

MODULE 3: PROJECT APPRAISAL

NEPAD

Module 3: Appraisal of Projects

TABLE OF CONTENTS

| | | |
|------------|--|-----------|
| 1.0 | INTRODUCTION | 3 |
| 2.0 | TECHNICAL APPRAISAL..... | 5 |
| 3.0 | SOCIAL APPRAISAL..... | 6 |
| 4.0 | GENDER APPRAISAL | 9 |
| 5.0 | ECONOMIC & FINANCIAL APPRAISAL : COST-BENEFIT ANALYSIS & IRR..... | 12 |
| 5.1 | SOCIAL COST BENEFIT ANALYSIS..... | 12 |
| 5.2 | INTERNAL RATE OF RETURN (IRR) | 15 |
| 6.0 | ENVIRONMENTAL APPRAISAL (ENVIRONMENTAL IMPACT ASSESSEMENT) | 16 |

MEMORANDUM

1.0 INTRODUCTION

Development projects impose a series of costs and benefits on recipient communities or countries. Those costs and benefits can be social, environmental, or economic in nature, but may often involve all three. Public investment typically occurs through the selection, design and implementation of specific projects to achieve the goals of policy. Why are some project proposals accepted and rejected, and how? What are the considerations in appraisal other than the economic rate of return? How are questions of environmental impact, welfare distribution and risk taken into account? In addition to being financially viable, a development project cannot usually be considered acceptable unless it is economically, technically and institutionally sound. It should be the least-cost feasible solution to the problem being solved and should expect to produce net economic and/or social benefits. For example, irrigation projects may facilitate the growing of cash crops in one locality, but cause water shortages, and hence economic, social and environmental pressures in another.

Appraisal is the analysis of a proposed project to determine its merit and acceptability in accordance with established criteria. This is the final step before a project is agreed for financing. It checks that the project is feasible against the situation on the ground, that the objectives set remain appropriate and that costs are reasonable.

The purpose of this module is to give a theoretical and applied background to project and programme appraisal techniques, including technical analysis, financial and economic analysis, impact assessment and risk analysis.

Technical Appraisal

- Whether pre-requisites for the success of project considered?
- Good choices with regard to location, size, process, machines etc.

Economic Appraisal

- Social cost-benefit analysis
- Direct economic benefits and costs in terms of shadow prices
- Impact of project on distribution of income in society
- Impact on level of savings and investments in society
- Impact on fulfillment of national goals :-
 - (1) Self sufficiency
 - (2) Employment and
 - (3) Social order

Ecological Appraisal

- Impact of project on quality of :- Air, Water, Noise, Vegetation, Human life
- Major projects ,such as these, cause environmental damage
 - Power plants

Module 3: Appraisal of Projects

- Irrigation schemes
- Industries like bulk drugs, chemicals and leather processing.
- Likely damage & the cost of restoration

Financial Appraisal

- Whether the project is financially viable?
 - Servicing debt
 - Meeting return expectations

Box 1: Project Appraisal Criteria

- ✓ **Technical:** will the project work? Has due attention been paid to technical factors affecting the project design? Given the human and material resources identified, can the project activities be undertaken and outputs achieved within the time available and to the required standards?
- ✓ **Financial:** can the project be financed? Will there be sufficient funds to cover the expenditure requirements during the life of the project?
- ✓ **Economic:** will the nation and society at large be better off as a result of the project? Will the project benefits be greater than the project costs over the life of the investment when account is taken of time (namely, is the Net Present Value of the project positive at the test discount rate)?
- ✓ **Social and gender:** what will be the effect of the project on different groups, at individual, household and community levels? How will the project impact on women and men? How will they participate in various stages of the project cycle? Will the social benefits of the project be greater than the social costs over the life of the investment when account is taken of time?
- ✓ **Institutional:** are the supporting institutions in place? Can they operate effectively within the existing legislative and policy environment? Has the project identified opportunities for institutional strengthening and capacity building?
- ✓ **Environmental:** will the project have any adverse effects on the environment? Have remedial measures been included in the project design?
- ✓ **Political:** will the project be compatible with government policy, at both central and regional levels?
- ✓ **Sustainability and risk:** will the project be exposed to any undue risks? Will the project benefits be sustainable beyond the life of the project?

2.0 TECHNICAL APPRAISAL

Clearly, every project must be technically feasible. Technical Appraisal provides a comprehensive review of all technical aspects of the project such as rendering judgment on merits of technical proposals and operating costs. Here is a checklist that can be used:

- Is the technology proven or tested? If not, has it ever been successful elsewhere and can that success be replicated in current context and conditions?
- Does the technology/ process/ equipment technically fit with the facility's existing technology/ process/ equipment & machinery? If not, what aspects of the technology / process do not fit and what measures is the implementing agency planning to take in this regard?
- List of equipments and machinery to be installed with cost and specifications of the equipment.
- Equipment capacity & whether it is as per requirement?
- List of recommended equipment suppliers.

A checklist evaluating the proposed implementation plan to assess whether the project can be implemented as per schedule and requirements should be reviewed and should form part of the project report. Below is a sample of such a checklist:

a. Skills & Experience of the Project Implementation Team:

- Who is implementing the project?
- Does the project implementation team have adequate skills and experience? Provide a list of relevant projects completed in the last two years as per table below:

Key Personnel in the Project

| | | | |
|--|--|--|--|
| Names of key people | | | |
| Position | | | |
| Total Length of Experience | | | |
| Number of years in current position | | | |
| Qualifications | | | |
| Training | | | |
| List of similar projects completed in last two years including his/her role in the project | | | |
| Availability for the project | | | |

b. Selection of suppliers

- Have suppliers been selected? If yes, provide a list of selected suppliers including equipments to be supplied by the supplier, price of the equipment and delivery schedule.

- Reputation of the suppliers – whether the supplier is a large national or regional distributor/ supplier or local supplier?
- Terms for supply and installation of the equipment by the suppliers.
- Is there any performance guarantees from the equipment suppliers?

c. Implementation time period

- Time period required to implement the project
- Consequencies in case project implementation is delayed.

3.0 SOCIAL APPRAISAL

A social appraisal reviews the project design and the process of project identification through to implementation and monitoring, from a social perspective. Particular attention is paid to the likely impact of the project on different stakeholders, their opportunities for participation, and the project's contribution to poverty reduction.

3.1 Stakeholder analysis and participation

Based on the distinction of primary, secondary and key stakeholders¹, stakeholder analysis reviews the following:

- ☐ Who comprise the different stakeholders?
- ☐ What are their interests?
- ☐ How will they be affected by the proposed project?
- ☐ What are the project priorities between the different groups?
- ☐ What is their capacity to participate in the project?

