जहाँ है हरियाली ।
वहाँ है खुशहाली ॥

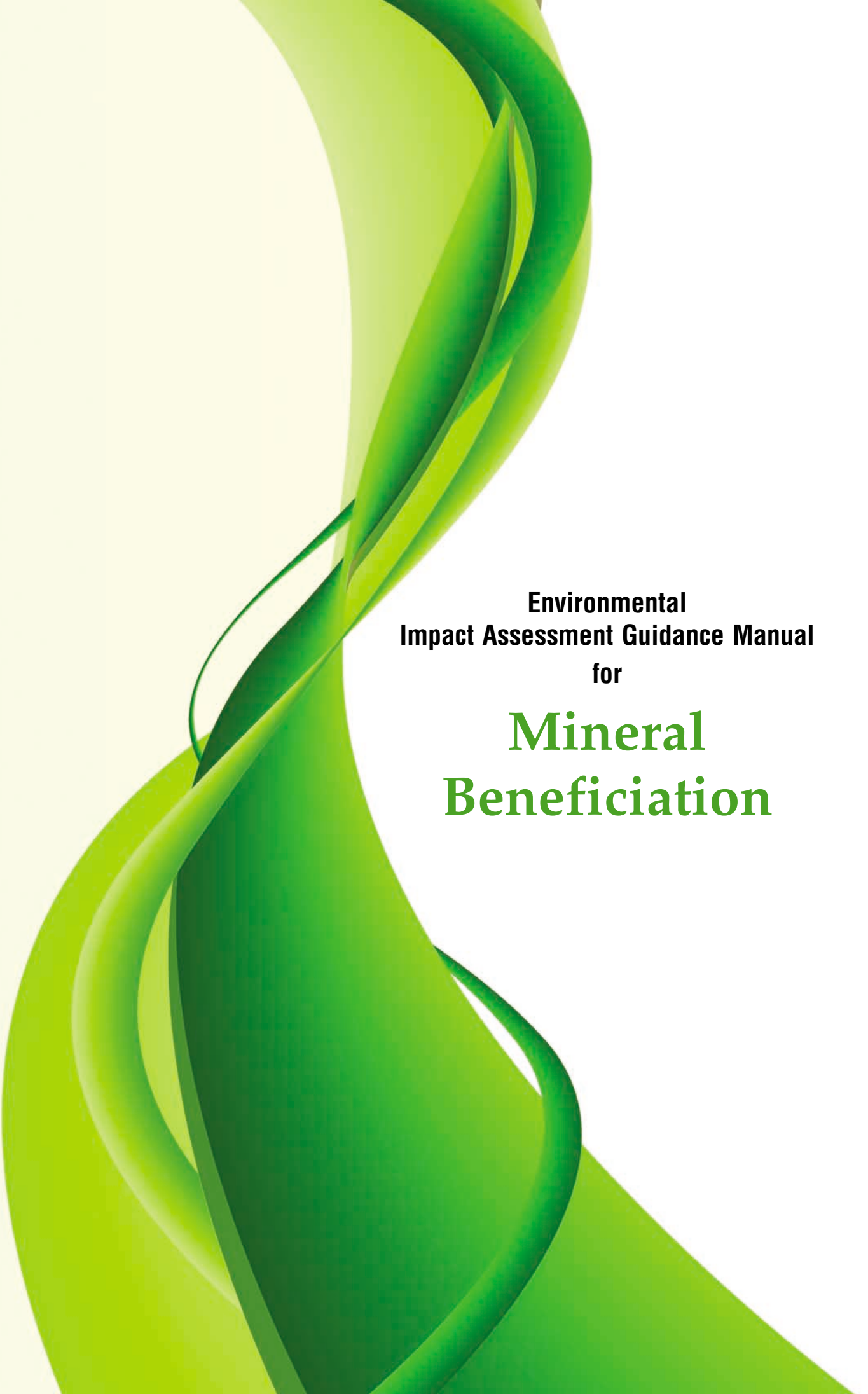
Ministry of Environment & Forests
GOVERNMENT OF INDIA, NEW DELHI

Environmental Impact Assessment Guidance Manual for MINERAL BENEFICIATION

Prepared by

Administrative Staff College of India
Bellavista, Khairatabad, Hyderabad

February 2010



Environmental Impact Assessment Guidance Manual for Mineral Beneficiation

Foreword

The EIA Notification 2006 not only reengineered the entire EC process specified under the EIA Notification 1994 but also highlighted the need to introduce specific sectors/categories under the sectors such as Industry and Infrastructure and also introduced new sectors such as Construction to be brought in the ambit of the EC process based on their extent of impacts on environment. The EIA Notification 2006 has notified 39 developmental sectors, which require prior environmental clearance. Based on the capacity, the Projects have been categorised into Category A or B which has been further categorised as B1 or B2. The Ministry of Environment and Forests (MOEF) has so far constituted 25 State level Environmental Impact Assessment Authorities (SEIAs) and State Expert Appraisal Committees (SEACs) to appraise B category projects.

The need for Sector specific manuals and guidelines for appraisal of projects under the EIA Notification 2006 has been felt for some time with a view to bringing clarity in the EC process consists of Screening, Scoping, Public Consultation and Appraisal for the purpose of granting and expediting environmental clearance. This need was further reinforced after the constitution of various SEIAs and SEACs in the various States, who were assigned this task for the first time. It was also felt that Manuals on each Sector would help in standardisation of the quality of appraisal and in reducing inconsistencies between SEACs/SEIAAs in granting ECs for similar projects in different States.

The MOEF at the first instance decided to bring out EIA Sector Specific Manuals for 37 developmental projects and the preparation of EIA Manuals of ten of these Sectors was assigned to Administrative Staff College of India (ASCI), Hyderabad.

1. Mining
2. Mineral Beneficiation
3. Ports & Harbours
4. Airports
5. (A) Building Construction
5. (B) Townships
6. Asbestors
7. Highways
8. Coal Washery
9. Aerial Ropeways
10. Nuclear Power Plants, Nuclear Fuel Processing Plants and Nuclear Waste Management Plants

The Manual for the sectors contain Model TOR of that Sector, technological options and processes for a cleaner production and waste minimisation, wherever applicable, monitoring of environmental quality, related regulations, and procedure of obtaining EC if linked to other clearances for eg., CRZ, etc.

The draft Manuals were uploaded on the MOEF website and comments/responses received were considered and finalised. Since the environmental clearance process itself is a dynamic one dependent on developmental needs, technologies available and standards for cleaner environment for a sustainable development, these manuals would require regular updation in the future. I hope the Manuals in their present form are of use and we would appreciate receiving responses from various stakeholders for further improvements that could be taken up in the future.

I congratulate the entire team in the Administrative Staff College of India, Hyderabd, experts of the sectors who were involved in the preparation of the Manuals, members of the Core and Peer Committees of various sectors and various Resource persons whose inputs were indeed valuable in the preparation and finalisation of the Manuals.

(JAIRAM RAMESH)
MINISTER OF STATE FOR ENVIROMENT & FORESTS

5th May 2010

Siripurapu K. Rao
M.A. (Cantab), Ph.D. (Cantab)
DIRECTOR GENERAL

asci
Leadership through Learning

Acknowledgements

Environmental Impact Assessment (EIA) is a planning tool generally accepted as an integral component of sound decision-making. EIA is to give the environment its due place in the decision-making process by clearly evaluating the environmental consequences of the proposed activity before action is taken. Early identification and characterization of critical environmental impacts allow the public and the government to form a view about the environmental acceptability of a proposed developmental project and what conditions should apply to mitigate or reduce those risks and impacts.

Environmental Clearance (EC) for certain developmental projects has been made mandatory by the Ministry of Environment & Forests through its Notification issued on 27.01.1994 under the provisions of Environment (Protection) Act, 1986. Keeping in view a decade of experience in the Environmental Clearance process and the demands from various stakeholders, the Ministry of Environment and Forests (MoEF) issued revised Notification on EC process in September 2006 and amended it in December 2009.It was considered necessary by MoEF to make available EIA guidance manuals for each of the development sector.

Accordingly, at the instance of the MoEF, the Administrative Staff College of India, with the assistance of experts, undertook the preparation of sector specific Terms of Reference (TOR) and specific guidance manual for Mineral Beneficiation. I wish to thank **Mr. J M Mauskar,** IAS, Additional Secretary, Govt. of India MoEF for his continuing support during the preparation of the manuals. I wish to place on record also my sincere thanks to **Dr. B Sengupta**, former Member Secretary, Central Pollution Control Board and Chairman of the Core Committee for his help in the preparation of the manuals. His suggestions helped us a great deal in improving the technical quality of the manuals. **Mr M Parabrahmam**, Former advisor MoEF and Chairman of the Peer Committee II for this project, has given constant guidance to the ASCI project team. His vast experience has been immensely helpful in preparing these manuals. I would like to thank the officials of the Ministry, **Dr. Nalini Bhat** and **Dr. T Chandini,** for coordinating the project from the Ministry side and for providing guidance whenever needed My thanks are also due to **Dr. S K Agarwal** of MoEF for the valuable inputs they had given during our interactions with the officials at Delhi and Hyderabad.

I thank **Dr. D K Behera,** Senior scientist, Orissa Pollution Control Board, resource person, who, drawing on his vast experience in the sector, prepared the EIA guidance manual on **Mineral Beneficiation** along with **Dr. Valli Manickam**, Member of Faculty of ASCI. The efforts put in by both of them are commendable.

I would like to thank all the Peer and Core Committee members for having given a valuable feed back in the preparation of the manual. I hope the manuals would prove to be useful to the community at large and to the experts working in this area in particular.

26 February, 2010 ***S.K. Rao***

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ABBREVIATIONS

ASCI – Administrative Staff College of India

CPCB – Central Pollution Control Board

CRZ – Coastal Regulation Zone

CSR – Corporate Social Responsibility

CGWB – Central Ground Water Board

EAC - Expert Appraisal Committee

EIA – Environmental Impact Assessment

EC – Environmental Clearance

ETP – Effluent Treatment Plant

EMP – Environmental Management Plan

DMP – Disaster Management Plan

IA – Impact Assessment

MoEF – Ministry of Environment and Forests

R O – Regional offices

ROM – Run-of-Mine

R&R – Rehabilitation and Resettlement

SPCBs – State Pollution Control Boards

STP – Sewage Treatment Plant

TOR – Terms of Reference

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About the Manual

Environmental Impact Notification S.O.1533 (E), of 14th September 2006, as amended in 2009, issued under Environment (Protection) Act 1986, has made it mandatory to obtain environmental clearance for scheduled development projects. The notification has classified projects under two categories 'A' & 'B'. Category A projects (including expansion and modernization of existing projects) require clearance from the Ministry of Environment and Forest (MoEF), Govt. of India (GoI), and for category B from State Environmental Impact Assessment Authority (SEIAA), constituted by Government of India.

The existing manual on Environmental Impact Assessment (EIA) of MoEF, is common for all the sectors requiring prior environmental clearance. Considering the diversity in all sectors related to infrastructure and industrial development projects, MoEF launched a program for development of sector specific technical EIA guidance manuals. The EIA guidance manual will help the project proponent / consultant in the preparation of the EIA report. It also helps the regulatory authority to review the report as well as the public to become aware of the related environmental issues. This EIA guidance manual accordingly addresses the related environmental concerns for the specific sector – "**Mineral Beneficiation**". This manual consists of terms of reference (TOR), manual and questionnaire.

The sector specific manual consists of twelve chapters, which correspond to the generic structure given as per EIA notification 2006, as amended Dec 2009.

