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Guidelines for the Preparation and Review of Environmental Reports

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1. INTRODUCTION

1.1 Context

This guideline is part of a package of regulations and guidelines which include:

The Pakistan Environmental Protection Ordinance 1997
Policy and Procedures for filing, review and approval of environmental assessments
Guidelines for the preparation and review of Environmental Reports
Guidelines for public participation
Guidelines for sensitive and critical areas
Pakistan environmental legislation and the National Environmental Quality Standards (NEQS)
Detailed sectoral guidelines

This guideline should not be read on its own, but in the context of the overall package.

The reader will be aware that few Environmental Reports meet the high standards described in this guideline, which presents a picture of "an ideal Environmental Report". In practice Environmental Reports will fall short of this ideal. Nevertheless, it is important to clearly set out what is desired, so that the quality and standard of Environmental Reports in Pakistan improves over time.

1.2 Scope

The scope of this guideline is confined to those aspects of environmental report preparation and review which are of a general nature. Sector specific provisions are not included, nor is the subject of public consultation, which is dealt with separately.

Although the Initial Environmental Examination is detailed early in the Guideline (Section 2), the material in all the other Sections applies to both IEE's and to EIA's. For example, the discussion of mitigation and impact management in Section 4 will apply to those few impacts described in an IEE, as well as the more significant impacts which may be described in an EIA.

1.3 Integrated environmental assessment

There is a growing awareness that the environmental impacts of a proposal cannot be considered in isolation. When significant impacts are identified in a proposal, a range of questions arise as to the best way to minimise the adverse effects—can the project objectives be achieved in a different way, should an alternative site be chosen, is the technology appropriate, and are prudent mitigating measures incorporated? These questions go well beyond the role of the environmental assessment team, if they have no responsibility for technical, financial and economic aspects of the feasibility study.

It is essential that there is close cooperation between those undertaking environmental assessment, and those undertaking the other aspects of pre-feasibility and feasibility studies. This cooperation must occur throughout the various stages of the project cycle, and not be confined to the mere bringing together of the various strands at the project approval stage. The cooperation needs to be continuous, to allow for continuous project modification in response to environmental issues, and to ensure that the environmental assessment continues to proceed on the basis of the emerging design concept for the project. In many cases, the cooperation will be facilitated when the various components of the feasibility study are undertaken in an integrated manner. Where this is not possible, then the activities should proceed in parallel.

1.4 Making environmental assessment credible and fair

No matter who prepares the Environmental report, some bias will exist. And bias is not restricted to proponents, nor to Agencies and Departments, but will be present in every NGO or community member who contributes or comments on an Environmental Report. Full public involvement provides a counterbalance to bias, and some further measures will also assist in making the environmental assessment process transparent, accessible and accountable to the public. These measures include:

- a requirement for the proponent to register all consultants' names and their terms of reference with the Responsible Authority;
- the listing of all consultants, their expertise and responsibilities in the environmental report;
- publishing the terms of reference in the environmental report;
- making all environmental reports available to the public;
- publishing lists of decisions–including the requirement for an EIA and the final outcome of environmental approval–along with the public availability of any recommendations for mitigation and impact management plans.

Where a proponent is concerned to ensure that confidential information, such as the details of a new manufacturing process, is not made available to competitors, such information need not be detailed in the Environmental Report, but made available to the Responsible Authority on a confidential basis.

1.5 Relationship between environmental assessment and good design

Good design practice will include careful consideration of environmental issues. It may be asked why environmental assessment is necessary beyond good design. Experience in both industrialised and developing countries shows that there are two systematic difficulties in ensuring good design practice. The first of these lies in the lack of interest, and consideration during the planning and design process, shown by many project proponents in the possible effect of proposals on environmental resources. The second results from differences in design assumptions on impacts, and the actual outcomes when the project goes into operation. Environmental assessment should address both these difficulties.

1.6 Inter-agency coordination

Inter-agency coordination is crucial to effective environmental assessment because environmental issues, in their complexity and variety, are often inter-sectoral and regional. Those preparing Environmental Reports need to be aware of the policies, information sets, and requirements of key Federal and Provincial agencies. The range of agencies which need to be involved clearly relates to the scale and magnitude of the proposal, and its likely resource requirements and impacts.

Inter-agency coordination is best achieved through inter-agency meetings at key points in the environmental assessment process. A meeting at the time of scoping is vitally important:

- to inform all interested parties about the project and the intention to prepare an Environmental Report;
- to seek their views throughout the process;
- to identify issues;
- to discuss any special type of analysis required and data sources; and
- to draft Terms of Reference for an EIA.

1.7 Early consideration of strategic context

The objectives of a proposal should always be clearly established at the beginning, along with the project relationship to broader strategic plans and goals. Considering the strategic context is essential when selecting options for the proposal. Strategic mechanisms such as policies and plans which illustrate how the proposal has been developed, should be discussed in the Environmental Report so that the information is available and relevant. Any existing relevant cumulative or strategic environmental studies should be considered when formulating a proposal. Existing air and water studies, state of the environment reports and local and regional studies should be taken into consideration as applicable.

All feasible alternatives that could satisfy the objectives of the proposal should be considered. When weighing up options, the biophysical, economic and social costs and benefits throughout the whole life cycle of the proposal should be considered. The 'do-nothing' option should also be included in these considerations. Careful option selection can lower community concerns and reduce potential costs of mitigation and management required to control environmental impacts. Early adoption of sustainable development strategies can reduce possible conflicts, and additional costs and delays at later stages of the approval process.

2. COMMENCING ENVIRONMENTAL ASSESSMENT

2.1 The purpose of the IEE

An IEE is required for projects in Schedule B of the "Policy and Procedures for the filing, review and approval of environmental assessments". *The Pakistan Environmental Protection Ordinance 1997* gives the following definition: "**initial environmental examination**" means a preliminary environmental review of the reasonably foreseeable qualitative and quantitative impacts on the environment of a proposed project to determine whether it s likely to cause an adverse environmental effect for requiring preparation of an environmental impact assessment."

An IEE is a relatively simple document, which systematically considers all the likely impacts arising from a proposal, identifies which impacts need further consideration, and for those impacts provides mitigation measures which reduce the impacts to an acceptable level. Where the IEE reveals more significant impacts, the Responsible Authority, in conjunction with the EPA, will determine the need for an EIA. In such circumstances, the Responsible Authority shall provide, in writing, the reasons why an EIA is required (e.g. the number and magnitude of impacts, the sensitivity of the proposed site, the level of community concern). The IEE will not usually require public advertisement and comment, but it remains a publicly accessible document, available to any person who wishes to inspect it at the offices of the Responsible Authority.

The IEE process is also to be followed for projects requiring EIA. Here, the IEE process of systematically considering all the likely impacts is used as a means of early identification of issues in order to prepare Terms of Reference for the EIA. In such cases, the formal documentation of the IEE Report is not undertaken, but replaced by the EIA preparation and reporting.

It is important not only to cover the environmental issues known at the inception of the study, but also to allow the breadth and flexibility so that new issues can be identified and, if significant, be addressed. However it is also important to frame the investigation so that time and resources are concentrated in areas where potential impacts are likely to be found. The work must be focused on the issues which are critical to decisions about whether the project should proceed, and under what conditions.

2.2 Steps in the IEE Preparation

At the earliest possible time, proponents should consult with the Responsible Authority to confirm the categorisation of the project, and to ensure that they are aware of the procedures that apply. Proponents may have already engaged consultants at this time, and should be aware that the proper specification of the consultant's task will only become clear as the work on the IEE and other scoping activity is undertaken. Proponents and their consultants will visit the site, talk with local people about their values and the proposal, collect available data, and consult with other Departments and Agencies.

The degree of effort expended in these and subsequent steps needs to be matched to the likely impacts of the proposal, the scale of the development, the sensitivity of the site, and the level of concerns held by the community. The information provided later in this Guideline on "Assessing Impacts", "Mitigation and Impact Management" and indeed all the other Sections, apply equally to projects subject to IEE or EIA.

Environmental assessment is most effective when even preliminary findings are made available early in the preparation process. At that time, alternatives which might be desirable from an environmental viewpoint can be considered realistically, and implementation and operating plans can be designed to respond to critical environmental issues in a cost-effective manner. Later on, making a major design change or selecting an alternative proposal—or deciding not to proceed at all with a project—becomes very expensive. Even more costly are delays in implementation of a project because of environmental issues which were not considered during design. Consequently, integration between environmental assessment and feasibility studies is essential. The environmental assessment team should provide for frequent coordination meetings with the feasibility study team to exchange information.

2.3 Format of the IEE

A Executive summary

Provide an executive summary where the IEE is more than 30 pages long.

B Introduction

This section should include the following:

- Purpose of the report, including identification of the project and the Proponent (including a contact person, and details of any Consultant associated with the IEE preparation), a brief description of the nature, size, and location of the project, and other pertinent background information.
- Extent of the IEE study, scope of the study, magnitude of effort, persons performing the study

C Description of project

Furnish sufficient details to give a brief but clear picture of the following (include only applicable items):

- Type and category of project.
- Objectives of project.
- Alternatives considered, and reasons for their rejection.
- Location (use maps and photographs showing general location, specific location, and project site layout. Include land uses on the site and surroundings, details of population centers and nearby dwellings, road access, topographic and vegetation features of the site, and other sensitive land uses such as national parks, wild life reserves or archaeological sites.)

- Size or magnitude of the operation, including capital cost, and associated activities.
- Proposed schedule for implementation.
- Description of the project, including drawings showing project layout, components of the project, etc. This information should be of the same extent as is included in feasibility reports, in order to give a clear picture of the project, its context and its operations.
- Details of restoration and rehabilitation plans at the end of the project life.
- Government approvals and leases required by the project.

D Description of environment (in area affected by project)

Furnish sufficient information to give a brief but clear picture of the existing environmental resources including the following (to the extent practicable, including photographs where relevant):

- **physical resources** topography, soils, climate, surface water, groundwater, geology/seismology;

- **ecological resources** fisheries, aquatic biology, wildlife, forests, rare or endangered species;

- **human and economic development** where applicable including, but not limited to:
  - population and communities—numbers, locations (summarise information in map form), composition, employment
  - industries, including known major development proposals
  - infrastructure—including water supply, sewerage, flood control/drainage, etc.
  - institutions
  - transportation—roads, rail, harbours, airports, navigable rivers
  - land use planning—including dedicated use areas
  - power sources and transmission;
  - agricultural and mineral development.
- **quality of life values** (including, but not limited to):
  - socioeconomic values
  - public health
  - recreational resources and development
  - aesthetic values
  - archaeological or historic treasures
  - cultural values

E Screening of potential environmental impacts and mitigation measures

Using the Sectoral guidelines, which contain a checklist of environmental parameters for different sectors, screen out “no significant impacts” from those with significant adverse impact by reviewing each relevant parameter according to the following factors or operational stages. Mitigation measures, where appropriate, should also be recommended:

- environmental problems due to project location;
- environmental problems related to design;
- environmental problems associated with the construction stage;
- environmental problems resulting from project operations;
- potential environmental enhancement measures; and
- additional considerations.

F Environmental monitoring program and institutional requirement

This section of the report must describe the management plan and monitoring surveillance programs, including periodic progress reports to be established and continued by the proponent following granting of Environmental Approval. The Responsible Authority must be assured that all necessary environmental protection measures are carried out in future as planned. The program must be accompanied by the details of the institutional capacity of the proponent, including staff training and equipment which will be provided to ensure implementation and operations.

G Conclusions

This section should include an evaluation of the screening process and should highlight whether significant environmental impacts exist which need further detailed study or an EIA. The IEE report should present the conclusions of the study briefly and concisely.

2.4 Scoping

While the basis of determining the scope of an IEE or EIA in Pakistan derives from the Sectoral Guidelines provided in the package, and the checklists of likely impacts and mitigation measures contained in the Sectoral Guidelines, proponents and reviewers are cautioned against adopting a mechanistic approach to the scoping process. No technique can replace the thoughtful consideration of the proposal, its siting, and the physical and cultural environment in which it is proposed.

Scoping is a vital early step, which identifies the issues that are likely to be important during the environmental assessment, and eliminates those that are not. In this way, time and money are not wasted on unnecessary investigations. Scoping is a process of interaction between the interested public, government agencies and the proponent. Scoping refers to the process of identifying, as early as possible:

- the appropriate boundaries of the environmental assessment;
- the important issues and concerns;
- the information necessary for decision-making; and
- the significant impacts and factors to be considered.

Scoping can be used to:

- consider reasonable and practical alternatives;
- inform potentially affected people of the proposal and alternatives;
- identify the possible effects on the environment of the proposal and alternatives;
- understand the values held by individuals and groups about the quality of the environment that might be affected by the proposal and the alternatives;
- evaluate the possible environmental effects and concerns expressed to determine whether, and how, to investigate them further;
- define the boundaries of any required further assessment in time, space and subject matter;
- determine the analytical methods and consultation procedures needed in any further assessment;
- organise, focus and communicate the potential impacts and concerns, to assist further analysis and decision-making; and
- establish the Terms of Reference to be used as the basis of the ongoing assessment.

