3.0 How to use this Chapter

This chapter provides guidance to the reviewer in judging the adequacy and reliability of the methodologies adopted in developing the Environment Impact Assessment (EIA) report submitted as part of a project application.

Although it is the responsibility of the proponent to (arrive at and) submit information in a transparent and logical manner, the reviewer will still need to go through the EIA report very carefully. In doing so the reviewer will need to appraise the information from a technical perspective, which ultimately, will assist the reviewer in making the following judgements:

Is the description of project and baseline conditions adequate?

Are the methods followed and models used in data generation and analysis reliable?

Are the methods followed and models used for impact prediction-comprehensive, relevant and reliable?

Has risk analysis done and based on which disaster management plan prepared?

Is uncertainty characterized, and where applicable, provided for?

Have project stakeholders been appropriately consulted and their concerns adequately addressed?

Are cumulative and cross-media impacts investigated and accounted for?

Are the unmitigated impacts acceptable?

Are identified mitigation measures feasible, appropriate, and adequate?

3.1 Scope

- Baseline conditions
- Site and process alternatives
- Public hearing
- Construction stage impacts
- Project resource requirements and related impacts
- Prediction of environmental media quality
  - Air quality impacts
  - Surface water quality impacts
  - Groundwater quality impacts
  - Impacts on soils and surrounding lands
  - Shoreline stability
- Ecological impacts (including fisheries)
- Occupational health
- Major hazard/risk assessment
- Impacts on transport system
- Socio-economic impacts
- Integrated Impact Assessment

3.1.1 Baseline Conditions

Baseline conditions refer to the background environmental features of the project site and surrounding identified area (commonly known as Project Impact Area)

Box 3.1 provides a checklist of key parameters that should be identified for each media.

Box 3.1
Checklist of Key Parameters
Land
⦂ Landforms including coastal zone
⦂ Litho logy and geomorphology
⦂ Soil composition and characteristics
⦂ Slope stability
⦂ Subsidence and Compaction
⦂ Seismicity/seismic zone characteristics
⦂ Floodplains/swamps
⦂ Landuse
⦂ Engineering and mineral resources
⦂ Buffer zones (Part of National Park and Wild Life habitats)
⦂ Soil erosion
⦂ Catchment area treatment
Surface Water
⦂ Shoreline
⦂ Bottom interface
⦂ Flow variation/ Ocean currents
⦂ Water quality
⦂ Drainage pattern/ water logging
⦂ Water balance
⦂ Flooding
⦂ Existing and planned future use
⦂ Siltation
Ground Water Potential
⦂ Water table
⦂ Flow regime
⦂ Water quality
⦂ Recharge rate
⦂ Aquifer characteristic
⦂ Existing use and proposed plans
Atmosphere
⦂ Air quality
⦂ Visibility
⦂ Meteorology
Noise and Vibration
⦂ Intensity
⦂ Duration
Frequency

Species and Population
⦂ Terrestrial flora / fauna
⦂ Other terrestrial vegetation
⦂ Aquatic/marine flora /fauna
⦂ Fish
⦂ Other aquatic/marine fauna
Habitats and Communities
⦂ Terrestrial
⦂ Aquatic/marine/estuarine communities including spawning, breeding and nesting grounds
⦂ Migratory path
⦂ Benthic flora and fauna
Health and Safety
⦂ Physical
⦂ Psychological
⦂ Occupational
⦂ Parasitic diseases
⦂ Communicable diseases
⦂ Water borne diseases
⦂ Psychological diseases
⦂ Disease Vectors
Socio-Economic
⦂ Agricultural Land
⦂ Employment/Training
⦂ Housing
⦂ Education
⦂ Utilities
⦂ Amenities (water, sanitation, ⦂⦂⦂⦂⦂electricity, transportation)
⦂ Community health
Aesthetic \ Cultural
⦂ Landscape
⦂ Wilderness
⦂ Climate
⦂ Tranquillity/ Sense of community
⦂ Community structure
⦂ Religious places and structures
⦂ Historic/ Archaeological places or structures

When describing project baseline conditions, a good practice is mapping the project-impacted region on a 1:25,000 scale. Mapping for critical themes of relevant environmental components should also be presented.

