OVERVIEW OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

Environmental impact assessment (EIA) is a multi-step process in which a wide range of environmental, social, and economic issues are taken into account to determine whether environmental constraints should be put on a project, or whether a project should be allowed to proceed at all. The effectiveness of an EIA is dependent on proper completion of a sequential assessment process covering all aspects of a proposed project or activity as depicted in Figure 1. The basic EIA process comprises six discrete steps from screening of proposed projects or activities to determine whether they should be subject to assessment to *post hoc* evaluation of the completeness of the evaluation process and the effectiveness of mitigation measures required. An overview of the procedural aspects of each of the steps in the EIA process is provided in this lesson. Additional detail on technical aspects of EIA including prediction of potential environmental impacts, risk assessment in informing the decision-making process, and environmental monitoring, is provided in Course E.

SCREENING

Project screening is the process undertaken to determine whether a project requires an EIA and, if so, what level of environmental review is warranted. Not all proposed developments require an EIA, as some projects may not pose an environmental threat. To require an EIA on every proposed project would be a waste of time, money and technical review capabilities. Screening answers the initial question of whether an EIA needs to be performed.

Screening is generally straightforward, as most current EIA legislation includes a detailed listing of project types and the appropriate level of environmental review. Types of proposed projects that often require full-scale EIA are summarized in Table 1. If, however, a country does not have specific screening guidelines, environmental managers can still do rudimentary screening on project proposals by considering a few key issues:

- What is the level of confidence in the prediction of environmental impacts? If assessors are unsure of the reliability of the information provided by a project proponent, they may insist on a more detailed environmental review.
- What is the proposed project location? Location is often the single most important factor contributing to a project's potential negative impacts. If a project is to be situated in or near a national park or environmentally sensitive area, the environmental review should be rigorous, with emphasis on protective and mitigation measures. Ideally, projects should be sited in locations where the natural environment will be minimally impacted.

Figure 1 The elements of environmental impact assessment

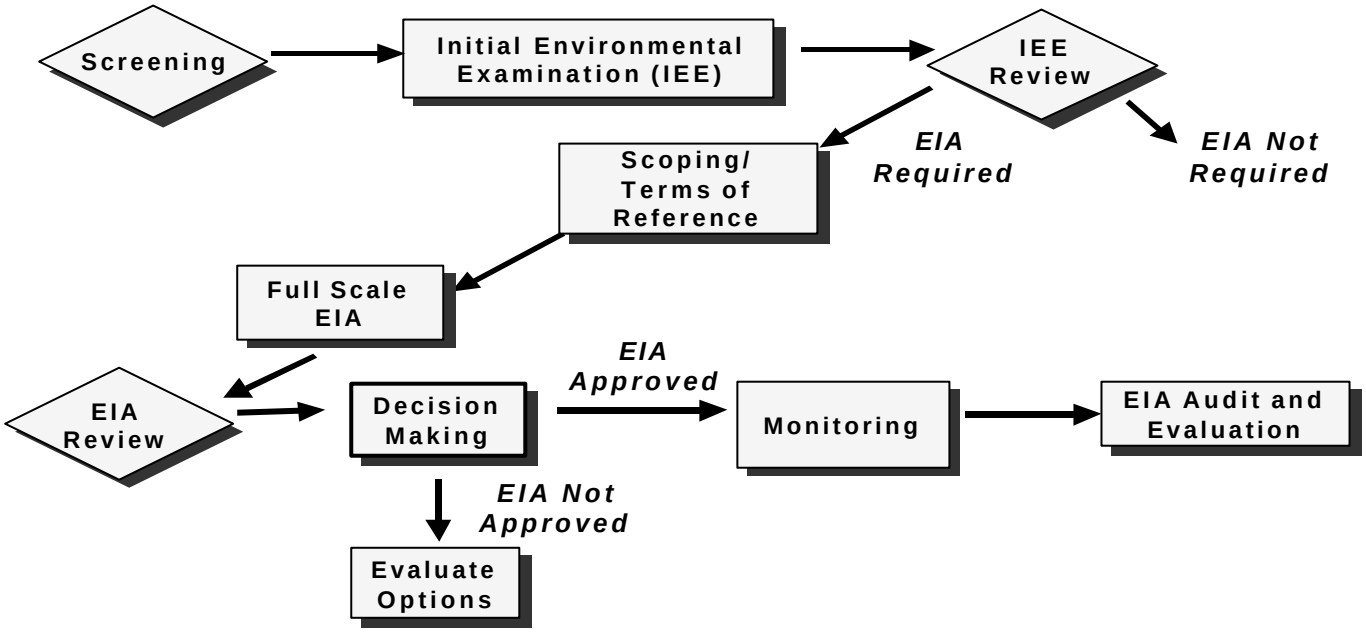


Table 1 Project types that often require full-scale EIA

SECTOR	PROJECT TYPE
Industry	Primary metals industries Leather tanneries Non-metallic mineral products (cement, glass, lime) Forest products (sawmills, wood preservation) Textile dyeing Lead-acid batteries Fertilizer/pesticide manufacturers
Mining	Coal mines Offshore mines Mineral mines Placer mines Sand and gravel operations Construction stone and industrial mineral quarries
Energy	Electric transmission lines and substations Power plants Transmission pipelines Energy storage facilities
Waste disposal	Local government liquid waste management facilities Local government solid waste management facilities
Food processing	Meat packing plants Poultry processing plants Fish processing plants
Transportation	Marine port facilities Public highways Airports
Water management	Dams Dykes Water diversion projects Groundwater extraction Shoreline development
Tourism and recreation	Destination resorts

