

**ENVIRONMENTAL IMPACT ASSESSMENT  
TERMS OF REFERENCE**



**Ministry of Environment & Forests  
GOVERNMENT OF INDIA, NEW DELHI**

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**TERMS OF REFERENCE [TOR] FOR EIA REPORT  
FOR ACTIVITIES / PROJECTS *REQUIRING*  
*ENVIRONMENTAL CLEARANCE***

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**AUGUST 2009**

**TERMS OF REFERENCE [TOR] FOR EIA REPORT**  
**FOR ACTIVITIES / PROJECTS *REQUIRING ENVIRONMENTAL CLEARANCE***

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## INTRODUCTION

Environmental Impact Assessment (EIA) is a planning tool now generally accepted as an integral component of sound decision-making. The Environmental Clearance [EC] process for majority of projects will comprise of a maximum of four stages - Screening, Scoping, Public Consultation & Appraisal. EC for developmental projects has been made mandatory by the Ministry of Environment & Forest through its Notification issued on 27.01.1994 under the provisions of Environment (Protection) Act, 1986. This was revised based on review of existing environmental clearance (EC) process and the demands from various stakeholders. Accordingly, MoEF issued revised Notification on EC process on 15.09.2006. This Notification has brought out structural changes in the clearance mechanism by decentralizing certain developmental activities based on its impact potential to the State Government and the Union Territory Administration. As a part of the standardization of the procedures for Environmental Clearance and in improving the quality of EIA documents as per the 2006 notification, MOEF identified the importance of the sector specific approach for EC. Accordingly preparation of Sector specific documents for EC are planned by identifying 36 sectors as given in the 2006 notification. The sector specific documentation designed to consist of the following:

- I ] Sector Specific Terms of Reference (TOR)
- II ] Sector Specific Guidance Manuals for preparation of EIA report.

The purpose of TOR is to enable the project proponent for planning and designing EIA. TOR is expected to provide a format and structure. The purpose of the Sector Specific Guidance manual is to enable the project proponent to have all detailed information to address all issues and implement field data collection and identify impacts and mitigation measures and EMP.

Administrative Staff College of India, Hyderabad has been assigned by MOEF in June 2008, the task of preparation of TOR and manuals for 10 sectors / developmental activities. These 10 sectors are categorized into two groups with a peer committee for each group consisting of Experts [Annexure 2] in various fields. In addition, a core committee is formed [Annexure 3] to oversee and review the reports endorsed and approved by peer committees. The details of experts involved in preparation of the TOR and manuals are given in Annexure 1. The sectors falling under Group I and II are as follows:

### **Project activities: Group I**

- Highways
- Ports & Harbours
- Airports
- Aerial Passenger Ropeways
- Building & Construction Projects and Townships and Area Development Projects

## **Project Activities: Group II**

- Nuclear Fuel Processing and Power Generation.
- Mining & Minerals
- Asbestos Based Products
- Coal Washeries
- Mineral Beneficiation

The TORs address sector specific issues relating to environmental impact assessment studies. While maintaining a common format for EIA Report preparation for all sectors, provision has been made to address issues unique or specific to each sector wherever applicable. The common format or generic structure essentially comprises of 11 sections which ultimately become 11 chapters in the Manual.

- i Objectives,
- ii General Information,
- I Introduction,
- II Project Description,
- III Analysis of Alternatives,
- IV Description of Environment [Land Air, Water, Noise],
- V Anticipated Environmental Impacts and Mitigation Measures,
- VI Environmental Monitoring Program,
- VII Additional Studies,
- VIII Project Benefits,
- IX Environmental Management Plan,
- X Summary and Conclusions, and
- XI Disclosure of consultants.

Terms of Reference (TOR) for all the sectors prepared by the experts were presented to the members of the Core and Peer committees. The peer and core committee members and invitees from MOEF have reviewed these documents. **This Report presents the Terms of Reference for eight sectors viz; Ports and harbors, airports, highways, building construction, townships and area development, mining of minerals, mineral beneficiation, coal washeries and asbestos.**

ASCI, Hyderabad

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*Terms of Reference*  
**For Environmental Impact Assessment of**  
**Ports and Harbors**

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*Terms of Reference (TOR)*  
**For Environmental Impact Assessment (EIA) of Ports and Harbors**

## **Objective**

Terms of Reference (TOR) for preparation of Environmental Impact assessment (EIA) for Ports and Harbour projects as per the EIA notification, 2006 has been devised to improve the quality of the reports and facilitate the decision making transparent and easy. TOR will help the project proponents and consultants to prepare report with relevant project specific data, which are informative, compact and easy to comprehend. TOR for Ports and Harbor projects is expected to cover all environmental related features.

## **General Information**

Development of port facilities can make a significant contribution to the economic development and the growth of maritime transport. At the same time it may also create adverse impacts on the surrounding environment. Port development may create a wide range of impacts on the environment through activities like construction work, dredging, reclamation, land fills, discharges from ships and cargo operations, and other port related activities.. Port development and operation should, therefore, be planned with careful consideration of their environmental impacts. The preparation of EIA report and implementation of EMP is essential for effectively managing these adverse effects.

EIA-EMP report should be based on maximum rated capacity of the project in terms of cargo handling, technology, equipment, manpower, resource use, etc. The report should be based on generic structure given in appendix III to the EIA notification 2006 for the project or its expansion based on proposed peak rated capacity. The report should incorporate the page numbers of various chapters, sections and sub-sections, tables, appendices, drawings and figures etc., with titles shall be clearly indicated under the heading contents.

**Ports and Harbors with cargo handling capacity  $\geq$  5 million TPA of cargo handling capacity (excluding fishing harbors are classified as category A projects and with cargo handling capacity  $<$  5 million TPA and/or  $\geq$  10000 TPA of fish handling capacity are classified as category B projects, subject to the applicability of General Conditions as stipulated in the EIA Notification, 2006.**

## 1.0 Introduction

This chapter should cover the following.

- Purpose of the project, project proponent, brief description of the project- name, nature, size, location of the project, its importance to the country and the region
- Land description- plot/ survey nos/ village, tehsil, district, state & extent of the land
- Profile of the project proponent, name and contact address with e-mail, implementing organization, organizational chart, project consultants etc
- Whether the project attracts the provisions of General Conditions of EIA Notification 2006. If so applicability should be discussed
- The proponent should confirm that the project meets the central/state/local environmental regulations and standards applicable for the project
- Any litigation pending against the proposed project and/ or any direction/ order passed by any court of law against the project, if so, details thereof
- In case of expansion/ modernization of the project, the environmental compliance status for the existing project should be explained

## 2.0 Project Description

This chapter should cover the broader details of the basic activities, location, layout and implementation schedule of the project.

- Type of the project- new, expansion, modernization, container cargo handling facility, fishing, minor / major port etc
- Relevance of the project in the light of the existing development plans of the region
- Project coverage, master plan, phasing and scope
- Description of a project site, geology, topography, transport and connectivity, demographic aspects, socio, cultural and economic aspects, villages, settlements
- Capacity of the port, types of cargo proposed for handling, cargo handling equipments, ancillary operations, housing, truck parking details etc
- Technologies involved for design, construction, equipment and operation
- Use of existing public infrastructure - road, railway and inland waterway net works, water supply, electrical power etc.
- Estimated water budget for the proposed project- during construction/ operation stages
- Estimated cost of development of the project, environmental cost, funding agencies i.e., whether governmental or on the basis of BOT etc.
- Details of land acquisition, rehabilitation of communities / villages present status of such activities
- Resources, manpower and time frame etc -required for project implementation

## Essential Maps to be provided with application

- A map specifying locations of the state, district and project location
- A map of project area and 10 km area from boundary of the proposed/existing project area, delineating protected areas notified under the wild life (Protection) Act, 1972 / critically polluted areas as notified by the CPCB from time to time / notified eco sensitive areas / inter state boundaries and international boundaries
- A map covering aerial distance of 15 km on the landward side from the proposed project boundary delineating environmental sensitive areas as specified in column no 9(iii), Form I of EIA notification dated 14<sup>th</sup> Sep 06.
- Land use map of the study area to 1: 25,000 scale based on recent satellite imagery of the project area and 10 kms from the proposed project boundary delineating the cropping pattern, wastelands, forest area and built-up areas, water bodies, human habitation and other surface features such as railway tracks, ports, airports, roads, NH, major industries etc.
- Site lay out plan of the proposed development shall be submitted to a scale of 1:5000, clearly marking the layout of breakwaters, navigation channels, harbour basin, berths, dry docks, work shops, container freight station, cargo handling systems, conveyors, covered and uncovered storage yards, ware houses, roads, railway tracks, effluent disposal point, administrative and operational buildings, utilities, town ships, greenbelt, dredged material disposal, etc. Boundaries of the proposed port shall be shown therein with latitude and longitude.
- Area drainage contour map of the project area and 2-5 km from the proposed project area shall be clearly indicated. In case of any proposed diversion of nallah/canal/river, same shall also be shown in the map
- Hydrographic charts of the offshore area giving general morphology of the coastal stretch to a scale of 1:50,000 shall be submitted covering water depth up to 10m beyond the maximum proposed dredging depths of the project and covering a distance of 5 km along the coast from the project limits on both sides
- The CRZ maps indicating the High Tide Level (HTL), Low Tide Level (LTL), demarcated by one of the seven authorized agencies and the project lay out superimposed on the map should be submitted on 1:5000 scale map. This map shall be recommended by the state/Union Territory CZM authority

### 3.0 Analysis of alternatives (Technology & Sites)

In case, the scoping exercise results in need for alternatives this chapter shall include:

- Description of various alternatives like locations or layouts or technologies studied
- Description of each alternative
- Summary of adverse impacts of each alternative
- Selection of alternative



## **4.0 Description of the Environment**

### **4.0 Study Area**

As a primary requirement of EIA process, the proponent should collect primary baseline data in the project area as well as in the area falling 5 km from the proposed project boundary and secondary data should be collected within 15 kms aerial distance from the project boundary, as specifically mentioned at column 9(iii) of Form I of EIA Notification 2006. The study areas mentioned in this document shall be considered for guidance purpose but the exact study area for different environmental attributes (water, air, noise, soil, etc) is to be submitted considering the proposed activities and location, along with proper reasoning, for review and approval by the expert appraisal committee.

### **4.1 Land Environment**

#### **4.1.1 Land**

Availability of land for earmarking for the port without causing a due hardship to local habitat and their socio cultural and economic aspects is very important. Data on the land availability is to be ascertained from local authorities, revenue records etc. Justification for the proposed quantum of the area is to be given.

#### **4.1.2 Topography**

Baseline data to be given on description of existing situation of the land at the proposed project area including description of terrain hill slopes coastal and inland topography, coastal features (lowland, beaches, littoral areas, shoal areas), terrain features, slope and elevation. Study of land use pattern, habitation, cropping pattern, forest cover, environmentally sensitive places etc, by employing remote sensing techniques (if available) and also through secondary data sources.

#### **4.1.3 Geology**

Baseline data to be provided on rock types, regional tectonic setting (reported fractures/faulting, folding, warping), and history of any volcanic activity, seismicity and associated hazards, mainly in the coastal area. Information on quarry yields, strengths of rock, distance of quarries from habitat, restrictions for quarrying, environmental controls, statutory permissions etc., should be provided.

#### **4.1.4 Soil**

Soil data including type, classification, characteristics, soil properties etc., are important from engineering considerations for design of structures, loading capacities of cargo stockpiles, green belt development etc. Changes in parameters of soil also may affect plantation and vegetative growth, which in turn may endanger the health of local habitat. Baseline data of the soil, results of investigations carried out to be provided for the project area.

#### **4.1.5 Meteorological Data**

Meteorological data covering the following should be incorporated in the EIA report. The data for at least a 10 year period should be presented from the nearest meteorological station, except for the history of cyclones and tidal surges for which 100 year data is required.

- Wind speed and direction
- Rainfall
- Relative humidity
- Temperature
- Barometric pressures
- History of cyclones

### **4.2 Water Environment**

#### **4.2.1 Ground water**

Baseline data of ground water including data of pH, dissolved solids, suspended solids, BOD, DO, coli-form bacteria, oil, heavy metals (depending upon the type of cargo) is to be collected at least for one season. Usage purpose of the ground water, if any, is to be indicated.

#### **4.2.2 Surface Water**

Baseline data on location of surface water like lagoons, lakes, tidal inlets, streams, rivers, their details, present quality and their utility, if any, is to be provided. Details of water bodies in the project area shall be described specifically. Water quality is to be monitored for one season.

## **4.3 Marine Environment**

### **4.3.1 Coastal Hydrology/geomorphology**

Coastal hydrology requires collection of oceanographic data during the study period, covering the following parameters:

- Tides
- Waves (wind waves and swells)
- Storm surges
- Currents
- Salinity
- Sea water temperature
- Suspended load, and
- Seabed bathymetry

Baseline oceanographic data should extend at least to depths more than 10m of proposed deepening of the harbor approach and basin as per master plan proposed. A study on likely changes in the sediment transport and littoral drift due to the construction of port particularly the breakwater should be taken up.

Details of mangroves, marshes and other coastal vegetation, sand dunes, coastal stability, seismic characteristics, history of any endangered species, coastal erosion, and shoreline changes should be furnished.

### **4.3.2 Bed sediment contamination**

Baseline data on bottom sediments and the associated bottom biota and other physical habitat, at the proposed project area and the neighborhood areas has to be collected and analyzed.

### **4.3.3 Sea/Harbor Water Quality**

Baseline data shall be collected on chemical parameters in the open sea and in the proposed port area for understanding hydro chemical characteristics in the marine environment (such as sea water temp, BOD, DO, pH, TSS, salinity, heavy metals depending upon the cargo, etc.)

## **4.4 Biological Environment**

### **4.4.1 Marine/Coastal Ecology**

Baseline data of aquatic flora and fauna at the project area, including the coastal area is to be ascertained by proper surveys including mangroves and marshes and other coastal vegetation, sand dunes. Data on coastal stability, seismic characteristics, history of any endangered species, coastal erosion, shoreline changes, if any, is also necessary.

### **4.4.2 Flora and Fauna in the neighborhood**

Details on secondary data on the existing flora and fauna in the study area as well as 15km from its boundary, carried out by an university/institution under the relevant discipline (such as BSI, ZSI, WII, etc) shall be included in the list of flora and fauna along with classification as per Schedule given in the Wild Life Protection Act, 1972 (for fauna) and in the Red Book Data (flora) and a statement clearly specifying whether the study area forms a part of an ecologically sensitive area or migratory corridor of any endangered fauna.

## **4.5 Air Environment**

Base line data of ambient air parameters namely RSPM, nitrogen dioxide, sulphur dioxide, carbon monoxide, heavy metals and other harmful air pollutants depending upon the type of the cargo should be monitored.

This data should be collected in an area extending at least 5 km from the project boundary by observation at a number of locations. Specific importance should be attached to areas in close proximity of project say up to 1 km. One season data should be monitored other than monsoon as per the CPCB Norms. One station should be in the up-wind/ non-impact/ non-polluting area as a control station.

## **4.6 Noise**

Baseline data on noise pollution at the project area and the neighbourhood up to 1 km or nearest residential areas is to be monitored as per the CPCB norms.

## **4.7 Existing Solid Waste Disposal facilities**

Details of authorized municipal solid waste facilities, biomedical treatment facilities and hazardous waste disposal facilities in the area should be inventorized, in case if it is proposed to utilize the same

## **4.8 Socio-economic and Occupational Health Environments**

Baseline data at the project area shall include the demography, particularly on human settlements, health status of the communities, existing infrastructure facilities in the proposed area and area of impact due to the proposed activity. Present employment and livelihood of these populations, awareness of the population about the proposed activity shall also be included.

## **4.9 Public Utilities**

Base line data of existing public utility infrastructure shall be ascertained and reported to assess the impacts of the project on these public utilities in order to incorporate desired methods in the EMP and monitor the same during the construction as well as operational phases of the port.

## **5.0 Anticipated Environmental Impacts and Mitigation Measures**

This Chapter should describe the likely impact of the project on each of the environmental parameters, methods adopted for assessing the impact such as model studies, empirical methods, reference to existing similar situations, reference to previous studies, details of mitigation methods proposed to reduce adverse effects of the project, best environmental practices and conservation of natural resources. The identification of specific impacts followed with mitigation measures should be done for different stages i.e., location of the port, construction including dredging, ship traffic including discharges from vessels and cargo operations.

## **5.1 Land Environment**

### **5.1.1 Land**

*Anticipated Impacts:*

Impact of project construction/operation on the land requirement / land use pattern should be assessed. Affect of future growth of the port facility and/or of the ancillaries should be carefully assessed by preparing master plans for the port and the ancillaries. Impact on the public utilities arising out of the utilities for the project activities and impact on the natural drainage system are equally important. Prediction of impacts should include impacts on the existing infrastructures like road network, housing, ground water/surface water etc., and loss of productive soil and impact on natural drainage pattern.

*Mitigation Measures:*

Mitigation measures to reduce adverse effects like adopting soil improvement techniques and adopting suitable design methods to reduce land requirement. Where land acquisition and consequential R&R methods are called for, it should be implemented duly adhering to the norms and complying with pertinent statutory requirements for such land acquisition. Strengthening of road and rail network infrastructure to handle the increase in traffic and truck parking arrangements, integration of Port development with the local land use plan should be planned.

### **5.1.2 Topography, geology and soil**

*Anticipated Impacts:*

Impact of port construction/operation on the topography due to activities like depletion of hills due to large scale quarrying, filling of low lying area with dredged spoil and borrowed material, damage to existing vegetation/green belt and plantation, changes in land use patterns, disturbance to existing protected areas like mangroves, forests and environmentally sensitive areas/zones should be assessed

Flooding due to filling up of low-lying areas should be assessed. Impacts on the surrounding land use pattern, on infrastructure like housing, ground water, etc should be assessed.

Impact of the project construction on the geology and vice-versa should to be studied in detailed. Impact of project construction/operation on the soil parameters, probability of settlement, subsidence, slides, surface drainage, leachets etc., are to be estimated

*Mitigation Measures:*

Mitigation measures to reduce adverse effects include study of alternative sites, improving green belt, obtaining construction materials from other sources, usage of alternative construction materials like fly ash, where possible; storm water management etc. Adopting soil improvement techniques and adopting suitable design methods, ground covering etc.

## **5.2 Water Environment**

### **5.2.1 Ground Water**

*Anticipated impacts:*

Discharge of trade effluent and sewage and its impact. Impact of project construction/operation on the ground water on account of leachets, run off from material and cargo storages and toxic or harmful substances, percolation, sea water intrusion etc.,

*Mitigation measures:*

Mitigation measures to reduce adverse effects like impervious paving the cargo areas, impervious roads, lined drains, routing surface drainage to settlement tanks/pits etc. Treatment of effluent, recycle/ reuse and disposal should be planned. Groundwater study on leaches should be carried out periodically and should be correlated with baseline data. Remedial measures should be taken in case of any deviation. Based on the total water budget of the project, the use of ground water should to be reviewed and alternatives to be presented.

## **5.2.2 Surface Water**

*Anticipated impacts:*

Impact of port operations on surface water sources, contamination due to cargo operations, impact on utility of surface water resources by the neighboring colonies, impact on surface water flow (ex. flooding) due to anticipated obstructions, etc

*Mitigation measures:*

Protection measures to surface water resources to prevent reduction in their quality due to construction and operational activities and choice of alternative resources. Proposals to treat effluents conforming to standards notified under EP Act 1996 should be submitted.

## **5.3 Marine Environment**

### **5.3.1 Coastal Hydrology**

*Anticipated impacts:*

Impact of the project construction/operation on the coastal hydrology on account of port construction should be assessed by suitable model studies.

*Mitigation measures:*

Careful site selection and port design should be planned to minimize impacts due to changes in current patterns and other coastal hydrology. Model experiments or computer simulations of these changes are useful in developing an appropriate design. Shore protection works like construction of sea walls, groynes, sand by passing or beach nourishment should be studied.

### **5.3.2 Bed sediment contamination**

*Anticipated impacts:*

Impact of the project construction/operation on the bed sediment contamination on account of port construction/operations is to be assessed by suitable empirical/model studies.

*Mitigation measures:*

A survey of contamination of bottom sediments should be undertaken before dredging

### **5.3.3 Sea/Harbor Water Quality**

*Anticipated impacts:*

Impact of the project construction/operation on the sea/harbour water quality on account of port construction is to be assessed by suitable empirical/model studies.

*Mitigation measures:*

Proper collection and disposal of liquid and solid waste from shore establishment and ships should be planned.

## **5.4 Biological Environment**

*Anticipated impacts:*

Impacts of the project construction/operation on the marine/coastal ecology on account of port construction should be assessed by suitable empirical/model studies. Impacts due to floodlights on the nesting of sea turtles and other species should be studied

*Mitigation measures:*

Mitigation measures to reduce adverse effects should be provided.

## **5.5 Air Environment**

*Anticipated Impacts:*

Impact of project construction/operation on the ambient air quality on account of emissions of dust during construction and cargo handling as well as emission of gases from equipment deployed for construction and cargo handling should be assessed. Prediction due to emissions during cargo handling/ emissions from the ships in the port area/ emissions due to increased traffic, emission inventory for critical pollutants with and without mitigation measures, prediction of the impact due to the existing activity on the proposed project, prediction of impacts due to sanctioned/on going projects in the surrounding area on the proposed project and the ambient environment shall be carried out.



*Mitigation measures:*

Mitigation measures proposed during the construction stage should include dust suppression measures by suitable techniques. Mitigation measures proposed during the operation stage should include alternative solutions such as closed conveyor system, closed silos, closed vehicles to transport dusty cargo etc, mitigation measures to lower the emissions from the ships and green belt development.

## **5.6 Noise Pollution**

*Anticipated impacts:*

Impact of project construction/operation on the noise and vibration on account of construction equipment, cargo handling equipment and road traffic.

*Mitigation measures:*

Mitigation measures to reduce adverse effects should be provided.

## **5.7 Solid Waste Management**

*Anticipated impacts:*

Impact due to non-hazardous and hazardous solid waste generated during the construction and operational stages should be assessed.

*Mitigation measures:*

Mitigation measures to comply the norms should be planned. Options for minimization of solid waste and environmentally compactable disposal/ recycling of waste to conserve natural resources should be planned. Management and disposal of temporary structures, made during construction phase should be planned.

## **5.8 Socio-economic and Occupational Health Environment**

*Anticipated impacts:*

Predicted impact on the communities of the proposed activity. Details of public and private land in the proposed and immediate surroundings socio-economic status of the affected owners of the private land shall be properly complied. Present status of health, housing, public utilities, commercial structures and transportation should be collected. Impact of the project on socio cultural aspects should be assessed. Socio-economic impacts due to displacement of fishing settlements and population influx due to increased activities should be assessed.

*Mitigation measures:*

Mitigation measures to reduce adverse effects including satisfactory R&R methods should be planned.

## 6.0 Environmental Monitoring Program

This Chapter shall include details of environmental monitoring programme. It should include the technical aspects of monitoring the effectiveness of mitigation measures (including measurement methodologies, data analysis, reporting schedules, emergency procedures, detailed budget & procurement schedules).

- Summary matrix of environmental monitoring, during construction and operation stage
- Requirement of monitoring facilities
- Frequency, location, parameters of monitoring
- Compilation and analysis of data, comparison with base line data and compliance to accepted norms and reporting system
- Plantation monitoring program

## 7.0 Additional Studies

Specific condition	Study required
Studies identified by the proponent and the Regulating Authority	Studies directed by the Expert Appraisal Committee while deciding the TOR for the project
Studies identified by the public and other stake holders	Public hearing with the issues raised by the public and the response of the project proponent in tabular form shall be discussed
Risk Analysis and Disaster Management Plan (DMP)	<ul style="list-style-type: none"> <li>• Risk analysis</li> <li>• Safety measures for handling bulk liquid substances</li> <li>• Personal protection equipment</li> <li>• Disaster management Plan (DMP)</li> <li>• Oil spill contingency plan</li> <li>• Emergency response procedures</li> </ul>
Natural resource conservation and optimization	<p>Plan of action for conservation of natural resources such as utilization of fly ash and other suitable waste materials availability for the construction of the project. Dredged material utilization and disposal plan should be furnished.</p> <p>Water Conservation measures should be addressed. Energy efficiency measures in the activity arte to be drawn up.</p>
R & R action plans	Detailed R&R plan with data on the existing socio-economic status of the population in the study area and broad plan for resettlement of the displaced population, site for the resettlement colony, alternative livelihood concerns/employment and rehabilitation of the displaced people, civil and housing amenities

	being offered, etc and the schedule of the implementation of the project specific R&R Plan. Details of provisions (capital & recurring) for the project specific R&R Plan
Specific studies requirement depending on the site and activity proposed shall be discussed	

## 8.0 Project benefits

This chapter shall include benefits accruing to the locality, neighbourhood, region and nation as a whole. It should bring out details of benefits by way of:

- Improvements in the physical infrastructure by way addition of project infrastructure, ancillary industries that may come up on account of the project
- Improvements in the social infrastructure like roads, railways, townships, housing, water supply, electrical power, drainage, educational institutions, hospitals, effluent treatment plants improved waste disposal systems, improved environmental conditions, etc.
- Employment potential –skilled; semi-skilled and unskilled labour both during construction and operational phases of the project with specific attention to employment potential of local population as well as necessity for imparting any specialized skills to them to be eligible for such employment in the project on a long term basis i.e., during operational and maintenance stages of the project and
- Other tangible benefits like improved standards of living, health, education etc.