Issues such as the geographical area to be considered, the time-frame for impact analysis, the methodologies to be used, sources of existing information and information gaps should all be addressed. While scoping is seen as a distinct activity early in the environmental assessment process, review of the scope is a continuous activity that proceeds throughout the detailed environmental studies, the decision-making , detailed design, implementation and monitoring. Unforeseen issues may arise at any of these stages, and will require further consideration.

A typical list of steps for scoping is:

(i) Prepare an outline of the scope, with headings such as:
- objectives and description of the proposal
- the context and setting of the proposal
- constraints
- alternatives
- issues
- public involvement (in scope), and
- timetable

(ii) Further develop the outline of the scope through discussion with key stakeholders, assembling available information, and identifying information gaps.

(iii) Make the outline and supporting information available to those whose views are to be obtained.

(iv) Identify the issues of concern (cross-reference with check lists in Sectoral Guidelines).

(v) Evaluate the concerns from both a technical and subjective perspective, seeking to assign a priority to important issues.

(vi) Amend the outline to incorporate the agreed suggestions.

(vii) Develop a strategy for addressing and resolving each key issue, including information requirements and terms of reference for further studies.

(viii) Provide feedback on the way the comments have been incorporated.

(These steps are only indicative, and should be tailored to meet the requirements of the particular situation.)

It should be remembered that environmental assessment is a flexible process. There is no fixed inventory of issues to be examined in any particular environmental assessment; instead, careful scoping is essential to determine the key issues for each particular proposal. When prioritising issues, consideration should be given to their potential severity, temporal or spatial extent, direct, indirect, secondary or cumulative impacts, and whether the impacts are continuous or intermittent, temporary or permanent, reversible or irreversible.

2.5 Roles of stakeholders in the Scoping process

The proponent:
usually knows most about the proposal, and will have a strongly developed view about the factors which will influence site selection and investment decisions. The scoping process will assist the proponent to recognise the perspective of others, to consider alternatives and issues of concern that are raised by those affected, and to make changes to the proposal which will both address the concerns raised and improve the proposal.

The Responsible Authority:
has responsibility for providing guidelines, confirming the categorisation of projects, and checking that the Environmental Report meets the statutory requirements. The Responsible

Authority will usually have a wealth of experience in environmental assessment, and knowledge of local conditions and data availability.

Other Departments and Agencies:
will contribute knowledge about specific issues within their jurisdiction. This knowledge may include specific legislation and policy frameworks, standards, data collections, methodologies, local knowledge and experience. Quite often sectoral agencies have the role of providing approvals, permits or leases, so knowledge of their requirements is essential.

Environmental practitioners and experts:
may act for the agencies involved, the proponent, or consultants bidding for the work, or they may belong to scientific, academic or professional bodies. The involvement and advice of these people can be of particular assistance in providing specialist knowledge.

Those affected:
by the proposal may have a major role in identifying issues and ensuring that local knowledge and values are understood. The views of those affected should be taken into account when choosing between alternatives, in deciding on the importance of issues, and in framing mitigation measures, compensation provisions and management plans. Affected communities may need help in understanding the proposal, its alternatives, and likely effects, and in dealing with the proposal and articulating their concerns. They may need the provision of community liaison workers and financial resourcing to allow them to participate.

The wider community:
including those indirectly affected, and local, national and sometimes international NGO's and interest groups will also provide a source of useful information and values, which can assist the scoping process.

2.6 Generating alternatives

A rigorous approach to the generation of alternatives is more commonly associated with proposals from the public sector, where the allocation of public funds and priorities is recognised as a legitimate public interest. Private sector proposals have not generally had the same attention paid to the matter of alternatives, since there has been the perception that the choice of project is a matter for the developer who is putting up the money. The considerations of alternatives will assume increasing importance, for both public and private sector projects, as sectoral policies are established, along with the implementation of policies for sustainability, strategic and cumulative impacts. Alternatives are generated and examined to determine the best method of achieving project objectives, while minimising environmental impacts. They can be grouped under such headings as:

- demand alternatives (eg using energy more efficiently rather than building more generating capacity);
- activity alternatives (eg providing public transport rather than increasing road capacity);
- locational alternatives, either for the entire proposal or for components (eg the location of a processing plant for a mine);
- process alternatives (eg the re-use of process water in an industrial plant, waste-minimising or energy efficient technology, different mining methods);
- scheduling alternatives (where a number of measures might play a part in an overall program, but the order they are scheduled will contribute to the effectiveness of the end result); and
- input alternatives (eg raw materials, energy sources–such as replacing high sulphur oil with low sulphur oil).

The 'no build' alternative is often used as a base case against which to measure the relative performance of other alternatives. In this case the relative impacts of the other alternatives are expressed as changes to the base case. If, overall, all the alternatives were judged to have unacceptable performance, the decision might be to adopt none of them, and stay with the status quo–the 'no build'. Alternatively a base case might be taken forward in its own right for evaluation against defined objectives.

Not all alternatives will be investigated in the same level of detail. It is quite common to undertake a preliminary analysis of a wide set of alternatives to decide which ones should be taken forward for further consideration, and which ones should be discarded. In many EIA's, the favoured alternative will be the only one examined in detail. It is not uncommon, however, for two or three alternatives to be examined and reported at the same level of detail.

2.7 Site Selection

While technical and operational aspects often dominate the initial selection of a site for a proposal, proponents should give equal weight to the suitability of the site in terms of compatible land use and adequate buffer distances.

While proximity to raw materials, transport, labour, markets, waste disposal options, and provision of services are all important, so too are adjacent land uses and the environmental sensitivity of the site.

The principles of site selection are shown in Figure 1.

Initial site investigations can help ensure a potential site's suitability before proceeding with a more detailed assessment. The initial site investigations should exclude fundamentally unsuitable sites.

Table 1 provides performance objectives and factors to be considered to determine separation distances.

Figure 1. Site selection principles

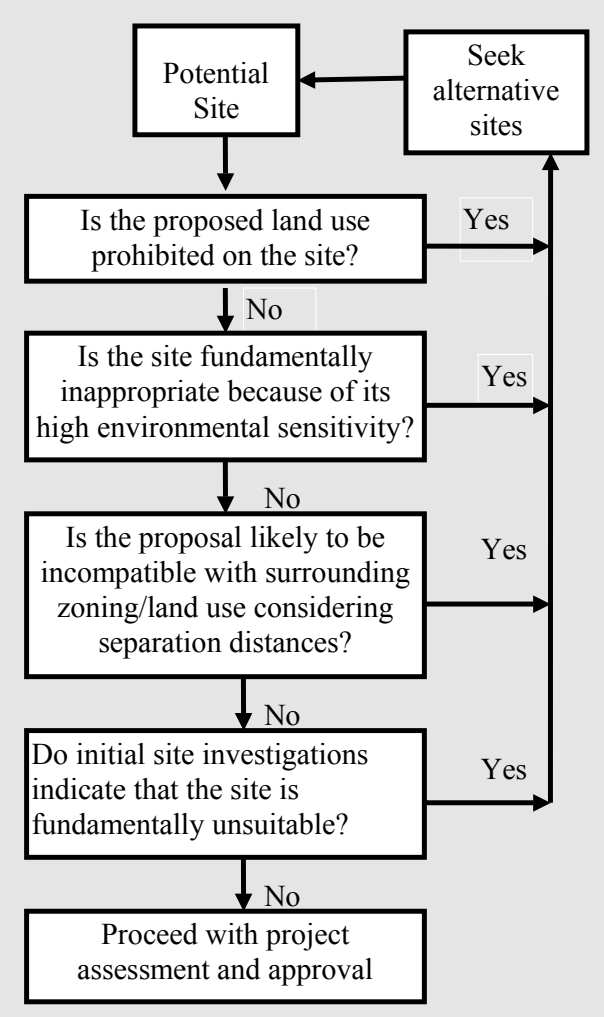


Table 1 Performance objectives and factors to be considered to determine separation distances.

Land Use	Performance objectives	Factors for determining appropriate separation distances
Residential areas, hospitals or schools	• Protect residential amenity and health: odour, fumes, visual amenity, noise, dust, seepage	• What is the likelihood of the performance objectives being achieved by the mitigation measures alone? • What is the likelihood of the mitigation measures failing? • What is the likelihood of an 'incident' (eg accident, system failure, natural disaster) which will result in a failure to meet the performance objectives? • What 'backup' mitigation measures are available? • What is the likely geographical extent of impacts, taking into consideration the proposed performance of mitigation measures and the local environment? • What is the likely geographical extent of impacts if mitigation measures fail or an 'incident' occurs. • what separation distances are required to achieve the performance objectives; — under normal operational and mitigation performance conditions — if mitigation measures fail or an 'incident' occurs?
Surface waters	• Ensure that surface waters are protected from pollutants • Ensure that no existing or likely future uses of surface waters are compromised • Ensure that no significant impacts occur to flora or fauna which uses the waters • Ensure that the ecological value of the waters will be maintained.	
Groundwater recharge zones	• Ensure that there is no deterioration in the quality of the groundwater • Ensure that no existing or likely future uses of groundwater are compromised	
Environmentally sensitive areas	• Ensure the environmental qualities of the particular area are not compromised	

3. ASSESSING IMPACTS

3.1 The 'assessing' task

The assessing phase of environmental assessment is the time when most of the work involved in impact assessment is carried out. Assessing usually involves three tasks:

- further and more detailed work on impact identification, refining the understanding of the nature of impacts, identifying indirect, cumulative and other impacts and ensuring identification of the likely causes of impacts;
- detailed analysis of the impacts to determine their nature, magnitude, extent and effect; and
- judgment of the significance of the impacts (whether they matter and whether something needs to be done to mitigate them).

3.2 Impact identification

Section 2 above has covered the subject of screening and scoping, and the detailed checklists provided in the sectoral guidelines have been introduced. One limitation of the checklist approach is that checklists are not effective in identifying higher order impacts or the inter-relationships between impacts. Care must therefore be taken in using them, to consider whether impacts other than those listed may be important. Care should also be taken to make sure that any extreme environmental features peculiar to the region in which the project is proposed are adequately catered for (eg flood, drought, temperature, seismic activity, land instability, disease vectors etc.). Practitioners will be aware that other methodologies in addition to the use of checklists are commonly employed to ensure that all significant impacts are identified. These methodologies include matrices, networks, overlays and geographic information systems, expert systems and professional experience.

An example of a network is given in Appendix B

Table 2. Main advantages and disadvantages of impact identification methods

	Advantages	Disadvantages
Checklists	• simple to understand and use • good for site selection and priority setting	• do not distinguish between direct and indirect impacts • do not link action and impact
Thinking through the stages of the project	• logical mental approach, linking action with impact • separates construction, operation and decommissioning impacts • distinguishes between direct and indirect impacts	• relies on good understanding of the project, and likely impacts
Matrices	• link action to impact • can be useful for displaying study results	• difficult to distinguish direct and indirect impacts • potential for double-counting of impacts
Networks	• link action to impact • useful in simplified form for checking for second order impacts • handles direct and indirect impacts	• can be very complex if used beyond simplified version
Overlays	• easy to understand • good display method • good siting tool	• address only direct impacts • do not address impact duration or probability
GIS and computer expert systems	• excellent for impact identification and analysis • good for 'experimenting'	• heavy reliance on knowledge and data • often complex and expensive

3.3 Impact analysis and prediction

Once the range of impacts has been identified, the potential size and nature of each one must be predicted. Prediction draws on physical, biological, socio-economic, and anthropological data and techniques and may employ mathematical models, photomontages, physical models, socio-cultural models, economic models, experiments and expert judgments. In many cases, this work will be carried out by specialists in the areas of interest. To prevent unnecessary expense, the sophistication of prediction methods used should be kept in proportion to the scope of the Environmental Report and the importance of the particular impact.

Where possible impacts should be predicted quantitatively. This makes comparison between alternatives, and with baseline conditions, more meaningful. If quantification is difficult, or not possible, then it is important that techniques are used that enable the impacts to be compared systematically.

3.4 Baseline data collection

The change caused by a particular impact can be evaluated by comparing the expected future state of environmental components if the proposal were not to go ahead (the baseline condition for the no-development option) with the predicted state of those components if the project does proceed. Therefore one of the first tasks involved in the detailed analysis of an impact is the collection of information that will help to describe the baseline situation at the expected time of implementation. Specialised knowledge is usually required to specify, and set appropriate limits on, the data collection required to meet the needs of any analysis and ongoing monitoring programs that may be established.

In some cases, particularly for major projects that may take some years for implementation, it is likely that the current baseline conditions will no longer apply at the time the project is operational. In these cases predictions will need to be made about what the future baseline conditions will be. This will involve consideration of:

- current baseline conditions;
- current and expected trends;
- effects of other projects being implemented; and
- effects of other proposals which will be completed before implementation of the proposal under consideration.

For example, the air quality near a new power station must be evaluated taking into account existing air quality, and any deterioration expected to result from other nearby power stations which have commenced construction or for which approvals have been granted.