- Can impacts be contained? If so, within what boundaries? If the project's design or the technology employed can adequately confine the expected impacts within certain boundaries, then decision makers may not have to expose the project to a full-scale EIA. Setting acceptable boundaries can be difficult though, as environmental impacts are sometimes observed far from the project site, even extending beyond country borders.
- What is the degree of public concern or involvement regarding a specific project proposal? Heightened public opposition to a proposed project suggests that it would be prudent to closely scrutinize the potential environmental and social effects of the project to ensure that these are properly understood and weighed in deciding whether to approve or reject the project, and in deciding what mitigative requirements should be attached to project approval.

An important caution needs to be voiced concerning project screening. Quite frequently, proposed projects are screened according to a particular size threshold. For example, oil and gas pipelines greater than 25 km in length may require an EIA, while those spanning less than 25 km may not. However, it is really the conditions of the natural environment at the proposed project location that should determine the need for an EIA. Ultimately, common sense must be exercised in deciding whether a proposed project 'triggers' the need for an EIA.

Environmental Screening Policy of the World Bank

The World Bank undertakes environmental screening by classifying projects into three categories, depending on the type, location, scale and sensitivity of the project.

Category A
A project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse or unprecedented. A full EIA is required, which must examine the potential positive and negative impacts and compare them with those of feasible alternatives. The EIA must recommend any measures needed to prevent, minimize, mitigate or compensate for adverse impacts and improve environmental performance.

Some example Category A projects include: dams and reservoirs, river basin development, mineral development and large-scale industrial plants.

Category B:
A project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas, including wetlands, forests, grasslands and other natural habitats, are less adverse than Category A projects. These impacts are site-specific, and few if any of the impacts are irreversible. In most cases, mitigation measures are easier to design than for Category A projects. A full EIA is not required, but the Bank does require environmental analysis.

Some example Category B projects include: rural water supply and sanitation, irrigation and drainage (small-scale), aquaculture and electrical transmission.

Category C
A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. No EIA or environmental analysis is required.

Some example Category C projects include: education, technical assistance, health and family planning.

INITIAL ENVIRONMENTAL EXAMINATION

After a proposed project has been screened and found to have the potential to cause environmental impacts, an initial environmental examination (IEE) is undertaken. The IEE is used to determine the probable environmental impacts associated with a project and to decide whether a full-scale EIA is required. The IEE is generally a low-cost environmental evaluation that makes use of information already available. It is guided by the professional judgement of experts who are knowledgeable about the impacts associated with similar types of projects. The IEE describes the proposed project and examines alternatives, addresses community concerns and environmental effects and provides direction for a future EIA. The overall objectives of the IEE include:

- Identify all significant environmental issues, including the nature and severity of these issues
- Resolve the simpler environmental issues by adopting necessary environmental protection measures or perhaps undertaking a limited monitoring program to assess any uncertainty about the extent or magnitude of potential impacts
- Develop the focus for follow-up studies based on unresolved significant environmental issues
- Begin to identify possible mitigation measures and impact reduction options for the significant environmental issues.

The outcome of the IEE is generally one of three options. If the project is expected to have no significant environmental impacts, the IEE serves as the final EIA report and there is no requirement for further environmental study. The IEE may reveal limited environmental impacts that can easily be managed, therefore justifying minimal additional environment study. If, however, environmental impacts are unknown or expected to be significant, then the findings of the IEE will demonstrate the need for a full-scale EIA

