PIE Tech

POLLACHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

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Department of Computer Science And Engineering

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OCE351 Environmental and Social Impact Assessment

Environmental Impact Assessment

Environmental Impact Assessment is a step to be carried out before any major activity undertaken to ensure that it will not harm to the environment.

The environment impact process was introduced with the purpose of identifying the impacts of development projects on the environment, taking in to account. It predicts how the project could harm to surroundings. After predicting, the EIA identifies measures to minimize the impacts and suggests ways to improve the project viability.

Objectives

1.Identifying, predicting, and evaluating economic, environmental, and social impacts of development activities.

2. Providing information on the environmental consequences for decision making. An impact can be defined as any change in the physical, chemical, biological, cultural or socio-economic environmental system as a result of activities relating to a project.

Salient features of EIA

• It identifies the possible positive and negative impacts which may be short term and long term.

• It provides a plan which will reduce the negative impacts of a project.

• This plan may be a project alternative or project modification or environmental protection measures which reduces negative impacts

• It measures the level of plan implementation and the degree of effectiveness of environmental protection measures.

Purpose/ Need of EIA

• When a new project starts in an area, it will disturb the environmental equilibrium, so that EIA is necessary to know whether the project should be started or not.

• To maintain quality of environment it is essential to study impacts of project on environment.

• EIA also suggests remedial measures for the pollution caused by the project, thereby we can implement pollution control methods(eg. Treatment units) along with the project.

• The opinion of public is considered for conducting EIA,so the decision taken about the commencement of new project will be more environment friendly.

Goals of EIA

- Resources conservation
- Waste minimization
- Recovery of byproduct

- Efficient use of equipment
- Sustainable development

Advantage of applying EIA:

- Systematic approach
- Information to the public
- Information to the decision maker
- Consistency of approach
- Improved design
- Provides systematic methods of impact assessment
- Estimates the cost/benefit trade-off of alternative actions

Disadvantage of applying EIA:

- Adds to complexity
- Adds to delay
- Costly
- Requires multidisciplinary team

BASIC CONCEPT OF EIA

EIA is an activity designed to identify and predict the impact of a project on bio-geo-physico-chemical environment and on human health so as to recommend appropriate legislative measures, programmes, and operational procedures to minimise the impact. EIA is an exercise to be carried out before any project or major activity is undertaken to ensure that it will not in any away harm the environment on a short-term or long-term basis. Any developmental activity requires not only the analysis, the monetary costs and benefits involved and of the need of such a project but also most important, it requires a consideration and detailed assessment of the effect of a proposed development on the environment. Often the results of manually-produced changes cause degradation in the surrounding environment. Although the proposed project or plan has a good intent and addresses an identified problem, or solves it, the ramifications of the project may be serious. For instance, it may result in degradation of the human environment offsetting the possible benefits of the proposed project or plan. The aim of environmental impact assessment is to assess the overall impact of development project on the environment. An impact can be defined as any change in the physical, chemical, biological, cultural or socio-economic environmental system as a result of activities relating to a project.

THE RIO DECLARATION ON ENVIRONMENT AND DEVELOPMENT (1992):

The United Nations Conference on Environment and Development, Having met at Rio de Janeiro from 3 to 14 June 1992, Reaffirming the Declaration of the United Nations Conference on the Human Environment, adopted at Stockholm on 16 June 1972, and seeking to build upon it, With the goal of establishing a new and equitable global partnership through the creation of new levels of co-operation among States, key sectors of societies and people, Working towards international agreements which respect the interests of all and protect the integrity of the global environmental and developmental system, Recognizing the integral and interdependent nature of the Earth, our home

Proclaimations:

PRINCIPLE 1

Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.

PRINCIPLE 4

In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.

PRINCIPLE 5

All States and all people shall co-operate in the essential task of eradicating poverty as an indispensable requirement for sustainable development, in order to decrease the disparities in standards of living and better meet the needs of the majority of the people of the world.

PRINCIPLE 7

States shall co-operate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem. In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command.

PRINCIPLE 8

To achieve sustainable development and a higher quality of life for all people, States should reduce and eliminate unsustainable patterns of production and consumption and promote appropriate demographic policies.

PRINCIPLE 9

States should co-operate to strengthen endogenous capacity-building for sustainable development by improving scientific understanding through exchanges of scientific and technological knowledge, and by enhancing the development, adaptation, diffusion and transfer of technologies, including new and innovative technologies.

PRINCIPLE 12

States should co-operate to promote a supportive and open international economic system that would lead to economic growth and sustainable development in all countries, to better address the problems of environmental degradation. Trade policy measures for environmental purposes should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade. Unilateral actions to deal with environmental challenges outside the jurisdiction of the importing country should be avoided. Environmental measures addressing transboundary or global environmental problems should, as far as possible, be based on an international consensus.

PRINCIPLE 20

Women have a vital role in environmental management and development. Their full participation is therefore essential to achieve sustainable development.

PRINCIPLE 21

The creativity, ideals and courage of the youth of the world should be mobilized to forge a global partnership in order to achieve sustainable development and ensure a better future for all.

PRINCIPLE 22

Indigenous people and their communities, and other local communities, have a vital role in environmental management and development because of their knowledge and traditional practices. States should recognize and duly support their identity, culture and interests and enable their effective participation in the achievement of sustainable development.

PRINCIPLE 24

Warfare is inherently destructive of sustainable development. States shall therefore respect international law providing protection for the environment in times of armed conflict and co-operate in its further development, as necessary.

PRINCIPLE 27

States and people shall co-operate in good faith and in a spirit of partnership in the fulfilment of the principles embodied in this Declaration and in the further development of international law in the field of sustainable development.

Definition of EIA

The International Association for Impact Assessment (IAIA) has defined environmental impact assessment as "the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made"

Environmental Impact Assessment is a stepwise process of identification, evaluation, monitoring and management of the potential impacts of proposed projects on the environment of the local area. By doing so it provides opportunities to minimize proposed environmental The main purpose of EIA is to provide information regarding the impacts of project on environmental, ecological, cultural, social and economic components of project area to the decision makers for decision making and policy

transformation. It works on the principle of sustainable development i.e. to ensure that no or minimum environmental degradation is caused due to proposed project. It also takes into account the short term, midterm and long term effects on the demography, ecology and environment of the area. In simple words, EIA is a planning tool for decision making regarding the starting or denying of proposed project based on the measurable environmental and social impact of the proposed activity.

Purpose and aims of EIA

The basic objectives of EIA are to

Consider environmental factors in the decision-making process of any project

Identify potential environmental, social and economic impacts of proposed activities

Take steps at initial stages to minimize adverse environmental impacts

Promote sustainable development through environmental management plan by either alternatives or mitigation measures.

Public participation in the decision making of the establishment of proposed activity

Origin and development of EIA

EIA is a formal policy innovation for environmental conservation in many countries. The process of EIA first started in USA in the early 1970s with the implementation of the National Environment Policy Act (NEPA) 1969. The other developed or high-income countries like Australia, Canada, and New Zealand also followed the footsteps of US and formally started the EIA. This was followed by other countries as well, which started EIA relatively early - Columbia (1974), Philippines (1978).

This was further strengthened by the efforts of the World Bank which adopted EIA in 1989. The World Bank made it necessary to undertake an EIA under the Bank's supervision for all major development projects funded by them. The main strength came from the Rio Earth Summit (1992). After this the consolidation and international dissemination of environmental impact assessment was officially recognized as decision-making tool for sustainable development. The three documents of Rio viz. Principle 17, Article 14, and Agenda 21 played very important role for the consolidation of EIA.

The Principle 17 of the Rio Declaration on Environment and Development states that “Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority”.

The Article 14 (titled Impact Assessment and Minimizing Adverse Impacts) of the Convention on Biological Diversity states that ”Each Contracting Party, as far as possible and as appropriate, shall: (a) Introduce appropriate procedures requiring environmental impact assessment of its proposed projects that are likely to have significant adverse effects on biological diversity with a view to

avoiding or minimizing such effects and, where appropriate, allow for public participation in such procedures; (b) Introduce appropriate arrangements to ensure that the environmental consequences of its programs and policies that are likely to have significant adverse impacts on biological diversity are duly taken into account". Fresh water resources" discusses about application of integrated approaches to the development, management and use of water resources though it started in late 20th century still it has been managed to be practiced in more than 100 countries.

Methods to carry out EIA

The methods available to carry out EIAs can be divided into General and industry specific assessment methods as described below:

a) Industrial products- To identify and measure the impact of industrial products on the environment, the method used is Product environmental life cycle analysis (LCA). The method assesses the environmental impacts associated with all the stages of a product's life from raw material extraction to its final disposal or recycling.

The impact assessment objectives of LCAs take into consideration of environmental concerns by: Making an inventory of inputs in terms of raw materials, natural resources and energy and release of pollutants in environment

Evaluate the environmental impacts associated with identified inputs and releases

Interpreting the results to help make decision

Types of EIA:

1. Single EIA

This type of EIA is an activity or study of a single environmental preservation project that is regulated by a supervisory agency. The easiest examples of a single type of EIA are hospital review projects, power plant projects, and the like.

2. Sectoral EIA

Sectoral EIA is an activity and study of impacts on the environment that is carried out sectorally. The reason is that the determination of the EIA (Environmental Impact Analysis) review is stipulated by the sectoral minister. For example, a toll road construction project.

3. Social EIA

The third type of EIA is the social EIA, in which the EIA review is carried out by a social enterprise. In its application, it certainly involves the authority of more than one social agency.

For example, the EIA project to build a school for scavenger children around the Bantar Gebang TPA.

4. Regional EIA

As the name suggests, namely regional EIA, this type contains important impacts of activities or businesses within the scope of a region. This type of regional EIA usually has a wider scope than the previous types. For example, the mangrove planting project in the Kutawaru area, Cilacap.

5. Integrated EIA

The last type of EIA is integrated EIA, which in general, is not much different from social EIA. What distinguishes the two is the focus and study system.

If the social EIA focuses on social aspects, then the integrated EIA contains a bigger and more integrated impact.

An example of an integrated EIA is an integrated residential development, industrial and factory development. Therefore, it is not surprising that this type of EIA has a wider scope and is sometimes more complicated.

2. Evolution of EIA

EIA is one of the successful policy innovations of the 20th Century for environmental conservation. Thirty-seven years ago, there was no EIA but today, it is a formal process in many countries and is currently practiced in more than 100 countries. EIA as a mandatory regulatory procedure originated in the early 1970s, with the implementation of the National Environment Policy Act (NEPA) 1969 in the US. A large part of the initial development took place in a few high-income countries, like Canada, Australia, and New Zealand (1973-74). However, there were some developing countries as well, which introduced EIA relatively early - Columbia (1974), Philippines (1978).

The EIA process really took off after the mid-1980s. In 1989, the World Bank adopted EIA for major development projects, in which a borrower country had to undertake an EIA under the Bank's supervision (see table 1: Evaluation and history of EIA).

Table 1: Evolution and history of EIA

	Development of EIA
Pre-1970	Project review based on the technical/engineering and economic analysis. Limited consideration given to environmental consequences.
Early/mid – 1970s	EIA introduced by NEPA in 1970 in US. Basic principle: Guidelines, procedures including public participation requirement instituted. Standard methodologies for impact analysis developed (e.g. matrix, checklist and network). Canada, Australia and New Zealand became the first countries to follow NEPA in 1973-1974. Unlike Australia, which legislated

	EIA, Canada and New Zealand established administrative procedures. Major public inquires help shape the process's development.
Late 1970 and early 1980s	More formalised guidance. Other industrial and developing countries introduced formal EIA requirements (France, 1976; Philippines, 1977), began to use the process informally or experimentally (Netherlands, 1978) or adopted elements, such as impact statements or reports, as part of development applications for planning permission (German states [lander], Ireland). Use of EA by developing countries (Brazil, Philippines, China, Indonesia) Strategic Environment Assessment[1] (SEA), risk analysis included in EA processes[2]. Greater emphasis on ecological modelling, prediction and evaluation methods. Provision for public involvement. Coordination of EA with land use planning processes.
Mid 1980s to end of decade	In Europe, EC Directive on EIA establishes basic principle and procedural requirements for all member states. Increasing efforts to address cumulative effects. World Bank and other leading international aid agencies establish EA requirements. Spread of EIA process in Asia.
1990s	Requirement to consider trans-boundary effects under Espoo convention. Increased use of GIS and other information technologies. Sustainability principal and global issues receive increased attention. India also adopted the EIA formally. Formulation of EA legislation by many developing countries. Rapid growth in EA training.

3. History of EIA in India

The Indian experience with Environmental Impact Assessment began over 20 years back. It started in 1976-77 when the Planning Commission asked the Department of Science and Technology to examine the river-valley projects from an environmental angle. This was subsequently extended to cover those projects, which required the approval of the Public Investment Board. Till 1994, environmental clearance from the Central Government was an administrative decision and lacked legislative support.

On 27 January 1994, the Union Ministry of Environment and Forests (MEF), Government of India, under the Environmental (Protection) Act 1986, promulgated an EIA notification making Environmental Clearance (EC) mandatory for expansion or modernisation of any activity or for setting up new projects listed in Schedule 1 of the notification. Since then there have been 12 amendments made in the EIA notification of 1994.

The MoEF recently notified new EIA legislation in September 2006. The notification makes it mandatory for various projects such as mining, thermal power plants, river valley, infrastructure (road, highway, ports, harbours and airports) and industries including very small electroplating or foundry units to get environment clearance. However, unlike the EIA Notification of 1994, the new legislation has put the onus of clearing projects on the state government depending on the size/capacity of the project.

Certain activities permissible under the Coastal Regulation Zone Act, 1991 also require similar clearance. Additionally, donor agencies operating in India like the World Bank and the ADB have a different set of requirements for giving environmental clearance to projects that are funded by them.

4. The EIA process

The stages of an EIA process will depend upon the requirements of the country or donor. However, most EIA processes have a common structure and the application of the main stages is a basic standard of good practice.

The environment impact assessment consists of eight steps with each step equally important in determining the overall performance of the project. Typically, the EIA process begins with screening to ensure time and resources are directed at the proposals that matter environmentally and ends with some form of follow up on the implementation of the decisions and actions taken as a result of an EIA report. The eight steps of the EIA process are presented in brief below:

- **Screening:** First stage of EIA, which determines whether the proposed project, requires an EIA and if it does, then the level of assessment required.

- **Scoping:** This stage identifies the key issues and impacts that should be further investigated. This stage also defines the boundary and time limit of the study.

- **Impact analysis:** This stage of EIA identifies and predicts the likely environmental and social impact of the proposed project and evaluates the significance.
- **Mitigation:** This step in EIA recommends the actions to reduce and avoid the potential adverse environmental consequences of development activities.

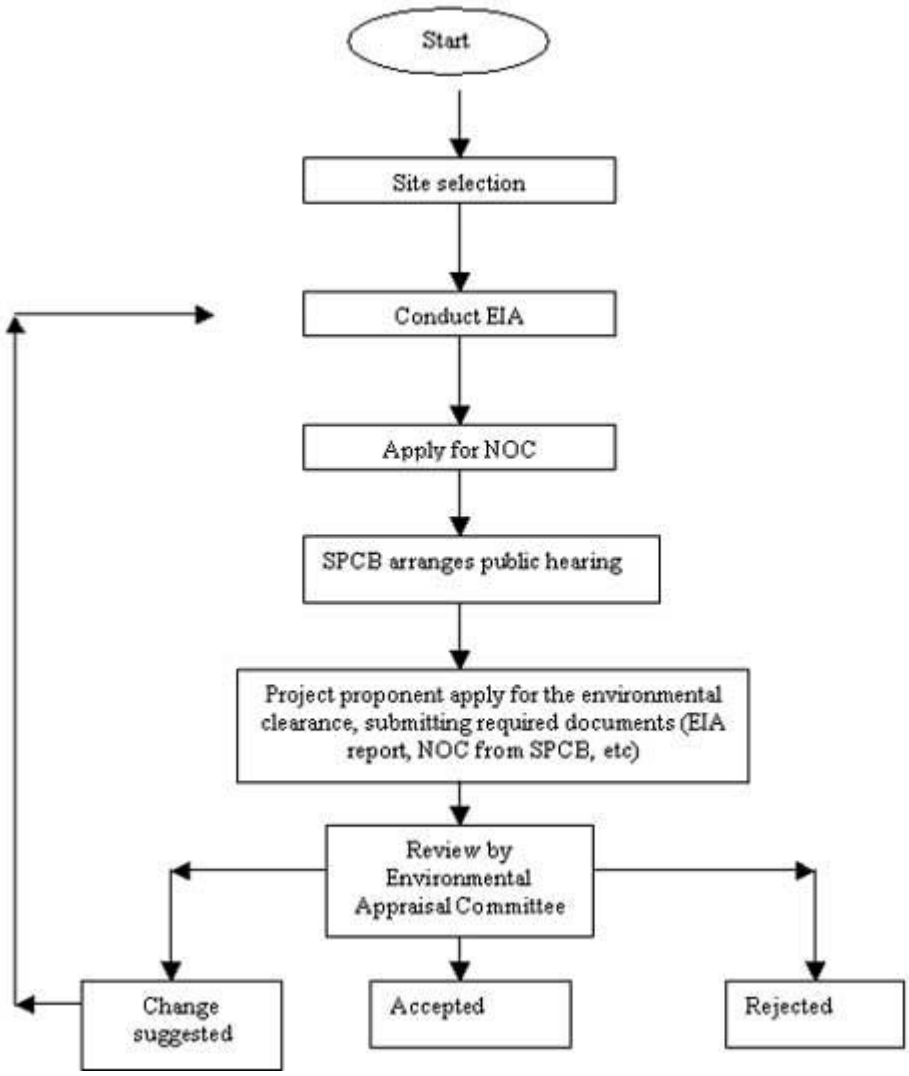
- **Reporting:** This stage presents the result of EIA in a form of a report to the decision-making body and other interested parties.
- **Review of EIA:** It examines the adequacy and effectiveness of the EIA report and provides the information necessary for decision-making.