There are many examples of EIA's in which massive amounts of money and effort were expended in collecting and reporting data on every aspect of the environment and producing voluminous reports in which there was as much insignificant and irrelevant information as there was findings of significance. The data collection must be focused on those issues which are critical to decisions about the project and its impacts, and must be a precursor to analysis and recommendations.

Where baseline data is to be collected first hand, careful consideration must be given to the design of the sampling program. Matters to consider include:

- the degree of understanding of the processes in question;
- the reasons for the data collection program;
- sampling program design;
- data collection procedures;
- data analysis methodologies;
- relevant quality assurance procedures.

The need for long term sampling to discern the variability of the environment should also be assessed as early as possible so that it is not overlooked or avoided due to time constraints. Assumptions and extrapolations used to draw conclusions from the data should be justified.

Where existing data is used, its adequacy and appropriateness for impact assessment of the proposal should be reviewed and discussed. Shortfalls or uncertainty of knowledge should be clearly identified.

It is not uncommon for a situation to arise where proponents seek immediate approval for a project for which no baseline data has been collected. Clearly such a situation is untenable, and testifies to a lack of proper project planning. When the initial environmental work is done at the pre-feasibility stage, as is advocated, there will be time to identify the key issues and gather baseline data. At the other extreme, proponents should not be unduly delayed in project approval over the lack of baseline data which is needed to confirm an evaluation that the impacts are not significant. For example, it may be that flora and fauna studies are desirable over a twelve month period, but environmental approval is urgently required. In such a case it may be acceptable to present a one month survey of flora and fauna, on the understanding that after the Environmental Approval, and during detailed design, further flora and fauna studies will be undertaken, and any modifications to the project which may be necessary can be regulated in the Operating Approval. Such situations will of course need to be agreed with the Responsible Authority.

3.5 Characteristics of impacts

Wathern defines an impact as having both spatial and temporal components, which can be described as the change in an environmental parameter, over a specified period and within a defined area, resulting from a particular activity compared with the situation which would have occurred had the activity not been initiated.

Aspects of impacts which should be considered include:

Nature The most obvious impacts are those that directly relate to the proposal (eg loss of wetlands, relocation of households, increased air emissions). Indirect impacts are usually less obvious, occurring at a later time or in a place other than where the original impacts occurred (eg spread of malaria as a result of tree removal, pesticides in the breast milk of mothers in cities due to the use of agricultural pesticides, environmental degradation of a river mouth resulting from dam building high in the catchment, and the resulting reduction in environmental flows).

Magnitude Note that while in general the sheer size of an impact contributes to its significance, sometimes small impacts can be very important (eg very small quantities of some toxic substances can cause large scale health problems for humans and animals).

Extent and location An indication of the location, distribution and size of the area(s) likely to be affected should be given for each impact, direct and indirect.

Timing Impacts from all stages of the life of the project should be considered (eg during construction, operation and decommissioning). Some impacts will occur immediately while others may be delayed, sometimes for many years (eg siltation of a dam).

Duration Some impacts may be short term, such as the noise arising from equipment during construction. Others may be long term, such as inundation of land after a dam is built. Impacts such as quarry blasting may be intermittent, whereas others, such as the severance caused by a freeway, may be continuous.

Reversibility Once the cause of an environmental impact has been removed it may be that the pre-existing environmental condition may be (more or less) restored to its original state. If impacts are reversible (either naturally or with human assistance) then restoration is very much easier. However some impacts are irreversible.

Likelihood (risk) Not all impacts share the same likelihood of occurrence. Some can be predicted to occur, more or less definitely, whereas others are less certain (but still capable of probabilistic estimation—eg the release of a toxic gas from a chemical installation). In all cases some estimate should be made of the uncertainty or 'margin for error' involved in the

prediction. It is important that impact assessment consider the effects of events that are low risk but high impact (eg oil spills, chemical road tanker accidents).

3.6 Prediction methods

There are a number of ways in which the characteristics of impacts can be predicted. These include:

Professional judgment It is important to note that all methods of analysis involve some degree of professional judgment. Sole reliance on professional judgment can be unavoidable when there is a lack of data to support more rigorous analyses, or there is a lack of suitable analytical techniques with which to make the predictions.

Examples of the use of professional judgment include:

- a sociologist basing the prediction of the effect that a water supply proposal might have on the nature of women's role in the community; and
- an anthropologist using a workshop approach to assess the cultural significance of a communal place.

Mathematical models Models are mathematical expressions developed to simulate some aspect of reality. Once they have been developed it is usually not difficult to make changes in the input conditions for the model and then to see how the outputs are affected. For instance, differences in air pollution can be calculated by changing, within the model, the height of a chimney stack or the rate of output of emissions.

When interpreting the output from mathematical models it should be remembered that all models are simplifications of the real world, and require the specialist to make a number of assumptions in both their development and use. If these assumptions are inappropriate then there can be significant implications for their accuracy and usefulness. Specialists should clearly state the assumptions inherent in the use of their models.

Traditionally mathematical modeling has been carried out for physical impacts, such as air dispersion or hydrological impacts: mathematical models are being developed to analyse biological, social and economic impacts.

Experiments and physical models Examples of such predictive methods include the exposure of fish in a laboratory to pollutants to determine rates of uptake and retention, and field trials of the effectiveness of different methods of erosion control.

Case studies Reviewing case studies of similar proposals in similar environments can provide a good basis for confirming the direction and findings of impact assessment.

3.7 Social impacts

The close relationships between social and environmental systems make it imperative that social impacts are identified, predicted and evaluated in conjunction with biophysical impacts during environmental assessment. People and their social groups are a component part of their environment, and environmental changes are often linked to social change (and vice versa).

Social impacts include changes that effect individuals, institutions, communities and larger social systems as well as the interactions between them. In basic terms they are alterations in the way people live, work, play, relate to one-another and organise to meet their needs, as well as changes in the values, beliefs and norms that characterise their 'group' and guide individual and collective actions. Social impacts can be divided into three main types:

- *demographic impacts* such as changes in population numbers, population characteristics (such as gender ratio, age structure, in-and out-migration rates and the resultant demand for social services, hospital beds, school places, housing etc.);

- *cultural resource impacts* including changes in archaeological, historical and cultural artifacts and structures and environmental features with religious or ritual significance; and
- *socio-cultural impacts* including changes in social structures, social organisations, social relationships and accompanying cultural and value systems (language, dress, religious beliefs and rituals).

The assessment of social impacts involves the collection and analysis of demographic and socio-cultural data. Much of this data will be identified or generated during the public involvement program for the environmental study. It is therefore best if specialist social scientists both undertake the public involvement and analyse the social impacts. To maximise the potential for integration of social and biophysical impacts throughout the environmental study, the social scientist should be engaged at an early stage in the study and be an integral part of the environmental study team.

In considering social impacts, the needs and likely impacts on individual segments of the community (e.g. women, children, low-income groups) should be carefully assessed and reported, and appropriate mitigating measures proposed.

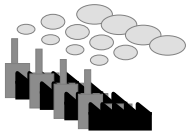
The influx of large numbers of workers and supervisory staff on a major construction project can lead to significant social impacts on local communities. These impacts can arise because of differences between the customs, beliefs and lifestyles of the local community and the new workers. It can also arise from the competition for resources (such as local produce and accommodation), which can distort local prices and lead to hardship and bad feeling. Proponents should plan carefully to avoid or minimise such impacts, both in the selection of contractors, and, where appropriate, in the provision of self contained camps for construction workers. Where such camps are provided, care must be taken that they are managed so that impacts on the environment are minimised, by providing adequate utilities (e.g. water supply, sewerage, power), and by ensuring social services are also adequate (e.g. recreation, shopping, cooking facilities).

3.8 Health Impacts

Development projects can result in considerable health benefits to people (eg the provision of safe drinking water): but they can also result in adverse effects on community health and safety. When environmental assessment includes the consideration of health impacts, the potential health-related effects of development can be predicted, mitigated and managed far more cost effectively than if they are left to emerge after project implementation.

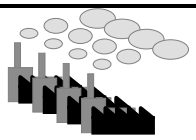
Health impacts can result directly from changes to the biophysical environment (such as exposure to toxic pollution) or indirectly as the result of other changes caused by the project (eg lowered socio-economic status resulting in increase morbidity and mortality). The implementation of proposals can also increase the risk of accidents and disasters (see Table 3).

Table 3. Some examples of major health impacts of development projects

(See key below)	Communicable disease	Non communic-able disease	Nutrition	Injury
Transport				
Mining				
Energy				
Natural resources				
Public services				
Manufacture and trade				

Source: Birley,M.—Liverpool School of Tropical Medicine, IUCN Pakistan

	Brazil, 1970s–Half the malaria cases in Amazonia were linked to the narrow area of influence of the Transamazon Highway Uganda, 1986–Along the main link road to Kenya, 32% of the truck drivers and 68% of the women working in bars were HIV positive
	Pakistan, 1994–88% of traffic police constables in Karachi develop respiratory problems within two years of commencing duty, 84% had mild to moderate pain while taking a deep breath, 37% often experienced heart palpitation
	Papua New Guinea, 1980s–Traffic accidents were estimated to cost 1% of GNP
	South Africa, 1980s–Many miners suffered from permanent dust-induced lung damage. This activates tuberculosis. Infection rates were 800–1000 per 100,000.
	Bolivia, 1970s–The population of 24,000 mineworkers in large mines had 5,430 injuries
	Household cooking on open fires may be the largest single occupational health problem of women. It leads to many respiratory and eye diseases.
	Sri Lanka, 1986–A rice development project created breeding sites for mosquitoes which transmit Japanese encephalitis. Pigs near the rice fields provided the virus. The result was an epidemic.
	Sri Lanka, 1970s–On some tea estates child labour was common, educational facilities minimal and water supplies inadequate. Chronic malnutrition and infant mortality rates were twice the rural average. Kenya 1980s–Participants in a dairy development project sold the available milk for cash. They did not reserve enough milk to feed their children.
	Burma, 1950s–Satellite towns built on swampy land became waterlogged during the rains. Mosquito breeding increased. Filariasis was transmitted.



Cubato, Brazil, 1980s–There were 23 major industrial plants and many small operators. A high rate of respiratory disorders was associated with high levels of water and air pollution. Neonatal mortality and birth deformities increased.

In developing countries, the annual rate of accidents causing disabling injuries to workers is 23%–34%, compared with 3% in the UK.

3.9 Economic and fiscal impacts

Economic impact assessment is carried out to predict changes to employment, per capita income and levels of business activity resulting from a proposal. For very large projects, and the assessment of programs and policy, the impacts on GDP, capital inflow, balance of payments and the structure of the economy also require attention.

Fiscal impacts are the changes in the costs and revenues of the various government sectors. These changes typically occur as the result of the project causing large increases in population and the consequent demand that this can place on community infrastructure provided by government (eg health services, roads, sewerage etc.).

As with other impacts, appropriate baseline data needs to be collected to describe the baseline economic and fiscal situations (without the proposal) and then prediction techniques are required to describe the changes likely to occur if the proposal is implemented. The factors that typically lead to economic and fiscal impacts are shown in Table 4:

Table 4. Factors leading to economic and fiscal impacts.

Factors affecting economic impacts	Factors affecting fiscal impacts
• duration of construction and operation periods; • workforce requirements for each period and phase of construction including numbers to be employed during the peak phase for construction works; • skill requirements (local availability); • earnings; • raw material and other input purchases; • capital investment; • outputs; and • the characteristics of the local economy.	• size of investment and workforce requirements; • capacity of existing service delivery and infrastructure systems; • local and regional tax or other revenue raising processes; and • likely demographic changes arising from project requirements (these need to be estimated during the assessment of social impacts).

3.10 Impact significance

Once impacts have been analysed, it is important to determine their significance, that is , whether they are acceptable, require mitigation, or are unacceptable to the community. Note that care should be taken to ensure that the assessment of significance is not confused with the decision about the future of the proposal. This latter task is the role of the decision - maker who can use the significance information in the decision-making process. The

significance of an impact is determined by the joint consideration of the impact characteristics and the importance (or value) attached to them.

Determining the importance of the various issues can sometimes be approached by comparing the likely or predicted impacts with current standards. If the proposal, including the adopted mitigating measures, does not cause the standard to be exceeded, the issue might well be considered to have been adequately addressed. If the anticipated impact is well below the standard, it usually means that the issue needs no further consideration. Reliance on standards, however, may suffer from two deficiencies:

- there may be no appropriate technical standard (eg social impacts, visual impacts, clearing of vegetation);
- there may be no community confidence in, or agreement on, the standards that have been established (eg blood lead levels, traffic noise levels, water quality parameters).

Ultimately, the significance of issues and their relative importance is subjective. Even the apparently scientific establishment of environmental discharge standards will have involved the balancing of environmental quality and economic reality. The approach used to determine significance must take into account the cultural and social aspects of local value systems and traditional practices.

Key bases for assessing impact significance are:
- level of public concern (particularly over health and safety);
- scientific and professional judgment;
- disturbance and disruption of valued ecological systems; and
- degree of negative impact on social values and quality of life.