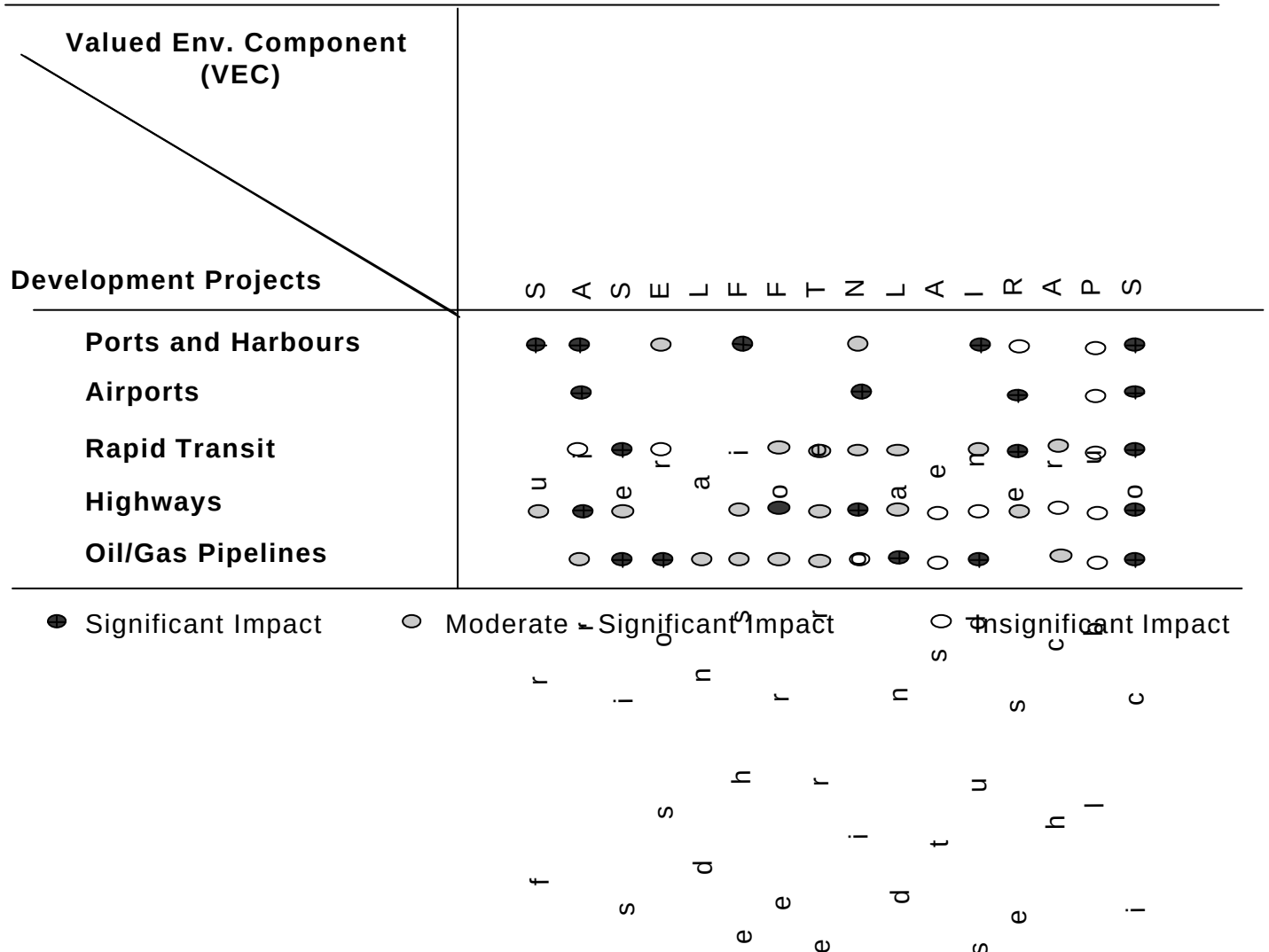
Perhaps the single most important requirement of an effective IEE is that it must be conducted by well-regarded experts who have demonstrated knowledge of the environmental issues raised by a proposed project or activity. The IEE is generally prepared quickly, and on a limited budget, so it is crucial that the experts involved have excellent judgement. The decisions made in the IEE affect the scope and content of the EIA report. Obviously, a poor IEE could result in a failure to recognize significant environmental impacts. A good IEE, however, can result in the resolution of environmental issues without impeding an economically-beneficial development (i.e., one of the main objections to EIA is that environmentally benign projects may be cancelled due to delays in project assessment and approval).

To make the concept of the IEE easier to understand, we can break it down into a series of five steps. A discussion of each step follows.

Identifying Potential Significant Environmental Issues

In order to determine the potential significant environmental issues (SEI) of a project, the IEE needs to identify all environmental components which could be degraded as a result of the proposed project or activity. For ongoing

Table 2 Example significant environmental issues identification matrix



projects, such as a chemical factory, it is necessary to consider impacts that could potentially occur both during factory construction and operation. Environmental components at risk are referred to as valued environmental or ecosystem components (VEC).

Potential effects of the project need to be determined for individual VECs and for all VECs within the project's spatial boundaries. Cumulative impacts to the area, including those from other existing and planned projects, also need to be considered. Table 2 is an example matrix for the identification of SEIs.

Consideration of potential different orders of impacts is the final step in the determination of SEIs. This step is complicated by the potential for several orders of impacts to occur. It is easy to identify obvious impacts of a particular type of development based on past experience. However, these first order impacts may themselves give rise to additional impacts – we'll call these second order, or secondary, impacts. Second order impacts can result in third order, or tertiary, impacts and the cycle can continue indefinitely. Table 3 gives examples of this process of cascading environmental impacts. The example proceeds through potential third-order impacts, but new impacts resulting from the previous order can continue through fourth-order and beyond, depending on the type of proposed project and the complexity of the ecosystem at risk.

Information Collection

Information collection is the stage of the IEE that allows assessors to become acquainted with the details of the proposed development project or activity. Specific data should be acquired in this step regarding the:

Table 3 Examples of cascading impacts from project activities

PROJECT ACTIVITY	FIRST-ORDER (PRIMARY) IMPACT	SECOND-ORDER (SECONDARY) IMPACT	THIRD-ORDER (TERTIARY) IMPACT
Drainage of swampland for agriculture	Turbidity / sedimentation	Decreased photosynthetic activity by aquatic plants	Decreased availability of cover for forage fish
		Burial of spawning beds	Reduced numbers of juvenile fish
	Stream channelization	Altered stream morphology and discharge patterns	Fish habitat quality degraded
	Loss of seasonal fish habitat	Reduced catch in seasonal fishery	Local economic pressures from reduced catch
Discharge of untreated industrial effluent	Turbidity and temperature change	Reduced numbers of more sensitive fish species	Change in natural balance of local fish populations
	Toxicity of effluent (potentially to both humans & aquatic biota)	Acute toxicity to aquatic biota (fish kills)	Chronic toxicity to aquatic biota (lowered reproduction of some fish species)

- Project type, size and location
- Area of potential impact – consider the project's impacts to physical resources, biological resources, economic development resources, quality of life and other existing and planned projects.

