strategies and for the analysis of impacts associated with site-specific proposals. We have seen that strategic planning decisions on option selection and facility siting at a national or regional level feed into mitigation of potential facility-specific impacts and through to monitoring and auditing of facility operations.

The past decade has seen calls for open debate and community participation in the decision-making process. Attempts to address waste management planning as a purely technical exercise in optimizing geographical and economic indicators have generally met with limited success. It has been recognized that failure to take into consideration the concerns and views of host communities will, at best, prolong the formulation of an acceptable waste management plan or a developer's scheme or, at worst, prevent the plan or scheme from coming to fruition. The abandonment of national hazardous waste management plans in countries such as Australia and Spain is testimony to the limitations of the 'technical' approach to waste management. A large literature has developed on the complex issues surrounding risk perception, the perceived democratic deficit at local level and public participation in the decision-making process in waste management (e.g. Cvetkovich & Wiedemann 1988; Wiedemann & Femers 1990; Armour 1991; Portney 1991; Cvetkovich & Earle 1991; Wiedemann *et al.* 1991; English *et al.* 1993; Petts & Eduljee 1994; Gray 1995; Petts 1995; Petts *et al*. 1996).

It is in this area that EIA will play an important future role. EIA includes within its framework an explicit process of consultation during scoping, impact prediction and evaluation and mitigation. Whilst past practice tended to limit consultation to statutory governmental consultees, such as the planning authority, consultation is increasingly being broadened to include the views of host communities. In the UK, the waste management plan for the county of Hampshire has been developed with active public involvement, through the medium of community advisory fora (Petts 1994, 1995). This consultative process has extended into the preparation of EIAs for the facilities envisaged in the waste management plan. The 'co-management' approach to facility management (see Section 15.5.2) has also been successfully employed elsewhere (Renn *et al.* 1995; Atkins 1996), and this model could become the norm in the management of future waste facility sites.

Moving public participation to centre stage will provide the driving force to raise the standard of waste management plans and site-specific EIAs, both in a technical sense and as effective vehicles for communication. This, in turn, will necessitate the further refinement of tools for impact prediction and evaluation, such as risk assessment, together with a formal analysis of uncertainty and the integration of EIA into the strategic environmental management techniques of LCA and SEA. The latter application of EIA perhaps offers the greater interpretative challenge, since it involves weighting the relative importance of widely disparate environmental impacts, balanced against the cost of adopting a particular option (see Section 15.3.1 and Table 15.2). The development of assessment techniques combining environmental factors and damage functions will improve the robustness of decision-making at both strategic and site-specific levels. EIA is set to play a vital role in raising public confidence in the practice of waste management.

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16: Environmental Impact Assessment of Road and Rail Infrastructure

ANN DOM

16.1 INTRODUCTION

It has long been recognized that transport infrastructure and its use—and especially road traffic—has an extensive negative impact on the environment. Road-oriented policies have in many countries led to a gradual decline of environmentally more sustainable forms of transport, such as rail transport, walking and bicycling. More and more countries realize that the development of sustainable transport systems requires new approaches to transport planning and adapted evaluation frameworks.

This chapter deals with the practice of environmental impact assessment (EIA) for linear transport infrastructures, i.e. road and rail infrastructure. An investigation is made into the extent to which EIA improves the integration of environmental concerns into infrastructure design and implementation. This chapter also illustrates the specific practical problems infrastructure EIAs have to deal with and outlines the main shortcomings of the current EIA applications. In addition, an overview is given of the recent developments regarding strategic environmental assessment (SEA), its role in transport infrastructure planning and how it aims at overcoming the limitations of project EIA.

16.2 IMPACTS OF ROAD AND RAIL INFRASTRUCTURE AND USE

Transport infrastructure and traffic have very diverse impacts on the environment, the geographical scope of which ranges from local (for noise nuisance, ambient air pollution, visual impacts), to regional (ozone formation, acidification) and global scales (transport is a major contributor to the greenhouse effect). The impacts of transport can be broadly classified into two impact groups: impacts caused by the construction and maintenance of infrastructure and those caused by the use and operation of infrastructure (i.e. transport activities). An EIA of an infrastructure project (i.e. a new road or rail link or the modification of an existing infrastructure) needs to address the causes of both impacts.

16.2.1 Impacts of infrastructure construction and maintenance

The (mostly temporary) impacts caused by the construction of roads or railway lines mainly concern the population in the immediate surroundings of the construction works and can often be mitigated effectively at project level. They are caused by, for example, the transport of materials, noise, vibration, dust and the barrier effect to traffic (including pedestrians). Infrastructure building also has local effects on geology and soils and can alter water conditions. Solid waste problems mainly involve the disposal of construction earth and rubble. Impacts at a wider range can be engendered by deviated traffic during construction (which increases the environmental pressure on other routes) and the (temporary) reduction of accessibility of certain areas.

The most direct impact caused by the presence of linear transport infrastructure is land take. This may have serious consequences for property and communities in towns and for seminatural resources in rural areas. The surfaces required by transport infrastructure are directly related to their technical and construction characteristics.

These also influence other environmental impacts, such as the barrier effect (which can disrupt and sever natural habitats, migration routes and communities) and the visual effects on landscapes.

Land consumption by transport infrastructure can be in conflict with other economic land-use functions, such as forestry and agriculture, as functional units (e.g. parcels of farm land) are consumed or divided and connections (roads) are crossed. In addition, the physical environment may be modified through drainage and changes in groundwater level, pollution and impacts on water run-off. Sometimes, linear infrastructure can also have positive impacts on landscapes, as it can offer the opportunity to improve the structural aspects of a landscape. A very specific problem exists in the exploration and conservation of the archaeological sites on the trajectory of a new road or rail line. For existing sites, the possible danger is damage by vibration. However, a positive side-effect of constructing infrastructure is that the excavation works often lead to the discovery of new sites of archaeological interest.

In certain countries, particular environmental issues may be of local importance, for example, the impact on the water table in the Netherlands and the impact of seismic activity in Greece. An example of an impact caused by the maintenance of a transport infrastructure is the water pollution caused by de-icing salts used on roads.

16.2.2 Impacts caused by road and rail traffic

The largest proportion of environmental impact is caused by the use of the infrastructure, i.e. passenger and freight traffic. A new project or the extension and improvement of existing infrastructure generally affects the overall transport system (traffic flows and modal split) in two ways, i.e. it can:

1 Change the modal split of the transport system: for example, a new high-speed rail (HSR) line can draw traffic away from the other modes for long distance traffic, such as motorways and aviation.

2 Induce an overall growth in traffic, as better infrastructure makes travelling easier and more attractive.

The main impacts caused by road and rail traffic are (OECD 1994):

- Emissions of acidifying gases and greenhouse gases (such as carbon dioxide (CO_2) and nitrogen oxides (NO_x).
- Ambient air pollution, caused by the emissions of CO, NO_x, hydrocarbons, particulates, etc., its associated health risks and ecological impact and the formation of photochemical smog and ozone.
- Noise disturbance, particularly caused by road traffic, which is an increasingly common nuisance, especially in densely built-up areas and at night.
- Vibration, which is mainly caused by heavy road vehicles and freight trains, causes nuisance comparable to that of noise, and may have harmful effects on soil, infrastructure, buildings and underground services.
- Waste production due to the recovery and recycling of metals from scrapped vehicles and the disposal of certain non-recoverable materials.
- Risks caused by the transport of dangerous goods or hazardous waste represent an increasing cause of concern because of the potential scale and intensity of the damage.
- The consumption of energy, which is a major concern as the transport sector is highly dependent on fossil fuels. Direct energy consumption is due to the operation of vehicles (e.g. consumption of petrol, diesel, electricity). In addition to this, an indirect energy consumption results from the production of transport fuels and electricity, the construction and operation of infrastructure, the manufacture of the vehicle fleet, the maintenance and disposal of vehicles and of the infrastructure installations, etc.
- The consumption of metals and other nonfuel minerals for the construction of transport infrastructure and vehicles, which raises longer-term issues of resource utilization and recycling.

16.2.3 Other impacts

In addition to the above listed direct environmental impacts, the assessment of large transport infrastructure projects should also account for safety impacts and effects on congestion. Even though these may not strictly be considered to be environmental impacts, they are often included in a project EIA or, if not in EIA, in other project evaluation frameworks.

Safety risks mainly concern road transport, as accidents in the other transport modes (rail, aviation) represent only a small proportion of the total toll of deaths, injuries and property damage attributable to transport accidents, albeit the number who may be harmed in a specific accident (i.e. the societal risk) may be large. Improved road infrastructure and safety features in vehicles and increasingly stringent law enforcement have during the past years tended to reduce fatalities and injuries in some countries. Statistics of the European Conference of Ministers of Transport (ECMT) show a slight, albeit irregular, decline in accident rates in recent years. Overall growth in road traffic (with a trend to more powerful, faster cars and heavier trucks) tends, however, to increase the risk of accidents. Excessive speed in built-up areas is considered to be the prime cause of accidents (OECD 1997a).

Congestion is mainly characteristic of urban road traffic. In addition to causing time losses and reducing accessibility, congestion can also greatly enhance the environmental impact of the traffic system. The driving characteristics of congested traffic, i.e. stalled or slow driving in 'stop and go' traffic, increases fuel consumption, pollution and noise. A supply side solution to the problem of congestion—i.e. the building of more roads in major urban centres, has failed generally to ease congestion, as it serves only to generate additional traffic. Traffic management measures, such as telematics (automatic signalling, routing information, etc.) can also be used to increase the capacity of the existing infrastructure. However, its effect on congestion is often very short term, as the capacity improvements merely lead to additional traffic in the longer term. Preventing and mitigating congestion problems require a systems approach and traffic demand management, which goes beyond the conventional, but often ineffective, measure of infrastructure building.

To guarantee that environmental considerations are integrated fully into the decision-making process, the results of an EIA of a road or rail infrastructure project also have to be evaluated from the perspective of its socio-economic, accessibility and investment implications. Ideally, all effects should be addressed in one integrated assessment framework. A recent review of national evaluation frameworks for road and rail projects in Europe demonstrated that there is a broad spectrum of approaches. Most countries have existing appraisal systems (using cost–benefit analysis (CBA) or multi-criteria analysis (MCA)) to evaluate a project's construction costs, operating and maintenance costs, revenue, time savings, service quality benefits, accident reductions and local environment effects. However, strategic environmental impacts, economic development and policy impacts are rarely addressed, with the exception of the impact on employment and conformity to larger sector plans (European Commission 1996a).

16.2.4 Cumulative and secondary effects

Recently, it has become apparent that the secondary and cumulative impacts of transport projects can sometimes be as significant as their direct impacts. A specific road or rail project not only causes effects directly related to the project and in its immediate surroundings, but can also significantly influence, on a much wider scale, the whole traffic system. For example, key-links such as the Channel tunnel (linking the UK with France and Belgium) or the Öresund link (between Denmark and Sweden) not only change significantly the local traffic flows, but also influence the traffic systems of various countries and regions, induce traffic growth and influence regional development.

Furthermore, transport infrastructure can cause structural changes, such as urban sprawl and the disintegration of economic activities. Motorways, for example, can lead to secondary development (industries, offices, etc.) near their access and junction points. Redevelopment projects near HSR stations are directed to attract a specific kind of activities (service, consultancy firms, etc.). These structural changes in their turn can have environmental effects, which need to be taken into account in environmental assessment of the infrastructure plans. Research on this issue has been initiated in various coun-

Box 16.1 Integration of transport and land-use planning: the UK example (Source: Department of the Environment 1995)

In the UK, guidance on the integration of transport and land use planning is available in the Planning Policy Guidance Note 13: Transport (PPG13). PPG13 aims to ensure that local authorities implement their land-use policies and transport programmes in ways which help to:

- Reduce growth in the length and number of motorized journeys
- Encourage alternative means of travel which have less environmental impact and hence
- Reduce reliance on the private car

PPG13 gives advice on how to develop integrated land use and transport policies which give appropriate weight to the objectives of environmental improvement and economic growth. It advises local authorities to encourage new development to locate in places where there are reasonable alternatives to the car. Those developments which are major travel generators should be located in existing centres which are highly accessible by a choice of means of transport. In order to secure desired improvements in air quality and other environmental impacts, these locational policies need to be supported by complementary measures to ensure that the reduced need to travel by car is translated into actual changes in travel behaviour. Unless effective complementary measures are in place, increasing the density of development in urban areas is unlikely to have a significant impact on traffic levels and could worsen congestion and air quality

At the beginning of 1998 the UK Government published a consultative document on a proposal to integrate more closely the regional land-use planning system with the planning of trunk roads. By placing greater emphasis on regional and local views on the impact of a new road and allowing the consideration of alternatives, such as public transport, the proposals could lead to earlier agreement on schemes and ultimately to faster implementation

tries (National Cooperative Highway Research Program 1998)

The role of spatial planning can be very important in ensuring that the provision of transport infrastructure complements land-use priorities rather than driving them. However, this requires close coordination between land-use planning and infrastructure planning, a link which is often weak or lacking. Some countries, such as the UK and the Netherlands, have issued guidelines in this regard (see Box 16.1).

16.3 EFFECTS AND LIMITATIONS OF PROJECT ENVIRONMENTAL IMPACT ASSESSMENT

One of the most immediate effects of linking EIA to infrastructure project approval is that it generally leads to the addition of mitigation and compensation measures to the infrastructure design and implementation. Another effect is that EIA procedures generally provide a more consistent and informed platform for public participation and for the involvement of various interest groups. In practice, this also means that public opposition to certain projects more and more leads to significant delays in project implementation and imposes often expensive mitigation measures upon an infrastructure project. Sometimes, the findings of an EIA may even lead to the refusal and complete revision of environmentally unsound projects. A recent example concerns a (planned) section of the Egnatia motorway in Greece, a priority project of the trans-European Transport Network (TEN). This motorway section was planned to cross the habitat of the brown bear, a protected area under international legislation (the European Habitats Directive). Following an EIA and an appeal by a non-governmental organization (NGO), the supreme court of Greece cancelled the authorization of the project and demanded the development of an alternative route.

To avoid delays during project implementation, developers in various countries increasingly tend to anticipate EIA results and introduce basic environmental mitigation measures during the design of the project. Some even reserve specific budgets for this purpose. For example, in developing their

Box 16.2 Major limitations of EIA of infrastructure projects

- A first severe limitation of the current practice of EIA for road and rail projects is that it is generally restricted to a unimodal evaluation of technical infrastructure variants. This means that decisions taken prior to project design regarding the need for the infrastructure, the modal choice, the characteristic of a link (i.e. building new infrastructure, improving the capacity of existing infrastructure) and its routing are made with little or no consideration of environmental effects
- Another shortcoming of current practice is the application of the 'salami technique': a longer connection between two points is split up into various shorter projects, for each of which an EIA is made, often without looking at the cumulative effects of the complete link. Limiting the environmental assessment to small-scale projects also means that significant location alternatives for the route are not evaluated and compared. Often the implementation strategy is to start evaluating and building those parts with the least environmental problems and to leave the problem sections until last. At this point it is inconceivable that the project should be cancelled, and costly mitigation measures have to be devised to get the project accepted. Often, this also leads to infringements of existing legislation on nature protection
- The wide range of impacts and their different geographical scope also means that certain impacts cannot be addressed at project-level EIA. There are some environmental considerations that are more appropriately assessed at the systems planning level (e.g. network assessments), as this also allows for impacts on other modes and networks to be taken into account: for example, purpose and need, greenhouse effect, regional air quality, ecosystem analysis, watershed evaluations, social and community impacts, indirect and cumulative impacts. Congestion is another impact which typically requires a systems approach
- EIA is not sufficiently large in geographical scope to allow a comprehensive analysis of the geographical distribution of the cost and benefits of a certain project. Often, the network effects are such that an improvement or addition of a certain link can have much wider socio-economic and environmental impacts. Sometimes, an increase in environmental burden has to be accepted in a certain location, as it can lead to a decrease in traffic elsewhere. A typical example is a ring road around a city, which will of course engender significant environmental impacts but which can also lead to a decrease of urban traffic and hence improve the quality of life within the urban centre
- In terms of the local environment, the majority of transport infrastructure EIAs take into account 'abiotic' effects, i.e. noise and air pollution. However, aspects such as the effect of severance, visual impact and particularly loss of amenity are often treated in a much less detailed manner. The main reason for this is the lack of monitoring data, indicators and methods for quantification
- Cumulative and secondary developments induced by new infrastructure can have severe environmental impacts. Project-level EIA, however, seldom addresses these issues, as, again, these typically require a more strategic and integrated view
- As monitoring is still lacking in most EIA frameworks, national proceedings for project approval do not always ensure that the required mitigation measures are actually implemented, and their effectiveness is seldom tested

large-scale HSR connections, the French and Belgian railway companies reserve 10–15% of their project budgets for environmental mitigation measures (e.g. noise screens, isolation of houses, wildlife crossings, etc.).

However, current practice shows that infrastructure project EIA still has severe limitations and does not always provide sufficient information to alleviate public concerns. The major limitations of project EIA are listed in Box 16.2. They are mainly caused by the fact that road and rail infrastructure projects are part of a larger transport system. Infrastructure planning is a long-term activity, with various decision tiers, i.e. the longer-term infrastructure planning (e.g. multi-year national transport plans), regional infrastruc-

Box 16.3 The Vasco da Gama bridge: an example of ineffective infrastructure planning and EIA (Source: Melo 1996)

The decision to build a new motorway over the Tagus in Lisbon was taken in 1992 by the Ministry of Public Works, Transport and Communication. The project's location was decided after the evaluation of three different corridors, based on environmental, urban management, technical and economic feasibility and transport system aspects. These studies, which discarded the tunnel solution, compared three corridors for a new road bridge: eastern (Sacavém–Montijo), central (Chelas–Barreiro) and western (Algés–Trafaria). The selected Sacavém–Montijo route crosses a Special Protected Area (under the European Birds Directive), which is considered one of the 10 most important wetlands in Europe. The new road crossing is composed of one cable-stayed bridge, several viaducts and a series of access roads, that stretch over a total length of 17 km. The river section is 12 km long. In 1994, an EIA was undertaken which built upon a preliminary environmental study. The project is one of the most controversial public works ever undertaken in Portugal. It implies major impacts on wildlife (in particular, on bird and fish habitats), road traffic generation and agricultural land occupation by urban development

Official and independent reports showed that an alternative system would provoke far fewer impacts, would be more successful in solving transportation and development problems and would be less expensive. Despite this, the government approved the Sacavém–Montijo option in July 1992, a decision which was strongly opposed by environmental NGOs, who filed a number of lawsuits against the government and complaints before the European Commission

In 1994, the government submitted the project to the Cohesion Fund, and the European Commission imposed an EIA, which was prepared in 2 months and subject to a public hearing between July and September 1994. It received harsh criticism from the scientific community, from the NGOs and from governmental agencies. The Commission dismissed the complaints and approved the Cohesion Fund financing at the end of 1994. The NGO filed new suits for infringement of the European Directives on EIA, the Directive on Bird Protection and the Habitats Directive. Despite an appeal by the President of the Republic to the government to review the process, the contract with the developer was signed in June 1995. By then, dredging works had already begun. At the start of June 1995, the NGO denounced repeated violations of the environmental protection measures imposed by the contract, such as construction works during nesting season and dumping of contaminated dredged sediments in the middle of the estuary. No action was taken either by the Portuguese government or the European Commission

ture networks, transport corridor plans. Transport infrastructure projects are selected for implementation based on the needs identified in the systems plan. The 'strategic' infrastructure plans are generally developed without taking environmental impacts into consideration. In the longer term, this has often created problems as sometimes projects are being recommended that are very difficult, if not impossible, to implement because of unknown environmental consequences that could have been easily identified, considered and possibly avoided much earlier in the planning process. Thus, various examples can be found where projects with a demonstrated negative environmental impact still go ahead, even when socio-economically acceptable and less environmentally damaging alternatives are available (see Box 16.3).

16.4 STRATEGIC ENVIRONMENTAL ASSESSMENT OF TRANSPORT INFRASTRUCTURE PLANS

Internationally, there is a growing consensus that SEA is essential to ensure that environmental considerations are incorporated at all levels of decision-making, in order to overcome EIA limitations (discussed in Box 16.2) and to ensure a more sustainable development of transport systems. SEA is particularly useful in assisting decisions in a multimodal approach. It helps the environmental analysis to be structured and focused on the key environmental benefits and costs of each transport mode, comparing alternative planning and management options in an integrated way and providing decision makers with the relevant information to take the most sustainable decision.

Recent international reviews of the application of SEA in the transport sector demonstrate that examples can be found in various countries (OECD 1994; European Commission 1996b; European Conference of Transport Ministers 1997). Some recent cases are described in Box 16.4. These SEAs are, in most cases, undertaken on a voluntary basis. However, some countries have legal requirements for SEA of transport plans or policies. In Sweden, for example, SEA has been mandatory since 1992 for both national and regional long-term planning for road investments (Swedish National Road Administration 1995). In the USA, the Environmental Policy Statement of the Federal Highway Administration requires that consideration of environmental protection is included in all the agency's programmes, including infrastructure programmes.

Most SEA examples are to be found for road programmes. This can be explained by the fact that road transport and infrastructure have a very dominant position in most transport systems. The German *Bundesverkherwegeplan* is one of the very few multimodal assessment frameworks used to appraise the development of national transport infrastructure networks. In France, a multimodal approach to SEA is used for assessing transport options for large corridors, and methods are being developed for the assessment of the national road and rail master plans (Ministère de l'Environnement 1997). In Sweden, the development plans for railways and roads are totally separate, although covering the same time periods. This is also the case in many European countries and reflects the fact that plans are produced by the respective sectoral authorities. It clearly demonstrates the lack of coordination and consistency across modes which persists in many states.

On an international level, the European Commission undertook in 1992–1993 an SEA of the European HSR network, in which the environmental impact of the network was compared with those of motorways, aviation and conventional rail (European Commission 1993). At the time of writing, the Commission is developing a major SEA work programme within the scope of the development of the multimodal TEN. The work is following the provisions of the recent Community guidelines on the TEN, which require that the Commission develops methods for the SEA of the whole TEN and for corridor assessments (Commission of the European Communities 1996). In this context, the Commission is undertaking a pilot SEA of the whole multimodal TEN and various transport corridor assessments (in cooperation with the Member States). In addition, a methodological handbook is being developed, which will provide practical guidance for the carrying out of transport network and corridor assessments (European Commission 1997).

The scope of a transport SEA (the alternative options and impacts that are to be assessed) and the degree of detail of the assessment depend largely upon the level of planning and the (environmental, socio-economic and traffic) objectives by which the strategic action is led. The assessment of global/regional effects, such as climate change and acidification, are typically conducted at a high planning level (e.g. transport policy or network level), where options can include modal choices, infrastructure and non-infrastructure alternatives (e.g. traffic demand management, fiscal measures). In addition to assessing the direct impacts from transport systems, SEA should also address cumulative impacts and impacts from secondary developments, which at the project level are difficult to assess. More local effects, which also depend upon the local characteristics of the environment (noise, visual impact, etc.), are easier to assess at lower planning levels (e.g. corridor assessments), where the assessment would focus more on location alternatives and eventually technical variants, such as tunnels or cuttings (at project-level EIA).

Box 16.4 Some recent examples of SEA on different levels of transport planning (Source: European Conference of Ministers of Transport 1997)

Belgium/the Netherlands

Comparative study of HSR lines between Antwerp and Rotterdam (major route alternatives)

The first proposals for the location of the Belgian HSR lines were made by the Belgian railway company in 1990 and subsequently integrated into the regional plans. The route choice of the Antwerp–Rotterdam line subsequently became a long-running issue of political discussion between the two countries. Project EIAs by both countries resulted in conflicting preferences as regards the line's location. In 1994, both governments decided to conduct a transboundary corridor evaluation of the major routes, which includes an overall environmental assessment. A Bilateral Working Group was created, including officials and experts from both countries and various governmental authorities and the railway companies. The Group's main task consisted in conducting a comparative transboundary assessment (in terms of environment, spatial impact, traffic and construction costs) of the various route alternatives. In Belgium, the public consultation was conducted in the framework of the procedure for revision of the subregional plans; in the Netherlands, consultation and public participation had already been conducted in 1994 within the procedure of the 'physical planning core decision' (*Planologische kernbeslissing*). The case is especially interesting because of its transboundary character and because it involves the combining of two different planning procedures

Finland

Environmental assessment of the Finnish part of the 'Nordic Triangle'

The Nordic Triangle is the traffic network connecting the Nordic capitals. In Finland this includes the Turku–Helsinki–Vainikkala railway and its connections to essential harbours, the E18 highway, the most important south coast harbours, Helsinki–Vantaa airport and subsidiary functions. The SEA of the Finnish part of the Nordic Triangle was undertaken in 1995, at the request of the Ministry of Transport and Communications, and conducted by a task force. It offers a holistic view of development aspects and the interaction of different projects and enabled the identification of large-scale and cumulative effects

France

Intermodal proposal for the A7–A9 route

The study was commissioned by the Ministry of Works, Transport and Tourism. The aim was to identify the measures to alleviate predicted road traffic saturation on the A7 and A9 by the year 2010. The following types of measure were assessed: road construction, alternatives to road construction (coach and rail transport, combined transport and railways) and traffic operation measures. The SEA was conducted on three scenarios: a comparison between motorway and HSR, new motorway links and a comparison of road, rail and waterway options in terms of their effect on water protection, air pollution and safety

Germany

The federal traffic infrastructure plan (FTIP)

The FTIP, approved in 1992, is a long-term (1991–2012) development plan for transport infrastructure within the whole of the Federal Republic. It covers railways, trunk roads, waterways and air transport concepts which are a federal-level responsibility. The broad objectives of FTIP include the reconstruction and improvement of the transport infrastructure in the new Länder, the establishment of an HSR network, investment in road construction in the old Länder, elimination of bottlenecks in existing rail capacity and increasing air traffic capacities. The SEA procedure was managed by the Ministry of Transport and provides a means of assessing the relative economic and environmental effects brought about by the different modes of transport

(Continued)

Box 16.4 *continued*

The Netherlands
The Second Transport Structure Plan (STSP)

The STSP is a Cabinet document, developed by the Ministry of Housing, Physical Planning and the Environment and the Ministry of Transport and Public Works. The purpose of the SEA and the plan is to organize transport in the Netherlands in a way which minimizes energy consumption, land take and impacts on air quality. The output of the SEA directly affects the contents of the STSP and therefore the nature and the scope of the Dutch programme for transport infrastructure and the framework in which decisions are made concerning transport provisions at a regional and municipal level

Slovenia
Environmental appraisal of transport policy

In this project, the impact of an unchanged traffic policy scenario on the environment in the country as a whole was estimated by means of traffic models and environmental impact models, using geographical information systems (GIS). The theoretical potential for a policy shift leading to less pressure on the environment was described, and its effects on mobility and the environment estimated. In the same project, the environmental impact of the connection of Slovenia to Europe was estimated roughly, and the impact of a certain previously defined HSR route was estimated and compared to other routes. This SEA is especially interesting because Slovenia has good arrangements for EIA, and at present the need for reconsideration of its traffic policy is widely recognized. The SEA, which gives a quite rough analysis but has salient conclusions, may serve as a boost for the required public discussion, which is still a 'new' phenomenon in this new democracy. The preparation of this SEA was an initiative of the European Commission (PHARE programme)

UK
Setting forth: strategic assessment

The Scottish Office commissioned the SEA in order to determine the performance of various transport strategies (road and rail) in relation to environmental and transportation objectives. The objectives were related to sustainability which makes it possible to evaluate environmental changes associated with the various strategies within the context of sustainable development. The output of the SEA assisted in the development of the proposals which are currently the subject of an EIA

European Union
The SEA of the European HSR network

The first outline plan of the HSR network was published by the European Commission in December 1990. The plan covers the period up to 2010, and comprises the (at the time) 12 member states plus Austria and Switzerland. In all, the network consists of ±9800 km new lines and ±14 400 km upgraded existing lines. Following a Council Resolution of 1990, the SEA of the network was conducted in 1992. It was the first multimodal network SEA conducted at a European level. A comparative assessment was made of the environmental effects of the HSR network and of the other modes that are used for the long-distance transport of passengers (i.e. conventional rail, motorways, aviation). The evaluation of the impact was performed by comparing future scenarios 'with' and 'without' the HSR network

16.5 IMPACT PREDICTION METHODS AND TOOLS

As most countries have many years of EIA experience in relation to transport infrastructure projects, predictive methods and models are widely known and used. Guidelines and manuals on the topic have been issued by various authorities. (Spanish Government 1991; Department of Transport 1993). Case experience indicates that most of the analytical methods and techniques needed for SEA are also available either from project EIA or from policy appraisal/plan evaluation.

As identified earlier, in terms of the local environment, the majority of transport infrastructure EIAs take into account 'abiotic' effects, i.e. noise and air pollution. However, aspects such as the effects of severance, visual impact and, particularly, loss of amenity are often treated in a much less detailed manner. Yet it is these kinds of impacts that are often perceived as the most serious by the general public and the cause of public resistance to projects. The main reason for this is the lack of indicators and methods for quantification.

Another shortcoming of the current assessment tools is the discrepancy in availability of predictive tools and knowledge amongst the modes; an overwhelming majority of tools and research deals with road transport, but much less information is available for rail, aviation and inland waterways. This constitutes a limiting factor, especially in multi-modal comparisons, which are therefore still very rare.

A problem is the wide range of factors that determine the traffic and environmental impacts of road and rail infrastructure projects, and which are related to, among other things, the infrastructure characteristics (designs, materials); the vehicle type and design (engine capacity, technology, fuel use); the traffic demand and traffic volume (which are determined by various socio-economic conditions); the driving behaviour (such as speed and occupancy or loading rate); and the receiving environment (surrounding fauna and flora, population density, topography, soil types, etc.). These many underlying factors introduce inevitable uncertainties in impact predictions. Often, however, predictive modelling results are presented without an explanation and analysis of the underlying uncertainties, thus creating a false impression of accuracy. A possible solution for dealing with these uncertainties is sensitivity analysis, in which the influence of a number of key-parameters can be tested and demonstrated.

16.5.1 Traffic models

Forecasts of traffic flows and modal split can be performed at international, national or regional level. Most countries have national or regional traffic forecast models, linked to a monitoring system. For smaller infrastructure projects, often fairly simple approaches can be used, for example, an existing series of traffic surveys or extrapolations of regional models can suffice to make crude estimates of the traffic impacts of the project.

Traffic forecasting is a difficult and uncertain process. Traffic demand and growth are determined by a wide variety of socio-economic factors, such as socio-economic conditions, behaviour and lifestyle, car ownership, the presence of infrastructure and public transport services, etc. Because of these many underlying factors and their interactions, and because of the timescale which the models have to consider (national traffic predictions are typically made for a time horizon of 10–20 years), traffic predictions can be very complex and are inevitably subject to many uncertainties. Traffic growth furthermore varies from link to link, which cannot be predicted accurately on a national or regional level. Also, as different countries often use different variables in their national traffic models, the tools are often nontransferable from one country to another.

Methods and models for predicting road traffic are well developed and in use in many countries. Public transport models are in practice much less advanced, as it is computationally more complex than road modelling and data on capacity, frequency and occupancy and revenue are often difficult to obtain. Another problem is the prediction of induced traffic, i.e. the additional traffic that is engendered by new, or the extension of an existing, infrastructure, which not only draws away traffic from other modes or routes, but can also make travelling easier and more attractive. A recent study by the European Commission demonstrated the many differences in existing approaches, the inadequacy of various models to deal with this specific issue and a general lack of knowledge and monitoring data (European Commission 1996c).

16.5.2 Environmental models

Most countries have operational noise, emission and air quality models, and the integration of these with transport demand models is relatively simple. Again, tools are mainly available for road transport; models for rail impacts (energy consumption, noise) being often much more limited.

On an international level, the lack of harmonization of environmental models often hampers a transboundary approach.

16.5.3 Geographical information systems

A geographical information system (GIS) can be a powerful analysis and evaluation tool and also provides many possibilities for clearly visualizing the results of traffic and environmental models. Its zoning features and the possibility to confront various layers of information can provide interesting solutions (e.g. sensitivity mapping), in particular for those impacts which have a direct spatial component (see Chapter 9, Volume 1 for further discussion).