Stakeholders have different abilities to influence the outcome of a project (Table 1). Often target beneficiaries are in a relatively weak position to influence the outcome of a project (at A) whereas much of the control lies in the hands of secondary and key stakeholders (at B). The former may be frustrated by a lack of access to information or be placed in a weak social position due to traditional hierarchies. In contrast the latter may have the time, money, organisational capacity or political power necessary to influence the project; however, if they are not interested in the project, they could pose a risk to the project's success by withholding support. Thus recommendations from the social appraisal may be to

¹ Stakeholders are individuals or organisations who, directly or indirectly, stand to gain or lose from a given development activity or policy. Distinction is drawn between **primary stakeholders** who are directly affected and would include the principal project beneficiaries, **secondary stakeholders** who are indirectly affected, and **key stakeholders** who are the agents of change.

Module 3: Appraisal of Projects

include additional project activities to ensure influential stakeholders support a project and to enable important yet weak stakeholders to become more influential.

Table 1: Classification of Stakeholders' by Ability to Influence a Project

| | Low level of ability to influence outcome of project | High level of ability to influence outcome of project |
|--------------------------------|--|---|
| Primary stakeholders | A | |
| Secondary and key stakeholders | | B |

The manner in which stakeholders participate in a project varies, both between stakeholders and over the life of a project. For example, some stakeholders may be informed about a project at the identification stage and consulted during project design. In contrast, other stakeholders may exercise control over certain stages of the project cycle or act in partnership with others.

BOX 2 - Case Study C²: Stakeholder Analysis and Participation

The stakeholder analysis identified several groups of primary stakeholders who would benefit directly from a proposal to rehabilitate 120 km of rural roads using labour-based methods. Distinction could be drawn between those who would benefit during the process of rehabilitation (road workers and local businesses) and those who would benefit from using the roads once they were rehabilitated.

Most of the power to ensure the successful outcome of the project lay in the hands of secondary and key stakeholders. This relationship had implications for the project design and implementation. It was envisaged that several key stakeholders, together with primary stakeholders, would work in partnership during project implementation and monitoring, under the control of the contractor. The Ministry of Roads and Transportation and the donor would take the lead on project evaluation, consulting with the District administration and community, and informing the Government of their findings.

² Refer to Appendix I on Case Study C

3.2 Poverty focus

Many projects are required to specifically address issues of poverty. In order to ensure the project incorporates a poverty dimension, it is necessary to determine:

- Who are the poor (at community, household and individual level)?
- What are the characteristics of their poverty (in terms of access to and control of resources and benefits, vulnerability and exclusion)?
- How may issues of poverty be addressed in the project?

Box 3 – From Case Study C: Poverty Focus

A poverty focus was an important guiding principle during project design. Through using labour-based methods, it was hoped that some of the benefits could be targeted directly to the poorer communities and individuals during rehabilitation. Characteristics of poverty were incorporated into the labour recruitment process. Priority was to be placed on ensuring people were recruited from poorer villages along the road corridor. Within villages, poorer people would be encouraged to register for work and at least 50% of the workers were to be women.

3.3 Social organisation

In addition to identifying stakeholders, the social appraisal reviews the way in which a community is organised socially. Appropriate use of existing social organisations could strengthen project implementation. Key questions include:

- ☐ What social organisation exists within the community?
- ☐ How is it arranged?
- ☐ How may it be used to strengthen the project?

Box 4 – From Case Study C: Social Organisation

An understanding of the social organisation of the community was crucial since works committees were to be formed in each village to oversee the recruitment process. Four principal groupings were identified (political, economic, social and welfare, and religious).

4.

5.

However, there were few opportunities for the poor to participate, with the exception of the social and welfare groups.

8.

Following the organisational review, two recommendations were made regarding the village works committees: members were to be drawn from across the different organisations and they were to be sensitised about the purpose of project (in particular, the importance of recruiting the poor and women as labourers since these people were often overlooked in social organisations).

4.0 GENDER APPRAISAL

The Gender Analysis Matrix (GAM) (Table 2) is a tool for conducting a gender analysis of a project (Parker, 1993). It may be used at the planning stage to determine whether the potential gender impacts of a project are desirable and consistent with the project purpose and goal. The GAM may also be used during implementation to monitor the impacts of a project and address any unexpected results. It can also be used during project evaluation.

Table 2: Gender Analysis Matrix

| | Tasks and skills | Workload | Resources/ benefits | Socio-cultural |
|------------------|-------------------------|-----------------|----------------------------|-----------------------|
| Women | | | | |
| Men | | | | |
| Household | | | | |
| Community | | | | |

Source: adapted from Parker (1993)

4.1 Levels of analysis

The analysis is usually conducted at four levels:

- *Women:* either the target group (if appropriate) or all women in the community

Module 3: Appraisal of Projects

- *Men*: either the target group (if appropriate) or all men in the community
- *Household*: all members of households as defined by the community (for example, women, men and children residing together)
- *Community*: everyone within the project area.

Other levels of analysis may be included if they are relevant to the project, such as youth, poor, disabled, or children.

4.2 Categories of Analysis

The impact of the project is examined in terms of:

- *Tasks and Skills*: changes in tasks performed, levels of skill required and labour requirements (how many people)
- *Workload*: changes in the amount of time it takes to carry out tasks
- *Resources/Benefits*: changes in access to resources and benefits as a result of the project, and changes in control over resources and benefits
- *Socio-Cultural factors*: changes in social aspects of participants' and the community's lives as a result of the project.

4.3 Interpretation

The matrix provides the basis for identifying project impacts from the perspective of different stakeholders with respect to the four categories of analysis. A brief description of the impact is recorded in the appropriate cell in the matrix. Once the matrix has been completed, each impact is reviewed in the light of the project's purpose and goal: if consistent, it is marked with + sign, if not, it is marked with - sign.

The + and - signs only help with a visual interpretation of the impact of a project from a gender perspective; they cannot be added together to determine the net effect of an intervention.

Remedial measures may be incorporated in the project design to overcome potentially adverse impacts.

Box 5 – From Case Study C: Gender Analysis Matrix

The impact of project implementation was reviewed with respect to four groups: women working on the road, poor men working on the road, their households and the community at large. Most of the impacts were desirable and were consistent with the project purpose and goal. Nevertheless, several measures were identified which would strengthen project implementation including village sensitisation, encouraging family members to support road workers, promoting the use of labour saving technologies in the home, and encouraging workers to join or form savings schemes.