- **Decision-making:** It decides whether the project is rejected, approved or needs further change.

- **Post monitoring:** This stage comes into play once the project is commissioned. It checks to ensure that the impacts of the project do not exceed the legal standards and implementation of the mitigation measures are in the manner as described in the EIA report.

The overview of the EIA process is represented in figure 1.

Figure 1: Generalised process flow sheet of the EIA process



EIA in Project cycle

The relevant EIA activities for each stage in the project cycle are

• Project Concept / Identification: At the initial stage of the project, quick environmental overview or preliminary EIA can indicate the environmental implications of any proposed alternatives.

• Pre-feasibility Stage: This stage identifies issues and impacts for investigation, which is equivalent to 'Scoping

• Feasibility Stage: EIA study is carried out during this stage.

• Project Appraisal and Decision: A decision on whether a project is feasible or not will be made at this stage.

• Implementation of the project: If the project is feasible, it will be implemented. EIA report will be used as guideline during this phase.

• Management of EIA Study: Conducting an EIA report that can be understood by all the related stakeholders.

Project Concept/Identification

At the initial stage of the project planning, information on the detailed project designs will not be available, but the basic nature of the project will be known (for example, whether it is to be a coal, oil or nuclear power station; a highway or a dam/reservoir) power output, and an area of land which is likely to be inundated and the site or sites where the project is being proposed to be implemented. At this stage, the project may be subject to "screening" to decide whether a full and comprehensive EIA report must be prepared.

If screening recommends that an EIA report is required, then the initial study will begin. At this early stage quick environmental overview/reconnaissance or preliminary EIA can indicate whether any of the alternatives proposed are environmental "disastrous". These can be eliminated from further consideration, and new alternatives can be identified. Major benefits of a "quick and dirty" overview are as follows:

• identification of "viable" alternatives (from an environmental viewpoint), and

• Provision of an early indication of likely significant impacts for further EIA work.

Pre-feasibility Stage

The main EIA activities, at this stage, are identification of issues/impacts for investigation and, formulation of the Terms of Reference (TOR) for the EIA. The term used for this activity is "scoping”.

Feasibility Stage

EIA study should be carried out:

• during feasibility stage in conjunction with economic, technical and design work,

• preliminary EIA works such as scoping and preparation of TOR should be carried out during project pre-feasibility stage,

• If EIA is carried out late in project cycle as an "add on", the process of EIA becomes cumbersome, time consuming and expensive to incorporate the EIA recommendations in the project construction.

Project Appraisal and Decision

During the project appraisal, a decision is made by the proponent or by the government, and in some case by the lending agencies, as to whether the project is viable. At this stage, EIA results will be put into consideration with feasibility study. An application for authorisation(s) has to be made by the project proponent to a local/central government agency. This decision is the final and

determines whether a project is to be implemented. The EIA report also plays an important role in this decision making process.

Implementation of the Project

At this stage, in the project cycle, the EIA report will act as a "reference" guide to the implementation and use of mitigation strategies and monitoring schemes. Thus, the usefulness of an EIA report does not end with the "official" authorisation to proceed. It may form a basis for management plan to assist project implementation and management practice. For example, EIA report recommendations can form a part of contract tender documents.

Environment Impact Assessment Notification

Environment Impact Assessment (EIA) Notification, 2006 The Environment Impact Assessment (EIA) Notification, 2006, is the governing legal instrument to grant green clearance for the establishment or expansion of an industry on the basis of the potential environmental impact of the project. The notification in recent times has been revised several times since its introduction in 1994.

Background:

While the 2006 notification is flexible and can adjust to the changing times, it has been exploited by governments, who have made efforts to dilute its provisions and norms to make it easier to establish and expand industries that generate pollution.

This has been achieved through the introduction of office memorandums, which are changes to the notification that do not require public consultation.

In the past five years, 110 such changes have been introduced, some of which have been challenged in the National Green Tribunal.

The year 2022-23 saw the highest number of changes introduced in the 2006• notification in the last five years.

Some of the major changes over the years are:

Rating system for state environment impact assessment authority (SEIAA):

The Indian government introduced a star-rating system for state environment impact assessment authorities (SEIAAs) to improve their efficiency and accountability.

However, the system seems to penalize them for following the 2006 EIA notification, which regulates the clearance of projects.

The faulty compliance module:

The MoEFCC released a notification on June 14, 2022, introducing a compliance module for projects that have received environmental clearance under the 2006 EIA notification.

The module aims to simplify the compliance and monitoring process and prevent delays in the submission of compliance reports to regulatory authorities.

However, it is unclear whether the reports and supporting documents will be accessible to the public.

Proponents upload the information on MoEFCC's Parivesh portal using their unique credentials, which may not be publicly available.

Undermining the public hearing process:

The process of public hearing involves public consultation, where comments on the draft EIA report are considered, and a gathering presided over by district officials to hear the concerns of stakeholders.

However, the Ministry of Environment, Forest and Climate Change issued an office memorandum in October 2021 allowing for a 20% expansion in production in the mining of minor minerals based only on public consultation, undermining the public hearing process.

In addition, legacy mining cases granted environmental clearance under the 1994 EIA notification now only have to conduct public consultation, not follow the entire process of a public hearing.

The public consultation process does not mandate the proponent to inform stakeholders via popular media about the project, its expansion or modification.

Extra details sought viewed as a burden:

According to the 2006 EIA notification, the Central and state authorities responsible for granting environmental clearance to projects have the right to seek additional details from project proponents if necessary.

However, an office memorandum issued by the MoEFCC in June 2021 directed authorities to refrain from asking for Extra Details Sought (EDS) and Additional Details Sought (ADS) that are not relevant to the project appraisal.

This direction undermines the legitimacy of the experts nominated by the ministry for project appraisal.

Change in coal source without amendment:

The ministry allowed coal thermal power plants to change their coal source without considering the potential increase in emissions resulting from the long-distance transport of coal from mines to the plants.

The government's directive aimed to increase India's reliance on domestic coal and allowed power plants to change from one domestic source of coal to another without considering the environmental impact of long-distance transport of coal.

Additionally, the ministry allowed for road transport of coal until the railway lines are laid in the area, diminishing the urgency to build railways to reduce emissions from coal transport.

Violation cases get recognition under the 2006 EIA notification:

In December 2017, the MoEFCC added a provision to the 2006 EIA notification to grant “post-facto” clearance to projects that were in violation of the notification.

This provision legitimizes projects that have already violated environmental laws and may lead to increased environmental degradation.

So, the recent developments in the environmental clearance process in India seem to be pushing for faster approvals at the cost of due diligence and public participation. It is important for the government to strike a balance between economic development and environmental protection while ensuring transparency, accountability and participation in the process.

Stakeholders and their Role in EIA:

EIA is a process that involves multiple stakeholders with different interests and perspectives [1].

The involvement of stakeholders, including local communities, is important as they have a better understanding of their environment and can provide valuable insights

Let’s look towards the role of stakeholders in eia process. An EIA process in India typically involves a variety of stakeholders, including:

- the “individuals, groups, and communities” who will be impacted by the proposal;
- the project proponent and other beneficiaries;
- government agencies; NGOs and interest groups; and Others, including donors, the private sector, academics, etc.

Any project undergoing an EIA involves three main stakeholder groups:

- the proponent,
- the regulators, and
- the community.

Examples of each of them were provided at the session and each one of them may serve as an incentive to participate in follow-up programmes. Separating the motivations of the follow-proponents from the public’s pressure to undertake it is one area where it can be difficult to do so in practice. Additionally, the results of the EIA follow-up may benefit various stakeholders in varying degrees. The examples that follow are taken from the results of current follow-up programmes.

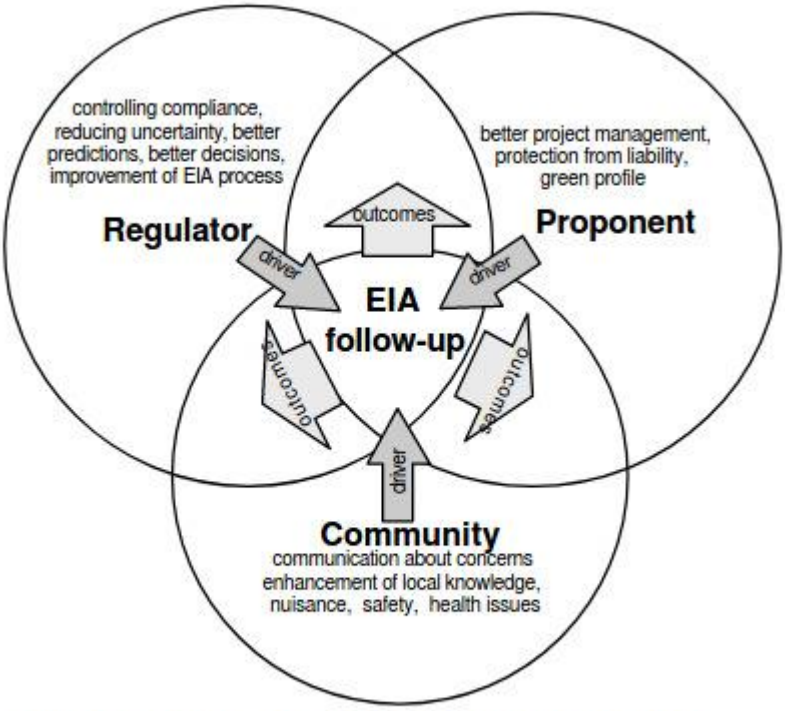


Figure 2. Outcomes of EIA follow-up for different stakeholders

UNIT II ENVIRONMENTAL ASSESSMENT

Steps in EIA process

EIA involves the steps mentioned below. However, EIA process is cyclical with interaction between the various steps.

Screening: The project plan is screened for scale of investment, location and type of development and if the project needs statutory clearance.

Scoping: The project's potential impacts, zone of impacts, mitigation possibilities and need for monitoring. The EIA agency has to follow the published guidelines by the Ministry of Environment and Forest (MoEF) of government of India.

Collection of baseline data: Baseline data is the environmental status of studyarea.

Impact prediction: Positive and negative, reversible and irreversible and temporary and permanent impacts need to be predicted which presupposes a good understanding of the project by the assessment agency.

Mitigation measures and EIA report: The EIA report should include the actions and steps for preventing, minimizing or by passing the impacts or else the level of compensation for probable environmental damage or loss.

Public hearing: On completion of the EIA report, public and environmental groups living close to project site may be informed and consulted.

Decision making: Impact Assessment (IA) Authority along with the experts consult the project-in-charge along with consultant to take the final decision,

keeping mind EIA and EMP (Environment Management Plan).

Monitoring and implementation of environmental management plan: Thevarious phases of implementation of the project are monitored.

Risk assessment: Inventory analysis and hazard probability and index alsoform part of EIA procedures.

Identification of impacts on the environment

Sl.No	Component	Important considerations
1	Air	Type of emissions released and the extent,creation of excess noise, Degradation.
2	Water	Availability, use and quality of water, effects on the aesthetics and aquaculture
3	Vegetation	Destruction of forest cover, depletion of cultivable land, changes in biological productivity, changes in the species diversity and hastening the disappearance of important species
4	Processes	Floods Droughts Erosion Earth quakesLand slides

Sl.No	Component	Important considerations
5	Solid waste	Excess generation of solid waste,Effects on environment
6	Solis and geology	Effects on physio-chemical characteristics of soilsEffects on stability/instability of soils
7	Cultural status	Employment situation, life style of people Health services
8	Ecological relationships	Food chain Diseases Spreading of virus
9	Man made facilities and activities	Structures Utility networks Transportation Wastedisposal

Impact on the Air Quality

During construction phase, dust will be the main pollutant, which will be generated from the site development activities and vehicular movement on the road. Further, concentration of NOx and CO may slightly increase due to increased vehicular traffic movement. However, change in ambient concentrations of air

increase due to operation of construction machinery such as bulldozers, pay loaders, trucks etc. These levels are expected to be insignificant as these machines will be operated intermittently. More over most of these will be movable. Hence,there will not be any concentration of emissions at any single point.

Impact on Noise Levels

The major sources of noise during the construction phase are vehicular traffic, construction equipment like dozers, scrapers, concrete mixers, cranes, pumps, compressors, pneumatic tools, saws, vibrators etc. The operation of these equipments will generate noise ranging between 85-90 dB (A) near the source. These noises will begenerated within the plant boundary and will be temporary in nature.

Impact on Water Quality

The water requirement during construction period will be met from the nearby surface water available. The wastewater generation during the construction period will be from the sanitary units provided to the workers. This waste will be treated inpackaged STP or soak pit. Hence, there will not be any impact on the water regimedue to discharge of treated wastewater.

Impact on Land Environment

Impact on Ecology

The proposed site is devoid of any major vegetation. A good green belt will be developed within the plant premises. This will result in the positive shift in the ecological status of the area.

Impact on Socio-Economic

Environment Local laborers particularly unskilled labours will be offered employment during construction activities. In addition to the opportunity of getting employment as construction laborers, the local population would also have employment opportunities based on the educational qualification like petty commercial establishments, small contracts/sub-contracts and supply of construction materials for buildings and ancillary infrastructures etc.

Impact on Terrestrial Ecology

The flora and fauna of an area shows a certain affinity to the existing environmental setting. Due to the proposed facility, there could probably be a change in the environmental surroundings for a short duration due to the construction phase and for a long term due to the operation of the project activities. Thus, in order to predict the ecological impacts from the project site, it is necessary to detail the

As no wastewater from the plant site is discharged outside the premises, there is noimpact as the ecology due to wastewater.

The flora and fauna of the area could be disturbed if the various air pollutants discharged from the facility would not be maintained within specified permissiblelimits.

Other emissions such as Particulate Matter, Sulphur Dioxide and Nitrogen Oxides are kept below the prescribed permissible limits. Thus, the potential impact of air emission can be rated as marginal impact.

The Company will adopt adequate pollution reduction measures for water, air and solid waste for effective protection of the environment. Thus, it could be concluded that the potential impact of solid wastes is insignificant.

Solid Waste Generation

The wastes generated from the plant are segregated into Non Hazardous and Hazardous wastes as detailed below:

Non hazardous waste Cement Dust & HDPE Bags

The main solid waste generated from the cement plant is cement dust collected from various pollution control devices. This generated cement dust is recycled to the process. Hence no solid waste for disposal is available in the cement plant. **Domestic Waste**

The generated solid wastes are segregated in biodegradable parts. The biodegradable waste will be composted and used as manure.

Sludge generated from the STP shall be used as manure for plantationHazardous waste

Used lubricating oil is used for scraper/screw conveyors internally and thebalance quantity will be sold to PCB / MoEF authorized recyclers.

Waste grease is sold to the PCB's approved recyclersLead acid batteries are exchanged with OEMs

EIA METHODOLOGIES

Introduction

EIA methods are described along with criteria to be followed for choosing most appropriate method in a given situation. Many times an EIA analyst or the person charged with the preparation of an EIA report is faced with a vast quantity of raw and usually unorganized data. Hence, each technique and method for the evaluation of impacts should have the following qualities and characteristics:

1. It should be systematic in approach;
2. It should be able to organize a large mass of heterogeneous data;
3. It should be able to quantify the impacts;
4. It should be capable of summarizing the data;
5. It should be able to aggregate the data into sets with the least loss of information because of the aggregations;
6. It should have a good predictive capability;
7. It should extract the salient features, and
8. It should finally be able to display the raw data and the derived information in a meaningful fashion.

Each of the different methodologies for the assessment of environmental impacts of development projects has their advantages and disadvantages and their utility for a particular application is largely a matter of choice and judgment of the analyst. Nevertheless, some objective criteria exist in making such a choice and these are stated below under the key areas that involve the assessment process.

Criteria for the Selection of EIA Methodology:

General

(a) **Simplicity:** The methodology should be simple so that the available manpower with limited background knowledge can grasp and adopt it without much difficulty.

(b) **Manpower time and budget constraints:** The methodology should be applied by a small groupwith a limited budget and under time constraints.

(c) **Flexibility:** The methodology should be flexible enough to allow for necessary modifications andchanges through the course of the study.

Impact Identification:

(a) **Comprehensiveness:** The methodology should be sufficiently comprehensive to contain all possible options and alternatives and should give enough information on them to facilitate proper decision-making.