Information sources include any existing reports on the environmental resources found in the proposed project area, such as soil types, migratory fish species and hydrologic patterns. Previous assessment reports, including IEE and EIA reports for similar project types or reports on projects that caused similar disturbances can also provide useful information. Additional valuable information might be uncovered through speaking with local resource users such as fishers and village elders – information gathered from these sources is generally referred to as traditional ecological knowledge (TEK).

Effects Classification

'Environmental effect' and 'environmental impact' are terms that generally refer to the same thing: a change in the natural environmental condition as a result of a particular action. Effects can be direct, which are caused by some aspect of a project and occur at the same time, or indirect, which are caused by the project but occur later in time (i.e., are delayed) or farther removed in distance from the project. Indirect effects, although detached either temporally or spatially, are normally still reasonably foreseeable by a knowledgeable person undertaking an IEE.

Effects vary in significance, depending upon their:

- Nature – positive, negative, direct or indirect, cumulative (additive), or synergistic (two or more effects combining to make a new effect)
- Magnitude
- Extent/location – area or volume covered and spatial distribution of effect
- Timing – effects often differ depending on the stage of a project, such as during construction, operation or decommissioning.

Classification of environmental effects is also dependent upon the duration of the effects – are they short-term or long-term, intermittent, or continuous? Environmental effects may be viewed as less significant if they are reversible, as opposed to permanent degradation of some VEC. Finally, the degree of confidence that can be placed in the effects prediction will contribute to the overall quality of the effects classification. In general, a high-quality effects classification will address these points:

- Importance of the affected resource
- Magnitude and extent of disturbance
- Duration and frequency
- Risk/likelihood of occurrence
- Reversibility
- Contribution to cumulative impacts.

Addressing SEIs

The strategy chosen for the resolution of SEIs depends upon their number, type and significance. Reviewing possible project alternatives is perhaps one of the most effective ways to address more serious environmental impacts. The 'no-build' alternative and the 'change of location'

alternative are two extremes in the consideration of project options. With significant pubic opposition or a proposed location within an environmentally critical area, decision makers may choose to reject a project proposal altogether. Often, though, a change in the project location can do a great deal to reduce the significant environmental effects.

Other alternatives should be considered when deciding how to address the potential SEIs. For example, consider a proposal for a new power generation plant. Is the new plant really necessary, or can existing energy capacity be used more efficiently? Or, in the case of a proposed pulp mill, we might ask whether the best process alternatives had been incorporated into the mill design, such as the re-use of processing water or minimization of effluent discharged to receiving waters. Scheduling alternatives, such as the timing of project construction, or input alternatives, such as the use of different raw materials or sources of energy, could also be considered in the analysis of alternatives for the pulp mill.

Reporting the IEE Outcomes

The purpose of the IEE report is essentially to 'grade' the significant effects of a proposed project. Effects grading options are illustrated as follows.

No effect

Insignificant effect

Unknown significant effect

Significant effect (resolution is within the scope of the IEE)

Significant effect (resolution is outside the scope of the EIA)

SCOPING

Scoping the one of the most critical steps in an EIA. Unless appropriate spatial and temporal boundaries are established for a proposed project and all potentially serious environmental impacts are considered, then the EIA is unlikely to provide and accurate project appraisal. In determining the appropriate scope for an assessment it is important to capture all potentially significant environmental impacts relating to a proposed project without placing too onerous a burden on the projects proponents in completing the assessment. Too narrow a scope will likely leave out an important factor or effect, but too broad a scope may make the environmental assessment cumbersome or take too long.

To illustrate the importance of correctly setting spatial boundaries for an assessment, consider the example of a large hydropower dam and reservoir project. A narrow scope might confine the environmental assessment to just the immediate geographic boundaries of the project site. However, the environmental impacts of dam projects are often felt far beyond the immediate project site. Fish downstream of the dam may be permanently blocked from their spawning grounds, and normal movements of wildlife populations may be restricted, causing stress and habitat

fragmentation. To properly address these issues the spatial boundaries of the dam EIA would need to be set quite broadly.

In general, scoping should involve the following steps:

- Review all available information on the purpose and the need for the proposed project
- Visit the proposed project location and any alternative sites
- Interview representatives from local communities which could be affected by the project
- Communicate with all interested parties who have a stake in the project (e.g., fishery department)
- Consult with local and regional scientists for guidance on technical issues (e.g., ask their opinion on potential project-related impacts to fisheries).

The overall intent of the scoping exercise is to identify which issues should be considered by the EIA. The output of scoping is the Terms of Reference (TOR) which explicitly sets out both the spatial and temporal boundaries for the EIA and questions which must be addressed in the EIA report. The TOR might be thought of as an EIA checklist where each item must be checked off in completing the assessment. An example TOR for a full-scale EIA is shown in Table 4.