Chapter 1: Introduction

This chapter contains the general information on the mineral beneficiation, major sources of environmental impacts in respect of mineral beneficiation projects and details of environmental clearance process.

Chapter 2: Project Description

In this chapter the proponent should also furnish a detailed description of the proposed project, such as the type of the project, need for the project, project location, layout, project activities during construction and operational phases, capacity of the project, project operation i.e., land availability, utilities (power and water supply) and infrastructure facilities such as roads, railways, housing and other requirements. If the project site is near a sensitive area it is to be mentioned clearly why an alternative site could not be considered. The project implementation schedule, estimated cost of development as well as operation etc should be also included.

Chapter 3: Analysis of Alternatives (Technology and Site)

This chapter gives details of various alternatives both in respect of location of site and technologies to be deployed, in case the initial scoping exercise considers such a need.

Chapter 4: Description of Environment

This chapter should cover baseline data in the project area and study area.

Chapter 5: Impact Analysis and Mitigation Measures

This chapter describes the anticipated impacts on the environment and mitigation measures. The method of assessment of impacts including studies carried out, modelling techniques adopted to assess the impacts where pertinent should be elaborated in this chapter. It should give the details of the impacts on the baseline parameters, both during the construction and operational phases and suggests the mitigation measures to be implemented by the proponent.

Chapter 6: Environmental Monitoring Program

This chapter should cover the planned environmental monitoring program. It should also include the technical aspects of monitoring the effectiveness of mitigation measures.

Chapter 7: Additional Studies

This chapter should cover the details of the additional studies required in addition to those specified in the ToR and which are necessary to cater to more specific issues applicable to the particular project.

Chapter 8: Project Benefits

This chapter should cover the 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, social infrastructure, employment potential and other tangible benefits.

Chapter 9: Environmental Cost Benefit Analysis

This chapter should cover on Environmental Cost Benefit Analysis of the project.

Chapter 10: Environmental Management Plan

This chapter should comprehensively present the Environmental Management Plan (EMP), which includes the administrative and technical setup, summary matrix of EMP, the cost involved to implement the EMP, both during the construction and operational phase and provisions made towards the same in the cost estimates of project construction and operation. This chapter should also describe the proposed post-monitoring scheme as well as inter-organizational arrangements for effective implementation of the mitigation measures.

Chapter 11: Summary and Conclusions

This chapter gives the summary of the full EIA report condensed to ten A-4 size pages at the maximum. It should provide the overall justification for implementation of the project and should explain how the adverse effects have been mitigated.

Chapter 12: Disclosure of Consultants

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

The contents of the manual are to be considered version 1.0 (2010). An updating / revision of the manual will be taken up by the ministry as per the requirements. In case of interpretation of any question related to law, the provisions of the original laws and the Rules made thereunder with various Government directions / resolutions will have to be read and followed. In case of amendment to the original Act / Rules / Notifications made thereunder, the provisions as amended from time to time shall be applicable. Any obligations of international conventions, where GoI is a signatory and accepted for implementation are also to be followed.

1

INTRODUCTION

1.0 Preamble

Environment plays a vital role in an overall development of the country. Recognizing the importance of environmental protection and sustainable development, the Ministry of Environment and Forest, Government of India had formulated policies and procedures governing the industrial and other developmental activities to prevent indiscriminate exploitation of natural resources and to promote integration of environmental concern in developmental projects.

The Ministry of Environment & Forest has made environmental clearance (EC) for certain developmental projects mandatory through its notification issued on 14th September 2006 and as amended on 1st December 2009. The categorization of the developmental projects / activities is specified in the EIA Notification 2006 and its amendment.

1.1 General Information on Mineral Beneficiation

Mining of coal, non-metallic and metallic mineral deposits produces rawmineral which needs to be processed further by a specified method depending on the mineral and waste product (s) associated with it. The beneficiation methods and its associated processes (gravity separation / floatation / magnetic or electrostatic separation) chosen concentrates the mineral to the desired level.

An intimate knowledge of the mineralogical composition of the ore is essential if efficient processing is to be carried out. With growing population and increasing demand for minerals for economic growth and decreasing higher grades of resources, there will be tremendous pressure on nations to exploit deposits at lower cut-off grades resulting in unprecedented generation of discarded beneficiation wastes which pose one of the most serious environmental challenges to the industry. The environmental effects are quite often, specific to the mineral / ore being processed.

Problems resulting from beneficiation are generation of solid waste, liquid waste and tailings, resulting from different processing operations. Atmospheric emissions resulting from transportation, crushing / grinding / dry process separation can be minimized by adopting suitable in-process, online control systems.

During mining, metal-bearing deposit, called ore, is extracted from underground or opencast mines. Metal concentrations in ore vary greatly. In order to upgrade the metal concentration, the ores are beneficiated for further use in industries. Mining and beneficiation can have a variety of environmental effects. The most visible effect will be disturbance of land and water regime due to waste disposal. The beneficiation process also includes ore transport, ore handling, crushing etc. Consequently, the environmental impacts of mineral beneficiation on the surroundings are considerable. Many times, the beneficiation plants are located in the mine lease area. The magnitude of environmental impacts in such cases is more significant and they will have add-on effects to the existing environmental conditions. However, mineral beneficiation projects are

unavoidable because of commercial use of minerals/ores and their contribution to national economy.

Noting the above, opportunities to minimize significant impacts at the planning and design phases must not be overlooked, as mitigation or restoration during or after construction is prohibitively expensive. It must be accepted that planning of a mineral beneficiation project and its subsequent operation has some impact on the environment. The purpose of the EIA is to quantify the impact and ensure that changes to the environment fall within acceptable predefined limits. In an ideal situation, the whole EIA process will be undertaken in parallel with the conceptualization, design and operation of the mineral beneficiation plant. While the EIA process can be complex and sometimes expensive, the early identification of adverse environmental impacts can provide the opportunity to take early corrective actions.

To address this, effective government policies as laid town in legislation and regulations, and management policy are important. Self-regulation by the project proponent, including the adoption of good management practices during planning, design and operation stages, will significantly help ensure environmental protection, in which an optimal balance may be struck between socio-economic, physical, morphological and ecological issues.

Mineral beneficiation is of great economic importance to the mining industry and the country. The continual growth of infrastructure with rapid industrialization, exploitation of minerals is likely to increase. The increasing demand of minerals also promotes mineral beneficiation to upgrade the ore. Mineral beneficiation methods commonly used are for coal, iron ore, asbestos, base metal sulphide ores, potash, tungsten, uranium, gold, titanium and others. Their activities during the construction as well as operational phases may create a wide range of impacts on the environment through activities like crushing, ore handling, tailings management, utilities services etc. The potential adverse effects of mineral beneficiation encompass water pollution of surface streams, groundwater contamination, air pollution, noise pollution, change in drainage pattern etc. The preparation of EIA report and implementation of EMP are essential to effectively manage these adverse effects. The flow diagram for mineral beneficiation plant is given in Fig.1.1

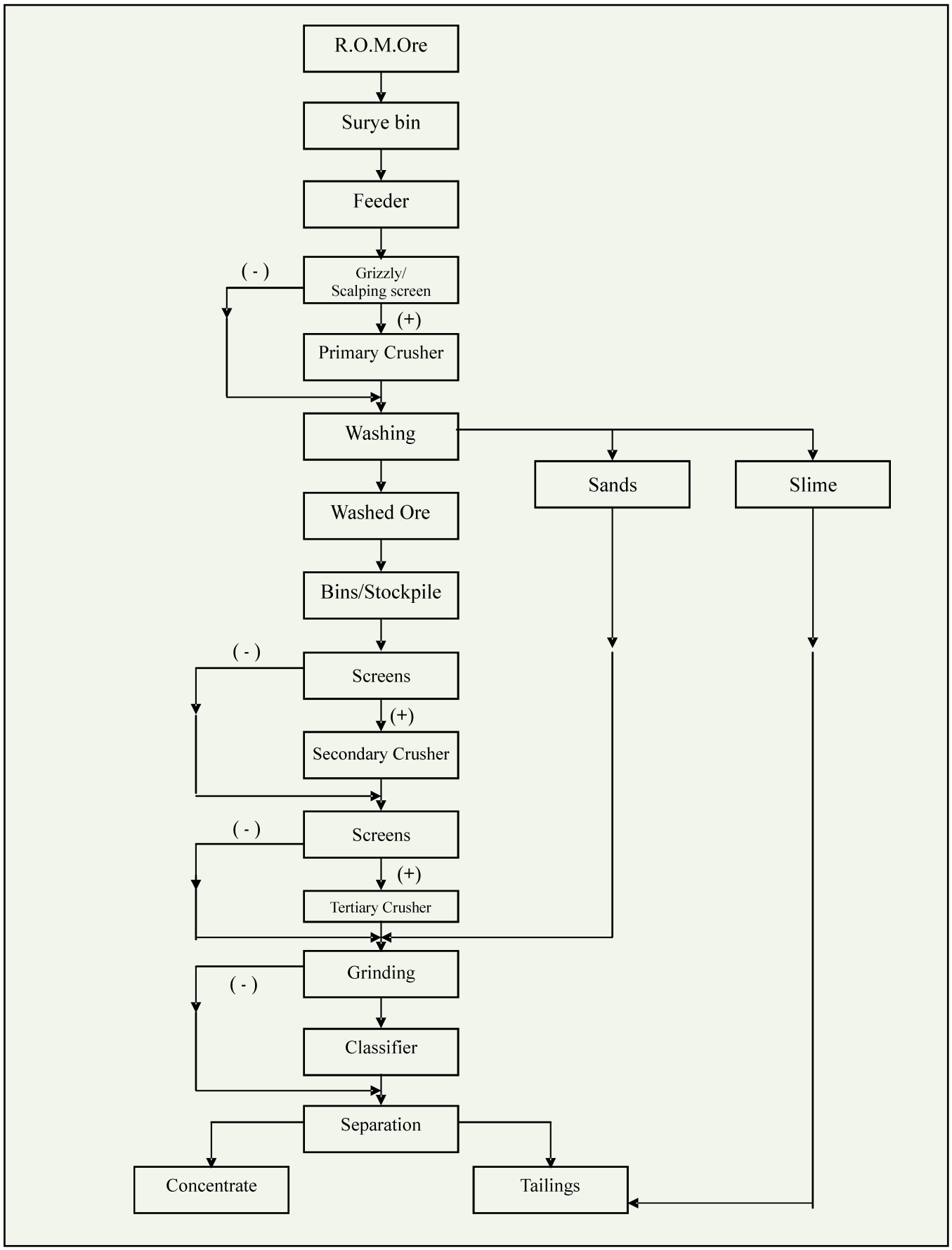

Fig1.1 Flow Chart for Ore Beneficiation Sharing Unit Operations

1.2 Environmental Clearance Process

As per EIA Notification of 2006, mineral beneficiation is divided into two categories:

Project or activity		Category with threshold limit
	A	B
Mineral Beneficiation	≥ 0.1 million TPA mineral throughput	< 0.1 million TPA mineral throughput
Authority for approval of TOR & issue / reject of EC	MoEF, GOI on the recommendations of Expert Appraisal Committee (EAC)	State / Union territory Environmental Impact Assessment Authority (SEIAA) on the recommendations of State or Union territory level Expert Appraisal Committee (SEAC)

(a) **General Condition (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 Wildlife (Protection) Act, 1972; (ii) Critically polluted areas as notified by the CPCB from time to time; (iii) Eco-sensitive areas as notified under section 3 of the Environment (Protection) Act, 1986, such as, Mahabaleswar Panchangi, Matheran, Pachmarhi, Dahanu, Doon Valley and (iv) Inter-state boundaries and international boundaries

The requirement regarding distance of 10km of the inter-state boundaries can be reduced or completely done away with by an agreement between the respective states or U.Ts sharing the common boundary in the case the activity does not fall within 10 kilometers of the areas mentioned at item (i), (ii) and (iii) above

(b) Mining proposals with mineral beneficiation should be appraised together for grant of clearance.