(b) **Specificity:** The methodology should identify specific parameters on which there would besignificant impacts.

(c) **Isolation of project impacts:** The methodology should suggest procedures for identifying projectimpacts as distinguished from future environmental changes produced by other causes.

(d) **Timing and duration:** The methodology should be able to identify accurately the location andextent of the impacts on a temporal scale.

Impact Measurement

(a) **Commensurate units:** The methodology should have a commensurate set of units so that comparison can be made between alternatives and criteria.

(b) **Explicit indicators**: The methodology should suggest specific and measurable indicators to be used to qualify impacts on the relevant environmental parameters.

(c) **Magnitude:** The methodology should provide for the measurement of impact magnitude, defined as the degree of extensiveness of scale of the impact, as distinct from impact importance, defined as the weighting of the degree of significance of the impact.

(d) Objective criteria: It should be based on objective criteria and the criteria should be stated explicitly.

Impact Interpretation and Evaluation

(a) **Significance:** The methodology should be able to assess the significance of measured impacts on alocal, regional and national scale.

(b) **Explicit criteria:** The criteria and assumptions employed to determine impact significance shouldbe explicitly stated.

(c) **Portrayal of "with" and "without" situation**: The methodology should be able to aggregate thevast amounts of information and raw input data.

(d) **Uncertainty:** Uncertainty of possible impacts is a very real problem in environmental impact assessment. The methodology should be able to take this aspect into account.

(e) **Risk:** The methodology should identify impacts that have low probability of occurrence but a high potential for damage and loss.

(t) **Depth of analysis:** The conclusions derived from the methodology should be able to providesufficient depth of analysis and instill confidence in the users, including the general public.

(g) **Alternative comparison:** It should provide a sufficiently detailed and complete comparison ofthevarious alternatives readily available for the project under study.

(h) **Public involvement:** The methodology should suggest a mechanism for public involvement in the interpretation of the impacts and their significance.

Impact Communication

(a) **Affected parties:** The methodology should provide a mechanism for linking impacts to specific effected geographical or social groups.

(b) **Setting description:** It should provide a description of the project setting to aid the users in developing an adequately comprehensive overall perspective.

(c) **Summary format:** It should provide the results of the impact analysis summarized in a format that will give the users, who range from the lay public to the decision makers, sufficient details to understand it and have confidence in its assessment.

(d) **Key issues:** It should provide a format for highlighting the key issues and impacts identified in theanalysis.
(e) **Compliance:** One of the most important factors in choosing a methodology is whether it is able tocomply with the terms of referel1Ce established by the controlling agency.

EIA Methods

List of Environment EIA Methods

The following are the important methodologies of utility for assessing the impacts of developmentalactivities on the environment.

1. Adhoc methods
2. Checklists methods
3. Matrices methods
4. Networks methods
5. Overlays methods
6. Environmental index using factor analysis
7. Cost/benefit analysis
8. Predictive or Simulation methods

Ad hoc Methods

Basically ad hoc methods indicatebroad areas of possible impacts by listing composite environmental parameters (for example flora and fauna) likely to be affected by any development.

Ad hoc methods involve assembling a team of specialists to identify impacts in their area of expertise. In this method, each environmental area, such as, air, and water, is taken separately and the nature of the impacts, such as, short-term or long term, reversible or irreversible are considered. Ad hoc methods are for rough assessment of total impact giving the broad areas of possible impacts and the general nature of these possible impacts. For example, the impacts on animal and plant life may be stated as significant but beneficial.

Impact assessment methodologies range from simple to complex and are also progressively changing from a static, piecemeal approach to the one that reflects the dynamism of nature and the environment. Consequently, the trend is away from mere listing of potential impacts towards more complex modes whereby the methodology can identify feedback paths, higher order impacts than merely those apparent, first order ones, and uncertainties. In short, the methodological trend is approaching an overall management perspective requiring different kinds of data different in formats and varying levels of expertise and technological inputs for correct interpretation. It is important to understand their drawbacks in order to determine which of the methods are most appropriate.

An evaluation of various methodologies is presented in Table 1.

Summary of current EIA methodology evaluation.

Criteria	Check lists	Over-lay	Net-work	Matrix	Environ-mental index	Cost/ benefit analysis	Simulation modeling workshop
1. Comprehensiveness	S	N	L	S	S	S	L
2. Communicability	L	L	S	L	S	L	L
3. Flexibility	L	S	L	L	S	S	L
4. Objectivity	N	S	S	L	L	L	S
5. Aggregation	N	S	N	N	S	S	N
6. Replicability	S	L	S	S	S	S	S
7. Multi-function	N	S	S	S	S	S	S
8. Uncertainty	N	N	N	N	N	N	S
9. Space-dimension	N	L	N	N	S	N	S
10. Time-dimension	S	N	N	N	S	S	L
11. Data requirement	L	N	S	S	S	S	N
12. Summary format	L	S	S	L	S	L	L
13. Alternative comparison	S	L	L	L	L	L	L
14. Time requirement	L	N	S	S	S	S	N
15. Manpower requirement	L	S	S	S	S	S	N
16. Economy	L	L	L	L	L	L	N

Legend : L = Completely fulfilled, or low resource need.

S = Partially fulfilled, or moderate resource need.

N = Negligibly fulfilled, or high resource need.

Table -1

1. Wildlife
2. Endangered species
3. Natural vegetation
4. Exotic vegetation.
5. Grazing.
6. Social characteristics
7. Natural drainage
8. Groundwater
9. Noise
10. Air Quality
11. Visual description and services
12. Open space
13. Health and safety
14. Economic values
15. Public facilities

The ad hoc methods, while being very simple can be performed without any training, merely present the pertinent information of a project's effects on the environment without any sort of relative weighting or any cause-effect relationship. It provides minimal guidance for impact analysis while suggesting broad areas of possible impacts. It does not even state the actual impacts on specific parameters that will be affected

The ad hoc method has the following drawbacks:

(a) It gives no assurance that it encompasses a comprehensive set of all relevant impacts;

(b) It lacks consistency in analysis as it may select different criteria to evaluate different groups offactors; and.

(c) It is inherently inefficient as it requires a considerable effort to identify and assemble anappropriate panel for each assessment.

As the expert judgement in assessing the primary impacts is done in an ad hoc manner it cannot be replicated making it to review or analyse the conclusions in EIA. As considerable amount of information about the social, economic, biological and physical environment are to be collected and analysed in EIA of any project activity ad hoc methods fail to do this in any meaningful way.

Because of the above drawbacks, it is not recommended as a method for impact analysis. It is after all ad hoc method and has utility only when other methods cannot be used for lack of expertise, resources and other necessities.

Checklist Methodologies

Checklist methodologies range from listings of environmental factors in highly structured approaches involving importance weightings for factors and application of scaling techniques for the impacts of each alternative on each factor. Checklists in generally strong in impact identification and are capable of bringing them to the attention and awareness of their audiences. Impact identification is the most fundamental function of an EIA and in this respect, all types of checklists, namely simple, descriptive, scaling and weighting checklists do equally well. Checklists are of four broad categories and represent one of the basic methodologies used in EIA. They are:

(a) Simple Checklists: that are a list of parameters without guidelines provided, how to interpret and measure an environmental parameter.

(b) Descriptive Checklists: that includes an identification of environmental parameter~ and guidelines on how parameter data are to be measured.

(c) Scaling Checklists: that is similar to descriptive checklist with the addition of information basis to subjective scaling or parameter values.

(d) Scaling Weighting Check Lists: are capable of quantifying impacts. "Simple checklists" represent lists of environmental factors. Which should be addressed however,No information is provided on specific data needs. Methods for measurement or impact prediction and assessment, "Descriptive checklists" refer to methodologies that include lists of environmental factors along with information on measurement and impact prediction and assessment. Scaling and weighting inherent in the latter types of checklists facilitates decision making such checklists. Apart from being strong in impact identification also incorporate the functions of impact measurement and to a certain degree of interpretation and evaluation, and it is those aspects that make them more amenable to decision- making analysis. But the impact of scaling and weighting is. Nevertheless, subjective and this poses the danger that society holds all diverse impacts to be equally important. Furtherit implicitly assumes that numerical values assigned to impacts can be derived on the basis of expel1 knowledge and

judgement alone. Scaling and weighting checklists, while capable of quantifying impacts reasonably well, albeit using subjective estimates make no provision for assessing dynamic probabilistic trends or for mitigation, enhancement and monitoring programmes. Identification of higher order effects, impacts and interactions are outside their scope. But simple and descriptive checklists offer no more than this. They merely identify the possible potential impacts without any sort of rating as to their relative magnitudes.

Methods that involve scaling and weighting and the consequent aggregation remove decision making from the hands of decision makers. Further they incorporate into one number various intrinsically different impacts and this deprives the decision maker of the possibility of tradeoffs.

In check lists methods impacts will be tabulated in the form of cells with information either in the descriptive form which give information of the possibility or potential existence of an impact while in the scaling or weighing methods the magnitude or importance of the impact as shown in Table 2.

Simple Checklists

Simple checklists represent a valid approach for providing systemization to an EIS and Table 2 presents a list of environmental factors to be considered in construction and operational phases. The checklist also includes information on mitigation.

Descriptive Checklists

Descriptive checklists are widely used in environmental impact studies. The methodology addresses the following issues actions and projects: riprap placement. Bulkheads; groins and jetties; piers, dolphins, mooring piles and ramp construction; dredging (new and maintenance) outfalls, submerged lines and pipes; and aerial crossings. For each of the items, environmental impact information was provided on potential changes in erosion, sedimentation and deposition; flood heights and drift; water quality; ecology; air quality; noise; safety and navigation; recreation; aesthetics; and socio-economics. Several descriptive checklists have been developed for water resources projects. For example. Canter and Hill suggested a list of about 65 environmental factors related to the environmental quality account used for project evaluation in the United States. For each factor information is included on its definition and measurement, prediction of impacts, and functional curves for data interpretation (whereone was available or easily developed).

The basis for estimates column presents a simplified, brief listing of key data models needed, if any for the factor.

Important Characteristics of Simple and Descriptive Checklists

I. Simple and descriptive checklists consider environmental factors and/or impacts, which can be helpful in planning and conducting an EIS, particularly if one or more checklists for the specific project type can be utilized.

2. Published agency checklists and/or project specific checklists represent the collective professional knowledge and judgement of their developers; hence, theyhave professional credibility and usability.

3. Checklists provide a structured approach for identifying key impacts andor pertinent environmental factors for consideration in impact studies. More-extensive lists of factors of impacts do not necessarily represent better lists, since relevant factors or impacts will need to be selected. Checklists can be easily modified (items can be added or deleted) to make them more pertinent to particular project types in given locations.

4. Checklists can be used to stimulate or facilitate interdisciplinary team discussions during the planning conduction, andor summarization of EISs.

5. In using a checklist it is important to carefully define the utilized spatial boundaries and environmental factors. Any special impact codes or terminology used within the checklist should also be defined.

6. Documentation of the rationale basics to identifying key factors andor impacts should be accomplished. Inthis regard. Factor-impact quantification and comparison to pertinent standards can behelpful.

7. Factors andor impacts from a simple or descriptive checklist can be grouped together to demonstrate secondary and tertiary impacts and or environmental system interrelationships.
8. Important weights could be assigned to key environmental factors or impacts; the rationale and methodology for such importance weight assignments should be clearly delineated.
9. Key impacts, which should be mitigated, can be identified through the systematic usage of a simpleor descriptive checklist.

Scaling Checklists

Simple and descriptive checklists in general are strong in impact identification and are capable of bringing them to the attention and awareness of their audiences. Impact identification is the most fundamental function of an EIA and in this respect; all types of checklists simple descriptive scaling and weighting checklists do well. But simple and descriptive checklists offer no more than this. They merely identify the possible potential impacts without any sort of rating as to their relative magnitudes. As a result they are most applicable at the IEE stage of an assessment. The Oregon Scaling Check- list methods go a step further and provide an idea of the nature of the impact by means of assigning a textual rating of the impact as long- term direct and so on. Nevertheless this approach is not suitable for impact measurement and does not aid much in the decision - making process. Rather it identifies the impacts and leaves the interpretation to the decision makers. The element of scaling and weighting that is inherent in the latter types of checklists makes it easier for decision - making. Such checklists, apart from being strong in impact identification, also incorporate the functions of impact measurement and to a certain degree those of interpretation and evaluation and it is these aspects that make them more amenable for decision - making analysis. Scaling and weighting checklists, while capable of quantifying impactsreasonably well. Albeit using subjective estimates, make no provision for assessing dynamic probabilistic trends or for mitigation. Enhancement and monitoring programmes, Identification of higher order effects, impacts and interactions are outside their scope.
Methods that involve scaling and weighting and the consequent aggregation remove decision-making from the hands of decision-makers. Further they incorporate into one number various intrinsically different impacts and this deprives the decision - maker of the possibility of trade-offs.

Weighting and Scaling Checklist Methods
As descriptive checklists cannot rank various alternatives various methods were developed for electing alternatives based on the following criteria
I. Appropriate set of environmental factors which are likely to be significant for the activity for which EIA has to be carried out are to be fixed for example, wild life, habitat etc) :
2. The units of measurement for each factor (e.g., hectares conserved) have to be determined
3. Data on a fixed unit (100 or 1000 hectares) with reference to various sets of environmental factors have to be collected
4. The interval scale (0-0.1) for each environmental factor has to be fixed and the data is converted into environmental factor index by normalizing the scale over maximum and minimum values and determining weight of each environmental factor.

5. Establish the method of aggregation across all the factors established.

The following example where two factors (Wild life habitat in hectares and employment increase in jobs) for two alternatives are considered will explain how scaling weighing method can be applied. In

this example the environmental factor data has been scaled to an index (0 is worst and I is best) Scaling was done by dividing the factor data by maximum values for both alternatives. Two aggregation methods were followed:

(a) Assuming all factors is equally weighted following simple addition indicates alternative 2 should be preferred.

In weighing scale weights of 0.8 for employment and 0.2 on wild life make first alternative preferable

Matrix Methods General

Characteristics

In matrix methods interactions between various activities and environmental parameters will be identified and evaluated. Matrix methods are basically generalized checklists where one dimension of a matrix is a list of environmental social and economic factors likely to be affected by a project activity. The other dimension is a list of actions associated with development. These relate to both the construction and operational phases. Making cells representing a likely impact resulting from the interaction of a facet of the development with an environmental feature identifies impacts. With some matrices qualitative representation of impact importance and magnitude are inserted in individual cells.

Matrices provide cause-effect relationships between the various project activities and their impacts on the numerous environmentally important sectors or components. Matrices provide a graphic tool for display impacts to their audience in a manner that can be easily comprehended.

Simple matrices, though able to identify first order effects, cannot show higher interactive effects between impacts. Simple, interaction matrices largely overcome this limitation. But such matrices are generally useful for depicting ecological interactions only for the sake of documentation. While the scale of the interaction is identified, individual actions of the project are not correlated with the resulting impacts on the environmental components.

The most serious criticism of such weighting matrices, which can also be extended to scaling and weighting checklists, is that

(a) They require large amount of information about the environmental components and projectactivities

(b) Through the inherent aggregation process, decision-making is, in effect, removed from the hands of the decision - makers and the public concerned. A great deal of information that is valuable to decision-making is lost in the conversion to number.

(c) Weights are assigned to environmental components and consequently to impacts without any guarantee that such weights and rating will represent the actual impacts that will be apparent once the project is implemented and operational; what is generally called an objective procedure the assignment of weights and the subsequent quantification is in fact an arbitrary assignment of scales of "environmental quality" based on the value judgment of "experts".

(d) Aggregation of numerical impacts through suitable transformation functions results in the combination of inherently different items into a single index or number and leads to loss of

information about the various impacts from the numerous project actions, thereby precluding the possibility oftradeoffs by the decision makers.

Matrices are strong in identifying impacts and unlike checklists. can also represent higher order effects and interaction. Some of the dynamic nature of impacts can also be identified. They can also provide the functions of impact measurement interpretation and evaluation, and can communicate the results in an easily understandable format to their audiences. But they cannot compare alternatives in a single format, and different alternatives need to be assessed and presented separately. The purpose of a matrix is to help the project planner to

I. Identify specific sources of potential environmental impact

2. Provide means of comparing the predicted environmental impacts of the various project options available

3. Communicate in graphic form the

(i) Potentially significant adverse environmental impact for which a design solution has been identified

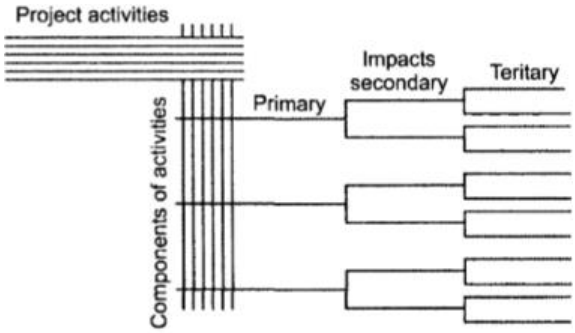
(ii) Adverse environmental impact that is potentially significant but about which insufficient information has been obtained to make a reliable predication

(iii) Residual and significant adverse environmental impact and

(iv) Significant environmental impact

Network Methods

Networks are capable of identifying direct and indirect impacts, higher order effects and interactions between impacts, and hence are able to identify and incorporate mitigation and management measures into the planning stages of a project. They are suitable for expressing ecological impacts but of lesser utility in considering social, human and aesthetic aspects. This is because weightings and ratings of impacts are not features of network analysis. Development of network diagrams Fig. 1 present the potential impact pathways as casual chains will be very useful for displaying first ,secondary, tertiary and higher order impacts.