Significance criteria can be categorised as follows:

Ecological importance, including aspects critical to ecosystem functioning as well as those valued for aesthetic reasons;
- effect on plant or animal habitat;
- rare or endangered species;
- ecosystem resilience, sensitivity, bio-diversity and carrying capacity; and
- viability of population levels of local species.

Social importance, including biophysical impacts which translate into effects on factors valued by humans:
- effects on human health and safety;
- potential loss of species with current or potential value, or commercially available production (farmland);
- recreational or aesthetic value;
- demands on public resources such as social services;
- demands on transportation and other infrastructure; and
- demographic effects.

Environmental standards, being criteria designed to contain certain environmental conditions within specified limits believed to be required to achieve social objectives (usually health related), including:
- limits on effluent discharge concentrations;
- clean air and water quality standards, policies or plans; and
- plans or policies that protect areas or limit the use of natural resources.

4. MITIGATION AND IMPACT MANAGEMENT

4.1 Purpose of mitigation measures

One of the main tasks of impact assessment is to predict and prevent unacceptable adverse effects through the implementation of appropriate project modifications—also known as mitigation measures. The purpose of mitigation in the environmental assessment process is to:

- look for better ways of doing things so that the negative impacts of the proposal are eliminated or minimised, and the benefits are enhanced; and
- make sure that the public or individuals do not bear costs which are greater than the benefits which accrue to them.

In order for this process to be cost effective, it is necessary that the impact assessment be carried out at the same time as the project feasibility design and that early links are established between those doing the environmental assessment and those designing the project. The key to effective mitigation of impacts is an understanding of the reason for the impact. This may be simple (eg construction noise) or quite complex (eg ecosystem protection). Ask:

- what the problem is;
- when the problem will occur and when it should be addressed;
- where the problem should be addressed;
- how the problem should be addressed;
- who stands to gain or lose.

The adverse consequences of projects can be felt far beyond the boundaries of the project site. In the past, many of the true costs of projects were not acknowledged or accounted for in the economic analyses of a project's worth, particularly in the operational and decommissioning phases of the project's life. The costs were, therefore, often borne by the community (or government) rather than by the proponent.

With the move towards sustainability there is now recognition that the proponent has responsibility to internalise (ie. include the costs within the project accounting) the costs felt beyond the project boundaries and incurred over the life of the project. The project plan must include the specific provisions needed for minimising or offsetting the predicted adverse effects, and the project's core budget must include funds for achieving this.

While it has been argued that mitigation measures add to the total project cost, this is not always the case. Many proponents have found that good design and management have actually resulted in significant savings. This outcome is similar to that found in industries applying the principles of cleaner production to improve their environmental performance. In many cases alternative production methods, although more costly in the short term, have been found to be cheaper or more effective in the long run. For instance, introducing measures to clean up effluent streams has been the catalyst for the implementation of recycling and recovery operations, with marketable by-products providing a cost return.

4.2 Different ways of achieving mitigation

When significant impacts are identified in the construction, operational or decommissioning phases of a project, collaboration is needed between the project designers and the environmental assessment team to see if design changes can mitigate these problems. Depending on the nature of the impacts and the timing in the design cycle, there are a number of ways in which problems can be managed. These include:

Alternative ways of meeting the project objectives—this option involves going back to the origins of the proposal, and is most appropriate when the planning is at an early stage or when a 'fatal flaw' is discovered in the proposal.

Changes in planning and design—the earlier environmental factors are considered and impacts identified in the development of a project, the less financial commitment there is to a particular course of action, and the easier it is for the project to be redesigned to avoid or minimise impacts. For instance, earthworks could be avoided during the rainy season to minimise surface runoff, or blasting could be done outside the nesting season of migratory birds. Construction techniques could also be altered from those generating unacceptable noise, such as pile driving by impact, to those causing less noise, such as 'screwed-in' piles.

Improved monitoring and management practices—the monitoring and management of impacts is a fundamental aspect of impact mitigation, and is developed in Section 4.3 below. Monitoring is required to keep track of whether impacts are of the nature that was predicted and within the levels allowed. Effective management is required to keep the impacts within the predicted levels (or take further mitigation measures if they exceed those levels), and to deal with unforeseen impacts or problems.

Compensation in money terms—money can be paid for land lost or the loss of amenity resulting from a proposal. While this approach to compensation may be appropriate where free markets for replacement of assets are available, and those being compensated have the ability to ensure they are not disadvantaged, there are many times when other methods of compensation, such as replacement, are more suitable, particularly when a net loss of environmental resource is predicted. Even with replacement, there are many examples of resettlement which have resulted in farmers being given inadequate replacement land, which has led to a downward spiral of poverty.

Replacement, relocation, rehabilitation—examples of these mitigation measures are:

- 'in kind' compensation such as the replacement of lost wetlands by constructing other wetlands, and planting forests to replace those lost;
- replacing farmland;
- relocating villages or people displaced by projects; and
- rehabilitating sites after a project is complete, particularly after mining and quarrying,

Because some of these mitigation measures may take place over a long period, it is quite possible that the proponent will sell the development or be financially unable to complete the mitigation plan. If such an outcome is a possibility, then a bond may be required from the proponent, to ensure that funds are available for rehabilitation or mitigation measures.

Often a combination of compensation and replacement, relocation or rehabilitation is needed. For example, people may be relocated and also receive financial compensation for the disruption that has been caused to their lives.

4.3 Preparing an environmental management plan (EMP)

An environmental management plan (**EMP**) is a document designed to ensure that the commitments in the Environmental Report, subsequent review reports, and Environmental Approval conditions are fully implemented. It is a comprehensive technical document which is usually finalised during or following detailed design of the proposal, after Environmental Approval of the development application.

A detailed EMP is not usually considered necessary for the Environmental Report. The Environmental Report should contain a comprehensive outline of the structure of the EMP with a summary of the environmental management and cleaner production principles which would be followed when undertaking the detailed design, construction and operation of the project. For issues where there are high levels of risk or uncertainty, details of management procedures to deal with any adverse outcomes should be included in the EMP outline in the Environmental Report. At the Operating Approval stage, it is essential for the proponent to

establish that the environmental impacts can be managed in an integrated and feasible manner, and for the EMP to be developed and form part of the Operational Approval..

With major or controversial projects, it is desirable to:

- establish a monitoring committee, comprising the proponent's project manager and environmental staff, key government Departments and Agencies, and representatives of the local community, to consult on the ongoing management and monitoring of the project;
- plan to exhibit an annual environmental report outlining the environmental performance of the proposal.

The EMP should provide a framework for managing or mitigating environmental impacts for the life of the project. It should also make provision for auditing the effectiveness of the proposed environmental protection measures and procedures. Further detail on these matters is given in Section 7, "Monitoring, implementing and auditing".

The proponent should take responsibility for communicating a commitment to good environmental practice to all those involved in the project. An environmental policy might state that "All contractors will be required to observe the mitigation measures stipulated in the Environment Approval." All stakeholders (employees, contractors, suppliers, clients and the community) should be made aware of the need for good environmental practice, and be helped to develop an understanding of what is trying to be achieved and why.

A person or group needs to be specifically allocated responsibility for the development, implementation and performance review of the environmental management plan. A close study of the Environmental Report, the conditions of the Environmental Approval, and the contents of the Environmental Agreement will enable all commitments and obligations to be identified. A range of tools will normally be used to ensure that impact management is undertaken (eg setting objective conditions for contracts, tenders, permits and approvals, establishing performance bonds to ensure environmental outcomes are achieved, staff training).

A schedule of the identified tasks should be drawn up, a time frame set for each activity, and responsibility for achievement of each task allocated. Contingency plans should be made for corrective action in the event of unacceptable adverse impacts. A management system for monitoring, reporting and responding to complaints and enquiries from outside parties should be established, with appropriate data storage, retrieval and access, and reporting intervals. Issues arising from the regular reporting should be reviewed, and preventative and remedial measures taken. The environmental management plan should be updated regularly, and independent audits undertaken.

5. REPORTING

5.1 Drafting style

Environmental Reports are designed to assist:

- the proponent to plan, design and implement the proposal in a way that eliminates or minimises the negative effect on the biophysical and socio-economic environments and maximises the benefits to all parties in the most cost effective manner;
- the government or Responsible Authority to decide whether a proposal should be approved and the terms and conditions that should be applied; and
- the public to understand the proposal and its impacts on the community and the environment.

Information provided should be clear, concise, objective (where possible and where appropriate), and supported by maps or other descriptive detail. When subjective material is

presented, it should be clearly represented as just that, and the impression that it is factual should be avoided. Repetitive or general non-specific data is distracting and is not relevant to the decision-making process. The use of jargon should be avoided. It is recommended that the Environmental Report be edited to ensure consistency of style and accuracy of transference of information from any appendices to the main document. The Environmental Report should make reference to all relevant studies and investigations that have been carried out in support of the proposal, or other studies, reports or literature used in the Environmental Report. These supporting documents should be available to all stakeholders at the time the Environmental report is publicly advertised.

The information should be arranged so that it is readily accessible and easily understood by all parties. It should clearly state issues in a non-technical way.

5.2 Main features of an Environmental Report

A general description of the format and content of an Environmental Report follows. The general format may need to be varied to accommodate:

- specific Terms of Reference which may have been adopted;
- the treatment of alternatives which will vary: sometimes alternatives are not considered in any detail, other times alternatives are addressed early in the study and it is only the favoured alternative which is taken forward for detailed study;
- the structure of investigations will sometimes lead to a logical presentation which varies from the general model;
- the treatment of baseline data: while the general model allows for a description of expected conditions in an early section of the Report, it is not uncommon for the existing conditions to be described under the relevant impact heading (eg under noise impacts, the existing noise environment would be described, followed by predictions of the noise levels expected to be generated by the favoured proposal and the main alternatives).

With those caveats, a general format for an Environmental Report will include:

Executive or non-technical summary
This is the part of the report that most people will read. It is often the only part that people will read (including decision-makers). A two to four page executive summary should contain:

- title and location of the proposal
- name of the proponent
- name of the organisation preparing the Environmental Report
- a brief outline of the proposal
- the major impacts
- recommendations for mitigation and compensation
- proposed monitoring

For major proposals the Executive summary might extend to ten pages but it should not be any longer. The executive summary may usefully be distributed to the public as an information brochure. In such cases, the Responsible Authority may contribute advice on the decision making process, and where submissions should be lodged. If a public display is intended, the information brochure should also contain the details (dates, times and places) where the display can be viewed.

Description of the objectives of the proposal
This section should outline the objectives of the proposal, and set the basis for an evaluation of how well the preferred alternative satisfies those objectives.

Description of the proposal and its alternatives

This more detailed description of the proposal indicates any reasonable alternatives that would meet the proposal's objectives, including the possibility of the 'do-nothing' alternative. This section of the report would include:

- the status of the proposal in the project cycle, such as pre-feasibility, feasibility or detailed design;
- a description of the planning, design and implementation stages in only enough detail for impact forecasts and management measures to be understood and appreciated;
- the requirements for raw materials, water, energy, and equipment;
- the planned operational characteristics—hours of operation, processes, products;
- visual aids such as maps of the area, site and plant layout, flow charts of the production process, and photographs of the site and similar projects (particularly to convey an appreciation of the scale and nature of the equipment involved);
- a comparison of proposal options (such as size, siting, technology, layout, energy sources, source of raw materials); and
- a summary of the technical, economic and environmental features of the proposal.

Discussion of the proposal and current land use and policies

This section should show how the proposal (and the alternatives) fit into current land use controls, and whether they are compatible with relevant government policies and strategies.

Description of existing and expected conditions

This is often covered in too much detail in Environmental Reports. Only enough detail should be given to allow an understanding of the impact analysis and assessment. It should contain a description of the following aspects of the proposal as they are expected to be at the time of implementation of the proposal:

- the spatial and temporal boundaries adopted for the various aspects of the study;
- the existing (baseline) condition of the relevant biophysical and socio-economic environment as well as trends and the anticipated future environmental conditions should the project not go ahead; and
- environmentally sensitive areas of special or unique value (including biodiversity, scientific, socio-economic, cultural, visual and heritage).

Evaluation of the impacts for each alternative

For both the proposal and its alternatives, the Environmental Report requires a description of the potential beneficial and adverse environmental impacts, both direct and indirect, for each component of the environment identified as important during the screening and scoping stages. This should include:

- an assessment of any impact on the local population (including gender issues);
- the relevant environmental data and predictive methods used and any underlying assumptions made;
- any gaps in knowledge and uncertainties encountered;
- compliance with relevant environmental standards;
- the assessed significance of the impact, stating the standards or criteria used as a basis for judgement; and
- possible measures for avoiding or mitigating the impact.

Possible cumulative or multiplicative effects should also be highlighted. Wherever possible information should be presented in summary form to help readers assimilate the information and to make a quick comparison between alternatives.