The environmental clearance process for new projects will comprise a maximum of four stages. These four stages in sequential order are:

Stage (1)-Screening

In case of Category 'B' projects or activities, this stage will entail the scrutiny of an application seeking prior environmental clearance made in Form 1 by the concerned SEAC for determining whether or not the project or activity requires further environmental studies for preparation of an Environmental Impact Assessment (EIA) for its appraisal prior to the grant of environmental clearance depending upon the nature and location specificity of the project. The projects requiring an Environmental Impact Assessment report should be termed Category 'B1' and remaining projects should be termed Category 'B2' and will not require an Environmental Impact Assessment report.

Stage (2)- Scoping

'Scoping' refers to the process by which the EAC in the case of Category 'A' projects or activities, and SEAC in the case of Category 'B1' projects or activities, including applications for expansion and / or modernization and / or change in product mix of existing projects or activities, determine detailed and comprehensive TOR addressing all relevant environmental concerns for the preparation of an EIA report in respect of the project or activity for which prior environmental clearance is sought. The EAC or SEAC concerned should determine the TOR on the basis of information furnished in the prescribed application Form 1 including TOR proposed by the applicant, a site visit by a sub-group of EAC or SEAC concerned only if considered necessary by the EAC or SEAC concerned and other information that may be available with the EAC or SEAC concerned.

Stage (3)- Public consultation

"Public consultation" refers to the process by which the concerns of local affected persons and others who have plausible stake in the environmental impacts of the project or activity are ascertained with a view to taking into account all the material concerns in the project or activity design as appropriate. All Category 'A' and Category 'B1' projects or activities should undertake public consultation, except the projects or activities concerning national defence and security or involving other strategic considerations as determined by the central government.

After completion of the public consultation, the applicant should address all the material environmental concerns expressed during this process, and make appropriate changes in the draft EIA and EMP. The final EIA report, so prepared, should be submitted by the applicant to the concerned regulatory authority for appraisal. The applicant may alternatively submit a supplementary report to draft EIA and EMP addressing all the concerns expressed during the public consultation

Stage (4)- Appraisal

Detailed scrutiny by the EAC or SEAC of the application and other document like the Final EIA report, outcome of the public consultations including public hearing proceedings, submitted by the applicant to the regulatory authority concerned for grant of EC

Flow-chart, depicting these stages in obtaining the environmental clearance for mineral beneficiation projects, is presented in Figure 1.2 and Figure 1.3.

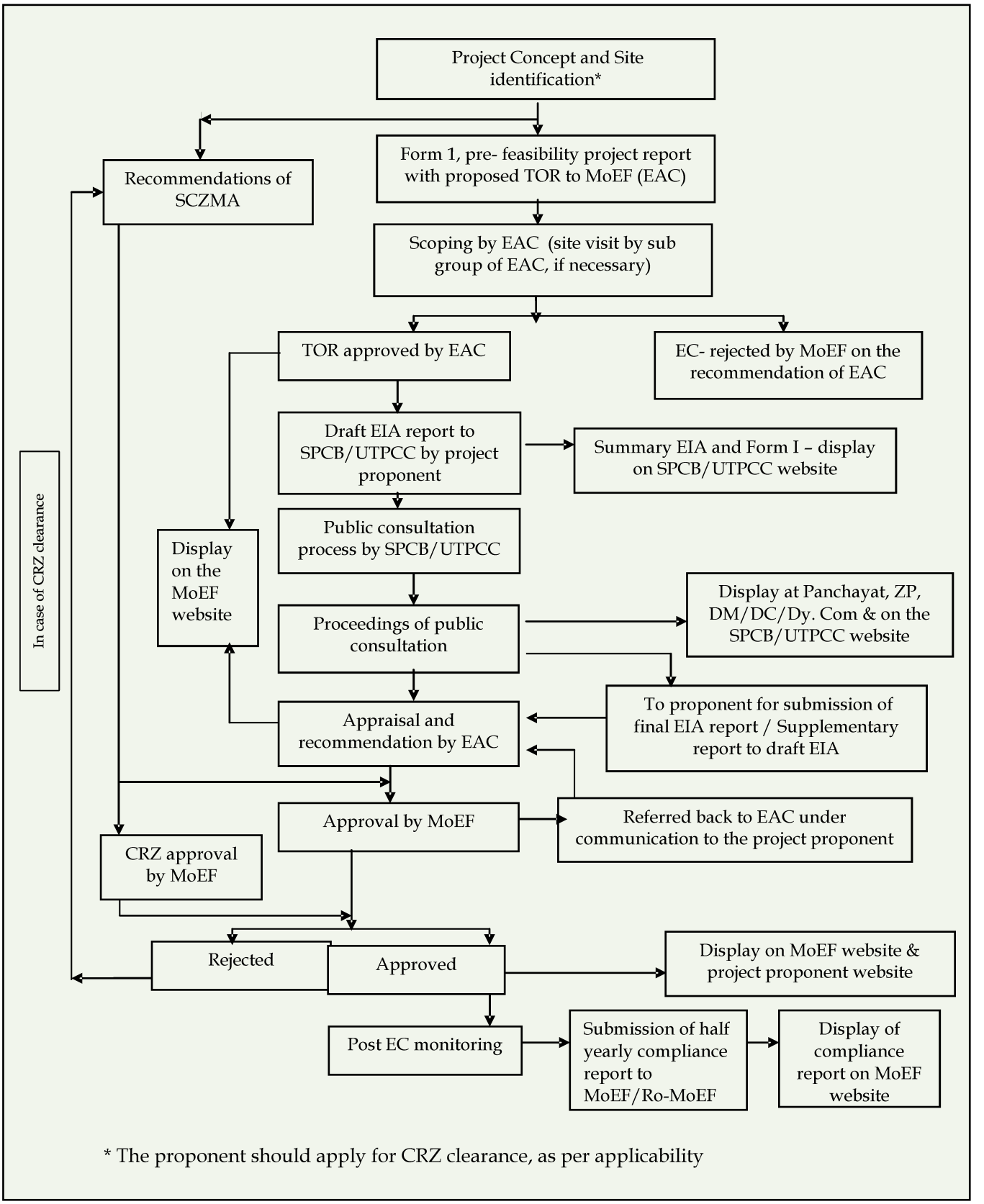

Figure 1.2: Prior Environmental Clearance Process for Category A projects

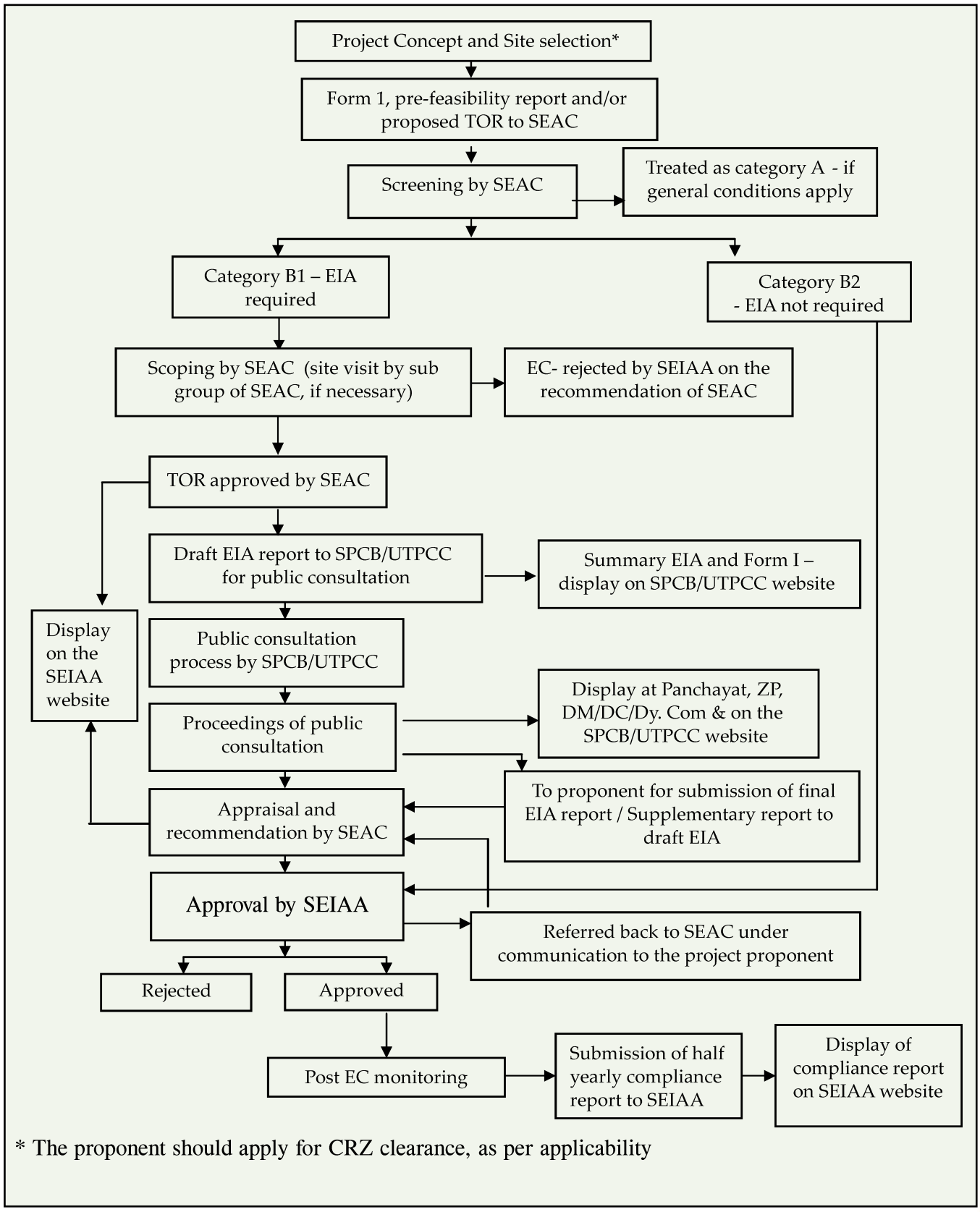

Figure 1.3: Prior Environmental Clearance Process for Category B projects

1.3 Terms of Reference (TOR) for preparation of EIA Report for Mineral Beneficiation Projects

Depending on the types of mineral / ore, processing may involve beneficiation, where mined ore is either concentrated for further processing (metallic ores) or graded (non-metallic ores) Beneficiation process normally consists of preparation by crushing and grinding gravity and magnetic separation or floatation aided by chemicals. The outputs of ore beneficiation are ore concentration and wastes, as solid rejects and / or tailings, which include process chemicals and heavy metals. The potential adverse impacts of mineral beneficiation involve air pollution, surface and groundwater pollution, tailings management, damage to flora and fauna, change in drainage pattern etc.

Terms of Reference (TOR) for the mineral beneficiation sector is prepared and attached as Annexure 1 to this document. In addition, the proponent is required to identify specific issues, if any, pertinent to the project site and include those issues also in the TOR for preparation of EIA and EMP reports upon approval of the TOR by the Expert Appraisal Committee.

1.4 Validity of Environmental Clearance

The environmental clearance granted for mineral beneficiation projects is valid for a period of five years. The regulatory authority concerned may further extend this validity period by a maximum period of five years.