Conceptual model of impact networks.

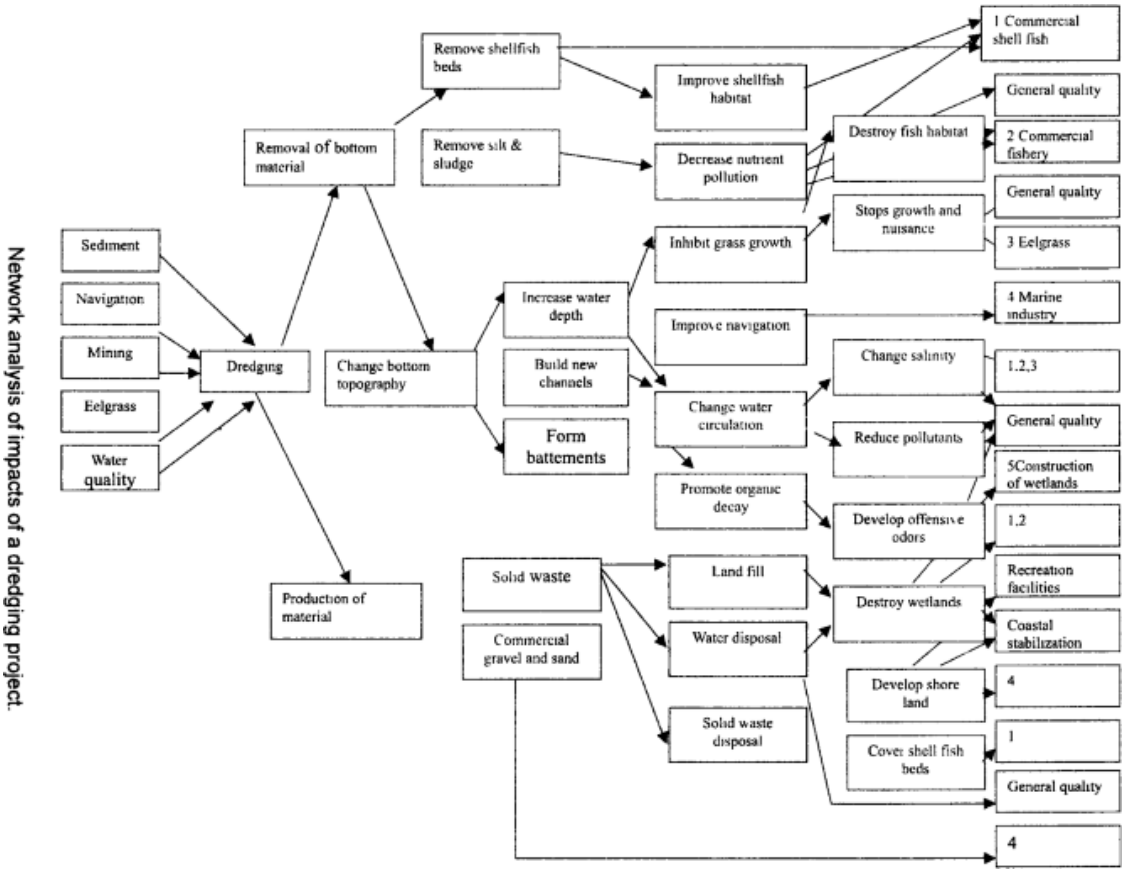
To develop a network a series of questions related to each project activity (such as what are the primary impact areas, the primary impacts within these areas the secondary impact areas the secondary impacts within these areas and so on) must be answered. In developing network diagram the first step 'is to identify the first order changes in environmental components. The secondary changes in other environmental components that will result from first order changes will be then identified. In turn third order changes resulting from secondary changes will be then identified. This process will be continued until the network diagram is completed to the experts' satisfaction. Network analyses are particularly useful for understanding the relationship between environmental components that produce higher order impacts, which are often overlooked in some major projects. Networks can also aid in organizing the discussion of anticipated project impacts. Network displays are useful in communicating information about an environmental impact study to an interested public

Stepped Matrix Technique for Networks

This technique developed by Sorenson (1971) was applied to Nong Pia Reservoir Fig. 2

Altered Element	Development Phase	Initial Condition	Changes	Final
PHYSICAL RESOURCE surface water hydrology	★ □	more water storage	more nutrient enrichment	disturbed aquatic habitat
		loss water flow	more salinity	disturbed coastal zone characterstics
Surface water quality	☆ □	more phosphate	more nutrient enrichment	more productivity
		more pesticides and fertilizer utilization	more residual pollution	more toxic accumulation in food chain
Ground water hydrology				
Ground water quality				
Soils	□	floaded area		loss of agriculture
		intensive land use	Soil loss	loss of soil fertility
Geology/seismology				
Erosion sedimentation	□	more sedimentation trapping	less storage capacity dam	less dam life
	□	more bank erosion	more turbility	less water quality
Climate	□	Changed relative humidity	changed microclimate	changed rainfall
ECOLOGICAL RESOURCE Fisheries	☆	more productivity	more job opportunity	more income
	□	less fish migration	less fish populator	more income
Aquatic biology	□	loss riverins habitat	less species in reservoir	less species diversity
	□	less nutrient	less primary productivity	less aquatic population
Terrestrial wildlife				
Forest	□	loss of decidious forest		change in climate
HUMAN USE VALUE agriculture Irrigation	□	loss of agricultural area		less job opportunity
	☆	more irrigated water		more crop production
Aquaculture	☆	more job opportunity	more income	more standard in life
Water supply	★ ★	more water supply	more consumption	good public health
Navigation				
Power				
Recreation	★	more recreation resources	more tourism development	more job opportunity
Flood control	☆ ★	reduce flood hazard		reduce flood damage
Dedicated area use				
Industry	☆ ★	more industrial water supply	more industrial development	more income
Agro-industry	☆ ★	more industrial water supply	more industrial development	more income
Mineral development				
Highway/railways	★ ★	more road network	more communication	better social economics
Land use	□	less agriculture	less product	less income
	☆	more agriculture	more production	more income
QUALITY OF LIFE VALUE Socio-economics	★ ☆	more income	better standard of living	better social welfare
Resettlement	□	more emigration	more social instability	more social problems
Cultural/Historical				
Aesthetic				
Archeological				
Public health	□	more mosquito breeding ground	more haemomagic malaria fever	worse public health
	★	all-year-round water supply	more water consumption	better public health
Nutrition	☆	more protein source	better nutrient status	better health
	☆	more purchasing power for fond		better health

Stepped matrix for Nong Pla reservoir.



The primary limitation of the network approach is the minimal information provided on the technicalaspects of impact prediction and the means for comparatively evaluating the impacts of alternatives. In

addition, networks can become very visually complicated. Networks generally consider only adverse impacts on the environment and hence decision making in terms of the cost and benefit of a development project to a region is not feasible by network analysis. Temporal considerations are not properly accounted for and short term and long term impacts are not differentiated to the extent required for an easy understanding. While networks can incorporate several alternatives into their format, the display becomes very large and hence unwieldy when large regional plans are being considered. Further, networks are capable of presenting scientific and factual information, but provide no avenue for public participation.

Overlay Methods

Overlay methods involve preparation of a set of transparent maps, which represent the spatial distribution of an environmental characteristic (e.g., Extent of dense forest area). Information on wide range of variables will be collected for standard geographical units within the study area which will be recorded on series of maps typically one for each variable. These maps will be overlaid to produce a composite Fig below. The resulting composite maps characterize the area's physical, social ecological,land use and other relevant characteristics relative to the location of the proposed development. To evaluate the degree of associated impacts many project alternatives can be located on the final map and validity of the assessment will be related to the type and number of parameters chosen. Normally to have some clarity the number of parameters that can be overlayed in a transparency map is limited to 10. These methods are widely used for assessing visually the changes inthe landscape before and after the activity. Secondly it can be used for preparing combined mapping with an analysis of sensitive areas or ecological carrying capacity. As these methods are spatially oriented they can very clearly show the spatial aspects of cumulative impacts

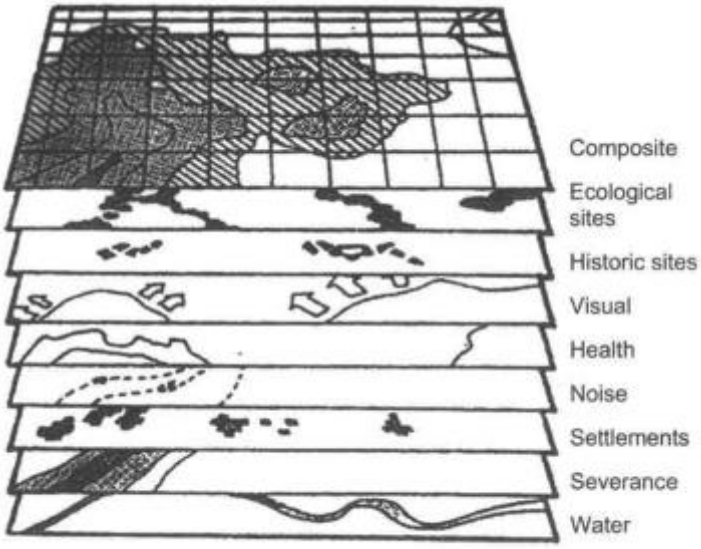
Overlays are very subjective in that they rely on the judgement of the analyst to evaluate and assess questions on compatibility relating to the existing land use patterns and the prospects of the development activity. In practice, overlays are self-limiting because there is a practical limit on the number of transparencies that can be overlaid.

Overlays are useful when addressing questions of site and route selection. They provide a suitable and effective mode of presentation and display to their audiences. But overlay analysis cannot be the sole criterion for environmental impact assessment.

There is no provision for quantification and measurement ofthe impacts nor is it assured that all impacts will be covered. The considerations in overlay analysis are purely spatial, temporal considerations being outside its scope. Social, human and economic aspects are not accorded any consideration. Further, higher order impacts cannot be identified. The methodologies rely on a set of maps of environmental characteristics (physical, social,ecological, aesthetic) for a project area. These maps are overlaid to produce a composite characterization of the regional environment. Impacts are identified by noting the impacted environmental characteristics lying within the project boundaries.

The approach seems most useful as a method of screening alternative project sites or routes, before detailed impact analysis.

Overlays can be useful for industrial EIA of any project for comparing land capabilities existing and projected land uses, road route alternatives and other under parameters, and alternative levels of air quality conditions along with pollution control.



Presentation of array of variables in overlay method.

The overlay approach is generally effective for selecting alternatives and identifying certain types of impacts; however, it cannot be used to quantify impacts to identify secondary and tertiary interrelationships.

UNIT 3

UNIT III ENVIRONMENTAL MANAGEMENT PLAN

Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna – Environmental Monitoring Plan – EIA Report Preparation – Review of EIA Reports – Public Hearing - Environmental Clearance Post Project Monitoring

ENVIRONMENTAL IMPACTS AND THEIR MITIGATION

Introduction

In this section environmental impacts related to construction and the operational phase of the Project are discussed and remedial measures proposed. Options for impact mitigation during detailed design are also indicated. Distinction will be made between significant positive and negative impacts, direct and indirect impacts, temporary and long-term impacts. Where possible, expected impacts will be described quantitatively and indications made on their geographical extent, the size of the affected population, the magnitude and complexity, probability, duration, frequency and reversibility of the impact.

Impacts on Ambient Air Quality and their Mitigation :

Impacts on ambient air quality will occur during the construction and the operational phase of the Project: During construction dust development will occur as an immediate result of clearance operations, site preparation, and the movement of heavy construction equipment. The operation of heavy machinery will adversely affect air quality through the emission of air pollutants. This impact would affect the workforce, the personnel attached to the DWC Store adjacent to the site, and the Mandir. The effect of construction-related dust development and air pollution will be short time and local. As regards human settlements the level and thus significance of such impact can most effectively be reduced by generally avoiding haulage of materials through narrow village roads. Where this cannot be totally avoided another effective mitigation measure would be to require contractors to regularly water haul routes in sensitive sections during dry periods. The potential impact of air and dust pollution on both the workforce and local residents can best be minimized at source by proper maintenance and handling of construction equipment and by providing appropriate protective working gear (masks, goggles etc.) as required. During the “Operation” Phase, impacts on air quality will be due to human activities of a domestic nature and to movement of private vehicles – in particular cars – within the Housing Estate. Given the size of the development, such impacts are estimated to be insignificant.

Impacts on Soils and their Mitigation:

The most significant impact on soils will be the permanent and irreversible loss of land due to the construction of the Housing Estate. Additional areas will be impaired through compaction due to the movement of heavy vehicles and equipment- which areas will eventually be constructed upon to provide for accesses within the property. In the context of the Project the net loss of soils cannot be avoided, but the scale of the overall impact will be minimized as follows: The topsoil will be removed

from the working EIA NHDC Project Cap Malheureux Feb 2011 VI – 2 area during the early stages of site preparation and be temporarily stockpiled at suitable locations. Later on the top soil will be reused in landscaping works. The cost for this measure will be made a separately priced item in the BoQ to secure implementation. The Supervising Engineer shall ensure that the Contractor complies strictly with the requirements of the works contract concerning this issue.

Impacts on Geomorphology and their Mitigation :

The impact of the Project on the natural relief will be permanent and irreversible but restricted to the project site. The scale of the physical and visual impact can be effectively mitigated through appropriate landscaping measures within the property. It may also be noted that the degree of the visual impact(s) is memory and time related. Viewed from this angle, it may also be said that such visual impacts are, in fact, temporal.

Impacts on Water Resources and their Mitigation:

As already mentioned earlier, there are no natural watercourses either crossing the project site or in the nearby vicinity. Consequently, the project will not have any significant impact on the quality of any surface waters. Further, since all wastewaters will be treated through a STP and treated to the tertiary level for use as irrigation water for lawns and other landscaping works, the quality of groundwater will not be impacted upon.

Impacts on Terrestrial Flora and Fauna and their Mitigation:

It can safely be concluded that the project is not going to have any negative impact on the biological environment On the contrary, since the built up area will cover only 19% of the area of the site, the project will provide good opportunities to planting native plants and to enhancing habitats for birds and reptiles.

Noise Impacts and Their Mitigation:

Construction noise is often explained as sound that is unwanted by the listener. Sound, pressure and noise are measured in units of decibel (dB) using a logarithmic scale. If a sound is increased by 10 dB, it is perceived as a doubling in loudness. Changes in a sound by 3 dB(A)2 is barely perceptible to the human ear. Noise is said to cause more off-site complaints than any other topic. Construction activities causing the greatest noise problems are: piling, use of pneumatic tools, demolition, earthmoving; scabbling (roughening of concrete surfaces); concrete pours; blasting and maintenance works. 2 The unit dBA means that the measured level is in decibels and that it has been passed through a filter so that it represents a level of noise that is very close to what can be perceived by the human ear EIA NHDC Project Cap Malheureux Feb 2011 VI - 3 Excessive noise levels on site represent a major hazard to site workers. If people need to shout to make themselves heard over background noise from a site, background noise is likely to be about 75 – 80 dBA. Continued exposure to noise levels of 90 dBA can permanently damage hearing. Sudden or continuous noise early in the morning or late at night, on rest days or holidays etc. is a frequent reason for complaints by local residents. Construction noise problems on site may be most effectively minimized by reducing the level of noise generated at source, e.g. proper site management and construction methods, plant used and screening. Where sensitive receptors like residential areas exist in the

vicinity of the site, construction may be limited to the daytime period where less restrictive noise standards apply (i.e. 60 dBA from 07:00 to 18:00 hours).

Impacts on Landscape and Their Mitigation:

The impact of the Project on the landscape will be permanent and irreversible, but restricted to the project site. The scale of the physical and visual impact can be effectively mitigated through appropriate landscaping measures within the property. Further, as already mentioned under paragraph 7.4 above, the degree of the visual impact(s) is memory and time related. Viewed from this angle, it may also be said that such visual impacts are, in fact, temporal.