## 9.0 Environmental cost benefit analysis

If recommended by the Expert Appraisal Committee at the scoping stage, this chapter shall include the environmental cost benefit analysis of the project.

## 10.0 Environmental Management Plan (EMP)

- Summary of potential impacts & recommended mitigation measures.
- Allocation of resources and responsibilities for plan implementation
- Administrative and technical setup for management of environment
- Institutional arrangements proposed with other organizations/Govt. authorities for effective implementation of environmental measures proposed in the EIA
- Safe guards/mechanism to continue the assumptions/field conditions made in the EIA Environmental specifications for contractors should cover the required safeguards during the design and construction stage

## **11.0 Summary & Conclusion (Summary EIA)**

It shall be a summary of the full EIA report condensed to ten A-4 size pages at the maximum. It should necessarily cover in brief the following chapters of the full EIA report - Introduction/ Project description/ Description of the environment// Anticipated environmental impacts & mitigation measures/ Additional studies/ Environmental monitoring programme/ Project benefits/ Environmental management plan / Disclosure of consultants engaged

## **12.0 Disclosure of consultants engaged**

This chapter shall include the names of the consultants engaged with their brief resume and nature of consultancy rendered.

## **Enclosures**

Feasibility report/Form I/Photos of proposed project site, impact areas

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*Terms of Reference*  
**For Environmental Impact Assessment of**  
**Airports**

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**Terms of Reference (TOR)**  
For  
**ENVIRONMENTAL IMPACT ASSESSMENT OF**  
**AIRPORT DEVELOPMENT / EXPANSION / MODERNISATION**

## **Objectives**

Terms of Reference (TOR) for preparation of Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for Airport Development / Expansion / Modernization are prerequisites for obtaining Environmental clearance as per the EIA notification of September 2006 read along with draft modification issued in January 2009 by Ministry of Environment and Forests (MoEF) GOI. They have been devised to improve the quality of the reports and make decision-making process transparent and easy. TOR will help the project proponents and consultants to prepare the report with relevant project specific data, which are precise, concise and easy to comprehend. TOR for Airport Development/ Expansion/ Modernization is expected to cover all environmental related features.

## **General Information**

Airports are classified as international, domestic with customs facilities and domestic airports. Aviation compared to any other mode of transport, has grown rapidly and made significant contribution to the economic development of countries world over. Development / expansion / modernisation of airport facilities (referred as Project) are a right step towards meeting that end. Associated with the economic benefits, they may also create adverse impacts on the surrounding environment during construction, operational and post operational phases of the project. These include pollution in land, air, water, noise, biological, socio-economic and health environments. The project development and operation should therefore be planned with careful consideration of their environmental impacts. To minimise these adverse effects that may be caused by the project and to identify suitable alternate methods /sites; techniques of Environmental Impact Assessment became necessary.

## **1.0 Introduction**

Airport development / expansion / modernisation is listed at Para 7 (a) of the schedule of list of projects dealing with physical infrastructure in MoEF notification as modified in January 2009. It is a category 'A' project as stipulated in the EIA notification 2006. Prior environmental clearance before starting any Construction work or preparation of land except for security the land is mandatory for this project.

This chapter shall cover purpose of the project, details of project proponent, brief description of the project; name, nature, size, location of the project and its importance to the region.

Profile of the Project Proponent, name and contact address, Implementing Organization, Organizational Chart, Project consultants etc., should be mentioned clearly.

Land description/ plot/ survey / khasra nos, village, tehsil, district, state & extent of the land must be mentioned clearly.

Description of existing National/State environmental laws/ regulations on the proposed activity with annexure giving their references is to be brought out clearly.

Any litigations pending against the proposed project site and / or any directions or orders passed by any court of law against the project are to be detailed out.

In case of expansion/ modernization of the project, the environmental compliance status for the existing project should be explained.

In the beginning of the EIA report, the page numbers of various chapters, sections and sub-sections, tables, appendices, drawings and figures etc., with titles should be clearly indicated.

## **2.0 Project Description**

The chapter should contain the broader details of the basic activities, location, lay out and implementation schedule of the project.

*Background of the project may contain the following:*

- Purpose of the project, goals and objectives of the proposed project
- Significance of the project both at local and national level and its contribution to national economy.
- Relevance of the project in light of the existing development plans of the region.
- Information on the proposed activity in the Indian context and its overall function.

*Project details should include information related to:*

- Project coverage, master plan, phasing and scope.

- Estimated cost of development of the project, environmental costs, funding agencies, whether governmental or on the basis of **BOO** or **BOT** etc
- Resources, manpower, time frame etc required for the completion of the project.

*Essential Toposheets / Maps to be provided with TOR application*

a. Topographical map

A map of the topo sheet of the study area (project area and area 10 km around its boundary) delineating the major topographical features such as land use, drainage, locations of habitats. Major constructions including roads, railways, pipelines, major industries, if any in the area are to be clearly shown.

A map of the study area covering aerial distance of 15 km from the proposed project boundary delineating environmental sensitive areas as specified in Form I of EIA notification of Sept 06.

b. Remote sensing imagery

Land use map of the study area to 1: 25,000 scale, based on recent satellite imagery of the study area delineating the cropping pattern, waste land, forest area and built up area may be prepared.

c. Digital Elevation Model (DEM) / Contour map

Contour map at sufficient or acceptable intervals as available in toposheets or as required for the study of project area and site plan of the area showing the various proposed break-up of the land may be prepared.

- Description of the project sites its geology, hydrology, topography, climate, connectivity by road/rail, demographic aspects, socio, cultural and economic aspects, villages, and settlements.
- Details of environmentally sensitive places, land acquisition and rehabilitation of communities/ villages with their present status. The siting criteria delineated by MoEF shall be discussed. Notified restrictions and limitations from environmental considerations etc., if any.
- Historical and climatic data such as climatic conditions, rainfall, wind pattern, history of cyclones, storms surges, visibility etc.,
- Layout plan of proposed project development , activity areas with facilities open to the sky such as runways, taxi/link taxi ways, aprons, drainages, sewage disposal,



navigation facilities, communication facilities, airfield lighting, crash fire & rescue facilities, car parking, access/approach roads, refueling facilities, boundary wall, meteorological observatory, landscape, waste disposal etc;

- Layout plan of proposed development of built up areas with covered construction such as terminal buildings and associated facilities, air traffic control tower, Repair& Servicing(R&S) hangars, AC plants, DG set rooms, operational buildings such as RADAR and Instrument Landing System(ILS) structures, administrative buildings, utilities such as main and stand by power, water supply installations, cargo storage facilities, Petrol Oil Lubricant (POL) stores ,Air Traffic Fuel(ATF) store etc;
- In case of expansion/ modernization of the project, the environmental compliance status for the existing project shall be explained. If the potential impacts on environment exceed the existing project limits fresh EIA process may be initiated before starting the project.
- Technologies involved for design, construction, equipment and operation are to be detailed.

### **3.0 Analysis of alternatives (Technology & Sites)**

If the scoping results in need for alternatives a clear description of the each alternative, summary of the impact - adverse and positive with each site and selection of alternatives is to be detailed out.

### **4.0 Description of the Environment**

Environmental data to be considered in relation to airport development would be: (a) land (b) ground water, surface water (c) air (d) biological (e) noise and vibration (f) socio economic and health environment.

#### *Study area:*

Primary data by measurements, field surveys and secondary data from secondary sources are to be collected in the study area within 10 km radius from Aero dome Reference Point (ARP). Beyond 10 kms, only secondary data is to be collected. Primary data should cover one season other than monsoon and secondary data for one full year.

Map of the study area clearly delineating the location of various monitoring stations (air, noise, water and soil) superimposed with location of habitats are to be shown. Monitoring should be done as per CPCB guidelines.

## 4.1 Land Environment

### 4.1a. *Physiography and Drainage Patterns:*

Land farms, terrain, may get affected due to construction of airport. It may require large scale quarrying, dredging and reclamation, which may cause changes in the topography. This in turn may affect the drainage pattern of the land / terrain.

Baseline data to be given on description of existing land area situation at the proposed project area including description of terrain hill slopes terrain features, slope and elevation. Study of land use pattern, habitation, cropping pattern, forest cover, environmental sensitive places etc., by employing remote sensing techniques and ground truthing is to be carried out.

Ecological features of forest area; agricultural land, grazing land, wildlife sanctuary land and national parks, migratory routes of fauna, water bodies, and drainage pattern including the orders of the drain and water sheds are to be shown clearly. Settlements in the study area may be delineated with respect to ARP on the site map. High rise buildings, industrial areas and zones, slaughter houses and other features of flight safety importance may also be marked on the map.

### 4.1b. *Soil*

Land is one of the important and rare resources. Airport projects require considerable land area for development of activity areas, operational and non-operational buildings, areas for ancillaries, utilities including townships. Sometimes acquisitions of large stretches of land and areas being used by the local habitat may be necessitated requiring rehabilitation measures. Availability of land for earmarking for the airport without causing undue hardship to local habitat and their socio cultural and economic aspects is very important. Site suitability for developing airport is also to be approved by aerodrome standards, directorate in the DGCA, Ministry of Civil Aviation in accordance with Para (xi) of the Aircraft Rules 1937. Baseline data of the land and its availability is to be ascertained from local authorities, revenues records etc., Justification for the proposed quantum of the area to be given.

Soil data including type, classification, characteristics, properties, etc are important from engineering considerations for structures etc. Changes in soil parameters may also affect plantation and vegetation which in turn may endanger the health of habitat.

Baseline data consisting of soil analysis and land use pattern of agriculture lands within the project area is to be collected to assess its fertility. Data pertaining to coverage of land for other purposes and general slope of the terrain within the study area is collected to assess the trends in the land use patterns and the natural runoff patterns.

## **4.2 Water Environment**

### **4.2a. Ground water**

Baseline data of ground water including data of pH, dissolved solids, suspended solids, BOD, DO, coliform bacteria, oil, fluorides, chlorides, heavy metals etc., to determine the quality of the ground water is to be estimated.

### **4.2b. Surface water,**

Baseline data on location sources of surface water like water bodies, lakes, their dimensions, present quality and their utility to be provided.

## **4.3 Air Environment**

Climatological Data: This is obtained from nearest India Meteorological Department (I M D) station for one full year. Micro meteorological data consisting of wind speed, wind direction, temperature, cloud cover, (amount and height), humidity, rainfall and wind rose, from primary and secondary sources in an area of 10km radius from ARP be obtained, on 24 hr basis.

Ambient Air Quality (AAQ) is important for the airport projects. The significance of aviation's impact on air quality will vary depending on many other factors such as, background pollution levels, other sources of pollution, weather and proximity of residential areas.

Aircraft engines produce emissions that are similar to other emissions resulting from any oil based fuel combustion. These, like any exhaust emissions, can affect local air quality at ground level. It is emissions from aircraft below 1,000ft, above the ground (typically around 3km from departure or, for arrivals, around 6km from touchdown that are chiefly involved in influencing local air quality. These emissions disperse with the wind and blend with emissions from other sources such as domestic heating emissions, factory emissions and transport pollution.

The local air quality relevant emissions attributed to aircraft operations at airports are oxides of nitrogen (NO<sub>x</sub>), carbon monoxide (CO), Unburnt hydrocarbons (NMHC and VOCs), sulphur dioxide(SO<sub>2</sub>), particulate matter (PM10 and PM2.5).

Aircraft engines, auxiliary power units, apron vehicles, de- icing, and apron spillages of fuel and chemicals emit these pollutants. Local factors influence the significance of individual emissions for each airport, but often NO<sub>x</sub> is by far the most abundant and is considered the most significant pollutant from an air quality stand point.

Baseline data of these parameters extending over an area of 10km radial distance from ARP of the project by observation at a number of locations, predominantly in the windward direction duly taking into account changes in predominant wind direction in the monsoon period and changes in humidity in atmosphere. Specific importance is to be attached to areas in close proximity of project up to 3km is essential, considering the mobile source of emission such as aircraft.

#### **4.4 Noise Environment**

Noise pollution is created by airside sources such as aircraft, under their flight paths and also by landside sources such as, DG sets, surface traffic, heavy machinery and aircraft on ground in start-up, taxi, take off and ground run phases. This type of noise during daytime effects the workers' and local population's health in the long run. The existing noise levels before starting the construction of airport are to be measured for collecting baseline data. The process is to be repeated during construction and operational phases of as well.

Measurements should typically be taken as per by CPCB guidelines and recorded as dB(A) in an area of 10km radius from ARP. Hourly equivalent noise levels, Leq, for day and night separately are to be recorded once in each season. Monitoring should typically be conducted with frequency of measurements more along the runways, near residential areas and near ground sources. Locations, at which measurements were taken, should be noted on a base map. Recorded values can be presented in Tables.

#### **4.5 Biological Environment**

Airport operations may cause loss of genetic material, loss or change of biomass and biodiversity, loss or change in local ecosystems, endangered species, effects on movements and breeding patterns of local wildlife. Existing biological conditions include the presence and distribution of indigenous and migratory animals, and indigenous plants. Known sensitivities of species of surrogate species should also be stated.

Baseline data on flora and fauna duly authenticated for study area should be furnished, based on field survey clearly indicating the Schedule of the fauna present. Data on sensitive habitats, wild or endangered species in the project area also is collected from Zoological Survey of India (ZSI), Botanical Survey of India (BSI), Wildlife Institute of India (WII) and Ministry of Earth Sciences.

## **4.6 Socio -Economic Environment**

Airport development may often require relocation of the local community, sometimes causing ethnic, cultural, tribal or religious conflicts with local people. Industrialization and modernization may change the cultural traditions of the local community. Baseline data on demographics, settlements, infrastructure facilities in the existing and relocated area, economic conditions in the existing and relocated area, cultural and archaeological assets within the project area should be catalogued and plotted on a base map.

## **4.7 Solid Waste**

The types of waste, which are generated, can be classified into construction or demolition waste and municipal waste, i.e., biodegradable and recyclable waste, hazardous waste and waste.

Details of authorized Municipal solid waste facilities, biomedical treatment facilities and hazardous waste disposal facilities in the area are to be given.

## **5.0 Anticipated Environmental Impacts and Mitigation Measures**

### **5.1 Prediction of impacts**

This should describe the likely impact of the project on each of the environmental parameters, methods adopted for assessing the impact such as model studies, empirical methods, reference to existing similar situations, reference to previous studies, details of mitigation, methods proposed to reduce adverse effects of the project, best environmental practices, conservation of natural resources; environmental management plan; post project environmental monitoring programme including budgeting for the expenditure proposed in the project cost. Reference to the models along with the inputs used may be given.

### **5.2. Land Environment**

#### **5.2.a. Physiography and drainage patterns**

##### *Anticipated Impacts:*

Impacts of project construction/ operation on the land requirement/ use pattern is to be assessed by standard procedures. Affect of future growth of the airport facility and/ or of the ancillaries is to be carefully assessed by preparing master plans for the airport and the ancillaries. Impact on the public utilities arising out of the project activities and impact on the natural drainage system are equally important. Prediction of impact on the existing infrastructures like road network, housing, loss of productive soil and impact on natural drainage pattern is to be considered. Loss of agriculture land is to be estimated by super posing the project lay-out on the land use site map.

*Mitigation Measures:*

Mitigation measures to reduce adverse effects like adopting soil improvement techniques and adopting suitable methods to reduce land requirement are to be identified. Strengthening of road network, infrastructure to handle the increase in traffic, parking arrangements, integration of airport development with the local land use plan are to be considered. Conformance to statutory regulations is to be ensured.

5.2.b. Soil

*Anticipated Impacts:*

Impact of airport construction / operation is to be assessed on the topography due to activities like large scale quarrying, filling of low lying areas with dredged spoil and burrowed material. Damage to green belt and plantation, changes in land use patterns, disturbance to existing protected areas like mangroves & forests and environmentally sensitive zones/areas, flooding due to filling up of low lying areas are to be assessed. Study on the trend of change in land use pattern for the last 10 years based on remote sensing data is to be made to establish trends in baseline data. Impact of the project construction / operation on the soil parameters, probability of settlement, subsidence, slides, surface drainage etc. is to be assessed.

*Mitigation measures:*

Measures for holding storm / flood waters entering project area and construction of drainage lines are to be discussed. Measures for soil erosion at quarry / burrow sites from which soil is drawn for filling, during construction phase to be discussed. Phase wise plan of plantation and compensatory forestation clearly indicating the area to be covered under plantation and the species to be given. Details of the plantation already done to be given. To reduce adverse effects like adopting soil improvement techniques and adopting suitable design methods etc., are to be considered.

**5.3 Water Environment**

*Anticipated impacts:*

Discharge of trade effluents and sewage, run off from cargo storages and toxic or harmful substances, and their percolation to underground water are to be assessed. Impact of airport operations on surface water sources, contamination due to cargo operations, impact on utility of surface water resources by the neighbouring colonies, impact on surface water flow (flooding) due to any anticipated obstructions and spillages etc. are some of the impacts to be mitigated. Detailed water balance along with flow chart of water use for the airports is to be provided.

*Mitigation measures:*

Mitigation measures include paving the cargo areas, impervious roads, lined impervious drains; routing surface drainage to settlement tank/ pits etc., Protection measures to surface water resources during construction and operational phases along with identification and provision of alternatives for their conservation may be clearly mentioned.

#### **5.4. Air Environment:**

*Anticipated impacts:*

The impact of project construction / operation on the ambient air quality on account of emissions of dust during construction and emission of gases from airside and land side sources such as aircraft, DG sets , surface traffic etc. in operational phases is to be assessed. Assessment of changes in AAQ parameters by suitable modeling techniques or empirical methods is to be resorted to. Prediction of fugitive dust / air emissions, prediction of point/line source emissions and emissions from the multi volume sources in the airport area is to be done in anticipation of increase in future air and surface traffic.

*Mitigation measures:*

Mitigation measures to reduce adverse effects during the construction stage and during the operation stage include alternative solutions such as closed conveyor system; lowering the emissions from the automobiles and the aircraft; institutional arrangements proposed with other agencies for effective implementation of environmental measures, applicable for environmental standards and compliance are to be proposed. Land scape development to mitigate the emission levels may be clearly mentioned.

Guidance on mitigation from airside sources, such as the procedures specified in ICAO Circular 303, AN176: and “Operational opportunities to minimize fuel use and emissions”; and the IATA “Guidance Material and Best Practices for Fuel Environmental Management” published Dec.2004 may be referred.

#### **5.5 Noise Environment**

*Anticipated impacts:*

Impacts on the noise environment are due to noise emitted by static and mobile sources from the ground side and air side are to be meduted. Noise pollution by static sources on ground are from aircraft in ground run, taxi mode and DG sets and machinery etc. Noise pollution by mobile sources is from aircraft engines and air frames under its flight path. Suitable modeling techniques may be used for prediction of noise levels.

*Mitigation Measures:*

Noise pollution can be controlled at the source of generation itself by employing techniques like control in the transmission path; installation barriers etc., Barriers between noise source and receiver can minimize the noise levels. Methods of reduction of noise from the airside sources are stipulated in chapter 3 standards in Annexure 16 of ICAO publication. Noise from DG sets may be reduced by provision of integral acoustic enclosure and by suitably modifying its dimensions. Certain proactive measures adopted in international practice which act as deterrents for noise generation may be used.

## **5.6 Biological Environment**

*Anticipated Impacts:*

Impacts of the projects during construction and operational phases, on the biological environment is to be assessed by suitable, empirical model studies. Effect of project on schedule-1 fauna and on fisheries due to displacement of water bodies if any is to be identified in the study area.

*Mitigation measures:*

In case of any Scheduled-1 fauna found in the area, the necessary plan for their conservation should be prepared in consultation with State forest Departments and details furnished. Measures adopted to preserve / relocate the water bodies as sources of irrigation and fisheries in study area be pointed. Phase wise plan of green belt near water bodies be provided. The expenditure may be budgeted in the project cost

## **5.7 Socio-Economic Environment**

*Anticipated Impacts:*

Impacts on the local population, infrastructure facilities, utilities are to be detailed out.

*Mitigation Measures:*

Preservation of cultural, historical and religious sites to honour the sensitivities of the residents may be carried out. Measures of socio- economic benefits proposed to the local communities be provided by the project proponent.

## **5.8 Solid Waste:**

*Anticipated Impacts:*

Impact of the project construction / operation on generation of waste is to be assessed. Prediction of quantity of solid waste to be generated is to be studied.

*Mitigation measures:*



Minimization of solid waste by using environmentally compatible disposable material; recycling of waste proper management and disposal of temporary structures, made during construction phase is to be done.

## **6.0 Environmental Monitoring Program**

This chapter should include:-

- Summary matrix of environmental monitoring, during construction and operation stage of project
- Technical aspects of monitoring for achieving effectiveness in mitigation measures.
- Requirement of monitoring facilities
- Frequency, location, parameters of monitoring
- Compilation and analysis of data and reporting system

## **7.0 Additional Studies**

### **7.1 Public consultation**

Public hearing with the issues raised by the public and the response of the project proponent in tabular form shall be provided.

### **7.2 Risk Assessment (ERA) and Disaster Management Plan (DMP)**

Activities associated with airport construction and operations also give rise to associated hazards and accidents. It is therefore desirable that based on the categories of hazards prevailing at the project site, risk analysis may be carried out by specialists in the field and recommendations may be implemented. Some of the activities requiring attention under this category are

- (a) Occupational hazards due to exposure etc.
- (b) Aircraft accidents near the airports,
- (c) Flooding of airport due to cloud burst,
- (d) Damage due to cyclones and
- (e) Sabotage to the aircraft and installation at the airport

### **7.3 Natural resource conservation**

Plan of action for conservation of natural resources and recycling of waste materials due to the project activity in the construction and operational phase of the project is to be discussed for open and covered area constructions. Energy efficiency measures in the activity are to be drawn up.

## **7.4 R&R Action Plan**

Detailed R&R plan with data on the existing socio-economic status of the population in the project area and broad plan for resettlement of the displaced population, site for the resettlement colony, alternative livelihood concerns/employment for the displaced people, civil and housing amenities being offered, etc and the schedule of the implementation of the project specific R&R Plan if any is to be given. Details of provisions (capital & recurring) for the project specific R&R Plan.

## **8.0 Project benefits**

This section details out the improvements in physical infrastructure, social infrastructure if any. Also it details out any employment potential and other benefits that are accrued if the project is taken up.

## **9.0 Environmental cost benefit analysis**

The detailed environmental cost benefit analysis is to be taken up if recommended in the scoping stage of the project.

## **10.0 Environmental Management Plan (EMP)**

Detailed EMP may be formulated to mitigate the residual impacts which should inter alias include the impact due to change in land use; due to loss of agricultural land and grazing land besides other impacts of the projects in air, water and noise environments. Budgeting for the EMP is to be included in EIA.

- Administrative and technical set up for management of environment
- In built mechanism of self monitoring of compliance of environmental regulations
- Institutional arrangements proposed with other organizations/ Govt. authorities for effective implementation of environmental measures proposed in the EIA
- Safe guards/mechanism to continue the assumptions/field conditions made in the EIA, for arriving the site suitability

Awareness and Training Methodology of training imparted to field personnel may be specified.

Record keeping & Reporting: Standard operational/administrative procedures for record maintenance and reporting may be prepared.