4.4 Summary

The gender implications of the project design may be classified in one of four categories (Moser, 1993):

- ☐ *Gender Blind*: the project fails to identify differences between women and men with regard to their activities, access and control of resources, access and control of benefits, and participation in decision making
- ☐ *Gender Neutral*: gender differences are noted but gender-specific solutions have not been identified
- ☐ *Gender Aware*: gender-specific solutions are included in the project activities but they focus on issues of efficiency and only address practical gender needs
- ☐ *Gender Planning*: project activities address both practical and strategic gender needs, thereby aiming to achieve gender equity and empowerment, as well as efficiency.

5.0 ECONOMIC & FINANCIAL APPRAISAL : COST-BENEFIT ANALYSIS & IRR

This includes an analysis of economic soundness of the project and the quantification and valuation of costs and benefits to ensure financial viability

5.1 Social Cost Benefit Analysis

Cost Benefit Analysis (CBA) is used for determining the attractiveness of a proposed investment in terms of the welfare of society as a whole. By presenting social benefits and costs in a monetary format, CBA not only facilitates choices between alternative investment options but also gives an idea of the project worth. The technique is principally used with regard to public sector investments.

CBA differs from financial appraisal which views an investment solely from the perspective of individual participants, focusing on private benefits and costs and using market prices. In contrast, CBA adopts a much broader approach, considering both monetary and non-monetary benefits and costs, and uses prices that more accurately reflect economic, environmental and social values.

The divergence between private and social costs and benefits arises for three reasons:

- Not all costs and benefits fall on the immediate group of individual participants; some may have wider impacts (known as externalities)
- Not all costs and benefits have market prices
- Not all market prices reflect the true costs and benefits to society.

Nevertheless, once social costs and benefits have been identified and valued, the methodology for conducting a CBA follows a similar procedure to financial appraisal; the key steps are outlined in Box 6. Choices between investment options may be based on a comparison of Net Present Values at the test discount rate, the Internal Rate of Return, payback periods, and benefit: cost ratios.

Box 6: Key Steps in Investment Appraisal

- ✓ Identify project **benefits** and **costs** (distinguishing between capital and recurrent costs)
- ✓ Calculate the **net cash flow** by comparing benefits with costs over the life of the investment
- ✓ **Discount** the net cash flow by expressing all future benefits and costs in present values in order to take account of people's preference for time
- ✓ Sum the discounted net cash flow to calculate the **Net Present Value (NPV)**
- ✓ Calculate the **Internal Rate Of Return (IRR)**, the discount rate at which the NPV equals zero (representing the maximum interest rate a project could pay and still break even)
- ✓ Conduct a **sensitivity analysis** to determine how sensitive the results are to changes in key variables

This section focuses on issues associated with incorporating socio-economic and gender impacts into CBA. For a more detailed discussion of investment appraisal, including economic pricing and environmental impact assessment, see relevant sections below.

1. Identifying social costs and benefits

Thorough social and gender appraisals will identify most of the social costs and benefits associated with a proposed investment. For the purposes of the CBA, they are drawn together under the headings of costs and benefits.

2. Quantifying and valuing social costs and benefits

Whilst it is often possible to express social costs and benefits in physical units, the biggest challenge in conducting a social CBA is placing meaningful monetary values on them. Many social costs and benefits do not have a market price. However, unless they have a monetary value, it is not possible to include them in the CBA along with any financial benefits and costs.

For tangible social costs and benefits, it is possible to derive approximate prices. One method is to identify the opportunity cost of using a resource or service. This represents the value of the next best alternative or opportunity forgone in order to use a resource for a particular purpose. Thus the shadow wage rate of family labour working at home would be the wages that could have been earned working outside the home.

Module 3: Appraisal of Projects

For intangible social costs and benefits, it is not possible to estimate monetary values. Nevertheless, for projects with a substantial amount of intangible benefits, comparisons can be made between the cost effectiveness of different proposals to achieve similar outcomes. This technique of Cost Effectiveness Analysis is widely used in health sector appraisal.

Adjustments are also made for goods and services that have market prices but the latter are distorted from their economic value. Shadow prices take account of market price distortions, such as transfer payments, foreign exchange distortions and market imperfections.

Box 7 From Case Study C: Valuing Social Costs and Benefits

The most important argument for adopting a labour-based approach to road rehabilitation was the social benefits that would accrue from recruiting women and the poor as workers. Expected benefits included improvement in quality of workers' homes, workers' empowerment, and changing gender roles in the home.

However, the benefits would be offset by various social costs such as additional workloads in workers' homes and disruption to marriage.

On balance, it was estimated that the benefits (totalling FM 103,500 per month) would exceed costs (FM 67,500 per month) but this was highly dependent on the validity of the underlying assumptions.

3. Weighting project impacts

The distribution of project impacts between different groups in the community may be weighted to reflect project priorities. For example, more significance may be attached to income earned by women from female-headed households than married men. However, the process of devising weights is highly subjective and many recommend that such decisions should be left to politicians.

4. Discount rates

Often governments and donors set test discount rates that vary according to the type of project. At present, discount rates for public sector investments stand at 12%; for projects with a strong poverty or environmental focus, rates may be as low as 3%. For private sector investments, discount rates usually reflect commercial rates of interest.

5. Sense of perspective

The process of CBA is not an exact science. The findings of a CBA should be seen to add insights into the decision-making process rather than being subjected to rigorous interpretations. Consequently, when identifying and valuing the social costs and benefits, it is important to focus on the more significant impacts and not to spend too much time on the minor details.

5.2 Internal Rate of Return (IRR)

The IRR of a project is defined as that rate of discounting the future that equates the initial cost and the sum of the future discounted net benefits. It is the discounted rate that makes the NPV of a project equal to zero OR its BCR = one. The decision criterion: A project with an IRR exceeding some predetermined level (Social discount rate) is deemed acceptable. It is calculated by using the following equation:

$$C_0 = \frac{B_1 - C_1}{(1+r)^1} + \dots + \frac{B_t - C_t}{(1+r)^t} + \dots + \frac{B_n - C_n}{(1+r)^n}$$

Or

$$\text{IRR: } \Sigma \text{ discounted benefits} - \Sigma \text{ discounted costs} = 0$$

The internal rate of return is a very popular method of project appraisal and it has much to commend it. In particular it takes into account the time value of money. Basically, what the IRR tells you is the rate of return you will receive by putting your money into a project. It describes by how much the cash inflows exceed the cash outflows on an annualised percentage basis, taking account of the timing of those cash flows.