1.5 Post-Environmental Clearance Monitoring

For category A projects, it shall be mandatory for the project proponent to make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their own cost by prominently advertising it at least in two local newspapers of the district or state where the project is located and, in addition, this shall also be displayed in the project proponent's website permanently.

For category B projects, irrespective of its clearance by MoEF / SEIAA, the project proponent shall prominently advertise in the newspapers indicating that the project has been accorded environmental clearance and the details of MoEF website where it is displayed.

The Project management should submit half-yearly compliance reports in respect of the stipulated prior environmental clearance terms and conditions on 1st June and 1st December of each calendar year. All such reports should be public documents.

1.6 Transferability of Environmental Clearance

A prior environmental clearance granted for a specific project or activity to an applicant may be transferred during its validity period to another person legally or organization entitled to undertake the project or activity on application by the transferor or the transferee with a written "no objection" by the transferor, to, and by the regulatory authority concerned on the same terms and conditions under which the prior environmental clearance was initially granted, and for the same validity period.

1.7 Generic structure of Environmental Impact Assessment Document

In terms of the EIA notification dated 14th September 2006, the generic structure of the EIA document shall be as under:

- Introduction
- Project Description
- Analysis of Alternatives (Technology and Site)
- Description of the Environment
- Anticipated Environmental Impacts & Mitigation Measures
- Environmental Monitoring Program
- Additional Studies
- Project Benefits
- Environmental Cost Benefit Analysis
- Environmental Management Plan
- Summary & Conclusion
- Disclosure of Consultants engaged

1.8 Identification of Project Proponent

Profile of the project proponent, contact address with e-mail, fax, phone number etc should be furnished. The authorized signatory shall make all correspondence with regulatory authority. The authorized signatory shall submit a document in support of his claim of being an authorized signatory for the specific project.

1.9 Brief Description of Project

Details of the project nature, size, location and its importance to the country and the region are to be included. Project site description- survey / village, tehsil, district, state & extent of the land, latitude & longitude of the boundaries as per the state / central govt. gazette notification should be furnished.

Description of existing environmental laws / regulations on the proposed activity is to be brought out clearly. If there are any notified restrictions / limitations from environmental angle, issued by the district administration, state or central government, the same should be furnished. Details of litigation(s) pending against the project / proposed site and or any direction passed by the court of law against the project, if any, should be stated.

In case of expansion / modernization of the project, the environmental compliance status for the existing project should be furnished for the following:

- Status of Environmental Clearance and compliance for the terms & conditions for the existing project

- Validity of the Air & Water Consent orders, and Hazardous Waste Authorization (HWA) from SPCB/ PCC for existing project
- Compliance status to the Standards and specific conditions issued by SPCB/PCC

Notices/directions issued by the regulatory agencies under section 33(A) of the Water Act, 1974 as amended, under section 31(A) of the Air Act 1981 as amended and any directions issued under the provisions of the E (P) Act, 1986 during the last one year

2

PROJECT DESCRIPTION

2.0 General

This chapter on project description in the EIA study report to be prepared by the proponent should include the following aspects:

- Purpose of the project, its goals and objectives
- Overall suitability of the project site and the proposed activity in the light of the existing environmental laws and serious deviations, if any.
- Significance of the project both at local and national level including background information and overall scenario of the proposed activity
- Relevance of the project in the light of the existing development plans of the region, project coverage, outline of master plan, phasing and scope, benefits of the project etc.
- Estimated cost of development of the project, estimated cost of environmental protection both during construction and operation phases of the project, funding agencies.
- Estimated water budget for the proposed project.
- Whether project implementation is proposed to be undertaken by the central or state government or through public-private participation or private entrepreneurs
- Resources such as construction material, equipment, energy, manpower, timeframe etc., required for project implementation and whether these are available indigenously or to be outsourced

It is to be noted that the location and layout of a mineral beneficiation plant also contribute to potential impacts on the environment. The description of the project to be given in the EIA study report should be reasonably adequate to understand the likely overall impact of the project during construction and operational phases on various components of environment. Keeping in view this aspect in order to enable the proponent to accordingly present the project description in the EIA report to obtain prior environmental clearance. Type of the project may be clearly mentioned if it is new (part of existing mine or as a standalone) or expansion or modernization.

2.1 Description of the Project

Description of the project should be brief but elaborate enough to assess the impact of the project location on the environment. The project details should include:

Background of the Project

- Objective of the project whether it is new or expansion or modernization
- Whether part of mining activities is in mining lease area with nature of deposit

- Justification of beneficiation
- Justification of the project highlighting the benefit to surrounding and economic development of the state and country

Project Details

- Location, longitude, latitude, topographic map (1: 50,000 scale, digitized map) of vicinity with in 5 km., showing the locations of beneficiation plant, tailings dam, water intake point, natural nallah, rivers, settlements etc.
- Details of mineral ore quality, the beneficiation process technology to be adopted for upgradation of mineral / ore and expected mineral / ore quality after beneficiation
- General description of unit process operations such as crushing, mineral processes with capacity and flowchart
- If the beneficiation plant is on the mine site owned by the same entrepreneur, brief details of mining activities
- Details of tailings generation, its composition and management strategy with material balance
- Detailed description and design with contour of the tailings dam
- Detailed layout plan showing the locations of all proposed activities
- Details of diesel generator set, if any
- Township description, (Area, dwelling units, distance from the plant, distance of water bodies)
- Water requirement and sources

Essential Toposheets / Maps to be provided with TOR application

a. Topographical map

A topo sheet (1:50,000 scale) 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 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 14th Sept 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

b. Remote sensing imagery

Land use map of the study area to 1: 50,000 scale based on recent satellite imagery of the study area delineating the agricultural land (irrigated, un-irrigated, un-cultivable land-as per the revenue records, forest area- as per the records) grazing & waste land is to be shown.

c. Digital Elevation Model (DEM) / Contour map
Contour map of acceptable contour intervals as required by 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, transport and connectivity, demographic aspects, socio-cultural and economic aspects, villages, settlements, meteorological data.
- Notified restrictions 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.

2.2 Description of Activities and Ancillary Operations

Details of various activities involved in both construction phase and operational phase along with flowcharts indicating required resources should be described duly supported with sufficient details in appropriate tabular form in order to enable assessment of impacts of the activities on various facets of environment. Details of wastes generated during construction and of mineral beneficiation including hazardous wastes as well as the disposal methods proposed should be elaborated in the EIA report.

Requirement of housing for the workers and employees in both construction operational phases should be specified in detail catered to by the proponent. In the event the proponent proposes to develop township for housing the workers / employees involved in the project, he should submit details of various types of buildings envisaged, layout plan of township, details of utilities and services along with methods of disposal and treatment of sewage. The proponent should comply with all statutory provisions and directions, as may be, imposed by concerned local bodies in this regard. Details of utilities such as water supply, power supply, along with sources and distribution network should be mentioned in the EIA report.

The proponent should also furnish details of proposed road network within the beneficiation plant area along with types of pavements, surface drainage arrangements, truck parking areas and repair facilities. Similarly, the proponent should furnish details of storage yard layouts for dispatch proposed to be developed if any. These infrastructure facilities should be planned to cater to a congestion-free traffic.

2.3 Use of Public Infrastructure

The proponent should furnish the connectivity of the project site to national road and rail network. In case the existing road and rail facilities are utilized, the proponent should furnish details of extra capacities required to augment the existing connectivity such that the infrastructure is not subject to congestion. The layout of such road and rail facilities should be incorporated in the project layout. Approval of appropriate authorities for the proposed layout of the connectivity should be pursued by the proponent and implemented as part of the project such that the public hitherto availing these utilities are not deprived of them as a consequence of the project implementation.

2.4 Manpower Requirement

The proponent should indicate the requirement and of various categories of manpower such as skilled, semi-skilled, unskilled workers, technicians, engineers, managers and other professionals for both construction phase and operational phases. The proposed training methods for imparting and up-gradation specialized skills development, where required, should be mentioned in the EIA Report.

2.5 Project Implementation Schedule

The proponent should also submit a detailed project implementation schedule through bar chart, CPM / PERT chart etc., duly bringing out interrelationship of major activities.

3

ANALYSIS OF ALTERNATIVES (TECHNOLOGIES AND SITE)

3.0 General

In case the scoping exercise results in a need for consideration of alternative sites or technologies on account of predicted environmental impacts, the details of such alternatives considered should be included in this chapter.

These details should comprise:

- Description of the various alternatives like site locations or layouts or modern technologies studied
- Description of each alternative with preliminary cash-flow assessment
- Summary of adverse impacts of each alternative
- Mitigation measures envisaged for each alternative, and
- Final selection of an alternative

4

DESCRIPTION OF ENVIRONMENT

4.0 General

Environmental data to be collected in relation to proposed mineral beneficiation would be: (a) land (b) water (c) air (d) biological prepared by(e) noise (f) socio-economic situation (g) health and safety environment, and so on.

Study area

The project area is referred to as "core zone" and area with 5 km radial distance from the boundary of project, as "buffer zone". Map of the study area (core and buffer zone) clearly delineating the location of various monitoring stations (air / water / soil and noise) superimposed with location of habitats are to be shown.

Baseline information is required to be collected by field surveys, monitoring etc. Secondary data with source should be clearly mentioned. The baseline environment information in a radius of 5 km from the outer boundary of the mining lease area (core) should be provided for all types of mineral beneficiation projects.

4.1 Land Environment

Land use / Land Cover

Mineral beneficiation projects require considerable land area for development of beneficiation and tailings disposal and areas for ancillaries, utilities and township. These may result in changes in land use pattern involving changes in land terrain like cutting of high grounds and hillocks, filling of low-lying areas and reclamation affecting drainage patterns as well.

In the event of land acquisition from either public or private sources is involved, justification for the extent of the area proposed is to be necessarily given. Availability of land for earmarking for the project activity without causing any hardship to local community and their socio-cultural and economic aspects is very important. Availability of required land for acquisition is to be ascertained from local authorities, revenue records etc. A location map to 1:50,000 scale presenting recent features with the help of satellite imagery of project area and surrounding area covering 10 km from project boundary delineating environmental sensitive places like protected areas notified under the wildlife (Protection) Act, 1972, critically polluted areas as notified by the CPCB from time to time, notified eco-sensitive areas, inter-state and international boundaries is to be prepared and submitted by the proponent.

Many a time, acquisitions of large stretches of land and areas being used by the local habitat, may be required for rehabilitation and resettlement (R&R) measures. It may also become necessary, in some cases, that some of the existing communities and villages to be shifted to other areas to earmark the area for development. The proponent has to undertake the required rehabilitation measures in such cases as part of the project. These aspects should be sufficiently detailed. The communities likely to be affected should be informed well in advance, in consultation with concerned authorities, such that they may express their concerns during the public consultation process.

The applicability of the General Condition (GC) for categorization (A or B) of the proposed site should be specifically described.

Topography

Landforms, terrain, coastal and inland topography etc., may get affected due to construction of a mineral beneficiation plant. If a large-scale surface mine is to provide ROM mineral / ore it 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 situation of the land at the proposed project site including description of terrain viz., hill slopes coastal and inland topography, coastal features (lowland, beaches, littoral areas, shoal areas in case of beach sand mining), terrain features, slope and elevation.

The land-use / land cover classification system for mapping different land-use / cover should be given as in Annexure 2

Specific importance is to be given to areas in close proximity to the project boundary say up to one km and land use classification and presence of ecologically sensitive places should be described in detail, with the help of a map

Geology

Geology of the area is indispensable to ascertain mineral resources and recoverable reserves. Baseline data is to be provided on rock types, rock texture and structure, geologic conditions, fractures, fissures, geophysical and morphological details, regional tectonics (intrusives, faults, folds, joints etc.), hydrology, history of volcanic activity, seismicity and associated hazards.