Impacts on Road Safety and Their Mitigation:

During construction road safety may be impaired through the temporary movement of heavy machinery, bad visibility, muddy, slippery roads etc. Such potential impacts would only be temporary, but may have significant adverse effects at the local level. In general, such risks can be effectively mitigated through appropriate traffic management, which would include the construction site and all temporary haul routes in- and outside the built-up areas. To this regard the specifications should require the contractor to provide a method statement on how he intends to achieve and effectively maintain road safety throughout the construction process. These proposed measures will need to be approved by the Project Manager and will be monitored by the Supervising Engineer (SE). It may be noted that the site borders the Vingt Pieds Road (B45) to Cap Malheureux. In this neighbourhood, the traffic density is quite low. After the commissioning of the project, road safety can be maintained and improved by strictly monitoring compliance with traffic rules and speed limits. However, the scale of the development is such that road safety will not be unduly affected by the proposed development. EIA NHDC Project Cap Malheureux Feb 2011 VI - 4

Beneficial Impacts:

As already mentioned under Section 3 above, the implementation of the proposed project is in line with Government Policy to provide a roof for everyone. The “Do Nothing” Scenario would be against such policy, and, obviously, to the detriment of the country. Since the middle-income group is targeted, the project will result in job creation. Possible jobs will concern housemaids, gardeners, and other artisans. People in the neighbouring village of Cap Malheureux, including fishermen, will certainly benefit from the project.

EIA Report Preparation

1. Introduction

Reporting is a critical stage in the EIA process because it presents the results of the evaluation, suggests mitigation techniques, and provides enough information to enable decision-making. The EIA Report is a collection of project components, including project details, environmental and social impact assessments, mitigation measures, and linked management and monitoring approaches. The information gathered is organized, and the findings of the investigations and consultations are summarized in the EIA report. The addressees of the EIA report are the sanctioning and executing

organizations, the project proponent, and the project affected people. The EIA report must be well-organized and clearly written due to its importance as a communication tool. An ideal EIA report must be complete, easily understandable, impartial, accurate, and written in simple language for nonprofessionals while also meeting the required technical standards. Though Environmental Impact Statement (EIS) and Environmental Statement (ES) are also used, 'ETA report' is the universal term. The basic goal, methodology, and structure of an EIA report are the same regardless of the title. The proponent is responsible for preparing the EIA report in accordance with the Terms of Reference (ToR) established during the scoping stage of the EIA process. EIA accurately predicts the harmful and unfavourable consequences of proposed actions, as well as their mitigation using well-defined methods.

2. EIA Reporting

The information to be included in an EIA report is generally detailed in a country's legislature, process, or guidelines, which may differ from one country to the next. The content of an EIA report is typically prepared in accordance with specific ToR established during the scoping stage. It may include additional issues/concerns and other concerns that have arisen as a result of the EIA study and must be addressed during the decision-making process. An EIA report typically includes the following sections:

A brief summary

• Statement of need and proposal objectives

• Policy, legislative, and regulatory frameworks

• Project implementation process description (construction, operation and decommissioning)

• Compilation of alternatives

• Project area description, including land-use and related policies and plans in the area

• Baseline and socioeconomic data, as well as identifying anticipated changes before project execution

• Evaluation of the public consultation/hearing process (opinions and concerns expressed by the stakeholders and the way these have been taken into account)

• Discussion of key positive and negative impacts identified as likely to be impacted by the project, including the degree of occurrence, scheduling, and mitigation measures.

If possible, assess the implications of outstanding impacts for each alternative.

• An Environmental Management Plan (EMP) with mitigation and monitoring recommendations

• Annotations (supportive technical data, data collection and analysis methods, references, etc.)

The best way to prepare an EIA report is to organize the data and interpret it in such a way that it provides justification for the recommended mitigation measures and changes in project execution. Terms of Reference guide the structure and interpretation of the EIA report (ToR). The guiding

principles of TORs differ depending on the funding agency and country; for example, the World Bank's ToR discusses the:

• Project description

• Project site

• Project alternatives (site, infrastructure, technologies)

• Prevailing environment and baseline data collection

• Determination of the probable impacts

• Analysis and estimation of risks

• Preparation of Environmental Management Plan

• Mitigation and Monitoring Plan

• Resettlement Action Plan (if relevant)

2.1. EIA Quality

An ideal EIA is believed to possess a well-defined structure with a logical sequence, which describes:
• Existing socioeconomic baseline conditions

• Predict the impacts (nature, extent and magnitude)

• Scope for mitigation

• Accepted mitigation measures

• Implication of inevitable impacts for each environmental concern

An ideal EIA must:

Prepare an executive summary.

At the beginning of the report, include a table of contents.

• Provide a description of consent procedures as well as how EIA supplements them.

Be succinct but thorough, with clearly defined goals.

• Be written in a balanced manner;

• Have a thorough understanding of development proposals; and

• Supplement the text with drawings, graphics, and pictures. Make use of a glossary and consistent terminology.

• Cites the information/sources used;•

• Clearly explains complex issues;

• Describes the methodology used to achieve each goal;

• Consistently covers all aspects of the environment;

• Documents the consultation process; Have an in-depth discussion of planned alternatives; and•

• Commit to mitigation and monitoring.

The assessment of EIA quality covers following parameters:

Site/ project description with:

• Photographs

• Layout maps

• Process flow diagrams of the manufacturing processes

• Material balance

• Environmentally sensitive receptors like water bodies

• Wetlands and estuaries

• Forests

• Wildlife sanctuaries national parks and biosphere reserves

• Human habitations, school and hospitals

• Archaeological and historical monuments

• Industrial setups

Consideration of alternative of sites/technology/ processes Methodology for collection of:

1. Primary baseline data for physical environment

2. Secondary data (reference, relevance, authenticity, period, ground validation).

3. Interpretation of data for categorizing environmental impacts and quantification, if required

4. Interpretation of ecological and social baseline conditions and assessment of potential impact and mitigation measures

5. Risks assessment and analysis of effects including an emergency plan

6. Environmental Management Plan and its supervision mechanism

7. Duly signed declaration of experts' clearly indicating their involvement in EIA preparation

8. Compliance to ToR and public hearing

2.2. Structure & Elements of EIA Report

This Final Environmental Impact Assessment Report describes the Environmental Impact Assessment process that was undertaken for a proposed project. It contains information regarding the Project, the likely significant effect of the Project, the Baseline scenario, the proposed Alternatives, the features and Measures to mitigate adverse significant effects as well as a Non-Technical Summary and any additional information.

The EIA report is a keystone document. It assembles the information that assists:

- the proponent in managing the impacts of the proposal;
- the responsible authority in decision-making and condition setting; and
- the public in understanding the likely impacts of the proposal.

2.3. Qualities of a Good EIA Report

The main aim of an EIA Report is to provide prudent information for two types of audiences – decision-makers and people potentially affected by a Project. The Report, therefore, must communicate effectively with these audiences. The quality should reflect the following:

- A clear structure with a logical sequence that describes, for example, existing Baseline conditions, predicted impacts (nature, extent, and magnitude), the scope for mitigation, proposed Mitigation/Compensation Measures, the significance of unavoidable/residual impacts for each environmental factor;
- A table of contents at the beginning of the document;
- A description of the Development Consent procedure and how EIA fits within it;
- Reads as a single document with appropriate cross-referencing; Is concise, comprehensive and objective;
- Is written in an impartial manner without bias;
- Includes a full description and comparison of the Alternatives studied;
- Makes effective use of diagrams, illustrations, photographs, and other• graphics to support the text;
- Uses consistent terminology with a glossary;
- References all information sources used;
- Has a clear explanation of complex issues;
- Contains a good description of the methods used for the studies of each environmental factor; •
- Covers each environmental factor in a way which is proportionate to its importance;

- Provides evidence of effective consultations (if some consultations have already taken place) • •
- Provides a basis for effective consultations to come;
- Makes a commitment to mitigation (with a program) and to monitoring;
- Contains a Non-Technical Summary which does not contain technical jargon;
- Contains, where relevant, a reference list detailing the sources used for the• description and assessments included in the report.

2.4. Structure & elements of EIA report includes following sections:

Section I (Introductory): The title of the report, list of contents, organization(s) accountable for the study, preferably with a list of key investigator(s)/consultant(s) and their institutional affiliation are all included in this section of EIA reports.

Section II (Executive Summary): Section II (Executive Summary): The executive summary is a concise account of key findings and recommendations. The emphasis must be on the critical information that can aid in decision making. The executive summary is brief, no more than 7 to 8 pages. Typically, the executive summary is the only part of the report that most people and decision makers read. The language of the executive summary is simple because it is intended to be distributed as an information brochure among stakeholders and project affected individuals; thus, an executive summary includes:

- Project planning blueprint;
- EIA Terms of Reference;
- The outcome of the public hearing;
- Alternatives have been considered;
- The project's key impacts and their significance;
- A summary of the proposed mitigation measures;
- An executive summary of the Environmental Management Plan; and
- Any other critical issues that may support in the decision-making process.

Section III (Need and Goal of the Proposal): The EIA is a well-defined and distinct statement that explains the need and goals of the proposal. Typically, the project's need is supported by a reference to relevant policies and plans. The proposal outlines the anticipated benefits of the project's activities.

Section IV (Legal and Policy Foundation):

This section of the EIA briefly describes the proposal's legal and policy framework. Other requirements or concerns are mentioned in conjunction with related aspects of the EIA procedure.

This section summarizes the EIA's Terms of Reference, elaborating on the reasons for any deviations from them. This section of the report may include a copy of the TOR.

Section V (Project Explanation and Alternates): This section of the EIA describes the elements and main activities that will take place during the project's construction, operation, and decommissioning phases. This section highlights the key differences between the alternatives, including the no-action alternative, as well as information on:

• The project's location (on-site and off-site topographies)

• Access to roads, power, and water

• Pattern of resource utilization, raw material inputs, and emission and waste releases;

• Operational characteristics, processes, and products;

• The relationship between the proposal's technical, socioeconomic, and environmental aspects;

• Evaluation of alternatives and options for size, location, technology to be used, design, energy sources, and raw material source.

This data is useful for assessing the impact and forecasting mitigation measures. This information is supplemented with appropriate maps, flow charts, and visual illustrations.

Section VI (Description of the Affected Environment):

In this section of the report, you will find brief information about:

• Field research and laboratory systems (biophysical and socioeconomic settings)

• Baseline data (socioeconomic background) with anticipated changes prior to the project

• Pre-existing land-use pattern

• Current policies and plans

• The main trends and the expected future situation

• Eco-sensitive areas and abundant resources

Section VI (Description of affected environment):

This section of report contains brief information of:

• Field investigations and laboratory systems (biophysical and socioeconomic settings)

• Baseline information (socioeconomic background) with anticipated modifications before the project

• Existing land utilization pattern

• Prevailing policies and plans

• Main tendencies and expected future situation

• Eco-sensitive areas and resource wealth

Field investigations and laboratory systems: Implementation of the methodologies developed are assessed with respect to:

a. Physical Environment

- Participation of ECs/FAEs in sampling protocols
- Data quality assurance while collecting, storing, and transporting samples
- Interpretation of data
- Baseline data specifics (name, address of laboratory, analysts, type of• sample; duration/dates of analysis, analytical method used; number of samples analysed)

b. **Ecological Environment**

• Participation of concerned ECs/FAEs in field investigation; use of field• equipment; observations recorded in field log book for primary data collection and confirmation of secondary data

• Data quality assurance for seasonality, timing, and duration, as well as• species identification

• Laboratory testing of field samples (data interpretation in terms of impact on• biological receptors (rare/threatened/endangered/endemic species and their habitat).

c. **Socioeconomic Environment**

• The procedure used to collect primary data on socioeconomic aspects,• including the type of data collected

- Involvement of relevant FAEs in scope planning for field-based socioeconomic surveys, design of questionnaire/interview schedules, and field log book maintenance
- Quality control (standardization of the methodology, sampling, etc.)

Section VII (Public Hearing and comments):

One of the most important components of an EIA report is a brief but comprehensive statement of the nature, scope, and outcome of the public hearing process. This section of the report includes the following points:

• Identification of key stakeholders and individuals who are likely to be impacted;

• Methodology chosen for conducting stakeholder analysis;

• Evaluation of communicated opinions and concerns

- Procedure for dealing with expressed opinions and concerns;

And

- Unresolved concerns and unresolved issues

Section VIII (Assessment of Environmental Impacts):

This section of the EIA report evaluates the likely positive and negative impacts of both the proposal and its alternates for each environmental component identified in the ToR. Impact is defined in terms of degree, severity, frequency, duration, and so on. The residual effects that cannot be mitigated are also clearly specified. This section contains the following information:

- Projection of major impact, its characteristics, and likely consequences;
- Discussion of their agreement with environmental standards and policy objectives.

- Methods for escaping, reducing, and mitigating the impact;
- determining the magnitude of residual effects; and
- Limitations associated with impact estimation and assessment, as specified by assumptions made, gaps in information, and doubts encountered.

The section describes the methodological framework used to collect the data, the predictive methods, and the standards used to evaluate the outcome. This data is typically tabulated for the benefit of the reader and stakeholders.

Section IX (Comparative evaluation of alternatives):

In this section, the proposal is thoroughly compared to the alternatives, and the methods for scrutinizing are also specified. The eco-friendly preferred options are identified and quantified, as well as the purpose for using them. A comparative analysis is carried out with regard to:

- Both negative and positive effects;
- The efficacy of relief methods;
- A cost-benefit analysis
- Any other potential opportunities for community and environmental development.

Section X (Environmental Management Plan):

This section of the EIA report is 'action oriented,' summarizing the recommended mitigation measures. It also defines the mechanism for implementing the measures. An EMP is all about the activities that are planned to be undertaken to monitor and manage the impacts of a project during its implementation and operation. The strategy entails:

- Suggestions for mitigating measures;
- Liabilities for EMP execution;
- The assumed activities' timetable;
- Keeping track of the schedule in relation to the goals;
- An Impact Management Plan to address anticipated changes;
- Emergency preparedness plans (if necessary); and
- Details of reporting, appraisal, and review processes The EMP plan includes• mandatory local institution reinforcement, capacity building, and training requirements for EMP implementation.

Section XI (Appendices):

This section contains information that technical professionals will need for reference or review. Appendices are typically used to include baseline data, technical information, and procedure accounts. These are necessary for a professional to understand the basis of an EIA report but may be unnecessary in the main text. The appendices may include: The appendices may include:

- Abbreviation list;
- Data and information sources
- A list of references used in the text
- A list of EIA team members and other contributors

Although an ideal report must be comprehensive, easily understandable, impartial, accurate, and consistent, it is extremely difficult to achieve due to certain constraints.

3. EIA Review Process

A review is the last quality check that an EIA report must pass in order to be approved. Once the EIA report is submitted, the designated authorities carefully review it, taking into account the methods used, data analyses, suggested measures, and conclusions drawn to assess the impacts of the proposed project. The review determines whether or not the project effectively addresses the major impacts and threats, as well as whether or not to grant project approval to the project proponent or to refer back for modifications/amendments (if any). In general, the review process suggests additional clarification on potential impacts, mitigation measures, or other phases, which not only improves the report's quality but also makes decision making more effective and transparent.

3.1. Purpose of EIA Review Process:

One of the most significant determining factors in the Environmental Clearance process is the calibre of the EIA report. There are a number of flaws in the EIA process, the most significant of which is the applicability, where there is misunderstanding regarding the exemption of projects with significant environmental impacts or the non-listing of certain activities in Schedule I of notification. Sometimes the committees formed to conduct EIA studies lack expertise, which can have an impact on the quality of the EIA report. In many cases, public opinion is not taken into account at an early stage, which frequently leads to conflict during clearance. Many projects with significant environmental and social implications are exempted from the mandatory public hearing process, which afterward becomes a source of contention.

It is critical that experts conducting EIA consider community traditional wisdom when suggesting mitigation measures, because this wisdom can be useful in achieving problem mitigation at the local level. Occasionally, due to a lack of authenticity, the consultants would either submit a fake EIA report or present cooked data that neither relates to the existing social and environmental conditions nor meets the criteria of an ideal report. The goal of the review is to validate the quality of the data and methods used in the EIA, as well as to ensure that the EIA report addresses all important mitigation measures. The main objectives of EIA review are to:

- Identify any issues that need to be fixed before the final submission of the• report.
- Determine whether the data is sufficient for decision making.
- Ensure that the public's input has been considered.
- Assess the suitability and quality of the EIA report

3.4. **Procedures for Evaluating EIA Reports**

As far as the review of EIA report is concerned, each nation has its own review process; however, the process may be internal or external. The internal review process is undertaken without formal guidelines by related government agency and thus lacks transparency. External review is undertaken by an independent body/ government agencies, with a formal, transparent procedure confirming high quality outcome.

The role of expertise is determined by environmental concerns and technical aspects of the proposal. Understanding public opinion is an important aspect of the review process. According to studies and experiences, public feedback is very important, which the review committee can gather by organizing a public consultation or inviting written comments from various stakeholders. This process not only ensures transparency, but it also validates the relevance of earlier public consultations held as part of the EIA process and contributes to the

evaluation of impacts. The outcomes of the public consultation process/written comments provide an overview of the issues discussed previously as well as sensitive concerns raised by the public during the consultation process. Thus, review is a double-checked procedure. However, the EIA report does not always meet the required standards, the most important of which are satisfactory, partially satisfactory, and unsatisfactory. The EIA, which identifies and mitigates the effects of development while also taking into account public participation and social implications, is thought to be of acceptable quality. The data and methodological approach used determine the report's quality. The EIA process that follows standard protocols and/or acceptable relevant standards usually meets the challenges of acceptability. The report's presentation is also a deciding factor in whether or not the report is acceptable. Sometimes the review committee/authority suggests some additions or deletions that, when incorporated into the final report, can make the report suitable. The EIA report, with a significant number of additions or deletions and an absence of proper redressal of public opinion and mitigation measures, is frequently only partially satisfactory. Such EIA reports require significant modifications, and the reviewing authority frequently enlists the necessary modifications, which, once incorporated, can make the report acceptable. The third category is the unsatisfactory report, which lacks proper data, is inadequately evaluated and presented, and is biased. Such reports are deemed unfit for consideration. Depending on the nature of the project, the review process is usually undertaken by a responsible authority, a government agency or committee, or an independent body.