IRR is also referred to as the 'yield' of a project.

(See case study in Appendix II for an example)

6.0 ENVIRONMENTAL APPRAISAL (ENVIRONMENTAL IMPACT ASSESSEMENT)

Environmental Assessment (EA) is supposed to provide the project analyst with a good quantification of the biophysical and social impacts from developments. Environmental Assessment generally refers to the broader system of environmental analysis, including project-specific Environmental Impact Assessment (EIA). Most countries have an EIA policy and supporting legislation. Traditionally, EIA was designed to operate at the project level; that is to identify impacts and mitigation measures for an individual project. In the past several years however, the EIA process has gradually been extended to sectoral levels, strategic reviews of policy, and even at a global level. This section will briefly discuss focus on project EIA.

Project-Level EA (Usually Called Environmental Impact Assessment EIA)

Project-level EA (usually called EIA) generally refers to the environmental assessment of a single project, such as one highway or a cement factory.

Definition of EIA

There are many definitions of EIA. The following are the sample of some of these definitions which indicate the nature of the process, including;

"an assessment of impacts of a planned activity on the environment" (United Nations)

"EIA is the systematic process of identifying the future consequences of a current or proposed action" (IAIA)

"an activity which identifies, predicts, interprets and communicates information, and proposes ameliorative measures, about impacts of a proposed action or development proposal on human health and the well-being of the ecosystem upon which human survival depends" (Sadar et al., 1994)

"a procedure for assessing the potential environmental impacts of a project before it is built, so that these impacts can be properly considered during the decision-making process and so that mitigative measures for detrimental impacts can be defined"

All of these definitions share the basic concepts of:

1. EIA as a process

2. EIA as a part of project planning

3. EIA as a proactive way of addressing environmental concerns

Module 3: Appraisal of Projects

We can summarise these definitions as follows: ***EIA is defined as the process of evaluating the direct and indirect environmental and social implications of a proposed development project.*** Or the systematic examination of the likely environmental consequences of proposed projects

The results of the assessment - which are assembled in a document known as an Environmental Statement - are intended to provide decision-makers with a balanced assessment of the environmental implications of the proposed action and the alternative examined. The ES is then used by decision-makers as a contribution to the information base upon which a decision is made. The overall goal of an EIA is to achieve better developmental interventions through protecting the environment (human, physical and biotic).

Reasons for Using EIA

EIA has been developed as a result of the failure of traditional project appraisal techniques to account for environmental impacts. Many development projects in the past were designed and constructed in isolation from any consideration of their impacts on the environment, resulting in:

- Higher costs,
- Failure of projects,
- Significant environmental change, and
- Negative social effects

Aims of EIA

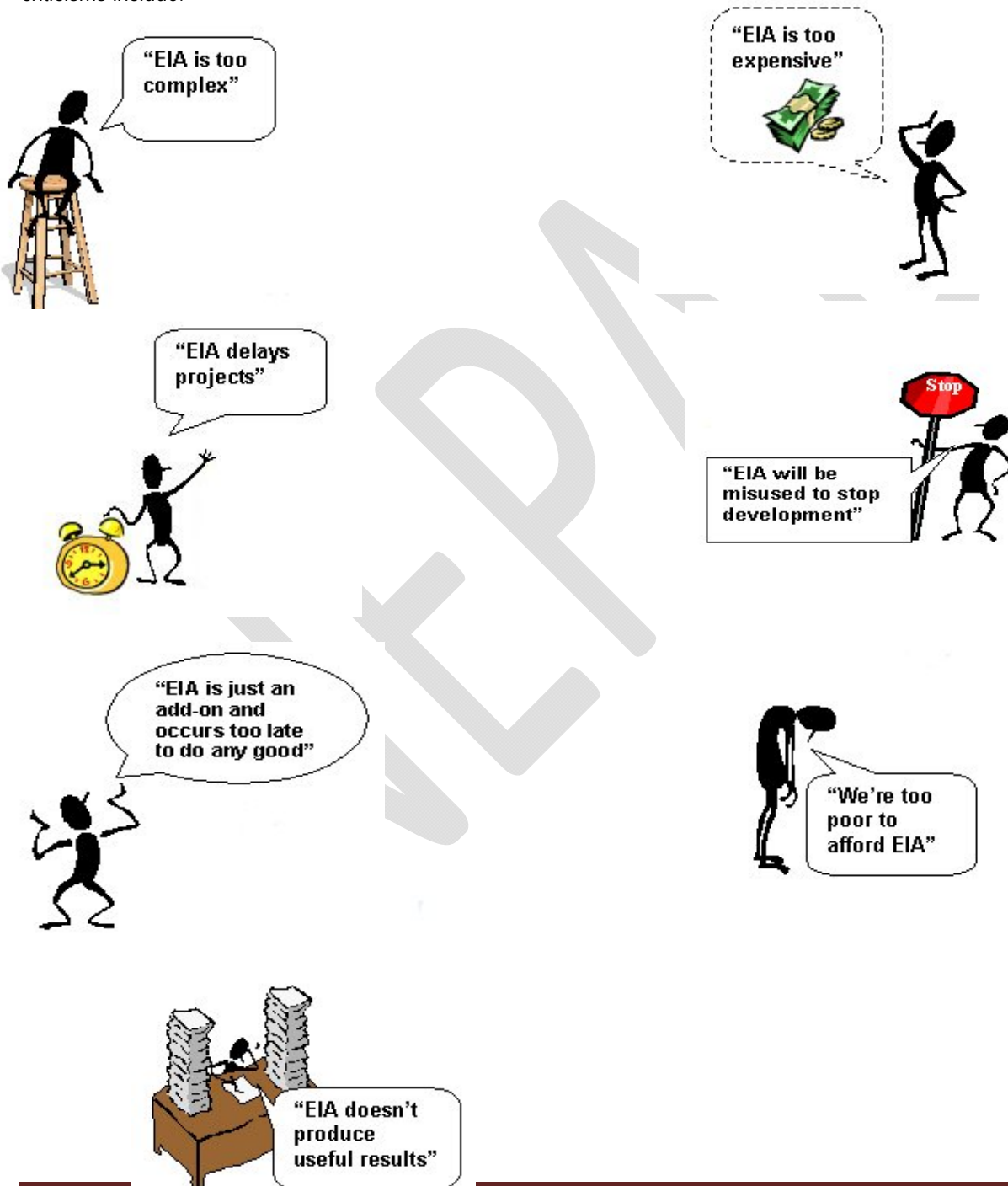
Despite differences in individual EIA systems throughout the world, the EIA process shares certain aims:

- *to provide decision-makers with analysis of the total environment* so that decisions can be made based on as nearly complete and balanced information as possible;
- *to assess and present intangible/unquantifiable effects* that are not adequately addressed by cost/benefit analysis and other technical reports;
- *to provide information to the public* on a proposal;
- *to formalise the consideration of alternatives to a proposal* being considered, in order that the least environmentally harmful means of achieving the given objective can be chosen;
- *to improve the design of new developments and safeguard the environment* through the application of mitigation and avoidance measures

Module 3: Appraisal of Projects

Misconceptions about EIA

The introduction of EIA has encountered resistance on the part of many planners and engineers, who have seen it as an unneeded change to traditional practices, in spite of its intended role in improving the project planning process. EIA has been severely criticised in some parts of the developing world as being inappropriate for application there. Some of these criticisms include:



Module 3: Appraisal of Projects

Strengths of EIA

It has a number of strengths.

- First, it can be a flexible process and employ a large number of evaluation methods and techniques.
- Second, EIA is increasingly viewed as a process, not as a mandated document.
- Third, EIA is becoming more commonly parallel to and part of standard pre-feasibility engineering and economic studies.

In general, EIA is focused on a previously selected project and only the better EIAs consider the sector as a whole or the wider implications, such as policies.

Weaknesses of EIA

Project-level EIA also has a number of weaknesses.

- First, a single project-level EIA has little leverage beyond the influence of the single project.
 - Project level EIAs can be piecemeal regards to sector or regional planning. EIAs have to be repeated for each sector or regional project.
 - An EIA rarely influences which projects are selected before the assessment is carried out. As a result, project-level EIAs are mainly reactive, at a time when pro-action becomes increasingly necessary.
 - In the worst cases, EIA does not begin until a fairly well defined project is proposed, then it is forced into reacting to a relatively rigid proposal. Ideally, EIAs should always address the outcome of the no-project alternative, emphasising that EIA is a public process rather than a single study. On the other hand, the no-project outcome must account for the costs of no project such as power outages, bad roads, ineffective schools, and inefficient or unsafe water supply. EA should help decision-makers ascertain the when, where, how and cost of proposed projects as well as the no-project option.
- Second, EIA is often weak on indirect and synergistic impacts unless the EIA team is unusually qualified and well funded. Some still think of EIA as a mandated document, rather than part of feasibility or as a valuable tool for standard project selection and design. Occasionally in the worst cases, an EIA becomes a post-project justification or mitigation exercise. In addition, project conditionality applying to environmental concerns is difficult to enforce.

6.1 The With-Without Analysis

Simply put, an EIA describes the impacts on the environment with and without the project in a similar manner to an economic analysis. Within EIA there are several tasks that are fundamental to the successful delivery of an EIA. EIA can be

Module 3: Appraisal of Projects

thought of as a data management process with three components. First, the appropriate information necessary for a particular decision must be identified and collated. Secondly, changes in environmental parameters resulting from the proposed project must be forecast and compared with the situation without the proposal. Finally, the actual change must be assessed and communicated to the decision makers. Figure 2 provides a schematic representation of this process.

To do this systematically, different attempts to categorise the elements comprising the environment, also called attributes, have been made (Box 8 provides one example). Changes in the environmental attributes provide indicators of changes in the environment. The EA describes, quantifies, then aggregates the effects of project activities on these attributes.

Box 8: Environmental Attributes for a project

Air

1. Diffusion
2. Particulates
3. Sulfur oxides
4. Hydrocarbons
5. Nitrogen Oxide
6. Carbon monoxide
7. Photochemical oxidants
8. Hazardous toxicants
9. Carbon dioxide

Water

10. Aquifer safe yield
11. Flow variations
12. Oil
13. Radioactivity
14. Suspended solids
15. Thermal pollution
16. Acid & Alkali
17. Biochemical Oxygen Demand (BOD)
18. Dissolved Oxygen
19. Dissolved Solids
20. Nutrients
21. Toxic Compounds
22. Aquatic Life
23. Fecal Coliforms

Land

24. Soil Stability
25. Natural Hazard
26. Landuse patterns

Ecology

27. Large animals (wild and domestic)
28. Predatory Birds
29. Small game
30. Fish, shellfish and waterfowl
31. Field crops
32. Threatened species
33. Natural habitat & vegetation
34. Aquatic plants

Sound

35. Physical effects
36. Psychological effects
37. Communication effects
38. Performance effects
39. Social behaviour effects

Human effects

40. Lifestyles
41. Psychological needs
42. Physiological needs
43. Community needs

Economics

44. Regional Economic Stability
45. Public sector review
46. per capita consumption

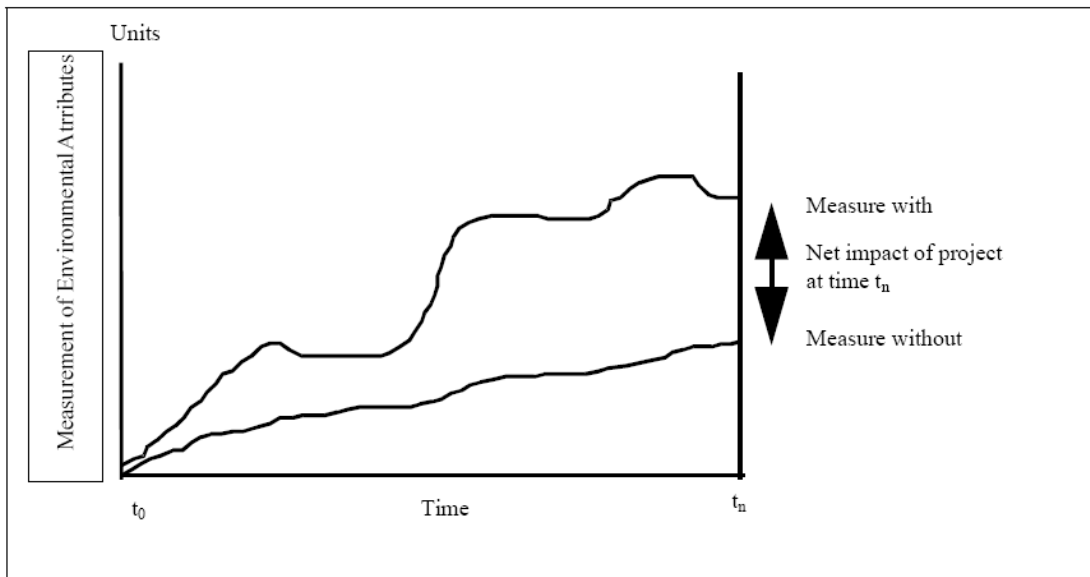
Resources

47. Renewable resources
48. Non-renewable resources
49. Aesthetics

Module 3: Appraisal of Projects

The EIA measures attributes with and without the project, or an activity within the project at a given point in time (Figure 1). The measure of attributes may change over time without the activity. The impacts have to be measured in terms of the “net” changes in the attribute at a given point in time.