Soil quality

Soil data including type, classification, characteristics, soil properties and son on, are important for design of structures, loading capacities, stockpiles etc. Changes in parameters of soil also may affect plantation and vegetative growth, which in turn may endanger the health of local community.

Baseline data of the soil ascertained by soil investigations is to be carried out as per CPCB norms (Annexure 3) and sampling stations are to be given as shown in Table 4.1 and the results are to be presented as shown in 4.2. Field surveys usually involve a combination of hand auger boring and drilling over the site on a systematic grid pattern, with focus on specific areas of interest. Soil surveys should provide both the physical and engineering properties of the soil

Soil data in the proposed green belt area to ascertain the suitability for development off greenbelt and for rain water harvesting is to be covered

4.2 Water Environment

Water environment includes three environmental settings, namely, ground, surface and marine (in the case of beach sand, mining and beneficiation). Baseline data with regard to these three environmental settings should be generated. Central Pollution Control Board (CPCB) has

stipulated criteria for raw water usages as well as water quality criteria for different uses (Annexure 3)

Groundwater

Groundwater quality is an important parameter, as change in its chemical parameters will affect the water quality. Mineral beneficiation during construction / operation may have impact on groundwater quantity and quality. Pollutants from the tailings are likely to enter the groundwater. This is likely to increase concentration of leachable pollutants from waste and ore concentrate, which may migrate to the neighboring groundwater. Surface water from ore stockpiles may percolate as leachate into the ground and may contaminate the groundwater resources.

Baseline data of groundwater quality for the season other than monsoon is to be established and other parameters to be decided based on the type of mineral / ore to be handled are to be collected and the sampling stations are to be given as shown in Table 4.3 and results presented as shown in Table 4.4. In case it is proposed to tap the groundwater during construction and / or operation stage(s), the same should be quantified, and source of water supply should be identified. Such data will also indicate if there is any pollution of the groundwater.

The stress, if any, on groundwater availability should be identified and comprehensive water demand should be estimated.

Surface Water

The description of the water sampling locations may be given (Table 4.5) and the results are to be presented as shown in Table 4.6. Surface water quality is to be monitored at least for one season. The parameters, sampling frequency, and methodology adopted are presented in Annexure 3. Central Pollution Control Board (CPCB) stipulated criteria for raw water usages and use based classification of surface water are given in Annexure 4.

In case it is proposed to tap the surface water during construction and / or operation stage(s), the same should be quantified, and source of water supply identified.

The stress, if any, on surface water availability should be identified and comprehensive water demand should be estimated.

The study should cover the following aspects :

- Locations of monitoring stations with direction and distance from the site
- Details of springs, rivers, streams, nallahs, lakes, reservoirs in the study area
- Physic-chemical characteristics including heavy metals, biological, bacteriological characterization of surface water resources for assessment of water quality.
- Water quality monitoring at upstream and downstream side of the project (tailings dam) should be carried out
- Delineation of watersheds and water drainage pattern in the study area using cadastral / aerial / remote sensing satellite imageries
- Surface water balance (drawal of surface water)
- Lean season flow of the nallahs / river from where water is drawn and tailings dam overflow water discharge if applicable

4.3 Air Environment

Major pollutants generated during operation of mineral beneficiation plant are dust and gases. The primary sources of dust are construction work and road traffic, crushing, grinding, screening, vehicular traffic and DG set gaseous pollutants.

Meteorological data

Meteorological data covering the following should be incorporated in the EIA report to be submitted by the proponent. The data for at least a 10-year period should be presented from the nearest meteorological station, except for the history of cyclones and floods for which 50-year data is required.

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

Wind speed and direction

For preliminary studies, information may be obtained from the available meteorological records of the area. Recording of velocity and direction of wind at the proposed site should be obtained by installing continuous and self-recording anemometers. Seasonal changes and monsoon periods affect the wind direction, intensity and duration of maximum wind velocity. Obtaining accurate wind data and its interpretation are of importance as wind acts as an agent to convey soot particulate matter etc generated both during construction and operational phases of mineral beneficiation from the project area to its neighborhood. The dispersal, however, depends upon the wind direction, intensity, and period as well as the density and size, shape of the particulate matter.

Rainfall, Humidity, Temperature

Historical data on other parameters like rainfall, temperature, and humidity at the proposed site area also should be collected. Seasonal changes of climate are associated with the changing monsoons. Data on rainfall and temperature are very important to plan and design safe operating systems, equipment, methods etc. Data collected should be correlated with data available at places nearest to project site and with recorded data available at the IMD for the region. The length of periods over which data on various meteorological variables should be compiled may vary considerably. The data on annual average, minimum and maximum temperature, rainfall, relative humidity should be provided in the report. The records on such data for the past may be available with the Indian Meteorological Department (IMD), Pune or at the station nearby.

History of Cyclones and Floods

The tailings dam, which contains huge amount of water and solid, involves risk of breakdown during floods. The rain from catchment area of a tailings dam likely to affects the capacity of holding. The flood situation in drainage system also plays an important role.

Ambient Air Quality (AAQ) is of utmost importance for the mineral beneficiation projects. Activities of construction, crushing, grinding and traffic movement are likely sources of emissions. Ensuring ambient air quality is very essential. Description of ambient air parameters namely, PM2.5, PM10, oxides of nitrogen (NO_x), sulphur dioxide (SO_2), carbon monoxide (Co), hydrocarbons (HC), heavy metals and other harmful air pollutants depending upon the ore processed.

Baseline data of the above parameters over an area up to 5 km from the project boundary is to be generated. Specific importance is to be attached to areas in close proximity of project say up to 1 km and areas of habitat, recreation places and sensitive zones such as schools and hospitals in the neighborhood, if any. Air Pollutants: PM2.5, PM10, SO_2, NO_x, CO and heavy metals (keeping in view the type of ore to be handled) for one season other than monsoon to be monitored as per the CPCB norms. Location of ambient air quality monitoring stations should be presented as shown in Table 4.7, the monitoring results should be presented as shown in Table 4.8 and the values should be compared with National Ambient Air Quality Standards (Annexure 5).

The number of monitoring stations must be selected based on the general criteria, giving due consideration to the sensitive environmental receptors in the study area.

4.4 Noise Environment

Construction equipment, crushing and grinding equipments etc and road traffic are the major sources of noise and vibration. Baseline data of above parameters at the project area and the neighborhood habitat is to be ascertained and monitored as per CPCB protocol. Noise pollution is generated by road traffic and beneficiation operations. Hourly monitoring of noise levels (leqs) should be recorded for 24 hours by using an approne noise level meter for 15 minutes during each hour. Noise standards have been designated for different types of land use, i.e. residential, commercial, industry areas and silence zones as per the Noise Pollution (Regulation and Control) Rules, 2001 notified by the Ministry of Environment and Forests, New Delhi, Feb., 14, 2000. The sampling stations and details of noise levels are to be given as indicated in Table 4.9. The Ambient Air Quality with reference of Noise is presented in Annexure 6**.**

The noise environment studies can be restricted up to 1km from project boundary or distance to nearest habitation whichever is more.

4.5 Biological Environment

The baseline status for biological environment should be established by studying distribution pattern, community structure, population dynamics and species composition of flora and fauna. Biological environment like water encompasses both land, coastal and marine habitat and as such field surveys differ widely in the three cases. The list of critically polluted industrial cluster / area as identified by CPCB is given as Annexure 7. Information of flora and fauna within the study area should be given separately.

Flora

- Assessment of plant species with respect to dominance, density, frequency, abundance, density index, similarity index, importance value index, mangrove in wetland coastal areas
- Quantitative estimation of forest and non-forest flora

- Information on the dependence of local people on minor forest products
- Photographs showing the vegetation in the area and important places

Fauna

- Assessment of fauna and avi-fauna, indicating endangered and endemic species with respect to Schedule of the Wildlife Protection Act
- Location of national parks, sanctuary, biosphere reserve, tiger reserve, elephant reserve, wild life migratory routes in mining lease area and 10 km radius
- Biodiversity, both terrestrial and aquatic

4.6 Waste Management

Wastes from construction are mainly spoils generated by civil construction. Wastes generated during operation of the mineral beneficiation plant include process water, beneficiation process coarse rejects, tailings from grinding mill, sludges, etc are to be analyzed.

- Tailings management (quality of tailings generated per day, its composition and solid – liquid ratio, with mineral specific metal / chemical leaching potential)
- Design details of tailings dam including life of the dam and measures taken for preventing the seepage losses and possibility of groundwater contamination.
- Mode of transport of tailings and distance from the tailings dam
- Plan for reuse of the discharge from the tailings dam and possible reprocessing of materials from the tailings.
- Methods of disposal including use as backfill in underground mines

Details of authorized municipal solid waste facilities, biomedical treatment facilities and hazardous waste disposal facilities in the area are to be ascertained by proper surveys. This will help the project proponent to ascertain the availability of common environmental infrastructure facilities or to plan separately.

Incase, common environmental infrastructure is planned for utilization, the adequacy of the same should be clearly explained.

4.7 Socio-Economic and Occupational Health

Installation of a mineral beneficiation plant often requires relocation of the local community, sometimes causing conflicts with local people and may change the cultural traditions of the local community. The wastewater from tailings pond and other activities may contaminate the water of nearby natural nallah/lake/reservoir, which is used for drinking and bathing or any other purposes.

Socio-cultural impacts include all kinds of influences on the local community and due to people's life style due to relocation of villages, industrialization, population growth, and the formation of slums. Annexure 8 gives the illustrative types of socio-economic Impacts due to mining of minerals. The data required for R&R of the effected population as per the state norms should be collected and made available.

Baseline data of the above parameters at the project site and the demography (Table 4.10), particularly on human settlements including indigenous people, health status of the communities, existing infrastructure facilities in the proposed area and distance / area of impact due to the proposed activity should be collected.

Present employment and livelihood of these populations, environmental awareness of the population about the proposed activity should be collected. Occupational pattern of people in the area should be presented.

4.8 Public Utilities

Vehicular traffic during the construction and operational phases may result in excessive use of existing public infrastructure like roads, railways and in-land waterways etc., resulting in congestion and early ageing etc. Similarly public utilities such as water supply, power supply, drainage, etc may greater attention.

Baseline data of existing public utility infrastructure should 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 project.

Incase of handling hazardous chemicals for beneficiation, the existing off-site emergency facility is to be explained. This will help the project to plan integration with the existing off-site emergency facility or prepare a special plan to meet the requirements.

ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

5.0 General

Mitigation measures with respect to identified anticipated impacts are of major concern. The construction work and operation of beneficiation plant are likely to affect, significantly, the surrounding environment to varying degrees. The purpose of the EIA is to quantify the impact and ensure that changes to the environment fall within acceptable pre-defined limits and to give the environment its due place in the decision-making process by clearly evaluating the environmental consequences of the proposed activity. The potential adverse effects of mineral beneficiation includes water pollution, air pollution, soil contamination, change in landuse are drainage pattern, solid (hazardous) waste, excessive liquid etc.

By suitable means, including modeling wherever necessary, the impact of all the identified environmental concerns of mineral beneficiation on each facet of the environment should be assessed both during construction phase and operational phase and suitable mitigation measures against the potential adverse impacts should be considered such that an effective EMP can be prepared and its strict implementation adhered to during the project construction and operational phases. Early identification and characterization of critical environmental impacts allows for the environmental acceptability of the proposed developmental project.

The impact of the proposed project activities and activities after decommissioning on the concerned environmental attributes must be assessed by standard methods.