It is important to ensure that the information utilised in impact prediction is provided in the description of base line conditions.

In assessing whether the data presented are both representative and reliable, the reviewer will firstly need to determine the suitability of the sampling procedure and measurement methods adopted.

For some attributes of baseline conditions, standard methods recommended by the Bureau of Indian Standards, Central Pollution Control Board, Ministry of Environment and Forests are available. In the absence of official recommendations, there are also a number of professionally accepted or accredited approaches applicable to specific media or issues.

Annex IV presents reviewers with a comprehensive overview of the sampling procedures and measurement methods applicable to the determination of baseline conditions.

3.1.2 Site and Process alternatives

The detailed project description will need to address the main project attributes during each phase of the implementation process, including:

- General siting;
- Project construction;
- Operation;

A list of the potentially significant issues for identification during each of these phases is supplied in **Box 3.2**

Box 3.2

General

- Layout map (1:2500 scale) showing different units, power line, roads, storage, water source, sewerage, storm drainage, water pools, housing, green belt and other important features and surrounding landuse
- Location of the project and its accessibility/ Capital and operating costs of pollution control, Project investment and implementation schedule
- Distance from coastal areas/surface water bodies/ecologically sensitive areas
- Requirements of land, its present use and whether change in land use will be conforming to the Country or Town Planning approved plans

Construction phase

- Direct employment during construction possible influx of labours and stress on public utilities and services
- Use of water and power and its source during construction, proposed earth moving, dredging and drilling operations
- Proposed plan for transportation and storage of construction material
- Detailed schedule of activity and resource requirements
- Disposal of solid waste/dredged material

Operation phase

- Direct employment for operation
- Raw materials, fuels and chemicals to be used, their quantities, characteristics, arrangements for transport to site, storage, including storage facilities, pipeline etc.
- Detailed manufacturing processes alongwith flow diagram
- List of main equipment and machinery,
- built-in pollution control equipment, their
- efficiencies
- Mining methods/dredging methods
- Requirement of utilities within the project site and their capacities (viz. boilers), workshop, treatment plants etc.
- (Existing and proposed)
- Facilities like canteen, staff colony, security, recreation centre, hospital, schools etc. (both existing and proposed)
- Products and by-products, their storage and transport

- Details of stacks, vents and flares, their heights, composition of emissions, their temperature and exit velocity etc.
- Noise levels produced by equipment and machinery at source
- Blast induced ground vibrations
- Quantities of solid, liquid and gaseous wastes generated (including overburden/maintenance dredging), their points of generation in the manufacturing process, their characteristics, proposed method of treatment and disposal
- Toxic and hazardous wastes

3.1.3 Public hearing

The State Board provides the details of Public Hearing to the reviewer. At this stage the proponent is obliged to respond to issues raised during public hearing.

In reviewing the adequacy of the consultation process, together with the incorporation of its results into the detailed EIA, the Impact Assessment Agency should examine whether the procedure has been followed as per MoEF notification and

- **An overview of the issues discussed**
- **How the concerns raised were responded to by the project proponent**
- **How these responses were conveyed back to those consulted**
- **What are the public hearing panel's observations**

To assist the review in appraising the adequacy of the consultation process, **Box 3.3** contains a checklist of programme objectives and issues for verification.

Box 3.3

Objective	Issues to verify
Stakeholders Identification	Is the Project Proponent aware of all those groups and individuals who will be directly affected by the social or environmental impacts of the project?

Impact Identification	Has project proponent addressed to mitigation options. Have all social and environmental impacts of significance to the local population and other stakeholders been assessed in the EIA (including the indirect social impacts)
Mitigation Options	Has the project proponent addressed the issues of project compensation and rehabilitation as per the procedure
Monitoring	Have project-affected groups been proposed to be involved in monitoring the effectiveness of social and environmental impact mitigation and is a plan for the same presented?
Community Development	Is proponent working to promote local development within the wider community?