The steps involved in the review process are:

The EIA is evaluated by an agency-formed multidisciplinary team/committee based on the nature of the project under consideration. Following the defined procedure, the team identifies flaws in the EIA report while keeping in mind the ToR, applicable rules/norms, criteria, and mechanism chosen for information gathering (based on standard protocols notified by national agencies/relevant authorities).

The MoEFCC in India developed a proper Accreditation Scheme to identify consultants capable of delivering a quality EIA report in order to improve the quality of EIA reports. As a result, in August 2007, the National Accreditation Board for Education and Training (NABET), a board of the Quality Council of India (QCI), launched a scheme. Later, in 2009, the MoEFCC issued an Office Memorandum for the preparation of EIA reports by Accredited Consultant Organizations (ACOs), and the Accreditation Scheme was made mandatory through a Gazette Notification dated March 3, 2016. NABET's 'Scheme for Accreditation of EIA Consultant Organizations' recognises the following basic requirements for EIA Consultant Organization:

- Qualification and technical knowhow of EIA Coordinators
- Prerequisites for field investigations and laboratory arrangement to confirm the quality of baseline data
- Adoption of quality management systems
- Provision of office facilities and other qualifying factors

The key persons involved in EIA reporting are:

- **EIA Coordinator**: EIA Coordinator (EC) must be well-conversant about the project and probable environmental, ecological and social impacts including the construction, operation and closure/ decommissioning stages which ensure the quality of EIA report.
- **Associate EIA Coordinator:** The EIA Coordinator is assisted by Associate EIA Coordinator and Functional Area Experts (FAEs).

• **Functional Area Experts:** The FAEs are expected to recognize and evaluate in their own areas of expertise the probable impacts of development activity and provide valuable feedback to the EC.

Re-accreditation (RA):

Following the principle of 'continual improvement', in Re-accreditation the stress is laid on the improvement recognized during the accreditation. The accreditation includes three steps:

• Application assessment process (for IA, SA, RA)
• Office assessment process
• Decision making process

The important outcomes of accreditation process are:

a. Accredited (when the applicant clears the assessment and accreditation processes successfully)
b. Not approved (when the AO/ACO fails to obtain 40 percent marks in assessment or does not fulfill any requirements of the scheme)
c. Cancellation (when an ACO does not justify the terms of certification or does not submit complete application)
d. Incomplete applications (when an AO submits an incomplete application and required details are not provided or these details do not meet the requirements of the scheme)

Post clearance monitoring:

Monitoring is an essential component for sustainability of any developmental project. It forms an integral part of any environmental assessment process. Monitoring of the project after its approval helps in verifying the outcome of the implemented mitigation measures and also to alter the mitigation measures in case of identification of problems.

Effectiveness of post clearance monitoring

We examined the effectiveness of post clearance mechanism of the approved projects through site verification, and examination of the compliances to the conditions as stipulated by SCZMAs as well as the clearances granted by MoEF&CC. Regional Offices of the MoEF&CC have been assigned the responsibilities for monitoring compliances to the conditions stipulated in the clearances. PPs are to submit half yearly compliance reports and annual environmental statements to the Regional Offices. SPCBs are to monitor the compliance to the conditions while granting ‘Consent to Establish/ Operate’. Our observations in this regard are given in succeeding paragraphs.

UNIT IV SOCIO ECONOMIC ASSESSMENT

Baseline monitoring of Socio economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental impacts – Cost benefit Analysis

The contingent valuation method (CVM) is used to estimate economic values for all kinds of ecosystem and environmental services. It can be used to estimate both use and non use values, and it is the most widely used method for estimating non-use values. It is also the most controversial of the non-market valuation methods.

The contingent valuation method involves directly asking people, in a survey, how much they would be willing to pay for specific environmental services. In some cases, people are asked for the amount of compensation they would be willing to accept to give up specific environmental services. It is called ¡¦contingent¡¦ valuation, because people are asked to state their willingness to pay, *contingent* on a specific hypothetical scenario and description of the environmental service.

The contingent valuation method is referred to as a ¡¦stated preference¡¦ method, because it asks people to directly state their values, rather than inferring values from actual choices, as the ¡¦revealed preference¡¦ methods do. The fact that CV is based on what people say they would do, as opposed to what people are observed to do, is the source of its greatest strengths and its greatest weaknesses.

Contingent valuation is one of the only ways to assign dollar values to non-use values of the environment¡¦values that do not involve market purchases and may not involve direct participation. These values are sometimes referred to as ¡¦passive use¡¦ values. They include everything from the basic life support functions associated with ecosystem health or biodiversity, to the enjoyment of a scenic vista or a wilderness experience, to appreciating the option to fish or bird watch in the future, or the right to bequest those options to your grandchildren. It also includes the value people place on simply knowing that giant pandas or whales exist.

It is clear that people are willing to pay for non-use, or passive use, environmental benefits. However, these benefits are likely to be implicitly treated as zero unless their dollar value is somehow estimated. So, how much are they worth? Since people do not reveal their willingness to pay for them through their purchases or by their behavior, the only option for estimating a value is by asking them questions.

However, the fact that the contingent valuation method is based on asking people questions, as opposed to observing their actual behavior, is the source of enormous controversy. The conceptual, empirical, and practical problems associated with developing dollar estimates of economic value on the basis of how people respond to hypothetical questions about hypothetical market situations are debated constantly in the economics literature. CV researchers are attempting to address these problems, but they are far from finished. Meanwhile, many economists, as well as many psychologists and sociologists, for many different reasons, do not believe the dollar estimates that result from CV are valid. More

importantly, many jurists and policy-makers will not accept the results of CV. Because of its controversial nature, users must be extremely cautious about spending money on CV studies and about using the results of CV studies.

This section continues with some example applications of the contingent valuation method, followed by a more complete technical description of the method and its advantages and limitations.

Hypothetical Scenario:
A remote site on public land provides important habitat for several species of wildlife. The management agency in charge of the area must decide whether to issue a lease for mining at the site. Thus, they must weigh the value of the mining lease against the wildlife habitat benefits that may be lost if the site is developed. Because the area is remote, few people actually visit it, or view the animals that rely on it for habitat. Therefore, non-use values are the largest component of the value for preserving the site.

Why Use the Contingent Valuation Method?
The contingent valuation method was selected in this case because of the importance of non-use values, and their potentially significant levels.

Alternative Approaches:
Since non-use values are significant, and few people actually visit the site, other methods, such as the travel cost method, will underestimate the benefits of preserving the site. In this case, contingent choice methods might also be used, depending on the questions that must be answered, and whether contingent choice question formats are more effective than standard contingent valuation questions. This would be decided in the survey development stage of the application.

Application of the Contingent Valuation Method:

Step 1:
The first step is to define the valuation problem. This would include determining exactly what services are being valued, and who the relevant population is. In this case, the resource to be valued is a specific site and the services it provides ¡¦ primarily wildlife habitat. Because it is federally owned public land, the relevant population would be all citizens of the U.S.

Step 2:
The second step is to make preliminary decisions about the survey itself, including whether it will be conducted by mail, phone or in person, how large the sample size will be, who will be surveyed, and other related questions. The answers will depend, among other things, on the importance of the valuation issue, the complexity of the question being asked, and the size of the budget.

In-person interviews are generally the most effective for complex questions, because it is often easier to explain the required background information to respondents in person, and people are more likely to complete a long survey when they are interviewed in person. In some cases, visual

aids such as videos or color photographs may be presented to help respondents understand the conditions of the scenario that they are being asked to value.

In-person interviews are generally the most expensive type of survey. However, mail surveys that follow procedures that aim to obtain high response rates can also be quite expensive. Mail and telephone surveys must be kept fairly short, or response rates are likely to drop dramatically. Telephone surveys may be less expensive, but it is often difficult to ask contingent valuation questions over the telephone, because of the amount of background information required.

In this hypothetical case, the researchers have decided to conduct a mail survey, because they want to survey a large sample, over a large geographical area, and are asking questions about a specific site and its benefits, which should be relatively easy to describe in writing in a relatively short survey.

Step 3:
The next step is the actual survey design. This is the most important and difficult part of the process, and may take six months or more to complete. It is accomplished in several steps. The survey design process usually starts with initial interviews and/or focus groups with the types of people who will be receiving the final survey, in this case the general public. In the initial focus groups, the researchers would ask general questions, including questions about peoples¡¦ understanding of the issues related to the site, whether they are familiar with the site and its wildlife, whether and how they value this site and the habitat services it provides.

In later focus groups, the questions would get more detailed and specific, to help develop specific questions for the survey, as well as decide what kind of background information is needed and how to present it. For example, people might need information on the location and characteristics of the site, the uniqueness of species that have important habitat there, and whether there are any substitute sites that provide similar habitat. The researchers would also want to learn about peoples¡¦ knowledge of mining and its impacts, and whether mining is a controversial use of the site. If people are opposed to mining, they may answer the valuation questions with this in mind, rather than expressing their value for the services of the site. At this stage, test different approaches to the valuation question and different payment mechanisms would be tested. Questions that can identify any ¡¦protest¡¦ bids or other answers that do not reveal peoples¡¦ values for the services of interest would also be developed and tested at this stage.

After a number of focus groups have been conducted, and the researchers have reached a point where they have an idea of how to provide background information, describe the hypothetical scenario, and ask the valuation question, they will start pre-testing the survey. Because the survey will be conducted by mail, it should be pretested with as little interaction with the researchers as possible. People would be asked to assume that they¡¦ve received the survey in the mail and to fill it out. Then the researchers would ask respondents about how they filled it out, and let them ask questions about anything they found confusing. Eventually, a mail pretest might be conducted. The researchers continue this process until they¡¦ve developed a survey that people seem to understand and answer in a way that makes sense and reveals their values for the services of the site.

Step 4:
The next step is the actual survey implementation. The first task is to select the survey sample. Ideally, the sample should be a randomly selected sample of the relevant population, using

standard statistical sampling methods. In the case of a mail survey, the researchers must obtain a mailing list of randomly sampled U.S. citizens. They would then use a standard repeat-mailing and reminder method, in order to get the greatest possible response rate for the survey. Telephone surveys are carried out in a similar way, with a certain number of calls to try to reach the selected respondents. In-person surveys may be conducted with random samples of respondents, or may use ¡¦convenience¡¦ samples ¡¦ asking people in public places to fill out the survey.

Step 5:
The final step is to compile, analyze and report the results. The data must be entered and analyzed using statistical techniques appropriate for the type of question. In the data analysis, the researchers also attempt to identify any responses that may not express the respondent¡¦s value for the services of the site. In addition, they can deal with possible non-response bias in a number of ways. The most conservative way is to assume that those who did not respond have zero value.

How Do We Use the Results?
From the analysis, the researchers can estimate the average value for an individual or household in the sample, and extrapolate this to the relevant population in order to calculate the total benefits from the site. For example, if they find that the mean willingness to pay is $.10 per capita, the total benefits to all citizens would be $26 million.

Baseline of environmental and social condition

The chapter incorporates the baseline data generated in the project site and secondary data collected from various Government and Semi-Governmental organizations. The details about the existing environmental values are presented in each section in the form of the maximum and minimum values at each location and indicating the duration of measurement. The area of the study covers 2 Km radius around the proposed site for flora and fauna assessment and 10 Km radius for the preparation of land use report. The existing environmental setting is considered to adjudge the baseline conditions which are described with respect to ambient air quality, water quality, ambient noise level, flora and fauna. An environmental baseline survey was conducted during the month of July 2020.

Methodology

The various environmental attributes were divided into primary and secondary studies. Primary attributes such as land environment, air environment, water, soil, biological environment were assessed by conducting field studies, on-site monitoring and secondary attributes such as land use studies, geology, hydrological characteristics, and socio-economic environment were assessed from literature review of previous studies and from various government publications. The primary filed studies and the collection of secondary attributes were completed.

The methodology for conducting the baseline environmental survey considered was as per the guidelines given in the Environmental Impact Assessment Guidance Manual for Building, Construction Projects (Give Proper Publication Name with Year). Baseline information with respect to air quality, noise level, water quality in the study area were collected by conducting primary sampling / field studies in July 2020.

Baseline status of the Biological environment was studied. The characteristics of study area with respect to the following environmental parameters were studied:

Primary Data Collection:

Noise and Vibration Level

Flora and Fauna

Surface water quality

Ambient air quality

Secondary Data Collection:

Social environment

Settlement social structure

Economic activity

Social infrastructure and public facilities

Land acquisition/ Involuntary resettlement

Historical and cultural heritage

Health, sanitation and hazard

Gender Natural Environment

Topography

Geology

Hydrology

Climate

I.Primary Data Collection

2.1. Noise Environment

The physical description of sound concerns its loudness as a function of frequency. Noise in general is sound, which is composed of many frequency components of various loudness, distributed over the audible frequency range. Various noise scales have been introduced to describe, in a single number, the response of an average human to a complex sound made up of various frequencies at different loudness levels. The most common and universally accepted scale is the “A” weighted Scale which is measured as dB (A). This is more suitable for audible range of 20 to 20,000 Hz. The scale has been designed to weigh various components of noise according to the response of a human ear. Noise monitoring has been undertaken for 24 hours at Southern side of Project Site near its Entrance. The main objective of noise monitoring in the study area was to establish the baseline

noise levels and assess the impact of the total noise generated by the activities associated with construction.

Method of Monitoring

Using hand held instruments Sound Pressure Level (SPL) measurements and the levels were measured and recorded for 1 second at each hour and this was taken for 24 hours continuously. The day noise levels have been monitored during 6 am to 10 pm and night levels during 10 pm to 6 am at all the sampling locations covered in the study area Observations of Ambient Noise Levels The noise levels in dB(A) Leq at various locations were observed to be in the range of 50.4 dB(A) to 53.1 dB(A). The noise levels were found within the permissible limits prescribed by NAAQ Standard.

Ambient Noise Levels Noise Level Min. Max. Leq (dB) Day 52.0 54.7 53.1 Night 47.3 52.7 50.4 2.2. Vibration Machineries used for the construction will vibrate. The level of vibration is a useful indication of the machine's condition. Poor balance, misalignment &loose structures will cause the vibration levels to increase, and it is a sure sign that maintenance is needed. Vibration instant reading was undertaken for 24 hours at the Southern side of Project Site near Entrance. The main objective of monitoring in the study area is to establish the baseline and assess the impact by the activities associated with construction. The existing site is vacant and far away from residential/commercial establishments.

The selection of monitoring location was noted considering the movement of vehicles and minor activities within the project site. Method of Monitoring Using handheld instruments the levels were measured at all locations, recording for 1 second at each hour was taken for 24 hours continuously.