5.1 Land Environment

Anticipated Impact

Changes in land use pattern, and change in agriculture, housing, and son on, due to the project activity may necessitate rehabilitation and resettlement (R&R) of affected communities / villages. Where such R&R measures as per State / Central government stipulations are required, the proponent should furnish the proposed measures and undertake to implement them after approval by the regulatory authority. While long-term impacts may be advantageous for regional development and improvement of economy, the changes in the land use pattern and related impacts should be acceptable to the affected communities or villages. They should also plan to bring back the land to an acceptable land use plan after rehabilitation.

Mineral beneficiation may change land terrain, by cutting of high grounds and hillocks etc. Such terrain changes are likely to affect drainage pattern as well as road and rail connectivity. The impacts of such changes in the terrain should be in order to incorporate desired methods in the EMP and monitor the same during the construction as well as operational phases. Long-term monitoring and post-closure monitoring for specified periods (if mining is associated) should be furnished.

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

Mitigation Measures

Careful site selection and proper layout of the mineral beneficiation plant should be carried out, focuses on the possibility of limiting the extent of land area requirement. Where R&R measures are necessitated, the proponent to the satisfaction of affected communities and the regulatory authority must undertake these measures. Provision of financial requirements for these purposes should be clearly spelt out.

Land acquisition, where required, should be carried out by duly acceptable transparent non-restrictive methods as may be directed by the concerned authorities for duly addressing the concerns of the affected communities / villages.

The proposed mitigation measures should include:

- Plan for restoration / rehabilitation of area (tailings dam) utilized and waste disposal area
- Plantation of local varieties of plants
- Prevent run-off / discharge contaminating the surroundings
- Prevention / minimization of adverse impacts on drainage pattern of the area.

The detailed plan of tailing dam and its rehabilitation should be given.

5.2 Water Environment

Anticipated Impact

The impact of tailings dam on nearby streams, tank and springs may prove to be significant. The chemical composition of tailings is very important to assess the leachibility of various contaminants. Mineral beneficiation, if wet, consumes huge amount of water. There may be adverse impact on surface, on the quality and groundwater resources due to water drawal.

The tailings pond overflow water, which is likely to be contaminated with process chemical and other leachable contaminants, may adversely affect the surface / ground water quality.

Mitigation Measures

The tailings dam should be constructed as per design prescribed by the Bureau of Indian Standards (BIS), (Tailings Dam Design, Technical Bulletin No.30, Ministry of Steel and Mines). If required, suitable lining may be provided to make it impervious to prevent percolation to groundwater. Tailings dam overflow should be recycled. The treatment facility should be designed on the basis of composition of the tailings, method of beneficiation employed etc and standards prescribed for the receiving body. Sewage treatment plant should be installed to treat domestic sewage from the plant and its utilities.

5.3 Air Environment

Anticipated Impact

Impact of project construction / operation on the ambient air quality on account of emissions of dust during construction and operation as well as emission of gases from equipment deployed for construction is to be assessed by empirical methods or models and / or reference to existing similar situations and supported later by actual on the field measurements. Impacts include accidental leakage of emissions, exposures, fumes, odors, hazardous airborne emissions. Assessment of changes in AAQ parameters should be carried out by suitable modeling techniques or empirical methods. Anticipated impacts during the construction stage and during the operation stage on the immediate surroundings may have a greater impact. The existing surrounding features up to 1 km and impact on them should be addressed specifically. Prediction of fugitive dust air emissions during loading, unloading, transportation, and storage of ore and waste, prediction of point source emissions, prediction of air emissions due to increase in traffic, prediction of impact on ambient air quality, emission inventory for critical pollutants with mitigation measures and without mitigation measures, prediction of the impact due to the already existing project activities on the proposed project, prediction of impacts due to sanctioned / on going projects on the surroundings.

Mitigation Measures

Mitigation measures to be proposed during the construction stage should include implementation of resorting to dust suppression measures by suitable techniques. Mitigation measures to be proposed during the operation stage should include alternative solutions such as closed conveyor system, closed silos, direct loading of closed vehicles to transport dusty materials etc, mitigation measures to lower the emissions during loading, un loading, transportation and storage of mineral / ores, mitigation measures to lower the point source emissions from crushers and grinding mills, mitigation measures to lower the emissions from automobiles and the tailings dam, green belt development as well as institutional arrangements proposed with other agencies for effective implementation of environmental measures, applicable environmental standards and compliance.

5.4 Noise

Anticipated Impacts

Construction activities may create the problem of noise and vibration generated by vehicles, construction equipment, traffic, crushing, grinding and screening and conveying equipment

Mitigation Measures

Transmission of noise and vibration is limited by the distance from their sources. Noise could be considerably reduced by adoption of low-noise equipment or by added retrofit or installation of sound barriers. Green belt of natural vegetation can be a good barrier. Selection of indigenous plants should be made in consultation with local forest officials. Limitation of working hours may be a possible means to mitigate the nuisances of construction activities.

Construction of mineral beneficiation plant entails development of necessary surface facilities catering to the plant by use of a variety of construction equipment, which create pollution control problems. Inside the beneficiation plant itself, noise and vibration control can present challenging problems due to a large number of noise sources present on equipment. The largest primary

noise sources are the large secondary crushers, screens grinding mills, centrifuges, sieve bends when handling hard ores requiring a combination of controls to reduce employee noise exposure.

Noise control measures that have been developed with reasonable success may be divided into:

- Engineering controls by noise reduction at the source
- Engineering noise control by interruption of the noise path from the source to the receiver
- Administrative noise control to the receiver

An optimal solution of a noise control problem might involve one or all of the above three control measures, which can be technologically achievable. Engineering noise controls, however, offer most effective permanent solution, which will prevent occupational hearing loss.

A few of the noise reduction measures that may be adopted, are:

1. Replacing the existing older and noisy equipment with new low noise equipment from the manufacturer, failing which use of additional retrofit if available
2. Modification of older equipment or process by incorporating minor design changes
3. Implementation of an effective planned preventive maintenance checklist, which reduces noise level by more than 50%.
4. Using noise barriers and total acoustic enclosures to block, redirect, or reduce the flow of the sound energy before it reaches the receiver.
5. Isolating continuous vibration sources from the noise radiating structures by proper mounting.
6. The administrative controls, namely,
    - Relocating noisy equipment to less noisy area
    - Moving personnel further from the noise source
    - Reduction of shift length, job rotation, shutting down equipment when not needed
7. Noise control on crushers, grinding mills, and screens:

Crusher

Separating crusher foundation from other structures, using special composite wear material for the liners, using synthetic liner for the product holding bin, feed plate.

Grinding mills

Using rubber liner bonded to the inner surface.

Screens

Use of synthetic screen surface, rubber and polyurethane effectively reduce noise level while offering exceptional resistance to abrasion.

5.5 Biological Environment

Terrestrial habitat alteration should be minimized to the extent feasible and be consistent with the requirement to protect and preserve critical habitat.

Anticipated Impact

While assessing the impacts on ecology, the proponent may also consider the following matters that are relevant to the proposed development:

- The general character of the existing site in terms of fauna and flora; landscape and geological features, lakes, creeks, marsh, mangroves, coral-reef, forest and bush, sand dunes, mud flats, breeding and spawning grounds, habitats, flight paths, migratory paths and aesthetics.
- The consistency of the proposed development and its adherence with any relevant statutory instruments, planning policies, heritage orders, measures under tribal or native people legislation.
- Alternative sites for the proposed project, or alternative process designs or techniques, which will reduce ecological risks or adverse impacts on ecology.
- An ecological inventory of at least the most endemic and endangered species with major plant and animal habitats, particularly habitats critical to the preservation of threatened or endangered species. The geographical relationship of species on the site.
- Infrastructure on the site as existing, such as roads, railways, buildings and other facilities relating to current uses to the local ecology: agricultural activities of the existing communities.
- A history of tribal activity on the site, with reference to archaeological, cultural, and heritage features.
- The possible effects of the proposed project on terrestrial species (plants and animals); on aquatic species (fauna, fish, coral); on habitats; on the aesthetics of the site; on natural resources such as soil, geological formations, dunes, beaches, lakes, forest (including rain forest), coral reefs, mangroves, swamps, outcrops, and the atmosphere; including the possible effects of noise.
- The implications of felling or selective logging of trees for timber and other forest products; the effects of road-building, drainage of wet areas, and the skidding, hauling of logs; the possibility of replacement by mono culture plantations; the danger of forest fragmentation causing genetic isolation of animal populations.
- Loss of 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, migratory corridors
- Impact on flora and fauna due to air emissions, noise and vibration, illumination, vehicular movement, wastewater discharges, changes in land use, township etc.

Mitigation Measures

- Mitigation measures to compensate for the loss of forest cover
- Regeneration of rare plants of economic importance including medicinal plants and wildlife species which require protection and conservation
- Afforestation plan in overburden, reclaimed-mined out areas
- Conservation plan for conservation and protection of flora and fauna including wildlife, migratory species, medicinal plants etc
- Institutional mechanism and plan for implementation and monitoring of various mitigative measures
- Outlay of financial needs for protection of biological systems

5.6 Waste Management

Anticipated Impacts

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

Mitigation Measures

- Tailings dam overflow treatment impervious lining of dam if required
- Tailings dam reclamation and post closure monitoring closure plan
- Stabilization plan to minimize impact due to run-off from solid waste disposal area.
- Solid waste management in township
- Routine maintenance of tailings dam dyke safety to prevent breaching

5.7 Socio-economic

Anticipated Impacts

The industrial activities cause change in socio-economic, cultural tradition & displacement of local community.

- Positive and negative impacts on the present status of livelihood in the area
- Impact on the cropping pattern and crop productivity within 2 km from the mineral beneficiation plant and tailings dam, as applicable
- Impact on community resources such as grazing land
- Displacement of human settlement from the core area

Mitigation measures

An appropriate resettlement plan could minimize the disturbance to the local community and ensure smooth transition to industrialization. Where R&R measures are necessitated, these measures are to be undertaken by the proponent to the satisfaction of affected communities and

the regulatory authority. Land acquisition where required should be carried out by duly acceptable transparent non-restrictive methods as may be directed by the concerned authorities duly addressing the concerns of the affected communities / villages.

Survey of archaeological heritage sites should be undertaken well in advance and a preservation plan included in the project plan.

The proposed mitigation measures should include;

- Rehabilitation plan for displaced people, project affected people
- Criteria and method for calculating compensation for loss of land and crops
- Training locals for employment in the project
- Employment opportunity and access to other amenities such as education, health care facilities for local people

The project proponents should workout social-economic cost-benefit analysis for the implementation of the project.

6

ENVIRONMENTAL MONITORING PROGRAMME

6.0 General

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

It should also include

- Summary matrix of environmental monitoring, during construction and operation stage
- Requirement of monitoring facilities and their onsite installation
- Frequency, location, parameters of monitoring
- Compilation and analysis of data, comparison with baseline data and compliance to accepted norms and reporting system
- Plantation monitoring programme

The different statutory returns / compliance reports, that showed be submitted are :

- A half yearly compliance report in respect of the stipulated prior environmental clearance terms and conditions in hard and soft copies to the regulatory authority concerned, on 1st June and 1st December of each calendar year
- An environmental statement for the financial year ending 31st March to the concerned state pollution control board on or before 30th September every year
- A format for maintaining records of hazardous waste in Form 3 as per Hazardous Waste (Management, Handling and Transboundary movement) Rules, 2008

7 ADDITIONAL STUDIES

7.0 General

The TOR to be adopted for mineral beneficiation projects as commonly applicable is prepared and attached to this EIA as annexure**.** It may however, be necessary to cater to more issues as may be applicable to individual projects in particular. The proponent or the regulatory authority may either identify such issues during the scoping process or other stakeholders including the public during public consultation. The EIA report and EMP should therefore address there issues also.