## **11.0 Summary & Conclusion (Summary EIA)**

The summary should be a clear presentation of the critical facts that make up each issue, and the resolution of the issues. Whenever possible, the summary should make use of base maps, tables and figures. Information should be condensed into succinct, but meaningful presentations. It must be able to stand alone as a document. It should necessarily cover and brief the following chapters of the full EIA report and address the following:-

- Introduction
- Project description & Project benefits
- Environmental Examination
- Additional Studies
- Environmental Management Plan and Post Project Monitoring Program
- Environmental Risk Assessment (ERA) and Disaster Management Plan (DMP)

## **12.0 Disclosure of consultants engaged**

The team of consultants engaged in this project is to be given.

### **Enclosures**

Feasibility report/ Duly filled in questionnaire / Relevant figures and tables if referred as annexure in the text/ Photos, or plates of proposed project site, impact areas

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*Terms of Reference*  
**For Environmental Impact Assessment of**  
**Highways**

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## **Terms of Reference (TOR) for Environmental Impact Assessment of Highway Projects**

### **Objective**

Terms of Reference (TOR) for preparation of Environmental Impact Assessment (EIA) and Environmental Management Plan for Highway Projects as per the EIA Notification, 2006 has been devised to improve the quality of the reports and facilitate the decision making transparent and easy. TOR will help the project proponents and consultants to prepare report with relevant project specific data, which are informative, compact and easy to comprehend. TOR for Highway Projects is expected to cover all environmental related features.

### **General Information**

Developments of Highway Projects are generally intended to improve the economic and social welfare of the people. At the same time it may also create adverse impacts on the surrounding environment. People and properties may be in the direct path of Road Works are effected. The Environmental impacts of highway projects include damage to sensitive eco-systems, soil erosion, changes to drainage pattern and thereby ground water, interference with animal and plant life, loss of productive agricultural lands, resettlement of people, disruption of local economic activities, demographic changes, accelerated urbanization and increase in air pollution.. Highway development and operation should, therefore, be planned with careful consideration of their environmental impacts. To minimize these adverse effects that may be created by the Highway development projects the techniques of Environmental Impact Assessment (EIA) become necessary. Identification and assessment of potential environmental impacts should be an integral part of the project cycle. It should commence early in the planning process to enable a full consideration of alternatives, and to avoid later delays and complications. Highway authorities should have a clearly designated staff member with overall responsibility for environmental matters and knowledge of environmental laws and regulations.

As per this EIA notification 2006, projects or activities included as Category 'A' in the Schedule shall require prior Environmental clearance from the Ministry of Environment and Forests on the recommendations of an Expert Appraisal Committee. All projects or activities included, as Category 'B' in the Schedule will require prior environmental clearance from the State/Union territory Environment Impact Assessment Authority

The highway projects are included in item no: 7(f) of schedule of MOEF notification 2006 with following categorization:

Project Activity	A Category	B Category	General Condition
Highways	i) New National Highways ii) Expansion of National Highways greater than 30 km, involving additional right of way greater than 20m involving land acquisition and passing through more than one State	i) New State High Ways ii) Expansion of National / State Highways greater than 30 km involving additional right of way greater than 20 m involving land acquisition	Any project or activity specified in Category 'B' will be treated as Category A, if located in whole or in part within 10 km from the boundary of: (i) Protected Areas notified under the Wild Life (Protection) Act-72, (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, (iv) Inter-State boundaries & international boundaries

All category A and category B1 Highway projects shall undertake Public Consultation except - **“Expansion of Roads and Highways which do not involve any further acquisition of land.”**

The EIA-EMP report should be based on generic structure given in Appendix III to the EIA notification 2006 for the project or its expansion / modernization. The EIA report should incorporate the page numbers of various chapters, sections and sub-sections, tables, appendices, drawings and figures etc., with titles shall be clearly indicated under the heading contents

## 1.0 Introduction

This chapter should cover the following:

- Purpose of the project, brief description of the project, project name, nature, size, its importance to the region and the country
- Profile of the project proponent, name and contact address with e-mail, organizational chart, project consultants etc., should be mentioned clearly

- Land description- village, tehsil, district, state and extent of the land must be mentioned clearly
- Whether the project attracts the provisions of General Conditions as per EIA notification 2006. If so, applicability to the project should be discussed
- The proponent should confirm that the project meets all the central/state/local environmental regulations and standards applicable for coal washeries and allied activities
- Any litigation(s) pending against the proposed project and/or any directions or orders passed by any court of law/any statutory authority against the project is to be detailed out
- In case of expansion/ modernization of the project, the environmental compliance status for the existing project should be explained
- National standards and codes of practice of Indian Roads Congress (IRC) and MoSRT &H particular to environmental issues, which are relevant to the proposed project should be furnished

## **2.0 Project Description**

### **2.1 Broader details of the project, location and alignment**

- Relevance of the project in light of the existing development plans of the region /state /nation
- Project coverage, master plan, phasing and scope
- Description of alternatives considered to avoid the ethnic minorities and indigenous people living in the proposed rights-of-way
- Procedures and criteria adopted for selection of the alignment of right of way and alternative alignments considered.
- Overall suitability of the identified alignment and the proposed activity in light of the existing Environmental Acts and deviations, if any
- Description of road alignment, broad geology, topography, connectivity, demographic aspects, socio, cultural and economic aspects, villages, settlements
- Details of land acquisition, rehabilitation of communities / villages present status
- Technologies involved for design, construction, equipment and operation
- Resources, manpower, time frame etc., required for project implementation
- Estimated cost of development of the project, environmental cost, funding agencies, whether governmental or on the basis of BOT etc,

### **Essential Maps to be provided with TOR**

- Highway alignment plan with the help of latest available cloud free satellite imagery of project alignment in 1:25,000 scale, and surrounding area covering 10

Km distance on either side of the proposed right of way showing the details of (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, (ii) Critically polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, (iv) Inter-state boundaries and international boundaries

- Alignment plan, with details such as nature of terrain (plain, rolling, hilly), details of villages, teshils, districts and states, latitude and longitude for important locations falling on the alignment shall be submitted
- A map derived from the recent satellite imagery covering aerial distance of 15 Km from the proposed alignment delineating environmental sensitive areas as specified in Form I of EIA notification dated 14<sup>th</sup> Sep 2006
- Land use map of the study area to 1: 25,000 scale based on recent satellite imagery of the study area delineating the crop lands (both single and double crop), agricultural plantations, fallow lands, waste lands, water bodies, built-up areas, forest area and other surface features such as railway tracks, ports, airports, roads, and major industries etc
- Area drainage map covering 500 meters on either side of proposed right of way shall be clearly indicated. In case of any proposed diversion of nallah/canal/river either during the construction phase or operational phase, it shall also be shown in the map
- Detailed ground surveyed map in 1:2000 scale showing the existing features falling within the right of way namely trees, structures including archeological & religious, monuments etc.

## 2.2 Activities for Site Preparation

- If the proposed route is passing through low lying areas, details of fill materials and initial and final levels after filling above MSL, should be provided
- If the proposed route involves stripping, the details of the area to be stripped, locations, volume and quantity of earth to be removed, type of soil and proposal for utilization of removed top soil with location of dump site to be provided
- If the proposed route involves cutting of earth, the details of area to be cut, depth of cut, locations, soil type, volume and quantity of earth and other materials to be removed with location of dump site to be provided
- If the proposed route is passing through any hilly area, and avalanche area the details to be provided
- If the proposed route involves tunneling, the details of the tunnel and locations of tunneling with geological structural fraction should be provided
- In case the road passes through a flood plain of the river, the details of micro drainage, flood passages and information on flood periodicity in the area should be provided
- If the proposed project involves any land reclamation, details to be provided for the activity for which land to be reclaimed and the area of land to be reclaimed



- If the proposed route involves any migratory path of animals, details about fauna, habitat and period of the year in which activity take place, should be provided
- Is there a possibility that the construction of roads will cause impacts such as destruction of forest, poaching, reduction in wetland areas, if so, details are to be provided
- If there will be any change in the drainage pattern after the proposed activity, details of changes to be furnished
- If the proposed route is passing through a city or town, with houses and human habitation on the either side of the road, the necessity for provision of service ducts to be studied

**If the project attracts the provisions of CRZ Notification:**

- In case the proposed route falls totally or partially in CRZ area, indicate the category of the area and also show under what provision this activity is permitted
- CRZ maps indicating the High Tide Level (HTL), Low Tide Level (LTL), demarcated by one of the seven authorized agencies and the project lay out superimposed on the map shall be submitted on 1:5000 scale map. This map shall be recommended by the state/union territory CZM authority
- If the proposed project involves extraction of sand, leveling or digging of sandy stretches with in 500 meters of high tide line, the area of stretches to be given
- If the project involves cutting/disturbance of mangroves, details about the area, species existing health status shall be given
- If any sand to be removed from sand dunes details to be given
- If the proposed project involves any dredging, details to be given
- Information should be furnished if any likely ingress of saline water into groundwater due to the proposed project

### 3.0 Analysis of alternatives (Technology & Sites)

In case, the scoping exercise results in need for alternatives this chapter shall include:

- Description of various alternatives like locations or technologies studied
- Description of each alternative
- Summary of adverse impacts of each alternative
- Selection of alternative

## 4.0 Description of the Environment

### Study area

As a primary requirement of EIA process, the proponent should collect primary baseline data in the right of way as well as the area falling within 500 meters on the either side of the right of way and secondary data should be collected within 15 kms aerial distance as specifically mentioned at column 9(iii) of Form I of EIA Notification 2006. The study areas mentioned in this document should be considered for guidance purpose only. The exact study area for different environmental attributes (water, air, noise, soil etc) is to be submitted considering the proposed project activity and location, with proper reasoning, for review and approval by the expert appraisal committee. Monitoring should be done as per CPCB guidelines.

TOR should contain details of secondary data, the source of secondary data, meteorological data from nearest station of IMD along with wind roses and proposed monitoring locations should be marked on the study map. Similarly the proposed locations of monitoring stations of water, air, soil, noise etc shall be shown on the study area map. One season monitoring data excluding monsoon should be collected. Period/date of data collection should be clearly indicated.

### 4.1 Land Environment

- Data of the proposed land and its availability should be ascertained from local authorities, revenue records etc.
- Description of the existing situation of the land along the alignment. Study of the land use pattern, habitation, cropping pattern, forest area, environmentally sensitive places, mangroves, notified industrial areas, sand dunes, nature of the terrain (plain, rolling, hilly), sea, river, lake etc. by employing remote sensing techniques followed by ground truthing and also through secondary data sources
- Details of villages, tehsil, districts and states, elevation above mean sea level & latitude and longitude of important locations from where the alignment will be passing
- Data on erosion potential, and natural drainage should be provided
- Geology: rock types, history of any volcanic activity, seismicity, land slides and associated hazards
- Soil - soil cover, physical and chemical properties

In case of expansion/ modernization of the existing road, the following additional information shall be provided

**Road factors:** (i) Land width (ii) Geometrics – curvature, gradient, and pavement width etc. (iii) structural condition of road and road structures

**Traffic factors:** Traffic volume- vehicles per day/traffic composition/average speed of travel/Presence of road intersection – nos./km and access control

## 4.2 Air Environment

- Climate and meteorology (max and min temperature, relative humidity, rainfall, frequency of tropical cyclone and snow fall); the nearest IMD meteorological station from which climatological data have been obtained to be indicated
- Wind rose (Wind direction and speed, 24 hourly data)
- Air quality monitoring data in respect of RSPM, SO<sub>2</sub>, NO<sub>x</sub>, and CO. Monitoring should cover one full season except monsoon. Frequency and methodology adopted should be as per CPCB guidelines
- Monitoring stations are to be located based on dominating wind direction, habitations, notified sanctuaries and terrain features in the study area. The locations of monitoring stations should be clearly specified

## 4.3. Water Environment

- Determine the sensitivity of the study zone and identify the main potential impacts, working from basic data on the drainage basin and watersheds, nature and frequency of flooding, water quality, water use, fauna species and habitats. Assess likely modification of baseline conditions arising from the project activity
- Details of springs, lakes, reservoirs within 500 meters of the proposed road right of way
- List the distance of the proposed alignment to the existing major water bodies used as drinking water in the down stream side of the alignment
- Fix-up the locations of representative monitoring stations along the proposed project road for surface and ground water resources and document them
- Samples should be collected for both surface and ground water and examined for physico-chemical, heavy metal and bacteriological parameters
- Delineation of water sheds and water drainage pattern in the study area using the topographical maps and the impacts of the proposed highways in changes the water course etc for examining the drainage patterns especially during monsoon season and during floods

#### **4.4. Noise Environment**

- Identify project activities during construction and operation phases, which will affect the noise levels and the potential for increased noise resulting from this project. Discuss the effect of noise levels on near by habitation during the construction and operational phases of the proposed highway. Identify noise reduction measures and traffic management strategies to be deployed for reducing the negative impacts if any
- Select the locations of monitoring stations along the alignment of the project covering sensitive locations such as residential, hospitals, schools, sanctuaries etc. Monitoring should be done for 24 hrs at each location

#### **4.5. Biological Environment**

- Details on secondary data on the existing flora and fauna in the study area, carried out by an university/institution under the relevant discipline (such as BSI, ZSI, WII, etc) shall be included in the list of flora and fauna along with classification as per Schedule given in the Wild Life Protection Act, 1972 (for fauna) and in the Red Book Data (flora) and a statement clearly specifying whether the study area forms a part of an ecologically sensitive area or migratory corridor of any endangered fauna
- If the proposed project site involves any breeding or nesting ground, details about the name of the aquatic organism, type of habitat and period of year in which activity takes place should be provided
- If the proposed route requires cutting of trees, then the information should be provided for number of trees to be cut, their species and whether it also involved any protected or endangered species
- Quantitative estimation of forest and non-forest flora
- Assessment of fauna and avi- fauna indicating endangered and endemic species with respect to schedule of the wild life protection act
- Location of national parks, sanctuary, and biosphere reserve, tiger reserve, elephant reserve and wildlife migratory routes with in aerial distance of 15 km either side of proposed alignment
- Information on dependence of local people on minor forest products

#### **4.6. Socio Economic and Health Environment**

- Details of the properties, houses, businesses etc. activities likely to be effected by land acquisition and their financial loses annually.
- Data covering the vulnerable groups or persons including women, children, elderly, people below the poverty line, indigenous people and notified settlements
- Identification of historical and archeological sites
- Data on diseases in the locality and existing health care facilities

- Data on demography including traditional skills and sources of livelihood along the proposed site

## 5.0 Anticipated Impacts and Mitigation Measures

This chapter shall describe the likely impact of the project on each of the environmental component, methods adopted for assessing the impact such as model studies, empirical methods, reference to existing similar situations, reference to previous studies, details of mitigation, methods proposed to reduce adverse effects of the project and reference to the models along with the inputs used should be mentioned. Mitigation measures should be proposed as required during the construction stage as well as the operation stage of the project for all the identified impacts.

### 5.1 Land Environment

#### *Anticipated Impacts:*

- The road itself – land requirement, removal of vegetation, fragmentation of natural habitat, removal of buildings and severance of form land causes, direct impacts. The most immediate and obvious effect of road development on soil is the elimination of the productive capacity of soil covered by the roads
- Impact of the project construction leading to soil contamination, soil erosion, destabilization of slopes, side- tipping of spoils material, loss of properties, loss of fertile lands and diversion of natural surface water flows are to be studied in detail
- Assess whether there is a possibility that the proposed project will adversely affect road traffic in the surrounding areas (e.g. by causing increases in traffic congestion and traffic accidents)
- Indicate whether the proposed project will cause impediment to the movement of inhabitants
- Impacts on the local area developments and integration with local master plan

#### *Mitigation Measures:*

- The extent of environmental impacts in construction, operation and post operation is largely determined during planning and route or site selection. Early consultation and determination of alternatives can substantially prevent and reduce the potential environmental impacts of these projects
- While selecting new road alignments attention must be paid to avoid areas prone to land slides, soil erosion, fertile agricultural lands and environmental sensitive areas.
- Before finalizing the alignment erosion potential of each alternative should be carefully examined and the one involving least disturbance to the natural ground should be preferred

- Balancing filling and cutting requirements through alignment choice to reduce the need for borrow pits and to minimize excess spoil material generation is to be examined
- Drainage improvement requirements to minimize water logging and flooding due to disturbance of the natural drainage pattern are to be examined
- Afforestation plan to compensate for the cutting of the trees during the proposed road construction activity
- List the mitigative measures to address the impediments to the movement of inhabitants

## 5.2 Air Environment

### *Anticipated Impacts:*

- The immediate surroundings may have a greater impact. The existing surrounding features such as habitation, hospitals, schools, notified sanctuaries etc. up to 500 meters and impact on them shall be addressed separately
- Impact during construction activities due to generation of fugitive dust from crusher units, air emissions from hot mix plants and vehicles used for transportation of materials
- Prediction of impact on ambient air quality using appropriate mathematical model, description of model, input requirement and reference of derivation, distribution of major pollutants and presentation in tabular form for easy interpretation shall be carried out

### *Mitigation measures:*

- Selecting road alignment, which avoids passing close to housing, schools and work places; providing sufficient capacity to avoid traffic congestion, even with projected increase in traffic flow
- Planting tall leafy vegetation between roads and human settlements
- Water sprinkling and transporting construction materials with tarpaulin coverage during the construction stage. Purchasing road metal from the crushing units, which are consented to operate by SPCB
- Crusher and hot mix units, if used on site, should be equipped with requisite air pollution equipment to meet the prescribed standard of MoEF and SPCBc
- Integration with the local government awareness campaign programmes on good practices of vehicle maintenance etc. to reduce the air emissions
- Environmental specifications for contractors should cover the required safeguards during the design and construction stage

### 5.3 Water Environment

#### *Anticipated Impacts:*

- Impact on surface water flow modifications can contribute to flooding, soil erosion, channel modification and siltation of streams
- Road drainage and excavation can lower the water table in surrounding areas while embankments and structures can raise water table by restricting flow. The potential effects include deterioration of vegetation, increased susceptibility to erosion loss of water for drinking as well as agriculture use
- Impact on water quality degradation (surface & ground water) can take place due to sedimentation, changes in biological activity in streams and on their banks
- Impact due to discharge of wastewater generation from the temporary project offices and temporary construction workers housing area
- Indicate whether there is a possibility of soil runoff from the bare lands resulting from earth moving activities such as cutting and filling will cause water quality degradation in downstream water courses or water bodies

#### *Mitigation Measures:*

- Avoiding alignments which are susceptible to erosion, such as those crossing steep slopes
- Minimizing the number of water crossings wherever possible
- Leaving buffer zones of undisturbed vegetation (with increased in proportion to slope) between road sites and bodies of water
- Mitigation measures such as providing adequate drainage modifications, settling basins, paving, infiltration ditches etc. is to be examined
- Adequate sanitation facilities and hygiene at construction workers colony should be provided
- Safe measures for temporary storage of fuels
- Environmental specifications for contractors should cover the required safeguards during the design and construction stage

### 5.4 Noise Environment

#### *Anticipated Impacts:*

- Noise levels may increase during construction activity, due to operation of various machines and equipments
- Noise levels may increase during operation of the highway due to increased traffic activities Prediction of noise levels should be done by using mathematical modeling at different representative locations
- Impact of vibrations during blasting activity, if any

*Mitigation Measures:*

- Development of bypass roads to avoid road alignment through noise sensitive areas
- Adoption of proper surface design and maintenance
- Provision of noise barriers. Specifications for installation of noise protection devices clearly indicating the location, design and material, and also provide for future maintenance requirements
- Prediction model outputs justify the selection of type of the noise barrier and thickness of the noise barrier etc.
- Planting tall leafy and dense vegetation between roads and noise sensitive areas
- Interaction with the local government and vehicular manufacturers to conduct awareness campaign programmes on good practices of vehicle maintenance etc. to reduce the noise emissions
- Environmental specifications for contractors should cover the required safeguards during the design and construction stage

## **5.5 Biological Environment**

*Anticipated Impacts:*

- Loss of wildlife habitat and biodiversity due to change in land use
- Fragmentation of wildlife habitat and territories
- Changes in water quality, soil profile, noise, light and air pollution, which may affect the nature and character of habitats
- Pressure on habitats wildlife as a result of increased access provided by roads
- Loss of forest resources, economically important plants, medicinal plants and threat to rare, endemic and endangered species

*Mitigation Measures:*

- Identification of sensitive natural environments in the early planning stage so that alternative routes, changes in width of the road can be examined
- Possibility of twin new road corridors with previously established transport rights-of-way, such as railway lines
- Provision of animal crossings in identified areas
- Compensate the loss of forest coverage by compensatory plantation programme
- Development of green belt along the alignment
- Regeneration and conservation of flora and fauna including rare plants of economic importance, medicinal plants and wildlife species
- Institutional arrangements for implementation and monitoring of various mitigating measures



- Environmental specifications for contractors should cover management of work forces (control of poaching and fire wood collection), machinery (speed, noise, and traffic), and prevention of erosion and contamination during construction

## **5.6 Socio-economic and Health Environment**

### *Anticipated Impacts:*

- Analysis of positive and negative impacts on the present status of livelihood
- Displacement of human settlement from proposed site. Impact on livelihood and loss of properties
- Impact on community resources
- Impact on historical and archeological sites
- Impact on the existing travel areas due to faster traffic, access controls and median barriers
- Impact due to accelerated urbanization

### *Mitigation Measures:*

- Rehabilitation plan for land outees, homestead outees, and for displaced persons. Institutional arrangement for effective implementation and periodical review through project implementation to be incorporated
- Criteria and method of calculation of compensation for loss of land and crops. Mechanism for providing effective guidance in financial planning to effected people.
- Training to local people for employing them in the proposed project
- Employment opportunity and access to other amenities such as primary education and health care facilities for local people
- Integration with the local master plan to prevent conflict of interest.
- Stipulation of environmental specifications for contractors

## **5.7. Solid Waste Management**

- Waste generated during construction may impact soil, agriculture and water quality
- Waste generated from workers' camps may impact sanitation, water quality and agriculture
- Oil spillage/ leakage from machines and vehicles may contaminate earth
- Proper environmental specifications to be stipulated in the contract

## **6.0 Environmental Monitoring Programme**

- Summary matrix of environmental monitoring, for all phases of the project viz. construction and operation
- Technical aspects of monitoring for achieving effectiveness in mitigation measures

- Requirement of monitoring facilities and methods adopted
- Frequency, location, parameters of monitoring
- Compilation and analysis of data and reporting system
- Procurement schedules and budgets in detail
- Training requirements

## 7.0 Additional Studies

Specific condition	Study required
Scoping Stage	<ul style="list-style-type: none"> <li>• Studies directed by the Expert Appraisal Committee while deciding the TOR for the project</li> </ul>
Public consultation	<ul style="list-style-type: none"> <li>• Public hearing with the issues raised by the public and the response of the project proponent in tabular form should be prepared</li> </ul>
Natural resource conservation and optimization	<ul style="list-style-type: none"> <li>• Plan of action for conservation of natural resources by utilization of fly ash, steel melting shops' slag and other metallurgical industries solid non hazardous waste</li> </ul>
R & R action plans	<ul style="list-style-type: none"> <li>• Detailed R&amp;R plan with data on the existing socio-economic status of the population in the study area and broad plan for resettlement of the displaced population, site for the resettlement colony, alternative livelihood concerns/employment and rehabilitation of the displaced people, civil and housing amenities being offered, etc and the schedule of the implementation of the project specific R&amp;R Plan.</li> <li>• Details of budget provisions (capital &amp; recurring) for the project specific R&amp;R Plan</li> </ul>
Accident prevention and Road Safety Management System	<ul style="list-style-type: none"> <li>• Examine road design standards, safety equipment specifications and training to ensure that design details take account of safety concerns</li> <li>• Identification of accident prone areas and avoidance/ mitigation</li> <li>• Identification of habitat fragmentation and traffic accident of wildlife and mitigation measures should be furnished</li> <li>• Provision of speed breakers, safety signals, service lanes and foot paths should be examined at appropriate locations through out the proposed road to avoid the accidents</li> <li>• Accident data and geographic distribution should be reviewed and analyzed to predict and identify trends - incase of expansion of the existing highways</li> <li>• Preparation of traffic management plan</li> <li>• Laws, regulations and enforcement related to speed, alcohol and vehicle safety should be reviewed</li> <li>• Institutional frame work for monitoring of road safety</li> <li>• Post accident emergency assistance and medical care to accident victims</li> </ul>

## **8.0 Project benefits**

It should bring out details of benefits by way of:

- Improvements in the physical infrastructure and road access
- Improvement in social services by quicker and safe transport mode
- Employment potential –skilled; semi-skilled and unskilled labour both during construction and operational phases of the project with specific attention to employment potential of local population as well as necessity for imparting any specialized skills to them to be eligible for such employment in the project
- Reduction in traffic congestion through city/town/ and other locations
- Development of tourism
- Reduced pollution, vehicle maintenance, fuel saving due to better quality of roads
- Over all development in economy and improved life style

## **9.0 Environmental cost benefit analysis**

If recommended by the Expert Appraisal Committee at the scoping stage, this chapter shall include the Environmental Cost Benefit Analysis of the project.