FULL-SCALE EIA

Once the TOR have been prepared for a proposed project, assessment of the project can begin. As noted in the previous section, the TOR is essentially a checklist of issues to be addressed in the EIA report. From this perspective, the TOR provides a roadmap for the assessment, clearly indicating spatial and temporal boundaries and telling assessors which potential impacts they must address in completing their report.

This overview of full-scale EIA has been organized the same as an EIA report to provide an easy-to-follow format. The reader is briefly introduced to each aspect of a full-scale EIA and important considerations for assessors and decision makers are highlighted.

The EIA report may be called by several different names, such as environmental impact statement (EIS), environmental assessment report (EA report), or environmental effects statement (EES). Whatever the report is titled, the content is basically the same. Ultimately, an effective EIA report provides necessary information to decision makers to guide their deliberations on whether the project should be rejected or approved, and, if approved, what mitigation measures should be implemented to minimize potential impacts.

Executive Summary

The executive summary is a critical part of the EIA report, simply because it is often the most-read section. It must be condensed and concise, yet clearly address all significant environmental issues identified in completing the assessment. Ideally, the executive summary will contain:

- A summary of impacts for each significant environmental issue
- Background information, including site maps and other aids to orient the reader to the project's location and ecological characteristics

Table 4 A partial framework for development of EIA terms of reference

EIA SECTION	INFORMATION COMPONENT	BASIC REQUIREMENT
Context	The problem	Summarize the basic development issues or problem being addressed by the proposed activity (such as water pollution, drought, erosion, public health concerns).
	The proposed solution	Summarize way in which the proposed activity is expected to resolve the issues.
	Objectives of the EIA	State the objectives of the EIA and how the findings will be used in project planning, design, implementation and mitigation / monitoring.
Institutional setting	Legal / policy base	Summarize the legal, policy and procedural basis of the EIA.
Alternatives	Alternatives to the project	Assess the potential of moving the project site to a different location.
	Alternatives within the project	Evaluate potential alternatives for key aspects of the proposed project (such as options for energy conservation, raw material sources, pollution control technology).
	Other projects	Assess the potential for achieving the same development objective by implementing other projects that are substantially different from the one proposed.
Required information and data	Description of the project	Describe the project: location, layout, size, capacity. Describe the inputs: land, raw materials, energy. Describe the outputs: products, by-products, wastes.
	Description of the environment	Identify study boundaries and provide baseline data on relevant ecological, economic and social conditions within those boundaries.
	Information quality	Assess the quality of all information. Identify data and information gaps and summarize how these limitations will affect the conclusions of the final EIA.
Analysis of impacts	Positive impacts	Predict how the lives of the people or conditions of the environment will be improved as a result of the proposed activity.
	Negative impacts	Predict any significant reduction in ecological conditions of human living standards as a result of the proposed activity.
	Cumulative impacts	Evaluate the contribution made by the project to the incremental degradation of the surrounding natural environment.
	Trans-boundary impacts	Evaluate the project's potential for impact on neighboring countries.
Environmental management	Mitigation	Provide a detailed plan covering mitigation of predicted impacts.
	Monitoring	Provide a detailed sampling and analysis plan for the environmental variables to be monitored throughout the life of the project.

- A listing of mitigation measures to be taken to reduce anticipated impacts, as well as any ecological enhancement or restoration efforts that will be undertaken as compensation for the project's unavoidable impacts
- Recommendations and conclusions.

Description of the Project

This section of the EIA report should contain a detailed description of each phase of the project, from construction, through operation of the facility and beyond into scheduled decommissioning once the facility has reached the end of its life. Breaking down the project into phases in this manner is important since many impacts can be temporary or transient. For example, erosion and sedimentation are often a serious problem during the construction phase of hydropower projects but all but disappear during the operational phase. In this situation, mitigation measures to prevent erosion and sedimentation may only be required during the construction phase and discontinued once the disturbances have ceased and reclamation measures have been implemented (e.g., replanting of exposed soil).

Another advantage of breaking down a project into phases is that it simplifies the task of identifying alternative ways of undertaking the project. Feedback on environmental issues of concern provided by assessors while undertaking an EIA can assist project proponents' efforts to immediately address these issues while some flexibility is possible in the design of the project. For example, baseline studies on fisheries may have determined that the proposed timing of dam causeway construction in a river coincides with the spawning run of an important fish species. If this information is known prior to the start of construction, then it may be possible to simply reschedule construction for another time of the year where fish are absent from the river. In this example, a potentially serious impact can be avoided entirely through good planning. Although concerns may remain regarding the restricted migration of fish once the project is operational, this is a separate issue which can possibly be addressed through appropriate mitigative measures (e.g., installation of effective fish ladders to allow spawning fish to move past the dam causeway).

A weakness of many EIAs is that the project description provided is incomplete and as such predicted impacts are understated. For this reason it is important to clearly detail the size or magnitude of the proposed project, including any associated activities required for or by the project. Project magnitude is particularly important – a project may take up very little physical space but could still cause significant environmental impacts. For example, an existing pulp and paper mill might wish to expand pulp production capacity by 50%. Such a production increase will require minimal land clearing for construction but would result in significant increases in the quantity of liquid effluent discharged to an adjacent river and logging to provide the raw materials needed for pulp production. In this situation, if the assessor only considers the physical scale of the mill expansion without recognizing the ultimate environmental footprint of the project then significant environmental impacts could be overlooked.