3.1.4 Construction Stage Impacts

The project construction phase (though generally short-term in comparison to the operation phase) can lead to significant environmental impacts. Significant impacts can result through short-term, high-intensity pressures on the physico-chemical environment in relation to air, groundwater, surface water, soils and land. Risks to fragile and ecologically sensitive systems are of particular importance while assessing the Construction Stage Impacts, in addition to hazards and risks posed to construction stage workers.

The stress on infrastructure, socio-cultural incompatibility due to immigration of construction workers and living conditions and consequent public hygiene are also important issues to be considered while assessing impacts during construction stage.

The reviewer will need to examine whether these specific issues are considered while adopting methods of prediction of construction stage impacts.

The prediction of construction stage impacts should also include any impacts occurring as a result of project infrastructure setup during construction, (e.g. quarries, roads, temporary labour colonies, borrow areas) the waste and refuse generated during construction, and any likely impacts resulting through de-commissioning of temporary structure(s) created during construction phase.

3.1.5 Project Resource Requirements and Related Impacts

This subsection guides in reviewing those impacts arising out of a proposed projects resource consumption. Again, the objective of the reviewer is to verify that all the significant impacts have been duly considered and that the analytical tools and approaches used for their prediction and the EIS are relevant and reliable.

This subsection, therefore, provides the reviewer with a series of checklists addressing the prediction of resource related impacts falling under the following headings:

- Impacts on public utilities **(Box 3.4)**
- Impacts on natural resources **(Box 3.5)**

The prediction of impacts resulting through the consumption of fuel and raw materials would of course depend on the materials in question. Specifically, focus would be required on materials whose availability is limited. Moreover, if raw material extraction is to be included as a part of the project impacts resulting from extraction / mining will also need to be predicted.

Box 3.4

Impact on Public utilities arising out of use of the utilities for project activities

- Stress on distributive resources e.g. water and power supply and transportation and resultant decrease in reliability and increase in break downs and accidents during construction and operation phases of the project

- Habitat fragmentation leading to disruption in supplies and transportation during construction phase
- Loss of open space and visual impairment to the residents in the contiguous areas
- Increased stress on sewerage and drainage systems
- Increased stress on health care, education and recreational utilities

Box 3.5

Impacts on resources arising out of use of the resources for project activities

- Conflicts with contiguous and / or downstream population arising out of use of surface water resources
- Extraction of groundwater subsequent lowering of ground water table and impacts on the use by contiguous population, land subsidence, salinity intrusion and degradation of water quality
- Land topography transformation and use of top soil
- Decrease in drainage into water bodies and groundwater recharge

3.1.6 Prediction of Environmental Media Quality

When reviewing the prediction of impacts on environmental media (air, water and land) quality it is important to note that impacts to sensitive receptors need to be delineated. The available scientific literature can be guidance in this matter.

Moreover if, during the public hearing process, impacts to a sensitive receptor are an issue of concern, it is the proponents responsibility to provide evidence supporting their prediction and the adequacy of any requisite mitigation measures.

There are five key steps in predicting environmental quality impacts.

Step 1 - Undertake a mass balance and estimate the quantity of wastes

Step 2 - Compare the above quantity of wastes (project emissions/ effluents/ solid wastes) with the baseline data

Step 3 - Identify the appropriate method for impact prediction

Step 4 - Prediction of impact

Step 5 - Look into uncertainties involved in the prediction.

The mass balance process can be verified in relation to the emission and discharge load information. The reviewer will need to check the input and output levels for each process depicted in the process flow sheet.

The next step in prediction is to collate the relevant data describing the attributes and wastes along with baseline conditions.

Step 3 will require the reviewer to validate the relevance of the method adopted **(Annex V)** for making impact predictions.

It is important to note that for many of the impacts, the approaches adopted are subjective. In all such cases, the reviewer will need to examine the effort made within the EIA study to remove the maximum feasible bias through the use of sampling procedures and Group interaction techniques viz. Delphi, brain, storming etc. Such impact predictions will, therefore, necessitate discussion. Any predictions based on subjective assessments will need to be clearly presented and accounted for.

In Step 4 the prediction made is verified.

The final stage (Step 5) of the environmental quality review will consider the previous 4 in relation to their presentation.