## **10.0 Environment Management Plan (EMP)**

- Administrative and technical set up for the management of environment, clearly defining the roles and responsibilities of persons/ party handling various functions
- Summary matrix of EMP and budget provision for EMP, during pre-construction, construction and operation stage
- Summary matrix of Environmental monitoring, during construction and operation stage
- Institutional arrangements proposed with other organizations/Govt. authorities for effective implementation of environmental measures proposed in the EIA
- Safeguards/mechanism to continue the assumptions/field conditions made in the EIA, for arriving the site suitability

## **11.0 Summary & Conclusion (Summary EIA)**

Summary EIA shall be a summary of the full EIA report condensed to ten A-4 size pages at the maximum. It should necessarily cover in brief the chapters of the full EIA report: Introduction, project description, description of the environment, anticipated environmental impacts & mitigation measures, additional studies, environmental monitoring programme, project benefits, environmental management plan and disclosure of consultants engaged

## 12.0 Disclosure of consultants engaged

This chapter shall include the names of the consultants engaged with their brief resume and nature of consultancy rendered.

### Enclosures

*Feasibility report/Form I/Photos of project site, impact areas/Summary of project details*

#### Summary of project details

S.No	Description	Quantity
1	Length of new alignment proposed (kilometers)	
2	Width of the new alignment (meters)	
3	Length of existing alignment proposed to be strengthened/widened (kilometers)	
4	Width of the existing alignment (meters)	
5	Width of the existing alignment after widening (meters)	
6	Total length of the alignment (kilometers)	
7	Number of bridges Major Minor	
8	Length of bridges (meters) Width of bridges (meters)	
9	Number of culverts	
10	Length of culverts (meters)	
11	Number and distance (meters) between underpasses	
12	Number of intersections	
13	Length of intersections (meters)	
14	Number of railway crossings	
15	Length of railway crossings (meters)	
16	Number of villages through which alignment passes	
17	Population of the villages through which alignment passes	

*Details of National parks etc with in 15 Km radius from the highway*

<b>S.No</b>	<b>Item</b>	<b>Name</b>	<b>Aerial distance (km) and reference point on the highway alignment</b>
1	National park		
2	Marine park		
3	Sanctuary/tiger reserve Elephant reserve/ Turtle nesting ground		
4	Core zone of biosphere reserve		
5	Reserved forest		
6	Wildlife habitat		
7	Habitat of endangered/exotic species		
8	Coral reef		
9	Mangroves		
10	Lakes/reservoirs/dams		
11	Breeding site		
12	Nesting site		

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*Terms of Reference*  
For Environmental Impact Assessment of  
**Building construction, Townships and Area  
Development projects**

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**Terms of Reference (TOR)**  
**For**  
**Environmental Impact Assessment of**  
**Building Construction and Township and Area Development Projects**

**Objective**

Terms of Reference (TOR) for preparation of Environmental Impact assessment (EIA) and Environmental Management Plan for building construction projects ( $\geq 1,50,000$  sq .mtrs) township and area development projects ( $\geq 50$  ha) as per the EIA notification, 2006 has been devised to improve the quality of the reports and facilitate the decision making transparent and easy. TOR will help the project proponents and consultants to prepare report with relevant project specific data, which are easily implementable. As per the EIA notification 2006, schedule item 8 corresponds to Building construction projects / area development projects and townships. The details of the categories mentioned in the given schedule are as follows:

Project or Activity	Category with threshold limit - B Category	Conditions if any
<b>8</b>	<b>Building /Construction projects/Area Development projects and Townships</b>	
8(a)	Building and Construction projects $\geq 20000$ sq.mtrs and $< 1,50,000$ sq.mtrs. of built-up area#	#(built up area for covered construction; in the case of facilities open to the sky, it will be the activity area)
8(b)	Townships and Area Development projects. Covering an area $\geq 50$ ha and or built up area $\geq 1,50,000$ sq .mtrs ++	++All projects under Item 8(b) shall be appraised as Category B1

EIA clearance is required in the case of the following:-

- a. Building construction projects ( $\geq 1,50,000$  sq .mtrs)
- b. Township and area development projects ( $\geq 50$  ha)

Accordingly the TOR to address the above two aspects of item 8(b) of the EIA notification 2006 are covered in this document. The TORs are given in two subsections (I) and (II) in which subsection (I) deals with building construction projects ( $\geq 1,50,000$  sq .mtrs) and subsection (II) deals with township and area development projects ( $\geq 50$  ha).

## I. Building Constructions projects( $\geq 1,50,000$ sq .mtrs)

### General Information:

Building construction projects as per the EIA notification of 2006 are under category 'B' covering built up area  $\geq 1,50,000$  sq .mtrs. All projects and activities listed as Category 'B' in Item 8 of the Schedule (Construction / Township / Commercial Complexes /Housing ) do not require scoping and will be appraised on the basis of Form 1 / Form 1A and the conceptual plan. All projects in this category will be appraised as Category B1. An application seeking prior environmental clearance in all cases should be made in the prescribed Form 1 and Supplementary Form 1A, after the identification of prospective sites for the project to which the application relates, before commencing any construction activity, or preparation of land, at the site by the applicant. The applicant should submit along with the application, in addition to Form 1 and the Supplementary Form 1A, a copy of the conceptual plan.

### 1.0 Introduction

Profile of the project proponent, name and contact address, implementing organization, organizational chart, project consultants etc., should be mentioned clearly.

Land description- plot/ survey numbers, village, tehsil, district, state and area of the land must be mentioned clearly.

Description of Centre/State/Local regulations and standards applicable for townships and area development projects should be discussed.

Any litigation(s) pending against the proposed project and / or any directions or orders passed by any court of law/any statutory authority against the project is to be detailed out.

### 2.0 Project Description

Goal and objectives of the proposed project, significance of the project both at local and regional level, relevance of the project in light of the existing development plans of the region are to be mentioned clearly. Background information and overall scenario of the proposed activity in the Indian Context, procedures adopted for selection, Criteria for selection of the site for the proposed activity, such as environmental, socio-economic, minimization of impacts, ecological sensitivity, Impact of existing activities on the proposed activity, etc. should be spelt out. Resource and manpower requirements have to be detailed. Time frame for project initiation, implementation and completion should be detailed.



- \_ Total site area
- \_ Total built up area (provide area details) and total activity area
- \_ Source of water and consumption
- \_ Source of power and requirement
- \_ Source of Power
- \_ Connectivity to the city center, utilities and transportation networks community facilities
- \_ Parking requirements
- \_ Type of building material to be used
- \_ Environmental liability of the site
- \_ Existing structure / type of material – demolition debris etc.

***Essential Toposheets / Maps to be provided with TOR application***

A map of the study area 5 km from the boundary of the project area, delineating the major topographical features such as land use, drainage, locations of habitats, major constructions including roads, railways, pipelines, industries if any in the area are to be mentioned.

A map covering aerial distance of 15 kms from the boundary of the proposed project area delineating environmental sensitive areas as specified in Form I of EIA notification dated 14<sup>th</sup> Sep 06. In the same map the details of environmental sensitive areas present within a radial distance of 1 Km from the project boundary shall be specifically shown

**Remote sensing satellite imagery**

Land use map of the study area in 1: 10,000 scale based on high resolution satellite imagery delineating the forest, agricultural land, water bodies, settlements, and other cultural features.

**Digital Elevation Model / Contour map**

Contour map on 1:10000 scale for the study area showing the various proposed break-up of the land.

Description of the project site, geology, topography, climate, transport and connectivity, demographic aspects, socio, cultural and economic aspects, villages, settlements should be given.

Details of environmentally sensitive places, land acquisition, rehabilitation of communities/ villages, present status of such activities are to be mentioned. .

Historical data on climate conditions such as wind pattern, history of cyclones, storm surges, earth quake etc., for the last 25 years are to be given.

Detailed layout plan of proposed project development, communication facilities, access/approach roads, landscape, sewage disposal facilities, and waste disposal etc; to be given. Layout plan of proposed development of built up areas with covered construction such as DG Set rooms, Administrative buildings, Utilities such as Main and Stand By Power, Water supply installations etc; to be given.

Requirement of natural resources and their sources are to be detailed out.

### *Site Selection and Planning*

The environmental impacts of construction and operation are established during the early phases of site selection and planning. Planning, site selection and design form an important stage in the development of these projects and will determine their environment impact(s)

Some Important factors for development, which should be addressed, are: -

- Status of ownership of land
- The boundaries of the project area
- A map that identifies the locations of all proposed development activities; and
- A map and photo mosaic showing the area proposed to be disturbed in relation to existing topographic features, township grids, wetlands and water bodies.
- Proximity to local communities;
- Proximity to sensitive surface or ground water bodies
- Compatibility with local building regulations
- Existing drainage pattern
- Any forest-cover within the proposed developmental area.

### **3.0 Description of the Environment**

Environmental data to be considered in relation to township development would be:  
(a) land (b) ground water, surface water (c) air (d) biological environment (e) noise  
(f) socio economic environment.

#### *Study area:*

Map of the study area clearly delineating the location of various monitoring stations (air/ water / soil and noise) superimposed with location of habitats are to be shown. Monitoring should be done as per CPCB guidelines. Primary data should be collected for one season except rainy season. Monitoring of the parameters should be carried out within the study area.

### **3.1 Land Environment**

The first feature which should influence the development of a new project is the existing land use pattern of the neighbourhood of the project, whether the proposed development conforms to the development for that area or not.

Study of land use pattern, habitation, cropping pattern, forest cover, environmentally sensitive places etc, employing remote sensing techniques and ground truth and also through secondary data sources.

Geographical latitude and microclimatic factors such as solar access and wind loads have a major impact. The following parameters have to be addressed under the baseline data for land environment.

**a. Topography**

Slope form

Landform and terrain analysis

**b. Soil**

Type and characteristics

Porosity and permeability

Sub-soil permeability

Inherent fertility

### **3.2 Air Environment**

Climatological data is to be obtained from nearest India Meteorological Department (IMD) station for one full year. Micro meteorological data consisting of wind speed, wind direction, temperature, cloud cover, (amount and height), humidity, inversions, rainfall (peak and average daily rainfall) and wind rose patterns, from primary and secondary sources in the study area.

Baseline data of air pollutant parameters extending an area of 5 KMs from the project should be monitored at a number of locations. Description of base line data of ambient air parameters namely RSPM, nitrogen dioxide, Sulphur dioxide, and carbon monoxide are to be collected. One season data is to be monitored other than monsoon as per the CPCB Norms. Sampling locations are to be located as per CPCB norms.

### **3.3 Noise Environment**

Construction equipment and road traffic are the major sources of noise. Baseline data of noise at the project area and the neighbourhood habitat areas is to be ascertained. Daytime and nighttime data should be collected.

### **3.4 Water Environment**

Identify Project activities, including construction phase, which may affect surface water or groundwater. Estimate water intake requirements and identify the source of water to be used. Describe how water will be taken from the surface water / river and conveyed to the site. Ground water budgeting has to be provided. Rainwater harvesting has to be detailed out.

Baseline water quality from all sources such as ground water, municipal water, surface water need to be determined and compared to the water quality norms prescribed for drinking water and State PWD specifications for construction water. Quantity of wastewater is to be provided.

### **3.5 Biological Environment**

Baseline data on the flora and fauna for the study area is to be detailed out. An inventory map is to be prepared along with a description of the existing terrestrial, wetland and aquatic vegetation. If there are any rare and endangered species in the study area they are to be clearly mentioned.

### **3.6 Socio Economic & Health Environment**

Baseline data should include the demography, settlements, existing infrastructure facilities in the proposed area.

### **3.7 Solid Waste**

Solid wastes from construction sector can be categorized into two phases i.e. during construction & during operation. Details of the following are to be given:

- Construction or demolition waste, i.e., massive and inert waste
- Municipal waste, i.e., biodegradable and recyclable waste
- Hazardous waste
- E-waste

Details of authorized municipal solid waste facilities, biomedical treatment facilities and hazardous waste disposal facilities in the area should be included.

#### **4.0 Anticipated Environmental Impacts and Mitigation Measures:**

#### **4.0 Anticipated Environmental Impacts and Mitigation Measures:**

##### **4.1 Land Environment**

###### *Anticipated Impacts:*

Some of the anticipated impacts, which need to be addressed, are

- Impact on the natural drainage system and soil erosion.
- Loss of productive soil and impact on natural drainage pattern.
- Study of the problem of land slides and assessment of soil erosion potential and the impact

###### *Mitigation Measures:*

Proper mitigation measures have to be suggested.

- If the topsoil is proposed to be preserved, the details relating to the quantity of topsoil stored, demarcated area on plan where it is stored along with preservation plan is to be given
- Details of soil erosion plan are to be given.

##### **4.2 Air Environment**

###### *Anticipated Impacts:*

Impacts on air quality during the construction and operation phase should be predicted. The existing surrounding features of the study area and impact on them should be addressed separately. It is necessary to predict the following if any

- Prediction of point source emissions
- Prediction of air emissions from the vehicles during the construction and operation phases.

###### *Mitigating Measures:*

Mitigative measures are to be proposed during the construction stage as well as the operational stage of the project. Some measures to be listed include: -

- Mitigative measures during construction phase due to reduce the emissions during loading, un-loading, transportation and storage of construction materials.
- Greenbelt development.
- Dust mitigation

### 4.3 Noise Environment

Impact of project construction/operation on the noise on account of construction equipment and road traffic is to be studied.

*Anticipated Impacts:*

- Noise due to demolition / construction activities
- Impact due to present and future transportation activities
- Impact of noise due to work at night.

*Mitigating measures:*

- Site plan and details for construction management showing the layout of noise and dust barriers should be given

### 4.4 Water Environment

Impact of construction and operational phases on the surface and ground water on account of the building construction is to be estimated.

*Anticipated Impacts:*

- Impact of water withdrawal on surface water is to be given
- Impact on ground water potential is to be detailed
- Waste water generation

*Mitigating measures:*

Prediction of ground water contamination and suggested mitigating measures to minimize the pollution level

- Hydrogeological information should be clearly detailed.
- Details of water conservation within the buildings
- Details of rainwater harvesting to recharge the ground water

### 4.5 Biological Environment

Impact of project during construction and operational phases on the biological environment on account of project activity is to be detailed.

*Anticipated Impacts:*

Impact of construction activity on flora and fauna is to be given.

*Mitigating measures :*

- Tree survey plan showing protected / preserved / transplanted / removed trees are to be given.
- Proposed landscape plan with details about species that are to be planted are to be given

#### **4.6 Socio Economic Environment**

*Anticipated Impacts:*

Predicted impact on the communities of the proposed activity is to be given. Impact on surroundings on socio-economic status is to be detailed.

*Mitigation measures:*

Mitigation measures to reduce adverse effects are to be given.

#### **4.7 Solid waste and Environment**

*Anticipated impacts*

Impact of the project during construction and operational phases for generation of waste is to be assessed.

*Mitigation measures:*

Options for minimization of solid waste and environmentally compactable disposal are to be given. Management and disposal of temporary structures, made during construction phase are to be addressed. Mitigation measures for handling biomedical wastes, e-wastes, municipal solid waste are to be detailed.

#### **5.0 Specific studies**

Describe the project energy requirements, infrastructure requirements needed for this activity. Discuss the steps taken to integrate the needs of other stakeholders into the location and design of access infrastructure to reduce and manage overall environmental impacts from resource development.

#### **5.1 Transport**

- Estimate any environmental implications from transportation (rail, road) related emissions associated with the construction and operational phases and suggest suitable options

- Provide a site plan showing the details of connectivity existing and proposed road and rail transport.
- Provide a site plan showing buildings, roads, and open spaces, confirming the hierarchy of roads as per the rules given by UDPFI guidelines.
- Discuss the impact of increased vehicle traffic and requirements for access improvements on roads in the site development area as a result of the Project, considering other existing and planned developments and operations in the region including what measures will be taken to reduce traffic and enhance vehicle safety on external roads;
- Discuss any expected change in traffic volume by Average Annual Daily Traffic (AADT) and any seasonal variability in traffic volume (include mitigation measures) prior to construction, during construction and at full site operation;

## **5.2 Building material and technologies**

- Detail the types of materials use in each component part of the building and landscape( envelope, superstructure, openings, and roads and surrounding landscape).
- Detail out the plans and sections of buildings showing use of new technologies and non-conventional methods
- Detail out the plans and sections of building using new construction techniques

## **5.3 Energy Conservation**

- Use of alternate renewable resources such as solar / wind power etc is to be discussed.
- Discuss the options considered for supplying the power required for the Project and the environmental implications, including opportunities to increase the energy efficiency of the Project;
- Details of U &R values are to be given
- Details of the renewable energy systems (sizing and design), building costs and integration details are to be provided

## **6.0 Environmental Monitoring Program**

- Frequency, location, parameters of monitoring
- Compilation and analysis of data and reporting system



## **7.0 Additional Studies**

### **7.1 Risk Assessment (ERA) and Disaster Management Plan (DMP):**

Discuss emergency plans for any environmental risks and such as earthquakes

- Types of Emergency; internal and external origin
- Emergency evacuation plan
- Emergency Procedures
- Helipad facilities for buildings with height beyond 60mts

### **7.2 Natural resource conservation**

Plan of action for conservation of natural resources and recycle waste materials due to the project activity in the construction and operational phase of the project is to be discussed.

## **8.0 Project benefits**

This section details out the improvements in physical infrastructure, social infrastructure if any. Also it details out any employment potential and other benefits that are accrued if the project is taken up.

## **9.0 Environmental Management Plan (EMP)**

Detailed EMP may be formulated to mitigate the residual impacts which should inter alias include the impact due to change in land use; due to loss of agricultural land and grazing land besides other impacts of the projects. Budgeting of the EMP may be included in EIA. The EIA should discuss in detail the following aspects:

- Sewage treatment plant has been designed to treat the wastewater from the building. The wastewater be treated to tertiary level and after treatment, reused for flushing of toilets in apartment building and gardening.
- Treated wastewater reused for landscaping, car washing etc. and partly discharged. Treated sewage should conform to E(P) Rules. Sewage Treatment Plants and monitored on a regular basis
- Spent oil from DG Sets should be stored in HDPE drums in isolated covered facility and disposed off as per the Hazardous Wastes (Handling & Management) Rules, 2003. Spent oil from DG Sets should be disposed off through registered recyclers only.
- Provision of Effective Controls and Building Management Systems such as Automatic Fire Alarm and Fire Detection and Suppression System etc. must be ensured. Adequate access to fire tenders should be provided.

- Provisions should be kept for the integration of solar water heating system and other energy conservation methods.

## **10.0 Summary & Conclusion (Summary EIA)**

This document should summarize the significant findings of the study. The summary must describe each significant environmental issue and its resolution in sufficient detail so that its importance and scope, as well as the appropriateness of the approach taken to resolve it are well understood. Wherever possible, the summary should make use of base maps, tables and figures given in the report. The following should be addressed in the summary if applicable: -

- Potential interruption or limitation of accesses to dwellings, businesses or productive resources either permanently or temporarily;
- Encroachment or reduction of green areas, parks, and other recreational areas;
- Demolition of buildings high architectural or historical value;
- Potential deterioration of urban quality and property value in the immediate vicinity of the works or deterioration of unique architectural characteristics in the neighbourhood;

## **11.0 Disclosure of consultant engaged**

This chapter shall include the names of the consultants engaged with their brief resume and nature of consultancy rendered.

### **Enclosures**

Conceptual plan / Questionnaire / Photos

## II. Township and area development projects ( $\geq 50$ ha)

### General Information

Township and area development projects as per the EIA notification of 2006 are under category 'B' covering an area  $\geq 50$  ha. All projects and activities listed as Category 'B' in Item 8 of the Schedule (Construction / Township / Commercial Complexes /Housing ) do not require scoping and will be appraised on the basis of Form 1 / Form 1A and the conceptual plan. All projects in this category will be appraised as Category B1. An application seeking prior environmental clearance in all cases should be made in the prescribed Form 1 and Supplementary Form 1A, after the identification of prospective sites for the project to which the application relates, before commencing any construction activity, or preparation of land, at the site by the applicant. The applicant should submit along with the application, in addition to Form 1 and the Supplementary Form 1A, a copy of the conceptual plan.

### 1.0 Introduction

Profile of the project proponent, name and contact address, implementing organization, organizational chart, project consultants etc., should be mentioned clearly.

Land description- plot/ survey numbers, village, tehsil, district, state and area of the land must be mentioned clearly.

Description of Centre/State/Local regulations and standards applicable for townships and area development projects should be discussed.

Any litigation(s) pending against the proposed project and / or any directions or orders passed by any court of law/any statutory authority against the project is to be detailed out.

### 2.0 Project Description

Goal and objectives of the proposed project, significance of the project both at local and regional level, relevance of the project in light of the existing development plans of the region are to be mentioned clearly. Background information and overall scenario of the proposed activity in the Indian Context, procedures adopted for selection, Criteria for selection of the site for the proposed activity, such as environmental, socio-economic, minimization of impacts, ecological sensitivity, Impact of existing activities on the proposed activity, etc. should be spelt out. Resource and manpower requirements have to be detailed. Time frame for project initiation, implementation and completion should be detailed.

### ***Essential Toposheets / Maps to be provided with TOR application***

A map of the study area 5 km from the boundary of the project area, delineating the major topographical features such as land use, drainage, locations of habitats, major constructions including roads, railways, pipelines, industries if any in the area are to be mentioned.

A map covering aerial distance of 15 kms from the boundary of the proposed project area delineating environmental sensitive areas as specified in Form I of EIA notification dated 14<sup>th</sup> Sep 06. In the same map the details of environmental sensitive areas present within a radial distance of 1 Km from the project boundary shall be specifically shown

### **Remote sensing satellite imagery**

Land use map of the study area in 1: 10,000 scale based on high resolution satellite imagery delineating the forest, agricultural land, water bodies, settlements, and other cultural features.

### **Digital Elevation Model / Contour map**

Contour map on 1:10000 scale for the study area showing the various proposed break-up of the land.

Description of the project site, geology, topography, climate, transport and connectivity, demographic aspects, socio, cultural and economic aspects, villages, settlements should be given.

Details of environmentally sensitive places, land acquisition, rehabilitation of communities/ villages, present status of such activities are to be mentioned. .

Historical data on climate conditions such as wind pattern, history of cyclones, storm surges, earth quake etc., for the last 25 years are to be given.

Detailed layout plan of proposed project development, communication facilities, access/approach roads, landscape, sewage disposal facilities, and waste disposal etc; to be given. Layout plan of proposed development of built up areas with covered construction such as DG Set rooms, Administrative buildings, Utilities such as Main and Stand By Power, Water supply installations etc; to be given.

Requirement of natural resources and their sources are to be detailed out.

### *Site Selection and Planning*

*The environmental impacts of construction and operation are established during the early phases of site selection and planning. Planning, site selection and design form an important stage in the development of these projects and will determine their environment impact(s)*

Some Important factors for development, which should be addressed, are: -

- Status of ownership of land
- The boundaries of the project area
- A map that identifies the locations of all proposed development activities; and
- A map and photo mosaic showing the area proposed to be disturbed in relation to existing topographic features, township grids, wetlands and water bodies.
- Proximity to local communities;
- Proximity to sensitive surface or ground water bodies
- Compatibility with local building regulations
- Existing drainage pattern
- Any forest-cover within the proposed developmental area.

### **3.0 Description of the Environment**

Environmental data to be considered in relation to township development would be: (a) land (b) ground water, surface water (c) air (d) biological environment (e) noise (f) socio economic environment.

#### *Study area:*

Map of the study area clearly delineating the location of various monitoring stations (air/ water / soil and noise) superimposed with location of habitats are to be shown. Monitoring should be done as per CPCB guidelines. Primary data should be collected for one season except rainy season. Monitoring of the parameters should be carried out within the study area.

### **3.1 Land Environment**

The first feature which should influence the development of a new project is the existing land use pattern of the neighbourhood of the project, whether the proposed development conforms to the development for that area or not.

Study of land use pattern, habitation, cropping pattern, forest cover, environmentally sensitive places etc, employing remote sensing techniques and ground truth and also through secondary data sources.

Geographical latitude and microclimatic factors such as solar access and wind loads have a major impact. The following parameters have to be addressed under the baseline data for land environment.