Purpose and Need for the Project

This section of the EIA report should clearly explain the project's purpose and need for the project. Degree of need does not necessarily have to be addressed but expected economic, social and, possibly, environmental, benefits should be identified. For example, while construction of a dam on a large river would undoubtedly raise concerns about potentially significant environmental impacts, these may be acceptable if the project were intended to address long-standing concerns about serious downstream flooding during the rainy season. Presented with clear information on both the advantages and disadvantages of the project in this manner, decision makers have the necessary information to determine what trade-offs are acceptable in making their decision. Another example might be a proposed new pulp mill which will utilize best available industry practices such as substituting for use of environmentally-harmful chlorine bleach in the pulping process. Decision makers faced with two proposed pulp mills projects, one using best management practices and other using older, chlorine bleaching technology would choose the former if they were aware of the differences between the pulping processes proposed.

An important consideration in identifying the need for a project is to distinguish between public need versus private need. Public need can be viewed as an identifiable benefit to society in the form of a service, facility, or opportunity. The absence of this benefit could be viewed as a hardship. Private need, however, may have no identifiable societal benefit. In cases where there is only benefit to the project proponent and serious, unavoidable environmental impacts exist, decision makers would need to think carefully about whether to approve the project.

Description of the Environment

The level of detail necessary in an EIA will depend on the sensitivity of the environmental at risk and the proximity of local communities to the proposed project location. In planning a project, location is perhaps the most important consideration from an environmental perspective. Ideally, development activities should be planned in areas where potential impacts are minimized (e.g., banning logging in old growth, undisturbed forests which support high biodiversity). In reality, it is often not possible to avoid environmental impacts through just good planning. For this reason, information provided in the EIA report concerning environments at risk is essential in deciding how best to proceed.

Perhaps the most important function of this section of the EIA report is the determination of natural baseline conditions. Once the spatial boundaries have been established for the EIA, it is important to study VECs which could potentially be impacted by a proposed project. Information generated as part of baseline studies is crucial in developing meaningful predictions of potential project-related impacts. This information also provides a benchmark against which actual impacts can be assessed if the project is allowed to proceed. In the absence of a good understanding of baseline conditions it is very difficult to accurately assess environmental impacts – feedback on actual impacts occurring as a result of a project is valuable in predicting environmental

impacts for similar projects proposed in the future.

Ideally, the majority of baseline information would already be available in government agency databases. In reality, much of this information has either never been collected in the MRB or it is not made widely available. If existing information is not available, the burden should be on the project proponent to fund necessary baseline studies to adequately characterize natural environmental conditions. Project proponents may not have to gather information on every possible environmental component but should definitely include components that may be significantly impacted by the proposed project. A partial listing of relevant natural conditions to consider follows:

- Physical components – topography, soils, climate, surface water, groundwater and geology.
- Ecological components – fisheries, aquatic biology, wildlife, forests, rare or endangered species, and ecologically sensitive or protected areas.
- Human and economic development – population and communities (i.e., numbers, locations, composition, employment), industries, infrastructure (e.g., water supply, sewerage, flood control structures), power sources and transmission, mineral development and tourism components.
- Quality-of-life values – socioeconomic values, public health, recreation, aesthetic values, cultural values.

ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Identification and quantification of potential impacts of a proposed project is the most important part of an EIA. If potential environmental impacts cannot be accurately assessed then it is likely that a project will be rejected. Current EIA practice places the burden of proof on the project proponent – they must demonstrate that the project will not cause significant environmental impacts. If the EIA is inconclusive in addressing potential significant impacts or if effective mitigation options have not been presented, then it is very difficult for decision makers to determine whether the project is justifiable in terms of resources lost and the social or economic benefits gained.

Irreversible and Irretrievable Commitment of Resources

In assessing potential impacts it is important to consider a project's irreversible and irretrievable commitment of natural resources. In other words, to what extent will the proposed project cause irreversible damage or remove potential uses of a particular resource? For example, projects which have a footprint on ecologically sensitive areas like wetlands and river floodplains may permanently impair the functioning of these ecosystems, potentially leading to a reduction in ecosystem function and biological diversity over time. Options for mitigation or impacts reduction really do not exist when natural resources are irretrievably committed to a project.

Irreversible environmental impacts may be inevitable for certain projects. Perhaps one of the greatest strengths of

a good EIA report is its clear identification of such impacts. A scientifically-credible and defensible analysis of a project's irreversible impacts can be immensely helpful for decision makers as they try to weigh lost resources against potentially valuable social gains. The real tragedy of some projects is not just that some ecosystems may be lost forever, but that people do not even know what they were losing until it is too late.

Another aspect to consider in the determination of irreversible and irretrievable impacts is the selection of a time frame for impact assessment. Consider a time frame of several hundreds of years versus a time frame of 10 to 25 years. To fully determine the nature and extent of irreversible impacts, assessors need to decide how far into the future they want to protect a particular environmental resource. For example, if a logging company wishes to clear-cut a large area of teak forest, we could certainly argue that in the 10 to 25 year time frame, this would constitute an irreversible and irretrievable commitment of resources. However, natural succession over a period of 100 years or more could return this ecosystem closely to its pre-impacted state.