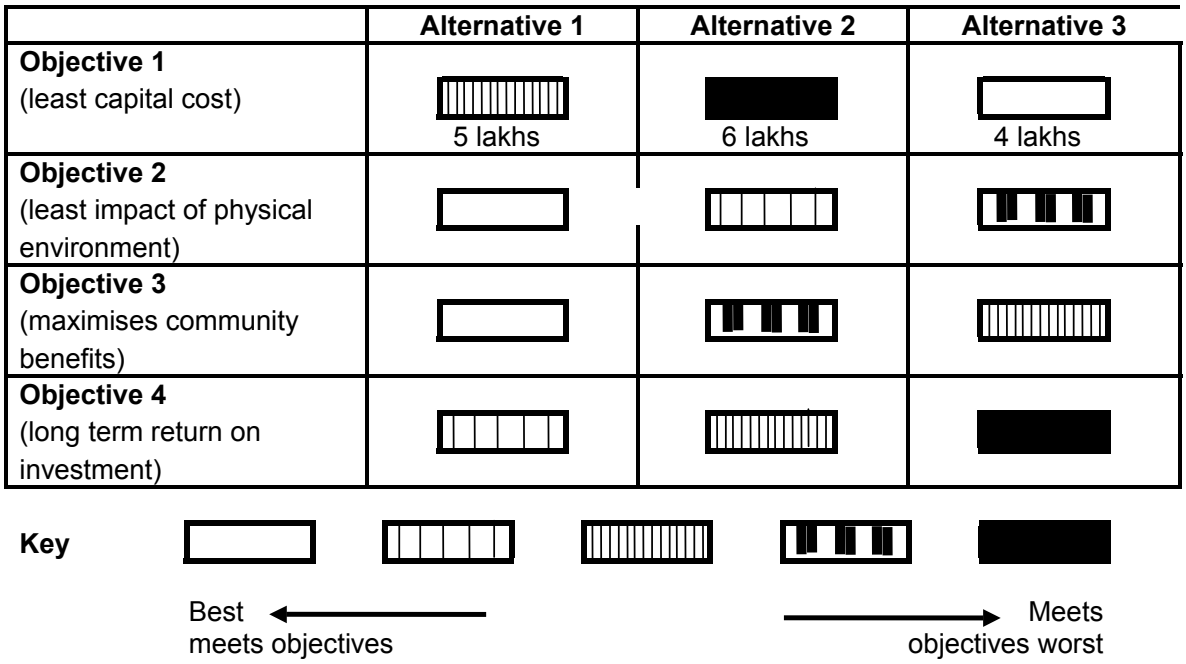
Comparative evaluation of alternatives and identification of the preferred option

In this section the alternative proposals should be compared, focusing on the significant adverse and beneficial impacts, after allowing for mitigation measures. The preferred alternative should be identified with a complete description of those impacts considered to be

of greatest significance and the measures proposed to avoid, reduce or mitigate them, and opportunities for environmental enhancement.

A summary of the evaluation of alternatives, indicating how each alternative satisfies the project objectives, is a most useful visual aid, and can take the form shown below in Figure 2.

Figure 2. Visual summary of the evaluation of alternatives



Environmental management plan, monitoring plan and proposed training
This is the 'action oriented' part of the Environmental Report. It summarises the mitigation measures which have been adopted to ensure that they are implemented, and that the impacts are in accordance with predictions. It is a plan for monitoring and managing the impacts during implementation and operation, outlining which activities will be undertaken by the proponent, and any activities which should be the responsibility of government. Environmental management and monitoring plans should:

- contain a description of the proposed mitigation actions;
- contain a schedule for implementation;
- assign responsibility for implementation (by name or position);
- present the monitoring program to assess performance;
- present the proposed reporting and reviewing procedures; and
- outline any training needs that are required to ensure that the plans can be implemented successfully.

Monitoring should be restricted to **the necessary minimum program** needed to protect the environment. All too often the proposed monitoring programs have been lists of various environmental parameters to be monitored without an explanation as to why these are needed. The monitoring program needs to be detailed and quantified with:

- description of work tasks, skills required, tests required, duration and frequency;
- the institutional system by which the monitoring data will be collected, collated, analysed, interpreted and action taken, if necessary, to prevent or reduce unwanted impacts;

- measures to ensure the monitoring information is available to Federal and Provincial Departments and Agencies, and to the public;
- a justification of the cost of the monitoring program in terms of public health and other benefits. (A fuller treatment of Monitoring is given in Section 7).

Appendices
Appendices contain information that may be needed for reference or for detailed review by technical experts. All technical information and description of methods used to provide conclusions in the Environmental report should be included in Appendices when they are not suitable for the main text. Appendices should also contain:

- a glossary;
- an explanation of abbreviations;
- a summary of the management of the environmental study process, including the public involvement, and listings of individuals or agencies consulted;
- sources of data and information and a full list of all reference material used;
- a list of names, qualifications and roles of the team members who carried out the study; and
- Terms of Reference for the Environmental report and those given to individual specialists.

Appendices are often best included in a separate volume, which will not generally require such extensive circulation as the main document.

5.3 Distribution of reports, and other forms of presentation

As a general rule, the report should go not only to government departments and decision-makers, but also to anyone who has a legitimate interest in the proposal. In most cases the executive summary is particularly useful to distribute to those who don't want to read the whole document. It can also be relatively easily translated into other languages where this would assist interested people to understand the proposal.
If formal public consultation has occurred in the time between scoping and the production of the report, it may be useful to have a section showing comments received, and responses to these comments.

Other forms of presentation of the findings should also be considered such as:

- local language video;
- local radio and television;
- presentations;
- newsletters and information sheets;
- displays, particularly if they are supported by members of the study team;
- gatherings based on local community groups;
- small meetings and workshops.

All have their place in effective communication, but none can be effective without the preliminary work involved in producing a clear and comprehensive report, factually accurate and consistent in its data.

5.4 Shortcomings of reports

It is difficult for Environmental Reports to achieve the goal of being complete, easily understood, objective, factual and internally consistent. This is to be expected in a process which involves so many contributors working to tight deadlines. A higher standard of

reporting can be achieved if the report writers are aware of common shortcomings of environmental reporting.

The objective of the activity is described too narrowly
Example: The Environmental Report describes the movement of people and goods only in terms of road transport neglecting the potential for rail or other means of transport.

The description of the activity does not cover the entire activity
Example: The Environmental Report describes the proposed construction of an industrial plant, but omits information about construction of a pipeline and other facilities to transport and handle raw materials and finished products to and from the plant.

Selection of alternatives does not take into account environmental aspects
Example: The Environmental Report on a coastal tourist facility only considers alternatives which meet operator's requirements, visitor 'needs' and public safety regulations, while overlooking environmental considerations such as the protection of geomorphology and ecology of the coastal landscape.

Key problems caused by the activity are not described
Example: The Environmental Report describes the proposed construction of a coal-fired power plant using surface water as a cooling medium. The report does not divulge that the surface water body is already used by other industrial activities for cooling water purposes to the limit of its cooling capacity.

Sensitive elements in the existing environment are overlooked
Example: The Environmental Report on a pipeline project does not indicate that the proposed alignment of the pipeline will dissect certain areas of ecological value.

Environmental target values and standards are not properly described and observed
Example: The Environmental Report for an extension to an airport provides for mitigation measures to limit the impacts up to the standard of 25% of people seriously affected, whereas the target value aims at limiting impacts to 10% of people seriously affected.

No alternative is described complying with legal environmental regulations
Example: The Environmental Report for a sanitary landfill indicates that the underlying groundwater is part of a regional groundwater resource with a range of beneficial uses. No impervious clay blanket has been proposed below the landfill, to stop leachate contaminating the groundwater.

Possible promising mitigation measures are not considered
Example: The Environmental Report for a sanitary landfill does not describe a system for collecting the methane gas produced in the landfill. Methane is a greenhouse gas contributing to global warming, and can be a hazard to human health and safety.

The alternative offering the best protection to the environment is not described or is insufficiently described
Example: The Environmental Report on a bridge or tunnel connection across an estuary does not take seriously the alternative whereby the connection is carried out as a drilled tunnel. A drilled tunnel underneath the bottom of an estuary has considerably less impact on the environment than a bridge connection or a tunnel composed of segments on the bottom of the estuary.

Serious impacts on the environment are not described or are not correctly described.
Example: In the case of the Environmental Report for a sanitary landfill in an area with very variable soil conditions, the report does not describe the impact on the environment following failure of the underlying sealing and drainage systems.

Insufficient or outdated prediction models are used
Example: The Environmental Report on an urban development scheme makes use of a mobility prediction model using national averages whereas local data is available enabling more precise predictions.

In comparing the alternatives, incorrect conclusions are drawn
Example: In the Environmental Report on a regional management plan for the disposal of municipal sewerage sludge, various methods of disposal are compared. One alternative involves composting the sludge into a low grade compost product. The comparison of the alternatives in the report presents the composting option as an attractive form of disposal as it greatly reduces its volume. The comparison does not, however, take into account the limited potential for applying the low grade compost as a soil conditioner due to the high heavy metal content of the sludge.

6. REVIEWING AND DECISION-MAKING BY RESPONSIBLE AUTHORITIES

6.1 The role of the review process

Reviewing is the step in the environmental assessment process that:

- determines whether the Environmental Report provides an adequate assessment of the environmental effects, and is of sufficient relevance and quality for decision-making;

  Clause 6(c) of the "*Policy and procedures for the filing, review and approval of environmental assessments*" stipulates that the Responsible Authority shall advise the proponent of the adequacy of the Environmental Report within 10 days of receipt. While the reviewer may seek clarification of various points from the Proponent of the Consultant firm which prepared the Environmental Report, any deficiencies in the Environmental Report which require the preparation of additional material or the submission of additional documents in order that the review can be completed shall be advised within the 10 days prescribed.

- collects and collates the range of stakeholder opinion about the acceptability of the proposal and the quality of the process that was adopted by the proponent;
- ensures that the Environmental Report complies with the Terms of Reference;
- determines whether the proposal complies with existing plans, policies and standards.

The purpose of the review is to provide information that the decision-makers will require to decide upon the acceptability of the predicted impacts. The review process can also be used to obtain an impartial judgement of the particular, and often conflicting, interests of parties involved and to avoid unnecessary costs and delays. Often a review will identify further information that is required or further mitigation measures that should be included.

The review will normally be undertaken by:

- assessment officers within the Responsible Authority, or
- by a Committee of Experts appointed by the Director General or Chief of the Responsible Authority, as provided for in Clause 6(g) of the "*Policy and Procedures for the filing, review and approval of environmental assessments*"; or
- a combination of both the above.

Any person undertaking the review must disqualify themselves from participating if they have any connection or interest, or are adversely affected by the proposal.

Review of Environmental Reports commences once the report has been submitted, and publicly advertised (which is mandatory for EIA's, and may be required by the Responsible Authority for some IEE's). It is good practice for the proponent (or his consultants) to maintain progressive contact with the Responsible Authority, to ensure that the preparation of the Environmental Report is on track, and to avoid any unanticipated rejection of the report.

Where there are issues that require further research, aspects of the proposal that require modification, or where the report is inadequate, reviewing may be an iterative process, with the report being returned to the proponent for amendment to correct the deficiencies identified. Any such deficiencies should be communicated in writing.

The review will also address stakeholder input. This will commonly be through the submissions made by other Departments and Agencies, and through submissions made by NGO's and the local community. Community input will not always be written: it can involve a range of forms, including comments made at displays and at meetings and briefings with affected and interested people. It is essential that key government Departments and Agencies who have responsibility for aspects of the environment affected by the proposal (eg wildlife management, provision of infrastructure) provide written submissions on the Environmental report, detailing whether the report addresses their key policies and standards, and whether the mitigation measures specified are adequate.

An important role of the review is to check that the feasibility design complies with relevant standards and policies, or standards of good practice where official standards do not exist. For instance, proposed levels of discharges for a proposal from a multi-national should not be greater than those allowed in the home country of the multi-national.

Review can also be carried out by proponents during the preparation of the Environmental Report, as part of the quality assurance process. In this way proponents can ensure that their work is of an appropriate standard before it is the subject of formal review by the Responsible Authority.

6.2 A consistent, systematic approach

There are benefits to all stakeholders if a consistent and systematic set of criteria is used to review Environmental Reports. The general standard of Environmental Reports can be improved when proponents are made aware of government or agency expectations about report standards and coverage. Also, an assessment can be made of the success of the review criteria in achieving government's aims or in the demands that they place on proponents, and criteria can be revised (strengthened or relaxed) as necessary.

Reviewing is carried out to decide whether:

- the Environmental Report has adequately addressed the Terms of Reference;
- there is sufficient information on the objectives of the proposal and its environmental setting, alternatives, impacts, baseline information, mitigation and monitoring;
- the information is correct and technically sound;
- the preparation of the Environmental Report was conducted appropriately, and the points of view of all parties were taken into account;
- the information has been presented so that it can be understood by both decision-makers and the public;
- the information is relevant to the decision-making; and
- there is sufficient information on the implications of the environmental impacts to provide reliable information to decision-makers.

6.3 Steps in reviewing an Environmental Report

The following steps can be adopted for a best practice approach to reviewing Environmental Reports.

Setting the scale
At the start of each review it is important to establish how much time is available for the review (ie. manhours, not elapsed time to meet a statutory deadline). The choices range from a quick overview by one person to an in-depth review by a team of experts assembled to do the job. The scale of the review will depend on the nature of the proposal and available resources. If inadequate resources are available to undertake a comprehensive review, this situation should be drawn to the attention of the decision-makers, and included in the written review report.