**c. Topography**

- Slope form
- Landform and terrain analysis

**d. Soil**

- Type and characteristics
- Porosity and permeability
- Sub-soil permeability
- Inherent fertility

### **3.4 Air Environment**

Climatological data is to be obtained from nearest India Meteorological Department (IMD) station for one full year. Micro meteorological data consisting of wind speed, wind direction, temperature, cloud cover, (amount and height), humidity, inversions, rainfall (peak and average daily rainfall) and wind rose patterns, from primary and secondary sources in the study area.

Baseline data of air pollutant parameters extending an area of 5 KMs from the project should be monitored at a number of locations. Description of base line data of ambient air parameters namely RSPM, nitrogen dioxide, Sulphur dioxide, and carbon monoxide are to be collected. One season data is to be monitored other than monsoon as per the CPCB Norms. Sampling locations are to be located as per CPCB norms.

### **3.5 Noise Environment**

Construction equipment and road traffic are the major sources of noise. Baseline data of noise at the project area and the neighbourhood habitat areas is to be ascertained. Daytime and nighttime data should be collected.

### **3.4 Water Environment**

Identify Project activities, including construction phase, which may affect surface water or groundwater. Estimate water intake requirements and identify the source of water to be used. Describe how water will be taken from the surface water / river and conveyed to the site. Ground water budgeting has to be provided. Rainwater harvesting has to be detailed out.

Baseline water quality from all sources such as ground water, municipal water, surface water need to be determined and compared to the water quality norms prescribed for drinking water and State PWD specifications for construction water. Quantity of wastewater is to be provided.

### **3.5 Biological Environment**

Baseline data should include list of dominant, rare, endangered, threatened, endemic and indicator species and species abundance and distribution of biological species of study area. An inventory map is to be prepared along with a description of the existing terrestrial, wetland and aquatic vegetation. Include any rare vascular and non-vascular plant species and rare plant communities in the study area. Details for fauna and flora to be included are:

- General type and dominant species
- Densities and distributions
- Habitat value
- Historically important specimen
- Rare and Endangered species (location, distribution and conditions)
- Specimen of scientific or aesthetic interest

### **3.6 Socio Economic & Health Environment**

Baseline data at the project area should include the demography, particularly on settlements, existing infrastructure facilities in the proposed area and area of impact due to the proposed activity. Present employment and livelihood of these populations, awareness of the population about the proposed activity should also be included.

### **3.7 Solid Waste**

Solid wastes from construction sector can be categorized into two phases i.e. during construction & during operation. Details of the following are to be given:

- Construction or demolition waste, i.e., massive and inert waste
- Municipal waste, i.e., biodegradable and recyclable waste
- Hazardous waste
- E-waste

Details of authorized municipal solid waste facilities, biomedical treatment facilities and hazardous waste disposal facilities in the area should be included.

## **4.0 Anticipated Environmental Impacts and Mitigation Measures:**

### **4.1 Prediction Of Impacts:**

This should describe the likely impact of the project on each of the environmental parameters, methods adopted for assessing the impact such as model studies, empirical methods, reference to existing similar situations, details of mitigation, methods proposed to reduce adverse effects of the project, best environmental practices, conservation of natural resources; environmental management plan; post project environmental monitoring programme including budgeting for the expenditure proposed in the project cost.

### **4.2 Land Environment**

#### *Anticipated Impacts:*

Some of the anticipated impacts, which need to be addressed, are

- Estimation of anticipated impacts on the surrounding land use pattern, on infrastructure like housing, road net work, environmentally sensitive places etc,
- Impact on the public utilities arising out of the utilities for the project activities.
- Impact on the natural drainage system and soil erosion.
- Loss of productive soil and impact on natural drainage pattern.
- Study of the problem of land slides and assessment of soil erosion potential and the impact
- Impact of construction activity on the fertility status of soil in the study area
- Prediction of ground water pollution due to seepage of pollutants through soil column

#### *Mitigation Measures:*

Proper mitigation measures have to be suggested.

Improved road network infrastructure to handle the increase in traffic

- Selection of suitable local plant species for greenbelt development in and around the sites.
- Top soil conservation plan and its re-utilization depending on its quality

### **4.3 Air Environment**

#### *Anticipated Impacts:*

Impacts on air quality during the construction and operation phase should be predicted. The existing surrounding features of the study area and impact on them should be addressed separately. It is necessary to predict the following if any

- Prediction of point source emissions



- Prediction of air emissions from the vehicles during the construction and operation phases.

*Mitigating Measures:*

Mitigative measures are to be proposed during the construction stage as well as the operational stage of the project. Some measures to be listed include: -

- Mitigative measures during construction phase due to reduce the emissions during loading, un-loading, transportation and storage of construction materials.
- Mitigative measures to reduce the point source emissions.
- Greenbelt development.
- Dust mitigation
- Estimate any environmental implications from transportation (rail, road) related emissions associated with the construction and operational phases and suggest suitable options
- Operation of DG sets

#### **4.4 Noise Environment**

Impact of project construction/operation on the noise on account of construction equipment and road traffic is to be studied.

*Anticipated Impacts:*

- Noise due to demolition / construction activities
- Impact due to noise levels generated by existing
- Impact due to present and future transportation activities
- Operation of DG sets
- Impact of noise due to work at night.

*Mitigating measures:*

Identification and adoption of mitigating measures for noise abatement including noise barriers for point sources and line sources as also measures to minimize effect of vibrations due to demolition and while new construction

#### **4.5 Water Environment**

Impact of construction and operational phases on the surface and ground water on account of the township is to be estimated.

*Anticipated Impacts:*

- Impact on water sources due to shifting of watercourses, if any
- Impact of water withdrawal on surface water / ground water resources.  
Impact on exploitation of surface/ground water
- Waste water generation

- Information regarding how the waste water is to be disposed off

*Mitigating measures:*

Prediction of ground water contamination and suggested mitigating measures to minimize the pollution level

- Water conservation within the buildings
- Rainwater harvesting to recharge the ground water
- Water conservation in landscape
- Adequate measures to be adopted for water conservation during construction and operation stage.

#### **4.6 Biological Environment**

Impact of project during construction and operational phases on the biological environment on account of project activity is to be detailed.

*Anticipated Impacts:*

- Impact of construction activity on fauna
- Pre- and post- topography, soil and parent material conditions and their contribution to flora and fauna and
- Aquatic and terrestrial ecosystem diversity.

*Mitigating measures :*

- Mitigating measures to compensate the loss of vegetation cover / providing green belt development
- Regeneration/Restoration of rare plants of economic importance including medicinal plants species which require protection and conservation
- Identification of measures through scientific conservation plan for protection and conservation of flora, fauna including wildlife, migratory avi-fauna, rare, endemic and endangered species and medicinal plants etc.

#### **4.7 Socio Economic Environment**

*Anticipated Impacts:*

Predicted impact on the communities of the proposed activity is to be given. Impact on surroundings on socio-economic status is to be detailed. Present status of housing, public utilities, commercial structures, transportation. Impact of the project in construction and operational phases on socio cultural aspects is to be assessed.

*Mitigation measures:*

Mitigation measures to reduce adverse effects are to be given.

#### **4.8 Solid waste and Environment**

*Anticipated impacts*

Impact of the project during construction and operational phases for generation of waste is to be assessed.

*Mitigation measures:*

Mitigation measures to reduce adverse effects. Options for minimization of solid waste and environmentally compactable disposal are to be given. Management and disposal of temporary structures, made during construction phase are to be addressed. Mitigation measures for handling biomedical wastes are to be detailed.

#### **5.0 Specific Studies**

Describe the project energy requirements, associated infrastructure and other infrastructure requirements.

Discuss the steps taken to integrate the needs of other stakeholders into the location and design of access infrastructure to reduce and manage overall environmental impacts from resource development;

#### **5.1 Transport**

- a) Include a map showing transportation access to the site from highways;
- b) Discuss how public access to, or within the project area managed during the construction phases of the Project;
- c) Discuss the impact of increased vehicle traffic and requirements for access improvements on roads in the site development area as a result of the Project, considering other existing and planned developments and operations in the region including what measures will be taken to reduce traffic and enhance vehicle safety on external roads;
- d) Discuss any expected change in traffic volume by Average Annual Daily Traffic (AADT) and any seasonal variability in traffic volume (include mitigation measures) prior to construction, during construction and at full site operation;
- e) Distance to the main access road along with the width of the roads are to be given

## 5.2 Building material and technologies

### *Anticipated issues and concerns*

- High consumption of resources
- High transportation cost

### *Alternate methods*

- Re-use of debris at existing site
- Use of Ready-Mix concrete
- Use of ash-based bricks and flyash should be explored to the maximum extent possible.
- Construction should conform to the requirements of local seismic regulations.

## 5.3 Energy Conservation

- Explore use of alternate renewable resources such as solar / wind power etc is to be discussed.
- Discuss the options considered for supplying the power required for the Project and the environmental implications, including opportunities to increase the energy efficiency of the Project;
- Details of U &R values are to be detailed

## 5.4 Storm water management

Storm water management plan should be implemented so as to prevent sudden discharge of excessive volumes of storm water to the receiving waters thus reducing the shock load on municipality drainage system, and impact on receiving water body are to be detailed out.

## 6.0 Environmental Monitoring Program

- Frequency, location, parameters of monitoring
- Summary matrix of environmental monitoring, during construction and operation stage
- Requirement of monitoring facilities
- Compilation and analysis of data and reporting system

## **7.0 Additional Studies**

### **7.1 Risk Assessment (ERA) and Disaster Management Plan (DMP):**

Discuss emergency plans for any environmental risks and such as earthquakes

- Types of Emergency; internal and external origin
- Emergency evacuation plan
- Emergency Procedures
- Helipad facilities for buildings with height beyond 60mts

### **7.2 Natural resource conservation**

Plan of action for conservation of natural resources and recycle waste materials due to the project activity in the construction and operational phase of the project is to be discussed.

### **7.3 R&R Action Plan**

Detailed R&R plan with data on the existing socio-economic status of the population in the study area and broad plan for resettlement of the displaced population, site for the resettlement colony, alternative livelihood concerns/employment for the displaced people, civil and housing amenities being offered, etc and the schedule of the implementation of the project specific R&R Plan if any is to be given. Details of provisions (capital & recurring) for the project specific R&R Plan

## **8.0 Project benefits**

This section details out the improvements in physical infrastructure, social infrastructure if any. Also it details out any employment potential and other benefits that are accrued if the project is taken up.

## **9.0 Environmental Management Plan (EMP)**

- Administrative and technical set up for management of environment
- In built mechanism of self monitoring of compliance of environmental regulations
- Institutional arrangements proposed with other organizations/ Govt. authorities for effective implementation of environmental measures proposed in the EIA
- Safe guards/mechanism to continue the assumptions/field conditions made in the EIA, for arriving the site suitability

- Provision of Effective Controls and Building Management Systems such as Automatic Fire Alarm and Fire Detection and Suppression System etc. must be ensured. Adequate access to fire tenders should be provided.
- Provisions should be kept for the integration of solar water heating system and other energy conservation methods.

Detailed EMP may be formulated to mitigate the residual impacts which should inter alias include the impact due to change in land use; due to loss of agricultural land and grazing land besides other impacts of the projects. Budgeting of the EMP may be included in EIA. The EIA should discuss in detail the following aspects:

#### *Sewage Treatment Plan*

- Sewage treatment plant has been designed to treat the wastewater from the township. The wastewater be treated to tertiary level and after treatment, reused for flushing of toilets in apartment building and gardening.
- Treated wastewater reused for landscaping, car washing etc. and partly discharged. Treated sewage shall conform to E(P) Rules. Sewage Treatment Plants and monitored on a regular basis

#### *Emission from Diesel Generator (DG) Set*

- The stack height and emissions from D.G. sets should conform to the norms of Central Pollution Control Board. The certification of space design for DG sets done by competent authority.

#### *Solid Waste Management*

- Spent oil from DG Sets should be stored in HDPE drums in isolated covered facility and disposed off as per the Hazardous Wastes (Handling & Management) Rules, 2003. Spent oil from DG Sets should be disposed off through registered recyclers only.

### **10.0 Summary & Conclusion (Summary EIA)**

This document should summarize the significant findings of the EIA report. The summary must describe each significant environmental issue and its resolution in sufficient detail so that its importance and scope, as well as the appropriateness of the approach taken to resolve it are well understood. Wherever possible, the summary should make use of base maps, tables and figures given in the report. The following should be addressed in the summary if applicable: -

- The need for resettlement of families/ if any agriculture/ the presence of squatters or any other land titling conflicts;
- Potential interruption or limitation of accesses to dwellings, businesses or productive resources either permanently or temporarily;
- Encroachment or reduction of green areas, parks, and other recreational areas;
- Demolition of buildings high architectural or historical value;
- Potential deterioration of urban quality and property value in the immediate vicinity of the works or deterioration of unique architectural characteristics in the neighbourhood;

### **11.0 Disclosure of consultants engaged**

This chapter shall include the names of the consultants engaged with their brief resume and nature of consultancy rendered.

#### **Enclosures**

Conceptual plan / Questionnaire / Photos

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*Terms of Reference*  
**For Environmental Impact Assessment of**  
**Mining of Minerals**

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**TERMS OF REFERENCE  
FOR  
ENVIRONMENTAL IMPACT ASSESSMENT OF  
MINING OF MINERALS SECTOR**

**Objectives**

Terms of Reference (TOR) for preparation of Environmental Impact Assessment (EIA) and Environmental Management Plan for “Mining of Minerals” as per the EIA Notification, 2006 has been devised to improve the quality of the reports and facilitate decision-making transparent and easy. TOR will help the project proponents and consultants to prepare report with relevant project specific data and easily interpretable information. TOR for mining of minerals is expected to cover all environmental related features.

**General Information**

Mining of stone and metals has been done since pre-historic times. Mining is the extraction of valuable minerals or other geological materials from the earth, which are processed and/ or used for production of materials of economic value. Mining of minerals plays a positive role in the process of country’s economic development. In addition to the contribution towards economic growth, mining can also be a major source of degradation of physical as well as social environment, unless it is properly managed.

Environmental impacts can arise during all activities of the mining process. Minimizing the damage due to mining operations depends on sound environmental practices in a framework of balanced environmental legislation. The potential adverse effects of mining activities include air pollution, surface and groundwater pollution, noise and vibration, damage to local ecology, natural topography and drainage, depletion of water resources etc. All these environmental components are required to be considered while selecting a proper methodology of mining, mitigation measures to reduce pollution load, conservation of natural resources etc.

**1.0 Introduction**

This chapter should cover purpose of the project, project proponent, brief description of the project name, nature, size, location of the project and its importance to the region/country.

As per the EIA Notification, 2006 under Environment (Protection) Act, 1986, the mining of minerals with more than 50 hectare of mining lease area (Asbestos mining irrespective of mining area) are categorized as Category-A projects.

In case of coal mining projects, mining lease area more than 150 hectares are categorized as category-A projects.

Mining lease areas of 5-50 hectare are classified as Category-B projects. In case of coal projects mining lease area of 5-150 hectares are classified as Category- B projects. Both the above categories are subject to the applicability of General Conditions.

All these mining projects are statutorily required to conduct Environmental Impact Assessment study for obtaining environmental clearance.

Mining Lease area less than 5 hectare is not covered under the EIA Notification, 2006.

Profile of the Project Proponent, name and contact address, Implementing Organization, Organizational Chart, Project Consultants etc., should be mentioned clearly.

Land description- plot/ survey / khasra numbers, village, tehsil, district, state and extent of the land must be mentioned clearly. The project site should conform to the CRZ guideline or modifications or stipulations made by the Central / State Govt., as applicable.

The proponent should confirm that the project meets all Centre / State / Local regulations and standards applicable for mining of minerals and allied activities.

Any litigations pending against the proposed project and / or any directions or orders passed by any court of law/any statutory authority against the project are to be detailed out.

In case of expansion / modernization of the project, the environmental compliance status for the existing project should be explained.

The EIA-EMP report should be based on maximum mineral extraction capacity and it should be based on generic structure given in Appendix III of EIA Notification, 2006 for the project or its expansion based on the proposed maximum mineral extraction capacity.

The mining projects linked to associated projects such as coal to power plant, limestone to cement plant etc., located within the impact zone are required to take up integrated EIA.

The report, the page numbers of various chapters, sections and sub-sections, tables, appendices, drawings and figures, source of data incorporated should be clearly mentioned etc., with titles should be clearly indicated under the heading contents.

## 2.0 Project Description

The chapter contains the broader details of the basic activities, location, lay out and implementation schedule of the project.

*Background of the project:*

- Location of the project ( Longitude, Latitude, revenue village, Tehsil, District, State, nearest Railway station, airport, and MSL)
- Objective of the project (captive mine, standalone etc) whether it is new or expansion (Increase in ML area or increase in annual production) or modernization. Proposed use of minerals (sale, use as intermediates or raw materials). Any change in technology proposed should be specified.
- Significance and relevance of the project highlighting the benefit to surrounding area and economic development of the Local/State/Country.
- Location of National Park, Wildlife sanctuary, migratory routes of wild animals etc. with in 10 km of mine lease area should be authenticated by the Chief Wildlife Warden.

*Project details should include:*

- Overall note on mineral reserves, rated capacity, life of the mine
- If the lease area/buffer zone is ecologically fragile, a detailed justification is to be given.
- Period of mining lease and calendar programme of ore and waste production.
- Status and stages of other regulatory clearances like approval of mining plan, forest clearance, consent to establish from State Pollution Control Board etc.
- In case of expansion/modernization, compliance of the statutory conditions given by SPCB, MoEF, DGMS, FC etc.
- Solid waste dumping strategy and management
- Energy demand/specific energy consumption
- Water requirement and reliability of its supply
- Manpower recruitment
- Capital cost estimate

- Market conditions vis a vis validity of the project

*Essential Toposheets / Maps to be provided with TOR application*

#### Topographical map

A topographical map 1:25,000 scale (if not available in 1:50000) of the study area (core zone and 10 km area of the buffer zone from boundary of the core zone) delineating the major topographical features such as land use, drainage, locations of habitats, major constructions including roads, railways, pipelines, major industries if any in the area are to be mentioned.

A topographical map, covering aerial distance of 15 km from the proposed project location and delineating environmental sensitive areas as specified in Form I of EIA Notification dated 14<sup>th</sup> Sep 06. In the same map the details of environmental sensitive areas present within a radial distance of 1 km from the project boundary should be specifically shown

#### Remote sensing imagery

Land use and land cover map of the study area in 1: 25,000 scales based on recent satellite imagery of 5.6 m or higher resolution of multispectral sensor delineating double crop, single crop, agricultural plantation, scrub land , land with or without shrub, forest land – dense, open, degraded, forest blank, waste land, water bodies, buildup area is to be shown.

#### Digital Elevation Model (DEM) / slope / Contour maps

Contour / slope map, as required for the study of core zone and site plan of the area showing the various proposed break-up of the land.

- Description of the project site, geology, topography, hydrology, climate, transport and connectivity, demographic aspects, socio-cultural and economic aspects, villages, settlements, meteorological data.
- Notified restrictions and limitations from environmental considerations etc., if any.
- Environmental data relating to history of natural calamity such as cyclones, storms surges Coastal areas), tornado, flood, etc. should be discussed,

The project description should include

- Geology (Regional and Local)
- Reserves and quality of the ore with chemical composition (Grade or Percentage). Associated minerals, if any, should be mentioned.
- Deposit condition such as ore strength, host rock strength, shape, grade, dip, size, uniformity and depth.
- General description of the project with ancillary operations such as crushing, beneficiation etc.
- Surface geological plan in the leasehold area, transverse section of mineral deposits, contour maps at intervals of not more than 03 meters
- Breakup of land use of leasehold area
- Project falling on Coastal Zone for mining in coastal area. Details of Coastal Zone Classification, Low Tide Line (LTL), High Tide Line (HTL), characteristics of beach
- Drawing (Digitized) showing project layout, components of project, leasehold area
- Type (Open cast, Underground or Both) and method of mining (Manual, Semi-mechanized or mechanized)
- Nearness to a large water body.
- Mode of transportation of ore and waste
- Hydrology of the area and calculation for mine seepage water and Groundwater drawdown

### **Open Cast Mining**

- Deposit conditions
- Maximum allowable stripping ratio (ratio of overburden in m<sup>3</sup> to mineral in ton), thickness of top soil and overburden (minimum, maximum and average),
- Working depth (below ground level and Mean Sea Level)
- Mining Plan (Height and Width of the benches in overburden, ore body, proposed inclination/slope of the sides),
- Surface plan showing mine working 5rd year, 10th year, 15th year, 20th year, 25th year, 30th year as per the approved mine plan.
- Type of blasting, drilling and explosives
- Detail of machineries (mining ,transportation, and material handling) with production capacity
- Plan for backfilling of mine pit.
- Overburden dumps stability study and reclamation.

## Underground Mining

- Deposit conditions
- Mode of entry to the mine (Shaft, Adit, Incline)
- Details of machineries in underground and on surface
- Method of mine development and stoping
- Subsidence (Maximum predicted subsidence, max. slope change, impact on surface features like natural drainage pattern, houses water bodies, water table etc.)
- Mine drainage water management details
- Ventilation system for adequate control of quality and quantity of air underground

## General Features

- Surface drainage pattern at mine site (modification/diversion in the existing drainage pattern)
- Mineral transportation outside mining lease area (road, rail, conveyor, Rope way, waterway, pipeline, others etc.)
- Beneficiation, Crushing, Processing etc. (process flow)
- Township description, (area, dwelling units, distance from mine, distance of water bodies)
- Power and water supply

## 3.0 Analysis of alternatives

This should be project specific and decided during the scoping process.

## 3.0 Description of the Environment/ Baseline Environmental Status

Environmental data to be collected in relation to proposed mining would be: (a) land (b) water (c) air (d) biological (e) noise and vibration (f) socio economic (g) health environment etc.

*Study area:*

Study area for the mining projects should be defined as follows:

- Mine lease area should be the “core zone”
- 10 km radius from the boundary limits of the mine lease area of more than 50 hectares should be the “buffer zone”.
- 5km radius from the boundary limits of mine lease area of 5-50 hectares should be “buffer zone”.

- Maps (appropriate scale) of the study area ( core and buffer zone), clearly delineating the locations of various monitoring stations (air/water/noise/soil), superimposed on locations of habitats are to be shown.
- Indicate 2km, 5km distance from the boundary limits of mine lease by appropriate line.
- Monitoring and testing should be done as per guidelines of CPCB/MOEF.

Baseline information is required to be collected by field survey, monitoring etc. Secondary data with source should be clearly mentioned. Normally, one season monitoring data (excluding monsoon) are to be collected. However, Expert Appraisal Committee (EPC) may specify collection of baseline data for a longer period base on the nature, size and location of the project.

#### **4.1 Land Environment**

Pre-mining land use pattern of (agricultural land/ forest land/ grazing land/ wasteland / water bodies/settlement) of the area is to be detailed out. Details of mineral resources, geological status of the study area and the deposit to be worked, ultimate working depth and progressive stage wise working plan / scheme until the end of the mine life should be mentioned on the basis of the approved rates capacity and calendar plan (s) of production. From the approved mining plan, geological maps should be drawn.

##### **4.1.a Land**

Baseline data on land, of mine leased-area is to be described. Total land available and proposed utilization for different purposes including built-up area be given. Justification of the use of area is to be given.

##### **4.1.b Topography**

Topography the study area through topographical maps (1: 50000), showing all relevant details required for assessment of the proposed activities. Description in relation to following be given

- Slope and elevation
- Natural drainage pattern and water bodies
- Land use pattern (habitation, cropping, forest cover, ecologically sensitive features etc. by employing remote sensing techniques (If available)

##### **4.1.c Geology**

Geology of the area is to ascertain seismic sensitivity. It also defines the layers of geological formations, from which the permeability and possible faults and fissures can be known.

#### **4.1.d Soil**

The study should include

- Soil quality at representative monitoring stations (type, classification, soil characteristics etc.)
- Fertility status of soil samples
- Pre-mining land use pattern, cropping pattern, vegetation cover etc. (remote sensing data)

#### **4.2 Air Environment**

. The study should include the following;

- Climate and meteorology (temperature (max. and min.), relative humidity, and rainfall) indicate the nearest IMD meteorological station from which climatological data have been obtained.
- Wind rose ( Wind directions and speeds, 24 hourly data)
- Air quality monitoring data in respect of SPM, RSPM, SO<sub>2</sub>, NO<sub>X</sub>, CO, Heavy Metals in SPM (Mineralogical Fe, Mn, Pb etc.), any other project specific pollutants. Monitoring should cover one full season except monsoon. Frequency and methodology adopted should be as per CPCB/MOEF guidelines.
- Monitoring stations are to be located based on dominating wind directions, habitations and terrain features in the study area. The monitoring stations should cover upwind, downwind, crosswind, core zone, habitations and sensitive areas.