GIS is more and more being developed as a key component of SEA of infrastructure plans. It can provide a quick and responsive way of assessing, for example, an infrastructure network's impact on nature and biodiversity, architectural and cultural impacts and water resources. A methodological approach to the ecological assessment of the TEN and its corridors is presented by the Royal Society for the Protection of Birds (*Birdlife International* 1995). The method basically consists of defining buffer zones around infrastructure and calculating the share of protected bird habitats that falls within these. Additional indicators and assessment methods to evaluate the impact of the TEN have recently been developed by the European Environment Agency (European Environment Agency 1998). In France, a GIS method has been developed for the assessment of the French national (road and rail) master plans. The method uses GIS to calculate various types of land take and to evaluate the degree of fragmentation of areas of biological quality engendered by new infrastructure (Ministère de l'Environnement 1994). Belgium has developed a GIS evaluation system for new roads which is based upon the identification of sensitive zones.

However, the application of GIS depends largely on the availability of the underlying geographical, infrastructure and environmental data (at a local, regional, national or international level). For the evaluation of individual projects, the tool (and the data-collection activities related to its use) is often too expensive, and assessors revert to more conventional graphic techniques, using maps and the drawing board.

16.5.4 Other techniques

Methods of measuring barrier effects and community severance in relation to people's movement have not been fully established or validated, although research has been undertaken (Abbot *et al.* 1995). A measure of the number of people at risk of severance by, for example, a road scheme can be made by first defining target locations (shops, post offices, etc.) and then mapping their catchment areas. The population potentially affected by severance can be estimated from the dwellings in the portion of the catchment severed from the facility by the scheme, using geographical databases or survey data to infer the number of users of the facility (OECD 1997a).

In areas with especially sensitive landscapes, visual intrusion is always a central theme of debate, and evaluation will often be expressed less through formal techniques and more in the development of public opinion. For assessing the visual impact of a road or railway, mathematical techniques using the angle of incidence have also been developed, but assessments are generally based on a subjective evaluation of the impact, taking into account the type of landscape and the number of people affected within a surrounding visual envelope. Improved visualization methods create detailed before-and-after illustrations, even at the relatively early stages of design.

Traditionally, impacts on fauna have been expressed as road kills or, for large animals, crash risks. Assessments of impact on flora have centred on possible risks associated with the destruction of sensitive habitats. As the importance of protecting biological diversity has become topical, research has been directed to impacts on animals and plant populations. A basic indicator of risk, especially to endangered species, is loss and fragmentation of natural habitats and loss of pathways (or corridors) between habitats. There is, however, a lack of data on the long-term effects of different degrees of severity of fragmentation and on the effect of mitigation measures, such as ecoducts and green bridges.

Emerging technologies in model development and programme management provide new opportunities and tools for managing and evaluating transportation projects. Technological advances in computer hardware and software provide scope for innovative approaches in the collection of environmental data and the assessment of environmental impacts and for enhancing communication. Among these techniques are expert systems; satellite imagery processing and manipulation; visualization; virtual design and visualization technology; interactive video; management information systems; and Internet technologies. Finally, life-cycle analysis is another emerging technique (which however, still requires extensive research), in particular within the scope of multimodal assessments.

16.6 EVALUATION TECHNIQUES

The most commonly used methods for evaluating the impacts of an infrastructure project are cost–benefit analysis and multi-criteria analysis. There are also more simple approaches, such as matrices, interaction-diagrams and checklists that can be used. For evaluating the future impacts of strategic plans and policies, scenario analysis is often used.

16.6.1 Cost–benefit analysis (see Chapters 3 and 6, Volume 1, for general discussion)

When making decisions on infrastructure investment, choices have to be made between very different benefits or costs. CBA is the analysis of the various cost and benefits of a proposed project using a unified (monetary) value. This gives the policy makers the availability of one measure of environmental loss, a measure which can be used alongside the many indicators expressed in physical terms. The monetarization of environmental impacts is possible to a certain degree, but there is no consensus as to the range of impacts that should adopt monetary values (Hansson & Markham 1992; Quinet 1993). The detailed methods and values used vary considerably between countries which adopt this approach. Problems mainly relate to the valuing of environmental impacts, as scientific knowledge is still incomplete and cost evaluation is often performed in a subjective or political manner. When integrated into an overall CBA, the monetary valuation of environmental impacts also involves a risk of double counting, as it is often impossible to separate out the effects of the different variables, which are often mutually correlated. Also, there are important environmental issues which do not lend themselves to the discounting practices that are generally applied in CBA.

16.6.2 Multi-criteria analysis

Multi-criteria analysis (MCA) is a technique used to rank projects, by giving separate scores on a number of key evaluation criteria. Using mathematical operations, combinations of weights and criteria scores provide a ranking of options. The advantage of MCA over CBA is that it allows for the joint analysis of both environmental and financial costs, even when the environmental costs cannot be valued in monetary terms. MCA is a 'subjective' technique; weighting criteria are either chosen using expert judgement or dependent on policy objectives and targets; however, as identified in Chapters 3 and 8 in Volume 1, there is scope for the involvement of other stakeholders.

16.6.3 Scenario analysis

Scenario analysis is a technique which is typically applied for the evaluation of longer-term transport plans and is therefore particularly suitable for SEA. It allows alternative policy and infrastructure options to be combined into packages and comparison of these alternatives in order to obtain an indication of possible or extreme future developments and their environmental (and socio-economic) impacts.

16.7 MULTIMODAL COMPARISONS

Although the range of impacts of road and rail infrastructure and traffic are broadly the same, some significant differences must be noted (see Box 16.5). A multimodal assessment therefore requires specific assessment indicators and tech-

Box 16.5 Difference in impacts between road and rail infrastructure and traffic (Source: Carpenter 1994)

- Railway construction is generally faster and less damaging than road construction because:
  (i) The volume of earthwork and the width of bridges are less
  (ii) Track-laying and ballasting can be completed more quickly, in km per day, than road pavement construction
  (iii) The electrification and ancillary trackside equipment can also be erected quickly, using rail-mounted equipment
- An HSR railway alignment is less flexible than a motorway alignment; the maximum allowable gradient is 3.5% for rail and 5–6% for motorways. Also, an HSR needs larger curves because of its speed (4000–5000 m for 1000–15 000 radius)
- Railway lines are more economic in their land consumption. The width of two-track railway formation is only one-third of that of a six-lane motorway. However, because the alignment is less flexible, the height of the cutting and embankment needed in undulating country might be greater. Even so, the amount of construction activity per kilometre is usually less than half that for a motorway
- Rail noise (i.e. peak noise generation) is perceived differently from road noise, which is a continuous source of noise. Exposure to railway noise gives rise to less general annoyance than road traffic noise
- As they are typically intended to connect urban and communal centres, railways have to pass through and take land already fully devoted to established rural or urban activities. The stringent requirements for HSR on curves and gradients materially affect the choice of route alignment and make small deviations to save particular land resources difficult. Roads, on the other hand, have more planning flexibility to avoid densely populated centres or sensitive nature zones
- The visual impact of an HSR line can be more severe than that of a two-lane motorway, since the HSR line is—for security reasons—fenced in. Also the overhead transmission infrastructure increases the visual intrusion effect
- The access to major railway infrastructure (such as HSR lines) is limited to stations, which are generally located at large distances. This means that direct access to inhabitants living in the regions the HSR passes through is more limited than for motorways (which has access points at, e.g. every 20 km)
- Electrical trains do not cause a direct impact on ambient air quality; emissions of air pollutants are, however, produced by the electricity plants, which, when fed with fossil fuels, can be a major point source of emissions

niques, as it differs in scope (impacts and alternatives to be considered) from a unimodal assessment.

A straightforward example is the prediction of the impacts on ambient air quality. When comparing air pollution caused by electric rail traffic and road traffic, it will generally not be feasible to use changes in air quality as an indicator, as this would require the comparison of the local and regional impacts from line emission sources (road traffic) and those of large point sources (electricity plants). In most multimodal assessments, emissions are therefore taken as an indicator. This also implies a limited form of life-cycle assessment, as the emission estimates have to take into account the energy consumption and emissions due to the production of fuels and electricity, vehicles and infrastructure. For impacts such as noise nuisance, visual intrusion and barrier effects, solutions are less obvious and proper indicators need to be agreed.

It is often accepted that, for comparable traffic levels, the environmental impact is significantly more negative for road than for rail transport. This assertion needs some qualification, however, as there are at present no significant quantified global comparisons except for pollutant and noise emissions (Carpenter 1994). The conditions for the comparison need to be clearly established, for example, by studying the modifications to environmental impact brought about by a switch from one mode to another. One difficulty with such comparisons stems from the fact that they virtually never consider the complete transport sequence from point of origin to point of destination.

16.8 MITIGATION AND COMPENSATION MEASURES

To be effective, mitigation measures have to be considered at the various tiers of infrastructure planning and have to address both the infrastructure design and the traffic that will use it. In practice, mitigation at project level consists mostly of adapting the technical design and the materials of the infrastructure so that disturbance is avoided or minimized. Measures can also be taken in the surroundings areas to limit disturbance (e.g. noise isolation of houses in the vicinity of the infrastructure). Some examples of infrastructure measures to prevent or limit damage are listed in Box 16.6. Certain protective measures may sometimes only be required for the construction period. However, as monitoring is still lacking in most EIA frameworks, project approval does not always ensure that the required mitigation measures are actually implemented and their effectiveness is seldom tested.

In urban and mountainous areas especially, tunnels are often the only environmentally acceptable (although extremely expensive) solution for road and rail infrastructure. Tunnels provide an effective solution for visual and noise pollution, for protecting designated areas and reducing (or avoiding) the barrier effect. Tunnel building and maintenance have, of course, certain environmental impacts, as tunnels require escape exits and ventilation shafts at regular distances and access routes are necessary for reasons of maintenance or emergencies. Cuttings form a much less expensive solution and can be effective for noise and visual impact, provided that the proper crossings (at ground level) are foreseen.

Often, a well-balanced route and alignment choice can avoid expensive technical mitigation measures at project level. As a rule, sensitive areas should be avoided where possible in planning new routes for roads and rail. Also, at a routing level, the use of existing transport corridors provides a means of mitigating certain impacts, i.e. by using space within or adjacent to existing transport infrastructure, thus making efficient use of land and minimizing new impacts on unspoilt countryside. Major gains can be achieved if the planning of roads and railways is coordinated with other landscape planning, such as natural and cultural environment programmes. Coordination should also take place between the design of the road and the work on municipal land-use plans.

Box 16.6 Project level mitigation measures (Source: Swedish National Road Administration 1995)

- Use of sustainable transport modes (e.g. inland waterways, rail) for the transport of materials during the construction phase
- Cuttings, i.e. adaptation of the elevation of the road/rail to better correspond to the form of the landscape
- Noise dampening measures, such as screening with embankments or screens, changing to triple glazing, antinoise road paving, speed reduction, redirection of heavy traffic
- The use of filter sheets to prevent turbidity when working in water near fish spawning areas
- The reinstatement of fish spawning areas, batrachia, etc.
- Underpasses for animals, for example where there are wildlife trails
- Wildlife fencing, clearance of vegetation to provide a clear view and speed reductions to reduce the risk of accidents
- Adaptation of the road, on a plane and in profile, so that it does not affect the quality or level of the groundwater
- Local management of storm water, construction or use of broad irrigation areas for the filtration of pollutants
- Special protection measures, such as reinforced crash barriers, impervious ditches with collection points, speed reductions in the vicinity of sources of water supply
- The construction of tunnels where sensitive areas cannot be avoided
- The use of designated lanes, such as high occupancy lanes (which only allow access to vehicles with two or more passengers) or lanes reserved for public transport or freight transport

Traffic management (i.e. measures designed to influence the modal choice and the choice of routes) and traffic demand management (aimed at the reduction of the traffic volume or of its growth) can have considerable potential in terms of reducing traffic congestion and the effects of traffic on the environment. There is now a wide range of techniques for promoting public transport, managing and limiting the use of private vehicles and encouraging other modes of transport, such as walking and two-wheeled vehicles. These techniques range from regulatory and physical traffic controls to pricing and economic incentives, as well as informational, organizational and planning instruments. Demand management reduces the need for travel by adapted urban planning, promoting new communications technologies, and developing more efficient packaging and delivery of goods, etc.

To be effective, traffic management and demand management measures must be integrated in a coherent package in order to maximize the effects of the individual measures. However, these measures are seldom applied to individual projects, as a project developer will generally not have the authority, for example, to impose a comprehensive traffic scheme or to make investments in public transport. Also, the application of such measures often proves to be politically difficult, as it requires a strategic approach and cooperation between various actors and interest groups.

Because of the varying nature of the infrastructure and traffic impacts, including environmental and safety impacts, some mitigation measures can lead to conflicting results. For example, as speed is a major determining factor associated both with accident risk and with air pollution, it is possible to reduce simultaneously the number of road fatalities and the emissions of certain pollutants. However, as the emission rates of a car are not linearly related to its speed, some emissions can increase with lower speeds. Another example is roadside trees; when planted too close to the carriage these are fatal obstacles for a car which leaves the road. Noise barriers can create severance effects or visual intrusion. Fencing along motorways and HSR lines creates a severance effect for animals. Salting of roads improves winter traffic and safety conditions, but may be harmful to soil and water. The use of porous asphalt on motorways increases safety (rapid drainage of surface water during rain) and leads to noticeable reduction in vehicle noise. It does, however, appear that such a road surface may cause motorists to increase their speeds (OECD 1997a).

Box 16.7 Examples of project-level compensation measures (Source: Swedish National Road Administration, 1995)

- Archaeological investigations in connection with the construction works
- Environmental protection measures at some other site in the vicinity
- Replacing areas lost for fixed facilities or outdoor recreational activities
- Supplementary planting to replace vegetation removed
- Digging-up and moving plants of special value
- Creating new water holes for wildlife
- Moving items such as milestones which would otherwise be damaged
- Designing a retention reservoir as an area of wetland

Examples of compensatory measures (see Box 16.7) include compensating for losses or severance of habitats and biotopes by creating an equivalent or other biotope elsewhere. For example, an area of forest land which has been destroyed by road or rail building may be replaced by an area of wetland elsewhere.

16.9 PUBLIC PARTICIPATION

In most societies, mobility is both highly valued personally and essential for social and economic reasons, and involves a wide range of interest groups and stakeholders. People and communities therefore need to be engaged fully in the decision-making process about sustainable transportation and empowered to participate. In order to do this, it is important that they are given adequate and appropriate resources and support, including information about the issues involved, as well as the benefits and costs of the potential alternatives.

EIA has the role of informing the public about transportation options and impacts and encouraging them to participate in decision-making, so that the needs of different communities (i.e. rural versus urban; cyclists versus drivers, etc.) can be understood and accounted for. Substantial mobilization of local communities against large-scale projects is sometimes evident preceding the EIA, for example in the UK in relation to the Channel Tunnel rail link.

The involvement of the public is often particularly difficult for large-scale road and rail infrastructure projects, as their planning involves various stakeholders (industry, agriculture, households, business and services), with often conflicting interests. However, instead of comparing a broad range of alternatives against common criteria, traditional methods and procedures for infrastructure evaluation often pit supporters of one alternative against those of another. As a result, public involvement processes intended to help resolve controversial issues often lead to polarization, forcing decision makers to side with one position or another.

Another problem is the fact that the public which is most directly affected by the environmental impacts of an infrastructure project is not always the main user. A new HSR line, for example, will cause environmental problems in all the communities it passes through, but, as it is targeted at long-distance traffic and only has access stations at major cities, it is often less accessible for these communities. As a result, people tend to only perceive the negative and local costs of the project, as they cannot relate directly to its benefits. In these cases, it is important, for example, to improve access to the infrastructure through the secondary networks (e.g. improve connections via conventional rail, buses, etc.).

16.10 INSTITUTIONAL AND POLITICAL BARRIERS

One of the major factors hampering the integration of environmental issues at the various levels of transport infrastructure planning is the current institutional and administrative structure and, in particular, the fragmentation of policy responsibilities across transport, environment, energy, finance and regional development ministries/departments and central, regional and local governments. Also, in most countries, transport ministries are still divided into modal sectors, with separate planning departments and administrations for road, rail, aviation and inland waterway transport. This constitutes a severe barrier to a more integrated, multimodal planning approach, as each administration will generally manage its own budgets and develop independently, with little (sometimes no) coordination. A more coherent approach and better coordination would help to avoid the many examples where measures aimed at developing the transport sector, improving the environment and traffic safety have been in conflict with others.

Sound infrastructure planning is also hampered by differences in planning (and assessment) procedures. Countries tend to have a typically nationalistic approach to infrastructure planning, and cooperation between authorities is often difficult or lacking, even in cases where a transboundary infrastructure is concerned.

Finally, infrastructure planning is often not as straightforward as theory would suggest. Political influences often determine the choice and design of projects. Enhancement of EIA at all planning stages could help to counteract this, as public participation generally introduces greater transparency into decision-making procedures.

16.11 THE NECESSITY OF SUSTAINABLE TRANSPORT FRAMEWORKS AND TARGETS

It is clear that the application of project EIA, together with other environmental and transport regulations and policies (relating to new vehicle standards, fuel saving, fuel quality and traffic management), has introduced significant improvements into infrastructure planning and design. However, because of the dramatic growth in road transport and increasing car ownership and vehicle capacity, these gains have been more than offset. In most countries, current trends point away from sustainability.

The main conclusion from the present overview is that the effectiveness of EIA as a tool to promote sustainable transport development can be much improved by a more integrated and strategic approach. As the definition of sustainable transport depends upon the socio-economic and environmental conditions of a country or region, there is clearly no unique way to achieve sustainable transportation systems. However, it is agreed generally that a common framework for action is necessary. Through its ongoing project on Environmentally Sustainable Transport (EST), the Organization for Economic Cooperation and Development (OECD) (1997b) defined sustainable transport as:

> Transport that does not endanger public health or ecosystems and meets needs for access consistent with (a) sustainable use of renewable resources at below their rates of regeneration, and (b) use of nonrenewable resources at below the rates of development of renewable substitutes.

In the same context, the OECD also developed a series of 'sustainable transport principles' that might serve to guide transport and environmental policy making, planning and related assessments (see Box 16.8).

However, the implementation of sustainability principles requires a set of clearly defined sustainability objectives and targets. In this respect, more and more countries realize that traffic reduction targets have to become one of the cornerstones of national, regional and local transport strategies and evaluation frameworks (for example, the UK's 1997 Road Traffic Reduction Act). Measurable objectives would allow the evaluation of progress toward sustainable development. Traffic targets can be formulated as, for example:

- traffic reduction targets (or growth reduction targets) for the whole traffic system of a certain country or region;
- a target relating to a particular transport mode, e.g. road traffic;
- a target related to the modal share of the transport system, e.g. shifting a certain percentage of passenger or freight traffic to rail;
- a target relating to a particular time of day or to a certain season, e.g. reducing peak hour traffic;
- targets related to certain areas, e.g. reduction of road traffic in cities, reduction of transit road traffic in sensitive areas, such as the Alpine crossings;
- a target relating to particular types of traffic, e.g. commuter traffic or journeys to school.

Sectoral environmental targets (e.g. emission reduction targets) can also assist in focusing the efforts of the transport sector upon its key environmental impacts.

The main challenge in the development of sustainable transport systems is to find ways of meeting the transport needs that are environmentally sound, socially equitable and economically viable. Achieving a proper modal balance is therefore a primary issue. Another prerequisite is the focusing of transport planning on accessibility objectives, and not merely on mobility. Sustainable accessibility can be realized through various non-infrastructure measures; i.e. by reducing the need for motor vehicle trips and shortening the trip lengths through sound urban and rural development (mixing of functions); the improvement of the public transport system; information and raising of awareness, etc. The increasing use of telecommunications provides additional perspectives for more sustainable forms of accessibility.

16.12 CONCLUSIONS

This chapter has shown that EIA practice for road and rail infrastructure projects is well established and has a demonstrated, though limited, effects. One of the most immediate affects of linking EIA to infrastructure project approval is that it generally leads to the addition of mitigation and compensation measures to the infrastructure design and implementation. Another effect is that EIA procedures generally provide a more consistent and informed platform for public participation and the involvement of various interest groups.

Tools and methods are fairly well established, although to a greater extent for road than for rail assessments. There are deficiencies in monitoring effectiveness of certain mitigation measures and also in the evaluation of biotic impacts.

Current practice indicates that EIA of linear infrastructure projects still has severe limitations. These are mainly caused by the fact that such projects constitute part of a larger transport

Box 16.8 OECD guiding principles for sustainable transport systems (Source: OECD 1997b)

Theme	Guiding principles
Access	Access to people, places, goods and services is important to the social and economic well being of communities. Transportation is a key means, but not the only means, through which access can be achieved ● *Principle 1: Access*. People are entitled to reasonable access to other people, places, goods and services, as well as responsible information that empowers them towards sustainable transportation
People and communities	Transportation systems are a critical element of a strong economy, but can also contribute directly to building community and enhancing quality of life ● *Principle 2: Equity*. Nation states and the transportation community must strive to ensure social, inter-regional and intergenerational equity, meeting the basic transportation-related needs of all people, including women, the poor, the rural and the disabled. Developed economies must work in partnership with developing economies in fostering practices of sustainable transportation ● *Principle 3: Individual and community responsibility*. All individuals and communities have a responsibility to act as stewards of the natural environment, undertaking to make sustainable choices with regard to personal movement and consumption ● *Principle 4: Health and safety*. Transportation systems should be designed and operated in a way that protects the health (physical, mental and social well-being) and safety of all people and enhances the quality of life in communities ● *Principle 5: Education and public participation*. People and communities need to be fully engaged in the decision-making process about sustainable transportation and empowered to participate. In order to do this, it is important that they be given adequate and appropriate resources and support, including information, about the issues involved, as well as the benefits and costs of the array of potential alternatives ● *Principle 6: Integrated planning*. Transportation decision makers have a responsibility to pursue more integrated approaches to planning ● *Principle 7: Land and resource use*. Communities should be designed to encourage sustainable transportation and enhance access, as a contribution to providing comfortable and congenial environments for living. Transportation systems must make efficient use of land and other natural resources while ensuring the preservation of vital habitats and other requirements for maintaining biodiversity
Environmental quality	Human activities can overload the environment's finite capacity to absorb waste, physically modify or destroy habitats and use resources more rapidly than they can be regenerated or replaced. Efforts must be made to develop transportation systems that minimize physical and biological stress, staying within the assimilative and regenerative capacities of ecosystems and respecting the habitat requirements of other species ● *Principle 8: Pollution prevention*. Transportation needs must be met without generating emissions that threaten public health, global climate, biological diversity or the integrity of essential ecological processes
Economic viability	Sustainable transportation systems must be cost effective. If adjustment costs are incurred in the transition to more sustainable transportation systems they should be equitably shared, just as current costs should be more equitably shared ● *Principle 9: Economic well-being*. Taxation and economic policies should work for, and not against, sustainable transportation, which should be seen as contributing to improvements in economic and community well-being. Market mechanisms should support fuller cost accounting, reflecting the true social, economic and environmental costs, both present and future, in order to ensure users pay an equitable share of costs

system. Internationally, there is a growing consensus that SEA is essential to ensure that environmental considerations are incorporated at all levels of decision-making. The effectiveness of environmental assessment as a tool to promote sustainable transport development could be much improved by a more integrated and strategic approach. There needs to be better coordination of environmental assessments with socio-economic, spatial and financial evaluations. Transport infrastructure planning needs to be integrated in a more effective way with regional development planning and local land-use planning. Improved coordination and cooperation at the institutional level are a prerequisite in this regard.

Evaluation frameworks should be consistent with the principles and objectives of sustainable transport planning. This implies a move away from the supply (infrastructure) orientated planning culture that still exists in many countries and the development of integrated strategies to reduce the road transport demand, without decreasing the accessibility of information and of socio-economic functions and services. Obviously, this is a long-term objective, as it would require a significant change in current transport planning systems. The practice of EIA (in particular at a strategic level) should stimulate and support such a change in thinking.

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17: Environmental Impact Assessment for Energy Projects

THOMAS RUSSO

17.1 INTRODUCTION

Energy projects pose a number of significant challenges to the environmental impact assessment (EIA) practitioner, despite the fact that many assessments have been prepared over the years. When examining previous EIAs, the challenge for the practitioner in many cases is the difficulty of separating the utility of the EIA approach from controversies associated with the proposed project. Another challenge is sorting through the large volume of information available on all facets of EIA, from scoping to detailed methodologies. Indeed, the practitioner may conclude that one only has to follow the same series of steps that were used to prepare an adequate EIA on the previous project in his or her country or region. Nothing could be further from the truth. In fact, viewing EIA of energy projects as such is simply a 'prescription for failure' in the long run. The products of such EIA exercises are voluminous and burdensome documents that confuse and confound rather than assist decision makers, investors and affected people.

Conducting EIA on energy projects has become very complicated. Part of the complication arises as a result of more educated and knowledgeable groups of participants who have experienced first hand the results of poorly planned and executed energy projects (Abacos & Ortalano 1988; IUCN & World Bank 1997). These participants and their increased knowledge of EIA since the late 1960s are demanding more relevant EIAs and open and transparent regulatory structures to evaluate proposed energy projects and ensure sustainable energy development. Finally, we must add the fact that global competition and privatization of the electric and natural gas industries are proceeding at an unprecedented rate and that the private sector will play an increased role in global energy development (Roseman & Mahorta 1996; Kerber 1997).

EIA practitioners can draw on almost 30 years of experience in conducting EIA on energy sector projects. The problem in relying solely on past experience is that the world has changed dramatically in the last 5 years. These changes present new challenges to the EIA practitioner today and in the future. For this reason, the goal of this chapter is not merely to identify good practice, but to help the reader to begin to fundamentally rethink EIA and to seriously question EIA practices. The ultimate goal of such an exercise is to achieve dramatic improvements in analysis and decision-making that lead to significant protection, mitigation and enhancement of environmental and social resources. The chapter also raises the need for a new and, perhaps, to some, a radical redesign and approach to EIA and decision-making. The author's goal is not solely to present a new approach. Those readers who are looking for pragmatic approaches that have been successful in preparing EIAs around the world should not be disappointed. The chapter discusses characteristics of energy projects, fuel cycles and regulatory structures, as well as analysis of environmental impacts and mitigation. All of these factors affect what EIA approaches are appropriate in a given situation

In the author's opinion, there is no perfect EIA for an energy project, despite the efforts of some very intelligent people and organizations who have spent large amounts of time and money preparing institutional guidance and hundreds of

EIAs on a variety of projects. Hence, instead of seeking the 'ideal EIA', the author has identified specific aspects from a wide variety of EIAs that illustrate good practice. The hope is that, through such a patchwork, the EIA practitioner will be able to fashion an EIA process that captures the principles outlined in Volume 1, and prepare a good EIA that is useful for decision makers and managers over the life of the project.

The term 'decision maker', however, requires some definition, since it is used very broadly in this chapter. Certainly, individuals who have the responsibility to authorize the project are included in the definition. However, decision makers also include individuals and organizations who will design and implement environmental mitigation, as well as the project proponent and those responsible for the construction, operation and maintenance of the project throughout its life. In addition, governmental organizations, indigenous peoples, non-governmental organizations (NGOs) and lenders also are decision makers as they will decide whether to support or oppose the proposed project with capital and other resources. The above definition is consistent with the author's strong belief that energy projects require sufficient capital and resources over the life of a project. Hence, the EIA must not be forgotten once the decision on the project has been made, but should be an 'adaptive' document rather than 'final' (Burton *et al.* 1981; Quintero 1997). Indeed, a good EIA should set the stage for what needs to be accomplished to avoid and minimize environmental and social impacts over the life of the project (Lee & McCourt 1997).

17.2 TYPES OF ENERGY PROJECTS

The energy projects discussed here fall into two general categories: electrical energy, and energy transport and storage projects. The electrical energy projects include the familiar coal, natural gas and biomass-fired electric generating plants, as well as cogeneration plants. Others include hydropower, geothermal, wind, solar and fuel cells powered by hydrogen, natural gas or propane. Energy transport projects include electric transmission lines and natural gas and oil pipelines, as well as liquefied natural gas (LNG) terminals.

Table 17.1 Sustainability and energy projects (modified from Goodland 1993).

Best	
1 Solar	Renewable and sustainable
2 Photovoltaics	
3 Wind	
4 Tidal and waves	
5 Biomass (= alcohol)	
6 Efficiency and conservation	
7 Hydropower	Potentially sustainable
8 Fuel cells	
9 Geothermal	
10 Gas	Non-renewable and unsustainable
11 Coal	
12 Nuclear	
Worst	

Goodland (1993) ranked energy projects according to their potential impacts and sustainability and whether they are renewable resources (Table 17.1). While this categorization is useful to orientate us with respect to EIA globally, there are many variables that can change the rankings or make them entirely irrelevant. For example, countries in arid areas with rich sources of oil may develop natural-gas fired combined cycle or combustion turbine electric energy projects. From their perspective, this might appear feasible when the alternative may be to flare the gas at the well site. Also, the distribution of hydropower, wind, geothermal and biomass resource potential is generally distributed unequally.

Another aspect of energy projects that can help the EIA practitioner gain some insight on selecting alternatives and in carrying out an analysis is the net overall electric efficiencies and heat efficiencies of different power plant types (Fig. 17.1). Dehli (1997) points out that hydropower projects and fuel cells are the most efficient in converting mechanical and chemical energy, respectively, into electrical energy. Combustion turbines, however, are making great strides in this area, with some technologies capable of breaking the 60% thermal efficiency barrier (General Electric Corporation 1998).

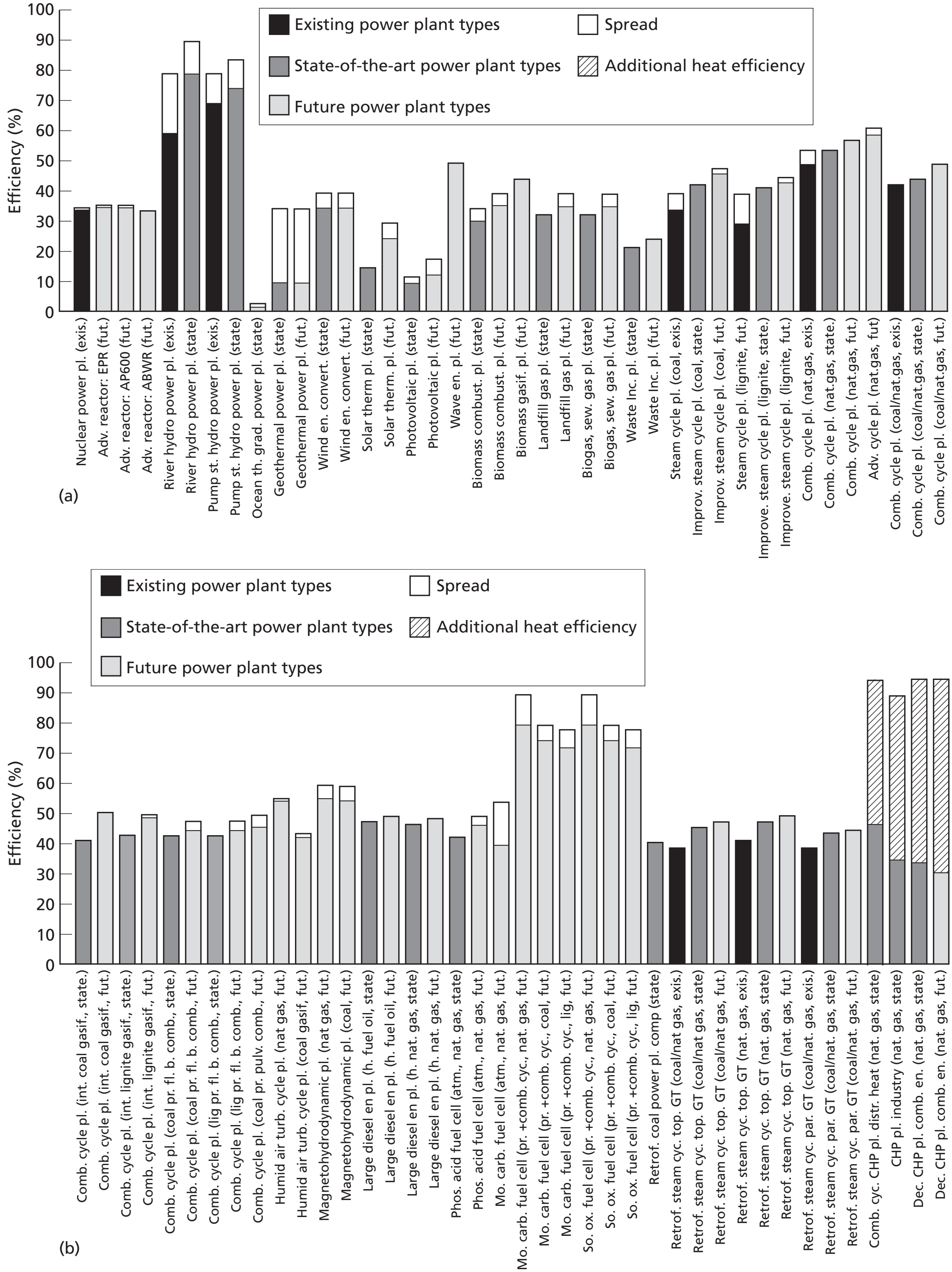

Fig. 17.1 Net overall electrical efficiences and additional heat efficiences of different power plant types (based on Dehli 1997).