Flora and Fauna

A rapid survey was done within the project site and outside the project site covering a distance of 2kms from the boundary of the site., This was done to evaluate the importance of the flora and fauna and the likely impacts once the project commences. The methodology followed was a detailed literature survey followed by rapid biodiversity survey. The literature survey covered the following: , Project details, reports, maps, and other documents prepared if any and Secondary data from similar project reports and published articles/ literature on land use, soil, geology, hydrology, climate, socioeconomic profiles, and other planning documents available from Government agencies and websites. objective of the study is to provide necessary information on floristic structure of the project area. The tree species, shrubs, herbs, climbers and grasses were documented during the study period. Faunal survey covers the Terrestrial Fauna, Avian Fauna and Aquatic Fauna. The survey was based on visual observation, enquiry with local population and records available. All the species observed were collected and identified with the help of local flora Gamble and Fischer 1915 - 1935; Matthew 1981 - 1983; Nair et al. 1983; Henry et al. 1989). For all plant species documented, the binominal and author citation have been checked with International Plant Name Index (IPNI). Flowering and fruiting phenology were monitored, and life forms were also categorized simultaneously according to their habitats. Based on the result of the survey, the documentation included identification of endangered and rare species as per Red Book. Both direct and indirect observation methods were used to survey the fauna. Visual encounter method was employed to record vertebrate species. Additionally, survey of relevant literature was also done to consolidate the list of vertebrate fauna distributed in the area (Ali and Ripley 1983, Daniel 1983, Prater 1993, Murthy and Chandrasekhar1988). Point counts were adopted to record bird species in early morning

and at evening. For point count, counts had been made within fixed time period using a pair of binoculars. Any birds presented within observable distance along the project site were recorded and identified. Identification was also made from bird calls. Since birds may be considered as indicators for monitoring and understanding human impacts on ecological systems. Based on the Wildlife Protection Act, 1972 species identified will be short-listed as Schedule II or I. Butterflies surveys had been conducted during morning and daytime when these insects are active. Point count method was followed, counts had been made within fixed time period. Any butterflies observed along the project site were identified by naked eyes. A pair of binoculars had been used for assisting / species identification when necessary. Biodiversity survey along project site (within the 2km radius) Results The survey was successful with regards to the objective. As the season was dry, it was evident that the late dry season time of the year within the study area when many of the residing fauna and flora are either dispersed (fauna), seasonal (flora) or dormant. Thus these specific limitations highlighted the necessity for a follow-up wet season survey for clear understanding of the biodiversity. The habitat The habitat type was largely limited to a single plain terrain large area on the South-west section of Madurai city. It consists of plain terrain and small boulders interspersed with grassy patches. This habitat type is regarded as natural, but slightly disturbed due to grazing by livestock. No significant forest or vegetative cover were observed and is limited in the local landscape, medicinal plants were recorded but no major dependence from the local villages on these resources was observed. Although care was taken to cover the habitat during the study time, it could not bring out the full list of biodiversity as the seasonal changes are significant for such a habitat. Despite the limited time limits and due to the limited distribution in the landscape, this habitat is regarded as having very less sensitivity. Flora Results were quite interesting, a total of 103 species of flora were identified from the project site of which 10 tree species followed by 63 herbs, 19 shrubs and 11 climbers. The conservation status of all the identified species were analyzed of which climbers Abrusprecatorius and Wattakakavolubilis was identified as Near threatened and an herb

The scrubland These habitats provide an excellent place for animals to survive during the usual environmental conditions and are a foraging place for small mammal species, which in turn form the basis for the tropical food chain. The study site comprises of a good percentage of the overall habitat, but these are extremely important breeding and foraging sites for small mammal species. Within the study area, this habitat represents the major habitat type followed by the agriculture fields. The grasses and groundcover in these habitats are not dense and don't have high forage value, this may change after the monsoon season as most of the ground cover are seasonal. Though the species diversity in this area was moderate to high, species from all trophic levels were not well represented and thus the overall diversity, connectivity and sensitivity of these areas were moderate. View of the grassland within site Fauna The field survey identified 20 bird species, 19 butterfly species, and 10 other fauna include amphibian, reptile and mammals Birds: The different species of birds observed in the study area during the study period are given below and also enlisted in the Table given below. The common important birds species observed in the study area were Small Bee-eater, Indian Robin, Common Babbler, Common Myna and Indian Roller. The vegetation and the landscape supported very less number of birds, as the landscape was barren with fragmented and sparse vegetation. Birds identified were moving, passing through or residing at the project site for a short duration. Butterflies are the important, and the most studied insect group in the world, they are good pollinators and indicators, butterflies extend their role as pests, predators and weed killers too. They belong to the order Lepidoptera, coming under the phylum Arthropoda

and the class Insecta. There are about has 1,501 species of butterflies in India and the Western Ghats harbours around 330 species of butterflies. 19 species of butterflies were identified during the AIIMS Madurai EIA Report Page _ 23 study period of which the Tawny Coster, Danaid Eggfly, Indian Cupid, Lemon Pansy, Lime Butterfly and Common Mormon were common and other species were spotted in few numbers and were of less frequency. Other fauna like 2 species of amphibians, 5 mammal species and 3 species of reptiles were identified of which the garden lizard, Squirrel and Common goose were spotted more frequently. Acraea terpsicore Danaus chrysippus Euploea core Hypolimnas misippus Figure 20 : View of butterflies from the study site

ENVIRONMENTAL IMPACT ASSESSMENT SYSTEM

During the past decade, the Environmental Impact Assessment System (EIA) has been developed and refined, as a basic procedural system for environmental management by most industrialized nations. Now, even large number of developing countries also adopt this system. It is stated that this system is the best one in deciding whether a project is environmentally sound or not. When adopted and legislated into the law of the land, it requires that all new projects, as well as ongoing projects, whether in the public or private sector be subjected to an EIA before they are given clearance to proceed or continue.

The system and the documentation in its operation can be briefed as follows:

1. E.I.A. System: It is a formal procedural analysis by which, it can interpret, predict and communicate the possible environmental impacts, resulting from a proposed project or action. By weighing such benefits against the benefits of alternate actions, will provide guidance in reaching responsible decisions relative to the approval or otherwise of the proposal.

2. Project Proponent: Any agency, company or individual, either public or private sector, which proposes an undertaking or operation, which might significantly affect the environment.

3. Initial Environmental Examination: A preliminary study prepared and submitted to the Lead Agency by the project proponent. It serves two functions: (a) Preliminary information to authorities that a project is under consideration and possible impact of in the environment; (b) For projects of little or no concern to the environment, the authorities can avoid unnecessary preparation of EIS which may be very time - consuming and costly process.

4. Environmental Impact Statement: It is a comprehensive description of the proposed project with a detailed technically supported data of forecast of potential environmental hazards, resulting from it, or by alternative action. It must provide all information necessary to identify, analyze, interpret and predict the environmental impact, resulting from implementation of a proposal or of alternate action, so that responsible decisions can be made. This should be prepared by the Project proponent on the basis of the format envisaged by the Lead Agency in consultation with the apex authority. The Certificate of Compliance is normally issued only by the apex authority, but it is forwarded to the project proponent through Lead Agency concerned.

COST – BENEFIT ANALYSIS

Cost-benefit analysis can be shortly defined as "an attempt to quantify the social advantages and disadvantages of alternative courses of action in terms of a common monetary unit. The unquantified effects, often known as intangibles, should also be described".

The objective of cost-benefit analysis is to quantify the net benefit to the community of following a certain course of action. This is done by valuing in terms of a common standard the costs and benefits of a policy action. The costs and benefits are those according to society as a whole, and not the specific firms or households. Hence, they, are referred to as Social Costs and Social Benefits.

Step Involved In The Cost-Benefit Analysis

(i) The different steps involved in the cost-benefit analysis can be identified as follows:-

(ii) Alternative Methods: The first and foremost question in cost-benefit analysis is to find out whether other techniques are available to realise the same objective and if those techniques are appropriate. Cost-benefit analysis is expensive and time- consuming process and the choicę of the technique should be made with great care after detailed study. The stated objective can be achieved in many ways. The correct analysis should result in finding the cheapest method of achieving the objective. This is called Cost-effectiveness study.

(iii) Alternative Projects: One of the characteristic contributions of economists is to suggest overlooked alternatives. For example, a water-supply project may be needed because people do not pay the true cost of the water they consume. So, an alternative project would be installing metres and charging the true cost, or simply asking the people to conserve water. Only the decision-taker can decide whether the alternatives are politically feasible, but the economist can point out that the relative costs may influence the electorate's political judgement.

(ii) Listing costs and benefits: When the cost-benefit actually starts, the first activity is to list as many effects of the projects as possible. Three questions arise at this stage: They are: (a) Distributional Changes; (b) Diversionary Effects; and (c) The Choice of Cut-off points.

(a) By Distributional Changes, we mean the effect of the project in benefiting some people and harming others. If we are content to assume that rupee one from someone is worth the same as rupee one given to someone else, then we are said to be ignoring distributional effects. If, however, we do not value the transaction equally, then we have to decide how to compare different people's losses and gains or to list exactly how the project affects different groups.) Economic analysts may have their own preferences for worthy groups in society, but if the gainers and losers are made public, then it can be left to the political process to decide. Economists cannot really criticise the political process, but they can insist that all the relevant information should be known. Thus, cost-benefit analysis has at least a minimal role, searching out some of the distributional (income-transferring) effects of projects.

(b) Diversionary Effects: An example of this might be a new road which transfers trade from servicestation to another, or a fly-over plan shich inflicts noise on one group of

people rather than another the amount involved is equal, should we bother about it at all? The answer really depends on the previous question, viz., distributional effects.
(c) Cut-off Points: The third problem while listing costs and benefits is to decide when to stop listing. This is rather easy to decide For example, for a project in West Bengal, decision- taker may say that they are not bothered about others, i.e., Bangladesh or Nepal. Similarly, there may be effects that are judged to be too small to be worth computing such as savings in time of less than five minutes on a journey or savings in cost of less than 5 per cent of the total cost of journey, so these become the cut-off points.
(iv) Quantifying Costs and Benefits: Next comes 'quantifying' the Costs and benefits in the process. This is rather a complex and a controversial area. However, we can identify some general principles, Which we can term (a) Market Prices (b) Shadow Prices (c) Standard Values and (d) Political prices. Each value is appropriate in particular circumstances and between them they cover a great-many problem areas'. Market prices are used to value costs and benefits when they are available and it is based on market economics of supply and demand, i.e., willingness to pay and willingness to supply, though monopolies distort prices. Shadow prices can often be calculated where something is never sold. In some cases, the decision-taker already has sets of shadow prices which are used in its cost-benefit analysis studies and these are often called Standard values. Using these values ensures that the cost- benefit analysis studies will be consistent with each other and with other decisions taken using other techniques.) If none of the previous sources of values is used, then we are left with some costs and benefits without money values on them. In such cases, we can value them by using political prices.

CONTINGENT VALUE TECHNIQUES

CVM requires that individuals express their preferences for some environmental resource, or change in resource status, by answering questions about hypothetical choices. The very nature of this methodology has therefore meant that CVM has been subject to criticism from both economic and psychological experimentalists, whose growing research focus has been the problem of preference elicitation. This criticism has in turn caused supporters of CVM to pay much more attention to a testing protocol in which questions of method reliability and validity are directly addressed. The respondents to a CVM questionnaire will be asked a variety of questions about how much they would be willing to pay (WTP) to ensure a welfare gain from a change in the provision of a nonmarket environmental commodity; or how much they would be willing to accept (WTA) in compensation to endure a welfare loss from a reduced level of provision. A basic question for the implementation of the CVM is therefore whether WTP or WTA is the most appropriate indicator of value in a given situation.

THE CONTINGENT VALUATION METHOD

METHOD AND ECONOMICTHEORY

Hanley (1990) identifies six distinct phases involved in the practical application of CVM which we have interpreted as follows:

Stage 1: Preparation in. Set up the hypothetical market: individuals may be presented with two basic variants: How much are you willing - to - pay (WTP) for a welfare gain? How much are you willing - to

accept (WTA) in compensation for a welfare loss? ii. Define the elicitation method. The major alternatives are: -Open ended; "how much are you willing to pay?". This approach produces a continuous bid variable and may therefore be analyzed using at least squares approaches (OLS) .- Take - it - or - leave it (dichotomous choice); "are you willing to pay £ X", the amount X being systematically stepped across the sample to test individuals' responses to different bid levels. This approach produces a discrete bid variable and requires logit - type analysis. - A recent variant upon the dichotomous approach is to supplement the initial question with an iterative second round (double - bound) question (see Haneman et al., 1991). For example if the respondent answers yes to the £ X bid then they are asked if they are WTP 2X (or £ 0.5X if they answered no to the initial question) -Other elicitation methods include the use of payment cards and bidding games with suggested starting points. iii. Provide information regarding: the quantity / quality change in provision of the good - who will pay for the good - who will use the good. iv. Define the payment vehicle, for example: -higher taxes - entrance fees - donation to a charitable trust

Stage 2: Survey Obtaining responses to the questionnaire. Interviews can be either on - site (face to face; users only), house to house (face to face, users and non - users) or by mail / telephone (remote; users and non - users)

Stage 3: Calculation Calculate the mean WTP (or WTA) from responses. This commonly involves the omission of protest votes3, and / or the use of trimmed means. In a dichotomous choice format experiment the mean is obtained by calculating the expected value of the dependent variable (WTP or WTA)

Stage 4: Estimation A bid curve can be estimated to investigate the determinants of WTP bids. For a continuous question format OLS estimation techniques are often employed. Typically, in WTP scenarios, the bid curve will relate bids (WTPi) to visits (Qij), income (Yi), social factors such as education (Si), and other explanatory variables (Xi). A parameter of the environmental quality of the site (Ej) may also be included. WTPi = f (Qij Yi, Si, Xi, Ej) There is no theoretical correct form of this function. However, if a log - log function is chosen then the coefficients are elasticities. In such a case the bid curve allows us to estimate changes in mean WTPi arising from changes in Ej. Indeed if the other relationships are sufficiently stable then we can use this curve to evaluate changes to other strongly related environmental goods, eg. impacts of water quality change upon wetland quality.

TRAVEL COST METHOD

The hedonic prizing method is mainly used to estimate economic values for economic benefits or costs associated with environmental quality (eg.; Air pollution, water pollution, or noise) and environmental amenities (eg, aesthetic views or proximity to recreational sites) . The travel cost method looks at how far people are willing to travel to enjoy an environmental nonmarket good such as a beach, lake, river, or wilderness area. Travel is costly in terms of time, fuel, and other expenses. We expect people who live closer to a pristine lake to visit it more often, on average, than people who live far away, just as we expect people to buy more pizza when the price is low than when the price is high. So, if we can estimate a demand curve for pizza using its price, then we can also estimate a demand curve for a pristine lake using the travel costs as a proxy for its price (where distance from the site means differences in travel cost). That is exactly what economists have been doing since the 1960s. To explain how the travel cost method works, a simple illustration probably works best. In the upper portion of figure 14.2, we designate three rings or zones for people who live

at different distances from the lake (five, ten, and fifteen miles). We conduct In addition to estimating benefits from environmental improvements, economic analysis can often help policymakers estimate the costs. In the case of reducing air pollution, for example, policymakers face great uncertainty about the costs of air quality improvements and how those costs may differ for a wide range of possible actions under consideration. After they combine technical and economic data, it is possible for economists to estimate the marginal cost and changes in emissions for individual actions such as imposing emissions standards, retrofitting high - use vehicles such as busses and taxis, inspections for enforcement, fuel improvements, or fuel taxes.

HEDONIC PRICING

Hedonic pricing is a model, which identifies price factors, according to the premise that price is determined both by internal characteristics of the good being sold and external factors affecting it. A hedonic pricing model is often used to estimate quantitative values for ecosystem or environmental services that directly impact market prices for homes. This method of valuation can require a strong degree of statistical expertise and model specification, following a period of data collection. The most common example of the hedonic pricing method is in the housing market, wherein the price of a building or piece of land is determined by the characteristics of the property itself (eg its size, appearance, features like solar panels or state - of - the - art faucet fixtures, and condition), as well as characteristics of its surrounding environment (eg if the neighborhood has a high crime rate and / or is accessible to schools and a downtown area, the level of water and air pollution, or the value of other homes close by). The hedonic pricing model is used to estimate the extent to which each factor affects the price of the home. When running the model, if non - environmental factors are controlled for (held steady), any remaining discrepancies in price will represent differences in the good's external surroundings. With regards to valuing properties, a hedonic pricing model is relatively straightforward as relies on actual market prices and comprehensive, available data sets.

CARBON TRADING

Carbon trading is an approach used to control carbon dioxide (CO2) pollution by providing economic incentives for achieving emissions reductions. It is sometimes called cap and trade or carbon emissions trading Carbon trading is administered by a central authority such as a government or international organization which sets a limit or cap on the amount of CO2 that can be emitted. Companies or other groups are issued permits that require them to hold allowances (or credits) in order to emit an equivalent amount of CO2. The total amount of allowances and credits cannot exceed the cap, limiting total emissions to that level.

Companies that need to increase their allowance must buy credits from those who pollute less. The transfer of allowances is referred to as a trade. The buyer therefore pays to pollute, while the seller is financially rewarded for reducing CO2 emissions. In theory, those that can easily reduce emissions most cheaply will do so. Carbon emissions trading has been steadily increasing in recent years. According to the World Bank's Carbon Finance Unit, 374 million metric tonnes of carbon dioxide equivalent (tCO2e) were exchanged through projects in 2005, a 240% increase relative to 2004 (110 mtCO2e). In 2008, the carbon market was valued at $ 47 billion, while in 2009 the World Bank estimated its value at $ 126 billion. On June 9, 2005, twenty - three multinational corporations from the G8 Climate Change Roundtable released a statement vocating market - based solutions to climate change. The group, including Ford, Toyota, British Airways, BP and Unilever, called on

governments to establish "clear, transparent, and consistent price signals" through "creation of a long - term policy framework" that would include all major producers of greenhouse gases

IDENTIFICATION OF PROJECT AFFECTED PERSONS (PAPs)

Who is a Project Affected Person (PAP)?

Development projects such as dams, mines, industries, roads, power plants and others need vast tracts of land for setting up and expansion of existing infrastructure. A typical thermal power plant of 1000 megawatts would need about 800 hectares of land. Normally the lands to be acquired for such projects are already used for different purposes like residential, agricultural, business, public utility and others. The persons utilising these lands for living, cultivating and practising any other activity, with or without legal ownership may need to give up the activity and/ or lose the land and structures thereon, fully or partially for the project. These persons are therefore affected adversely or negatively and are called Project Affected Persons (PAPs). In other words, a project affected persons is anyone affected by land acquisition, relocation, or loss of incomes associated with project-changes in use of land, water and other natural resources. Although projects often have many adverse impacts by way of displacing or affecting shelter, business or any other activity, they also have positive impacts on certain populations who can be called 'beneficiaries' of the project. Our concern here is for those affected adversely or negatively by the project since they require resettlement and rehabilitation in restoring or improving their previous living standards

Definition of PAP in Various Acts and Policies

1) Asian Development Bank's (ADB) Involuntary Resettlement Policy, 1995 As per the ADB policy, the term affected person includes any people, households, firms or private institutions who, on account of changes that result from the project will have their (i) standard of living adversely affected; (ii) right, title, or other interest in any house, land (including residential, commercial, agricultural, forest, and/or grazing land), water resources, or any other moveable or fixed assets acquired, possessed, restricted, or otherwise adversely affected, in full or part, permanently or temporarily; and/or (iii) business, occupation, place of work or residence, or habitat adversely affected, with or without displacement (ADB Operations Manual F2/BP Footnote 3).