Using input from public comment
Practical experience from a number of countries has shown that seeking comment from the public is very important to the quality of the review process. The input from the public is critical in checking and determining the quality of the descriptions of the existing environmental conditions, the importance of the effects to be expected from the proposed activity, and the acceptability of possible alternatives.

A question of adequacy
The following points should be considered in assessing the adequacy of Environmental Reports:

- the purpose of an Environmental Report is to bring matters to the attention of members of the public, the decision-makers, and the Responsible Authority, so that the environmental consequences can be properly understood;
- the Environmental Report must be sufficiently specific to direct a reasonably intelligent and informed mind to potential or possible environmental consequences;
- the Environmental Report should be written in understandable language;
- the Environmental Report should contain material which would alert both lay persons and specialists to potential problems;
- an Environmental Report would be unacceptable if it was superficial, subjective or non-informative;
- an Environmental Report would be acceptable if it was objective in its approach and alerted relevant parties to the environmental impacts and community consequences of carrying out or not carrying out the proposal.

Identifying the review criteria
Review criteria should include:

- the Terms of Reference for the Environmental Report;
- existing reviews of EIA reports of comparable activities in similar settings;
- studies and experience of the actual impacts of similar projects which have been implemented;
- general review criteria, including the requirements of PEPO '97, and the "*Policy and Procedures for filing, review and approval of environmental assessments*";
- the quality of the scoping and screening, impact prediction, evaluation of impact significance, the assessment of alternatives, the mitigation and monitoring measures proposed, and the EMP, and in particular, whether:
    - the executive summary is adequate. Decision-makers may read only the summary, therefore it must present the significant impacts (in order of importance), clarifying which are unavoidable and which are irreversible; the measures which can be taken to mitigate them; the cumulative effect of impacts; and the requirements for monitoring and supervision.;
    - recommendations are clearly stated in the executive summary;

- the project outline description is complete, in so far as the aspects which can affect the environment are concerned;
- project alternatives are described;
- the baseline study section in the main report is concise and useful to readers who are not specialists in the scientific disciplines covered. The section should give an overall picture of present conditions and trends, and include ongoing and proposed development activities in the study area. It should provide comments on the quality of the data and the completeness of the data bases;
- consideration of probability is provided in the section in which impacts are predicted and evaluated. An explanation should be given for potential impacts that were expected at the scoping stage, but not found, and for issues which are dropped from further consideration. Significant impacts should be analysed in more detail than less significant ones;
- mitigation measures both control adverse impacts and enhance project benefits. The institutional arrangements for implementing the measures should be defined. The costs of implementing all recommendations should be adequately budgeted in the cost estimates;
- when monitoring programs are described, the reasons for and costs of the monitoring activities are detailed. There should be a commitment to carrying out the monitoring work, evaluating the results, and initiating any necessary action to limit adverse impacts disclosed by monitoring;

- the involvement of local people in the study process, including an overview of the issues raised and their treatment;
- the clarity of reporting, which should be free of jargon, and explain technical issues in terms that are intelligible to a non-technical reader.

Carrying out the review

The review should progress through three steps;

Step 1: identify the deficiencies in the Environmental Report using the criteria listed above.

Step 2: focus on the critical shortcomings observed in the Environmental Report and determine if any shortcomings are so critical that remedial action must be taken.

Step 3: following any remedial action that is required, complete the review, including recommendations on the acceptability of the proposal, and any necessary project changes, mitigation measures and monitoring requirements.

6.4 Determining remedial options

The appropriate remedial option depends on the nature and extent of the inadequacy of the Environmental Report.

- **The shortcomings of the Environmental Report are so serious that they require immediate remedy in the form of a supplement to the Environmental Report, or a new Environmental Report.** Those responsible for preparing the report should be given the opportunity of correcting the deficiencies, but if they are unable to do so, a different, more competent team will be required. In this situation, the review report must give a clear statement as to how the additional information can be collected and presented. The Responsible Authority will be aware that this course of action will delay the decision-making until the new report or supplement is completed.

- **The shortcomings can be rectified fairly easily by means of explanations and conditions attached to the Environmental Approval**. This option has the advantage that the decision-making can proceed without delay, while requiring that the deficiencies be addressed during the detail design phase.

- **The shortcomings are not major, but cannot be remedied immediately, either by providing supplementary information, or by providing explanations and approval conditions, because they require too much time and effort to collect**. In this case the review may recommend monitoring the shortcomings and uncertainties during the implementation and operation of the project with possible corrective measures being required if impacts turn out to be worse than expected.

In some rare cases, the proposal or the Environmental Report can be so unacceptable that the proposal is rejected. If there are unreasonable delays by the Responsible Authority, the Proponent may request the EAAC (through the Director General) to examine the review process.

6.5 The decision-making process

The decision-making process varies depending on whether private sector or public sector projects are being considered, as shown in the Figures 3 and 4 below.

Figure 3. Decision-making process—private projects

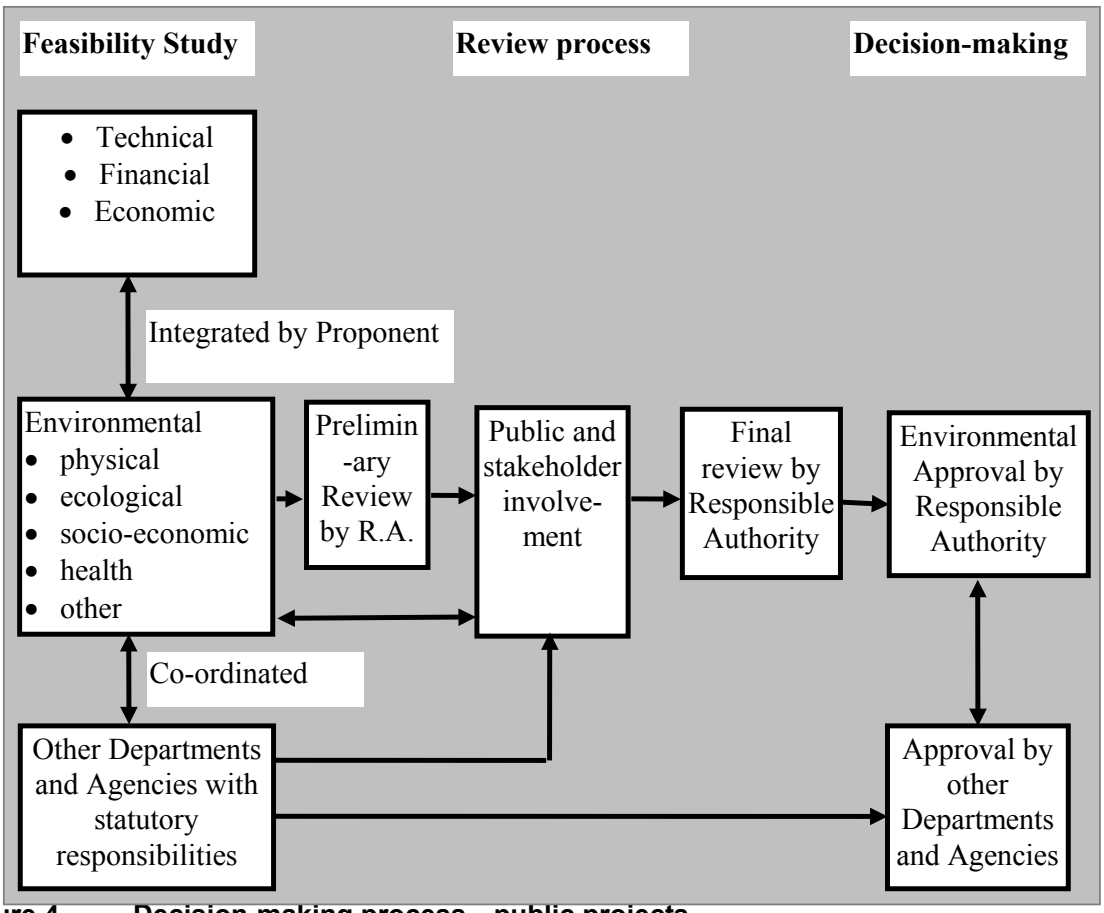
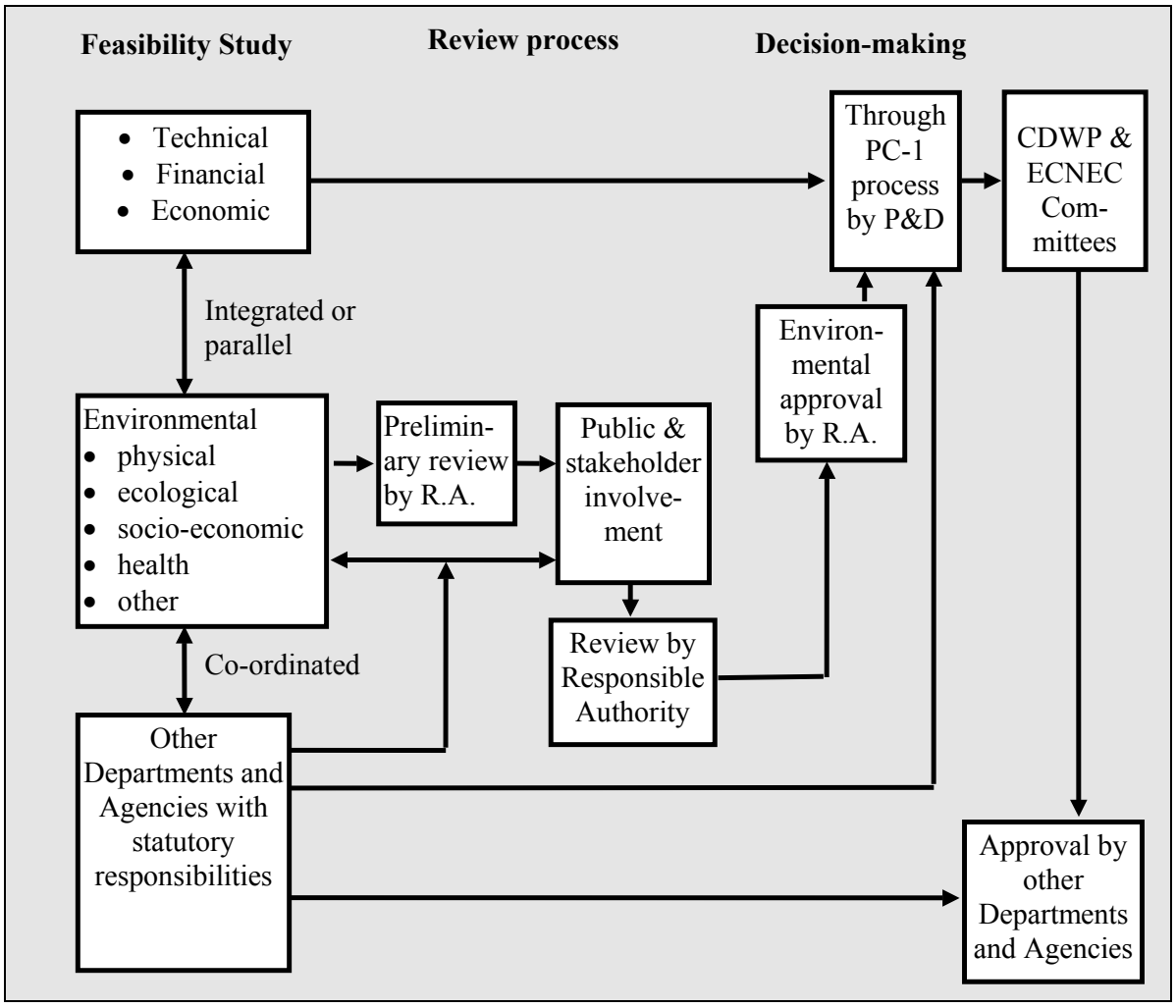


Figure 4. Decision-making process—public projects



The decision on the Environmental Approval will be taken by the Responsible Authority. As set out in Annex V of the "Policy and Procedures for the filing, review and approval of environmental assessments" it will be done by an authorised Committee of Officers, following receipt of advice in the form of a written report from an Assessment Officer, or from a Committee of Experts, or both.

6.6 Checks and balances

A number of checks and balances are built into the environmental assessment system which help to ensure accountability and transparency.

- The Environmental Report is a public document (subject to the withholding of any commercial-in-confidence material).
- EIA's are publicly advertised for comment.
- The review of Environmental Reports is undertaken by a government Responsible Authority that is separate from the proponent (this is particularly relevant in the case of public works).
- The review of the Environmental Report and the subsequent decision is made public.
- A register is kept of decisions, which is available to the public.
- The decisions contain conditions relating to the nature of the project and commitments by the proponent, mitigation and monitoring measures that are required.

- An Agreement is signed by the proponent committing him to implement the project in accordance with the Environmental Report and the Environmental Approval conditions.
- When the project is built, but before it commences operations, an Operating Approval must be granted. This step allows a check to be made that the project has been built in accordance with the Environmental Approval, and allows the firming up of discharge levels, monitoring requirements and the EMP to take account of refinements in the detail design and construction phase.
- Any decisions taken by the Responsible Authority during the environmental assessment are subject to appeal in the Environmental Tribunal.