The quality of fuel used in coal-fired electric energy projects can also spell the difference between severe air quality and water quality problems. For example, coal that has a high sulphur and ash content will not only release sulphur oxides (SO_x) into the atmosphere, but require washing prior to being used in a coal plant. Washing the coal and subsequent disposal of the ash may contaminate other land and water resources.

The EIA practitioner will be faced with a wide variety of energy production systems associated with electricity. While specific expertise in a given technology is not imperative, a thorough knowledge of the characteristics of the energy systems will generally assist the EIA practitioner in determining impacts and also determining whether an alternative energy system is reasonable (Edison Electric Institute 1984). General knowledge of the energy systems is imperative if the practitioner does not have an engineering background. An overview of the energy production systems associated with electricity shows how complex energy systems can be for coal (Table 17.2).

The EIA practitioner may think of energy projects as 'pure plays', that is, the project produces or transmits energy and these are the only other benefits or opportunities. This is not the case for every type of energy project. For example, some of the earliest hydropower projects constructed in the USA, Europe and Canada in the early 1900s began as pure play energy projects, but over the course of more than 50 years the projects now provide multiple benefits, such as flood control, irrigation, water supply, fish and wildlife habitat, cooling water for coal- and nuclear-fired energy projects and recreational use (American Society of Civil Engineers 1997). Other projects, like the Glen Canyon Project on the Colorado River, were

Table 17.2 Energy production systems associated with electricity (modified from International Atomic Energy Agency 1992).

Energy group	Energy source	Energy system
Fossil fuel	Coal	Direct coal combustion
		Pressurized fluidized bed combustion
		Atmospheric fluidized bed combustion
		Coal gasification
		MHD
	Oil	Direct oil combustion
	Natural gas	Gas steam boiler
		Gas turbine
		Fuel cell
	Peat	
	Oil shale	
	Tar sands	
Nuclear		PWR
		BWR
		Candu
		HTR
Renewables	Hydropower	Run of river
		Conventional storage
		Pumped storage
	Geothermal	Conventional binary
	Solar—photovoltaic	Central tower
	Solar—thermal	
	Wind	
	Biomass	Harvesting energy crops
	Waste incineration	

BWR, boiling-water reactor; HTR, high temperature reactor; MHD, magnetohydrodynamics; PWR, pressurized-water reactor.

constructed to provide irrigation benefits. The revenues from sale of hydroelectric power generation have been used to pay for these irrigation benefits (Palmer 1997). Cogeneration projects will also be encountered and should be viewed as viable alternatives when electric energy and LNG terminal projects are being contemplated for industrial users. Cogeneration projects use steam or hot water, the byproducts of an industrial process to produce electricity. Some energy projects are multipurpose from conception, but others may become multipurpose over time. While this complicates EIA for both practitioner and decision makers, it also challenges the analyst to develop mitigation programmes that increase benefits to participants that may arise over the life of projects.

Electric transmission line and natural gas/oil pipeline projects are not only distinguishable by the fundamental differences in the physics of electricity and natural gas/oil, but by the conduits that transmit them. For the most part, natural gas will flow from point A to point B with few problems associated with back flow or loop flows. The flow of electricity is similar in a linear system, but things change rapidly in an interconnected system. The electricity transmitted from a hypothetical power plant is indistinguishable from the electricity generated by other power plants. In other words, we do not have any idea where the power produced from our hypothetical power plant will end up (Pierce 1994). The relevance of the latter may not seem obvious at first glance, but is very important in defining what constitutes the proposed energy project. For example, if a geothermal project is being proposed and electric power will be transmitted into an existing 700 km long interconnected transmission system, should the EIA practitioner analyse the 700 km transmission line or a portion of the line? This question is addressed in greater detail in Section 17.4.5.

17.3 CHARACTERISTICS OF ENERGY PROJECTS

EIA practitioners need to focus on the complete life cycle of the energy facilities they are evaluating and specifically address strategically the fuel cycle associated with a proposed facility. Despite the different kinds of energy projects that the EIA practitioner will face, there are generally a number of characteristics that are common to all. As illustrated in Figs 17.2–17.4, these characteristics

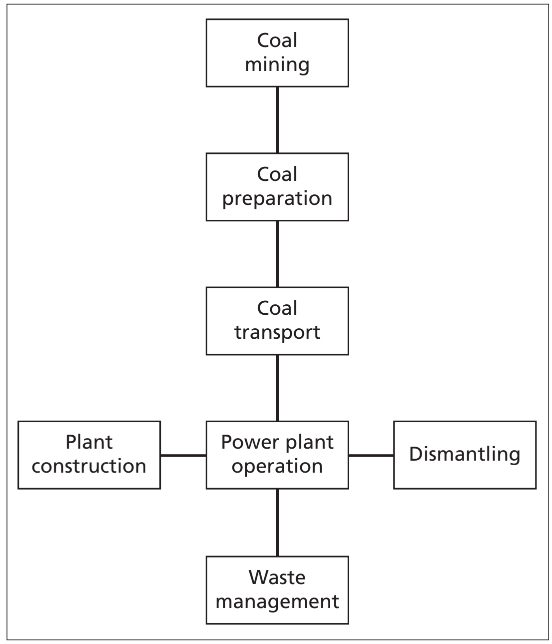

Fig. 17.2 The coal fuel cycle (based on International Atomic Energy Commission 1992).

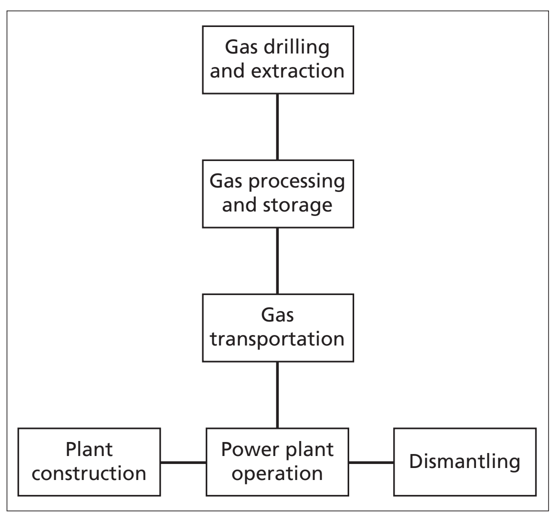

Fig. 17.3 The gas fuel cycle (based on International Atomic Energy Commission 1992).

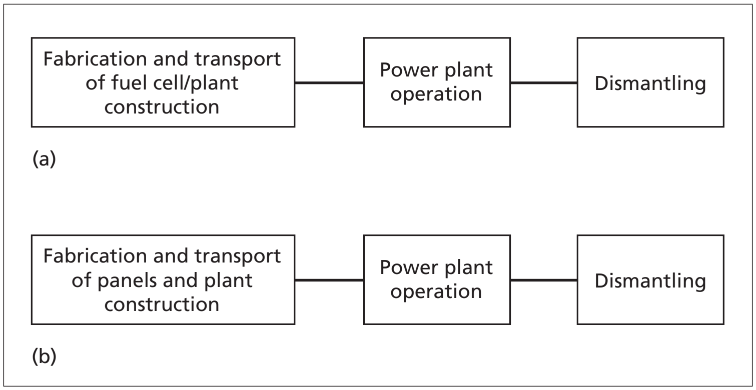

Fig. 17.4 The (a) photovoltaic and (b) solar (thermal) fuel cycle (based on: International Atomic Energy Agency 1992).

Table 17.3 Daily fuel use and emissions from typical 450 MW power station (source: Serchuk & Means 1997).

	Fuel used (t)	Energy efficiency (%)	Solid waste (t)	Waste heat (GWh)	SO_x emitted (t)	NO_x emitted (t)	CO_x emitted (t)
Conventional coal	3657.6	38.0	457.2	17	76.2	10.2–35.6	9144.0
Coal with 90% FGD	3708.4	37.5	599.4	17	8.1	10.2–35.6	9245.6
Conventional oil	2286.0	39.0	1.0	17	172.7	7.1–15.2	7620.0
Oil with 90% FGD	2316.5	38.5	304.8	17	17.3	7.1–15.2	7721.6
Conventional gas	2133.6	40.0	0.0	16	0.0	3.0–15.2	6096.0
Combined cycle gas	1778.0	48.0	0.0	13	0.0	2.0–10.2	4572.0

CO_x, carbon oxides; FDG, flue gas desulphurization; GWh, gigawatt hours; NO_x, nitrogen oxides; SO_x, sulphur oxides.

are: (i) extraction/harvesting/collection of the fuel; (ii) preparation of the fuel; (iii) transportation of the fuel to a power generating site or plant; (iv) plant construction; (v) plant operation; (vi) waste management; and (vii) decommissioning. These characteristics should dictate the types of analysis undertaken and specifically the mitigation to reduce or eliminate project impacts. Looking at various fuel cycles can help organize EIAs of various energy projects, as well as illustrating some of the important characteristics. In assessing various energy project proposals the pertinent fuel cycle should be factored into the analysis. Failure to do so will result in a biased analysis. For example, failure to consider the source of coal, its extraction and transportation and associated impacts on land and water may give the impression that the only significant impacts are on air quality. Even a brief discussion of whether the coal mining was deep-mine or surface would give decision makers an idea of impacts to land and water from the mining activities.

Another aspect of the fuel cycle that the EIA should focus on is the fuel characteristics. For fossil fuels, these include:

- caloric value;
- moisture content;
- ash content;
- sulphur content;
- carbon content;
- trace metals;
- impurities;
- tar content.

Knowledge of the quality of the fuel often provides additional insight into whether a higher quality might offset costly scrubbers or additional preparation and waste disposal activities associated with a poor quality fuel (Table 17.3). For example, a fuel with lower caloric value might be preferable to one with a higher sulphur content if

SO_x and acid rain were considerations. In addition, an entirely different fuel, such as natural gas, might be substituted in one of the generating units of the coal-fired electric project (Serchuk & Means 1997).

Most energy projects are long-lived assets. Once constructed, they are usually in place for at least 35 years and, for some such as hydropower projects, up to 100 years, assuming that they are adequately designed and maintained (American Society of Civil Engineers 1997). EIAs spend a great deal of time and effort focusing on the immediate construction related impacts on the environment and human environment. Few EIAs devote sufficient attention to the operational aspects of the projects, let alone mitigation measures to eliminate or reduce operational impacts. This is a great oversight given the fact that few countries have strong programmes to revisit energy projects periodically to ensure that their operations are conforming to current standards of environmental quality or the public interest. Coal plants and gas fired combustion turbines generally have a life expectancy of about 25–35 years, while hydropower projects generally can operate for at least 50 years or longer. Some hydropower projects in the USA have been operating for at least 75 years or more. Generally, at the end of their life cycles, most energy plants are either refurbished using the same fuel or with a fuel that has economic and/or environmental advantages. The same is true for hydropower projects, which, generally at the end of the first 50 years, have little or no debt service. Advances, which include computerized operating systems, increased efficiency and lower operating costs of new coal, gas and hydropower turbines and generators, ensure that most energy projects undergo refurbishment and substantial life extensions.

17.4 UNCOMMON ISSUES

The relevant issues associated with analysing the environmental impacts of energy projects can be divided into several categories: (i) regulatory structures; (ii) environmental and mitigation/enhancement analysis; (iii) implementation and compliance; (iv) project proposal definition; and (v) decommissioning. As will be apparent from the following discussion, there is considerable overlap between these categories. In keeping with the other chapters in this Part of the Handbook, these issues are discussed under the above categories and then areas of good practice in relation to site selection, scoping, baseline surveys, predication, evaluation, mitigation, monitoring and auditing are addressed.

17.4.1 Regulatory structures

Churchill (1992) and Russo (1994, 1995) advocate the need for a dispute resolution mechanism to deal with safety, health and environmental issues. Such a mechanism is needed irrespective of the kinds of environmental and energy laws and regulations in a country. The need for a dispute resolution mechanism in the form of an independent regulatory body, decision makers or a quasi-judicial body and the role of EIA are important considerations as projects become more complex and affect environmental and human resources (Hoecker 1992). Some projects, by their very nature, however, if sited properly can easily avoid or satisfactorily mitigate adverse environmental and social impacts. Energy transport and storage projects like natural gas and oil pipeline projects, as well as LNG terminals, fall into this category. However, in the case of large hydropower projects, the need for dispute resolution mechanisms increases exponentially.

All energy projects will be conceived, sited, analysed, constructed and operated according to a regulatory triad, based on politics, law and the market (Fig. 17.5). In countries like the USA, the regulatory scheme relies ultimately on rule of law or regulation. Disagreements over the adequacy of an EIA or procedural aspect of a siting process are ultimately decided by a government regulatory agency or the courts. Most of the energy projects developed in the USA, Canada and other western countries fall into this type of regulatory scheme either at the national or provincial/state level. Energy pipeline projects are usually conceived and processed rapidly with little or no problem. Hydropower projects and electric transmission line projects take much longer to site or authorize.

Many of the developing countries tend toward the right-hand side of the triad shown in Fig. 17.5,

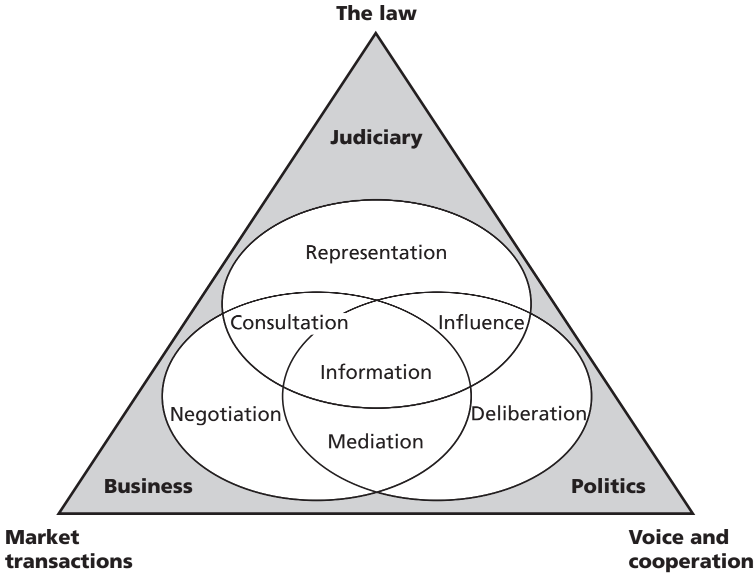

Fig. 17.5 The regulatory triad (based on Churchill 1992).

where politics is an important feature. Most of these energy projects are developed and operated by national governments or special ministries. Traditionally, energy and power ministries have had a great deal of political power, since electricity was, and still is, used as a social instrument. For example, electric power or water resources are made available at below market rates, etc. In this regulatory arena, influence, rather than facts or information, usually dictates the outcome (Fig. 17.5). Few countries, except for the UK and New Zealand, have embraced a regulatory structure that relies on the market. However, the USA, Canada and many other countries are beginning to privatize their electric and energy industries and promote competition through non-discriminatory open access to transmission systems and transparent energy tariffs on a real-time basis. Competition is also being enhanced by separating generating assets from transmission and distribution lines so that consumers know the relevant costs of each service.

The regulatory triad and the presence, absence and performance of the specific regulatory structures play a significant role in influencing how projects are conceived by developers and analysed in an EIA. The structure dictates to a large extent whether the EIA is just a 'paper' exercise or a document that will serve as a basis for sound decisions regarding project proposals and ultimately design, construction and operation. In a sense, the type of regulatory system in a country or region can prevent the open and transparent EIA and siting process that is desired. In reality, the project proponent or lead government ministry who prepares the EIA is a natural adversary of other participants, such as international and national environmental NGOs, indigenous peoples and other governmental organizations within a given country. This tension between participants is reflected in how the various groups align themselves in the regulatory triad (Fig. 17.6).

As more countries rely on the private sector to commercialize and finance energy projects, the length of time taken for the siting process and preparation of EIAs has become more important. Extensive delays in the overall process and perceived risks can cause shifts in capital away from certain classes of energy projects (Russo & von Stackelberg 1994). The best example of these phenomena is hydroelectric projects, whether they are small or mega-projects. The high risk and extensive time needed to site and prepare the EIAs of such hydro projects have shifted capital to non-renewable fossil-fuelled electric plants, which take much less time to site and are less

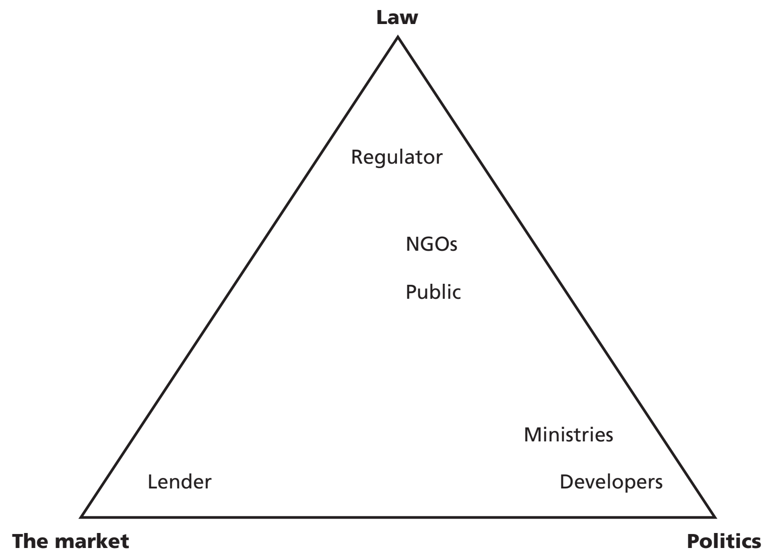

Fig. 17.6 How energy project participants normally align themselves in the regulatory triad. NGOs, non-governmental organizations.

controversial. The unfortunate fact here is that developers are willing to cope with the risks and uncertainty of higher future fuel prices rather than deal with the higher risks and controversy associated with environmental issues associated with hydro projects.

The extensive delays in siting large, complex projects are usually a result of the lack of, or an overly burdensome, dispute resolution mechanism in place for specific classes of energy projects. In the former case, the project proponents and participants are left to wage a 'war of words' with each other and wield political influence as a means of affecting outcomes. In the latter, the regulatory body may be too preoccupied with process and creating a record. Hence, because the regulatory body is risk adverse, the process becomes expensive and produces untimely decisions. Time is of critical importance to EIA also. When there are extensive delays in the preparation of the EIA, comments and recommendations from participants can grow stale, new laws or regulations may be developed, or the EIA team may not be able to stay together for the duration of a long siting process fraught with controversy. Senecal (1997) alluded to the psychological stress on EIA practitioners who were analysing the Three Gorges Hydroelectric Project in the People's Republic of China. He also indicated that the increasing demands for information made by project opponents were unrealistic and generally beyond the capabilities of the analysts. In such cases, the demands for scrutiny of every aspect of a project, no matter how insignificant, can affect the quality of the overall analysis and impede the development and implementation of necessary mitigation if such a project is authorized.

In terms of the regulatory triad, one might conclude that all one has to do is to move the developers and participants to the middle of the regulatory triad (Fig. 17.7). Whilst this is correct in general for certain types of projects, it does not mean that there should be a 'one size fits all' process for all types of energy projects. A comparison by the Federal Energy Regulatory Commission (FERC) (1994) of the regulation and siting of private sector sponsored natural gas pipelines and hydropower projects illustrates this point.

The most complex natural gas pipelines proposed in the USA are several hundred kilometres long. These pipelines cross state boundaries and multiple jurisdictions. Yet the siting process and preparation of an EIA take little more than one year to complete. In contrast, hydroelectric projects, irrespective of their size, take at least three times as long, even when the project is being relicensed or reauthorized. Here, the FERC is the

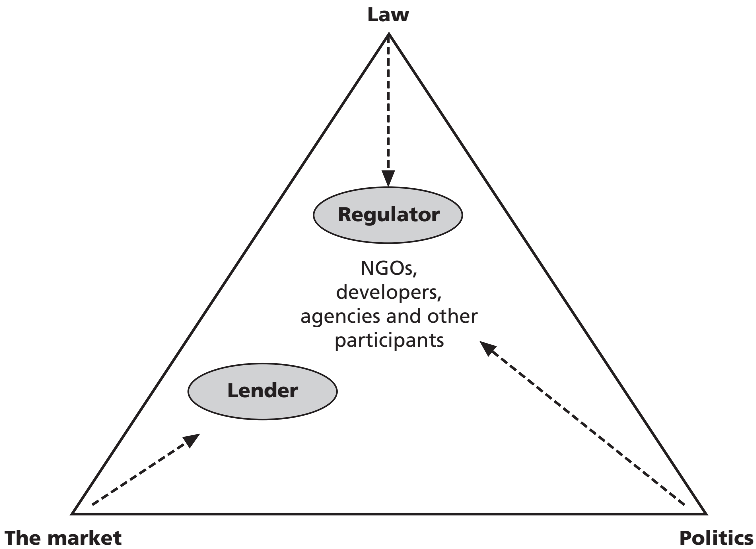

Fig. 17.7 An optimum alignment of energy project participants in the regulatory triad. NGOs, non-governmental organizations.

dispute resolution mechanism discussed above, so in general this does not account for the large differences in the siting and EIA processes. These differences are caused by the inherent nature of gas pipeline projects and hydropower projects, the regulations governing each, the efficiency of the regulatory process and the behaviour of the natural gas and hydropower industries. In both cases, FERC always seeks to avoid and mitigate environmental impacts. However, in the case of a gas pipeline, it is much easier. The EIA analyst can change the route of the pipeline to avoid a sensitive environmental area. Specifically, pipelines can avoid an adverse impact by going around it, under it or above it. At the same time, the economic viability of the pipeline project is seldom jeopardized by route changes or the above mitigation measures to parts of the route. This is not the case with hydropower projects. These projects follow the river and, while there are many mitigation options available, it is not as easy to avoid impacts and still maintain the viability of the project. Thus, gas pipeline projects may not require the same regulatory process as hydropower projects, although both types of projects benefit from moving toward the centre of the regulatory triad.

17.4.2 Collaborative environmental assessments and teams

In the case of hydropower and other types of complex and controversial energy projects, what is essentially needed is to move all the participants to the middle of the regulatory triad and to form a collaborative or cooperative team. Generally, the more complex and larger the project, or the greater the number of projects proposed in a region or country, the greater the need to form such a team. The team would ultimately prepare an EIA for decision makers and share responsibility for the design and mitigation needed to avoid and mitigate significant adverse effects on the human environment. Ideally, the team would prepare an EIA for a proposed project that could be supported by all or a majority of the participants. This EIA is termed a collaborative or cooperative environmental assessment (COEA).

The formation of a team and preparation of a COEA is the antithesis of a traditional project cycle. Under the latter, the project proponent prepares the EIA and the numbers of participants increase over time as the EIA is finalized and submitted for approval to a regulatory or funding body. Just the opposite usually occurs with the formation of a COEA team and, in some cases,

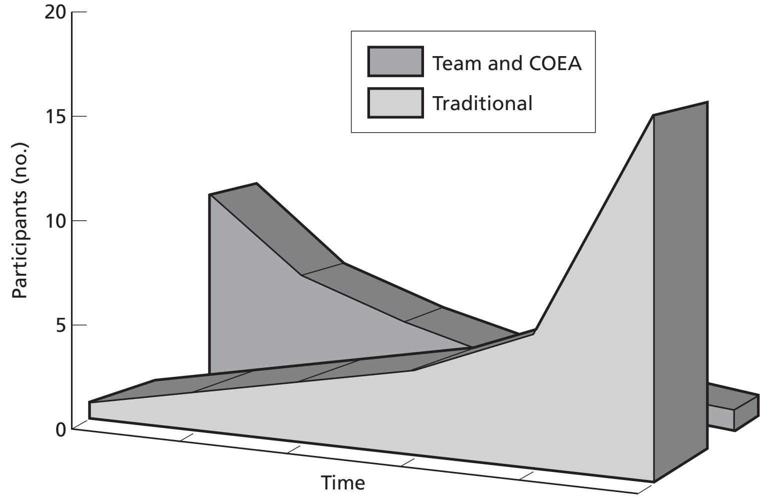

Fig. 17.8 A comparison of public participation over time with a traditional preparation of EIA and cooperative environmental assessment. COEA, cooperative environmental assessment.

smaller numbers of participants are involved, because NGOs and the public have greater confidence that issues will be satisfactorily addressed prior to submission for approval and/or funding.

A COEA is a reflection of the reality of sharing power and decision-making authority with participants. Such a process also imposes obligations on NGOs and indigenous people to pool resources and work towards solutions rather than to create impediments to the siting process. In some circumstances, proponents fund participation of NGOs and indigenous people as well. Without such commitments by project proponents and a majority of participants, the likelihood of a successful COEA is low. Such a process requires some degree of structure, which is provided by a third-party facilitator or regulatory body to oversee and to make certain that information is shared, that participants are allowed to explore non-traditional options with respect to mitigation and siting alternatives and that participants live up to their obligations. The regulator's or third-party facilitator's major duty is to serve as an information resource, bring an overview of successful mitigation strategies and creativity to the table and gain the commitment to ensure that the mitigation agreed to will be carried out as promised (Russo 1994; Russo & von Stackelberg 1994; Silliman & Russo 1997). Hence, the regulator or third-party facilitator must bring a great deal of 'people' and negotiating skills to the process. Because the goal of a COEA is to ensure that projects are sustainable and environmentally acceptable, the project proponent and participants may also wish to legitimize any agreements and conditions (New England Power Company 1997). These agreements or conditions would be reflected and evaluated in the COEA and made a part of the financial package and national or regional permit authorizing the project.

The critical difference between a COEA and an EIA prepared under a traditional siting process is that, under the former, the design is very preliminary and the proponent and participants are left to design the preferred project that should be developed (Fig. 17.8). Hence, a great deal of work goes into the COEA prior to formally filing it with the government entity and/or international lenders for approval. Once filed, the decision makers ensure that the proposal meets their respective requirements and that the financing is adequate to implement all aspects of the project, especially the mitigation measures and compliance features.

Giffen (1997) and Burkhart *et al.* (1997) provide a good explanation of the dynamics of collaborative arrangements as a means of resolving disputes and the preparation of COEAs for hydropower projects. Recently, the US FERC finalized regulations that promote the establishment of collaborative/cooperative teams and the preparation of COEAs (Federal Energy Regulatory Commission 1997b). There are about 30 COEAs being prepared by FERC hydropower licensees and other participants in the USA. Most of the COEAs are on hydropower projects that are being relicensed or reauthorized and which have been operating for a period between 30 and 50 years. The largest of such projects is the relicensing of the St Lawrence–Franklin Delano Roosevelt Project on the St Lawrence River, which constitutes the international border between the USA and Canada. A cooperative team, consisting of the project operator and 43 organizations, has prepared a scoping document which outlines what resources should be analysed in an EIA (Federal Energy Regulatory Commission and New York Department of Environmental Conservation 1997).

The success, and growing acceptance, of COEAs in the USA is due to a significant shift by participants toward the middle of the regulatory triad and away from the notion of the courts and administrative, trial type hearings as a means of resolving disputes. Market forces are also influencing COEAs as deregulation, and increased competition in, the electric industry accelerates. FERC's policy of encouraging settlements and discussions between environmental NGOs and the hydropower proponents has also borne results. In fact the relationship between FERC and its harshest critics, the Hydropower Relicensing Reform Coalition, consisting of American Rivers, the Audubon Society, Conservation Law Foundation, Trout Unlimited and others, has been improving as a result of FERC's encouragement and support of collaborative and cooperative processes. These changes have required fundamental changes in the behaviour of FERC, the hydropower industry and environmental NGOs from their traditional ways of doing business.

In the international arena, it also appears that there is finally some promising movement toward the centre of the regulatory triad on siting large dams. At a conference in Gland, Switzerland, in early April 1997, the World Conservation Union (IUCN) and the World Bank Group invited a diverse group of participants from around the world to explore whether they could work together in seeking resolution of highly controversial issues associated with large dams. To the surprise of the 37 workshop participants, who represented large dam construction and equipment companies, the private sector, consultants, environmental NGOs, indigenous people, government and international lenders, a consensus was made on how to proceed and on the breadth of issues to be investigated (IUCN & World Bank 1997). As a result, the participants agreed to form a World Commission on Large Dams to investigate experience and if and how large dams can contribute to sustainable development. These developments are a necessary prelude to COEAs and will have a beneficial impact on all hydropower projects, not only large dams.

17.4.3 Environmental and mitigation analysis

EIAs in the developed countries have historically gone to great lengths in analysing environmental impacts. Besides becoming encyclopaedic and taking too long to prepare, EIAs and associated methodologies are too mechanistic and, for the most part, inappropriate for most developing countries (Biswas 1993). Furthermore, their sheer size and complexity are at odds with the document needs of decision makers. If that is the case, then one has to wonder why so much emphasis is placed upon analysis of impacts when generic impacts for certain kinds of energy projects are well documented. In fact, these impacts are so well known for certain kinds of projects that many experts have designed criteria for avoiding them based on international, continental and regional bases (Ledec 1997; IUCN & World Bank 1997; Robinson *et al.* 1997). How is it that, with so much known about the environmental impacts of energy projects, so little effort is applied to analysing and outlining detailed mitigation measures, that are necessary to avoid or reduce adverse impacts? This is especially relevant given the fact that: (i) we have nearly 30 years of experience of doing EIAs on energy projects; (ii) energy projects are long lived assets; and (iii) the actual evidence shows that problematic energy projects do not have the necessary mitigation in place.

Given short timeframes and limited budgets, EIA practitioners would be well served by shifting the emphasis to mitigation instead of producing detailed impact analyses. EIA on the proposed and now abandoned Arun III Hydroelectric Project in Nepal is a case in point. The EIA consisted of volumes of impact analysis, but the information on mitigation measures and implementation was quite generic. Decision makers could take no assurance from the EIA that the proposed mitigation measures would reduce or eliminate the environmental or social impacts as stated.

Irrespective of whether or not the controversial Arun III Hydroelectric Project should have been approved, an alternative to the voluminous EIA and associated environmental reports would have been the development of a very detailed environmental mitigation plan for the project that would have covered not only its construction, but its operation for many years to come. Such a detailed plan would include specific mitigative measures and costs, including those for institutional strengthening, needed to ensure implementation and compliance.

In Canada and the USA, the development of environmental mitigation plans and their associated costs is becoming increasingly important. The development of such plans is in many cases the major ingredient in obtaining project approval and convincing participants that impacts will be reasonably dealt with. The greater reliance on environmental mitigation plans is part of a greater movement away from pure analysis or the notion of producing good paper. An example dealing with a large thermal power plant illustrates the point presented by Ahmad (1997).

The challenge to the EIA practitioner may be in selecting from amongst multiple mitigation measures with various costs. Of course, the relative importance and magnitude of the environmental and social resources will be a factor, together with the effectiveness of the measures and whether they can be implemented. As documented by Ahmad (1997), IUCN recommended a passive and much more cost-effective mitigation strategy for a coal-fired electric generating project in Pakistan. IUCN recognized that the willingness of the project proponent to accept certain measures was dictated by cost and also the institutional capacity of the Water and Power Development Authority (WAPDA) to implement and maintain mitigation measures. Given the facts and the emphasis of most developing country power operators to deal with power-related issues, there was greater likelihood that the scrubbers might not have been maintained properly and environmental conditions would have worsened over the life of the project. The selection of natural gas or a cleaner fuel was a better alternative.

In the USA, protection of fish migrating downstream of hydropower projects is commonplace. Hence, screening turbine intakes, spilling water and diverting fish to outlet structures are all typical fishery mitigation measures. Whilst screening intakes may seem appropriate at first sight, river systems with large quantities of organic matter may clog the screens. This may cause greater rates of impingement of fish on the screens if they are not cleaned adequately. Cada *et al.* (1997) have recognized the need for better measures to protect fish and are working on the design of a fish-friendly turbine, in which the survival of fish is enhanced compared with existing designs.