Assessment of Significance

Determining the significance of expected project impacts is obviously a key element in the EIA report. However, this can be a difficult section to write as few detailed guidelines exist to determine the significance of environmental impacts for a variety of project types. Considerable expert judgement and technical knowledge are required to fully understand the nature and extent of environmental impacts. As was noted previously, such knowledge is often lacking in MRB riparian countries.

Issues which assessors should consider when judging the significance of a proposed project's environmental impacts include:

- Loss of rare or endangered species, or their breeding and foraging habitat
- Reduction of species diversity, or increase in exotic species
- Loss of critical productive wildlife habitat
- Transformation of natural landscapes
- Toxicity impacts to human or wildlife health
- Reduction in the capacity of renewable resources to meet the needs of present and future generations
- Loss of current use of lands and resources for traditional or cultural purposes.

Additional criteria for evaluating a project's environmental issues are summarized in Table 5. These criteria should be evaluated for each impact.

The Asian Development Bank (ADB) offers additional guidance in assessing impact significance. Questions which the ADB recommend be posed in assessing projects include:

1. Will the project create unwarranted losses in precious or irreplaceable biological diversity or other resources?
2. Will the project induce an unwarranted acceleration in the use of scarce resources and favour short-term over long-term economic gains?

3. Will the project result in unwarranted hazards to endangered species?
4. Will the project tend to intensify undesirable rural-to-urban migration to an unwarranted degree?
5. Will the project tend to increase the income gap between the poor and affluent sectors of the population?
6. Will the project contribute to global effects (e.g., increasing carbon dioxide emissions, ozone depeletion, climate change)?
7. Will the project have effects on national financing (e.g., domestic hydropower projects reducing dependence on imported oil)?

Assigning Significance

A widely used classification system to assign significance to anticipated project impacts is briefly summarized as follows.

No Impact

The potential impact of the project can be assessed as 'no impact' if the project activity is physically removed in time and space from VECs.

Significant Impact

An impact can be termed 'significant' if the project activity has the potential to affect an element of the natural environment. Issues to be considered when determining whether an impact meets this classification are:

- Spatial scale of the impact – Is it confined to the site only, or beyond to the local, regional, national or transboundary environments?
- Time horizon of the impacts – Will the impact be felt in the short, medium, or long-term?
- Magnitude of the change in the ecological component brought about by the project activity (i.e., small, moderate, or large).
- Importance to local human populations – Will the impact be felt by local fisheries, drinking water, agricultural products?
- National or international profile – Such as rainforests and any rare or endangered species.

Table 5 Criteria for assessing the significance of project impacts

CRITERIA	DESCRIPTION
Importance	The value that is attached to a specific environmental component in its current condition
Extent of disturbance	The area affected by the disturbance that is anticipated to occur from the project
Duration and frequency	The amount of continuous time the disturbance-causing activity will occur and the frequency of occurrence
Reversibility	The ability of the environmental components to recover their value after a disturbance has occurred
Risk	The probability of an unplanned incident caused by the project that could result in additional significant environmental impacts

Although these guidelines are useful in assessing significance, MRB riparian countries may wish to develop a Basin-specific methodology for the determination of impact significance. A quantitative, scientifically-defensible method could help to standardize the assessment of significance of impacts related to specific project types. For example, the significance of an impact could be closely tied to Basin-wide water quality or air quality standards. Existing differences in standards currently being used by MRB countries could mean that the same impact is considered significant in one country and insignificant in a second country. Inconsistency introduced by different standards is perhaps undesirable given that wildlife do not recognize country borders and the same rivers are shred among countries.

In assessing signifcance, assessors should distinguish between the degree of impacts before and after mitigation measures have been implemented. Of most concern in deciding whether a project should proceed are significant impacts that cannot be effectively mitigated; assuming of course that assurances are provided that required mitigation measures will indeed be properly implemented. Elimination of potential impacts that can be effectively mitigated in this manner focuses attention on remaining significant effects that are likely to occur if the project proceeds.

Insignificant Impact

If an impact cannot be termed 'significant', it can be given the status of 'insignificant'.

Unknown Impact

The potential impact of a project can be termed 'unknown' if:

- The nature and location of the project is uncertain
- The occurrence of VECs within the study area is uncertain
- The time scale of the effect is unknown
- The spatial scale over which the effect may occur is unknown
- The magnitude of the effect cannot be predicted.

Impacts termed 'unknown' should be identified as information gaps in the EIA report. These impacts will require further study before a decision can be made as to their significance.

Mitigated Impact

The potential impact of a project activity on a particular ecological component can be considered 'mitigated' if:

- There is potential for a significant impact; and
- The proposed mitigation measure will prevent the impact or reduce it to acceptable standards (i.e., such as national or international water quality standards).

Consideration of Alternatives

If a proposed project is expected to cause serious losses or degradation of VECs, the EIA report should consider alternative means of carrying out the project which would generate the same benefits but with fewer impacts (e.g., changing the project location to avoid ecologically-sensitive areas). Where appropriate, alternative locations, designs and technologies should be considered so that findings can be considered in the early stages of project planning. Alternatives for projects can include:

- Site selection
- Design or treatment alternatives
- Project scale
- Construction phasing alternatives for large, staged projects
- Timing alternatives for project construction, operation and decommissioning.

The EIA report should document the rationale for the final project location and design and justify all choices made.