#### **4.3 Water environment**

Sources of water (river, groundwater, mine water, other surface water), their requirement, and utilization for various operational need of the project, at different stages are to be discussed.

A detailed water balance should be provided. The breakup of water requirement as per different activities in the mining operations should be given separately. Approval of competent authority for utilization of ground and surface water should be provided.



#### **4.3. a. Surface Water**

The study should cover the following;

- Locations of representative monitoring stations showing direction and distance from the mine lease site
- Details of rivers, springs, lakes, reservoirs and drains up to first order in study area.
- Physio-chemical analysis including heavy metals, biological, bacteriological characterization for assessment of water quality. Water quality of water body with respect to upstream and downstream should be covered.
- Delineation of water sheds and water drainage pattern in the study area using remote sensing satellite imageries
- Surface water balance (Withdrawal of surface water and release of mine drainage water)
- Lean season flow of the nallah from where water is drawn

#### **4.3.b Groundwater**

Since the mining is excavation of the earth, the groundwater is affected to a great extent.

The study should include;

- Groundwater potential, recharge and budgeting
- Hydrogeology and aquifer characteristics of the area
- Groundwater quality, groundwater potential of the area and its availability, groundwater table (pre monsoon and post monsoon)
- The details of locations of groundwater observation wells with respect to core zone should be described.
- The monitoring stations should cover the whole study area

#### **4.3.c Additional Information**

- Water bodies existing and water bodies likely to be created due to mining activities
- Water requirement and waste water generation from various activities of mine, including township, beneficiation etc.
- Waste water treatment, recycling and reuse

#### **4.4 Noise Environment**

The study should include

- Locations of monitoring stations for noise measurements in accordance with the direction and distance from the sources and habitations.
- Day-time and night-time noise level monitoring (leq)
- Vibration and air over pressure, caused due to blasting, transport and process equipments, wherever applicable

#### **4.5 Biological Environment**

Information on flora and fauna within the study area should be given separately

##### **4.5(a) Flora**

- Detail description of vegetation type in core and buffer zone ( include photograph)
- Assessment of plant species with respect to their dominance, density, frequency, abundance, diversity index, similarity index, importance value Index.
- Quantitative estimation of forest and non-forest flora
- Type of forest in study area and its conservation status.
- Information on the dependence of local people on minor forest products
- Location of National Parks, Sanctuary, Biosphere Reserve, Tiger Reserve, Elephant Reserve, wild life migratory routes in core and buffer zones

##### **4.5(b) Fauna**

- Assessment of fauna and avi-fauna.
- List out endangered and endemic species as per the schedule of the Wildlife Protection Act, 1972
- Information on breeding and hibernating sites in core and buffer zone.

#### **4.6 Socio- Economic Environment**

The baseline study should cover the following

- Data on demography, traditional skills, sources of livelihood within the study area
- Socio-economic profile of the people with in 2, 5 and 10 km from the mine.
- Human settlement, health status, sources of livelihood

- Data relating to historically, culturally and ecologically important places in core as well as buffer areas
- Information on notified tribal settlements, if any
- Details of private lands with ownership in the core area indicating financial loss annually
- Health status of the population in the study area

#### 4.7 Waste Generation

The report should cover the following

- Solid waste from mining and processing operations, their quality and quantity (overburden, low-grade ore etc.) Quantity and quality of associated minerals and possible recovery
- Top soil quantity , quality and its management
- If waste contain any hazardous/toxic/radioactive substances or heavy metals, then details
- Recovery and recycling possibilities
- Site features of locations of waste storage and disposal
- Leaching properties of overburden and other solid waste
- Solid waste generation from Effluent Treatment Plant township, hospitals etc.

4.8 Any specific inputs which are likely to be added the site and its surroundings. Salient feature of the area, which require specific study.

Specific Condition	Study Required
Nearness to Water Body/reservoir	Detail Hydrogeology and Hydrology
Nearness to Forest/	Detail Conservation Plan
Nearness to Township	Blasting Vibration Study
Groundwater Scarcity Area	Details of Groundwater Recharge

#### 5.0 Anticipated Impacts and Mitigation Measures

This chapter should describe the likely impact on each of the identified environmental component by adopting methods such as mathematical model, empirical method, reference of previous studies etc., Details of mitigation measures proposed in the project (site specific) to minimize the adverse effect, should be discussed. The information should cover mine development, operation and closure phases of the project, as applicable.

## 5.1 Land Environment

### *Anticipated Impacts:*

- Impact on topography, drainage pattern, land use with respect to agriculture, forestry, built-up area etc.
- Impact on soil quality and agriculture
- Soil erosion
- Subsidence
- Visual Impact on surrounding environment

### *Mitigation Measures:*

- Plan for restoration/rehabilitation of mined-out area
- Technological measures to prevent soil erosion from core and buffer zones
- Plantation/afforestation of local varieties of plants
- Measures to control and conserve runoff from various locations.
- Landscaping, plantation, afforestation to minimize adverse visual and noise impact

## 5.2 Air Environment

Impact of mineral transportation within and outside the lease. The entire sequence of mineral production, transportation, handling, transfer and storage of minerals and wastes and the impacts on air quality is to be shown in a flowchart with specific points where fugitive emissions can arise and specific pollution control / mitigative measures are proposed to be put in place. The adequacy of roads existing in the area and if new roads are to be laid the impact of the construction of roads particularly if it is crossing forest lands.

### *Anticipated Impacts:*

- Emission Inventory of SPM, RSPM, SO<sub>2</sub>, NO<sub>X</sub>, and site specific pollutants
- Prediction of fugitive dust emissions due to mining activities, crushing and cleaning plants, loading and unloading, transportation by rail, road or conveyor.
- Impact of fugitive dust emission on flora and fauna  
Prediction of impact on ambient air quality using appropriate mathematical model (area, point and line sources). Description of model, input requirements and reference of derivation. Isopleths distribution of major pollutants and their analysis and presentation in tabular form/base map.

*Mitigation Measures:*

- Measures to reduce the emissions of pollutants during mining, loading, unloading, transportation, drilling, blasting, crushing etc to maintain the air quality
- Adoption scientific mining methods to reduce dust emission from point and line source
- Planned green belt development

### **5.3 Water Environment (surface and groundwater)**

Impact of mining on hydrology, changes of natural drainage, diversion and channeling of the existing rivers / water courses flowing through the mine lease and adjoining area and its impacts on existing users and mine operations.

Impact of water drawal and mine water discharge on the hydrogeology and use of groundwater regime in the core zone and buffer zone are to be detailed out. Long-term modeling studies on the impact of mining on the undergroundwater regime should be carried out.

*Anticipated Impacts:*

- Impact on groundwater regime/streams / lake / springs due to mining, to be assessed from hydro-geological study
- Impact of water drawal on surface and groundwater resources
- Impact on surface and groundwater quality due to discharges from mining, tailings pond, workshop, township, leachate from solid waste dumps etc.
- Ingress of sea water, particularly for mining projects in coastal areas.

*Mitigation Measures:*

- Measures to minimize contamination of surface and groundwater
- Construction of gully checks, check dams, sedimentation ponds, settling tanks, water weirs, retaining walls etc. with design and site features for control of run-off
- Mine water treatment for meeting the prescribed standard
- Slope stabilization by constructing retaining walls, vegetation etc.
- Steps to minimize impact on water table if mining intercepts groundwater regime.
- Wastewater treatment for township sewage, workshop(s), tailing pond overflow etc.

## 5.4 Noise Environment

### *Anticipated Impacts:*

- Prediction of noise level by using mathematical modeling at different representative monitoring stations
- Impact of vibrations including damage to materials/structures due to blasting
- Impact on ambient noise level due to rock excavation, transportation, processing equipments and ancillaries.

### *Mitigation Measures:*

- Measures for noise abatement including point source and line source
- Measures to minimize effect by blasting
- Lay out planning to minimize the impact on receiving environment
- Planned preventive maintenance
- Selection of low noise equipment failing which use of retrofit for existing equipment

## 5.5 Biological

### *Anticipated Impacts (Flora and Fauna):*

- Impact on forest resources, economically important plants, medicinal plants and threat to rare, endemic and endangered species
- Impact on terrestrial and aquatic biodiversity
- Impact on wildlife including avi-fauna
- Impact on wildlife habitat and migratory corridors
- Impact on flora and fauna due to air emissions, noise, vibration, illumination, vehicular movement, waste water discharges, changes in land use, township etc.

### *Mitigation Measures:*

- Measures to compensate the loss of forest coverage
- Regeneration of rare and endangered plants of economic importance including medicinal plants.
- Measures for protection and conservation of wildlife species
- Green belt and its raising schedule
- Progressive afforestation in overburden, reclaimed mined out areas

## 5.6 Socio- Economic Environment

### *Anticipated Impacts:*

- Displacement of human settlements during the life of the mine
- Positive and negative impacts on present status of livelihood in the area
- Impact on the cropping pattern and crop productivity in the buffer zone
- Impact on community resources such as grazing land

### *Mitigation Measures:*

- Rehabilitation and resettlement of land oustees and displaced people
- Compensation for loss of land and crops
- Training to locals for employment in the project
- Employment opportunities and access to other amenities such as education, health care facilities to be extended to locals

## 5.7 Mine Wastes

### *Anticipated Impacts:*

- Impact of runoff from overburden, top soil, low-grade ore and other stock piles on water bodies (siltation, contamination etc)
- Loss of vegetation and wildlife habitat
- Impact on surrounding agricultural land
- Impact on groundwater quality due to leachate
- Sliding of waste dump
- Impact of hazardous wastes and liquids

### *Mitigation Measures:*

- Land reclamation and mine closure plan
- Overburden dumps stabilization to minimize impact due to runoff
- Overburden utilization for back-filling and other purposes. Simulation model with 5 years projection with digitized maps
- Municipal solid waste management in township
- Measures to control runoff from waste dumps and mining surface.
- Hazardous waste management as per regulatory guidelines

## 6.0 Environmental Monitoring Program

In order to focus on environmental management during project implementation and execution stage, the project proponent is required to spell out detailed plan and should include the following;

- Monitoring of quality of water, air, noise, vibration and occupational health status of project personnel and surrounding habitations.
- Planned monitoring program to evaluate the effectiveness of various / specific aspects of technological / mitigation measures.
- Environmental audit of various activities including budgeting and financial management with reference to environmental management.
- Hydrogeological monitoring for the entire mine life and restrictive monitoring during reclamation.
- Plantation monitoring programme to ensure survival and growth rate of plantations.
- Analysis of data, its interpretation and evaluation (any additional studies to be carried out if required)
- Mine closure plan along with the fund requirement for implementation of the activities proposed there under.

## 7.0 Additional Studies

### 7.1 Public consultation

Public hearing with the issues raised by the public and the response of the project proponent in tabular form should be discussed

### 7.2 Risk Assessment (RA) and Disaster Management Plan (DMP)

Mining activities are always associated with risk relating to hazards and accidents. Therefore risk analysis and risk mitigation should be clearly indicated in the report. This should include the following:

- Identification and type of risk associated with mining (slope failure, subsidence, fly rock fragments, fires, toxic / hazardous / flammable gas release / explosion, inundation etc.)
- Details of safety measures to prevent accident and disaster
- Disaster management plan and emergency response system with proper organizational setup to deal with such situation.
- Disaster management plan for safe mining particularly for underground mines where toxic fumes and other risks are involved.
- Occupational health risks



### **7.3 Natural resource conservation**

Plan of action for conservation of natural resources and recycle waste materials due to the project activity in the construction and operational phase of the project is to be discussed. Energy efficiency measures in the activity are to be drawn up.

### **7.4 R & R Action Plan**

Detailed R & R plan with data on the existing socio-economic status of the population in the study area and broad plan for resettlement of the displaced population, site for the resettlement colony, alternative livelihood concerns/employment for the displaced people, civil and housing amenities being offered, etc and the schedule of the implementation of the project specific R & R Plan if any is to be given. Details of provisions (capital and recurring) for the project specific R & R Plan and monitoring mechanism for the implementation of the plan.

Details of Corporate Social Responsibility activities and cost provisions (capital and recurrent per annum over the life of the project)

### **8.0 Project benefits**

This section describes the improvements in physical and social infrastructure. It details out the employment potential and other benefits that are accrued.

### **9.0 Environmental cost-benefit analysis**

The environmental cost-benefit analysis is to be taken up if recommended in the scoping stage.

### **10.0 Environmental Management Plan (EMP)**

- Administrative and technical set up for management of environment
- Mechanism of self monitoring for compliance with environmental regulations
- Institutional arrangements proposed with other organizations/ Govt. authorities for effective implementation of proposed environmental management plan
- Conservation plan for the endangered / endemic flora and fauna found in the study area and for safety of animals visiting / residing in the study area and also those in the migratory corridor.
- Integrating in the environmental management plan measures for minimising use of natural resources – water, land, energy etc.

## **11.0 Summary and Conclusion (Summary EIA)**

The summary should be a clear presentation of the finding of critical environmental issues and their resolutions. Whenever possible, the summary should make use of base maps, tables and figures. Information should be succinct with meaningful presentations. It must be able to stand alone as a document. It should necessarily cover the following:

- Introduction
- Project description and Project benefits
- Anticipated environmental impacts and mitigation measures
- Additional studies
- Environmental Monitoring Program
- Environmental Management Plan
- Risk Assessment (RA) and Disaster Management Plan (DMP)

## **12.0 Disclosure of consultants engaged**

The team of consultants engaged in this project is to be given.

## **Enclosures**

Feasibility Report / Questionnaire / Photos and plate of the Project Site

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*Terms of Reference*  
For Environmental Impact Assessment of  
**Mineral Beneficiation Projects**

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**TERMS OF REFERENCE  
FOR  
ENVIRONMENTAL IMPACT ASSESSMENT OF  
MINERAL BENEFICIATION PROJECTS**

**Objective**

Terms of Reference (TOR) for preparation of Environmental Impact Assessment (EIA) and Environmental Management Plan for mineral beneficiation projects as per the EIA Notification, 2006 has been devised to improve the quality of the reports and facilitate the decision making transparent and easy. TOR will help the project proponents and consultants to prepare report with relevant project specific data and easily interpretable information. TOR for mineral beneficiation projects is expected to cover all environmental related features.

**General Information**

Depending on the types of mineral / ore processing may involve beneficiation where mined ore is either concentrated for further processing (metallic ores) or graded for sale (non- metallic ores). For metallic ores, beneficiation normally consists of preparation by crushing and / or grinding, gravity concentration, magnetic separation, and flotation aided by chemicals. The outputs from beneficiation process are ore concentrate and wastes, in the form of tailings, which include process chemicals and heavy metals. The beneficiation process may cause adverse impact on the surrounding environment. The potential adverse impacts of mineral beneficiation involve air pollution, surface and groundwater pollution, solid waste generation, damage to flora and fauna, socio-economic etc. The developer is therefore, required to plan their activities considering the site specific environmental concerns and minimize the adverse impacts.

**1.0 Introduction**

This chapter should cover purpose of the project , brief description of the project, project name, nature, size etc. AS per the EIA Notification, 2006 under Environment (protection) Act, 1986 the mineral beneficiation with more than 0.1 million tones/ annum mineral throughput are categorized as category 'A' projects and less than 0.1 million tonne/ annum mineral throughput are categorized as category 'B' projects subject to applicability of general conditions. Mining proposals with mineral beneficiation should be appraised together for consideration of environmental clearance. All the mineral beneficiation units are statutorily required to conduct Environmental Impact Assessment study based on which environmental clearances should be considered.

Profile of the Project Proponent, name and contact address, Implementing Organization, Organizational Chart, Project consultants etc., should be mentioned clearly.

Land description- plot/ survey / khasra numbers, village, tehsil, district, state and area of the land must be mentioned clearly.

The project site to confirm to the CRZ guidelines or modifications or stipulations made by the central / state government, as applicable.

The proponent should confirm that the project meets all Centre/State/Local regulations and standards applicable for mining of minerals and allied activities.

Any litigation(s) pending against the proposed project and / or any directions or orders passed by any court of law/any statutory authority against the project is to be detailed out.

In case of expansion / modernization of the project, the environmental compliance status for the existing project should be explained.

The EIA-EMP report should be based on maximum mineral extraction capacity and it should be based on generic structure given in Appendix III of EIA notification, 2006 for the project or its expansion based on the proposed maximum mineral extraction capacity.

In the beginning of the EIA report, the page numbers of various chapters, sections and sub-sections, tables, appendices, drawings and figures etc., with titles should be clearly indicated under the heading contents.

## **2.0 Project Description**

This chapter should contain details of the basic activities, location, layout and implementation schedule of the project.

*Background of the project:*

- Location of the project, latitude, longitude, revenue, village, tehsil, district and MSL
- Objective of the project whether it is new (part of on existing mine or as a standalone) or expansion or modernization project
- Upgradation of mineral ore quality by beneficiation

- Justification and relevance of the project highlighting the benefits to the surrounding region and economic development of the State and country
- Location of national park, wildlife sanctuary, migratory routes within 5km of beneficiation plant if any should be authenticated by the chief wildlife warden.

*Project details should include::*

- Location, longitude, latitude, topographic map (1: 50,000 scale, digitized map) of vicinity within 5 km and up to 15km of the site in case of eco-sensitive area, showing the locations of the beneficiation plant, tailings, dams, water source, natural drainage channels, rivers, human settlements, etc.
- Estimated project cost
- Details of ore quality (rated capacity and peak capacity), the beneficiation technology to be adopted and anticipated mineral quality after beneficiation
- General description of unit process operations such as crushing, sizing, grinding, mineral processing with their capacities and flowchart. The operations should give various resources utilized, their sequencing and planned reuse / utilization / disposal.
- If the beneficiation plant is on the mine site details of mining operations and the consequential add on effects should also be clearly mentioned.
- If project falling on coastal zone details thereof
- Details of tailings generation, its composition and management strategy with material balance
- Details of tailing dam, size, capacity, life etc.
- Detailed layout plan showing the location of plant and infrastructure facilities
- Township description, (area, residential area, distance from the plant, distance of the water bodies)
- Water requirement and sources. If groundwater is proposed to be used its availability and impacts on groundwater resources should be given. Future plans if any using the tailings for recovery of materials.
- Mineral transportation to mineral beneficiation plant by road, rail, conveyor, ropeway, pipeline etc
- Characterization of material

### ***Essential Maps to be provided with TOR application***

#### Topographical maps

A map of the topo sheet (1:25,000 scale and if not available 1:50000) of the study area (core zone and 5 km area of the buffer zone from boundary of the core zone)

delineating the major topographical features such as land use, drainage, locations of habitats, major constructions including roads, railways, pipelines, major industries if any in the area are to be mentioned.

A map of the topo sheet covering aerial distance of 15 km from the proposed project location delineating environmental sensitive areas as specified in Form I of EIA Notification dated 14<sup>th</sup> Sep 06. In the same map the details of environmental sensitive areas present within a radial distance of 1 km from the project boundary should be specifically shown

#### Remote sensing imagery

Land use and land cover map of the study area in 1:25,000 scales based on recent satellite imagery of the study area delineating the vegetation (agricultural land, irrigated, un-irrigated, un-cultivable land-as per the revenue records, forest area- as per the records) grazing and waste land is to be shown.

#### Digital Elevation Model (DEM) / Slope / Contour map

Contour map for the study of core zone and site plan of the area showing the various proposed break-up of the land is to be shown.

- Description of the project site, geology, topography, hydrology, climate, transport and connectivity, demographic aspects, socio, cultural and economic aspects, villages, settlements, meteorological data.
- Details of tailings generated, composition and disposal by surface improvement using tailings dams.
- Notified restrictions and limitations from environmental considerations etc., if any.
- Environmental data relating to history of natural calamity such as cyclones, storms surges coastal areas, tornado, flood etc. should be discussed,

### **3.0 Analysis of alternatives**

This should be project specific and decided during the scoping process.

## 4.0 Description of Environment / Baseline Environmental Status

Environmental data are to be collected in relation to proposed would be: (a) land (b) water (ground water and surface water) (c) air (d) biological (e) noise and vibration (f) socio economic (g) health environment etc.

### Study area

The project area is referred as “Core Zone” and area with 5km radial distance from the boundary of the project as ‘buffer zone’. Map of the study area (core and buffer zone) clearly delineating the location of the various monitoring stations (air/ water / soil and noise) super imposed with location of habitats are to be shown. Monitoring and testing should be done as per CPCB / MoEF guidelines.

Baseline information is required to be collected by field survey, monitoring etc. Secondary data with sources should be clearly indicated. The baseline environmental information in a radius of 5km from the outer boundary of project area should be provided for all types of mineral beneficiation projects. One season monitoring data excluding monsoon are to be collected. However, Expert Appraisal Committee (EAC) may specify collection of baseline data for a longer period based on the nature, size and location of the project.

### 4.1 Land Environment

Existing land use of the project area is to be detailed out.

#### 4.1.a Land

Baseline data on land for all activities associated with mineral beneficiation is to be described. Total land available and proposed utilization for different purposes including built-up area be given with Justification.

#### 4.1. b Topography

Topography including terrain of the project area is to be presented Description of the terrain, hill, slopes, coastal and inland topography should be presented. Topography of the area includes

- Slope and elevation
- Natural drainage pattern and water bodies



### **4.1.c Geology**

Geology of the area is to ascertain seismic sensitivity. It should also define the strata of geological formation, from which the permeability, possible faults and fissures can be determined.

### **4.1.d Soil**

The report should include

- Soil quality at representative monitoring stations (type, classification, soil characteristics etc.)
- Fertility status of soil samples

## **4.2 Air Environment**

Air quality in mineral beneficiation plant is affected because of many emission sources such as crushing, grinding, screening, ore processing and tailings. The study should include the following

- Climate and meteorology (temperature, relative humidity, and rainfall) indicate the nearest IMD meteorological station from which climatological data have been obtained.
- Wind rose ( Wind directions and speeds, 24 hourly data)
- Air Quality Monitoring data, SPM, RSPM, SO<sub>2</sub>, NO<sub>x</sub>, CO, Heavy metals in SPM (any other project specific pollutant related to air handling). Monitoring should cover one full season except monsoon. Frequency and methodology adopted should be as per CPCB/ MoEF guidelines.
- Monitoring stations should be located based on dominating wind direction, habitations and terrain features in the study area. The direction and distance of monitoring stations with respect to core zone should be clearly specified. The monitoring stations should cover upwind, downwind, crosswind, human settlements and sensitive area.

## **4.3 Water Environment**

Sources of water (river, groundwater, mine water, other surface water), their requirement, and utilization for various operational needs of the project, at different stages determined.

A detailed water balance should be provided covering the microwater shed area where the project is located. The break up of water requirement for different processing

activities should be given separately. Approval of competent authority for utilization of ground and surface water should be provided.

#### **4.3.a Surface water**

Surface water is the receiving water body in the area and is likely to be affected due to mineral beneficiation effluents. The study should cover the following

- Locations of the representative monitoring stations with direction and distance from the site
- Details of springs, rivers, streams, nallahs, lakes, reservoirs, drains upto first order in the study area
- Physico-chemical characteristics including heavy metals, biological and bacteriological characterization of surface water resources for assessment of water quality.
- Water quality monitoring at upstream and downstream side of the project should be carried out
- Delineation of water sheds and water drainage pattern in the study area using cadastral/aerial/remote sensing satellite imageries
- A surface water balance to be completed (inflow into and outflow out)
- Lean season flow of the nallah from where water is drawn and mine water discharged if applicable.

#### **4.3.b Groundwater**

Since mineral beneficiation involves generation of large quantities of waste residues and wastewater, which require storage and disposal, the groundwater is likely to be affected to a great extent. The study should include:

- Hydrogeology and aquifer characteristics of the tailings pond area
- Groundwater potential, recharge data
- Groundwater potential of the area, its availability, groundwater table (Pre - monsoon and Post- monsoon)
- Ground water recharge potential, availability ground water table.