The EIA practitioner may also be faced with analysing mitigation measures that would restore wetlands and natural habitats. Caution should be exercised in this area unless there is a long-term commitment to restoration and the mitigation is well funded. Rather than attempting to restore wetlands in the vicinity of the proposed energy project, it might be more cost effective and beneficial to have the developer purchase wetland habitats and protect and manage these for the life of the project.

17.4.4 Implementation and compliance

Currently, the controversy and long delays associated with some kinds of energy project proposals are caused by the historically poor performance in constructing, operating and maintaining the projects already authorized and operating with respect to environmental and social concerns. One does not have to search very hard to find an energy project that does not have all of the required environmental and social mitigation measures promised in the EIA. Either the mitigation measures are not implemented at all, or they fall short of expectations because of poor performance, non-specificity, lack of technical expertise, insufficient budget or unanticipated impacts. Participants only have to experience this first hand or read about poor performance elsewhere for controversy and delays to envelop the siting and EIA process for entire segments of the energy sector. The relative performance of France's and Canada's nuclear power programmes compared to the poor performance of the nuclear power industry in the USA provides a striking example. Despite the threat of global warming and the limited number of economically feasible hydropower sites in the USA, the public is reluctant to embrace nuclear power. The reason is a lack of confidence in the regulatory process and the ability of the regulators to protect the public.

Internationally, there is a growing concern about the ability, or willingness, of energy project proponents to implement mitigation measures having obtained approval and the loan. There does not seem to be an effective and efficient mechanism to either ensure implementation of the mitigation plan or compliance with it, although this may be changing. Most electric utilities or power ministries in developing countries have poor institutional capacity in simply performing the day-to-day activities that ensure a healthy power sector organization. Asking the same organizations to implement environmental and social mitigation programmes successfully is very problematic. Clearly, the same long-term view and policy of strengthening the institutional capacity of energy sector organizations has to apply to the environmental performance. Many power sector organizations and international energy developers have recognized the need to consider and effectively deal with the environmental aspects of their projects (Russo & von Stackelberg 1994). Even the related irrigation agencies in some developing countries are beginning to recognize that investments in environmental capacity-building are the key to managing their infrastructure projects (Dames & Moore 1996; DuBois *et al.* 1997).

Many countries have regulatory structure and environmental laws to ensure that environmental controls are adhered to. In the USA, Canada, Europe and other developed countries, environmental protection agencies enforce air quality emission standards, water quality standards and waste disposal. Whilst these enforcement agencies deal with many of the most obvious environmental measures, most have no experience of dealing with relocation of people, indigenous issues, fishery passage and protection, minimum stream flows, cultural resources, wetlands, aesthetics and recreation. Whilst compliance with air and water quality standards is relatively straightforward, the success of other mitigation measures and plans is not as well defined. The responsibility for designing and implementing mitigation measures falls on the project proponent in most cases.

Ensuring that the mitigation is implemented according to the environmental management or mitigation plans falls on another regulatory body in most cases, and their are wide variations from country to country. For example, Canadian electricity regulation is at the provincial level, Scandinavian countries have national and local siting laws and regulations, whilst that in Japan is dictated by the Ministry of Industry and Trade, which promotes pollution control technology and encourages the 10 major Japanese utilities to do likewise. In Argentina, Brazil and Uruguay, there are ad hoc regulatory systems and much is left to the discretion of the state and federally run power producers. In contrast, Chile has considerable private sector participation which is regulated by the National Energy Commission (Gilbert *et al.* 1996).

In the USA, specific agencies that own and operate projects are responsible for implement-ing mitigation measures, which are a part of the agency budgets. The US Army Corps of Engineers and Bureau of Reclamation operate a large number of government-owned hydroelectric projects which fall into this category. The Department of Energy and the associated power administrations, such as Bonneville Power, Western Area, Tennessee Valley Authority and others, own and operate both extensive electric transmission lines and some hydropower and other power generating plants and bear the responsibility for implementing mitigation measures. The measures may include raptor-proofing transmission lines to prevent electrocution of birds of prey or burying portions of the line to avoid perceived impacts from electromagnetic fields and visual quality intrusions into a view shed.

Private sector energy projects in the USA are regulated by either the respective states or the federal government. Fossil-fuel generating facilities are regulated by the states, although federal air emission standards usually must be complied with. The FERC regulates all non-federal hydropower projects, LNG terminals and interstate natural gas and oil pipelines (Federal Energy Regulatory Commission 1994; Russo & Narins 1994). FERC has the authority by law and regulation to condition hydropower, natural gas pipeline and LNG terminal proposals so that they comply with a host of national environmental protection laws. FERC also has the power to ensure compliance through a system of fines and penalties, issuing orders to discontinue operations until compliance is achieved and revoking licences and pipeline certificates for non-compliance. In summary, one finds that the responsibility for mitigation always rests with the project proponent, subject to national laws and national and regulatory bodies, like FERC.

In the absence of well-developed legal and regulatory systems that can enforce mitigation or a philosophy of self regulation, the EIA practitioner should refocus efforts to build the needed institutional capacity to implement the mitigation over time. For large hydropower projects, such as the 2700 MW Yacyreta Project on the Paraña River in Argentina and Paraguay, Quintero (1997) makes a good case for institutionalizing the use of the EIA as an adaptive management tool, to counter the tendency to use EIAs only during the planning phase of projects and also to address environmental and social impacts not addressed in the EIA. Quintero (1997) and Lee and McCourt (1997) both advocate focusing on developing and financing an institutional strengthening package to implement an environmental management plan for both the Yacyreta Project and Lesotho Highlands Water Project in Africa for several years after the project is constructed.

One critical aspect of conducting EIAs on energy project proposals in most parts of the world is the notion that there is only one opportunity to do so, i.e. when the project is being proposed. In most countries, there is no legal provision to re-examine the project after a period of time, let alone make modifications to its operating regime. In many countries, permits or authorizations are indefinite or for the life of the project. In the USA, FERC-licensed hydropower projects must undergo an environmental review before a new licence can be reauthorized and also before changes to a project's operation are allowed. In a similar vein, water projects authorized by the US Bureau of Reclamation are also subject to environmental review when existing contracts expire and prior to signing new contracts. This makes sense, given the increase in our knowledge regarding environmental impacts and the mitigation needed to solve problems. In Canada, Hydro Quebec has instituted a form of environmental review and improvements when refurbishing some of their hydroelectric projects (P. Senecal, personal communication). This programme is entirely voluntary and is a good example of what a conscientious energy developer can accomplish. The EIA practitioner would be wise to try to stage needed mitigation over a period of the project's life, especially after debt service is reduced (Russo 1997).

17.4.5 The bigger picture—criteria for defining the project

What constitutes a proposed energy project and what to analyse in an EIA are common questions that must be dealt with. For example, is it appropriate to prepare an EIA of a an electric transmission line separately in conjunction with an EIA of a proposed electrical energy project, such as a hydropower or fossil-fuel electric generating plant? The answer depends upon a number of factors and is complicated by the physics of electricity as described earlier. In the USA, EIA practitioners at the FERC have made distinctions between primary transmission lines and those that are part of the interconnected system, when evaluating proposed or existing hydropower projects (Federal Energy Regulatory Commission 1993). FERC defines primary transmission lines as those necessary to evacuate the electricity from the power plant to the interconnected system. Therefore, if a new hydropower project were being evaluated, the construction of the 2.5 km of new transmission line between the powerhouse and the existing high voltage interconnected system would be evaluated in the EIA and be considered a part of the proposed project. The interconnected system, however, would not be evaluated. In some countries, the existing transmission system may be highly connected and there may be a tendency to evaluate the entire transmission line system, especially if it has not been subjected to an EIA before. This may not be appropriate, except to consider the route in the context of cumulative impacts. In other instances, primary transmission lines are quite long and will affect the viability of remote power stations. In this case, the primary transmission lines are part of the hydropower project and should be evaluated along with any new roads required to construct the transmission line or generating facilities. For example, multiple small hydro sites or a remote thermal station may be economically constrained not so much by the site-specific environmental and financial feasibility of the proposed power plants, but by the costs to transmit or evacuate the power to a user or the interconnected system.

Pires *et al.* (1993) provide a good overview of how extensive transmission lines in Brazil should be examined. In situations involving very long transmission lines, irrespective of whether they are primary or interconnected, the line may be a stand-alone project. In such cases, the potential impacts of the line, together with the institutional capacity to carry out an EIA, should be used to guide the decision. If the institutional capacity of the organization is not strong, it may be better to analyse the transmission line as a stand-alone project and focus the analysis on determining the environmentally preferable route. Analysing an extensive transmission line and associated power plants is good EIA practice, especially in addressing cumulative effects. The latter may be difficult to analyse and mitigate when separate documents are prepared on transmission line and power plant components.

Other aspects of newly proposed energy projects have to be considered also. For example, roads associated with the construction of the project and other facilities, such as switch yards, penstocks, natural gas pumping stations, etc. Generally, an EIA should assess those activities associated with constructing and operating energy generating facilities. Another aspect of defining a project is peculiar to hydropower projects. Most EIA practitioners will agree that a proposed hydropower dam and associated reservoir are certainly a part of the project to be analysed. We also have to factor in rights of way for penstocks, the tailwater areas immediately downstream from powerhouses and spillways and lands adjacent to the project reservoir. Historically, some hydropower projects in the USA have included a significant amount of land around reservoirs in FERC hydropower projects, while others have not. In some cases, there may be as many as 8000–10000 acres of land associated with a project. The inclusion of land in a project boundary is a regulatory decision, as part of the land is not subject to flooding from reservoir operations (Russo & Narins 1994). In the USA, land included in the project boundary has received a certain degree of protection from other activities, such as mining or timber harvesting, and is also managed for fish and wildlife protection. These activities are permitted only after receiving approval from the FERC, which usually prepares an EIA on larger, more complicated activities. In a sense, the inclusion of additional land adjacent to a reservoir has also served to ensure the integrity of the proposed hydropower project, by ensuring that land disturbing activities in the watershed do not cause excessive erosion, sedimentation and other adverse impacts that could jeopardize the financial feasibility of the project (Russo & von Stackelberg 1994).

17.4.6 Decommissioning and reauthorizing projects

As discussed previously, decommissioning is a part of the life cycle of many energy projects. Whilst, in theory, the EIA practitioner should consider this in a newly proposed energy project, one has to question the merits of analysing the impacts of an event that *may* materialize in 35–50 years, let alone committing resources toward such an activity. In practice, most EIAs do not analyse such impacts or provide even a general analysis. Some EIA analysts rely on other regulations and laws to deal with such a scenario in the distant future. For example, in the USA, the FERC and the Nuclear Regulatory Commission have regulations governing the decommissioning of natural gas pipelines, hydropower and nuclear power projects, respectively. EIAs are usually required before decommissioning such projects.

Decommissioning can also have various meanings depending upon the type of energy project. For example, with natural gas pipelines, it could mean totally removing the pumping stations and pipelines that are above ground and leaving the underground pipelines in place. With hydropower projects, decommissioning could mean removing the dam and all of the associated penstocks and transmission lines. It could also mean simply removing the generating equipment from the powerhouse and retaining the project dam and associated reservoirs. The latter situation is very prevalent on hydro projects that have been in existence for 30–50 years and have a large number of other activities associated with them. For example, hydro project reservoirs may be the source of water for irrigation, municipal and industrial purposes as well as for fish and wildlife. Towns and cities may develop adjacent to the reservoir to take advantage of dependable water supplies. Decommissioning can also take the form of a partial breaching of a dam. Thus, over time, riverine conditions would be established, but at less cost.

With respect to hydropower projects and dams, the most authoritative work on decommissioning is by the American Society of Civil Engineers (1997). This work was prepared by a working group of hydropower project operators, dam safety experts, environmental agencies and the major environmental NGOs in the USA This work uses a planning process that relies heavily on EIA to determine whether or not to decommission, how to do it and what mitigation measures are required. Recently, the FERC used an EIA to assess decommissioning and reauthorizing the Edwards Dam Project at the mouth of the Kennebec River in Maine. The final EIA supported FERC's decision to totally remove the project (Federal Energy Regulatory Commission 1997c).

The other factor that has to be dealt with in relation to older energy projects is reauthorization and/or refurbishment. Reauthorization of the project may come about as a result of regulatory requirements, such as the expiration of a permit, or an economic event, such as refurbishing generating units or increasing generating or transmission capacity to increase the life of the project. Advances in technology which increase efficiency, low interest rates, etc. may also make the refurbishment advantageous.

Prior to the time that an existing permit is about to expire or refurbishment is needed, an energy project operator could also propose to decommission or abandon the project. In these cases, an EIA would analyse the impacts and mitigation measures to reduce or avoid impacts. If the operator was interested in reauthorization and/or refurbishment, the project would be subjected to an environmental analysis on decommissioning and consideration of how the project could be operated differently to enhance environmental values. The scope of the decommissioning analysis is highly case specific. The key question on decommissioning is whether or not it is voluntary on the part of the project operator or is a reasonable alternative in an analysis that examines whether the project should be reauthorized and, if so, under what conditions.

The 'no action' option should be a relevant part of any EIA dealing with a decommissioning, reauthorization or refurbishment proposal. This may seem counterintuitive at first glance, especially with regard to decommissioning. However, retaining some project features may result in less environmental impact than their wholesale removal. An energy project should also be analysed from the perspective of its components and as a whole. Most important, the EIA must objectively examine environmental benefits and adverse effects of removing as well as retaining structures. Finally, the operation of the project should be evaluated, especially if certain features are retained. For example, there may be more environmental benefits in retaining the underground portions of a natural gas pipeline than the associated erosion and impacts to water quality involved with removing it. Hydropower projects are a special case, because people and multiple beneficial uses may develop within a reservoir and its watershed over a 30–50-year period. This is not the case for other energy projects. For example, a hydropower reservoir maintained and operated in an environmentally sensitive manner may promote benefits to fish and wildlife species and habitats associated with the reservoir and also benefits downstream as well. Hence, the beneficial environmental effects of removing a hydropower dam and restoring a river to its natural condition may not exceed the adverse impacts on existing beneficial uses associated with the project reservoir. Large and deep hydropower reservoirs are usually good sediment traps. The chemical quality of the bottom sediments generally reflects development in the river basin. Hence, heavy industrialization may result in hazardous materials in the bottom sediments, and removal of the dam may suspend and introduce toxins to the downstream portions of the watershed. There is no single answer as to whether or not removing certain facilities is warranted. Each hydropower project will be different and possess a different set of beneficial and adverse uses. The EIA must objectively analyse both the beneficial and adverse effects associated with the decommissioning proposal and the no action alternative and its components. As with any EIA of an energy project, the identification of mitigation necessary to support the proposal should be given a high priority.

17.4.7 Leveraging sustainable development

Reauthorizing energy projects may become more common as the private sector is called upon to construct and/or operate energy projects for limited terms, provided by build–own–operate (BOO) and build–own–operate–transfer (BOOT) schemes. Usually such schemes have terms of 25–35 years and some permits/licences for private sector ownership of an energy project are from 30 to 50 years. Reauthorizing projects provides an opportunity to re-evaluate an energy project's operation. It also allows the EIA analyst to call attention to changes in various societies, technological advances in energy generation and scientific advances in environmental science and mitigation and, importantly, to promote more sustainable energy projects. The idea of reauthorizing a project also recognizes the limitations of EIA to predict impacts over extensive periods of time and the fact that the environmental setting after 30–50 years may be very different as a result of the project. If energy projects are well maintained, life extensions are possible at considerably lower costs. More financial resources may also be available to fund environmental mitigation and thus operate the project in a more environmentally sustainable manner.

Russo (1997) advocated focusing attention on existing water projects as a means of leveraging sustainable development. This is especially relevant if existing hydropower or other energy projects are subject to reauthorization or renewal and EIA is required. The strategy is also relevant in countries where there is no regulatory requirement to reauthorize energy projects. The rationale behind this approach is not to limit the EIA's focus to proposed 'greenfield' energy projects, but to identify environmental mitigation measures from other projects in the region or watershed that will maximize environmental benefits within the constraints of the environmental mitigation budget. This approach is particularly relevant when the project operator owns multiple energy projects in a region or watershed, or water rights and natural resource concessions. For example, under normal circumstances an EIA practitioner's analysis may include what type of scrubber is required to reduce nitrogen oxide (NO_x) and SO_x emissions in a new coal-fired plant, whilst ignoring two other older coal-fired facilities in the same airshed owned by the company that have no scrubbers at all. In this situation, the EIA might focus on least-cost environmental mitigation that will provide the greatest environmental benefits to the entire airshed. All things being equal, this might include requiring minimally acceptable scrubbers on all three coal plants, rather than a state-of-the-art scrubber on the newest project, or substituting more environmentally friendly fuels on some or all of the existing and new coal-fired electrical generating units.

Existing hydropower projects offer an extraordinary sustainable development opportunity when examined in the context of a regulatory structure that requires reauthorization or refurbishment, as well as in the absence of such a structure. Many of the older hydro projects have altered watersheds significantly since they control downstream flow releases. These older projects are operated as a system with other hydropower projects in the watershed. Because of their relative age, many of these projects also have little or no debt after 30–50 years of operation. This fact, together with their ability to regulate whole or significant portions of river systems, makes them ideal candidates to effect mitigation that can produce significant environmental benefits. When such projects are examined in conjunction with other similar projects on the same river or river basin, the opportunities for identifying least cost environmental mitigation increase dramatically. This is because the universe of possibilities has gone beyond just a single project and the river basin and its environmental resources have become the unit of analysis. An example will illustrate the point. In the USA, 11 hydropower projects were subject to reauthorization and EIA. These projects were located in three distinct river basins and each project was characterized as a peaking project or base-load plant. By examining all 11 projects across the three river basins together, participants were able to identify parts of the river systems and projects that were very valuable from a power standpoint and those other projects where mitigation would do the most good and benefit environmental resources. As a result, four of the marginal peaking projects were operated as base-load plants, while the remainder continued to produce power as peaking projects. Significant environmental mitigation was identified at the marginal power sites.

17.5 EXAMPLES OF GOOD PRACTICE

In this section, attention is focused on examples of good EIA practice in relation to site selection, scoping, baseline surveys, prediction, evaluation, mitigation, monitoring and auditing, to the extent that these are available for energy projects. As stated earlier, few EIAs will excel in all of the areas. The author's intent here is to discuss a number of the most exciting examples and shed some light on why he believes they are steps in the right direction to making EIA more useful in the energy sector.

17.5.1 Site selection

The Navajo Transmission Line Project Environmental Impact Statement (EIS) is an excellent example of how to use EIA for site selection (USDOE Western Area Power Administration 1996). The EIS emphasizes site selection from numerous transmission route/corridor alternatives and mitigation through the selection of the most cost-effective route by avoiding significant environmental impacts. As part of the scoping, the analysts performed a rigorous regional corridor environmental feasibility study, which included a resource inventory, impact assessment and mitigation planning to select the environmentally preferred route. The study identified alternatives. Only then the EIA used to analyse these four alternative routes in detail and help select the final route.

This approach is very relevant not only to electric transmission line projects, but also to natural gas pipeline projects and other energy projects, where the possibility of multiple routes and alternatives can easily overcome one's technical and resource capabilities. The environmental feasibility study is certainly not as detailed as the EIA of the four alternative routes. Nevertheless, it narrows the field of alternatives in line with the objectives of scoping. As in this case, when done with the participation of different interests, a burdensome EIA can be avoided and resources devoted to identifying the best corridor or project alternatives. The approach is very interesting, because it seems to answer the fundamental question of many participants regarding how the proponent arrived at a decision on what project to actually propose and how that project was conceptualized. In this case, Diné Power Authority, representing the Navajo Indian Nation, used a scaled down form of EIA and the participants to help them identify and narrow project alternatives or concepts. They then used the EIS to make the final selection.

17.5.2 Scoping and baseline surveys

An excellent example of scoping and designing baseline surveys is the activities associated with the relicensing/reauthorization of the 912-MW, St

Lawrence–Franklin Delano Roosevelt Project Hydropower Project on the St Lawrence River, which is the international border of Canada and the USA. Scoping on this project consisted not merely of a few meetings and site visits, but included monthly meetings between the hydropower operator and 39 other organizations (60–70 individuals from the USA, Canada and the Mohawk Nation) over a 14-month period. The New York Power Authority (NYPA) with the assistance of FERC and the New York Department of Environmental Conservation (NYDEC), worked with all of the participants to prepare a Scoping Document, which defined the relevant issues, necessary studies to analyse impacts and specific mitigation that would meet some resource needs (Federal Energy Regulatory Commission & NYDEC 1997). The scoping process is noteworthy here, because it promoted ongoing dialogue amongst participants in special subcommittees and in the larger group. This type of process helps not only to structure the EIA, but also to focus on the necessary mitigation that would avoid or reduce impacts to environmental resources and make the project more environmentally sustainable (Russo 1997; Silliman & Russo 1997). Baseline studies were designed by NYPA and the participants' organizations, with special attention paid to the level of analysis and what specific information was needed to define an impact and the necessary mitigation to avoid or eliminate it. Because participants reviewed the study design plans, a staged approach was agreed to. For example, if initial study results shed sufficient information on the resource issue, there would be no need to complete the entire study.

17.5.3 Mitigation, monitoring and compliance

There are several excellent examples of how organizations have employed EIA to develop mitigation measures, along with monitoring and auditing. These examples include the Muzaffargarh Thermal Power Station, Pakistan, the Yacyreta Hydropower Project in Latin America and the Lesotho Highlands Project in Africa (Ahmad 1997; Lee & McCourt 1997; Quintero 1997). The case study of the Muzaffargarh Thermal Power Station in Pakistan is of interest, as it illustrates how mitigation can be approached by the EIA analyst when the entire fuel cycle is examined. In this case, IUCN focused on low-cost and practical solutions, which included alternative fuels, such as natural gas, instead of the usual expensive flue gas desulphurization system to reduce air pollution impacts. IUCN's approach had additional environmental benefits in that it caused the WAPDA in Pakistan to develop a computerized plant management and maintenance system and improve its solid waste management and gas emission monitoring at the Muzaffargarh Thermal Power Station. WAPDA has also started to implement these measures at some of its other plants. Hence, the mitigation proposed by IUCN has strengthened the institutional capacity of WAPDA, which will translate into less adverse environmental impacts in Pakistan's energy sector.

The 2700-MW Yacyreta Hydropower Project and associated navigation lock on the Paraña River in Paraguay and Argentina is an excellent example of how EIA can be used to strengthen the institutional capacity of a bi-national organization to deal with both expected and unexpected impacts from the operation of a large hydropower project. The situation at Yacyreta illustrates how EIA can fail to identify all impacts, especially if the project is large and controversial and environmental regulations are lacking. Despite this drawback, the use of the EIA as a basis and tool to deal effectively with unanticipated impacts is noteworthy. In the case of Yacryeta, the EIA did not predict that filling the reservoir would result in 'floating islands' or that highly oxygenated water flowing over the project spillway would cause nitrogen gas supersaturation and large fish kills. These two unanticipated impacts were dealt with successfully because the EIA on the project had focused on: (i) minimizing impacts through implementation of detailed mitigation plans; (ii) developing the institutional capacity in both Argentina and Paraguay to deal with unforseen environmental situations; and (iii) using the EIA as an adaptive tool rather than just the final document to advance project approval and financing.

The Lesotho Highlands Water Project (also discussed in Chapter 9, this volume) and the increased importance of the environmental management plan (ERM) and its successful implementation are a good example of a trend in EIA to focus more attention on mitigation plans. Detailed ERMs that are well thought out in terms of cost and scheduling bring an important aspect of energy projects to the attention of decision makers: that long-lived assets like hydropower projects will require extensive ERMs if impacts are to be mitigated satisfactorily. The costs of developing and implementing ERMs over an extensive period of time are legitimate project costs, that must be factored into the decision well before construction begins. The costs and the relative success of implementing the ERM is of concern to international lenders, because failure to do so can adversely affect the economic feasibility of the project and increase the risks (Russo & von Stackelberg 1994). Institutional strengthening is a major component of ERMs because well maintained hydropower projects are amongst the assets that last the longest and cannot be easily removed once constructed.

Good examples of EIA on natural gas pipelines and LNG storage facilities are the FERC's EISs on the Northern Border Project and the Eco Eléctrica LNG Import Terminal and Cogeneration Project. The EIA of the Norther Border Project (Federal Energy Regulatory Commission 1997a) analysed two competing applications to expand natural gas service to new and existing customers in the Midwest USA, primarily the Chicago, Illinois, area. Northern Border Pipeline Companies wanted to construct 628 km of new natural gas pipeline, eight new compressor stations, nine metering stations and 13 new communication towers. The competing proposal by Natural Gas Pipeline Company of America (Natural) called for 138 km of new gas pipeline, one new compression station and other associated facilities. The EIS evaluated a range of systems and route alternatives, route variations and compressor site alternatives. A preferred recommended natural gas pipeline project was the result of the analysis and included required environmental mitigation during construction and operation of the project, using guidelines outlined in FERC's *Natural Gas Pipeline Environmental Compliance Work Book* (Federal Energy Regulatory Commission 1996) and Hosmanek (1984).

The EIS on the Eco Eléctrica LNG Project is instructive because it illustrates what island nations or other countries may be faced with when natural resources are limited. In addition, the project configuration illustrates how a project can be developed to improve energy efficiency and develop other resources in a sustainable manner by looking at the entire fuel cycle. In the case of Eco Eléctrica, the major aspect of the proposal was the decision to try to satisfy the other development needs of Puerto Rico, such as demands for electricity and adequate water supplies. This was accomplished by using vaporized flue gases from the LNG plant as a fuel source to power a 461-MW electric cogeneration plant. These flue gases would have been flared if they were not used by the cogeneration plant. In turn, the surplus waste heat from the cogeneration facility was used to power a salt water desalinization plant capable of producing 15.1 million litres per day of fresh water needed for the LNG plant. Surplus water then would be sold for public use in Puerto Rico for other uses.

Both the FERC and the Puerto Rico Planning Board (1996) prepared the EIS, with English and Spanish versions being published. Both the FERC and the Board evaluated a variety of mitigative measures beyond that proposed by Eco Eléctrica, as well as site, facility layout and operational and energy alternatives. The EIS not only analysed the impacts of the terminal and project, but also LNG ships and the risks associated with LNG spills and the risks to marine life. Both the FERC and Board staff recommended additional studies and developed specific mitigation measures, which were made part of the certificate authorizing the construction and operation of the project.

The EIA of the 3100-km Bolivia–Brazil Gas Pipeline project is the basis for an extensive ERM which incorporates the concept of impact avoidance and compliance from construction, operation and maintenance. Many EIAs prepared on projects in developing countries, and particularly those funded by international lenders, like the World Bank, Inter-American Development Bank and the Corporación de Fomento, are committed to mitigation measures (see Chapter 6, this volume). Whilst this is a step in the right direction, few of the EIAs or ERMs discuss how this will be done and, more importantly, who will ensure compliance. The ERM on the Bolivia–Brazil Gas Pipeline Project answers both of these questions—only time will tell how things actually work out. Aside from the length of the pipeline, there is the fact that Enron Corporation, a global energy company, is participating in the project.

The ERM for the Bolivia–Brazil Gas Pipeline project will rely on three levels of review to accomplish the goals of environmental protection established for the project: (i) the construction contractor, (ii) the environmental monitoring contractor and (iii) a third-party environmental auditor. The construction contractor is responsible for conducting environmental inspection on their own work. The environmental monitoring contractor, independent from the construction contractor, will oversee all activities and report any non-compliance to the environmental project manager. The third-party environmental auditor, who will report directly to the international lenders, will audit all activities related to the environment, from field activities to the reporting activities of the environmental monitoring contractor. The ERM and a similar Indigenous Peoples Development Plan will provide guidance to the construction contractor, monitoring contractor and environmental auditor to ensure project compliance with all programmes (Dames & Moore 1997a, b).

The above compliance programme is interesting because it places environmental personnel and an independent audit function alongside the construction contractor to ensure compliance. As discussed earlier, the regulatory structure of a country does affect how EIA is performed and, in this case, has led to a compliance component that goes far beyond what has been the case previously. The reasons for the development of the strong compliance programme are: (i) the extensive length of the project and scale of impacts to large parts of Bolivia and Brazil; (ii) the participation of Enron Corporation, with its expertise in constructing and operating natural gas pipelines and familiarity with good practice and FERC compliance in the USA; and (iii) pressure on international lenders to take more responsibility for what happens after loans are approved.

Although the compliance programme is novel in many respects, the experience in South Africa on the Drakensberg Pumped Storage Project is also noteworthy. In the mid 1970s, the Department of Water Affairs formed the Drakensberg Environmental Committee, to determine the impact of the project and make recommendations on measures to exclude or reduce construction impacts on the environment. The Committee was also empowered to obtain assistance from environmental experts. The Committee conducted studies, made recommendations and implemented a number of mitigation measures to reduce or eliminate environmental impacts. Roberts and Erasmus (1982) indicated that the most important part of the Committee's work was the implementation of the recommendations. They found it crucial to obtain the cooperation of management and the design and site personnel. The Committee and management formed a special coordinating committee to work with the construction site personnel during the implementation phase.

The Drakensberg Pumped Storage Project and its activities are cited as good practice, because it illustrates that a complicated regulatory scheme is not required to design and implement environmental mitigation. Well-thought-out and simple mitigation plans which could be integrated with the design and construction team were the hallmark of success. The author believes that the ability of the Committee to work with the project proponents and integrate environmental components into the construction and operation of the project should not be overlooked.

The final example of good practice deals with the EIS on the relicensing of the Edwards Dam Project in Maine. This hydroelectric project, whilst controversial, illustrates good practice in analysing a decommissioning alternative which included total removal of all project facilities. The EIS included a thorough analysis of the costs and environmental effects of removing the dam, including those of resuspension of bottom sediments, and the beneficial and adverse environmental effects of decommissioning the project with refurbishment, adding additional generating capacity and constructing upstream fish passage facilities.

17.6 CONCLUSIONS

There is no single EIA on any energy project reviewed that scores high marks in all areas. The EIA practitioner must, in a sense, stop looking at the last EIA done in his or her own country or region and begin looking at other experiences in other countries. It is hoped that this chapter provides the beginning of that journey and hopefully a good step in the right direction. A number of the references cited here refer to further interesting EIAs. Practitioners need to be very creative and modify approaches to suit their countries and special situations.

Most energy projects are long-lived assets. Therefore, the EIA practitioner should devote more time and effort to the analysis of environmental mitigation measures that will avoid, reduce or compensate for unavoidable adverse effects well beyond the construction phase. The EIA practitioner needs to be cognizant of the regulatory structure in the country where the facility is to be sited. In the absence of a well-structured regulatory programme, mitigation measures should not be complicated or beyond the institutional capacity of the environmental organizations who will be implementing them. EIAs should be used as an adaptive management tool rather than a final document on the way to project approval. EIAs should serve as a basis for setting up a long-term environmental mitigation programme that is replete with capital and operating costs.

Privatization of the energy sector may be beneficial in some respects for EIA and the environment, as many energy companies from developing countries are more familiar with good siting and environmental practices than host country developers or the national governments. EIA practitioners must try to develop compliance mechanisms into ERMs. Also mitigation measures need to be recast in the light of when they will occur. In other words, the EIA practitioner must realistically indicate not only what is needed, but also when it is needed, given the 30–100-year lives of some energy projects.

Cooperation between energy project developers and EIA practitioners is crucial if one is to find least-cost mitigation measures that provide the greatest environmental benefits. The formation of collaborative and cooperative teams is an idea that should be explored during the design and implementation of an energy project. COEAs are an idea whose time may have come, as energy project proponents recognize the need to pool resources with participants and affected people to design and carry out projects that are sustainable. Settlements and agreements on how projects should be designed and operated can reduce a project's financial and environmental risks.

Finally, EIA practitioners should not overlook the rich assortment of energy projects that have also been developed over the last 50 years. While these projects may not be a part of the current proposal, they may be owned and operated by the same proponent. Hence, the opportunities to identify least-cost environmental mitigation might be more fruitful and the environmental benefits more significant.

Note: The views expressed in this chapter are those of the author and do not represent the official views and policies of the US Federal Energy Regulatory Commission.

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18: Environmental Impact Assessment for Mining Projects

ALEX WEAVER & PAULA CALDWELL

18.1 INTRODUCTION

This chapter outlines the types of environmental impacts associated with different mining operations and the need to integrate environmental assessment and management with the full mining life cycle and describes some of the key environmental impact assessment (EIA) methodologies appropriate at different stages of mining projects.