7. MONITORING AND AUDITING

7.1 Need for systematic follow up

A systematic environmental assessment follow up process is needed to:

- ensure that attention is paid to the actual effects arising from construction & operation;
- ensure that anticipated impacts are maintained within the levels predicted;
- ensure that unanticipated impacts are managed or mitigated before they become a problem; and
- ensure that environmental management brings about real environmental benefits and achieves environmental sustainability, rather than the Environmental Approval process being a mere paper chase to secure a development approval;

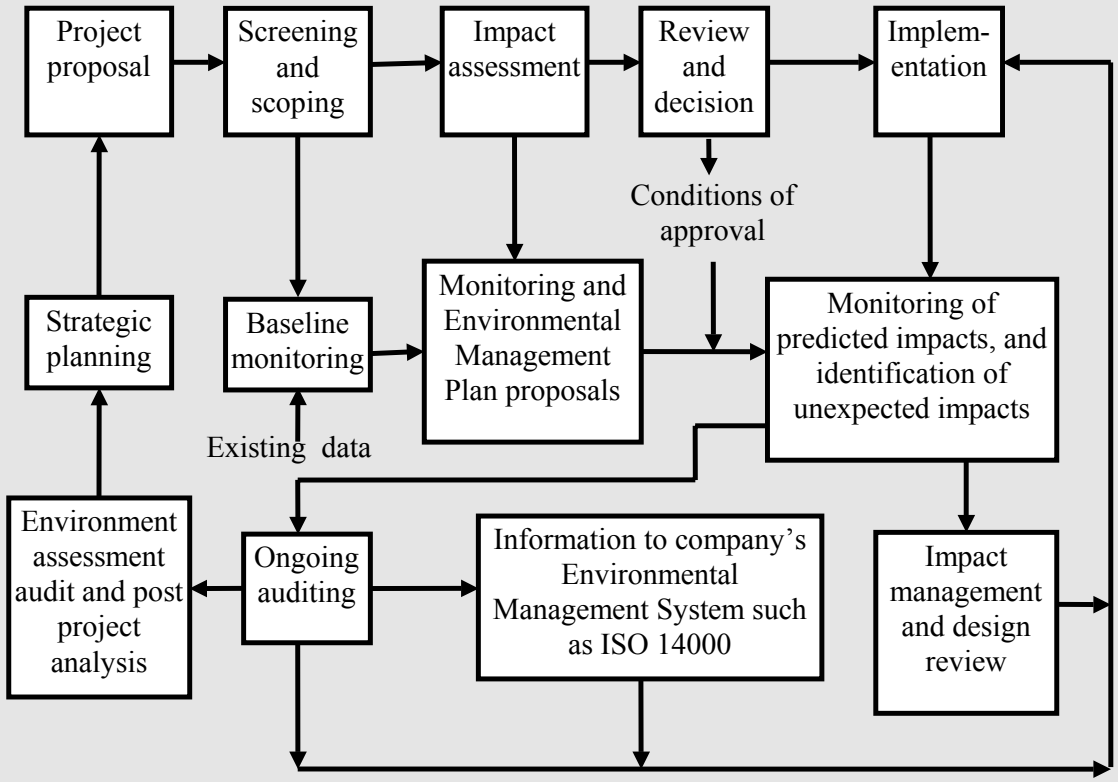
Responsible Authorities will also use the results of monitoring and auditing to improve their knowledge of project impact prediction and management, so that the environmental assessment and review processes can be progressively improved. There are a range of environmental planning and management tools that can be used individually or in combination to achieve improved information, environmental performance and decision-making. Some of these tools are listed below according to their primary purpose (see Table 5).

Table 5. Environmental planning and management tools

Purpose	Examples of available tools
Systematic approaches to business or organisational management	environmental management systems ISO 14000 series, quality assurance systems ISO 9000 series
Designing and assessing environmentally sound projects and products	environmental assessment, risk assessment, life-cycle analysis, technology assessment
Predictive analysis of individual impacts	specific and often highly technical techniques such as modelling changed hydrological conditions or air quality
Monitoring progress	testing specific parameters for a predefined purpose (eg suspended solids, BOD for water quality)
Audit, evaluation and review	often a “one off” picture of the current environmental conditions used to indicate past or current status (eg compliance audits, environmental assessment audits, contaminated site audit, State of the Environment reporting)

Figure 5 below shows the relationship between monitoring, management and auditing, and the steps in the environmental assessment process.

Figure 5. The relationship between monitoring, management and auditing, and the steps in the environmental assessment process



In recent years environmental assessment has become increasingly oriented towards ensuring effective environmental management during the implementation and operation of a proposal. The development of impact management and monitoring programs as part of the environmental assessment process enabled proponents and their contractors to use business systems (such as quality and environmental management systems) to ensure that all parties are aware of their responsibilities and that they carry them out.

7.2 Definition and purpose of monitoring

Environmental assessment monitoring is the planned, systematic collection of environmental data to meet specific objectives. Monitoring can be used to ensure that the benefits anticipated as a result of the Environmental Report are effectively achieved as the project proceeds. Monitoring can be particularly important when the decision to proceed with a proposal is controversial—where overall the project is seen to provide net community benefit, despite considerable uncertainty concerning the scale and significance of one or more adverse impacts. The local community may be concerned about the potential impact of a project on an important resource (eg a fishery) even if the environmental study indicates that no significant impacts are likely. In such situations agreement to implement and fund a monitoring program can be important in reducing community fears and hostility towards the

project. At the same time, the monitoring data will function as an “early warning system” indicating if an impact is occurring, and allowing remedial action to be taken before the impact has reached unacceptable levels.

Monitoring involves the planning of a monitoring program, the collection and analysis of samples, and the interpretation and reporting off data. Data compiled from monitoring can be used to:

- document the baseline conditions at the start of the environmental study;
- assess performance and monitor compliance with agreed conditions specified in the Environmental Approval, Environmental Agreement and Operating Approval for a project;
- review predicted impacts in order to effectively manage risks and uncertainties;
- identify trends in impacts;
- periodically review and adjust environmental management plans and activities;
- verify the accuracy of past predictions of impacts and the effectiveness of mitigation measures, in order to transfer this experience to future activities of the same type; and
- review the effectiveness of the environmental management.

The proponent is responsible for:

1. undertaking and paying for the monitoring (including the provision of monitoring equipment);
2. the management of the information gained from monitoring; and
3. implementation of any action that might be required as a result of monitoring.

Different stakeholders can be involved in different aspects of monitoring and follow up activities. For instance:

- Responsible Authorities make decisions on, and inspect or check implementation of, the conditions of approval;
- proponents or their agents are responsible for implementing the projects, including monitoring the actual effects, implementing remedial measures, and verifying the accuracy of predictions;
- Environmental Protection Agencies and Departments as regulatory authorities check compliance with NEQS, and verify the effectiveness of mitigation measures; and
- the public can be formally or informally involved in monitoring activities and may highlight inadequacies in monitoring programs. They may also have practical suggestions to help solve problems as they arise.

7.3 Effective data collection and management

Monitoring is expensive. It needs to be aimed at the level required to successfully manage the project and review the adequacy of the environmental assessment without wasting money by unnecessarily monitoring impacts. Monitoring should be focused on the impacts that are either significant, or where there is uncertainty. Monitoring is not necessarily required for all impacts. The collection of information needs to be optimised so that enough is collected to be useful, but not so much that it is wasted. Careful thought must be given to the design of a monitoring program, as to how the results will be used in practice, and for how long the monitoring needs to be continued.

Monitoring should be linked to impact prediction so that there is information on the nature, magnitude, geographical extent, time scale, probability, and significance of the impact.

Monitoring programs need to be constantly reviewed to make sure that they are effective, and to identify the time when they can be stopped. While monitoring activities frequently require sophisticated equipment, the value of simple observation should not be under-estimated. For this reason, amongst others, the involvement of local communities can be most effective.

Effective monitoring programs have:

- a realistic sampling program (temporal and spatial)
- sampling methods relevant to the source (eg point source, diffuse)
- collection of quality data
- compatibility of new data with other relevant data
- cost-effective data collection
- quality control in data measurement and analysis
- innovations (eg tracing contaminants, and automated stations)
- appropriate databases
- multi-disciplinary data interpretation to provide useful information
- reporting for internal management and external checks
- allowance for, and response to, input from third parties
- presentation in the public arena

Monitoring programs should provide time series data which can be analysed from time series graphs, which will show statistical significance of variations, and rates and directions of change.

Monitoring programs need to be costed in detail, and funds allocated for the purpose and accounted for in the overall costing of the project. They can generally be offset against the benefits which monitoring brings. There are always immediate cost savings in identifying and rectifying unacceptable environmental impacts at an early stage in the project. Where waste streams require treatment, this can be a catalyst for the recovery of commercially valuable constituents. Longer term gains include decreasing future costs for decommissioning, and improving the credibility of the proponent when proposing future projects.

7.4 Environmental Monitoring Committees

The Responsible Authority may, at their discretion, set up an Environmental Monitoring Committee for any approved project to assist and guide the proponent in the management of the monitoring program. Such action shall be taken where the Responsible Authority considers that the scale of likely impacts, or the level of public concern, warrant such action. The Monitoring Committee shall consist of representatives of the Responsible Authority (who will chair the committee), the Proponent (and his Consultants as required), key Government Agencies, relevant Municipal Authorities and representatives of NGO's and the local community.

Draft Terms of Reference for such an Environmental Monitoring Committee would typically include the following points:

- the committee shall meet periodically to advise the proponent whether the monitoring actions being undertaken meet the requirements of the Environmental Approval and the Operating Approval, and as further detailed in the Environmental Management Plan;
- the committee shall advise on any further public consultation which it thinks is desirable;

- the committee shall consider any significant environmental impacts not foreseen in the Environmental Report, and shall advise the proponent of suitable mitigating measures;
- the committee would consider drafts of the Annual Report on the project prepared by the proponent;
- the committee would advise the Director General of any matters which they believe should be drawn to his attention.

7.5 Environmental auditing

Environmental auditing is a review process similar to that carried out in financial auditing and can be done on a regular or ad hoc basis. It usually takes the form of an independent 'one off' examination and assessment of past performance, such as for the audit of a contaminated site. One special type of environmental audit is the environmental assessment audit which can provide an evaluation of the conditions of approval along with an assessment of the effectiveness of a particular Environmental Report at predicting impacts, both their type and characteristics. A formal environmental assessment audit can therefore only be commenced after partial or complete project implementation. Feedback from this type of audit can be used to improve the effectiveness and efficiency of other Environmental Reports in the future.

The environmental assessment audit would usually be undertaken by (or on behalf of) the Responsible Authority, and the Responsible Authority would pay for the audit. It would not necessarily be undertaken for every project, but desirably it would be done every two or three years for a representative sample of projects which have been subject to an Environmental Report and approval, and have been operating for several years.

Environmental assessment auditing is a management tool that:
- determines the actual impact and outcomes of projects that have been the subject of an Environmental Report, including the extent to which the environmental review has influenced decision making, and the extent to which community benefits have resulted from the environmental components of the project;
- assesses whether conditions established in the Environmental Approval and Operational Approval for mitigating the environmental impacts of development have been implemented and enforced, and whether those mitigating measures were sufficient to ensure that the environment was protected;
- identifies the nature and accuracy of impact predictions, and evaluates the role of impact prediction in the management of environmental impacts of developments;
- evaluates the effectiveness of the environmental assessment process in order to identify ways of improving the utility and efficiency of future assessments.

An environmental assessment audit is planned to be specific to the site, although it can offer information which is general to the environmental assessment process as a whole. It can include the completion of checklists and questionnaires, as well as following written guidelines and using rating systems. The table of contents of an Environmental Management Plan can be used as a checklist for an audit.

Auditing can also result in:
- an improved image for the project as environmentally sound;
- reduction in public opposition to operations; and
- avoidance of penalties which could result from non-compliance with environmental controls.

Findings of the audit and other less formal reviews need to be fed back into the monitoring plan and the management systems. In this way strengths will be highlighted, weaknesses

acknowledged and remedied, and gaps in information for effective reporting defined. Both the Environmental Management Plan and the monitoring program may need to be amended.

8. PROJECT MANAGEMENT

8.1 The importance of the role of the environmental study manager

The main purpose of the environmental study manager is to manage proposals in such a way that the environment is protected while still maximising the other economic and social goals of the project. While the immediate objective of the environmental study manager may be the production of a successful Environmental Report, the longer term goal of project management is to minimise adverse environmental impacts through the environmental assessment process. It is important to understand that environmental assessment needs to be a total environmental process which puts a proposal in proper perspective within technical, economic, fiscal and environmental spheres. Environmental assessment produces better projects—projects that are financially viable, that continue to provide benefits in the long term, and that consume only as many resources as necessary. Environmentally sound projects will be sustainable, bring better financial returns and will conserve scarce resources.