#### **4.4 Noise Environment**

The study should include

- Location of monitoring Stations
- Day time and night time noise level monitoring
- Inventory of noise sources

## **4.5 Biological Environment (Flora and Fauna)**

Information of flora and fauna within the study area should be given separately

### **4.5.1 Flora**

- Detailed description of vegetation type in core and buffer area (include photographs)
- Assessment of plant species with respect to dominance, density, frequency, abundance, density index, similarity index, Importance Value Index. Mangrove in wet land coastal areas
- Quantitative estimation of forest and non-forest flora
- Type of forests and their conservation status in the study area
- Information on the dependence of local people on minor forest products
- Photographs showing the vegetation in the area

### **4.5.2 Fauna**

- Assessment of fauna and avi-fauna. List out endangered and endemic species as per Schedule of the Wild Life Protection Act in the study area if any
- Location of National Parks, Sanctuary, Biosphere Reserve, Tiger Reserve, Elephant Reserve, wild life migratory routes in project area
- Information on breeding and hibernating site in the study area

## **4.6 Socio- Economic Environment**

The baseline study should include:-

- Data on demography, traditional skills, sources of livelihood within the study area
- Data relating to historically, culturally and ecologically important places in core and buffer area if applicable
- Information on notified tribal settlements, if any
- Health status of population in study area based on information from nearby hospitals and one time survey.

## 4.7 Plant Wastes

The study should cover the following:

- Tailings management (quantity of tailings generated per day, its composition and solid – liquid ratio, with mineral specific metal leaching potential)
- Design details of tailings dam including site location, layout, the stability of the dam, and measures taken for preventing the seepage losses.
- Mode of transport of tailings and distance from the tailing dam
- Plan for recycling of the discharge from the tailings dam and possible reprocessing of tailings.

## 5.0 Anticipated Impacts and mitigation measures

This chapter should describe the anticipated impacts on each of the identified environmental components by adopting methods such as mathematical model, empirical method, reference to previous studies etc., Details of mitigation measures proposed for the project (site specific) to minimize the adverse effects, should be discussed. The information should cover construction, operation and closure phases of the project, as applicable.

### 5.1 Land Environment

*Anticipated Impacts:*

- Impact on topography, water drainage pattern, land use with respect to agriculture, forestry, fisheries, built-up area etc.
- Impact on soil quality and agriculture

*Mitigation Measures:*

- Plan for restoration/rehabilitation of area utilized for beneficiation, waste disposal etc
- Plantation of local varieties of plants
- Prevent runoff from contaminating surrounding areas

### 5.2 Air Environment

The emission sources of air pollutants should be identified and quantified to assess the impact on ambient air quality of the area.

*Anticipated Impacts:*

- Prediction of fugitive dust emissions containing heavy metal particulates due to crushing grinding, screening, sizing plants, transportation by rail, road or conveyor and tailing dam
- Impact of fugitive dust emission on flora and fauna and plantations
- Prediction of impact on ambient air quality using appropriate mathematical models. Input requirement and reference of derivation. Isopleths distribution of major pollutants and presentation in Tabular form.

*Mitigation Measures:*

- Control measures/equipment proposed to be adopted to reduce the fugitive and stack emissions during ore handling, loading, unloading, transportation, crushing, grinding, screening etc
- Control of particulate and dust suppression in tailings pond
- Control measures during construction phase
- Control measures for gaseous emissions that are likely to be generated within the process, specific to the units of the plant / ore handled.

### **5.3 Water Environment**

Modification of natural drainage channel, water abstraction, discharge from tailings dam, storage of huge tailings in ponds with long-term impacts. Long-term modeling studies on the groundwater regime should be done.

*Anticipated Impacts:*

- Impact on groundwater regime/stream/lake/springs due to tailing dam. To be assessed from comprehensive hydro-geological study
- Impact of water withdrawal on surface and groundwater resources
- Impact of process wastewater (other than tailing pond discharge)

*Mitigation Measures:*

- Lining of tailing ponds.
- Tailings dam and process waste water

### **5.4 Noise Environment**

*Anticipated Impacts:*

- Impact due to processing equipments
- Prediction of noise level at different monitoring stations
- Impact due to transport of ore through human settlements

*Mitigation Measures:*

- Measures for noise and vibration control in processing equipments
- Layout planning to minimizing the impact on receptors
- Plantations around the project site

## **5.5 Biological Environment**

*Anticipated Impacts:*

- Loss of forest resources, economically important plants including medicinal plants and threat to rare, endemic and endangered species
- Impact on terrestrial and aquatic flora and fauna
- Impact on wildlife including avi-fauna
- Impact on wildlife habitat, migratory corridors
- Impact on flora and fauna due to air emissions, noise and vibration, illumination, vehicular movement, waste water discharges, changes in land use, township etc.

*Mitigation Measures:*

- Mitigation measures to compensate for the loss of forest cover
- Conservation of rare plants of economic importance including medicinal plants and wild life species
- Afforestation plan in reclaimed tailings pond
- Green belt development

## **5.6 Socio- Economic Environment**

*Anticipated Impacts:*

- Positive and negative impact on present status of livelihood in the area
- Impact on the cropping pattern and crop productivity with in 2 km from the mine
- Impact on community resources such as grazing land
- Displacement of human settlement from core area

*Mitigation Measures:*

- Rehabilitation plan for land oustees and displaced people
- Criteria and method for calculating compensation for loss of land and crops
- Training to locals for employment in the project

- Employment opportunity and access to other amenities such as education, health care facilities for local people

## **5.7 Plant Wastes**

### *Anticipated Impacts:*

- Loss of vegetation and wildlife habitat
- Impact on surrounding agricultural land
- Impact on ground water quality

### *Mitigation Measures:*

- Surface impoundment facilities
- Tailing dam reclamation and closure plan
- Stabilization plan to minimize impact due to run off from solid waste disposal area.
- Solid waste management in township
- Routine maintenance of tailing dam dyke safety to prevent breaching

## **6.0 Environmental Monitoring Program**

In order to focus on environmental management during project implementation and execution stage, the project proponent is required to spell out detail plan and should include the following;

- Monitoring of the quality of water, air, noise, occupational health status of the project personal and surrounding habitations.
- Planned monitoring program to evaluate the effectiveness of various mitigation measures.
- Environmental audit of various activities including budgeting and financial management with reference to environmental management.
- Post project hydro geological monitoring, restrictive monitoring during reclamation.
- Plantation monitoring programme during post project period to ensure survival and growth rate of plantations in reclaimed area

## **7.0 Additional Studies**

### **7.2 Public consultation**

Public hearing with the issues raised by the public and the response of the project proponent in tabular form should be discussed.

## **7.2 Risk Assessment (RA) and Disaster Management Plan (DMP)**

Mineral beneficiation projects are associated with risks relating to hazards and accidents with respect to hazardous chemicals handled and breaching of tailing dam. Therefore, risk analysis and risk mitigation should be clearly indicated in the report. This should include the following:

- Identification and type of risk associated with mineral beneficiation
- Tailing dams safety measures and risk assessment in worst case scenario of breaching
- Disaster management plan and emergency response system to deal with downstream contamination risk.
- Occupational health hazards.

## **7.3 Natural resource conservation**

Plan of action for conservation of natural resources and recycle of waste materials generated due to the project activity in the construction and operational phase of the project is to be discussed. Energy efficiency measures in the activity are to be drawn up.

## **7.4 R&R Action Plan**

Detailed R&R plan with data on the existing socio-economic status of the population in the study area and broad plan for resettlement of the displaced population, site for the resettlement colony, alternative livelihood concerns/employment for the displaced people, civil and housing amenities being offered, etc and the schedule of the implementation of the project specific R&R Plan if any is to be given. Details of provisions (capital and recurring) for the project specific R&R Plan and monitoring mechanism for the implementation of the plan.

Details of Corporate Social Responsibility activities and cost provisions (capital and recurrent per annum over the life of the project)

## **8.0 Project benefits**

This section describes the improvements in physical and social infrastructure. It details out the employment potential and other benefits that accrue.

## **9.0 Environmental cost benefit analysis**

The environmental cost benefit analysis is to be taken up if recommended in the scoping stage.



## 10.0 Environmental Management Plan (EMP)

- Administrative and technical set up for management of environment
- A plan for monitoring health of workers and the community in the vicinity should be drawn and submitted along with financial allocation
- Mechanism of self monitoring for compliance with environmental regulations
- Institutional arrangements proposed with other organizations/ Govt. authorities for effective implementation of proposed environmental management plan
- Conservation plan for the endangered / endemic flora and fauna found in the study area and for safety of animals visiting / residing in the study area and also those in the migratory corridor.
- Integrating in the environmental management plan measures for minimising use of natural resources – water, land, energy etc.
- Environmental audit of various mitigation measures proposed for different components.
- Setting up environmental management cell and formulation of monitoring protocol for various environmental components.
- Post project closure plan

## 11.0 Summary and Conclusion (Summary EIA)

The summary should be a clear presentation of the findings of critical environmental issues and their resolutions. Whenever possible, the summary should make use of base maps, tables and figures. Information should be succinct with meaningful presentations. It must be able to stand alone as a document. It should necessarily cover the following:

- Introduction
- Project description and Project benefits
- Anticipated environmental impacts and mitigation measures
- Additional Studies
- Environmental Monitoring Program
- Environmental Management Plan
- Risk Assessment (RA) and Disaster Management Plan (DMP)

## 12.0 Disclosure of consultants engaged

The team of consultants engaged in this project is to be given.

### Enclosures

Feasibility Report / Questionnaire / Photos and plate of the Project Site

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*Terms of Reference*  
**For Environmental Impact Assessment of**  
**Coal Washeries**

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## Terms of Reference (TOR) for Environmental Impact Assessment of Coal Washeries

### Objective

Terms of Reference (TOR) for preparation of Environmental Impact assessment (EIA) and Environmental Management Plan for coal washeries as per the EIA notification, 2006 has been devised to improve the quality of the reports and facilitate the decision making transparent and easy. TOR will help the project proponent and consultant to prepare report with relevant project specific data and easily interpretable information. TOR for coal washeries is expected to cover all environment related features.

### General information

Development of coal washeries can make a significant contribution to the economic development of the country. At the same time it may also create adverse impacts on the surrounding environment during the construction and operational stages. To minimize the adverse effects that may be created by the project, techniques of Environmental Impact Assessment (EIA) become necessary

Coal washeries with  $\geq 1$  million ton per annum throughput of coal are classified as category A, projects with  $< 1$  million ton per annum throughput of coal are classified as category B, subject to the applicability of general conditions (GC)\* as stipulated in the EIA notification, 2006. *If located within mining area the proposal shall be appraised together with the mining proposal.*

#### \* General Conditions (GC)

Any project or activity specified in Category B will be treated as Category A, if located in whole or in part within 10 km from the boundary of; (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, (ii) Critically polluted areas notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, (iv) Interstate boundaries and international boundaries.

The EIA - EMP report should be based on the highest achievable peak rated capacity of the project. The report should be based on generic structure given in the Appendix III to the EIA Notification 2006, for the project. The report should incorporate the page numbers of various chapters, sections and sub-sections, tables, appendices, drawings and figures etc., with titles shall be clearly indicated under the heading contents.

## 1.0 Introduction

This chapter should cover:

- Purpose of the project, brief description of the project, project name, nature, size, its importance to the region and the country
- Profile of the project proponent, name and contact address with e-mail, organizational chart, project consultants etc., should be mentioned clearly
- Land description- plot/ survey / khasra nos, village, tehsil, district, state and extent of the land must be mentioned clearly
- Whether the project attract the provisions of General Conditions of EIA Notification 2006. If so, applicability should be discussed
- The project site to confirm to the CRZ guidelines or modifications or stipulations made by the central/state government, as applicable
- The proponent should confirm that the project meets the central/state/local environmental regulations and standards applicable for coal washeries
- Any litigation(s) pending against the proposed project and/or any directions or orders passed by any court of law/any statutory authority against the project is to be detailed out
- In case of expansion/ modernization of the project, the environmental compliance status for the existing project should be explained

## 2.0 Project Description

This chapter should cover the following:

- Broader details of the basic activities, location of coal washery
- Type of the project - new/expansion/modernization
- Details whether stand-alone coal washery, if so details of run-of-mine (rom) coal supply or captive coal washery on the mine site along with the mining/power production should be furnished. In case of integrated coal washing, cumulative environmental impacts should be considered
- General description of unit operations such as crushing, screening, sorting coal washing with their capacities and flow chart
- The technology used for coal washing, description of technology and justification of chosen technology should be given. The mode of transport of incoming unwashed coal and the outgoing washed coal by rail, road, water or combination of these should be furnished. The operations should give various resources utilized, their sequencing and planned reuse/utilization/disposal. Impact of choice of the selected use of technology and impact on air quality and waste generation should be furnished
- Raw material requirement and capacity of the product output for daily and yearly average and peak values, route of travel and method of transportation of

coal from mines to washery and the product to the end user. Storage facilities and truck parking/rail/road/waterways requirements should be furnished. Land requirement for reject storage should be specifically mentioned. Description of technology for washery rejects should be provided

- Water requirement and its reliability should be furnished
- Details of sample test analysis of the following should be furnished
  - Characteristics of coal to be washed – this includes grade of coal and other Characteristics – % of ash, calorific value, sulphur and heavy metals including levels of Hg, As, Pb, Cr (total and hexavalent) and Cd
  - Characteristics of washed coal for the above parameters
  - Characteristics of coal waste rejects for the above parameters and quantum of rejects
- Copies of MoU/Agreement with linkages (for stand alone washery) for the capacity for which EC has been sought should be furnished
- Manpower requirement at different stages of the project and time frame
- Estimated cost: capital/operational cost. State specifically, the cost for environmental issues (capital and operational cost)

### **Essential topo sheets/maps to be provided with TOR application**

- A map specifying locations of the state, districts and project location
- A map covering aerial distance of 15 km from the proposed project location delineating environmental sensitive areas as specified in Form I of EIA Notification dated 14<sup>th</sup> Sep 06. In the same map the details of environmental sensitive areas present within a radial distance of 1 km from the project boundary should be specifically shown
- Land use and land cover map of the study area (project area and 5 km area from project boundary) in 1:25,000 scales based on recent satellite imagery of the study area delineating the vegetation (agricultural land, irrigated, un-irrigated, un-cultivable land as per the revenue records, forest area (s)- as per the records) grazing and waste land is to be shown
- Layout plan to a scale 1: 5000 clearly showing latitude and longitude of the boundaries covering administrative and operational buildings, storage yards, township, green belt etc., should be submitted
- Contour map of the project area and 2 km from the project boundary should be clearly indicated. In case of any diversion of nallah/stream (temporary or permanent), it should be clearly shown on the map

### **3.0 Analysis of alternatives (Technology & Sites)**

In case, the scoping exercise results in need for alternatives this chapter shall include:

- Description of various alternatives like locations or layouts or technologies studied
- Description of each alternative

- Summary of adverse impacts of each alternative
- Selection of alternative

#### **4.0 Description of the environment/ baseline environmental status**

##### **Study area**

As a primary requirement of EIA process, the proponent should collect primary baseline data in the project area as well as the area falling within 5 km from the proposed project boundary and secondary data should be collected within 15 kms aerial distance as specifically mentioned at column no 9(iii) of Form I of EIA Notification 2006. The study areas mentioned in this document shall be considered for guidance purpose only. The exact study area for different environmental attributes (water, air, noise, soil etc) is to be submitted considering the proposed project activity and location, with proper reasoning, for review and approval by the expert appraisal committee.

TOR application should contain details of secondary data, the source of secondary data, meteorological data of nearest station of IMD along with wind roses and proposed monitoring locations should be marked on the study map. Similarly the proposed locations of monitoring stations of water, air, soil, noise etc shall be shown on the study area map. One season monitoring data excluding monsoon should be collected. Period/date of data collection should be clearly indicated.

##### **4.1. Land Environment**

- Study of land use pattern, habitation, forest cover, surface water bodies, fauna and flora, environmentally sensitive places etc. by using recent satellite imagery or through secondary data sources
- Baseline data of soil at the project site and within study area is to be included. Soil data should be generated to ascertain suitability for development of greenbelt and rainwater harvesting structures
- Road/rail/waterways connectivity and suitability for transporting the raw material and finished product should be discussed

##### **4.2 Air Environment**

The baseline data should include the following:

- Climate and meteorology (temperature, relative humidity, and rainfall). Indicate the nearest IMD meteorological station from which climatological data have been obtained.

- Wind rose (Wind directions and speeds, 24 hourly data)
- Air Quality Monitoring data for pollutants like RSPM, SO<sub>2</sub>, NO<sub>x</sub> and CO. Monitoring should cover one full season except monsoon. Frequency and methodology adopted should be as per CPCB/ MoEF guidelines/norms
- Monitoring stations should be located based on dominating wind direction, habitations and terrain features in the study area. The direction and distance of monitoring stations with respect to project area should be clearly specified. The monitoring stations should cover upwind, downwind, crosswind, human settlements and sensitive area

#### **4.3 Water Environment**

- Water requirement during construction and operational stages from various activities should be furnished
- Information on surface water bodies and ground water table along with present use should be furnished. Locations of monitoring stations should be shown on a scale map. Criteria for selecting the locations for monitoring stations should be discussed
- Suggested parameters for monitoring: pH, TSS, TDS, oil & grease, BOD, COD, sulphates, sulphides, phenolics, Hg, As, Pb, Cr (total & hexavalent) and Cd

#### **4.4 Noise Environment**

Noise levels at outer limits of the project boundary during daytime and nighttime and current noise levels within 1 km from the project boundary especially at habitation should to be monitored

#### **4.5 Biological Environment**

Secondary data on the existing flora and fauna in the study area generated by any university or institution under the relevant discipline (such as BSI, ZSI, WII, etc) shall be included in the list of flora and fauna along with classification as per schedule given in the Wild Life Protection Act, 1972 (for fauna) and in the Red Book Data (flora) and a statement clearly specifying whether the study area forms a part of an ecologically sensitive area or migratory corridor of any endangered fauna.

#### **4.6 Socio-economic Environment**

The baseline study should include

- Data on demography, traditional skills, sources of livelihood within the study area
- Data relating to historically, culturally and ecologically important places
- Information on notified tribal settlements, if any

- Human settlements and health status of population in study area based on information from nearby hospitals and one time survey

## **5.0 Anticipated Environmental Impacts and Mitigation Measures**

This chapter should describe the likely impacts of the project during its construction and operational phases, on each of the environmental parameters, methods adopted for assessing the impact, reference to existing similar situations, reference to previous studies, details of mitigation methods proposed to reduce adverse effects of the project, best environmental practices and conservation of natural resources.

### **5.1. Land Environment**

*Anticipated Impacts:*

- Impact on the land use pattern should be assessed by standard procedures. Loss of productive soil and impact on natural drainage pattern of the area should be assessed
- Impact due to storage of coal and washery rejects on the surrounding land, crops, and habitation is to be assessed. Impact on infrastructure like road/rail network etc. should be assessed
- The immediate surroundings may have a greater impact. The existing surrounding features up to 1 km and impact on them should be specifically addressed

*Mitigation Measures:*

Site selection on environmental considerations like nearness to mines or users of rejects, selection of suitable local plant species for green belt development along the road side, coal handling plant, office building and all along the boundary, improved road/rail/waterways network to handle the increase in traffic and truck parking arrangements, usage of alternative building materials such as fly-ash and integration with the existing local master plans, if any.

### **5.2 Air Environment**

*Anticipated Impacts:*

- All relevant aspects covering material transportation, material handling at site, processing, having significant adverse effect on air environment should be identified
- Total pollution load generation before mitigation measures should be estimated. Impact due to accidental discharges should be addressed



- Assessment of changes in AAQ parameters by suitable modeling techniques. Anticipated impacts during construction stage, start-up stage and operational stage shall be discussed
- The impact on the immediate surrounding up to 1 km shall be addressed specifically
- Prediction of impacts due to sanctioned/ on going projects in the surrounding area on the proposed project and on the ambient environment should be addressed

*Mitigation Measures:*

- Provision of control systems should meet the fugitive emission standards of “ the difference in the value of suspended particulate matter, delta ( $\Delta$ ), measured between 25 and 30 meter from the enclosure of coal crushing plant in the downward and leeward wind direction shall not exceed 150 microgram per cubic meter
- The crushers/pulverizers/screen should be provided with suitable control measures to meet stack emission standard of 150 mg/nm<sup>3</sup>, if stack is provided or provision of adequate water sprinkling arrangement
- Water or water mixed chemical spray arrangements should be provided at all strategic coal transfer points. Enclosures, as practically possible, for conveyors, transfer points etc should be provided
- Area, in and around the washery is to be made pucca either asphalted or concreted
- Transportation of coal by closed trucks or tarpaulin covered should be provided. Smoke emission from heavy duty vehicles operating in the coal washeries should conform to the standards

### **5.3 Water Environment**

*Anticipated Impacts:*

- Quantity and characteristics of industry and domestic effluent and its impact on the environment should be assessed. Impact on ground water and surface water on account of leachate, runoff from stockpiles should be assessed
- Impact on the short/long time ground water and surface water availability due to the project usage should be assessed

#### *Mitigation Measures:*

- Provision of operation with zero effluent discharge should be made. If in case due to some genuine problems like periodic cleaning of the system, heavy rainfall etc., it become necessary to discharge the effluent to sewer/ land /stream, the effluent should conform to the standards at the final outlet of the coal washery: P<sup>H</sup> - 5.5-9.0, Total suspended solids - 100 mg/l, Oil & Grease - 10 mg/l, B.O.D (3 days 27 °C) - 30 mg/l, COD - 250 mg/l and Phenolics - 1.0 mg/l. The efficiency of the settling pond and wastewater treatment system should achieve minimum 90 %
- Establish management practices to achieve water consumption norms, not to exceed 1.5 cu.m per ton of coal processed. Standard measurement practices should be adopted
- Garland drain(s) around the stockpiles and other process areas to collect and carry the contaminated water to treatment/settling pond should be provided. Properly designed system to collect and divert the storm water should be provided

### **5.4 Noise Environment**

#### *Anticipated Impacts:*

Anticipated impacts due to operation of machinery and DG sets during normal operation and commissioning of equipments

#### *Mitigation Measures:*

- Environmental specifications for contractors and equipment purchase to meet the noise standards
- Operational / working zone – not to exceed 85 db (A) Leq for 8 hours exposure. The ambient air quality standards in respect of noise as notified under Environment (Protection) Rules, 1986 should be complied at the boundary of the project
- Noise from the DG set should be controlled by providing an acoustic enclosure or by treating the room acoustically

### **5.5 Biological Environment**

#### *Anticipated Impacts:*

- Loss of forest resources, economically important plants including medicinal plants and threat to rare, endemic and endangered species
- Impact on terrestrial and aquatic flora and fauna
- Impact on wildlife including avi-fauna
- Impact on wildlife habitat, migratory corridors

- Impact on flora and fauna due to air emissions, noise and vibration, illumination, vehicular movement, waste water discharges, changes in land use, township etc

*Mitigation Measures:*

- Identification of sensitive areas in the early planning stage around the site so that alternative site can be examined
- Mitigation measures to compensate for the loss of forest cover
- Conservation of rare plants of economic importance including medicinal plants and wild life species
- Green belt development

## **5.6 Socio-economic Environment**

*Anticipated Impacts:*

- Positive and negative impact on present status of livelihood in the area
- Impact on heritage/historical sites in the study area
- Fuel savings in transportation of washed coal in place of coal to the power plants
- Reduction in the generation of fly ash quantity at the user point by using washed coal in place of coal
- Impact on the cropping pattern and crop productivity with in 2 km
- Impact on community resources such as grazing land
- Displacement of human settlement from project area
- Revenue contribution to government/local bodies and local area development activities

*Mitigation Measures:*

- Rehabilitation plan for land oustees and displaced people
- Training to locals for employment in the project
- Employment opportunity and access to other amenities such as education, health care facilities for local people
- Socio-economic survey conducted and the analysis to identify areas of corporate contribution to improve quality of life

## **5.7 Solid Wase Management**

*Anticipated Impacts:*

- Impact due to solid waste should be assessed
- Middlings, coal fines, slurries and washery reject – quantification, handling, utilization and disposal

- Impact on surrounding agricultural lands should be assessed

*Mitigation Measures:*

Plan for use of washery rejects and middlings for either in-house power generation or linkages to a power generator unit, near by and the details should be furnished

## 6.0 Environmental Monitoring Program

It should include the technical aspects of monitoring the effectiveness of mitigation measures (including measurement methodologies, data analysis, reporting schedules, emergency procedures, detailed budget & procurement schedules.