Humans have been dependent on minerals contained in or on the earth since the use of stone tools in the Stone Age. This dependence has increased to the point today where modern society is utterly dependent on mining. The need for modern mineral-derived artefacts and energy is not going to decrease in the foreseeable future, with the demands of population growth and improving standards of living. Table 18.1 shows the key countries responsible for meeting this global mineral demand in 1995.

The process of mining has traditionally been seen as a temporary use of land and, in general does not enjoy a good reputation in environmental management (Khoshoo 1983). This situation is changing rapidly with increased public awareness and consumer pressure on the mining industry, as well as a realization by the industry itself of the benefits of and necessity for a longer-term view of mining and the implementation of EIA and environmental management techniques. There are a growing number of examples where the mining industry leads in this field. The challenge of meeting modern society's growing needs for mineral-based products in an environmentally sustainable fashion has renewed focus on environmental assessment in the mining industry. Most countries with EIA legislation classify mining as 'an activity likely to significantly affect the environment', meaning that a detailed EIA is required prior to final decision-making. For example, European Commission (EC) Directive 85/337/EEC (revised 97/11/EC) makes EIA compulsory for all oil and gas extraction and for quarries and opencast mining over 25 ha. In Canada, the proposed construction, expansion, decommissioning or abandonment of mining projects above an established production capacity (e.g. 600 t per day of ore for gold mines, 3000 t per day for other metal mines) requires an EIA.

Generic examples of potential impacts associated with poorly planned and managed mining activities include the following:

- Accelerated soil erosion, stream turbidity and sedimentation from disturbed areas and residue deposits. This can lead, for example, to decreased water quality, reduced soil fertility and ecosystem disturbance, such as damaged fish habitat and impacts on aquatic biota.
- Leaching of toxic elements from overburden, waste rock, tailings, wastes or spills of fuel and chemicals leading to contamination of surface or underground water.
- Destruction of surface or subsurface hydrological integrity with subsequent loss of water quality or aquifer depletion.
- Dewatering of underground mines can lead to subsidence and sinkhole development with associated impacts on agricultural or urban land.
- Mine residues, containing sulphur or sulphides or exposed sulphide mineralization in open pit mining, generate acid through bacterial oxidation when exposed to water and oxygen (commonly

Table 18.1 Major world producers of selected minerals in 1995 (extracted from *Financial Times Mining International Year Book* 1997).

	Mineral							
Rank	Gold (t)	Silver (t)	Copper (000 t)	Lead (000 t)	Zinc (100 t)	Tin (000 t)	Platinum (t)	Uranium (t)
1	South Africa (522)	Mexico (2480)	Chile (2488)	Australia (453)	Canada (1111)	China (54.0)	South Africa (104.2)	Canada (10 094)
2	USA (312)	Peru (1908)	USA (1865)	USA (408)	Australia (903)	Indonesia (46.0)	Russian Federation (37.3)	Russian Federation (7940)
3	Australia (253)	USA (1450)	Canada (728)	China (396)	China (734)	Peru (22.0)	Canada (6.0)	Australia (3713)
4	China (160)	Canada (1247)	Russia (480)	Peru (234)	Peru (688)	Brazil (19.0)	USA (2.0)	Nigeria (2974)
5	Canada (150)	Chile (1036)	Indonesia (460)	Canada (210)	USA (610)	Bolivia (14.0)	Colombia (0.8)	USA (2327)
6	Russia (129)	Australia (920)	Peru (405)	Mexico (170)	Mexico (347)	Russia (9.0)	Japan (0.7)	South Africa (1443)
7	Brazil (77)	Poland (800)	China (396)	Sweden (100)	Ireland (184)	Malaysia (6.4)	Australia (0.1)	France (1020)
8	Peru (57)	Bolivia (425)	Poland (384)	South Africa (87)	Spain (172)	Portugal (4.6)	Finland (0.1)	China (800)
9	Indonesia (56)	Kazakstan (402)	Australia (379)	Morocco (67)	Sweden (168)	Vietnam (3.6)		Gabon (630)
10	Papua New Guinea (52)	Morocco (332)	Zambia (342)	North Korea (55)	India (154)	UK (1.9)		Czech Republic and Slovakia (600)
World total	2089	13 698	10 014	2680	6670	192.6	151.2	31 541

referred to as acid mine drainage), with associated impacts on water resources.

- Heavy machinery and blasting create dust and noise, which impact on the surrounding environment.
- Direct loss of biodiversity as a result of clearing and indirect loss through spread of pathogens and weeds in disturbed areas.
- Damage to soils, including acidification, salinization, compaction, loss of structure and destruction of soil profile.
- Emission of atmospheric pollutants, primarily as particulates (dust), especially from haulage roads and ore crushing operations during mining operations.
- Aesthetic impacts associated with excavation, residue deposits and mine infrastructure.
- Infrastructure impacts associated with large mining operations in close proximity to small towns: for example, on existing roads, water supply, waste disposal, sewerage, hospitals and recreation facilities.

- Direct impacts on heritage sites, e.g. historical monuments or sites of archaeological or palaeontological importance.
- Social impacts associated with displacement of communities. In-migration of workers can result in gender imbalances. Miners themselves are often exposed to unusually high occupational health and safety risks. Most prevalent is the competition for land use and concomitant conflict with the users of the land, for example, agriculture, grazing and horticulture.

18.2 LIFE CYCLE AND METHODS OF MINING

The nature and extent of environmental impacts associated with mining activities vary according to the phases of the mining operation, the mining method used, the nature of the mineral itself and the resultant mine waste deposits.

18.2.1 Lifecycle

A typical life cycle of a mining operation requires a number of phases and activities—sometimes occurring simultaneously, otherwise in sequence: for example, prospecting, development (including verification of ore quality, quantity of ore and amenability to various mineral-processing methods); construction; operation; staff housing and support; product stockpiling; mineral processing; waste management; rehabilitation; and, eventually, shut down. A typical mine life span is in the region of 25 years, although actual life spans can vary from less than 1 year (for example, road material quarrying) to over 100 years (for example, the East Rand Proprietary Mines (ERPM) gold mine in South Africa). Different environmental interactions and possible impacts can be associated with each of these and it is important to recognize this and to integrate environmental management into the mining life cycle. This requires close collaboration between EIA practitioners and the mining company and a good mutual understanding of each other's procedures. Simple process diagrams are useful to describe the framework within which Environmental Assessment and Management should operate. In Chapter 1, Volume 1, a generic EIA process diagram is provided. Similar diagrams are used to describe mining. Figure 18.1 provides, by way of example, a simplified flow chart of a coastal diamond mining operation and associated impacting processes (Council for Scientific and Industrial Research 1994). Table 18.2 provides an example of an interaction matrix, a tool often used in scoping to ensure that impacts associated with different phases and activities in the mine life cycle are included (Wright & Greene 1987, pp. 6–7).

Good practice means developing a clear vision of the post-mining environment as early in the project life-cycle as possible. Such 'end-use planning' (Smithen *et al.* 1997) will allow, for example, the EIA team to collect data in the predecision phase, which would be needed by, but otherwise not be available to, the rehabilitation team, who might only be appointed a decade later. Proponents should design the mine and its operations and close-out to create an environmental asset rather than just a cleaned-up site. In some countries (e.g. Canada), 'end use planning' is formally recognized and post-closure plans are required as part of the EIA.

A number of agencies worldwide are promoting this integrative approach to environmental management in mining, for example, the Australian Environmental Protection Agency, the Canadian Department of Natural Resources and the Department of Environment and South Africa's Department of Mineral and Energy Affairs. Figure 18.2 from Freer (1993) illustrates the integration of environmental management into the full mine life cycle in South Africa. Freer's 5 phases are:

Phase 1: project generation

This phase includes the development of an environmental awareness and the identification of inherited environmental problems. Prospecting (or exploration) requires the preparation of an EIA and an acceptable rehabilitation plan. During this phase a geologist should provide mining and metallurgical engineers with information on environmentally sensitive matters, such as groundwater, minerals in the rock that could lead to acid mine drainage and land ownership. The exploration phase should also provide information for a preliminary environmental baseline assessment.

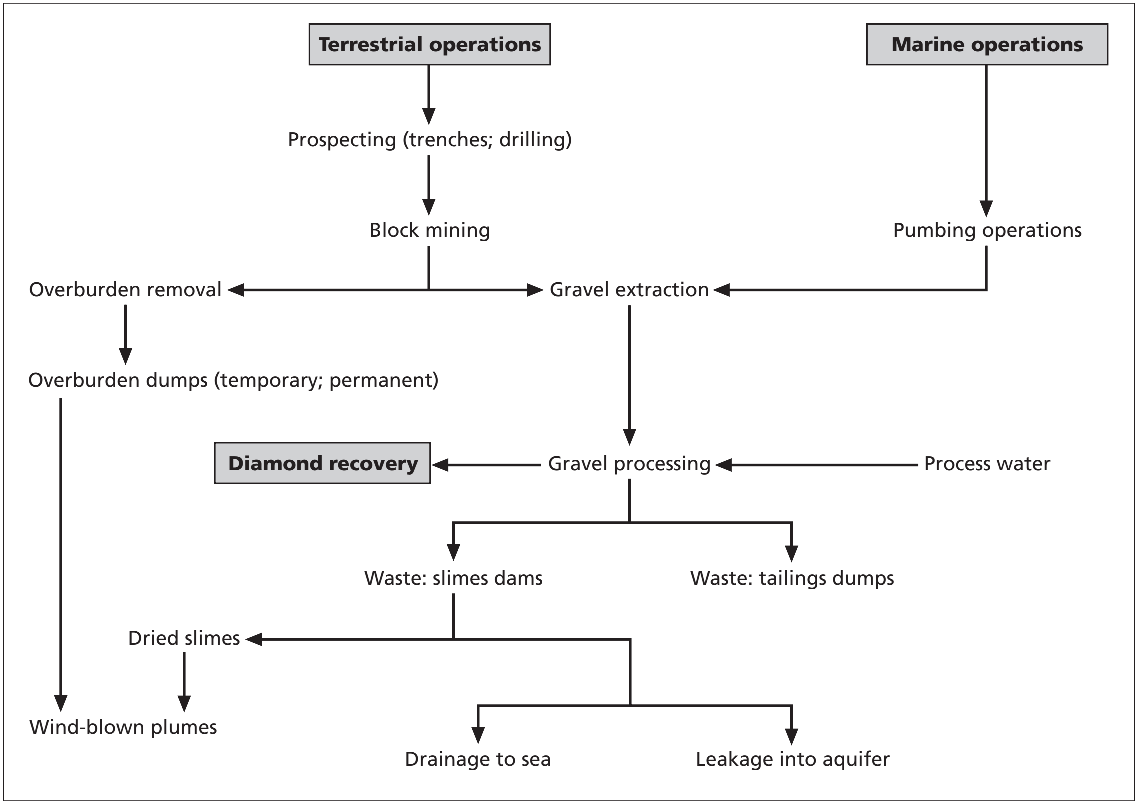

Fig. 18.1 Main components of a coastal diamond mining operation (based on CSIR 1994).

Phase 2: project evaluation

Mine design, process engineering, staffing, finance, marketing and other information becomes available from a variety of disciplines at this stage and an opportunity is available to integrate environmentally sound practice into these multidisciplinary pre-feasibility studies. This is the stage when a full, independent EIA is commissioned; that is the full baseline studies are carried out, impacts are predicted and prevention and remediation measures are identified. The EIA will provide an important input into the feasibility study and (along with the environmental management programme (EMP)) to decision-making.

Phase 3: design and construction

After approval, the project team moves into detailed design, procurement and construction. At the same time, environmental management plans, based on the EIA, are developed and integrated with the design. Environmental control guidelines laying down contractor performance standards and mitigation measures are prepared. A key activity at this stage is staff training to ensure that the environmental management philosophy is carried over to the commissioning and operating teams. Most importantly, an on-site environmental management authority is identified.

Phase 4: operation

Operational environmental management plans include monitoring programmes to ensure (for example) that limits of pollution of water, air and soils are not exceeded and that equipment and processes are maintained to operate to design specifications. Annual audits should take place to

Table 18.2 An example of an environmental interaction matrix (after Wright & Greene 1987, pp. 6–7).

					Terrestrial		Aquatic							Health and safety		Socio-economic			
		Air			Habitat	Wildlife	Hydrology		Quality		Habitat							
		Climatology: wind, humidity, insolation, temperature, precipitation, evaporation, visibility, snow depths	Meteorology: wind speed, wind direction, stability	Quality: nitrogen oxides, sulphur dioxide, carbon monoxide, total suspended particulates, radionuclides	Soils, lichen, vegetation, community	Caribou, moose, beaver, wolves, birds	Surface water: water levels, discharge, scour	Groundwater: flow system	Surface water: major anions and cations, trace elements, micro and macro nutrients, radionuclides, phys. parameters	Groundwater: pH, DO ionic strength, major ions, trace elements, radioisotopes, radon	Flora: macrophytes, phytoplankton, periphyton	Fauna: benthos, zooplankton, fish, fish predators (birds, mammals)	Worker: non-radioactive dusts, combustion products, radionuclides, radon, noise and vibration, chemicals/fumes, gamma/beta radiation	General public: non-radioactive dusts, radionuclides, radon, gamma/beta radiation, chemicals, combustion products	Land uses: forestry, fishing, hunting and trapping, recreation/aesthetics	Community: community services, commercial services, infrastructure, transportation/communications, local government, commercial vitality	Economics: population, direct employment, direct income, indirect employment, indirect income, direct project revenue, government revenue and expenditure, economic base/stability, cost of living, external economic impacts	Cultural and social impacts: archaeology, region, migration patterns, community satisfaction, social organization, community stability, job and education aspirations, job satisfaction
Exploration	Prospecting and surveying, access, exploration camp, geology of deposit			○	○	○							○	○	○	○	●	
Construction	Mine: draining of lake, dam construction, mine dewatering, site-water treatment and disposal, pit construction, mine buildings, overburden removal, waste rock pile	●	●	●	●	●	●	●	●	●	●	●	●	○	○	○	●	●
	Mill: mill buildings, preparation of tailings management areas, transmission lines and pipelines	○	○	○	○	○	○		○		○	○	○		○	○	●	●

(*Continued on p. 382*)

Table 18.2 *continued*

		Air			Terrestrial		Aquatic						Health and safety		Socio-economic			
		Air			Habitat	Wildlife	Hydrology		Quality		Habitat		Health and safety		Socio-economic			
		Climatology: wind, humidity, insolation, temperature, precipitation, evaporation, visibility, snow depths	Meteorology: wind speed, wind direction, stability	Quality: nitrogen oxides, sulphur dioxide, carbon monoxide, total suspended particulates, radionuclides	Soils, lichen, vegetation, community	Caribou, moose, beaver, wolves, birds	Surface water: water levels, discharge, scour	Groundwater: flow system	Surface water: major anions and cations, trace elements, micro and macro nutrients, radionuclides, phys. parameters	Groundwater: pH, DO ionic strength, major ions, trace elements, radioisotopes, radon	Flora: macrophytes, phytoplankton, periphyton	Fauna: benthos, zooplankton, fish, fish predators (birds, mammals)	Worker: non-radioactive dusts, combustion products, radionuclides, radon, noise and vibration, chemicals/fumes, gamma/beta radiation	General public: non-radioactive dusts, radionuclides, radon, gamma/beta radiation, chemicals, combustion products	Land uses: forestry, fishing, hunting and trapping, recreation/aesthetics	Community: community services, commercial services, infrastructure, transportation/communications, local government, commercial vitality	Economics: population, direct employment, direct income, indirect employment, indirect income, direct project revenue, government revenue and expenditure, economic base/stability, cost of living, external economic impacts	Cultural and social impacts: archaeology, region, migration patterns, community satisfaction, social organization, community stability, job and education aspirations, job satisfaction
Operation	Camp: buildings and other facilities	○		○	○	○	○		○		○	○			○	○	○	○
	Transportation: airstrip, access roads	○		○	○	○	○		○		○	○			○	○	○	○
	Mine: pit dewatering, ore extraction, ore stockpile, conveyance to mill, other wastes	●	●	●	●	●	●	●	●	●	●	●	●	●	○	○	●	●
	Mill: power generation, ore processing, process wastes (water, solid, air), yellowcake, other wastes, tailings management (stability, effluent, seepage, emissions)	●	●	●	●	●	●	●	●	●	●	●	●	●	○	○	●	●

	Camp: waste management, power generation, water use, equipment operation, housing, recreation	●	●	●	○	○			○	○	○	●	●	○	○	○	○	○
	Transportation: people transport, raw materials transport, product transport, fuel storage	○		○					○				○	○	○	○	●	○
Project personnel and support services	Personnel, hiring policy, training, support services, marketing of product					●			●	○			○	○	○	○	●	●
Reclamation and abandonment	Mine, mill, camp, transportation: see 'construction' and 'operation'	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	○	○
Accidents and upsets	Mine, mill, camp, transportation: see 'construction' and 'operation'	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

●, high priority interaction; ○, low priority interactions.

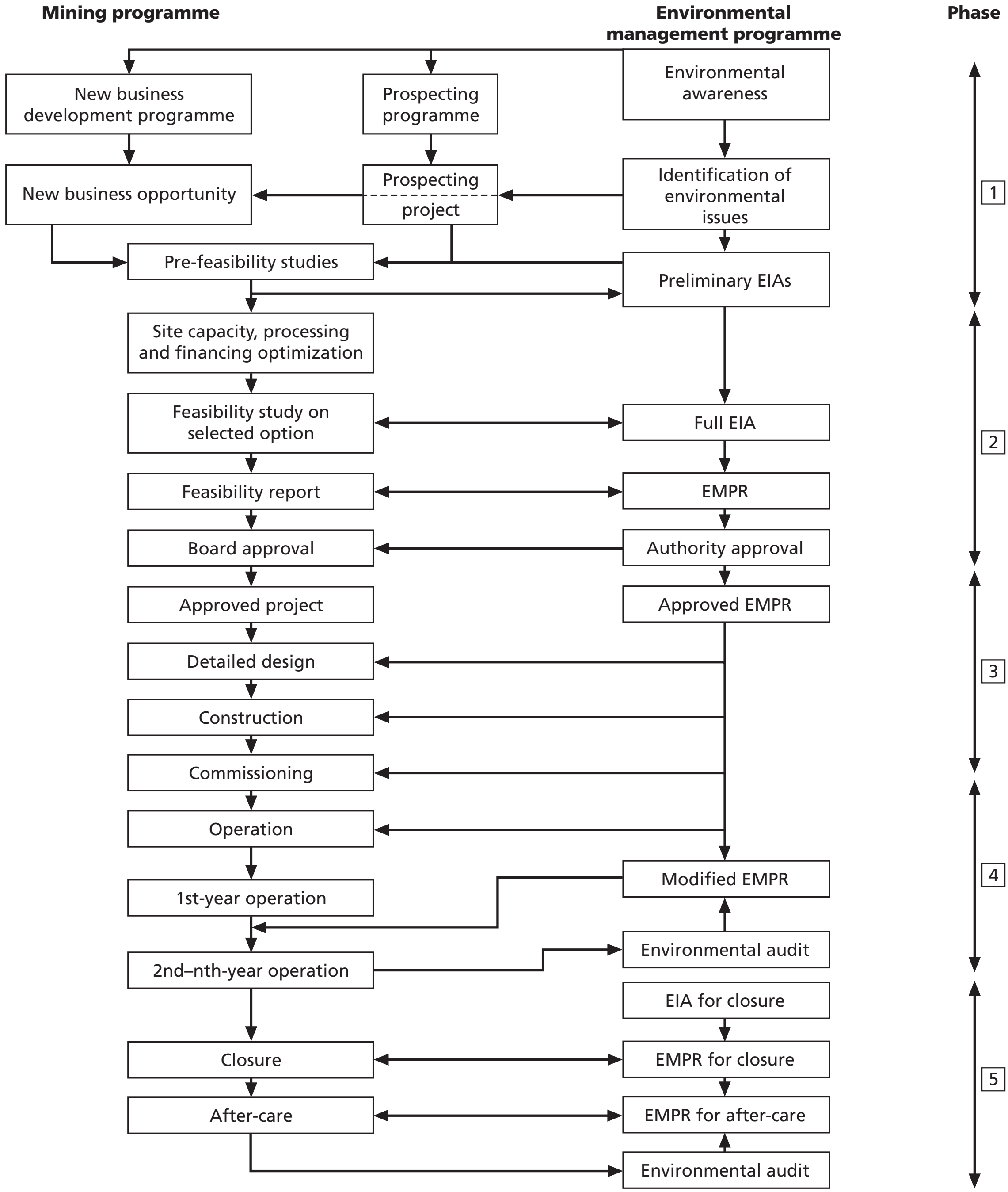

Fig. 18.2 Integrating environmental management with the mining project cycle (based on Freer 1993). EIA, environmental impact assessment; EMPR, environmental management programme report.

critically review the effectiveness of the EMP and incorporate new standards where appropriate. This phase should include environmental effects monitoring in the receiving environment and comparisons with baseline and predicted effects and implementation of prevention or remediation measures.

Phase 5: closure

This might include the requirement of a separate EIA for the closure plan, but normally covers the successful completion of rehabilitation, some after-care and continuous auditing until a certificate of closure is supplied by the relevant authorities. In some cases proponents have to care for a site 'in perpetuity'. It is during this phase that the proponent/operator could implement measures to enhance the economic value of the site.

18.2.2 Mining methods

Mining methods and concomitant impacts also vary widely—largely as a result of the location of products. Table 18.3 provides an overview of typical effects associated with different mining and mineral processing methods. Surface mining methods are the most economical methods to apply in situations where the mineral deposits occur close to the surface (e.g. coal, salts and other evaporite deposits or road quarry material) or is part of the surface soil (e.g. alluvial diamonds and heavy mineral deposits). Surface mining methods include: strip mining, open pit mining, dredge, placer and hydraulic mining. 'Complete disruption of the surface always occurs, which affects the soil, surface water and near-surface ground-water, fauna, flora and all types of land-use. Because of this, an understanding of the pre-mining environment is essential' (Fuggle & Rabie 1994, p. 340). So too is an understanding of the mining method employed, so that surface rehabilitation and post-closure land-use targets can be planned and committed to in advance. This has proven to be cost effective as it is better to identify potential environmental problems in the early stages than to decide on developing a mine based on geology alone and then discovering that there are environmental constraints and liabilities which have to be cleaned up.

Shallow underground mining, up to about 50 m below the surface, includes room and pillar mining (often used in coal mines), where pillars of the coal seam are left to support overlying material. In some cases in the older coal mines in South Africa, after mines were closed, roof collapse occurred, allowing air to enter the old workings and to start spontaneous combustion in the residual coal. These workings have continued burning for many years and result in unplanned surface collapse and groundwater contamination through acidification and salinization of aquifers (Fuggle & Rabie 1994). Abandoned coal mines in Appalachia generate acidic, iron-rich waters that adversely affect more than 6400 km of rivers and streams (Kleinmann *et al.* 1995).

The major environmental impacts associated with deep underground mining (for example, coal and gold) are linked to mine wastes and blasting residues brought to the surface, causing water pollution from leachates, visual pollution, change in land use, dust and surface subsidence as a result of mine dewatering.

Offshore minerals, such as diamonds, oil and gas, heavy minerals, phosphorite, glauconite and manganese, are exploited in various parts of the world. The environmental impact of offshore mining differs according to the locality and the effects of the operation on inter-tidal, sub-tidal or deep-sea marine environments.

Apart from the rate and method of mining, the nature and extent of impacts can be affected by the location of the mine infrastructure: for example, haul roads; ventilation shafts; surface facilities (e.g. offices, workshops, car parks and warehouses); tailings and waste disposal areas and methods; transport and service corridors (e.g. railway lines, roads, pipelines, conveyors, airstrips, port facilities, power, water and gas corridors); product stockpiles; ore processing facilities; chemicals and fuel storage; and township and housing location (Environmental Protection Agency 1995a).

Different minerals react differently when brought to the surface and are in contact with air and water—this too can affect the type of impact

Table 18.3 Overview of mining and mineral processing and related environmental effects (source: Australian International Development Assistance Bureau 1993).

Mining or mineral process	Description
Surface mining	Process causes total disruption of the deposit site, which can range from several has to occasionally many km^2, with operations involving the creation of open pits and overburden stockpiles Depending on the project, some of the potential significant environmental impacts are: ● Airborne particulate matter from excavation ● Transport of materials from and erosion of exposed surfaces ● Noise and vibrations from blasting and diesel equipment ● Disruption of soil, natural vegetation and habitat ● Contamination and disruption of water supplies, surface and groundwater ● Adverse visual impact ● Disruption of traditional lifestyles ● Impacts on health and safety
Underground mining	Most blasting and excavation activity is beneath the surface and may result in large underground voids and surface rubble pile, a major concern in health and safety. In hard rock mines, the presence of voids may have no impact Types of mining include cut and fill, room and pillar, shrinkage stope, block caving, jet bore and longwall mining There is risk of soil instability and subsidence, although this is likely to be less severe than that associated with surface mining
Leaching	Can take place *in situ* at old or newly mined material piles *In situ* leaching involves a widespread surface network of drill holes, pipelines and pumps to circulate the leachate material through the ore body or on engineered pile After extraction of the mineral, a neutralizing solution is flushed through Potential environmental problems are: ● Loss of control of the leachate which is usually highly toxic ● Spills, leaks and incomplete flushing
Beneficiation	Covers a wide range of operations, including the washing of raw material, separation and concentration of ore by a variety of techniques, including gravity (iron/some gold), chemical leaching (gold, uranium) and flotation Ore processing usually produces large amounts of waste material, which can either be disposed of at or near the site, or in some instances some of it is returned to mined-out area as back fill Potential environmental problems include: ● Air pollution from the processes, including gaseous stack emissions; however, emissions are well regulated and impacts are usually minor or localized ● Noise from transport and the crushing and grinding of ores ● Visual intrusions ● Surface impacts from construction of facilities ● Impacts on surface water ● Health and safety impacts

expected. Table 18.4 provides examples of different impacts' sources (i.e. where in the mining activities the impact occurs), the resulting impact on the environment and possible treatment or mitigation measures that can be deployed to minimize these impacts. Although the types of impact identified appear to be fairly severe, it should be recognized that sophisticated mitigation measures have been devised through the sharing of best practice in the industry.

Table 18.4 Generic overview of typical environmental impacts and mitigation measures—mining and mineral processing (extracted from Government of Canada 1991; Sadar *et al.* 1992).

	Impact source	Impacts	Treatment/mitigation measures
Water quality impacts			
Metals	Metals are present in sludges, tailings, waste rock, dusts and gaseous emissions from smelting and refining. The escape into the environment of metals from these sources is one of the most significant environmental concerns for the mining industry. For example, metals leached from tailings and waste rock piles that generate acid drainage may escape into the receiving environment during snowmelt and periods of high rainfall. Metals emitted from smelting are deposited in lakes and rivers, where they can affect water quality and accumulate in sediments	Metal contamination of lakes and rivers from mining activities occurs in most mining regions of Canada Naturally occurring high levels of metals in waters and sediments in mining regions, which result from the natural weathering of rocks containing the metals, can be confused with industrial discharges. Often these high natural levels are discovered only once human activity gets under way at a given site. Baseline studies should identify these conditions Although minute quantities of many metals are essential to life, high concentrations can be harmful to many parts of the ecosystem, including zooplankton, phytoplankton and, with high enough concentrations, fish and mammals	Mine effluents, containing such metals as arsenic, cadmium, copper, iron, lead, nickel and zinc,are treated with lime to precipitate the dissolved metals in the form of hydroxides. Such treatment is generally effective at removing over 90%—in some cases, as much as 99%—of metals and suspended sediments from the mill effluent. In some instances, effluents discharged from tailings ponds must be treated further with lime to raise their pH and hence lower their metal content, before the water can be discharged to the natural receiving environment Sludge is commonly pumped back into the tailings pond. To prevent any leaching of harmful quantities of metals from the pond to surrounding environment, the storage systems must be structurally stable and the sludge itself chemically stable
Cyanide	Cyanide is widely used in the milling of gold and, to a far lesser extent, in base metal, e.g. copper, lead and zinc, operations. The small quantity of cyanide used at base metal mills is not considered to pose an environmental problem, and the low concentrations present in effluents usually degrade naturally in the tailings ponds	The cyanide and cyanide–metal compounds must be removed from the effluents, because natural degradation alone is not always adequate to treat these wastes. However, natural degradation of cyanide is often adequate, given proper extended exposure to sunlight. Cyanide is extremely toxic to biological organisms	Several effective alternative treatment methods have been devised, which either treat gold mill effluents directly or treat the water decanted from the tailings pond in which natural degradation is occurring. These include the Inco sulphur dioxide–air process, the Noranda sulphur dioxide process, hydrogen peroxide and biodegradation. With these technologies, cyanide removal can be over 95% effective. The cyanide, which is precipitated as a metallocyanide complex, generally ends up in the tailings pond. Liquid discharges to the environment also contain some cyanide, but significant impacts have not been reported

(*Continued on p. 388*)

Table 18.4 *continued*

	Impact source	Impacts	Treatment/mitigation measures
Acid mine drainage	The ore from which the common metals are extracted, for example, may contain minerals composed of from 1% to over 50% sulphur. After the ore is processed, the sulphur-bearing minerals are discarded with the tailings and waste rock These metallic sulphide minerals react chemically and biologically with oxygen, moisture and bacteria that use sulphur as a source of energy. The oxidation of the most reactive sulphide minerals, such as pyrite and pyrrhotite, can, in turn, cause the oxidation of other less reactive ones. Sulphuric acid is produced, which dissolves metals contained in the exposed rock and tailings	Acid generation is a problem for two reasons. First, the metals dissolved under acidic conditions can enter the aquatic environment, where they can be toxic to various organisms. Secondly, the acidity itself causes conditions that are toxic to organisms, especially fish, which have an optimal water pH range between 6.5 and 9.0 The lag time for the onset of acid mine drainage may vary from 1 year to more than a decade, and acid may be generated for many years, causing more widespread environmental impacts Low pH levels and high concentrations of such metals as copper and zinc can pollute receiving waters, causing elevated metal concentrations in bivalves, reducing fishing success and changing plankton community structure	Treatment methods exist to neutralize acidic mine waters and to reduce the acid generation of tailings and waste rock. These methods involve ongoing expenditures and maintenance; none offers permanent, safe, 'walk away' solutions. The potential for acid generation in the future and the costs of managing the problem are issues of great concern Operating mines that are currently creating acid mine drainage all operate neutralizing treatment plants Research into understanding, predicting, preventing and mitigating the impacts from acid mine drainage have been carried out for many years. Much of it has focused on preventing oxygen from coming into contact with the sulphide tailings and waste rock Techniques to inhibit acid formation are under investigation; these include the use of impermeable covers and the burial of tailings and waste rock submerged under water
Saline mine drainage	Saline mine drainage is associated mainly with the production of potash. Potash mines annually produce millions of tonnes of tailings, composed of sodium chloride, potassium chloride, clay, gypsum and dolomite, in addition to liquid effluent brines.	Both the tailings and brine have the potential to contaminate surface water and groundwater through saline drainage runoff and seepage. Wind may also transport and deposit salts on to surrounding land. These particulate emissions, as well as the visual impact of the tailings piles, are growing concerns Saline drainage does not appear to be causing any major environmental damage at present	The industry is implementing control measures to meet provincial regulations, and the mines have caused few impacts beyond the mine site. However, no long-term management solutions or reclamation techniques exist. If Canada continues to be a world leader in potash production, between 14 and 18 billion tonnes of salt waste (tailings, brines and slimes), covering between 80 000 and 160 000 ha, could accumulate by the middle of the next century. The long-term problem, therefore, centres around how to manage the accumulating waste, the lack of long-term tailings and brine management solutions and the cost of ensuring that scarce water resources, particularly in Saskatchewan, are not contaminated with salt

(*Continued*)

Table 18.4 *continued*

	Impact source	Impacts	Treatment/mitigation measures
Air pollution			
Dust from tailings	Tailings ponds allow solids to settle out so that process water can be decanted off. As the surface of the tailings dries, it is subjected to wind erosion, particularly during dry periods of the year	Asbestos is a dust that has received more attention than others. Environment Canada found the levels of asbestos fibres in the air of a Quebec mining region to be 10–10 000 times higher than urban background levels. Although prolonged occupational exposure to asbestos dust has been linked to forms of lung cancer, epidemiological studies of the region's residents have not been able to determine the health effects resulting from exposure to asbestos fibres at these levels. The presence of asbestos fibres in rivers near tailings disposal areas is not considered to be a problem from either human health or environmental points of view	The mining industry controls dust by spraying the surface of tailings with latex sealants or water, by maintaining a water cover and by revegetating areas that are no longer used

18.3 SCOPING

Modern EIA practice favours the use of scoping as a method for the identification of the key issues upon which the detailed EIA should focus (see Chapter 10, Volume 1). Scoping involves meetings between the mining company, various planning and environmental agencies, infrastructure and raw materials suppliers (e.g. water and power), members of the public and other interested and affected parties. In some countries, for example, Canada, public involvement in scoping is mandatory. The end result of this process is a clear and concise definition of the scope of the impact assessment which is to follow. Public involvement in the scoping phase has gained international acceptance as part of good practice (Sadler 1996; see Chapter 8, Volume 1). Even in countries (like South Africa) where public involvement has not been mandatory, it has proved indispensable in focusing mining EIAs. Figure 18.3 (Weaver & Rossouw 1996) provides a graphical description summarizing the approach to public involvement in scoping currently practised in South Africa and elsewhere. It should be noted that the public consultation process described in Fig. 18.3 forms an integral part of the EIA and plays a vital role in identifying the issues (phrased as questions) that should be focused on in the detailed EIA which follows the scoping stage.