Mitigation Measures

Impact mitigation measures are intended to counter the adverse effects of a development project. The EIA report should provide a detailed description of recommended mitigation measures. Ideally, the project would be designed to first avoid environmental impacts, then to reduce impacts, and finally to compensate for those impacts which cannot be avoided. Each mitigation measure should be described in terms of:

- The impact it is designed to mitigate
- Its likely effectiveness in terms of reducing or preventing impacts
- The next best alternative to the selected mitigation measure
- Cost of the mitigation
- The plan for implementation, construction and maintenance of the mitigation measure.

A number of mitigation measures are generally available for different types of development projects or activities. For example, various land use practices can be used to mitigate the effects of intensive agriculture on adjacent water bodies. Planting vegetation buffers between farm fields and streams, as well as seeding ditch banks can trap sediments before they enter aquatic systems. Thinking in the longer term, careful water table management and the planting of cover crops can slow the rate of soil loss, thus prolonging the life of the farmed area and reducing the need for additional land clearing and cultivation.

Mitigation for severe unavoidable impacts can involve some form of compensation, either to the natural environment or to a local community. Habitat areas away from the project site but preferably within the same watershed, could be protected or enhanced in order to preserve some of the local ecosystem functions. In exchange for unavoidable impacts at the project site, proponents could be required to protect valued habitat elsewhere within the watershed. Governments also have the option of requiring the purchase of conservation easements, which is essentially the purchase of a property's development rights. Upon establishment of the conservation easement, that parcel of land would be protected from any future development.

Project proponents can also elect to enhance a parcel of land that has previously been impacted by development activities. The idea is that no net loss of valued habitat would occur because the proponent would effectively replace habitat impacted by their project. For example, a proponent could reforest an existing clear-cut logging site and provide sedimentation and erosion control measures until the site is stabilized. Over time, that site would very likely be able to sustain some wildlife species.

Finally, a proponent might be required to compensate local people

impacted by the project. Such compensation can be in the form of cash payment, land for people who will lose their homes due to the project, or reduced service costs when the facility is operating (e.g., subsidized electricity from a hydropower plant).

EIA Review and Evaluation

In previous sections we have already highlighted many aspects of the EIA process which may be subject to later review. A completed EIA report is normally reviewed prior to its submission to decision makers for their consideration. Reports may also be subject to review by interested parties such as international funding organizations. The main purpose of the review is to verify that all components of the assessment as stipulated in the TOR have been addressed and that the information provided and conclusions presented in the EIA report are adequate for informed decision making.

A major consideration in reviewing an EIA report is the competence of the reviewers. In many developing countries, it may be difficult to identify reviewers with sufficient expertise to complete the necessary in-depth review of an EIA report. Lacking such expertise, review of an EIA report may be limited to simply checking off tasks specified in the TOR when what is really needed is a systematic evaluation of the EIA content and conclusions.

Arrangements for review of completed EIAs vary among countries and jurisdictions. In most cases, evaluation of the EIA report is subject to detailed review by the responsible government agency (i.e., generally a central government ministry or department responsible for a particular resource such as fisheries) who will make a final determination on the merits of the project. Possible decisions are almost identical to those at the EIA screening step:

- The project is not likely to cause significant impacts, in which case the project should be approved with conditions under which it may proceed (i.e., implementation of mitigation measures and monitoring programs); or
- The project is likely to cause significant impacts that cannot be justified, in which case the project should be rejected.

International funding bodies such as ADB and the World Bank who have a role in a proposed project will also undertake their own review and evaluation of the EIA report. Their decision will not be to approve or reject the project but rather whether they should provide funding or not according to their internal funding criteria.

Environmental Monitoring

The subjects of baseline and environmental effects monitoring are covered in detail in Course E. For the purpose of this overview of full-scale EIA, we will focus on what needs to be documented in the EIA report.

In general, an EIA report should include both an environmental management plan and monitoring plan. The environmental management plan outlines the mitigative measures and other recommended project conditions to ensure compliance with environmental laws and regulations, to reduce or eliminate adverse impacts, and to promote environmental enhancement measures. The environmental monitoring plan

provided in an EIA report should spell out in detail the monitoring objectives and methodologies, the required frequency of monitoring, sampling locations, and data analysis techniques.

Monitoring programs typically undertaken as part of an EIA or as follow-up activities are intended to:

- Document baseline conditions in support of the environmental assessment
- Monitor project compliance with agreed-upon conditions for the project's approval
- Review the accuracy of impact predictions made in the EIA
- Evaluate the effectiveness of prescribed mitigation measures.

Taken together the environmental management and monitoring plans should ensure that, if a proposed project is approved, environmental issues will continue to be closely scrutinized.

Follow-up and evaluation should be a fundamental component of the EIA process but regrettably is often neglected once project approval has been given. Follow-up is needed to determine whether environmental protection measures and monitoring programs which were conditions of project approval have been undertaken as required. Follow-up should not be thought of as just a procedural step in the EIA process – the intention is that the findings of follow-up activities will be acted upon. Monitoring is required to determine if mitigation measures have been effective in addressing anticipated environmental impacts and to assess the need for additional mitigation. Monitoring results can also provide important insights into the responses of ecosystems to project-related stress which are valuable in undertaking future assessments of similar projects.