- Summary matrix of environmental monitoring during construction and operational stages
- Planned monitoring program to evaluate the effectiveness of various mitigation measures
- Requirement of monitoring facilities
- Compilation and analysis of data, comparison with base line data and compliance to accepted norms and reporting system
- Plantation monitoring programme during post project period

## 7.0 Additional Studies

Specific condition	Study required
Scoping stage	Studies directed by the Expert Appraisal Committee while deciding the TOR for the project
Public consultation	Public consultation should be conducted as per the procedure laid down in EIA Notification 2006. The issues raised by the public and response of the project proponent should be furnished in a tabular form
Risk Assessment and Disaster Management Plan	Identification of all aspects of emergencies like catching fire etc, which may have environmental risk and discuss contingency plan with objectives, role and responsibility to handle the emergency.

## 8.0 Project benefits

This chapter shall include the improvements in physical infrastructure and social infrastructure (s), if any. Employment potentials – skilled; semi-skilled and unskilled labour both during construction and operational phases of the project with specific attention to employment potential of local population. Skill development of the project related activities

## 9.0 Environmental cost benefit analysis

If recommended by the expert appraisal committee at the scoping stage, the environmental cost benefit analysis of the project should be done

## 10.0 Environmental Management Plan (EMP)

- Administrative and technical set up for management of environment.
- Summary matrix of EMP and costing of EMP, during construction and operation stage
- Mechanism of self monitoring for compliance with environmental regulations
- Institutional arrangements proposed with other organizations / Govt. authorities for effective implementation of environmental measures proposed in the EIA
- Safe guards/mechanism to continue the assumptions/field conditions made in the EIA for arriving the site suitability

## 11.0 Summary & Conclusion (Summary EIA)

It shall be a summary of the full EIA report condensed to ten A4 size pages at the maximum. It should necessarily cover in brief the chapters of the full EIA report - introduction/project description/analysis of alternatives/description of the environment/anticipated impacts and mitigation measures/ environmental monitoring programme/additional studies/project benefits/ /environment management plan/disclosure of consultants engaged

## 12.0 Disclosure of consultants engaged

This chapter shall include the names of the consultants engaged with their brief resume and nature of consultancy rendered.

### Enclosures

Feasibility report/Form I/Photos of proposed project site, impact areas

#### **Suggestion for MoEF consideration:**

*Incase of stand-alone coal washeries, implementation of code of practice prescribed by MoEF stipulates zero discharge. In such situation collection of primary baseline data with 1 km from the boundary of the project is adequate for environmental impact assessment, considering that there are no stack emissions and liquid discharge. MoEF may take a view on this.*

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*Terms of Reference*  
**For Environmental Impact Assessment of**  
**Asbestos based industries**

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## **Terms of Reference (TOR)** **For Environmental Impact Assessment of Asbestos based Industries**

### **Objective**

Terms of Reference (TOR) for preparation of Environmental Impact Assessment (EIA) and Environmental Management Plan for Asbestos and asbestos based products as per the EIA notification, 2006 has been devised to improve focus of the reports to specified sector and to facilitate the decision making transparent and easy. The TOR will help the project proponents to prepare report with relevant project specific data and easily interpretable information. TOR for Asbestos based products project is expected to cover all environmental related features.

### **General Information**

Asbestos is common term used for various types of naturally occurring mineral fibres of Magnesium silicate. Key element related to the sector is health effects of Asbestos related issues. EIA report should provide latest scientific reports on these issues particularly related to the type of Asbestos used and the type of industry. Every chapter should contain information relevant to use of asbestos and explain the regulatory approach and adequacy of measures proposed to address the issue. To minimize the adverse effects that may be created by the project, techniques of EIA become necessary.

All projects of Asbestos milling and asbestos based products are classified as category-A projects as per the EIA Notification, 2006.

The EIA-EMP report should be based on highest achievable i.e., peak rated capacity of the project in terms of Asbestos fibre handling, technology, equipment, manpower, resource use, land requirement etc.

The report should be based on generic structure given in Appendix III to the EIA notification 2006 for the project. The report should incorporate the page numbers of various chapters, sections and sub-sections, tables, appendices, drawings and figures etc., with titles shall be clearly indicated under the heading contents.

### **1.0 Introduction**

This chapter should cover the following:

- Purpose of the project, brief description of the project, project name, nature, size, its importance to the region and the country
- Profile of the project proponent, name and contact address with e-mail, organizational chart, project consultants etc., should be mentioned

- Land description – plot/survey/ village, tehsil, district, state & extent of the land should be mentioned clearly
- The proponent should confirm that the project meets the central/state/local environmental regulations and standards applicable for asbestos based industries
- Any litigation(s) pending against the proposed project and/or any directions or orders passed by any court of law/any statutory authority against the project is to be detailed out
- In case of expansion/ modernization of the project, the environmental compliance status for the existing project should be explained

## **2.0 Project description**

This chapter should cover the following:

- Broader details of the basic activities. Type of the project – new/expansion/modernization
- Magnitude of operation giving the production quantities, energy requirements, area of buildings for operation, storage etc. This should include location of any ancillary operations and associated activities. Type of fibres used (Asbestos and others) and preference of selection from techno-environmental angle should be furnished
- As asbestos is used in several products and as the level of precautions differ from milling to usage in cement products, friction products gasketing, textiles and also differ with the process used, it is necessary to give process description and reasons for the choice for selection of process
- Technology adopted, flow chart, process description and layout marking areas of potential environmental impacts
- Land acquisition and rehabilitation - present status of such activities should be discussed.
- National standards and codes of practice in the use of asbestos particular to the industry should be furnished
- In case of newly introduced technology, it should include the consequences of any failure of equipment/ technology and the product on environmental status.
- Manpower requirement at different stages of the project and time frame
- Estimated cost: capital/operational cost. State specifically, the cost for environmental issues (capital and operational cost)

### **Essential topo sheet/maps to be provided with TOR application**

- A map specifying locations of the state, districts and project location
- A map of covering aerial distance of 15KMs from the proposed project location delineating environmental sensitive areas as specified in Form 1 of EIA notification dated 14<sup>th</sup> Sep 06



- Land use map of 5 KM from of the boundary of the project site to 1:25,000 based on recent satellite imagery
- Layout plan to a scale of 1:5000 scale for the proposed development covering administrative and operational buildings, storage yards, township, green belt development etc, boundaries of proposed activity with latitude and longitude is to be submitted

### **3.0 Analysis of alternatives (Technology & Sites)**

In case, the scoping exercise results in need for alternatives this chapter shall include:

- Description of various alternatives like locations or layouts or technologies studied
- Description of each alternative
- Summary of adverse impacts of each alternative
- Selection of alternative

### **4.0 Description of the Environment**

#### **Study area**

The chapter on environmental baseline data should include baseline data of all the pertinent parameters of environment. As a primary requirement of EIA process, the proponent should collect primary baseline data in the project area as well as the area falling within 1 km from the proposed project boundary and secondary data should be collected within 15 kms aerial distance as specifically mentioned at column no 9(iii) of Form I of EIA Notification 2006. The study areas mentioned in this document shall be considered for guidance purpose only. The exact study area for different environmental attributes (water, air, noise, soil etc) is to be submitted considering the proposed project activity and location, with proper reasoning, for review and approval by the expert appraisal committee.

TOR application should contain details of secondary data; the source of secondary data, meteorological data of nearest station of IMD along with wind roses and proposed monitoring locations should be marked on the study map. Similarly the proposed locations of monitoring stations of water, air, soil, noise etc shall be shown on the study area map. One season monitoring data excluding monsoon should be collected. Period/date of data collection should be clearly indicated. The proposed monitoring stations of water, air, soil, noise etc should be shown on the study area map

#### **4.1 Land Environment**

- Data of the land and its availability and justification of the proposed area
- Study of land use pattern, habitation, forest cover, surface water bodies, fauna and flora, environmentally sensitive places etc. by using recent satellite imagery or through secondary data sources
- Baseline data of soil at the project site and within 1Km of boundary should be included. Soil data should be generated to ascertain suitability for development of greenbelt and rainwater harvest structures
- Road/rail connectivity and suitability for transporting the raw material and finished product should be discussed

#### **4.2 Air Environment**

- Climate and meteorology (temperature, relative humidity and rainfall). Indicate the nearest IMD meteorological station from which climatological data have been obtained.
- Wind rose (Wind directions and speeds, 24 hourly data)
- Description of ambient air parameter within 1km from the project boundary in relation to the discharges anticipated should be covered. One station should be in the up-wind/non-impact/non-polluting area as a control station. Measurements of RSPM, NO<sub>x</sub> and asbestos fibre as per CPCB procedures should be done. Measurement of SO<sub>2</sub> and CO in case a boiler or dryer is used should be taken up
- Measurement of concentration of fibrous material by phase contrast optical microscopy at outer limits of factory and within 1 KM from the project boundary in downward wind direction should be done
- 24-hour air quality monitoring, during non-rainy days, at selected locations for a minimum of 4 times should be carried out.
- In case of expansion and modernization existing records of stack emission and particulate matter should be furnished

#### **4.3 Water Environment**

- Water requirement during construction and operational stages from various activities should be furnished. Wastewater generation during the construction and operational stages with a suitable flow chart should be furnished.
- Information on surface water bodies and ground water table along with present use should be furnished. Locations of monitoring stations should be shown on a scale map. Criteria for selecting the locations for monitoring stations should be discussed
- Suggested parameters for monitoring: pH, TSS, TDS, oil & grease, BOD, COD, sulphates, sulphides
- Water quality within 1Km from the project boundary should be monitored

#### **4.4 Noise**

Note noise levels at outer limits of the project boundary and within 1km from the project boundary especially at habitation should be monitored during daytime and nighttime

#### **4.5 Biological Environment**

Details on secondary data on the existing flora and fauna in the study area, carried out by an university/institution under the relevant discipline (such as BSI, ZSI, WII, etc) shall be included in the list of flora and fauna along with classification as per schedule given in the Wild Life Protection Act, 1972 (for fauna) and in the Red Book Data (flora) and a statement clearly specifying whether the study area forms a part of an ecologically sensitive area or migratory corridor of any endangered fauna.

#### **4.6 Socio-economic environment**

Present employment on livelihood of these populations, awareness of the population about the proposed activity is to be included. Settlements, health status of the communities, existing infrastructure facilities within the study area should be covered.

#### **4.7 Solid waste**

Type and quantity of solid waste generated during the construction and operational stages. Details of authorized municipal solid facilities/HW waste disposal facilities, if the project is proposing to dispose the solid waste with these facilities. Include methodology for safe storage practices, disposal of used asbestos bags and used filter bags of asbestos.

### **5.0 Anticipated Environmental Impacts and Mitigation Measures**

This chapter should describe the likely impacts of the project during its construction and operational phases, on each of the environmental parameters, methods adopted for assessing the impact, reference to existing similar situations, reference to previous studies, details of mitigation methods proposed to reduce adverse effects of the project, best environmental practices and conservation of natural resources.

## 5.1 Land Environment

### *Anticipated impacts:*

Impact of the project on the land requirement/use pattern should be assessed. Prediction of impact on the existing infrastructures like road network, housing, ground water/surface water etc. loss of productive soil and impact on natural drainage pattern. The immediate surroundings may have a greater impact. The existing surrounding features up to 1 Km and impact on them should be addressed

### *Mitigation Measures:*

Proper mitigation measures should be covered. Some examples include: Selection of suitable local plant species for green belt development in and around the site, improved road network to handle the increase in traffic and truck parking arrangements, usage of alternative building materials such as fly-ash. Rainwater harvesting systems

## 5.2 Air Environment

### *Anticipated Impacts:*

All relevant aspects having significant adverse effect on air environment should be identified. Identification of fugitive emissions during material transport, transfer, storage, manufacturing process etc. and the impacts should be assessed. Details of stacks, nature of pollutant discharge, pollution load with and without control systems should be assessed

### *Mitigation Measures:*

- Provision of air pollution control equipment used to comply with the emission standards of 0.2 fibre/ cc for asbestos fibre and 2 mg/Nm<sup>3</sup> for total dust.
- Provision of control systems and establish management practices to comply the asbestos fibre concentration at work place of 1 fibre/ cc, as per the factories act
- Number of stacks, location and type of pollutant present in the discharge
- Impact on environment using approved air dispersion modeling with controls
- Methods employed for reduction of fugitive emissions where asbestos fibres and other raw materials are stored and handled
- Material transfer points should be connected to dust extraction system
- Floor cleaning by vacuum cleaner/ Minimization of manual handling of asbestos

### **5.3 Water environment**

#### *Anticipated impacts:*

Quantity and characteristics of trade effluent and domestic effluent and its impact on the environment should be assessed

#### *Mitigation Measures:*

Methods proposed to reduce consumption by re-usage should be covered. Treatment methods proposed to treat the effluent to comply the norms and point of final disposal. Energy efficient systems proposed for treating the liquid waste. Best practices for house keeping maintenance. Water harvesting proposal to recharge underground water

### **5.4 Noise**

#### *Anticipated Impacts:*

Impacts due to the operation of machinery and DG sets should be assessed

#### *Mitigation Measures:*

- Engineering controls proposed to reduce the noise levels by sound absorbing materials of higher NRC using enclosure of restraining material with higher STC
- Noise from the DG set should be controlled by providing an acoustic enclosure or by treating the room acoustically
- Environmental specifications for contractors and equipment purchase to meet the noise standards
- The ambient air quality standards in respect of noise as notified under Environment (Protection) Act, 1986 should be complied at the boundary of the project

### **5.5 Biological Environment**

#### *Anticipated Impacts:*

- Impact on flora and fauna due to air emissions, noise and vibration, vehicular movement, waste water discharges, changes in land use, township etc

*Mitigation Measures:*

- Identification of sensitive areas in the early planning stage around the site so that alternative site can be examined
- Green belt development

## **5.6 Socio- economic Environment**

*Anticipated Impacts:*

- Positive and negative impact on present status of livelihood in the area
- Impact on heritage/historical sites in the study area
- Impact on the cropping pattern and crop productivity within 2 km
- Impact on community resources such as grazing land
- Displacement of human settlement from project area
- Revenue contribution to government/local bodies and local area development activities

*Mitigation Measures:*

- Rehabilitation plan for land oustees and displaced people
- Training to locals for employment in the project
- Employment opportunity and access to other amenities such as education, health care facilities for local people
- Socio-economic survey conducted and the analysis to identify areas of corporate contribution to improve quality of life

## **5.7 Solid waste Environment**

*Anticipated Impacts:*

- Anticipated waste per unit of production- hazardous, non-hazardous should be assessed
- Impact due to solid waste during handling, storage and transportation should be assessed

*Mitigation Measures:*

- Steps to minimize the waste generation should be furnished
- Steps to maximize utilization by recycling or use in other products should be furnished

- Treatment of such waste to render them less harmful or non-hazardous and disposal by secured landfill should be furnished

## 6.0 Environmental Management Program

This chapter shall include details of mitigation measures to be followed. It shall include the technical aspects of monitoring the effectiveness of mitigation measures (including measurement methodologies, data analysis, reporting schedules, emergency procedures, detailed budget & procurement schedules)

### Project Monitoring

- Safety audit of Engineering controls adopted and their effectiveness
- Method used for measuring stack emissions for asbestos fibres and particulate matter
- Proposed air quality monitoring, scheme for Asbestos exposures
- Frequency of air quality monitoring of stack emission, personal sampling, static background dust sampling and at project boundary
- Requirement of monitoring facilities
- Quantity and measurement of discharges and disposal of solid wastes and effluents if any and take steps to progressively recycle in any of products
- Plantation monitoring programme

### Control Initiatives

List out data from BIS codes of practice, CPCB publication, other Government studies and data related to Asbestos-Health control objectives that would be implemented at appropriate place in EIA

## 7.0 Additional Studies

Specific condition/Area	Study required
Scoping stage	Studies directed by the Expert Appraisal Committee while deciding the TOR for the project
Public consultation	Public consultation should be conducted as per the procedure laid down in EIA Notification 2006. The issues raised by the public and response of the project proponent should be furnished in a tabular form
Worker Education	Workers should be informed of the need to take precautions and use all protective measures to control dust in working environment. They should also be advised consequences of ignoring these precautions

Occupational health	Steps taken to follow factory rules for health monitoring of workers. Pre employment data, Periodical monitoring and at Cessation of employment Scheme as per IS: 11451 - 1986 History of exposure, X-ray of Chest PA, Lung function test, Clinical examination are identified for this health monitoring
Work place Health Monitoring	Specify activities in process with potential for release of asbestos into environment. Engineering controls at work place to reduce exposure to less than permitted levels. Equipment for fiber measurement of personal and site sampling. Dust measurement scheme identifying potential exposure sites as per the relevant BIS
Risk analysis and DMP	Although asbestos industry will not cause any disastrous emergencies, control measures due to accidental discharge, spillages of asbestos during transportation, storage and manufacturing process is to be discussed such as vacuum cleaning, wet mopping, sealing, re-bagging. The responsibilities and co-ordination during the emergencies is to be discussed

## 8.0 Project benefits

This chapter shall include the improvements in physical infrastructure and social infrastructure, if any. Employment potential – skilled; semi-skilled and unskilled labour both during construction and operational phases of the project with specific attention to employment potential of local population

## 9.0 Environmental Management Plan

- Administrative and technical set up for management of environment
- Summary matrix of EMP and costing of EMP, during construction and operation stage
- Institutional arrangements proposed with other organizations/Government authorities for effective implementation of environmental measures proposed in the EIA
- Safeguards/mechanism to continue the assumptions/field conditions made in the EIA for arriving the site suitability
- Air pollution equipment to meet standards under EP Act/ Factories act should be provided



## **10.0 Summary and conclusion (Summary EIA)**

It shall be a summary of the full EIA report condensed to ten A4 size pages at maximum. It should cover in brief the chapters of full EIA report - Introduction / Project description/ Description of the environment/ Anticipated Environmental impacts and Mitigation measures/ Additional studies/ Environmental monitoring programme/ Project benefits/ Environment Management Plan/Disclosure of consultants engaged

## **11.0 Disclosure of consultants engaged**

Area of consultancy and relevant resume of consultant for Environmental issues and Occupational health issues. Competency and experience of project proponent or the consultant to control schemes for environmental safety should be furnished

## **Enclosures**

Feasibility report / Form I / Photos of proposed project site, impact area

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## Annexure 1

### Resource Persons and Project Team

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Prof V S Chary,	<b>Director,</b> Centre for Energy, Environment, Urban Governance, and Infrastructure Development Administrative Staff College of India, (ASCI), Raj Bhavan Road, Hyderabad - 500 082 Ph:- +9140-66534221, <a href="mailto:schary@asci.org.in">schary@asci.org.in</a>
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Dr Valli Manickam	<b>Area Chairperson</b> - Environment Area, ASCI <b>Project Coordinator</b> Ph:- +9140-66534365, <a href="mailto:vallim@asci.org.in">vallim@asci.org.in</a>

Sector	Resource persons	Affiliation	Email
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	Mr. SVSLN Sastry	Chief Engineer (Retd) Visakhapatnam Port Trust	sripadasastry@yahoo.com
	Mr. G Balasubramanyam	Advisor ASCI, Hyd	<a href="mailto:gbs@asci.org.in">gbs@asci.org.in</a>
Airports	Wg. Cdr. GSR Sarma	Wg Cdr (Retd.) Indian Air Force	<a href="mailto:gsr_sarma@yahoo.com">gsr_sarma@yahoo.com</a>
	Dr. Valli Manickam	Environment Area, ASCI, Hyd.	<a href="mailto:vallim@asci.org.in">vallim@asci.org.in</a>
Highways	Mr. GK Anand	Chief Engineer (Retd)- Parke Davis (India)	<a href="mailto:gka999@hotmail.com">gka999@hotmail.com</a>
	Mr. G Balasubramanyam	Advisor ASCI, Hyd	<a href="mailto:gbs@asci.org.in">gbs@asci.org.in</a>
Building construction, townships and area development	Dr. IV Murali Krishna	Adjunct Professor, AIT, Bangkok,	<a href="mailto:ivm@ieee.org">ivm@ieee.org</a>
	Dr. Valli Manickam	Environment Area, ASCI, Hyd.	<a href="mailto:vallim@asci.org.in">vallim@asci.org.in</a>
Mining of minerals	Dr. DK Behera	Senior Environmental Scientist, Orissa PCB	<a href="mailto:dk_behera@yahoo.com">dk_behera@yahoo.com</a>
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Asbestos	Mr. V Pattabhi	Consultant, Building Products, Hyderabad	<a href="mailto:vangala.p@hotmail.com">vangala.p@hotmail.com</a>
	Mr. G Balasubramanyam	Advisor ASCI, Hyd	<a href="mailto:gbs@asci.org.in">gbs@asci.org.in</a>

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**Annexure 2**  
**Peer committee members -**  
**by Ministry of Environment and Forests, Government of India**

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**Peer Committee I**

<p><b>Dr.B. Sengupta</b>  Ex-Member Secretary/ Chairman  Central Pollution Control Board, Govt of India, New Delhi</p>	<b>Chairman</b>
<p><b>Shri B P Shukla</b>  CPCB Regional office, Bangalore</p>	
<p><b>Dr. P M Raju</b>  E.E (Env), Vishakhapatnam Port Trust  Visakhapatnam</p>	
<p>Head of Environment Division  National Highway Authority of India, New Delhi</p>	
<p>The Chief Planning Officer  Hyderabad Urban Development Authority</p>	
<p>GMR  Hyderabad International Airport Ltd</p>	
<p><b>Shri N V Bhasakara Rao</b>  APPCB, Visakhapatnam</p>	
<p><b>Shri G V Raghava Rao</b>  RAMKY, Hyderabad</p>	
<p><b>Sri P Janardhan Reddy</b>  SPEQUEL, Hyderabad</p>	
<p><b>Sri G Udaya Bhaskar</b>  GM-Env, Essar Group, Mumbai 400 034</p>	
<p><b>Dr. Swarna Subba Rao</b>  Director, Survey of India, Hyderabad</p>	
<p>Representative  Town and Country Planning, Hyderabad</p>	
<p><b>Er. Nanda Kumar</b>  Energy Conservation Mission  Institute of Engineers, Hyderabad</p>	

## Peer Committee II

<b>Shri M Parabramham</b> Former Advisor, MoEF, GOI.	<b>Chairman</b>
<b>Dr. Gopalakrishna</b> Ex-Chairman, Atomic Regulatory Board	
<b>Prof. M A Ramulu</b> Ex-Head, Dept.of Mining Engg IIT, Kharapur	
Member Secretary West Bengal Pollution Control Board	
<b>Dr. S P Vivek Chandra Rao</b> General Manager - Occupational Health Hyderabad Industries Limited, Hyderabad	
<b>Dr. G Suryanarayana</b> I/c Head (EE&M), Environment Protection Training & Research Institute (EPTRI), Hyderabad	
<b>Mr. P Sharath Kumar</b> Office of CGM (Proj. Planning) The Singareni Collieries Co.Ltd Kothagudem	
<b>Dr. S Ramakrishna Rao,</b> AP State Expert Appraisal Committee	
<b>Mr. S V Swamy</b> Scientist SF, Nuclear Fuel Complex, Hyderabad	
<b>Dr. J A Kamalakar</b> Manager CNV (Environment) NMDC Ltd, Hyderabad	

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**Annexure 3**  
**Core committee members -**  
**by Ministry of Environment and Forests, Government of India**

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<b>Dr.B. Sengupta</b> Ex-Member Secretary Central Pollution Control Board, New Delhi	<b>Chairman</b>
Chairman of peer committee 1	
Chairman of peer committee 2	
<b>Dr. M S Narayan</b> Former Chairman, Coal India, New Delhi	
<b>Dr. P G Sastry</b> Hyderabad	
<b>Dr. Wate</b> Head, EIA Division NEERI, Nagpur	
<b>Chairman,</b> Karnataka Pollution Control Board, Bangalore	
<b>Shri A K Debnath</b> CG M, Central Mine Plan & Design Institute, Ranchi	
Representative from Ministry of Urban Development, Nirman Bhavan, New Delhi	
<b>Dr. Irulappan</b> General Manager (Com), Airport Authority of India, New Delhi	
<b>Mr. V K Sharma</b> Head, Environment Division National Highways Authority of India, New Delhi	
<b>Ms. Sarita Sawhny</b> Confederation of Indian Industry, New Delhi	
Representative from Atomic Regulatory Board, New Delhi	
<b>Mrs. Rohini Devi</b> Director, HTCC, Sg -'G' ASL/DRDO Kancharbagh, Hyderabad 500 005	
<b>Shri Arvinder Singh Brar</b> Member Secretary Rajasthan Pollution Control Board, Rajasthan	
<b>Capt. Rama Rao</b> N G O, Hyderabad	