Even though there is a danger in using checklists, because they are not guaranteed to be 100% comprehensive, they can help the practitioner in the identification of issues. These should be carefully tested in a thorough public participation process. An example of an issues checklist is reproduced in Box 18.1. As in the process described in Fig. 18.3, questions are used to define the issues. This is a valuable way of focusing the specialist impact assessments. All unanswered questions form the basis for the terms of reference for the EIA.

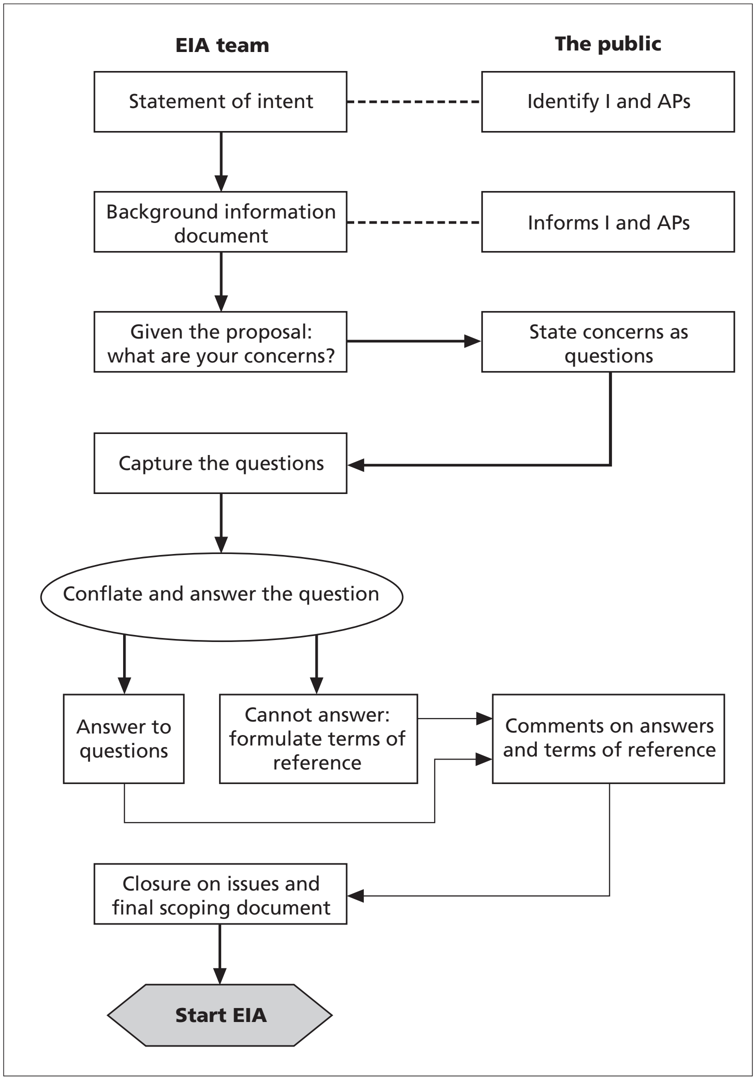

Fig. 18.3 Flow chart illustrating public involvement in the scoping phase of a mining project (based on Weaver & Rossouw 1996). EIA, environmental impact assessment; I and APs, interested and affected parties.

18.4 BASELINE SURVEYS

Adequate baseline information is necessary before mines can be planned in an environmentally responsible way. As discussed in a number of the project-related chapters in this Part of the Handbook, a commonly made mistake is to 'get out there and collect data' before clearly identifying the type of data needed for the EIA. The nature and degree of detail of baseline information collected are largely determined by the key issues identified in the scoping phase of the EIA (see Section 18.3) and the availability of data. Examples of the type of baseline information that might be required are given in Box 18.2. In big projects, it is well worth the investment to involve information technologists in designing the evolving database upfront to ensure compatibility between the various electronic data sources and mine management systems. Spatial information in geographical information systems (GIS) format collected prior to mining could, for example, be

Box 18.1 Example of an issues checklist to be used in EIA scoping (NORAD 1994, pp. 26–9)

Will the project:

Cause pollution of water, air or soil?

- Has any assessment and/or mapping been done with regard to the current pollution situation, user interest and possible conflicts in the affected recipients (air and water)?
- Will there be discharges of solid or dissolved substances to waste water, causing pollution of groundwater, surface water or coastal waters?
- Will the project increase the risk of erosion resulting in water sources becoming turbid or muddy, and cause the accumulation of silt on the bottoms of these water sources?
- Have plans been established to reduce the discharge to water and are these measures considered sufficient?
- Have the impacts on the recipients' usage as water source for drinking water purpose or as water source for agriculture and aquaculture been considered?
- Will the activity, including transport, cause discharge of dust to air which may cause damage or discomfort for the settlement areas in the vicinity?
- Is there a risk that the activity can cause discharge of gases that are damaging to health and environment?
- Have measures for reduction of discharge to air been planned, and will these measures be sufficient?
- Will discharge outlets for wastewater and chimneys for gases be located and dimensioned so that the concentrations of discharge substances become as small as possible?
- Will the project be subject to local environmental regulations, and will these be sufficient to avoid local damage and discomforts?
- Has a plan for operation been established which will consider the risk for both short- and long-term pollution?

Cause waste problems?

- Will waste be created during the operation which is hazardous to people or environment, e.g. gangue containing sulphide, tailings containing sulphide, radioactive waste, etc.?
- Will the various types of waste be deposited in such a manner that they cannot contaminate soils and water resources?
- Will the activity have its own tailings pond?
- Have the long-term environmental impacts of the deposition of tailings and gangue been considered sufficiently and with a satisfactory result?
- Is the national definition of hazardous waste in accordance with the strictest international regulations?
- Will the management of hazardous waste be in accordance with the strictest national and international regulations and guidelines?

Affect areas with conservation-worthy fauna or flora or other especially vulnerable ecosystems?

- Will the activity, including any open pit mining, and the affiliated roads and other facilities create barriers for animals, or in any other manner expropriate important habitats for fauna and flora?
- Will there be a sufficient distance to vulnerable natural areas?
- Will the activity displace fauna or flora species that are economically important vulnerable or conservation-worthy?
- Will the discharges of wastewater or the deposition of tailings from the activity threaten the aquatic resources?
- Will the project through physical, location, pollution impacts or impacts on the composition of species and production contribute to the destruction of or change vulnerable or conservation-worthy ecosystems?
- Will transport of dangerous substances go through areas with vulnerable or conservation-worthy ecosystems, flora or fauna?

Affect areas with conservation-worthy objects or landscapes?

- Will any open pit mining, tailings ponds, waste rock dumps and mining facilities otherwise change the visual expression of the landscape in a manner which greatly impacts the scenic value of the landscape for the local population and makes it less attractive for recreation and tourism?

(*Continued on p. 392*)

Box 18.1 *continued*

- Will houses, other buildings or landscapes that are of importance to the local population be affected by the project?
- Will areas or objects with a historical, cultural or religious value for the population be affected?
- Have plans been made prior to the initiation of the project for the adaption of the project to the landscape. And have plans been made for rehabilitation measures upon the closing of the project?

Constitute a health risk for the workers and the local population?

- Will any national regulations regarding working environments be complied with?
- Is there a risk that the working environment could cause harm or work-related illnesses for the workers?
- Will houses or other sensitive areas be affected by noise? The noise conditions at night should be considered specifically
- Will the activity processes utilize environmentally harmful chemicals or substances?

Contain a risk of accidents with serious consequences for the population and nature?

- Will there be a risk of large explosions (dust explosions) or fires as a result of the activity?
- Are the tailings ponds dimensioned to withstand incidents like earthquakes, floods, hurricanes, etc., which may occur in the area?
- Is the operation of the open pit mining or underground mining adapted to the geological conditions in the area, in order to prevent cave-ins of landslides?
- Are safety zones located surrounding open pit mining facilities?
- Will the factory utilize substances which are inflammable, toxic or environmentally damaging?
- Will there be a controlled use of such dangerous substances?
- Will the factory have a system for marking, risk formation, handling and stockpiling of dangerous substances?
- Is there a danger for accidental discharges of dangerous substances to air, water or soils?
- Will the industry have emergency routines in case of accidents?
- Will there be quality control of waste and discharge with regard to the content of pollutant substances?
- Will transport of dangerous substances pass through settlement areas, agricultural areas or water supply areas?

Change the population's way of life?

- Will the local population, or those who are to work in the activity, have long traditions within industry or mining, or does mining represent something radically new?
- Will the project create a new division of labour between men and women?
- Is there a risk that women and children will be exploited as cheap labour?
- Will the establishment of mining lead to new population concentrations and thereby increased strain on the soil, fuel and water resources?

Cause conflicts with regard to land tenure and land use?

- Will the project affect areas which are used for transport and movement?
- Will the project affect areas which are used for agriculture, forestry or fishing?
- Could the project cause a lowering of the groundwater table in the area? If yes, which interests would suffer as a result?
- Will the project's consumption of water in the processes be in accordance with the existing use of water in the affected area?
- Will the activity cause extensive migration to the area, slum settlements and potential conflicts between migrant groups and the groups already living in the area?
- Will changes to the power structures, way of living and natural resource management cause conditions which indirectly increase the exploration of the total natural resource base in the area?

(*Continued*)

Box 18.1 *continued*

Prevent or cause considerable changes to the local population's use of natural resources and areas other than those directly affected by the project?

- Will the project force other activity to relocate to new areas and thereby place excessive strain on the natural resources and areas in the new areas?
- Will the project activities indirectly lead to a substantially increased or uncontrolled exploitation of other resources previously either insignificantly utilized or not utilized at all?
- Will the project entail the initiation of other activity, such as raw material extraction, workshop, industry, transport, etc.?
- Will the new activities mentioned above cause impacts on the environment?

Other general conditions

- Will the project utilize technology with little environmental impact?
- Will the products be environmentally critical both in use and as waste?
- Will the mining activity establish a system for environmental administration which secures that the management takes environmental responsibility and is in a position to handle environmental issues in a satisfactory manner?
- Are local, national and international environmental requirements known?

Box 18.2 Description of the existing environment (NORAD 1994, p. 24)

Natural environmental conditions

- Geology and soil conditions
- Hydrological and hydrogeological conditions
- Topography
- Climate
- Vegetation and fauna, with emphasis on
  (a) Especially vulnerable ecosystems
  (b) Vulnerable and conservation-worthy animal and plant species
- Unique and conservation-worthy natural landscapes
- Man-made environmental conditions
- Socio-economic and socio-cultural conditions.
- Demographic conditions:
  (a) Size of affected population groups
  (b) Any ethic belonging and variations
- Health situation:
  (a) With special emphasis on environmentally related diseases
- Settlement pattern and means of production:
  (a) Specified for ethnic group, class or caste
  (b) Division of labour organized on the basis of gender and age within the population groups in question
- Existing land use and utilization of natural resources:
  (a) Also including more extensive utilization of nature areas
- Unique and conservation-worthy cultural landscapes or objects and buildings of historical, archaeological, architectonic, cultural, aesthetic or scientific value
- Existing environmental problems and environmental stress:
  (a) e.g. Pollution of air, water and soil
- Other existing or planned activities that may hold future consequences for projects within mining and extraction of sand and gravel

extremely useful in evaluating the success of rehabilitation programmes later on (see also Chapter 9, Volume 1).

An often encountered difficulty associated with baseline surveys in remote, data-poor environments is linked to the limited amount of time available for these studies. Sites are often affected by periodic events, and accurate evaluation of climatic data, streamflow records and groundwater levels require monitoring over the long term. In terms of biota, certain plant species can only be identified by their flowers and, in arid areas, flowering might only occur after a critical amount of rain has fallen. Likewise, migratory birds might be excluded from a survey completed at a certain time of the year. Another difficulty is the identification of who is responsible for collecting the baseline data.

18.5 EVALUATION OF ALTERNATIVES AND SITE SELECTION

The choice as to where a mine should be placed is predetermined by the location of mineral deposits. Alternatives in mining projects differ from other developments where alternative sites could be considered or, conversely, there could be a wide variety of development options for a specific site.

> The choice between alternatives comes in the consideration of mining methods, location of mine infrastructure and waste deposit sites, and the sources of power, water and raw materials needed for mining. Mitigation of environmental impacts by moving a mine to a more environmentally suitable site cannot therefore be considered, as would be the case for most other development projects (Fuggle & Rabie 1994, p. 337).

Box 18.3 Examples of alternatives to be evaluated in mining projects

- Are there alternative deposits that can be mined?
- Are there alternative technologies that can be applied in all aspects of the operation?
- Are there alternative water resources that can be used?
- Are there alternative power sources?
- Are there alternative road routings?
- Are there alternative locations for mine infrastructure?
- Are there alternative transport options?
- The 0 alternative, i.e. evaluate the impacts of not having the project
- Are there alternative land users?
- Are there alternative labour options?

Some examples of alternatives that could be considered in mining projects are summarized in Box 18.3. The manner in which a mine is planned can have a major influence on the magnitude and the duration of impacts over the life of the development and following its closure (Environmental Protection Agency 1995a).

18.6 PREDICTION AND EVALUATION OF IMPACTS

The scoping process will have determined the issues requiring impact assessment. Impact prediction involves defining the impact and determining the likely consequences of that impact. There are as many approaches to impact prediction as there are disciplines involved. It is important that the various expressions of impact are reduced to a standardized format so that impacts can be compared across disciplines and environmental media. Table 18.5 provides an example of the set of conventions used in the St Lucia Heavy Mineral Sands EIA (Council for Scientific and Industrial Research Environmental Services 1993a).

Once impact description conventions have been defined clearly, the various specialists can use these to concisely define impact in a consistent fashion. The following paragraph, directly drawn from CSIR Environmental Services (1993b, p. 232) illustrates the use of standard terminology in impact description:

> Drainage problems may arise due to the buried pipeline and be aggravated by hippopotamus using the rehabilitated area as a path and causing drainage canals during the rainy season. This impact is negative and **moderate** as drainage canals can lead to erosion of soils and undercutting of embankments in the *short*, *medium* and *long-term*. Damming of water may result from the elevated roads and the railway. With mitigation, this **moderate** negative impact could be reduced to a **very low** positive impact for water-loving terrestrial vertebrates and a **very low** negative impact for grazers and grassland dwellers in the *short*, *medium* and *long-term*.

Table 18.5 Conventions used to describe impact in the St Lucia heavy mineral sands EIA (source: CSIR Environmental Services, 1993a, pp. 40, 42.)

(a) Spatial scales adopted for the EIA of the eastern shores of Lake St Lucia (Kingsa/Tojan Lease area)
The impact of each land-use option was considered at the following spatial scales:
- International
- National
- Regional
- Subregional
- Eastern Shores area (29 867 ha)
- Prospective lease area (3419 ha)
- Proposed mine path (1437 ha)

(b) Timescales related to the estimated duration of impacts as adopted for the EIA of the eastern shores of Lake St Lucia (Kingsa/Tojan Lease area)
The timescales for rating impacts, in this report underlined in the text, are:

• Short term	0–5 years
• Medium	6–30 years
• Long term	More than 30 years

(c) Significant rating scale adopted for the EIA of the eastern shore of Lake St Lucia (Kingsa/Tojan Lease area)
The significance rating scale adopted, indicated in bold, is as follows:

Very high	Of the highest order possible within the bounds of impacts which could occur. In the case of negative impacts, there would be no possible mitigation and/or remedial activity to offset the impact at the spatial or timescale for which it was predicted. In the case of positive impacts there is no real alternative to achieving the benefit
High	Impacts of a substantial order. In the case of negative impacts, mitigation and/or remedial activity would be feasible but difficult, expensive, time-consuming or some combination of these. In the case of positive impacts, other means of achieving this benefit would be feasible, but these would be more difficult, expensive, time-consuming or some combination of these
Moderate	Impact would be real but not substantial within the bounds of those which could occur. In the case of negative impacts, mitigation and/or remedial activity would be both feasible and fairly easily possible. In the case of positive impacts, other means of achieving this benefit would be about equal in time, cost and effort
Low	Impact would be of a low order and with little real effect. In the case of negative impacts, mitigation and/or remedial activity would be either easily achieved or little would be required, or both. In the case of positive impacts, alternative means for achieving this benefit would likely be easier, cheaper, more effective, less time-consuming, or some combination of these
Very low	Impact would be negligible. In the case of negative impacts, almost no mitigation and/or remedial activity would be needed, and any minor steps which might be needed would be easy, cheap and simple. In the case of positive impacts, alternative means would almost all likely to be better, in one or a number of ways, than this means of achieving the benefit
No effect	There would be no impact at all—not even a very low impact on the system or any of its parts

(d) Conventions on degrees of certainty adopted for the EIA of the eastern shores of Lake St Lucia (Kingsa/Tojan area)
Predicted impacts are associated with varying degrees of certainty. These are indicated in bold and are:

Definite	More than 90% sure of a particular fact. Substantial supportive data exist to verify the assessment
Probable	Over 70% sure of a particular fact, or of the likelihood of that impact occurring
Possible	Only over 40% sure of a particular fact or of the likelihood of an impact occurring
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring

The use of standardized terminology such as this allows the EIA coordinator to pull together the separate specialist impact assessments in the form of summary tables (Table 18.6).

Difficulties in impact prediction in mining projects are similar to those encountered in other sectors. These commonly include a paucity of baseline data upon which to make predictions, a lack of time in which to complete the valuations and, in many cases, limited budgets. Given these generic weaknesses, the use of standardized terminology and approach, such as the example described above, is essential in ensuring that levels of confidence, basic assumptions, time periods of applicability and consistency in approach are achieved. On a more positive note, impact prediction has become more reliable with the globalization of information. EIA practitioners can now verify if impact predictions related to similar projects in the past have been accurate through the monitoring and auditing processes that the mining industry has put in place. Another tool is environmental management systems (EMS) that require follow-up on the original predictions in an EIA (see Chapter 11, Volume 1).

18.7 MITIGATION OF IMPACT

Unlike almost all other developments which permanently alienate land from its original use, mining is very often a temporary land use. Being a true extractive industry, mining of the mineral resources cannot be sustainable at one place, because the deposit is finite and therefore is eventually exhausted. However, the post-mining land surface and the terrestrial habitat can be reclaimed to a sustainable condition. Thus, it is important to evaluate the residual bio-physical environmental impacts of mining after the operation has stopped, to arrive at a true measure of its impact. The residual impact results from a comparison of the 'before' and 'after' conditions rather than comparing the 'before' and 'during' situation. Evaluation of the residual impact must therefore take into account the mitigation measures that are implemented: for example, surface rehabilitation (Fuggle & Rabie 1994).

Mitigation of impact and rehabilitation is not restricted to bio-physical impacts. A good example of social impact mitigation occurred with the Rossing uranium mine near Swakopmund in Namibia, where, even though it would have made economic sense to locate the mineworkers as close to the mining operation as possible, this would have left a 'ghost town' after mining. In mitigation, the mine chose to locate mine housing in the town and bus mineworkers 30 km on a daily basis. Locating in town also allowed for better integration of mineworkers into the local community and the construction of more durable housing that could be used long after mining ceased. In Canada, 'fly in, fly out' of mine workers on a scheduled basis from existing communities is commonly more cost- and environmentally effective than creating a new community that will only exist when the mine is in operation.

Good practice requires that practitioners identify possible mitigatory measures for each of the impacts identified as well as the residual impact. Mitigation measures refer to action that can be taken to avoid or minimize the actual or potential adverse effects of the mining project. These might include the no project alternative; locational alternatives for infrastructure and waste disposal sites; adopting different mining and beneficiation technologies; cleaner production alternatives; recycling of materials; pollution control measures; rehabilitation and landscaping; and acquisition of additional property to compensate for lost habitat. Table 18.7 provides an example of an impact table which includes an assessment of residual impact after mitigation.

An innovative idea employed in some countries to ensure that post-closure commitments are met is that of mine bonding. This refers to the depositing of a sum of money (the posting of a bond) with a consent authority (government agency) by the mining company before beginning operations. The deposit is intended to guarantee the reclamation and rehabilitation of the area to be mined. If the mining company goes bankrupt or fails to comply with the conditions imposed, they forfeit the bond to the consent authority, which then becomes responsible for the rehabilitation of the mine site (Gilpin 1995).

Table 18.6 Example of EIA summary table (source: CSIR Environmental Services, 1993c).

Environmental factor	Mining option, with ecotourism development where feasible	Nature conservation and tourism option (no mining and full ecotourism development)
Terrestrial vegetation	**Very high** negative impact on the mine path in the short term, but with mitigation (the implementation of a programme of rehabilitation), **low** to **very low** in the long term. A total of 7.5% of the natural vegetation on the eastern shores would be affected by mining	
	A localized negative impact at tourism development nodes	Localized negative impacts at tourism development nodes
Terrestrial animals	**Moderate** loss numbers of some species, such as red duiker, gaboon adder, Samango monkey and dwarf chameleon, from mine path in the medium term. Mitigation in the form of capture and transfer to other areas or retention in captivity is possible	**Low** positive impacts, through reintroductions of game
Topography	**High** to **very high** negative impacts on dune topography in the mine path in the long term. While major topographical features could be recreated, they would be displaced by about 500–1000 m. Some steep slopes would become flatter. Changes to topography are expected to have **no effect** on ecosystem function	**No effects**
Soils	**High** decrease in soil nutrient status in the mine path in the medium term. Mitigation in the form of rehabilitation would probably lead to a return of soil nutrient levels in the long term	**No effects**
Wetlands	Some **low** or **very low** negative impacts due to mining in the medium term, on the Eastern Shores. In cases where water from the mine pond would impact groundwater levels, mitigation in the form of toe-drains or pumping from deep boreholes would easily rectify these impacts	
	Low negative impacts associated with ecotourism developments in the long term, on the eastern shores	Some **low** negative impacts associated with ecotourism development in the long term on the eastern shores
Biodiversity	**Very high** reduction in biodiversity at the scale of the mine path in the short term, reducing to **moderate** or **low** in the long term	**Low** to **moderate** positive impacts through reintroductions and rehabilitation of pine plantations
	Mitigation in the form of rehabilitation is possible; rescue plan for rare species could be implemented	

Table 18.7 Example of mitigation and residual impact assessment (source: CSIR Environmental Services 1993b, p. 116).

			Scale of residual impact		
Impact	Possible mitigation	Residual impact	Spatial	Time	Degree of certainty
High negative impact of mining on Iron Age archaeological sites located in the mine path	Utilization of material exposed by mining	**Very high** positive effect through increased knowledge	International	Long	Definite
Moderate negative impacts on visitors to Mission Rocks due to noise of the mining operation	None	**Moderate** negative	Lease area	Short	Definite
High negative impact on tourists due to increased traffic during construction and decommissioning stages of the mine	Construction of suitable roads to carry traffic	**Moderate** negative	Eastern Shores	Short	Definite
High negative impacts on tourism during construction of HMC pipeline	Construct during low tourist season	**Moderate** negative	Pipeline route	Short	Definite
Increased traffic during construction of new roads	Construct during low tourist season	**Low** negative	Eastern Shores	Short	Probable
Improved accessibility to Eastern Shores after construction of roads	None	**Low** positive	Eastern Shores	Long	Definite
Very high negative visual impacts of mining	Use of vegetation, including existing plantations, to screen mining Restrict drilling and bush clearing ahead of mine path Increase the rate of rehabilitation	**Very high** to **high** negative	Eastern Shores	Short	Definite
High negative visual impacts of mining	Shrouding of lights at night Camouflage of mining plant	**Moderate** negative **Very high** negative	Eastern Shores	Long	Probable

18.8 MONITORING AND AUDITING

The most effective EMS are those which dovetail seamlessly with existing operations, rather than adding another layer of management and control. The Australian Environmental Protection Agency (1996) lists 10 criteria for effective integration of EMS and mining operations:

- The company and its people are committed.
- Employees and management receive environmental training as soon as possible.
- Existing procedures, reports and meetings are used where possible.
- Employees are familiar with the system.
- Employees are encouraged to use the system.
- Employees understand why the EMS is there.
- EMS-related problems are fixed quickly.
- People have sufficient time and resources to implement the EMS.
- The company keeps it simple.
- The company keeps it brief.

A crucial part of EMS is performance monitoring which provides the necessary quantitative data for review. The review should, at a minimum, compare company performance against regulatory requirements, pre-mining baseline conditions, EIA requirements and predictions and previous audit recommendations (Environmental Protection Agency 1995b, p. 28). An example of a performance monitoring programme is given in Table 18.8.

An important management tool for mine environmental managers is the Environmental Audit. This allows for periodic and objective evaluation of the mine and its installations to assess compliance with regulatory requirements and the extent to which EIA predictions or commitments prior to commencing the mining operation are reflected in the results of the monitoring during mine operation.

Many North American companies carry out voluntary internal environmental audits, with the audit teams being made up of members of environmental staff from several plants or outside contractors. The team carries out an evaluation of the site as part of the audit process. By undertaking this activity, there is a commitment from the company to keep its own 'house in order'. Canadian companies are required to monitor effluents and emissions and report this information to provincial and/or federal authorities. The regulatory agencies may periodically carry out inspections of sampling programmes to verify compliance.

18.9 VALUE OF ENVIRONMENTAL IMPACT ASSESSMENT FOR MINING PROJECTS

For proponents, a well coordinated EIA of a proposed mining project can contribute significantly to effective planning. EIA is a process through which a wide range of expertise, including mining specialists, environmental experts and persons knowledgeable about local conditions, can be brought into focus. EIAs of mining projects require a holistic approach of the entire life-cycle of a mine: from exploration to mine closure and rehabilitation. Many mining companies have realized that this is ultimately the most cost-effective approach to planning and managing a mine and, specifically, to managing environmental effects.

In summary, EIA can help to reduce costs and unscheduled project delays and minimize future economic and environmental liabilities. It also provides a venue for identifying and responding to all other legislative requirements pertaining to the project, thus streamlining the subsequent approval process. Finally, a credible approach to EIA by the proponent company can serve to support the reputation of both the company and the mining industry generally, as participants in planning for the sustainable development of the world's resources.

For governments, EIA provides a mechanism for coordinating the work of the various agencies that have some responsibility for the mining project in question. More fundamentally, it is an opportunity to ensure that the project serves, or at least does not compromise, regional and/or national sustainable development goals.

For local communities, the EIA of a proposed mining project is an opportunity to contribute information on local conditions and aspirations to the planning process. The EIA process also provides an opportunity to establish and strengthen lines of communication with the project's propo-

Table 18.8 An example of an environmental performance monitoring programme: Mount Thorley Coal (source: Environmental Protection Agency, 1995b, pp. 24–25).

Area	Frequency	Procedure	Analysis and review of results	Compliance requirements	Other details
Water	7 monitoring stations (EPA Licence, Condition A17 [iii]) 7 monitoring stations (Schedule 11 of the Clean Waters Act, 1970)	Monthly and/or during overflow events Quarterly (done to set baseline data)	Collection by site. Analysis by Envirosciences or Australian Coal Industry Research Laboratories. Results tabled	Done monthly to assess regional quality. Results checked against Australia and New Zealand guidelines	No discharge licences, therefore very conscious of regional quality
Dust	11 depositional gauges located around the site (EPA Licence Condition A17 [i]) 1 high volume sampler located at Tutts shed (EPA Licence, Condition A17[ii])	Monthly 1 day in 6	Collection by P. Zib and Associates. Analysis by R.W. Miller Laboratory (C&A). Reported on a monthly basis and checked for levels		In accordance with EPA and Australian Standards
Noise	7 locations on, and around, the site (EPA Licence, Condition A17 [iv])	Quarterly	Undertaken by Caleb Smith Consulting. Reporting and tabled for comparison		In accordance with Australian Standards
Meteorology	Automatic weather station on Tharah dump (EPA Licence, Condition A17 [vi])	Continuous	Undertaken by P. Zib and Associates. Analysis tabled and reviewed		No real compliance but data used as assessment tool
Vibration	2 blast monitors (overpressure and ground vibration), location at Pike's property (EPA Licence Condition)	Each blast (1 fixed and 2 portable units)	Site/R.W. Miller personnel. Tabled for analysis		Last year 350 blasts with only 2 exceedances

EPA, Environmental Protection Agency.

nent. Most importantly, it is an opportunity to assess the overall effects of a proposed mine prior to its implementation and to take steps to ensure that the effects are at least not deleterious to local livelihoods and culture and at best make a positive contribution. For the larger community of concerned individuals, EIA processes provide an opportunity to bring broader considerations to bear on decision-making about mining activities.

It is important to note, however, that, although project EIA is inherently context-dependent and so must reflect regional biophysical, economic and socio-cultural attributes, it should not serve as an avenue for the development of regional plans, the settlement of political issues or the resolution of other broad-based land-use issues. Whilst experience has shown that EIA processes are likely to be more effective and efficient when the proposed project can be assessed within the context of a well-defined regional land-use regime, this is not usually the case in most countries in the world.

Box 18.4 Benefits of mining EIA (Source: McLellan 1996)

Properly conducted, EIA contributes to decision-making for sustainable development by revealing whether and how proposed projects can be implemented without unacceptable impacts and in a way that will maximize benefits. More specifically

EIA seeks to ensure that projects that proceed are implemented in a way that:

- Safeguards valued ecological processes and heritage areas
- Avoids irreversible and unacceptable loss and deterioration of natural capital
- Is tailored to the potentials and capacities of the resource base
- Optimizes the use, conservation and management of natural resources
- Protects human health and community well-being and avoids disrupting traditional lifestyles
- Leads to the attainment of durable and equitable social and economic benefits

EIA processes also have a variety of associated benefits. EIA can:

- Enhance the profitability of projects through better planning
- Improve coordination among participating agencies and help to clarify accountability/responsibilities
- Provide an avenue for the integration of knowledge and suggestions of local communities and other public interest groups
- Contribute to community development and build local knowledge and participating capacity in relation to resource development
- Help to instil environmental values and accountabilities across a range of institutions
- Promote application of the precautionary principle
- Contribute to the internalizing of environmental costs and damage, lessening the burden on society at large
- Facilitate identification and planning of beneficial postclosure of the site and/or its infrastructure

Societal benefits and costs of mining: the Canadian experience

The importance of mining can be illustrated by the following quote:

> Minerals and metals play a critical role in the everyday lives of Canadians, from food production to transportation and medical care. Mining and minerals make a $20 billion contribution to Canada's gross domestic product and provide jobs for approximately 350 000 Canadians. In 1994 this industry represented a trade balance surplus of over $11 billion

It is widely recognized, however, that virtually all stages of mineral development, including mining, smelting and refining, have the potential to cause significant environmental effects as a result of surface disruption, solid waste generation and toxic and non-toxic air emissions and liquid effluents

EIA can help minimize these environmental and related social and economic impacts and maximize the benefits to society

Neither can environmental assessment processes resolve fundamental philosophical disagreements about the nature of sustainable development. However, there are numerous initiatives in recent years, such as the multi-stakeholder Whitehorse Initiative in Canada, which have shown the potential for different stakeholders to come to agreement on the requirements for a socially, economically and environmentally sustainable mining activity. Conducted with care and commitment by all parties, EIA has an important role to play in making these shared views a reality. Box 18.4 summarizes some of the benefits of EIA and of mining with EIA in Canada.