Figure 1: Measure of impact with & without a project



The nature and importance of the impact is determined by the conditions of the environment without the project. The stressors may have impacts beyond the boundary and time frame of the project. Baseline analysis is more than making a statement on the initial environment of the proposed project. Because projections of future environmental conditions that may affect the project should also be made, it is necessary to adopt a dynamic and not static approach to the study of the environment. In effect, the baseline analysis should permit a comparison of project-induced environmental changes with other expected environmental changes in the no-project situation.

This dynamic approach may be more challenging, but will engender useful additional studies and dialogues. It should take account of: (a) past trends in environmental quality over time, (b) community preferences or competing demands regarding resource utilisation, and (c) other current or proposed development programs and projects under study. The quality of the analysis of baseline conditions establishes the viability of the appraisal of the impacts, and therefore of the EIA itself.

Module 3: Appraisal of Projects

Identifying impacts involves two aspects: the **stressors**, or sources of impacts i.e. what causes the impacts created by a project activity, and the **receptors**, or the attributes (refer again to Figure 1). This identification is done through a screening followed up by a scoping procedure. The screening determines if a project needs a full EIA, a partial EIA or none. The scoping identifies the project's main environmental impacts and the depth of the analysis required. The terms of reference of the EIA are often established at that point. The nature and importance of the impact is determined by the conditions of the environment without the project. The stressors may have impacts beyond the boundary and time frame of the project.

For each type of potential important impact or environmental concern, the analysis should predict the nature and significance of the expected impacts, or explain why no significant impacts are anticipated. Some environmental effects are quantifiable, while others may need to be described qualitatively. Impacts should be quantified in terms of their physical effects on human health and welfare, and on ecosystems. The impact of a stressor on a receptor, or environmental attributes, may be modelled by dose-response functions (Figure 3). Such information is not often readily available and can be costly to gather. Often the dose function are transferred from other studies and modified for the difference in geography, duration of exposure and population specifics.

Once all the impacts of a project have been identified and quantified as well as possible, one has to value the impacts and develop a new project cash flow integrating the environmental impacts. However, such an ideal situation in which a dose-response exists and can be valued and entered into a cash flow is often the exception. Attributes may have to be aggregated or compared to each other. Some type of ranking relying on expert judgement may have to be developed using a Delphi method for instance. The comparison then becomes multi-criteria rather than trying to reduce all costs and benefits into monetary measures. It also has greater potential to capture non-use values.

In an EIA, mitigation measures may be proposed to avoid or diminish environmental and social impacts. Then, new activity or production processes can be proposed resulting in a new input-output schedule and cash flows. In an economic appraisal, the alternatives can then be compared in terms of the economic viability (Net Present Value, Internal Rate of Return).

If benefits are difficult to estimate, the analysis can focus on cost-effectiveness⁴. If changing the project or introducing different activities or technologies is not possible, the analyst will see if the negative components of a project or the project itself should not be eliminated altogether. If not, compensation can be sought which can be materials for reconstruction,

prevention, shadow project to follow a no-net-loss policy, or financial such as compensation for loss of property or some property right.

6.2 STEPS IN THE EIA PROCESS

Various institutions and countries implement different project-level EIA processes. However, they all follow the logic of the With-Without analysis just presented.

a) Screening

Screening is used to decide the nature and extent of the EIA to be carried out. The process of screening usually involves the review of the project proposal against a checklist of projects to determine whether an EIA is a mandatory requirement. Often there is some uncertainty and an environmental assessment specialist may be required to help advise.

The environmental review process begins with environmental screening at the time a project is identified. In the screening, the project team determines the nature and magnitude of the proposed project's potential environmental and social impacts, and assigns the project to one of three environmental categories (Box 9). Most screening processes are similar in having three categories of projects. The main difference is that in some countries, the order is reversed (category A does not require an EIA, while category C does). The reason for initial screening is simple; not all projects have significant environmental impacts and thus do not warrant a full-blown and expensive EIA.

The Screening Process results in the production of the Environmental Screening Summary Note (ESSN), which should contain the following information:

- Brief project description
- Environmental issues apparent at screening (scope of environmental impacts, risks and/or benefits).
- Significance of environmental impacts, risks and/or benefits and likely mitigation measures required.
- Environmental investigation proposed (Environmental Appraisal, EIA, Environmental Audit, etc.) and/or any other special information required
- Other issues
- Actions to be taken (and by whom)

Box 9: Classifying EIAs by category

Module 3: Appraisal of Projects

Category A: A full EIA is required. These projects are expected to have adverse impacts that may be severe, irreversible and diverse, with attributes such as direct pollutant discharges large enough to cause degradation of air, water or soil; large-scale physical disturbances of the site and/or surroundings; extraction, consumption or conversion of substantial amounts of forest and other natural resources; measurable modification of hydrological cycles; hazardous material in more than incidental quantities; and involuntary displacement of people and other significant social disturbances.

Category B: Although a full EIA is not required, some environmental analysis is necessary. Category B projects have impacts which are less significant, and not as sensitive, numerous, major or diverse. Few, if any of these impacts are irreversible, and remedial measures can be more easily designed. Typical Category B projects entail rehabilitation, maintenance or upgrading rather than new construction.

Category C: No EA or other environmental analysis is required. Category C projects have negligible or minimal direct disturbance on the physical setting. Typical Category C projects focus on education, family planning, health and human resource development. Projects with multiple components are classified according to the component with the most significant adverse impact if there is a Category A component, the full project is classified as A.

The structure of the EIA is important. When a project is classified as Category A, a full-scale EIA is undertaken, and presented in an EIA report. Category B projects are subject to a more limited EIA, the nature and scope of which is determined on a case-by-case basis.

b) Scoping

Allied to the screening process is scoping which commences early in the project cycle, so that it can be influential in project design and provide the platform for continuing dialogue on the environmental constraints and opportunities. A scoping process is undertaken to identify key issues and develop the Terms of Reference (TOR) for the EIA once a project is categorised. It is essential to identify more precisely the likely environmental impacts and to define the project's area of influence at this stage. As part of this process, information about the project and its likely environmental effects is disseminated to local affected communities and NGOs, followed by consultations with representatives of the same groups. The main purpose of these consultations is to focus the EIA on issues of concern at the local level.