For large projects, environmental quality (and resource status) results will be presented in the form of maps at a scale of 1:25,000 or 1:50,000 (optionally using Geographical Information Systems) along with the thematic maps of baseline conditions.

3.1.7 Socio-economic Impacts

The prediction of socio-economic impacts can include assumptions and value judgments. Attention need to be paid in cases presenting the social cost-benefits of different stakeholder groups that were not determined or resolved through the process of consultation.

Much of the socio-economic data required for EIA does not exist, except to a limited extent in the Census records (conducted every 10 years, with the next due in 2001), and Revenue records. In many cases, these data will need to be validated and suitability verified by the project proponent/consultant through sample surveys. It is the responsibility of the reviewer to check the adequacy of data and suitability of sampling methods adopted in social surveys.

In many cases village maps and toposheets etc. are not updated, and may be inaccurate. The proponent may be asked to supplement the data by way of satellite imageries.

3.1.8 Ecological Impacts

This subsection provides guidance for review of assessment of ecological impacts due to the project activities, viz. construction and operation. The assessment of impacts on ecosystem is normally based on subjective judgments. It is a good practice to base the subjective judgments on the available knowledge on

- Plant and animal life and their habitat requirements and migratory routes
- Biotic communitys ability to withstand or respond to disturbance
- Impending changes, impacts and results from similar projects and classification of impacts based on their intensity, time scale and spatial extent.

A few bad practices normally found in EIA reports and need to be discouraged by the reviewer are:

- Evasion of possible impacts and lack of their assessment
- Omission of pertinent information necessary for unbiased evaluation of impacts
- Inadequate description of adverse impacts
- A plethora of biotic data or information without interpretation or correlation with possible impacts

An illustrative lists for consideration in an assessment of impacts on ecological systems are outlined in **Annex VI** and reviewer may take into account if the relevant issues are adequately addressed in the assessment or not. Guidance for relevant issues for different project types is in **Annex VII**.

The **Annex VIII** guides for ecological impact prediction and reviewer needs to verify the compliance.

3.1.9 Occupational Health Impact

The report should identify major occupational health and safety hazards and whether provision has been made to meet the available standards/ guidelines. Specific measures for control of fugitive emissions and odour nuisance should be enumerated. A list of references in this regard is enclosed as **Annex IX**.

3.1.10 Major Hazard/ Risk Assessment

Risk assessment can be applicable at a number of levels. Where it has been identified that the proposed project may contain significant risks and hazards, the following recommended methodologies **(Annex X)** constitute good practice on behalf of the proponent in assessing their probability and mitigation.

- **Hazard Prone Units** - Maximum Credible Accident Analysis using Fire Explosion and Toxicity Indices as listed in Dow's manual
- **Damage Distances** - EFFECTS or WHAZAN models (TNO, Netherlands)
- **Failure Probabilities** - HAZOP or Fault Tree analysis
- **Assessment of Risk** - using exposure potential, failure probability and damage distances
- **Screening of risk -** accept or reject decisions based on fatality rates
- **Mapping of risk contours**
- **Layout and locations of hazard/risk prone areas/units**

During the review all the areas/units methods followed, their reliability, and presentation will need to be determined.

3.1.11 Impact on Transport System

Raw materials including water and fuel and/or finished products including wastes are transported to / from the project site both during construction and operation phases. The impact of this on transport system, viz. Capacity to carry, congestion, need for expansion/augmentation should be assessed. In the case of pipeline transport, risk analysis and DMP should follow it.

3.1.12 Integrated Impact Assessment

The integrated impact assessment should include the identification of impacts resulting from the accumulation of impacts to the project region. These impacts are often termed cumulative and can result through cross media transfers and blending of pollutants.

Adequate account of potential cumulative impacts should, therefore, identify the:

- Dispersal of pollutants
- Cross media transfer of pollutants
- Accumulation of pollutants
- Environmental problems are acute (eutrophication of water bodies, heavy metal contamination and entry into the food chain etc.)
- Environmental media status is bad
- Ecosystems are fragile
- Sensitive areas are under stress

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