18.10 CONCLUSIONS

Mining is an extremely cost-conscious industry. Fluctuations in mineral prices on world markets lead to regular closure of mines and resultant loss of employment. A frequently asked question by the mining industry is, 'what will this cost us?' The rule of thumb for EIA costs accepted by the World Bank is 1% or less of the total project costs (World Bank 1996). Outlays directly associated with integrating environmental management into all aspects of mining operations (i.e. from scoping and assessment through to implementation, monitoring and auditing) are estimated by the Australian mining industry to be up to 5% of both the capital and operating costs for new mining projects (Environmental Protection Agency 1995d).

In the immediate short term, environmental practitioners in the mining industry need to strive towards the integration of environmental considerations into the full mine life cycle, from cradle to grave. This requires the development of a clear vision of the desired postmining environment during the preparation of EIAs in consultation with interested and affected parties.

In the longer term, optimum resource utilization is rapidly becoming the guiding philosophy as countries subscribe to, and gain, a better understanding of the sustainable development ideal. Tools like strategic environmental assessment will be keys in providing a logical framework within which we can practise mining EIA. There is much debate around whether mining can ever be viewed as being a sustainable form of development. The consensus at this stage seems to be that mechanisms should be implemented to direct mineral-derived wealth into other activities in affected communities (such as small businesses, renewable and sustainable local utility development, sanitation, health and protection of environmental quality), so that the country is not left worse off than if the mineral wealth had never been generated (Epps 1996).

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19: Environmental Impact Assessment for Water Projects

ANDREW BROOKES

19.1 INTRODUCTION

Many guidelines are now available for water resources projects around the world (United Nations Environment Programme 1982; United Nations Economic and Social Commission for Asia and the Pacific 1990; Roe *et al.* 1995; Environment Agency 1996). The purpose of this chapter is not to attempt to review or reiterate these disparate sources, with the objective of perhaps producing more universal guidance on all types of water project. Rather, the focus of this chapter is an in-depth examination of some of the key issues and problems which arise from various experiences around the world. The premises of the discussion is that practice over and above the legal minimum requirements of many countries has the potential to provide better protection and even improve the environment through positive impacts. The quality of the scientific and technical content of an environmental assessment is paramount to environmental protection. A more pessimistic view might be that environmental impact assessment (EIA) is all too often regarded as a procedure which a developer merely follows to obtain a development consent. For example, in the UK there are many observed weaknesses in environmental statements for water projects submitted with planning applications by private developers (Box 19.1).

Relatively few EIAs for water projects refer specifically to the choice of the 'best practicable environmental option' (Royal Commission on Environmental Pollution 1988). This can be taken to mean establishing an option which provides the most benefit and least damage to the environment as a whole, at acceptable cost, in both the short and longer term.

The chapter focuses on discussion of scoping, baseline survey, alternatives, impact prediction, consideration of social issues and public involvement, criteria for success, post-project appraisal and the need for more integrated and strategic approaches to the appraisal of options for water projects.

19.2 TYPES OF PROJECTS

Virtually all types of development project will potentially impact upon the water environment, whether intentionally, as a result of direct use or control of a water resource, or because of the inevitable siting of a development within a watershed or in a tidal or coastal zone. Table 19.1 outlines a classification of water projects and lists some of the common issues which may be impacted: for example, surface water hydrology; channel morphology; surface and groundwater quality; surface and groundwater hydraulics; terrestrial and aquatic ecology; and human impacts, such as health.

For each issue there will be a series of potential impacts which will arise from sources of impact specific to a particular development type. The actual impacts will vary according to factors such as local conditions and types of mitigation measures. Scale of development may also be a factor: some reservoirs may have impacts which span international boundaries, whilst flood control works are often regarded as having a more localized impact, perhaps specific to a particular town and the immediate downstream river reaches. Whilst it is good practice to consider

Box 19.1 Some observed weaknesses in environmental statements for water projects based on UK experience

- Failure to consider construction phase impacts (e.g. fine sediment release)
- Failure to consider alternatives and evaluate the '*best practicable environmental option*'
- Lack of quantification (e.g. of impact on channel hydraulics)
- Poor baseline surveys (e.g. carried out at the wrong time of the year when aquatic plants are absent)
- Apparent lack of consultation
- Failure to consider in detail impacts and mitigations at the planning stage which are covered at a later stage of granting consents and licences (e.g. distance of a development from a watercourse to allow for an adequate ecological corridor)
- An assumption that technology will solve all the problems (e.g. that it is feasible to recreate an ecologically important floodplain habitat elsewhere)
- Failure to detail monitoring programmes

environmental issues in relation to all of the water projects listed in Table 19.1, in practice projects of a large scale or potential significance are those which typically require formal environmental assessment (categories (i) and (iii) in Table 19.1). Scale issues may also affect the approaches taken in different countries: for example, public consultation is now an increasingly important component of the development of both public and private water projects in the UK and elsewhere in Europe (e.g. Weston 1997), but community participation, in the sense of including indigenous people in the consideration of dam construction, takes on a different dimension in other countries (e.g. Goldsmith & Hildyard 1984; Asian Development Bank 1994). Vector-borne diseases may be a key issue for water resource projects in particular countries (e.g. Birley 1991).

Table 19.1. Water projects.

A *Projects designed to have a direct impact on the water environment*	
Fluvial	(i) Potentially watershed-scale impacts
	• Water supply reservoirs
	• Hydroelectric power
	• Points of large discharge
	• Sewage treatment works
	• Interbasin transfers of flow
	• Points of large abstraction
	• Irrigation
	• Groundwater abstraction
	(ii) General reach scale or local impacts
	• Channel works
	• Flood diversion channels
	• Flood storage areas
	• Flood embankments
	• Dredging
	• River bank protection
	• Water-based recreation
	• Navigation works
	• Restoration and enhancement of channels
	• Fish farms
Coastal and tidal	(iii) Potentially extensive spatial impacts
	• Sea outfalls
	• Coastal protection
	• Marinas
	• Barrages
	(iv) Generally local impacts
	• Beach nourishment
	• Suction dredging
	• Managed coastal retreat
B *Some projects which typically do not have the intention of controlling the water environment but can still have impacts of significance*	
Large residential developments	
Large industrial/manufacturing developments and operations	
Power stations	
Oil refineries/oil exploration	
Roads and road widening	
Airports	
Railways	
Forestry	
Golf courses	
Wind farms	
Pipelines	
Mineral extraction—mining and quarrying	
Restoration of mineral extraction sites	
Waste management	
Redevelopment of contaminated land	
Agriculture	
Intensive livestock/poultry units	
Petrol stations	
Septic tanks/cesspits, etc.	

19.3 SCOPING OF WATER PROJECTS

19.3.1 UK guidance

As discussed in Chapter 10, Volume 1, scoping is key to the success of EIA and is widely regarded as good practice in water projects. For example, in the UK the former National Rivers Authority (1989–1996), now part of the Environment Agency, concluded that too little attention was being given to the scoping of key issues early in the process. From the developer's point of view, scoping would lead to better targeting of resources for study and analysis of key issues, potentially leading to fewer delays later in the process, particularly on submission of an environmental statement. Ideally, the process should be open, with scoping briefs produced by the developer. Not all countries formally accept scoping (see Chapter 2, this volume, for a comparative review): but as early as 1978, the Council on Environmental Quality in the USA introduced it as a National Environmental Protection Act regulation (Council on Environmental Quality 1992). In the UK, the Environment Agency (1996) produced a *Scoping Handbook for Projects* dealing with over 60 development types. Each checklist was produced by reference to experts, both within the Agency and outside, and draws upon both an extensive literature review, as well as professional judgement. An example checklist for scoping for reservoirs is shown in Table 19.2.

Clearly, it is not wise to be prescriptive (e.g. in terms of direction of change) at the scoping stage, but rather to provide a checklist of issues and potential impacts. It is also important to note that, for the water environment, construction impacts can be potentially just as significant, if not more so, than the end-state impacts.

The scoping exercise can be used to create a dialogue at the earliest possible opportunity with a developer, thereby avoiding subsequent delays and extra cost in assessing impacts that were not identified early on and eventually prove significant. In theory, scoping should include the active participation of consultees, local authorities and the public. However, the approach taken to scoping of certain water projects, such as privately provided water supply reservoirs, is often hindered by the issue of commercial confidentiality. There is less of an excuse in relation to publicly funded projects, such as flood control works.

19.3.2 Other checklist approaches

Of all EIA methodologies, checklists are perhaps the most widely used (see Gilpin 1995; Canter 1996; Barrow 1997). Box 19.2 provides a checklist for economic, social and environmental elements for consideration in a sewage treatment plant.

Box 19.2 raises some interesting issues about good practice as opposed to legislative EIA requirements. For many countries, issues 1–29 would be a precursor to a relatively comprehensive and technically good EIA. However, issues 30–34 go beyond the minimum legislative requirements of most countries and, to date, have appeared rarely in EIA documentation. However, issues such as public education, progressive improvement of plant performance, an annual report, continuing public involvement after the initial EIA and the political implications of a sewage treatment plant are essential if principles such as sustainable development and the precautionary approach to environmental protection are to be applied. In the UK, for example, such issues have only been given cursory attention, if any, in environmental statements produced to date (e.g. Construction Industry Research and Information Association 1994).

It is perhaps important to understand that 'all projects, regardless of their stated purpose, their location, or their design—do accomplish some degree of "social engineering"' (Erickson 1994). All projects maintain or change, enhance or redirect or otherwise affect patterns of human life. Table 19.3 provides examples of the impacts of river and coastal engineering works and water supply and wastewater treatment works on socio-economic parameters, based substantially on European experience (Construction Industry Research and Information Association 1994).

Issues range from disturbance caused by noise, light and vibration, to a changed cultural/economic base resulting from a new port or marina to resettlement as a result of inundation by a reservoir. Construction of flood defence projects, coastal protection schemes, dams and

Table 19.2 Example of scoping guidance for reservoirs.

Issues	Sources of impact	Potential impacts
Surface water hydrology/hydraulics	Impoundment	Changed flow velocities Riparian drainage affected Changed surface water runoff
	Release regime	Changed flow regime Regulated flow Changed magnitude of flooding Changed flow velocities Changed frequency of flooding Changed duration of flooding
Channel morphology/sediments	Impoundment	Changed bank/bed stability Change of bed slope Change of planform/pattern Changed channel size Changed suspended sediment load Changed bed load Degradation/erosion of bed and/or banks
	Release regime	Changed suspended sediment load Change of planform/pattern Degradation/erosion of bed and/or banks Changed suspended sediment load
Groundwater hydraulics	Impoundment	Changed direction of flow Change in water-table (level)
Surface water quality	Impoundment	Change in oxygen content Organic pollution Nutrient enrichment Microbial contamination (roosting birds) Changed suspended sediment load Stratification Resuspension of contaminated sediments Changed dilution capacity Change in quality
	Release regime	Changed dilution capacity Changed suspended sediment load
	Associated afforestation (conifers)	Change in pH (acidification) Chemical pollution Nutrient enrichment Changed hydrological cycle
Aquatic ecology	Impoundment and release regime	Altered habitat Changed fish biomass Changed invertebrate biomass Loss of sensitive species Loss of rheophilic flora and fauna Disturbance of sensitive species Effect on fish behaviour Change in fish community Effects on fish spawning Changed species diversity

(*Continued on p. 408*)

Table 19.2 *continued*

Issues	Sources of impact	Potential impacts
	Dam wall	Barrier to fish migration Barrier to mammals Changed invertebrate biomass Loss of sensitive species
	Release structure	Loss of sensitive species Effect on fish behaviour Altered habitat Change in the fish community Changed invertebrate biomass Changed plant biomass Changed species diversity
Terrestrial ecology	Impoundment	Wetland changes Changed habitat (loss of terrestrial) Disturbance of sensitive species
	Associated pipelines	Changed habitat Disturbance of sensitive species
	Flood meadows	Wetland changes Changed habitat
Human-related	Impoundment	Changed flood risk Changed water resource Adverse odour Health risk Nuisances
Land use change	Impoundment	Restriction to future development
Visual amenity	Impoundment	Altered aesthetic value Altered landscape
Recreation-related	Impoundment	Alterations to access Change in angling quality Disruption to users of the water environment Altered facilities
Heritage and archaeology	Impoundment	Change to historic landscape

wastewater treatment works will usually have only a relatively limited impact on socio-economic parameters. Employment is likely to be temporary and the requirement for raw materials, which may be available in the area, and labour remain low following construction. However, reservoirs may attract local business as a result of leisure facilities, such as fishing and water sports. Similar knock-on effects and benefits result from port, harbour and marina developments. Waste-water treatment works have relatively little impact on the socio-economic character of an area, although there could be an impact on land and property values. Negative aesthetic impacts can dissuade leisure activities.

Checklists should be seen as a means of sorting out complex situations, to identify gaps in knowledge, but they should not be seen as final analyses. For example, they do not indicate impact significance, they generally exclude site-specific details and they cannot be used easily to assess cumulative or indirect impacts. Post-project appraisals for water projects can often provide valuable input for future checklists.

Table 19.4 provides a further example, listing activities that may result in particularly

Box 19.2 Sewage treatment plant (Adapted from Gilpin 1996)

1 The contribution the sewage treatment plant would make to improving the environment of the community served, through the elimination of septic tank and other systems, and the protection of the effluent-receiving waters
2 Alternative sites for the proposal and alternative treatment systems
3 The consistency of the proposal with national, regional or local planning instruments; the relationship to neighbouring residential or tourist areas
4 The types of sewage and waste to be treated (domestic, industrial, hospital, agricultural)
5 The number of inhabitants to be served by the plant, both now and in the future, arrangements for extension
6 Quantity of sewage and wastes involved, m^3 per day, per year, per season
7 Characteristics of sewage and wastes to be treated
8 Layout of the plant
9 Final disposal of treated effluent (for agriculture, to sea or river); chemical, physical and bacteriological characteristics of the treated effluent
10 Sludge quantity and characteristics
11 Method of sludge treatment and disposal (incineration, discharge into ocean after stabilization, improving fertility of soils, providing compost for horticultural industry, land rehabilitation, landfill)
12 The measures to maintain the reliability of the sewage treatment plant, so that plant bypasses, which lead to raw sewage discharges, are reduced to a minimum
13 The measures to reduce overflows from the sewerage system resulting from illegal stormwater connections
14 The arrangements for the separation of stormwater from the sewerage system, and the modes of disposal of stormwater
15 The measures to reduce the emission of odours from the treatment and disposal activities; use of odour scrubbers
16 The provision of additional sewerage services to reduce the pollution of waterways caused by runoff from on-site sewage disposal systems
17 Measures which could be adopted for reducing the deleterious effects of urban run-off
18 The possible impacts of measures on drinking water quality and recreational beaches
19 The effects of the project on flora and fauna
20 Proposals for landscaping and screening of plant
21 The construction impacts should extensive construction of sewers be required
22 In certain climates, the risks of mosquito breeding
23 Measures to improve the quality of influents into the system, domestic, industrial and commercial
24 Proposals for the monitoring of the entire system
25 The existing environment: physical site characteristics, climatological and meteorological conditions; geological and hydrological condition; present land use of site and surroundings; any other particular characteristics
26 The implications for aesthetics, amenities, ecology and health, nearby residential districts, schools, hospitals, etc.
27 Enforcement procedures by management
28 Emergency services and responses
29 Prospective future developments in the same locality which might suggest incompatibilities
30 Proposals for education of the public in environmentally sound practices
31 Measures for the progressive improvement of plant performance and environmental management of the entire system over coming years
32 The political implications of the project
33 The arrangements for continuing public involvement following the initial EIA
34 Annual report to the environmental, planning and public works agencies

Table 19.3 Socio-economic parameters: examples of the impact of river and coastal engineering works (adapted from Construction Industry Research and Information Association 1994).

Issue	Possible cause	Typical effects	Predictive techniques	Appropriate standards/controls	Mitigation and enhancement options
Disturbance	Noise (e.g. piling); light; vibration; traffic	Stress; worry; loss of sleep; safety concerns	Background measurement; experience at similar sites	BS 7385 BS 7482 BS 5228 (Parts 1, 2 and 4)	Daytime working; careful selection of piling techniques; screening; angle of lighting; double glazing; routeing of traffic to avoid sensitive areas
Employment opportunities	Construction work; port or harbour expansion; marina development; support industries	Local job creation; immigration; boost to local economy but large construction project may create non-sustainable 'boomtown' economy	Economic modelling; employment forecasting	Case specific	Provide skills training for local people
Unemployment	Port rationalization/ automation; end of major construction project	Social problems; demoralization, dereliction, vandalism; economic stagnation; emigration	Socio-economic modelling	Case specific	Local or central government employment initiatives
Immigration	Employment opportunities	Pressure on existing short- or long-term accommodation, schools, health services, etc.	Demographic modelling	Case specific	Contractor to provide temporary accommodation; encourage use of local labour; provide skills training; developer to fund/contribute to new services, etc.
Increased property prices/rents	Increased demand; change in status of site due to new marina or redevelopment of port/harbour	Local people or business priced out of market	Supply/demand analysis	Case specific	Provide concessions for local business
Changed cultural/ economic base	Major development or redevelopment (e.g. new port; marina; etc.)	Changed social class through immigration; rural to urban society; social upheaval; attract tourists/ visitors to area	Demographic modelling; economic analysis	Case specific	Retain local cultural features; respect local customers; establish and provide for local needs
Health benefits	Reduced flooding/ erosion risk	Reduced stress and worry		Case specific	Good dissemination of information to the public; effective emergency plan; trained personnel

BS, British Standard (of the British Standards Institution, London).

Table 19.4 Activities that may result in potentially significant impacts (construction phase) (adapted from Construction Industry Research and Information Association 1994).

Activity	Examples	Reservoirs	River intakes	Treatment works	Sludge treatment including incineration	Outfalls
Construction phase						
Site works	Clear excess vegetation and buildings; relocate populations; earthworks; store materials	■	□	□	□	□
Dredging	Dredge outfall trench		□			□
Ancillary works	Temporary access; power supplies; water supplies	■	□	□	□	□
Raw materials demand	Aggregate; rock armour to cover outfalls; borrow pits	■	□	□	□	□
Transport of raw materials	Aggregates; concrete; pipes; steel structures	■	□	■	□	■
Transport of employees	Daily journeys to site	□	□	□	□	□
Immigration	Contractors; temporary workforce	□	□	□	□	□
Employment	Local people	□	□	□	□	□
Local expenditure	Materials and services	□	□	□	□	□
Lighting	Construction site	□	□	□	□	□
Vibration	Piling; traffic; earth moving; tunnelling	□	□	□	□	□
Noise	On-site plant; traffic; blasting	■	□	■	■	□
Odours	Sewage and sludges during commissioning			□	□	□
Dust and particulates	Earth moving; stockpiles; blasting	■	□	□	□	□
Gaseous emissions	Exhaust from vehicles	□	□	□	□	
Aqueous discharges	Pollution incidents; storm runoff	■	□	■	■	■
Dredged material disposal	Trenching	□	□			□
Solid waste disposal	Spoil; construction material	□	□	□	□	□
Accidents/hazards	Slope failure; spillages	□	□	□	□	□
Navigation	Shipping lanes offshore; river traffic	□	□			□

□, occasionally causes significant impact; ■, commonly causes significant impact.

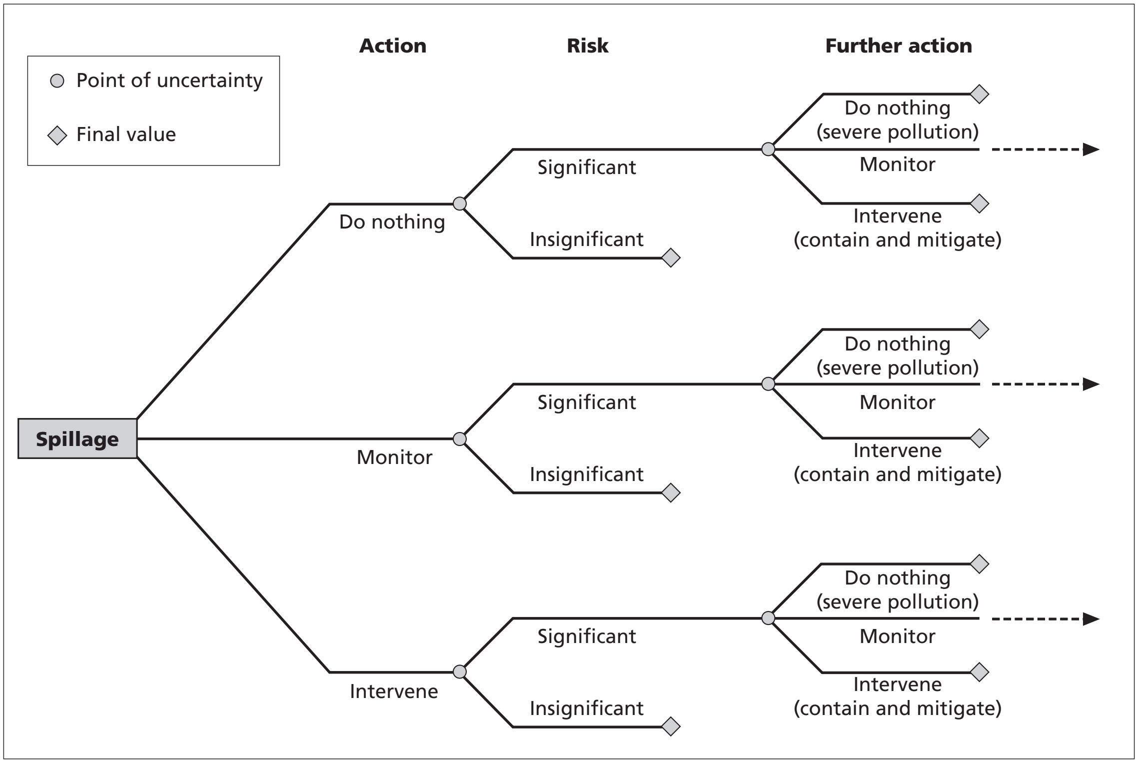

Fig. 19.1 Decision tree for accidental spillages and pollution risk.

significant impacts during the construction phase of a project (Construction Industry Research and Information Association 1994). Many of the unforeseen significant impacts of water projects are those due to construction. For example, rain-washed silt from a site can adversely affect a downstream fishery, particularly where particles clog the substrate required for spawning of particular species of fish.

As an alternative to checklist approaches, there are a large number of practical and theory-based methods which have various advantages and disadvantages (Barrow 1997). Decision or event trees are a specific example, particularly useful for analysing complex problems concerning the water environment; they involve an ordered sequence of decisions and outcomes. The example shown in Fig. 19.1 is a simplified example for a spillage, with potential pollution risk to a watercourse. Event trees can also include subjective probabilities and the magnitude of impacts as judged by experts.

19.4 BASELINE STUDIES

Box 19.3 indicates that, in the water environment, timescale and timing of baseline surveys are very important. In order to define and model a particular system, it may be necessary to have access to, or collect, extensive data, so that variability, seasonality and trend can be adequately accounted for. Ecological data may need to be collected over a minimum of 12 months. A typical example is a fast-tracked environmental assessment programmed for a 6-month period over the winter. If it is found that there are insufficient existing data on aquatic plants then it may be virtually impossible to collect comprehensive survey data at the site during the winter months (see Chapter 15, Volume 1, for a detailed discus-

Box 19.3 Example of the constraints on the collection of baseline survey data

Data requirement	*Some constraints*
Rainfall/river flows	Several years of data may be required for modelling purposes (including both high and low flows)
Water temperature	There may be seasonal as well as diurnal variation of temperature requiring several months of data collection
Groundwater	Several years of records may be required, covering wet years as well as periods of drought
Riverine or coastal	Sediment transport or morphology erosion rates may only be ascertained over a number of months, perhaps including winter storms/high flows
Animals	There may be seasonal (including birds and fish) patterns relating to migration, breeding and feeding of different species
Plants	It may only be possible to accurately record the presence of particular plants during the flowering season

sion of ecological assessment). It is therefore essential that baseline surveys are commenced as early as possible. Modelling the hydrology and hydraulics for a water project can be an expensive process, involving specialist staff trained in the use of sophisticated techniques. Equally, the monitoring of sediment loads may not only include the cost of instrumentation on site but also the use of a laboratory to analyse sediment volume and particle size. This can be extremely expensive. Fisheries surveys involving electrofishing apparatus and undertaken by specialists can also be relatively expensive. Surveys involving mapping of plant habitats and species can be relatively less expensive: experienced surveyors usually make a charge per unit length of watercourse.

In practice baseline surveys may have to be undertaken at various stages of project decision-making and can be complex and protracted. For example, Beanlands (1988) demonstrated the stages for hydroelectric development for Labrador in eastern Canada, where a key issue was the potential impact of dams on populations of the Atlantic salmon (*Salmo salar*). At the 'approval in principle' stage, studies were directed towards determining whether it was possible to proceed with the project and meet the requirements of the Canadian Fisheries Act. For example, a review of historical catch records and recent population surveys by government agencies provided an initial answer. At the stage of 'deciding where the project should be built', a total of 11 potential sites had been looked at in terms of engineering feasibility along a specific river, the Eagle River. Only three of these sites were considered to be economically viable (i.e. in meeting the objective of a 600 MW output). At this stage, more detailed baseline studies included an assessment of the total salmon population which would be prevented from reaching their spawning grounds and the potential losses of habitat of various classes.

This type of environmental information is important in trade-offs between the engineering costs of different dam sites and the financial implications of maintaining salmon populations and of reducing the loss of spawning habitat. This trade-off might also conceivably have involved reconsideration of some of the eight other sites originally rejected. Baseline surveys are also typically required at the stage of 'how should the project be designed'. Dam design would have to take into account such considerations as the maximum and minimum downstream water flows necessary to protect migrating adult fish, as well as the viability of juvenile stages, and whether fish ladders should be incorporated. Finally, studies may be required at the stage of determining 'how a project should be operated'. Monitoring could concentrate on determining the long-term survival of salmon moving past the dam and assessing other predicted impacts.

19.5 ALTERNATIVES

As discussed in Chapter 2, this volume, EIA regulations in most countries place relatively little legal emphasis on consideration of alternatives in any water project (for example, the UK Town and Country Planning [Assessment of Environmental Effects] Regulations, 1988). However, this is not to imply that alternative options have not been considered in relation to specific projects as a matter of good practice by some developers. There are different types of alternatives that can be considered for water projects, ranging from design options, to different site locations, to more strategic approaches that look at fundamental choices in programmes or policies. The only alternatives (apart from the fundamental action or no-action alternatives) which might be considered for replacement flood or sea defence structures may be site specific. For example, the use of materials such as geotextiles and natural vegetation for river bank protection (potentially more ecologically acceptable and aesthetically desirable), compared to a concrete or stone-clad wall. For many other types of projects the proposals are also site specific: port facilities which depend upon deep-water access, sewage effluent outfalls serving existing systems and major restoration and rehabilitation projects. In these instances, the alternatives should be concerned more with scale, appearance, technology and mitigation measures. There may also be the potential to move a development by a few tens or hundreds of metres to avoid unnecessary damage or to allow adequate space for mitigation measures. Without scoping or fully understanding the environmental concerns at an early stage, developers often get 'locked in' to a particular line drawn on a map and subsequently it is very difficult to 'go back to the drawing board'. For example, in one major road development affecting the floodplain along a 15–20 km length of river valley in the UK, consideration in an Environmental Statement, published in 1992, was given to only two alternatives (at a specific location affecting 50 m road length):

1 Passing the road under the canal.
2 Routeing the road over the canal.

Initially, no attention was given to moving the road away from the existing river. Negotiating an alternative route for the road along the same river valley may potentially have led to the best practicable environmental option.

For some water projects reasonable alternative sites within a region are often appropriate: for example, for reservoirs and wastewater treatment facilities. In the USA, there are now many examples of the evaluation of alternative sites for dams (Richardson *et al.* 1978; United Nations 1987; Solomon *et al.* 1997). This may be relatively straightforward where the project; being promoted is public, except perhaps where it crosses certain administrative boundaries. There are potentially greater difficulties with private developments, which may be promoted by one individual or organization within a set geographical boundary.

A particular flooding problem may also be solved by alternative measures taken throughout a specific catchment, such as the storage or diversion of flood water, rather than solutions which involve site specific and potentially damaging channel works. For example, between 1984 and 1988, an EIA was carried out on the lower Colne river system to the west of London, UK. This involved a distance of some 25 km of river valley subject to flood risk (Thames Water 1988a). Whilst there was a need to minimize flood risk to urban property within the valley, there was also a need to produce the best practicable environmental flood alleviation option. Sophisticated hydraulic modelling allowed the development of alternate options at over 60 sites along the river. Broad options included the preservation of existing floodplain storage; removal or modification of significant bottlenecks (e.g. old weirs); provision of strategic transfers of flow between channels; use of embankments or walls; or channel widening and deepening; and the provision of individual protection to isolated properties. Adopting a catchment approach allowed selection at the outline design stage of the best practicable environmental option. Figure 19.2 shows the options for strategic transfer of flows from the Colne Brook to Wraysbury River (both parts of the Colne

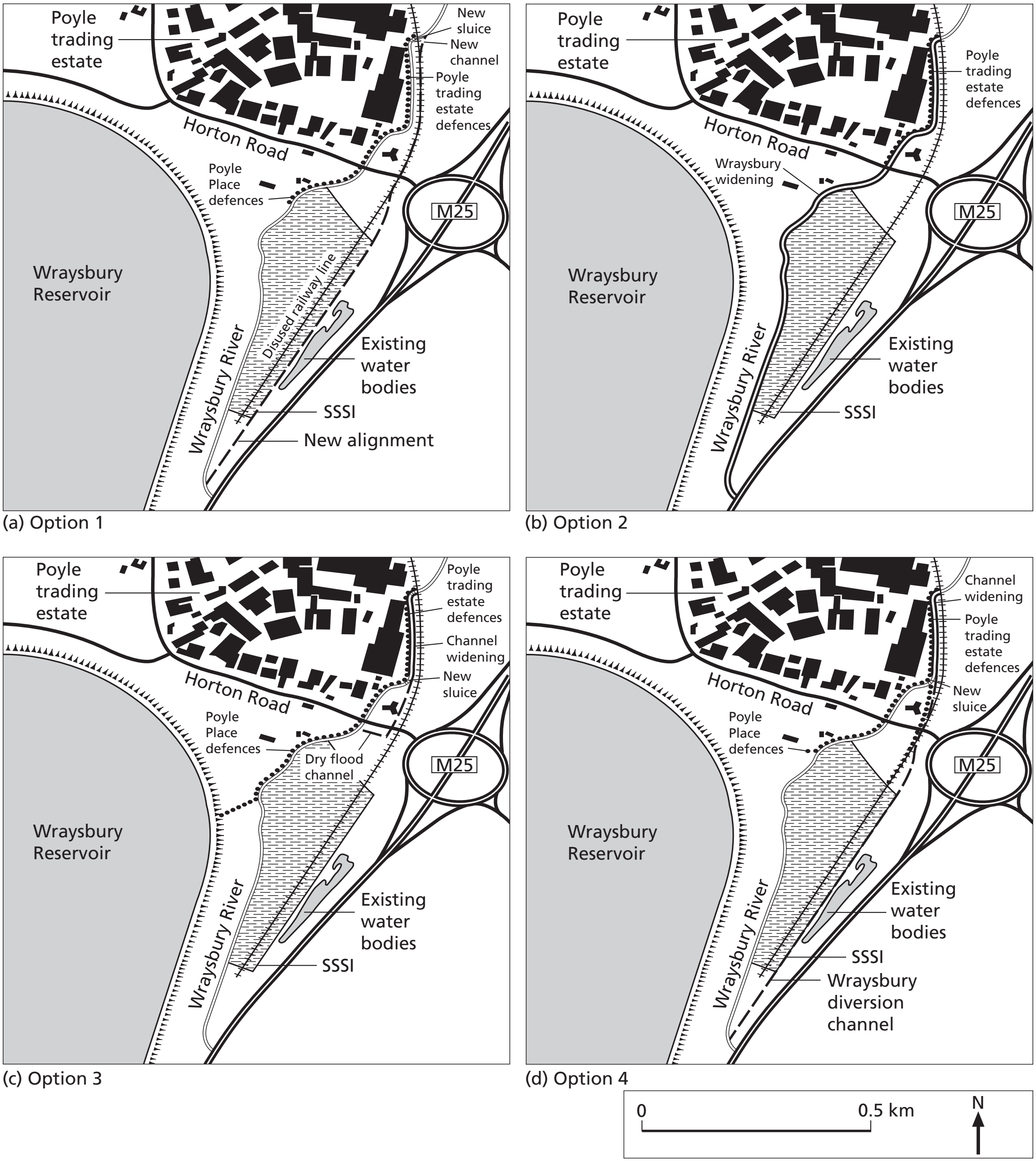

Fig. 19.2 Options for strategic transfer of flows from Colne brook to Wraysbury, to the west of London. SSSI, Site of Special Scientific Interest.