The specific objectives of the process are:

- To enhance the environmental benefits of the proposed project or programme.

Module 3: Appraisal of Projects

- To ensure compliance with relevant local legislation, as well as commitment to Multilateral Environmental Agreements and international best practice
- To consider the alternatives to the proposal that should be examined;
- To identify any significant adverse environmental effects, and identify action (possibly further studies)
- To provide for public consultation and input to the identification of issues to be examined;
- To define the data assembly needs and field survey activities;
- To determine the predictive techniques and environmental objectives that are to be employed;
- To provide a timetable for undertaking the EIA alongside the project design process.

c) Impact Identification

The process of impact identification is based upon an appreciation of how the proposed project might interact with its receiving environment. As such, this requires an appreciation of what are considered to be the valued environmental and community resources within the vicinity of the proposal. A projection is then required of the future state of these resources without the proposed project. From this a series of environmental design objectives can be established to aid both the EIA and project design process.

The manner in which the proposal interacts with the future environmental setting must be examined in terms of its construction, operational and decommissioning phase taking into account of any important maintenance activities. A wealth of checklists and guidance documentation exists on the broad effect that different types of project may cause. Such aids are no more than this and there is no substitute for an expert understanding of the potential interactions between the project and its environment.

The public should be involved in this process.

d) Impact Prediction

Once potential impacts are identified, the project design should be examined to attempt to minimise those which are adverse and maximise those that are beneficial. Once optimised, the process continues with the forecasting of the effects in the following terms:

- Magnitude;
- The affected feature/resource/population;
- Action causing the effect;

Module 3: Appraisal of Projects

- Timescale and duration of the effect;
- Level of uncertainty in the forecast;
- Proposed mitigation/enhancement measures
- Significance.

The effects must be recorded in terms of whether they are short term, long term, direct, indirect, synergistic, cumulative, increase or reduce with time. This is generally undertaken with the use of expert opinion and is to be presented in a transparent way stating all the assumptions employed.

e) Mitigation and Enhancement

Environmental mitigation can often result in reduced project costs and lower community costs when incorporated as a fundamental part of project design rather than as an add-on exercise. Often simple design changes such as the type of bridging strategy or the time of year that major earth moving activities take place can have a dramatic effect upon improving environmental performance. The mitigation and enhancement measures identified should be capable of being delivered in a cost effective manner and be fully justified. Mitigation measures that have not been thought through generally don't happen.

f) Reporting

The purpose of the exercise is to improve the project design prior to its submission for consent and then to report the findings to the decision makers and the affected public in a manner that they can understand. An EIS is not a long academic thesis on the effects of a proposal, but is to be focused upon the key issues that the decision maker should appreciate.

While guidance exists on the content of Environmental Statement from the various Donors, as a minimum, the EIS should report the following:

- Environmental objectives and policy context;
- Existing environmental situation
- Future do minimum situation
- A description of the project
- An assessment of the effects of the project
- An environmental action plan or management plan
- A summary of the effects and recommendations

A summary of the EIS is often required for communication with the general public.

Module 3: Appraisal of Projects

What is important for the analyst is that the baseline without the project and the projected environmental impacts with the project are clearly reported. The information should be easily translatable in an input-output schedule for an economic analysis.

Alternatively some clear indicators per project alternatives should be provided. This information will form the backbone of the cash flow analysis and the comparison of project alternatives. Once the draft EIA report is complete, the analyst submits it for review by environmental specialists. If found satisfactory, the project team is authorised to proceed to appraisal of the project.

On the appraisal, project staff review the EIAs procedural and substantive elements, resolve any outstanding issues, and assess the adequacy of the institutions responsible for environmental management in light of the findings. They also ensure that the mitigation plan is adequately budgeted, and determine if the EIA recommendations are properly addressed in project design and economic analysis. The project team is responsible for implementing the project according to agreements derived from the EIA process. An ex-post evaluation of the project and its EIA is carried out after the project ends. This information will allow the improvement of the EA process and project effectiveness of similar projects in the future.

Environmental Management Plan (EMP)

As well as providing an input to design and appraisal, environmental issues are incorporated into the implementation phase of the project cycle. An Environmental Management Plan (EMP) should be prepared, which sets out the actions for monitoring and evaluation of the project during implementation or construction and operation. This should form a fundamental part of the project specifications. Its content will include:

- Mitigation measures to minimise adverse impacts
- Measures to enhance environmental benefits
- Identified risks and uncertainties
- Institutional support required for effective monitoring
- Monitoring and auditing programme details
- Environmental legislation and standards which apply
- Resources, funds, contractual and management arrangements

Environmental Audit/Evaluation

Module 3: Appraisal of Projects

When the project is in existence, then an environmental audit may be required in order to satisfy an appropriate environmental standard. The audit seeks to confirm the operational practices and to highlight any deviation from the accepted norm.

An environmental evaluation is increasingly undertaken to confirm that the performance of the project, once constructed and operational, conforms to the specification and environmental performance standards specified as part of the consent or funding arrangements. Frequently, the environmental evaluation seeks to examine the EMP and review the monitoring data in order to reveal aspects where improved practice is possible and where future EIAs can be enhanced.