7.1 Items Identified by the Proponent

The proponent may be able to identify issues beyond those included in the common TOR as may be specifically considered by him important from environmental point of view. In such cases the proponent shall include such issues as additional studies under TOR and pursue them in the EIA study after the regulatory authority approves TOR.

7.2 Items Identified by the Regulatory Authority

During the scoping process, the regulatory authority may direct specific issues, beyond those is included in the TOR proposed by the proponent, as may be specifically considered important from environmental point of view. In such cases the proponent shall pursue those issues as additional studies in the EIA study after the regulatory authority approves TOR.

7.3 Items Identified by the Public and Other Stakeholders

After completion of the public consultation, the applicant shall address all the material environmental concerns expressed during the process, and make appropriate changes in the draft EIA and EMP. The final EIA report, so prepared, shall be submitted by the applicant to the concerned regulatory authority for appraisal. The applicant may alternatively submit a supplementary report to draft EIA and EMP addressing all the concerns expressed during the public consultation. A statement of the issues raised by the public and the comments of the applicant shall also be prepared in the local language and in English and annexed to the proceedings.

7.4 Risk Analysis and Disaster Management Plan

The objective of the risk analysis study is to identify potential credible hazards arising out of the facilities that handle, process, store and transport hazardous substances, so as to mitigate severity and to aid in preparing effective emergency response plans by designing a disaster management plan to handle on-site and offsite emergencies.

Mineral beneficiation projects are associated with risk relating to hazard and accident with respect to hazardous chemicals handled and breaching of tailings 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 using hazardous chemicals, breaching of tailings dam etc.

- Details of safety measures to prevent accident and disaster
- Disaster management plan and emergency response system with proper organization set up for safe mineral beneficiation.
- Occupational risks to health and safety of workers and communities nearby.

Safety measures of tailing dams

The waste generation is directly related to mineral/ore production. The site investigation for location of tailing dams should include

- Dimension and layout of the surface impoundment
- Consequence of possible failure
- Risk of pollution of atmosphere or water resources

The tailings water should be recycled to conserve water resources.

Tailings Treatment

Tailings are mineral processing solid rejects containing mainly host-barren rocks along with minor amounts of unrecovered or non-recoverable mineral values. Wet concentration techniques usually discard solid particulate materials (tailings) in the form of a slurry. The quantum of tailings produced may be as much as 98% of Run- Of –Mine (R.O.M.) in case of precious metal ores or sulfide ores, and as low as 5 to 10% in case of low-value minerals like iron ores. In most cases 50 to 60% of tailings are finer than 70 microns and about 10 to 15 percent finer than 2 microns and engineering properties of such material are similar to silt. Slurry concentrations are in the range of 35 to 50 percent solids by weight. The slurry of tailings is transported either after thickening process or by pipelines or launder with gravity flow. These methods are described below.

(a) Slurry transport

Tailings are slurried in water and transported by pipeline or launder with gravity flow. The slurry under certain conditions may be discharged into a natural drainage channel and collected at a lower elevation for distribution to a pond area. The system becomes more complicated when gravity flow is not possible, requiring a pumping station. Slurry concentrations are in a range of 35 to 50 percent solids by weight.

i) Gravity flow

To avoid cost and problems of pumping the ideal situation is to have gravity flow from the mill thickeners to the tailings pond for the entire life of the pond. To prevent excessive wear; it is important that the velocity is not too high and to preclude plugging of the line the velocity should not be too low. The flow should be between 1.2 and 1.8 m per second for non-ferrous tailings and as high as 3.6 and 4.2 m per second for taconite.

ii) Pumping

When the above-mentioned system does not work i.e. gravity flow is not possible then pump must be installed for discharging the tailings to the tailings pond.

Centrifugal pumps are common for low –head demands in concentrators where seal water is available and easily controlled. Where several pump stations are required in the pump line, valve should be placed just ahead of each pump station, with a catch basin to hold the entire contents in case of a power failure.

Centrifugal pumps of abrasive resistant plastic liner are much simpler to operate and are probably the must popular for tailing slurry pumping. Different types of pipes used for tailing disposal are steel pipes, wood stave pipes, reinforced concrete pipes, transit pipes, fibreglass pipes and plastic pipes. Wood stave pipes are used in older installations.

(b) Tailings containment / impoundments

Tailings containment must have sufficient dimensions to allow the mine or plants operate during its estimated life time.

The type of tailings impoundment used is generally determined by seismic activity, water classification, tailings properties and stability foundation conditions, hydrological conditions, tailings distribution and environmental considerations. The tailings impoundment has other functions than the storage of tailings. It is also used for water clarification and sometimes as a water reservoir for the operation of the plant. The site of tailings impoundment must be forbidden in the vicinity of populated zones or near tourist sites. In selecting the location for tailings impoundments the smaller catchment, the less inflow that has to be by-passed around impoundment or handled through the impoundment and its outlet facilities, is also important. The control of water in tailings impoundment is a critical requirement in the overall design necessary to ensure embankment stability. The control of seepage is important to protect the quality of surface and groundwater and hence seepage study of the proposed area for the tailings containment is necessary. All dam safety measures considering the most climate condition should be examined & accordingly addressed in detail in the EIA report.

Guidelines for assessment, relevance and reliability of analytical methods and framework used for impact prediction and risk assessment is given in Annexure 9.

7.3 Natural Resource Conservation and Optimization

Plan of action for conservation of natural resources such as utilization of fly ash and other suitable waste materials available for the construction of the project should be examined and detailed in this chapter.

Energy efficiency and green house gas reduction potential of the activity if any should also be highlighted in this chapter.

7.4 Rehabilitation and Resettlement(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

The Corporate Social Responsibility / Community development need be also prepared where R&R measures are to be taken by the Proponent. It is to be arrived at after conducting the socio-economic survey of the surrounding population. Adequate budget should be catered to in the project cost estimates to cater to the proponent's responsibility. Similarly other agencies if any involved should also identify their responsibility and cater adequately and details thereof should be included.

8

PROJECT BENEFITS

8.0 General

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

- Improvements in the physical infrastructure by way of 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 of necessity of 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 and so on.

9

ENVIRONMENTAL COST-BENEFIT ANALYSIS

9.0 General

If recommended by the Expert Appraisal Committee at the Scoping stage subject to the TOR, this chapter should include the Environmental Cost Benefit Analysis of the project.

9

10

ENVIRONMENTAL MANAGEMENT PLAN (EMP)

10.0 General

In practice, mitigation is emphasized in the EIA process following impact identification and prediction, and the recommended measures will be an important part of the EIA report. These measures will be incorporated into the terms and conditions of project approval and implemented during the impact management stage of the EIA process. The objectives of impact management are :

- to ensure the mitigation measures are implemented
- to establish systems and procedures for this purpose, and
- to monitor the effect

10.1 Components of EMP

The EMP should contain the following:

- 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 minimizing use of natural resources – water, land, energy etc and make provision for reuse and recycle.
- Environmental audit of various mitigation measures proposed for different components / sections.
- Setting up environmental management cell and formulation of monitoring protocol for various environmental components
- Post project closure plan
- Approach towards voluntary compliance (ISO 14001 & ISO 18001) should be explained

10.2 Environment Cell

It is desirable for the proponent to set up a separate environmental cell to oversee implementation of the EMP and evaluate the results of monitoring survey and analysis to be carried out periodically. The environmental cell should be under the control of a suitably qualified and trained professional with adequate authority and due responsibility. The results of such monitoring surveys should be deliberated in house for achieving continual improvement of all environmental attributes. Whenever the study reveals departure from predictions by way of exceedences, such

departures should be immediately brought to the notice of regulatory authority and the reasons for such variations should be evaluated and if required, as may also be directed by the regulatory authority, additional studies should be carried out to recommend corrective action including additional measures as may be required. The proponent, at his own cost, should implement such corrective actions and additional measures to protect the environment forthwith.

11

SUMMARY AND CONCLUSIONS

11.0 General

Summary of EIA should be a summary of the full EIA report condensed to a maximum of ten A-4 size pages. 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
- Project Benefits and Costs Evaluation
- Important Aspects of the Environmental Management Plan and
- Important Aspects of the Environmental Monitoring Programme
- Disclosure of Consultants Engaged

DISCLOSURE OF CONSULTANTS ENGAGED

12.0 General

The EIA consultants shall have accreditation with Quality Control of India (QCI) / National Accreditation Board of Education and Training (NABET) as per office memorandum dated 2nd December 2009 of MoEF. This chapter shall include the names of the consultants engaged, along with their brief resume and nature of consultancy rendered. The consultants shall include the copy of the accreditation certificate and data provided by the other organizations / laboratories including their status of approvals and son on.

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GLOSSARY

Acid mine drainage
Acidic mine water from the ore deposit.

Adit
An opening driven horizontally for providing access to a mineral deposit

Backfilled
Filling up mining void with overburden and top soil.

Benches
Different levels in an open cast mine.

Beneficiate
To concentrate or enrich; the ore for further processing.

Crushed ore
Ore that is broken into manageable small pieces.

Leaching
When something is washed out of a substance by water passing through it or over it.

Mineral
A naturally occurring homogeneous substance having definite physical properties and chemical composition and, if formed under favorable conditions, a definite crystal form.

Mineral Processing
Process using machines which separate the good ore minerals from the rubbish ore minerals or the ore minerals that the company does not want to produce (make).

Tailings
Material rejected from a mill after most of the recoverable valuable minerals have been extracted.

Tailings pond
A low-lying depression used to confine tailings, the prime function of which is to allow enough time for heavy metals to settle out or for cyanide to be destroyed before water is discharged into the local watershed.

TABLES

Table 4.1 Description of Soil Sampling Locations

Station No.	Location	Distance & Direction from project area	Project area/ study area	Environmental Setting

Table 4.2 Analysis of Soil Samples

S. No	Parameters	Unit	Result			Standards
			SS1	SS2	SS3	
1.						
2.						
3.						

Table 4.3 Description of Ground Water Sampling Locations

Station No.	Location	Distance & Direction from project area	Project area/ study area	Environmental Setting

Table 4.4 Analysis of Ground Water

S. No	Parameters	Unit	Result			Standards
			GW1	GW2	GW3	
1.						
2.						
3.						

Table 4.5 Description of Surface Water Sampling Locations

Station No.	Location	Distance & Direction from project area	Project area/ study area	Environmental Setting
SW				

Table 4.6 Analysis of Surface Water

S. No	Parameters	Unit	Result			Standards
			SW1	SW2	SW3	
1.						
2.						
3.						

Table 4.7 Description of Ambient Air Quality Monitoring Stations

Station No.	Location	Distance & Direction from project area	Project area/ study area	Environmental Setting

Table 4.8 Analysis of Ambient Air Quality

Parameter	PM_{10}				$PM_{2.5}$				NO_x				SO_2				CO			
Monitoring Station & Category*	No. of samples	Maximum	Minimum	Mean	No. of samples	Maximum	Minimum	Mean	No. of samples	Maximum	Minimum	Mean	No. of samples	Maximum	Minimum	Mean	No. of samples	Maximum	Minimum	Mean

Table 4.9 Description of Noise Monitoring Stations

S. No	Location	Environmental Setting*	Average Day noise level (dBA)	Average Night noise level (dBA)	Day time (6.00 A.M. to 10.00 P.M)	Day time (10.00 P.M. to 6.00 A.M)
					Standard (L_{eq} in dBA)	Standard (L_{eq} in dBA)

*Industrial area/ Commercial area /Residential area /Silence zone

Table 4.10 Demographic Profile

Particulars	With the project site
Population	
No. of villages	
Number of households village-wise	

ANNEXURES

Annexure 1

Terms of Reference (TOR) 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, socioeconomic 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 the 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 conform 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.