Table 19.5 Evaluation of alternative options for the strategic transfer of flows on the lower Colne, UK.

Engineering option	Key environmental impacts	Reason for initial rejection
Option 1 Aligning the Wraysbury diversion alongside a disused railway line, rather than enlarging the existing channel	*Landscape*: Least disruption to mature willow trees along the banks of the existing Wraysbury channel *Planning*: Disused railway line to be reinstated by the owner for a rail depot	Rejected on planning grounds
Option 2 Widening the Wraysbury through the Poyle Estate, together with a wall, and enlargement further downstream	*Landscape*: Could dramatically alter the existing attractive character of the river *Wildlife*: Effects on water table in an adjacent wetland unclear	Rejected on engineering and environmental grounds Not considered to be the best engineering option but may still be a viable alternative
Option 3 Use of a dry flood channel to divert flow back into the Wraysbury River below Horton Road, together with a wall	*Wildlife*: Possible effects on water table of the important wetland downstream	Rejected on hydraulic and/or engineering grounds because of the difficulty of limiting flood flows into the Wraysbury River

system). This transfer of flow between the channels is principally intended to prevent flooding of the residential areas of Poyle and Poyle Trading Estate. Several alternative options were evaluated (Options 1, 2 and 3) but were rejected, mainly on planning or environmental and engineering grounds (Table 19.5). The preferred option at the time of outline design (1988) was to construct a new diversion channel (option 4).

Subsequent to 1988, more detailed surveys showed that the new diversion channel was not viable, principally because of difficulties with landowners, but also because of concerns about controlling water levels. The final option chosen (which was constructed in 1992) was Option 2 (Brookes 1996). This required a formal environmental statement because of the unavoidable significant effect of widening and deepening the existing channel. However, the new channel (Fig. 19.3) was designed in such a way as to retain many of the mature trees on islands and to incorporate a low-flow notch at a depth of 200 m below the design bed level. This notch confines flows, which approximate the natural low-flow width anticipated, by a series of carefully sited deflectors or groynes that train the flow. Over a 4-year period successful morphological and ecological adjustments have been observed (Brookes 1996). The flood defence walls were never built, partly because of the permeable nature of the floodplain gravels with depth, which would have meant that adjacent properties would eventually have flooded when river levels were high for any prolonged period in the Wraysbury River.

There is potential for strategic environmental assessment (SEA) at the policy, plan or programme levels to provide for consideration of the best practicable environmental option for water projects. A very small number of countries have made mandatory SEA provisions (Sadler & Verheem 1996; see also Chapters 13 and 14, this volume). Some European Union Member States have made provision for the application of SEA to certain policies, plans and programmes, although as yet there is no agreed Directive (Thérivel 1992; Gilpin 1995). However, in 1991, the UK Department of the Environment (now part of the Department of the Environment, Transport and the Regions) published *Policy Appraisal and the Environment* and the Planning Policy Guidance Note no. 12 (PPG12), *Development Plans and Regional Guidance,* which are both forms of more strategic guidance.

Issues such as sustainability and cumulative effects can be considered within an SEA framework. SEA could embrace a national water

Fig. 19.3 The new diversion channel from Colne Brook to Wraysbury.

resources policy, dealing with many key issues and setting targets and standards for environmental projects. Individual projects could then undergo a separate EIA, in effect a two-stage process. For example, in southern England, Hendry (1995) found that detailed examination of the need for a specific reservoir was cathartic. Inspection of a particular scale of a reservoir depends upon assessment of demand (requiring assumptions to be made about water metering and social change, future development prospects and longer-term industrial prospects) and supply (assumptions to be made include the degree of success in reducing pipe leakage and source dependability and interchangeability). Hendry (1995) concluded that considerable local interpretation was needed in the absence of a more strategic approach. The SEA of policies for water resources for some countries might conceivably include a policy on leakage control, compared with the granting of licences for abstraction. Other countries have, at least, appraised alternative water resources options. Some examples are shown in Box 19.4.

One of the problems with SEA applied to the water environment is the degree of uncertainty in dealing with impact identification and analysis at this level (Beaufort 1992; Sadler & Verheem 1996). Often cause–effect pathways are not clear in policies, plans and programmes, compared with projects.

Box 19.4 Some examples of strategic approaches

For example, in the UK a total of 10 water transfer schemes were considered in an initial study by the National Rivers Authority (1993), simple matrices being used to compare the significance of potential impacts (low, moderate or high) on water quality, fisheries, aquatic ecology, geomorphology, hydrology, terrestrial ecology and recreation/navigation. An overall ranking was then obtained for each option

Other examples in the UK include a study in 1992 for three water authorities to determine the best way of meeting the demand for water in Kent over the next 30 years (Binnie and Partners 1991) and a study in 1988 by North West Water to determine what works were needed to achieve the European Community bathing water standards along a defined length of the Fylde coast (North West Water 1988)

19.6 IMPACT PREDICTION

Determining the scale and importance of impacts for water projects is not a precise art and typically involves subjective judgement, although quantitative assessments can somehow be made. Table 19.6 summarizes a number of the issues concerning water supply schemes. Some of the impacts are very difficult to predict.

Table 19.6 Some impacts considered in water supply schemes.

Issue	Example of impact	Methods of prediction
Air quality	Dust from construction activities affecting residents	Entrapment of dust could be modelled, the results being checked against on-site dust monitoring
Water quality	Reservoirs trap pollutants, such as nitrates, from agricultural land, seriously affecting lake ecology	Water quality in reservoirs is very difficult to predict
Water resources	Impacts on downstream river regimes (e.g. decrease in high flows and impact on downstream abstraction points)	Standard hydrological methods available
Land	Soil erosion and slope instability on recently exposed excavations	Site investigations
Physical processes	Clear-water flows causing downstream erosion	Use of geomorphological process studies and modelling
Natural habitats	Impacts on downstream ecology	Use of computer programs which correlate environmental and ecological parameters
Leisure activities	Fluctuations of reservoir water level affecting activities such as fishing, rambling and water contact sports	Studies of reservoir contours will show extent of exposure of shoreline
Landscape	Potentially adverse impacts to local residents, etc.	Use of sketches of proposed scheme with different water levels
Cultural heritage	Inundation may cause loss of valuable sites	Archaeological investigation in area likely to be affected

At the very least uncertainties should be stated in an open and honest way. Unfortunately, for various reasons, including ignorance, few environmental statements are fully transparent, clearly stating assumptions and limitations. Success criteria for a good EIA should include the scientific and technical credibility of impact prediction and rely less on the style of writing and checks on grammar and spelling (e.g. Kreske 1996). A recent study by the Institute of Terrestrial Ecology in the UK (Thompson *et al.* 1997) has shown that the majority of environmental statements are still lacking in scientific and technical information and are relying heavily on professional judgement. Of particular concern are bold statements made in environmental statements that seem to imply that 'technology will fix it'! Some actual assertions for water projects are summarized in Box 19.5.

Box 19.5 Uncertainty and translocation

Typical developer's assertions from environmental statements for water-related projects:

1 'Translocation of as much as possible of soils and flora of the ancient woodland and creation of a new woodland by re-using the smaller trees and shrubs and planting new ones to create a locally native woodland community'

2 'Translocation of alluvial grassland and crack willows (taken as cuttings)'

3 'Translocation of plant rhizomes and parts'

With regard to the first statement in Box 19.5, it could argued that it is virtually impossible to recreate the same soil conditions at a site which may have taken several thousands of years of natural processes to form. At the other extreme there is scientific evidence to demonstrate that

Table 19.7 Uncertainties in design of river restoration projects (from Brookes *et al.* 1998).

Design parameter	Means of determining	Uncertainties of methods
Recreating a meandering channel	Use historical maps which show the original course or look for depressions or 'low spots' in the floodplain	Hydrological and sedimentological conditions may have changed (e.g. due to upstream land use change) since historical times. Using the old course may not be the best option
Channel profiles (long-section and cross-section)	Assessment of variation of channel morphology along an adjacent reach, particularly in relation to pools and riffles and planform	Adjacent reach may be unsatisfactory as a template due to local conditions. Bank erosion mechanisms not fully understood for all key channel types
Low-flow width in channel design	Can be obtained from neighbouring natural section of same slope and geology	Site-specific measurement required. Natural widths for a range of channel types related to catchment area largely unavailable
Design and location of pools and riffles	Information on topographical, sedimentary and flow characteristics, size, location, spacing and slope values	Knowledge base limited mainly to gravel-bed rivers. Limited knowledge of adjustments during and after flood flows
Substrate reinstatement	Reinstatement of gravels	Most knowledge is for mobile gravel-bed rivers. Limited knowledge for the majority of channel types, particularly where the substrate is to remain static (e.g. armoured)
Anticipating future channel change	Use of historical records, maps or surveys to assess previous channel change (including lateral and vertical change) and extrapolating into the future	Imperfect knowledge for a wide range of channel types (e.g. sandbed rivers). Method assumes change at a site will be an ongoing process

transplanting single species, such as willows taken as cuttings, works well and may therefore be successful at the specific site proposed for development.

In practice, in relation to impacts of water projects, all that is known is the tip of the iceberg. The certainty and direction and reversibility or irreversibility of change are often unknown and may be peculiar to the individual site under consideration. This is compounded by the fact that, for riverine environments, there may be tens, if not hundreds, of different major river types characterized by differences in local geology, bed material discharge and stream power (Brookes & Shields 1996).

To be aware of and to list the inherent difficulties of predicting impacts for specific development types is a more credible approach. Table 19.7 depicts some of the problems surrounding river restoration projects. For example, the development of a meandering course, using the original sinuous course, assumes that significant changes in the hydrological and sedimentological processes have not occurred because of changes in catchment conditions over time. It is also difficult due lack of knowledge to know how reinstated pools, riffles and substrate will perform in a particular environment. The lack of knowledge for a wide range of river types means that it may be difficult, if not impossible, accurately to predict future changes of the course of a river channel. The value of this approach is that it not only focuses the decision maker's mind on the uncertainties surrounding particular impacts, but it also produces an 'audit trail', by which new and untried mitigations and technologies may be evaluated later. Protection and management of the water environment often requires many new and novel techniques, which may have been untried elsewhere or at least under similar conditions. It is responsible management to learn from new trials and to feedback into the overall decision-making framework.

Risk assessment can be regarded as a tool or technique which supports impact assessment (Gilpin 1996; Barrow 1997; see also Chapter 17, Volume 1 for a detailed discussion of its basis and application). It is fundamentally concerned with identifying the frequency, causes, extent and severity of exposure of different 'targets': humans, ecosystems, physical structures, as well as potential psycho-social and economic targets. Risk assessment is integral to the design of many types of water project, whether these be the risk of structural failure of a dam, or structure, or an assessment of the flood or health risks on populations. As a tool it has proven valuable in estimating the magnitude, certainty and timing of impacts. A field less well developed internationally is ecological risk assessment, a greater emphasis being placed to date on the assessment of the risks to the human environment. There is potential for wider application of risk assessment from water projects to more strategic levels. However, in seeking to apply this tool, it should be remembered that ecosystems are complex, open and dynamic, that the timescale to cause measurable impact or recover from impacts may be longer than a human lifetime, that an ecosystem has inherent variability and recoverability, that cause and effect relationships are often difficult to measure and that the acceptability of risks to environmental resources is dependent upon human values.

19.7 PUBLIC PARTICIPATION IN WATER PROJECT ENVIRONMENTAL IMPACT ASSESSMENT

The nature and extent of public involvement varies considerably even between democratic countries. In the USA for example, freedom of information laws mean that citizen participation is encouraged. This is reflected in extensive water project consultation work, not least where whole indigenous populations can be severely impacted (Petersen & Gemmell 1981; United Nations 1987; Gilpin 1996; Kreske 1996). It is particularly advantageous to involve the public in the quest for sustainable development. Unfortunately, in other countries, including the UK, the approach to public involvement tends to be ad hoc.

An example of less desirable practice (Gilpin 1996) is a hydroelectric and new diversion scheme on the Achelous River in Greece, involving the construction of two dams and the diversion of one-third of the river's waters eastwards to irrigate cotton fields. This project had potentially major ecological impacts, as well as inundating 14 villages. Above all, the World Wide Fund for Nature criticized the Greek government for not informing the country about the project and its potential impacts on the lives of Greek citizens. The scheme was also challenged because it would reduce electricity production from three existing hydroelectric plants.

The River Colne study in the UK, mentioned earlier in this chapter, involved very extensive public consultation over about a 2-year period for each of the 60 or so projects proposed. A summary of the recommendations is given in Box 19.6.

19.8 MONITORING AND POST-PROJECT APPRAISAL

Monitoring of water projects can in theory be provided at the start of an impact assessment, during it or after completion. In practice, it typically focuses on specific elements or indicators. Arrangements should be made to maintain and review the accuracy of predictions made in an environmental statement and the success of specific mitigation measures. This is especially important where there is uncertainty connected with the impact prediction process (e.g. monitoring downstream sediment and flow regimes, turbidity during construction and the recovery of vegetation).

It is proposed here that a more rigorous approach would be to set 'criteria for success' as part of the EIA process, listing these explicitly in the environmental statement. Such criteria can be monitored during the life of a project and used in post-project appraisal. Setting criteria for success for water projects is still comparatively

Box 19.6 Recommendations from the public consultation exercise on the River Colne, UK (Source: Thames Water 1988b)

The response from members of the public to the outline preferred scheme was positive and constructive. The response should greatly assist in developing a detailed design which will be acceptable to riparian owners and the general public at large and should facilitate speedy and efficient implementation

Thames Water (the developer) has established much goodwill and useful liaison with interested members of the public and local groups and organizations. It is important that this liaison continue through the various stages of the detailed design and into the implementation period to facilitate development of the scheme

Early contact with the riparian owners directly affected by the proposed works will do much to engender cooperation. The public are now expecting a second phase of consultation on the detailed design, either through the medium of planning applications or through direct contact with riparian owners and parish councils at appropriate stages of the scheme's development

rarely practised in Europe. However, it is increasingly being used, particularly in relation to public sector projects, such as flood alleviation schemes. Table 19.8 lists a selection of the criteria for success in the construction of pools and riffles in European rivers which may have their courses changed or modified as a result of channel works.

Unfortunately, many countries at present fall short of 'good practice' in terms of impact monitoring. For many water projects, monitoring programmes are non-existent, partly because there are few mandatory requirements, but also because monitoring can be extremely costly, particularly if conducted over a protracted length of time. Only on certain larger projects, for example, those requiring authorization under integrated pollution control in the UK, are monitoring arrangements made. The site-specific nature of water projects often means that established monitoring and gauging networks within the same catchment are placed too far away to be of direct use. Certain parameters, such as fine sediment loads, may not be recorded at established monitoring stations.

In 1988, a task force to the Economic Commission for Europe on Environmental and Water

Table 19.8 Examples of criteria for success for pool–riffle reconstruction in lowland Europe (from Brookes *et al*. 1998).

Issue	Example criteria	How to measure
Surface-water hydrology	The topographical highs caused by the riffles should not be so high that they cause overbank flooding of property	Flood monitoring
	The riffles should be of sufficient height to cause divergence of flow	Mapping of flow patterns
	The gravels forming the riffles should remain free of significant silt deposition	Repeat topographic surveys and/or visual checks during and after construction
Channel morphology	The gravels forming the riffles should remain *in situ* (i.e. should not erode out during moderate to high flows)	Repeat topographic surveys and/or visual checks during and after construction
Aquatic ecology	There should be an increase in the diversity of fish, plant and invertebrate species	Repeat ecological surveys before, during and after construction
Visual amenity	The diversity introduced should improve the aesthetic value of a channel	Repeat public perception surveys of the existing and improved channels
Recreation	The addition of pools should improve angling quality	No standard methodologies exist at present

Problems set about developing general approaches for post-project appraisal, based on 11 previous examples drawn from eight countries (United Nations 1990). Table 19.9 summarizes the roles which should be played by post-project appraisals (PPAs) based on the recommendations of the study.

First, it was found that regulatory compliance monitoring required by competent authorities is a significant component of several PPAs. Secondly, review of predicted impacts for environmental risk management was undertaken in many cases. In the Polish copper mines (see Table 19.9, example c) the results were actually applied to adjust project management plans. Review often points to the need for extra effort to deal with environmental impacts that are more serious than anticipated. Conversely, PPAs may also show that less diligence is required in other areas because predicted impacts do not materialize.

Table 19.9 Post-project appraisal (PPA) for some water projects (adapted from data in United Nations 1990).

	Case study description	Compliance monitoring	Review of predicted impacts for risk management	Modification in the light of unprecedented effects	Verification of predictions	Review of environmental management effectiveness
a	Groundwater extraction in the Lueneburger Heide near Hamburg, Germany (constructed during the 1970s)	Permit granted by water authorities required studies (e.g. agriculture, forestry, hydrological and ecological studies)	PPA studies have been used to provide evidence for the legal permit process used for water extractions	PPA studies were refined during the life of the project, partly as a consequence of public pressure	PPA involved verification of impact predictions	—
b	Disposal site for contaminated silt dredged from Rotterdam Harbour, the Netherlands (constructed in 1988)	Licences for the project required monitoring of effects of silt deposition on beaches, changes in the morphology of the area and effects on flora and fauna	PPA concentrated on permanent effect. Less attention given to impacts that could be effectively mitigated. Impacts which may play a role in future comparable projects also looked at	Gradual development and refinement of PPAs from the initial environmental review through to project implementation	Impact predictions verified through the PPA	—
c	Zelazny Most copper mines tailings pond, Poland (constructed in 1977)	—	Main purpose of PPA was to verify and improve the methods used for predicting impacts so that future mines could benefit	The PPA results were used to suggest modifications to mine operations if unacceptable impacts were observed	Impacts in an ecologically sensitive area used for assessing future projects	—

A gap does not mean that this category was not undertaken for a specific project, rather that this was not a key focus for the PPA.

Thirdly, coping with environmental surprises should be an essential component of PPAs, although one of the most difficult tasks to undertake well. This requires flexibility, such as the need to modify a particular technique during construction because of unforseen impacts. In the groundwater extraction case (see Table 19.9, example a), involving 30 deep wells, public pressure on the proponent following PPA findings of unexpected impacts resulted in a downward adjustment in the rate of water extraction. Fourthly, PPAs can be undertaken to verify impact predictions. For example, the Polish copper mines example (see Table 19.9, example c) involved a determination of impacts in an ecologically endangered area where future copper mines are proposed. All of the PPAs in Table 19.9 provide a *modus operandi* and insight, which help when assessing further projects.

The final category involves review of environmental management effectiveness. This allows for scrutiny of the procedural and administrative aspects of the project and of the EIA process. This is the least developed area for the three water project case studies listed in Table 19.9. Other studies, involving examples from the USA and Canada, now demonstrate the environmental management of natural resources, the effectiveness of an EIA review processes in contributing to management goals and the means by which the EIA process is locally implemented (United Nations 1990). Good practice recommendations for PPA of water projects include the need for a preliminary plan to be prepared during the initial stages of the EIA, a more detailed PPA framework being developed when a decision to proceed with a project is made. Clearly, PPA of water projects should focus on important impacts about which there is insufficient information, i.e. there should be some form of prioritization of impacts. This is essential because, for example, it has been shown that the costs of scientific and technical studies for demonstration of impacts in river channel restoration may exceptionally exceed the capital costs of the original project (Brookes & Shields 1996). This is a pragmatic and responsible approach to river management. There may be justification to undertake PPAs for all major projects with significant impacts, or for more focused PPAs where there is a need to learn from particular types of projects.

19.9 SUSTAINABLE WATER RESOURCE MANAGEMENT

There are those who fear the 'watering down' of the environmental assessment process, as practised in Europe under Directive 85/337 (Commission of the European Communities 1985), by consideration of other factors, such as cost–benefit and social issues at the same stage of decision-making. However, it could also be argued that, as a matter of good practice, EIA could be placed in the context of sustainable water resource management and that in the future there is a need for a more interactive and integrated assessment process. To this end, there appears to be an ever-increasing number of papers concerning sustainability assessment (also sometimes referred to as strategic appraisal) of projects, as well as specific policies, programmes and plans. Appropriate techniques for evaluation appear to be trade-off analyses (Canter 1996), full-cost analyses (Goodland & Sadler 1995; Sadler & Verheem 1996) and multi-criteria analyses. Sustainability assessments require that to achieve a best option as far as possible, all environmental, social and economic impacts should be appraised and taken into account. This compares with other well established approaches: for example, for public sector projects, such as flood control works, cost–benefit analysis (CBA) is often the recognized decision-making tool, with EIA becoming a complementary exercise (Bowers 1997; see also Chapters 3 and 6, Volume 1).

The following sections are two examples of provisional application of sustainability assessment to specific types of water project.

19.9.1 Case study: incised river channels

Incision of river channels and subsequent adjustment is one of the most pernicious forms of stream corridor habitat degradation. It is endemic in many countries, including the loess regions of central USA, parts of Poland and southern Germany. Incision-related processes often operate in a positive feedback loop, in which the

Table 19.10 Comparison of options for river rehabilitation (after Shields *et al*. 1998).

Option	Financial costs	Uncertainties/ environmental impacts	Environmental benefits	Social/political implications
Watershed rehabilitation measures	Very large costs (which may be prohibitive)	Uncertainties in prediction. Tools for implementation are beyond the 'state of the art'	May attack root cause of channel incision. Potentially effective but may take several decades to realize due to lags in sediment transportation and storage	May need cooperation of a large number of landowners; may only be effective with a change in legislation
Reach-scale projects	Moderate to large capital cost, e.g. associated with remeandering and backfilling of incised channel with material	Uncertainties; but possible impacts in contiguous reaches which are not restored. Some risk that renaturalized channels may not be sustainable, e.g. may become sediment traps due to reduced slopes	Potentially very positive impacts, e.g. the creation of in-stream habitats	May be implications for riparian owners due to land take and/or increased overbank flooding
Local control structures	Relatively low cost	Difficult to design. Bank protection projects generally fail if not accompanied by measures to check bed erosion	Limited ecological gains because measures are only local	May be a piecemeal approach undertaken by a single landowner. May have 'knock on' effects for other landowners
Natural recovery	Costs concerned with devising a management plan, monitoring and subsequent intervention may not be significant	Poor simulation models mean a lack of understanding of the nature and rate of channel evolution. Hard to be time specific about impacts (e.g. downstream sedimentation)	Could be short-term ecological benefits from growth of vegetation; but development of in-stream habitats may be long term	Uncertainties of nature and rate of channel evolution may be unacceptable to landowners

enlargement of channels confines larger and larger flows within banks, leading to elevated stream power and more channel enlargement (Simon *et al.* 1996). In alluvial channels which have been artificially straightened, there is also potential for incision and many lowland European streams have been impacted in this way (Brookes 1988). Straightening tends to increase the channel slope, allowing the transport of more sediment than is supplied at the upstream end of the straightened reach. This leads to erosion of the channel bed, in erodible materials, often accompanied by the collapse of banks. Physical degradation of aquatic habitats by channel incision is a key negative impact (Karr *et al.* 1985).

Restoration of such channels has presented many challenges and opportunities over the past 15 years (Brookes & Shields 1996; Shields *et al.* 1998). During this time a range of options have been developed and tried for the restoration of incised channels (Table 19.10). It is useful to analyse these options in the context of techno-

Fig. 19.4 A reach-scale project, which involved the replacement of an incising artificially straightened reach with a re-meandered channel.

logical, environmental, economic and social/political criteria. Some of the most commonly tried techniques include local control structures, which may be low cost but, because of their local impact, may only provide limited ecological gains. Figure 19.4 depicts a reach-scale project, which involved the replacement of an incising artificially straightened reach with a re-meandered channel. Such projects have been adopted in the 1980s and 1990s in lowland Europe and are of moderate cost, but they only tackle part of the problem. At the other extreme are rehabilitation measures, which may attack the root cause of channel incision at the watershed scale, but may be prohibitive in terms of cost and because of the need to cooperate with a large number of landowners (Table 19.10). Such an approach is qualitative, but at least it is systematic and provides a checklist of key factors, which may help those making a decision on the best practicable environmental option at a particular site.

19.9.2 Case study: floodplain development

Such systematic checklist floodplain development approaches have recently been tentatively trialed in the UK. In practice, restoration opportunities for previously degraded rivers in many countries may arise from development applications. Typical developments might include housing, business parks and infrastructure projects, road, rail and airport construction and other types of land-use change. Any substantial attempts at channel restoration, such as restoring bends and at least partially re-creating floodplains will require land take. Restoration may be carried out as an integral part of a development, at adjacent sites along the same river or in a nearby catchment, as a direct mitigation of impact. Such activity could be regarded as a positive impact of a water-related project. The example discussed here for a site in south-central England demonstrates how development of the wider floodplain for housing was undertaken, leaving a residual 7 km of river corridor, up to 60 m in width, and a more natural, sinuous, low-flow channel (Fig. 19.5). The river corridor also accommodates the 100-year flood discharge with a multi-stage channel planted with appropriate vegetation. In this example, the channel was previously degraded by straightening and deepening through an agricultural drainage scheme, allowing the adjacent land to be used for arable production. A similar approach has now been adopted for about 30 km of river in the UK. In practice, this concept of partial restoration or rehabilitation of a channel and floodplain is likely to be one of the most widely used because of the many development applications which occur.

Table 19.11 is a provisional sustainability assessment for one of these projects. It qualita-

Fig. 19.5 Creation of new channel prior to housing development on the adjacent floodplain: example from South-central England.

tively compares options in terms of risks, public perception, environmental impacts, uncertainties, mitigations, criteria for success and (hypothetically) some financial costs. In terms of overall evaluation of Table 19.11, Option 2 would probably have been the minimal option acceptable from a flood risk point of view, i.e. no housing development would have been allowed on the floodplain without compensation in the form of a two stage channel. Option 3 is clearly the preferred environmental option, involving the loss of 100 sites for houses due to the wide river corridors. Additional capital costs of construction of Option 3 are therefore put at £1.5 million (i.e. £8.5 million minus £7.0 million). Enhancement to house prices is calculated at £10 000 per house (i.e. the difference between Option 3 and Option 2), providing a direct financial benefit to the developer of £6.0 million. The actual financial benefit to the developer is therefore £4.5 million (i.e. £6.0 million minus £1.5 million) *despite* the loss of land for the building of houses. Although these are hypothetical calculations based on a true case of negotiation, they demonstrate that potentially substantial benefits can be gained as a result of people wishing to purchase a house close to an improved river environment.

Such a checklist is still open to interpretation and judgement of the individual decision maker, but it could be argued that having all of the data in one checklist is a powerful tool. This approach is still in a developmental phase and the checklist could become more quantitative for evaluation purposes. At a simple level, key boxes could be highlighted, whilst, at a more detailed level, the numbers of environmental impacts, the extent and nature of public opinion and the potential effectiveness of mitigation measures could be specified for each option.

19.10 CONCLUSIONS

Despite periodic amendments to legislation on EIA in some countries, the potential for minimalist approaches remains. Amendments to legislation tend to be cautionary and slow, and yet it could be argued that many countries have come a long way since the initial introduction of EIA, which might typically have been regarded as subservient to the main goal of economic growth. However, even a slow pace of legislative change is welcome. For example, one of the current issues for debate in the UK is that, for many types of activity or industrial process, there are two types of consent for which EIA may be undertaken: (i) land-use consent (granted by the competent planning authority); and (ii) authorization by a regulator of the water environment (such as the Environment Agency). In practice, this has been favoured by developers who may prefer to be

Table 19.11 Provisional sustainability assessment for a housing development in south-east England.

	Option 1: 'do nothing'	Option 2: widening and deepening of existing channels; narrow river corridor	Option 3: sinuous multi-stage channel with natural low-flow width; wide corridor up to 100 m	Option 4: culvert existing channel
Flood risk	Unacceptable. Flooding of adjacent properties unavoidable at 1 : 100 years return interval	Narrow river corridor would have to be seeded with grass and regularly mown to maintain conveyance of the 1 : 100 year flood	1 : 100 year flood accommodated; management plan required for corridor to ensure that woody vegetation does not encroach	Low risk of flooding if adequate design. However, high risk of blockage at upstream end; depends on maintenance during flood
Flood perception	'Open channels are dangerous for children.' Over-deep channel may present some difficulties for children	'Open channels are dangerous for children.' Over-deep channel may present some difficulties for children	'Open channels are dangerous for children.' Natural channels with variable sloping banks are generally not dangerous	'Safe for children.' Problems with children entering culverts. Rescue may be difficult
Key impacts	Not applicable	During construction Erosion of bed/banks Increased turbidity Deposition/siltation	Erosion of bed/banks Increased turbidity Deposition/siltation	Increased turbidity Deposition/siltation
End-state impacts/ risks	Existing adverse characteristics of channel (i.e. over-deep, straight and with limited habitat diversity) will remain	Potential for erosion Limited terrestrial habitats Poor instream habitat	Increased hydraulic roughness Change of sedimentation patterns Improved habitat Improved recreation	Decreased hydraulic roughness Elimination of habitats Scope for recreation limited
Uncertainties	Unlikely that channel will recover from existing state	Construction sediment may not wash out for several years Replanted vegetation may be disrupted by children	Construction sediment may not wash out for several years Channel may not function as desired; channel may silt Replanted vegetation may be disrupted by children	Culverts may inhibit passage of fish from upstream/ downstream
Mitigation	Not applicable	Timing of construction Sediment mitigation techniques	Timing of construction Sediment mitigation techniques Management plan	Timing of construction Sediment mitigation techniques Placement of gravel substrate within culvert Consideration of off-site mitigation

(*Continued on p. 428*)

Table 19.11 *continued*

	Option 1: 'do nothing'	Option 2: widening and deepening of existing channels; narrow river corridor	Option 3: sinuous multi-stage channel with natural low-flow width; wide corridor up to 100 m	Option 4: culvert existing channel
Success criteria	Not applicable	The diversity should improve the aesthetic value of the channel There should be no erosion of bends, particularly close to structures	The gravels forming the riffles should remain *in situ* and free from siltation There should be an increase in the the diversity of fish, plant and invertebrate species	Not really suitable
Capital costs (est. £ million)	0.0	7.0	9.5	24.5
Benefiting houses	1675	1600	1500	1675
Average price of house (£ thousands)	90	95	105	90
Total price (£ million)	151	152	158	151

assured that they have successfully obtained land-use planning consent before investing considerable resources in collecting data and undertaking analyses to meet the requirements of an authorization. Although a debate has been going on for several years on the issue of *parallel tracking* between these two systems, it is only recently that the linkages between, for example, the European Union (EU) legislation on environmental assessment (Commission of the European Communities 1985, 1997) and the Integrated Pollution Prevention and Control (IPPC) Directive (Commission of the European Communities 1996) are being explored and potentially improved. There is the possibility, therefore, that, through legislative change, crucial decisions about the location of development can be made in the light of more scientific assessment of the water environment.

Good practice guidance continues to emerge on various issues, including the desirability of considering alternatives. In practice, at least for a majority of smaller and medium-sized water projects, few developers are realistically able to offer alternative sites or even alternative technical solutions. In several countries this weakness has been recognized and there are an increasing number of examples of guidance produced by governments which, at the very least, recommend that alternatives should be considered (e.g. Department of the Environment 1995). Clearly there is a requirement for further universal guidance on the specific aspects of good practice promulgated in this chapter.

For certain water projects that are funded and carried out by public bodies, there is at least the potential to 'lead by example' and to thereby influence practice on private projects. For example, in the UK, the Environment Agency has itself practised the scoping of publicly funded flood control projects and has tried new approaches to river management (Environment Agency 1996).

Whilst it is wise to be cautious about being over-optimistic on the future of EIA applied to water projects, it is clear that advances are being made all the time. Perhaps, on the pessimistic side, EIAs are still too often regarded by developers as a bureaucratic hurdle to be overcome in obtaining a development consent, rather than a tool for environmental protection and/or improvement. However, there is reason for some optimism in relation to countries which have enshrined the principles of sustainable development and the precautionary principle in their legislation/guidance. Impact assessment is likely to move towards a broader, holistic and adaptive process.

In terms of specific ways forward, environmental statements for water projects should one, perhaps, adequately discuss trade-offs among costs, benefits and risks of alternatives in the context of sustainable development; environmental statements should, perhaps, also discuss conflicts among individuals or groups and look at the acceptability of environmental risk.

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EIA, environmental impact assessment