MEMORANDUM

Module 3: Appraisal of Projects

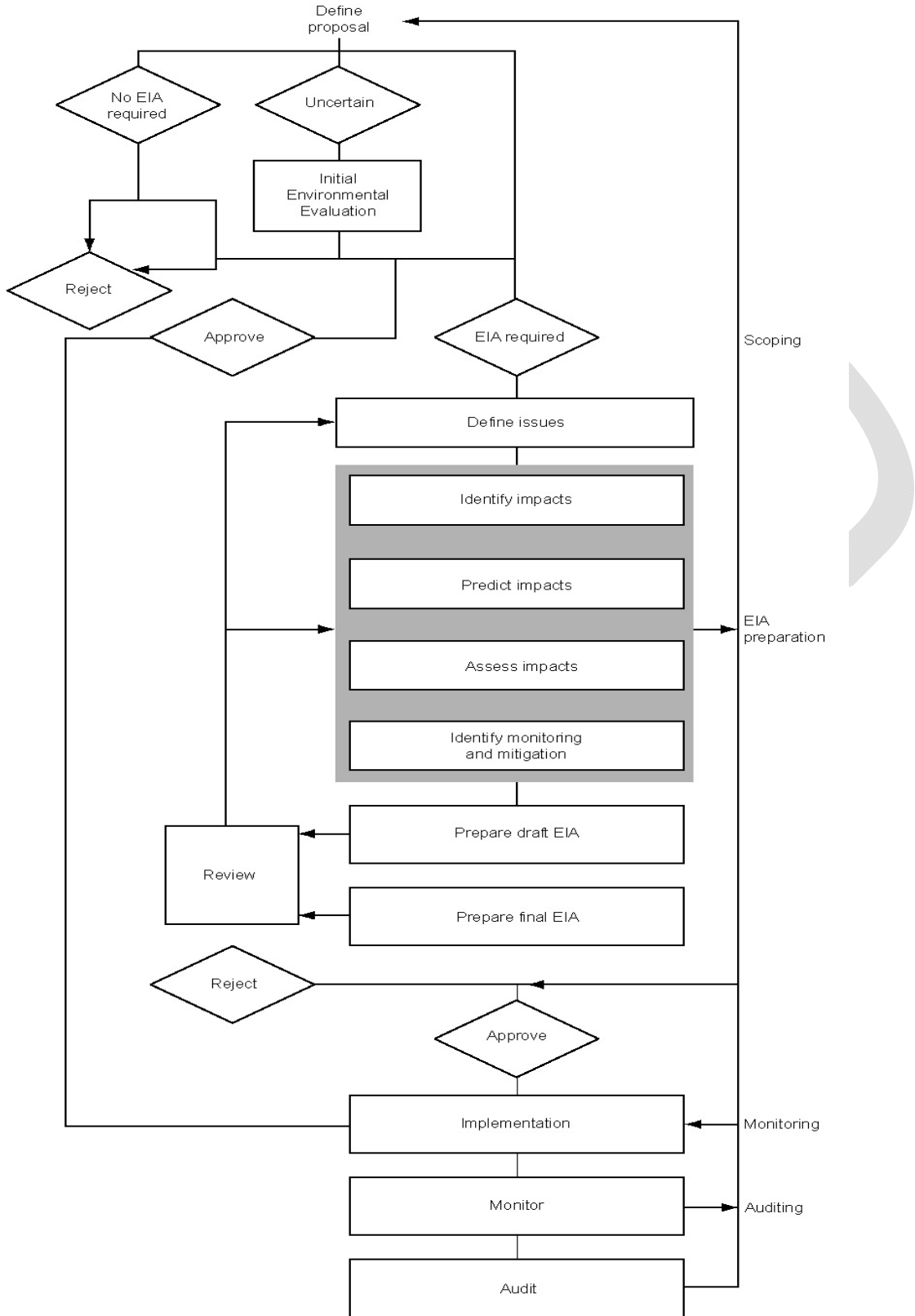


Figure 2: Flow diagram showing the main components of an EIA system

Project-Level EIA Tools

Different techniques apply to the different steps of an EA especially, Identification - Prediction and Project options comparison. Ideally, significance once the environmental impacts have been identified, the difference with and without the project on the environment is calculated using engineering or biophysical information (production function – doseresponse function) and an economic analysis is made based on that information. If this scenario is not possible, different presentation type tools can be used in particular for impact identification: Check list, overlays, matrices, networks, and simulation models. The differences between these tools lie in the explanatory power linking cause and effects.

Checklists help in the process of environmental appraisal. They present a specific list of environmental parameters to be investigated for possible impacts or a list of activities known to have caused environmental concern. They are useful for categories of projects but do not establish cause-effect link. As part of the Screening Process, checklists are available which cover environmental features, development features, potential adverse and beneficial impacts, and impact characterisation. At the project approval stage, checklists are available to decision makers to determine the nature and scale of potential environmental constraints and opportunities, and the extent to which these have been adequately addressed in project design. Examples of the content of the checklists are shown in Box 9 below.

Box 10: Checklists

Screening Checklists

- **Environmental Features**

Areas containing rare or endangered species
National parks, nature reserves, Etc.
Habitats providing important resources for vulnerable groups
Moist or dry tropical and sub-tropical forest

- **Development Features**

Important policy changes likely to affect the environment
Major changes in land tenure or use
Substantial changes in water use
Large infrastructure projects

- **Potential adverse and beneficial effects**

Livelihoods
Culture
Land management
Water quality and quantity
Local air quality
Global impacts
Conservation

- **Impact characterisation**

Is the impact beneficial, benign or harmful?
What is the scale and intensity of impact?
Are effects irreversible?
Are the effects due to construction and/or operations?
Are the effects likely to be politically or socially controversial?
Will there be different effects on different members of society?
What are the timescales of impact?

Checklists for Policy Approvers and Decision-makers

- **Project setting**

Have underlying causes of environmental damage been considered?
Would these underlying causes be better addressed by other means?

- **Impact identification**

Is there any effect on environmentally sensitive or important areas?
Have the environmental and social risks been evaluated?
Have indirect effects been addressed?

- **Mitigation measures**

What mitigation measures are proposed?
What measures will be taken to enhance environmental benefits?
What consultation was there with concerned stakeholders?

- **Procedures**

Have appropriate guidelines been followed?
Have the beneficial and adverse environmental effects been integrated into the economic analysis?
Have the appropriate authorities been consulted?

- **Implementation**

Do local institutions need strengthening in order to effect the environmental measures?
Who will monitor the environmental impact?
Have environmental measures been costed, and funds allocated?

Module 3: Appraisal of Projects

Matrix related project activities or stressors with possible receptors and their interaction can be indicated as important or not in the corresponding cells. An example of a Leopold matrix is provided in Figure 5 for a phosphate-mining lease. The matrix could have different units in the boxes, a “yes-no”, a check-mark signifying a linkage, a simple score out of five or ten points, or a multiple score as shown where the lower unit represents weight and the upper number a score.

Networks provide a logical display of impact initiating activities with a number of phases moving left to right identifying impacts. They indicate the impact causes and effects between stressors and receptors as pictured in Figure 6.

Computer-aided methods are developing fast. Geographic Information Systems are helpful to organise overlays. Mathematical models develop stressor-receptors and dose-response functions. These methodologies use a combination of tools to identify activities with potential impact, and to propose mitigation. They use models establishing cause-effect relationships and form the basis of Environmental Information Systems. Ecozone is an example of such system to help organise environmental impacts of Agriculture projects.