There are many participants in the environmental assessment process: political parties, donor agencies, consulting firms, review and regulatory agencies, NGO's, academics, the public and the media. Each of these becomes to some degree clients of environmental study manager, who needs to understand and take account of their varying needs and demands.

8.2 Attributes of a good environmental study manager

To be effective, the environmental study team needs strong support from environmental study manager and very clear agreements on what is to be achieved, what the deadlines are, how money and resources will be allocated, who does what, and who reports to whom. Good environmental study manager will be:

Technically skilled A successful project manager has a good understanding of the technical and social complexities of the environmental consequences of the project. This is necessary even when the interdisciplinary team undertaking the study includes specialists in environmental and social assessment. There is little point in appointing a environmental study manager who is not an experienced environmental assessment practitioner.

Action oriented Environmental study managers need to be action oriented as deadlines are often very tight. Good environmental study manager move ahead quickly, in the directions they consider reasonable, and then correct these directions as required. Excessive caution in the early stages delays the time for this sort of correction.

Team leader To command the respect of the team the environmental study manager must have a clear idea of what is to be done, good management skills, the ability to motivate team members, integrity, and good judgement.

Able to learn from others The environmental study manager is likely to be a generalist rather than a specialist, and needs to know enough about each of the specialisations to win the respect of the specialist team. In specialist areas, the team leader needs to rely on the expert judgement of the specialist.

Good communicator Environmental assessment management involves information management. It is critical that the project manager communicates well with the client, regulatory bodies, the community and the members of the inter-disciplinary team.

Good negotiator It is the environmental study manager's job to get resources for the environmental study, to get the best out of team members, and to negotiate compromises between numerous stakeholders.

Planning and budgeting skills Without good planning, scheduling and budgeting, there is little likelihood that the Environmental Report will be accomplished on time and within budget.

8.3 Core tasks of the environmental study manager

The environmental study manager, as the team's leader, needs considerable interpersonal skills. A major part of the job is visualising the larger picture within the environmental study, and supporting, building confidence, communicating, leading, asking the right questions, and allowing team members to organise and carry out work in ways which are appropriate to the individual while insisting on quality control.

Key tasks which the environmental study manager must accomplish include;

- establishing the purpose of the proposal, understanding the issues involved as well as the receiving environment;
- defining work components and developing a work program for them;
- establishing and managing a budget;
- establishing a management structure, and clear lines of communication;
- setting time schedules;
- selecting an interdisciplinary team for the impact investigations;
- writing Terms of reference for specialist sub-Consultancies, and managing the tendering and appointment process;
- defining the roles of each team member, the products required, the methods of delivery, quality standards of work and payment procedures;
- coordinating a public involvement program;
- managing and coordinating the information generated by the study;
- providing the results and recommendations of the environmental assessment in a form that meets both the needs of all stakeholders.

8.4 Interdisciplinary teams

Most proposals have a number of potential impacts, often including physical and chemical impacts, biological impacts, and cultural and economic impacts. No one person can be an expert in all of these fields. The multiple viewpoints of the team will lead to a more reasoned evaluation. An interdisciplinary team consists of a group of people, trained in different fields, who interact as a group throughout the environmental study and produce a coordinated Environmental Report. The team, if it is to be competent, must include an engineer who is knowledgeable about the design and operation of the plant or technology needed for the project. This team member will form a link with the technical feasibility team (if indeed the two teams are separate), and ensure that progressive results of the environmental studies, and changes to the technical specifications (whether resultant from environmental advice, or from other causes) are communicated in both directions.

Putting together the team requires searching for appropriate local consultants, or experienced people from universities or research organisations. Sometimes expertise will have to be obtained from further afield. The team members should be selected for their experience in environmental assessment and their competence in a discipline relating to the key issues of the study. While it may be desirable to have many different specialists

contribute to the study, the choice of team members is often limited to who is available, and what can be afforded (see Tables 6 and 7).

Table 6. Factors that can affect the selection of team members
• finances available; • range of impacts to be studied; • demonstrated expertise and experience; • demonstrated local knowledge; • availability; and • ability to work with others and contribute to team efforts.

Table 7. Qualities of successful inter-disciplinary team members
• good team skills; • creativity; • adaptability; • good oral and written communication skills; • good organisational skills; • the ability to listen and to assimilate information; • patience.

Specialists engaged on environmental studies should be experienced in their field, the type of proposal, the geographic region and in environmental assessment. Where professional judgement is used without also employing other more objective methods of analysis, the environmental study manager should be aware that the judgement and values of the specialist concerned may influence the outcome.

There will always be conflict for the environmental study manager to manage. Conflict within the team can be either because of disagreement about scientific interpretation, or because team member do not get on with each other. Often proponents will disagree with the study team because they do not recognise the importance of some impacts. Other stakeholders may demand information which is not available, or attempt to push their individual or group interests, and may oppose findings of the team because they do not understand the basis for these, or because they see things in terms of their own interests. The worst conflict of all for the environmental study manager is when the proponent wishes to alter the content of the Environmental Report, to present the proposal in a more favourable light, or to suppress potentially damaging material.

Some of these conflicts can be avoided by providing readily available information at a level which can be understood by the various parties and making sure that the information is communicated to all who need it. Other conflicts within the team and with the proponent are likely to require all the communication and negotiation skills available to successful environmental study managers.

8.5 Programming and budgeting

Scheduling involves planning how the study will be broken down into component activities and how these activities will fit together. To produce a schedule it is necessary to:

- identify key events or dates that control the study;
- break down the project into stages;
- estimate the timing of each of these stages;
- identify the resources required; and
- estimate the cash flow.

Scheduling is often supported by techniques such as bar charts (eg Gantt charts) and critical path methods (eg PERT) which are often computerised. The logic needed to construct the network consists of the activities to be performed, the relationship between the activities, and the activities which must precede or follow each other.

For example, a common sequence of activities to evaluate the health effects of a transportation study is:

- gathering data on existing transport modes;
- identifying alternatives;
- calibrating a transportation model for the current network and conditions;
- identifying future population and land use, and inputting these parameters to the model;
- for each alternative, inputting the new transportation measures (eg new roads);
- running the model;
- determining traffic flows on key road segments;
- predicting noise, air quality and safety values;
- providing these predictions to the health specialist for evaluation.

It is not uncommon to see much study time consumed on the early steps of gathering data and getting the model calibrated and run, leaving insufficient time for the prediction of noise, air and safety impacts. The likelihood of the health specialist having sufficient time to do his work carefully will be remote unless the study is well managed.

Project managers need to exercise strict control to ensure that time and effort is not spent on unnecessary baseline data collection. Remembering that the object of environmental assessment is not specifically to describe baseline conditions, they may wish to impose limits on the space in the Environmental Report devoted to the description of the baseline situation.

The most difficult part of budgeting is making the initial estimate on which the request for funding will be made. Early decisions need to be made that identify the most important issues and how they are related to each other. From this can come an estimate of the studies to be made, the people to undertake them, the time required to carry them out, the services required to support the team, the equipment required and the overhead costs. Experienced project managers fight hard for an adequate budget.

A major and on-going task of the project manager is to have in place, and use, reporting systems that track expenses and chart progress against the schedule.

8.6 Capacity building aspects of project management

Before the team disperses it is useful to have a team ‘post-mortem’ of performance during the project. This discussion should include representatives of the Responsible Authority, so that problems identified and lessons learnt can be applied widely. If this is done systematically then the lessons learned can be used to improve the next environmental study. Data collected should be properly formatted and stored for use in future assessments. Lists should be made of all contacts—specialists, institutions, and officials—and, if possible, these should be updated from time to time. Reference materials should be properly catalogued and stored.

These matters are particularly important in Pakistan, which is moving to establish systematic environmental assessment processes. The lessons learned and the contacts made can all contribute significantly to capacity building and make future studies more effective.

9 References

This, and other guidelines in the package, rely heavily on existing sources, which include:

- The UNEP *Environmental Impact Assessment Training Resource Manual* June 1996
- *Environmental Assessment Requirements and Environmental Review Procedures* of the Asian Development Bank March 1993
- The World Bank *Environmental Assessment Sourcebook* 1994
- The NSW Department of Urban Affairs and Planning *EIS Guidelines* October 1996
- Bisset, R (1995) *EIA: Issues, Trends and Practice*. The Environment and Economic Unit UNEP, Nairobi

Specific references to a number of generic issues which are detailed in The World Bank Environmental Assessment Sourcebook, Volume I, and provided in Appendix A.

Global, cross-sectoral and cultural issues in environmental assessment **APPENDIX A**

Specific references to a number of generic issues which are detailed in The World Bank Environmental Assessment Sourcebook, Volume I, and provided below:

Topic	Page
Global and trans-boundary concerns and regulations	
• Atmospheric pollution	55
• International treaties and Agreements on the environment and natural resources	63
• International waterways	65
Cross-sectoral issues	
• Biological diversity	68
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• Tropical forests	83
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• Coastal zone management	87
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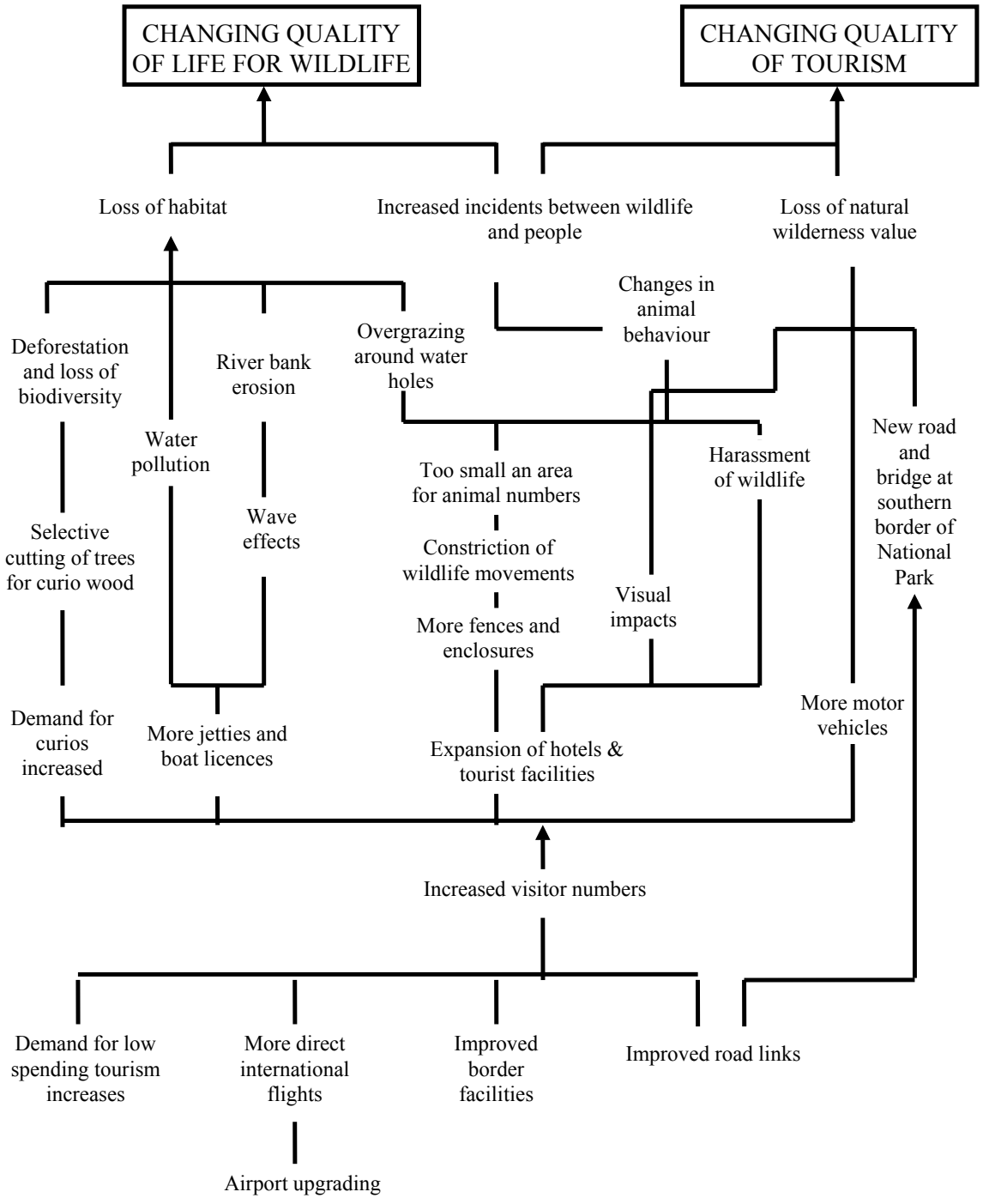
Social and cultural issues in environmental review	
• Core concerns in social analysis	108
• Social issues in ecologically sensitive areas	111
• Indigenous peoples	114
• Cultural property	120
• Involuntary resettlement	123
• New land settlement	126
• Spontaneous or unplanned agricultural settlement	129
• Induced development	130

Network showing impacts linkages leading to changes in quality of life, wildlife and tourism arising from increased visitor numbers at a national park

APPENDIX B