2) World Bank's Operational Policy on Involuntary Resettlement OP 4.12, December 2001 (Revised April 2004) The World Bank was one of the first international institution to come up with a comprehensive policy on involuntary resettlement. The Bank broadly defines the "Project affected persons" as persons affected by land acquisition, relocation, or loss of incomes associated with change in land use due to the project. The World Bank Operational Policy on Involuntary resettlement, December 2001 defines the term "displaced persons" as persons who are affected by the involuntary taking of land resulting in (i) relocation or loss of shelter; (ii) lost of assets or access to assets; or (iii) loss of income sources or means of livelihood, whether or not the affected persons must move to another location; or (iv) the involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the livelihoods of the displaced persons.

3) The Land Acquisition (LA) Act, 1894 In India, compensation for land acquisition (LA) and resettlement assistance for project-affected people, until very recently, was governed by the Land Acquisition (LA) Act of 1894 which has categories of 'person interested' and 'displaced person'. In

section 3 (b) of the LA Act 1894, a 'person interested' includes all persons claiming an interest in compensation to be made on account of the acquisition of land under this Act; and a person shall be deemed to be interested in land if he is interested in an easement affecting the land (also see Unit 6 in MRR-101). The term includes all persons who suffer or are likely to suffer displacement on account of intended acquisitions of land or agricultural labourers and all other labourers and all persons who depend on land intended to be acquired for their right to livelihood, customary or otherwise (Fernandes and Paranjype 1997: 251). In other words, an individual should have an interest in the land, which is being acquired. Such an interest may be an absolute one such as that of an owner or a partial one such as that of a tenant or a licensee. In section 3(h) of the L.A. Act 1894, a 'displaced person' means any person who is in occupation of revenue land, with or without a patta, forest land or one who is enjoying the usufructs of the forest land and other common property resources, the fisherfolk, grazers, the agricultural labourers, seminomads who occupy that area periodically, small traders, village artisans who reside in the affected zone and for the purpose of the project have been displaced from such land or other property (Fernandes and Paranjype 1997: 256).

4) National Policy on Resettlement & Rehabilitation (NPRR), 2004 Since the LA Act only provides for cash compensation for the land acquired (private property) and does not require the Government to ensure the resettlement and rehabilitation or livelihood restoration of those families who are uprooted as a consequence of acquisition of their land, it was felt necessary to have a specific policy that can address the impacts of development-induced displacement in a comprehensive manner. As a result, a National Policy on Resettlement & Rehabilitation has been adopted by the Government of India (GOI). This policy is applicable to all developmental projects where 500 or more families' en masse in plain areas or 250 or more families' en masse in hilly areas are displaced due to project activity. It essentially addresses the need to provide succor to the assetless rural poor, supports the rehabilitation efforts of the resources and provides a broad canvas for an effective consultation between PAFs and authorities responsible for their R&R. The policy also recognises the special needs of the vulnerable groups such as indigenous people & BPL families The NPRR defines both displaced persons/family" and "project affected persons/family". Section 3.1.q of the policy defines a "project affected family" as a family/person whose place of residence or other properties or source of livelihood are substantially affected by the process of acquisition of land for the project and who has been residing continuously for a period of not less than three years preceding the date of declaration of the affected zone or practicing any trade, occupation or vocation continuously for a period of not less than three years in the affected zone, preceding the date of declaration of the affected zone. Whereas a "displaced family" refers to any tenure holder, tenant, government lessee or owner of the other property, who on account of acquisition of his land including plot in the abadi or other property in the affected zone for the purpose of the Project, has been displaced from such land or other property

CATEGORIES OF DEVELOPMENT INDUCED PAPs

Persons affected by development projects can be broadly categorised into people who are namely,

i) directly affected by the project

ii) indirectly affected by the project. Directly affected PAPs include those whose lands and/ or structures are fully or partially acquired for the project namely:

i) Owners of houses, businesses, agricultural land and other structures

ii) Those using the land and/ or structures of others with no ownership but are dependent on the lands and/ or structures for their dwelling or livelihood purposes like agriculture, residential tenants, labour working on the lands and commercial establishments.

Directly Affected PAPs: Titleholders, Non-titleholders and Users Rights

The difference between these three categories of directly affected PAPs is dependent upon the asset ownership status. The persons who own a movable or fixed asset with a valid legal title are called titleholders whereas those without any legal ownership comprise of non-titleholders. The non-titleholders mainly comprise of tenants, sharecroppers, landless/wage labourers, squatters and vendors (on public land) without land titles or ownership rights on the affected land.

The third category of affected PAPs constitutes of customary users' groups with customary/traditional rights to the land and other resources affected by the Project. This group mainly comprises of indigenous or tribal groups without any formal land titles.

Indirectly Affected PAPs

The indirect affects of displacement are generally in the form of deprivation of access to common property resources (CPRs) and public utilities and new pressures exerted on the socio-economic infrastructure of the host population.

i) Loss of Access to CPR and Public Utilities: The setting up or expansion of a project may not only affect people directly, but may also deprive some from accessing community resources and public utilities such as grazing pastures, community well, public offices, electricity etc. In rural India, the poor derive some income support from a wide range of community resources, in addition to those owned by them. For example, acquisition of grazing pastures for Ramagundam National Thermal Power Corporation has caused reduction in cattle population and consequent fall in the income levels of those dependent on milk business (Parasuraman, Singh and Prasad 1995). Loss of access to community water tanks for a project means loss of a permanent water source as well as potential impact on ground water table. This would affect the people by way of losing water for domestic purpose and affecting irrigation potential of the region, although they do not lose anything directly to the project.

ii) Host Area Population: The receiving population wherein the displaced are resettled constitutes the host population. The host population, in general, would be affected because the larger population after relocation competes for public utilities, natural resources and local employment. Conflicts may also arise because of extension of assistance to the DPs and PAPs discriminating against the host population

APPROACHES AND TECHNIQUES FOR IDENTIFICATION OF PAPs

PAPs Identification: Temporal Context

The time context in identification of PAPs has become important in view of large-scale displacement of PAPs in the old development projects. They were implemented inadequate or there were no R&R measures. This leads to the emerging awareness among stakeholders and researchers to address these old PAPs in the changing social setting.

i) Current and Future Projects

The current and future projects are the ones, which are yet to be implemented and are at the conceptual stage. These projects have sufficient time to inform the project communities on the scope of the project and its impact; consult community on their perceptions on the project and its impact as well as the mitigation R&R measures and based on this plan the entire process of R&R right from the pre-project stage.

ii) Old and Executed Projects

There are many projects, which were implemented with no provisions for the resettlement and rehabilitation of the project-affected communities. An estimated 21.3 million people have been displaced for various projects during 1950-1990 and of this 75 per cent are yet to be resettled (Fernandes and Paranjpye, 1997). With changing social awareness, particularly on the rights of the PAPs, the implementing agencies are attempting to address the needs of such displaced PAPs while expanding or completing the old projects.

Approaches and Techniques for Identification of Directly Affected PAPs: Titleholder, Non-titleholders and Customary Users

Identification of the PAPs and accurate data reflecting the precise impacts on them is essential for effective resettlement planning. There are several techniques and approaches that are adopted for identification of directly affected persons in a project which are enumerated below:

i) Census Based Survey Census survey is the complete enumeration of all affected households and their assets through household questionnaire. It is the most exhaustive method as it covers all the affected persons in the project area and serves three key objectives namely – a) to prepare a complete inventory of PAPs and their assets as a basis for compensation, b) to identify non-titled persons and c) to minimise impact of later influx of outsiders to the project area (ADB Handbook on Resettlement – A Guide to Good practice, 1998). The key information collected by means of the census survey comprises of: one, the extent and type of physical and financial loss as a result of the project in terms of the loss of structure, land, source of livelihood, shelter etc. and two, the socio-economic profile of the families and /or individuals who are likely to be the sufferers.

ii) Verification of Project Records Prior to conducting a detailed census survey, available project records need to be reviewed to understand project boundaries and any other information available in project records on PAPs, which are useful in carrying out the census survey.

iii) Verification of Records of Rights/ Land Records Records of Rights maintained by Revenue Department are the primary land records, which need to be consulted to determine the ownership, size of land, type of soil and utilisation pattern of the land getting affected under the Project. Though census survey gives some of this information, the information from the revenue records is important to validate the ownership title of a titleholder. However, the land information systems in India have several deficiencies because of stamp paper agreements. The lands sold on stamp paper agreement without registering the sale deeds cannot get into land records. Many a times in most cases, land records are not updated and therefore cannot give instant information on land ownership without passing through a detailed procedure.

In order to procure rapid information for estimation purposes without waiting for the completion of land acquisition process, the following can be attempted:

i) superimposing the project design on the cadastral map to delineate the project boundaries and to identify the owner by verifying the records

ii) verification of the land records at the field level through contacting the actual owners if available or knowledgeable persons and neighbours in case actual owners are not available

iii) contacting the Village Administrative Officer / Village head/Sarpanch/ Pradhan.

vi) Verification of Electoral and Public Utility Records The identification of non-titleholders though done through census survey, their tenure of stay and ownership of the structure in a specified locality can be assessed by verifying public records such as electoral records, ration cards, electricity bills etc.

Approaches and Techniques for Identification of Indirectly Affected PAPs: Loss of Access to CPR and Host Area Population

The census survey and the verification of land records and cadastral maps are also effective techniques for determining the loss of common property resources and public utilities for the project. The same can also be used to assess the socio-economic infrastructure in the host area. However, for the assessment of loss of access of CPRs to those in the displaced location, public consultation through PRA techniques can be employed. Similarly, in the relocation area to estimate the potential of common resources and their carrying capacity to accommodate the needs of both host area population and the DPs and PAPs, public consultation can be used.

Participatory Rural Appraisal (PRA) Techniques

Participatory rural (resource) appraisal is a method to understand the rural social situation. It is a participatory exercise where the outsider that is the researchers and developmental agents play the role of convenors, catalysts and facilitators to enable people to undertake and share their own investigation and analysis. PRA is about learning and sharing knowledge that enables local people to conduct their own analysis,

and often to plan and act. It is a learning process for both the outsiders and insiders. Some of the PRA techniques are discussed below.

Public/Village Meetings: The purpose of the village meeting is to bring transparency and sharing of in formation to understand the demographic, family types and occupational characteristics of a village. Another key aspect of these meetings is to share project information with all stakeholders in the village at a common platform. The village meeting provides general information about the following factors:

i) Demography

ii) occupational pattern

iii) institutional arrangements and social security

iv) infrastructure, resources and manpower

v) needs, problems, priority and opportunity

vi) general awareness level

Walkover Survey: The purpose of walkover survey or transect walk is to assess the main features, resources, uses and problems of main land zones/ tracts in a village. This exercise provides information about the following elements: i) patterns of land use ii) cropping pattern iii) soil and tree species iv) potential for area development.

This exercise is conducted systematically by walking with informants through an area, observing, asking, listening, discussing, identifying different zones, local/ indigenous technologies, newly introducedtechnologies, seeking problems, solutions and opportunities and mapping and diagramming resources and findings.

Social Mapping: The purposes of social mapping are: i) to gain an understanding of the physical lay-out of the village and spatial distribution of social groups ii) to understand access of different social groups to infrastructure and basic services iii) to gather information on village demography, land distribution pattern among various social and economic groups, occupational pattern, quality of human resources, infrastructure facilities available and required iv) to mobilise the community for participatory planning. This exercise is conducted through identifying knowledgeable persons of the village set-up, explaining and organising the activities, facilitating the people to prepare a map on the ground showing residential patterns of different caste and economic groups, housing types and infrastructure like school, health centres, markets, temples etc.

Resource Mapping: The purpose of resource mapping (see also Unit 15 in MRR-102) is to assess the resource potential of the village and its development pattern. This exercise gives information regarding the following factors. i) nature/types of resources available and used in the village ii) ownership pattern of the resources iii) infrastructure available to use the resources iv) implication for planning This exercise is conducted through identifying knowledgeable persons, explaining the purpose, and helping the villagers in mapping all resources and infrastructure of the village using local materials.

Subsequently, the gathered information and the map will be discussed and analysed collectively.

Focus Group Discussion (FGD) and In-depth Interview: The purpose of FGD is to identify various kinds of groups like social groups, user groups, gender groups etc. to assess their perception and ability in the resource use as well as their social position in the decision making and accessibility of resources. Indepth interview is conducted by identifying and often deliberately constructing the groups namely, women, youth, Scheduled Castes and Scheduled Tribes, beneficiaries of a scheme, farmers, labourers, handicraft workers etc. This exercise gives information about the following elements. i) position and understanding of different social and occupational groups and their social distance from commonality in a village ii) differential needs and problems iii) dominant groups/ power structure of a village

Treatment and Identification of Vulnerable PAPs

The vulnerable sections in a community are the economically poor and socially disadvantaged groups like the Scheduled Castes and Scheduled Tribes and women. The socially inherent gender discrimination and restriction hardly allows the women in a general village meeting and survey, to express freely their interests, problems, preferences and priorities. The dominant views and preferences are then likely to become that of the men in a community. The role and aspirations of women are in general downplayed and controlled by the men. Focus group discussions with women, separately, allow free discussion, interest and opinion sharing. This subsequently helps in planning of a development programme and controlling and directing the benefit towards the women for achieving gender equity. Similarly, separately held discussions with the Scheduled Castes and Scheduled Tribes are likely to provide specific information on interests and perceptions of their groups, respectively. The vulnerability of the weaker sections is more visible in a multi-caste village or community. The welloff sections and higher communities, in general, control the decision making power and it is their interests and preferences that are reflected in the image of a village. In situations like this, PRA technique of participatory wealth ranking can differentiate the social groups and can give the weaker sections collective awareness and confidence to argue their case. The identification, expression and resolution of conflicts of interest remain a frontier for participatory methods.

Treatment and Identification of New Settlers

New settlers can be defined as those who have moved into a project area after the cut-off date of the survey and as a result not entitled for R&R assistance. To address the issue of new settlers in the project area, a cut-off date has to be fixed by the project authorities. Whoever is found after the cut off date need not be considered for assistance. The cut-off date in the case of land acquisition, affecting legal titleholders would anyway follow the procedure as laid down in the LA Act. This is in general the date of issuing of the notice under section 4 (1) of the LA Act. In cases where people lack land title, the cut-off date will be the date of census survey undertaken by the Project.

WHO WILL IDENTIFY THE PAPs?

It is important to note that the responsibility for identification as well as the adequate R&R of the PAPs is of the project authority or implementing agency (PIA). However, in case due to the lack of skill or specialised human resource constraints, since the identification process entails social research skills, the PIA can engage a qualified NGO or consultancy agency to undertake the identification of PAPs. Despite this delegation, the responsibility of supervision and quality control of the process of identification of PAPs rests with the PIA. It is the PIA's responsibility to review the data generated by the process and finalise the same for preparation of resettlement plans (RPs). PIA needs a qualified person with a background in social work or social sciences to supervise the process of identification of PAPs at their end. In case of absence of an NGO or consultancy agency involvement, the PIA can also hire social researchers and enumerators to undertake the process under the supervision of a specialist officer on the issue. Many a times, (as described by an officer of National Hydro-Electric Corporation) it is seen that the consultant/ NGO hands over this socio-economic survey and other documentation to the PIA's Central Office. The role of consultant/ NGO is over after providing the final report to the centralised authority. The Central Office in turn hands it over to its state-level subsidiaries for further implementation purpose. At the state-level, the data is used for carrying out the R&R process as per its own specific rules and provisions. It is not clear to what extent and in what manner thus collected data are made use of in carrying out R&R processes. Those who prepare the final report of socio-economic survey move on to yet another project to carry out yet another survey. In this scenario, the PIA and its officials are by and large untouched by the direct understanding of the trauma and suffering of the PAPs. It thus becomes imperative that the R&R manager/ officer and his/her staff of the development project need to be directly involved in the process of identification of the PAPs. This will provide them opportunities of understanding the types of losses being incurred by affected communities and vice versa. Any participatory approach is effective only if there is direct communication. Help of consultants/ NGOs surely facilitates the process but it is only a part of the process. The R&R officers of the PIA need to supervise and get involved in the process, rather than leaving all work of direct contact with the PAPs on the NGOs or consultants. A participatory approach implies that the NGO and the R&R staff work together and the PAPs come in direct contact with both. Using NGOs as a buffer between the PIA and PAP is an element that often complicates the R&R operations.