At the beginning of the EIA report, the page numbers of various chapters, sections and sub-sections, tables, appendices, drawings and figures and so on., 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 capabilities and flowchart. The operations should give various resources utilized, their sequencing and planned reuse / utilization / disposal.
- If the beneficiation 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 tailings 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 the materials.
- Mineral transportation to mineral beneficiation plant by road, rail, conveyor, ropeway, pipelines etc
- Characterization of material

Essential Maps to be provided with TOR

Topographic Maps

A map oA map of the topo sheet (1:25,000 scale and if not available 1:50,000 scale) of the study area (core zone and 5km area of the buffer zone from boundary of the core zone) delineating the major topographic 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 14th 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 scooping 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 the terrain of the project area along with the 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 is affected by a nimber of 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_2, NO_X, 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 areas.

4.3 Water Environment

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

A detailed water balance should be provided covering the micro-water 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 by 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 Ground Water

Since mineral beneficiation involves generation of large quantities of waste residues and wastewater, requiring 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

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.

4.6 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 and so on.
- Plantation of varieties of local saplings
- Prevention 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, wastewater 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

7.1 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)

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

A Plan of action for conservation of natural resources and recycling of waste materials generated on account of the project activity in the construction and operational phase of the project, must be discussed. Energy efficiency measures in the activity are must 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
- 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
- A plan for monitoring health of workers and the community in the vicinity should be drawn and submitted along with financial allocation
- 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 minimizing 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

Annexure 2

Land use / Land Cover Classification System

Level -I	Level -II	Level –III
1. Built – up land	1.1. Built –up land	1.1.1. Urban (towns & cities)
2. Agricultural land	2.1. Crop land	2.1.1. Irrigated crop land
	(i) kharif (ii) rabi (iii) double cropped	2.1.2. Unirrigated crop land
	2.2. Fallow	2.2.1. Fallow
	2.3. Plantation	2.3.1. Types of plantation, casuarina, coconut, tea etc.
3. Forest	3.1 evergreen/semi-evergreen	3.1.1. Dense / closed 3.1.2. Open
	3.2. Deciduous	
	3.3. Degraded scrub land	
	3.4. Forest blank	3.4.1. Degraded forest
		3.4.2. Forest blank
	3.5. Forest plantation 3.6. Mangrove	3.5.1. Types of plantatin eg. teak, sal etc.
4. Wastelands	4.1. Salt affected land	
	4.2. Water logged land	
	4.3. Marshy / swampy land	
	4.4. Gullied / ravinous land	
	4.5. Land with or without scrub	
	4.6. Sandy area (coastal & desertic)	Minimum mappable unit IS 2.25 hectares on 1:50,000 scale
	4.7. Barren rocky / stony waste / sheet rock areas	
5. Water bodies	5.1. River / stream 5.2 Lake/reservoir/tank/canal	
6. Others	6.1. Shifting cultivation	6.1.1. Current
		6.1.2. Old / abandoned
	6.2.grassland / grazing land	6.2.1. Grassland / grazing land
	6.3. Snow covered/glacial area	6.3.1. Snow covered / glacial area
	6.4. Mining area	6.4.1. Mining dumps

Note : Land use / Land cover categories at different levels and corresponding scales for mapping, are as follows:

Level – I	– categories	–	1:1000,000 scale
Level – II	– categories	–	1:250,000 scale
Level – III	– categories	–	1:50,000 scale and 1:25,000 scale

(Sources: Description and classification of land use / land cover : NRSA – TR – LU & CD – 01 –90)

Annexure 3

Sampling, Frequency & Method of Baseline Environment Monitoring

Attributes	Sampling		Measurement Method	Remarks
A. Air Environment	**Network**	**Frequency**		
Meteorological IS 5182 Part 1-20 • Wind speed • Wind direction • Maximum temperature • Minimum temperature • Relative humidity • Rainfall • Solar radiation • Cloud cover • Environmental Lapse Rate	1 site in the project area	1 hourly continuous	weather station Max/Min Thermometer Hygrometer Rain gauge As per IMD specifications As per IMD specifications Mini Sonde/SODAR	Mechanical/automatic Site specific primary data is essential Secondary data from IMD
Pollutants • SPM • RSPM • SO_2 • NO_x	**Nos. of sampling locationto be decided** @4 hourly. Twice a week, One non monsoon season 8 hourly, twice a week	24 hourly twice a week	As per CPCB guidelines	Monitoring Network • Minimum one locations in in upwind side, two sites in downwind side / impact zone • All the sensitive receptors need to be covered for core zone and buffer zone

Attributes	Sampling		Measurement method	Remarks
B. Noise	**Network**	**Frequency**		
• Hourly equivalent noise levels	Identified study area	Once in season	Noise level meter	IS:4954-1968 as adopted by CPCB
• Peak particle velocity	150-200m from blast site	Once	PPV meter	
C.Water				
Parameters for water quality • pH, temperature, turbidity, magnesium hardness, total alkalinity, chloride, sulphate, nitrate, fluoride, sodium, potassium, salinity • Total nitrogen, total phosphorus, DO, BOD, COD • Heavy metals • Total coliforms, faecal coliforms • Phyto plankton	• Set of grab samples for ground and surface water		Samples for water quality should be collected and analysed as per : • IS : 2488 (Part 1-5) methods for sampling and testing of Industrial effluents • Standard methods for examination of water and wastewater analysis published by American Public Health Association.	
D. Land environment				
Soil • Organic Matter • Texture • pH • Electrical conductivity • Permeability • Water holding capacity • Porosity	Sample from villages (soil samples be collected as per BIS specifications)	**One season**	Collected and analysed as per soil analysis reference	Analysis be done as per BIS specifications

Adopted from: EIA manual 2001, Ministry of Environment and forests, New Delhi

Annexure 4

Criteria for Raw Water used for Organized Community Water Supplies (Surface and Ground Water) Primary Parameters

Parameters	Range/Limiting Value		Note
	Use with only disinfection	Use after conventional treatment	
1. pH	6.5 to 8.5	6.0 to 9.0	To ensure prevention of corrosion in treatment plant and distribution system and interference in coagulation and chlorinating.
2. Colour Pt. scale Hz Units	< 10	< 50	Color may not get totally removed during treatment
3. Suspended Solids mg/l	< 10	< 50	High SS may increase the cost of treatment.
4. Odour, dilution factor 5.DO, (%saturation) 6.BOD, mg/l	< 3 90-100 < 3	< 10 80-120 < 5	May not be tackled during treatment. May imply higher chlorine demand. Same as above.
7. TKN, mg/l	< 1	< 3	Same as above.
8. Ammonia, mg/l	< 0.05	< 1	Same as above.
9. Faecal coliform MPN/ 100 ml	< 200	< 2000	Not more than 20% samples show greater than limit.
10. EC, µm/hos/cm	< 2000	< 2000	High conductivity implies dissolved high solids making water unpalatable.
11. Chloride, mg/l	< 300	< 300	May cause physiological impact and unpalatable taste.
12. Sulphates, mg/l	< 250	<250	May cause digestive problems
13. Phosphates, mg/l	< 0.7	< 1.0	May interfere with coagulation
14. Nitrate, mg/l	< 50	< 50	May cause methamoplobinemea
15. Fluoride, mg/l	< 1.0	< 1.5	Higher value shall cause fluorosis and lower value shall carries.
16. Surfactants, mg/l	< 0.2	< 0.2	May impair treatability and cause foaming.

Additional Parameters for Periodic Monitoring (Seasonal – Only to be done when there are known natural or anthropogenic sources in the upstream catchment region likely or apprehended to contribute or other well founded apprehensions)

Parameters	Desirable	Acceptable	Note
Dissolved Iron mg/l	< 0.3	< 0.5	Affect taste and cause stains
Copper, mg/l	—	< 1.0	May cause live damage
Zinc, mg/l	—	< 5.0	Cause bitter stringent taste
Arsenic, mg/l	< 0.01	< 0.05	Cause hyperkeratosis & skin cancer
Cadmium, mg/l	< 0.001	< 0.005	Toxic
Total Chromium, mg/l	< 0.05	< 0.05	Toxic
Lead, mg/l	< 0.05	< 0.05	Physiological abnormality
Selenium, mg/l	< 0.01	< 0.01	Toxic symptoms similar to arsenic
Mercury, mg/l	< 0.005	<0.0005	Carcinogenic and poisonous
Phenols, mg/l Cyanides, mg/l	< 0.001 < 0.05	< 0.001 < 0.05	Toxic and cause taste and odour problem Physiological abnormality
PAH, mg/l	< 0.0002	< 0.0002	Carcinogenic
Total Pesticides, mg/l	< 0.001	< 0.0025	Trend to bioaccumulates & carcinogenic

(Source: Ecological Impact Assessment Series: EIAS/03/2002-03 Published by CPCB)

Use based classification of surface waters in India

Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	1. Total Coliforms OrganismMPN/100ml shall be 50 or less 2. pH between 6.5 and 8.5 3. Dissolved Oxygen 6mg/l or more 4. Biochemical Oxygen Demand 5 days 20oC 2mg/l or less
Outdoor bathing (Organized)	B	1. Total Coliforms Organism MPN/100ml shall be 500 or less 2. pH between 6.5 and 8.5 3. Dissolved Oxygen 5mg/l or more 4. Biochemical Oxygen Demand 5 days 20oC 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	1. Total Coliforms Organism MPN/100ml shall be 5000 or less 2. pH between 6 to 9 3. Dissolved Oxygen 4mg/l or more 4. Biochemical Oxygen Demand 5 days 20oC 3mg/l or less
Propagation of Wild life and Fisheries	D	1. pH between 6.5 to 8.5 2. Dissolved Oxygen 4mg/l or more 3. Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	1. pH between 6.0 to 8.5 2. Electrical Conductivity at 25oC micro mhos/cm Max.2250 3. Sodium absorption Ratio Max. 26 4. Boron Max. 2mg/l

(Source: Guidelines for Water Quality Management –CPCB 2008)

Annexure 5
National Ambient Air Quality Standards

S. No	Pollutants	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Areas	Ecologically Sensitive Area (notified by Central Government)	Methods of Measurement
1.	2.	3.	4.	5.	6.
1	Sulphur Dioxide (SO_2), $\mu g/m^3$	Annual*	50	20	Improved west & Gaeke
		24 hours**	80	80	Ultraviolet fluorescence
2	Nitrogen Dioxide (NO_x), $\mu g/m^3$	Annual*	40	30	- Modified Jacob &
		24 hours**	80	80	Hochhieser (Na-Arsenite) - Chemiluminescence
3	Particulate Matter (size less than 10 ìm) or PM_{10}, $\mu g/m^3$	Annual*	60	60	- Gravimetric
		24 hours**	100	100	- TOEM - Beta Attenuation
4	Particulate Matter or (size less than 2.5 ìm) $PM_{2.5}$, $\mu g/m^3$	Annual*	40	40	- Gravimetric
		24 hours**	60	60	- TOEM - Beta Attenuation
5	Ozone (O_3), ìg/m^3	8 hours**	100	100	- UV Photometric
		1 hour**	180	180	- Chemiluminescence - Chemical method
6	Lead (Pb), $\mu g/m^3$	Annual*	0.50	0.50	- AAS/ICP method after
		24 hours**	1.0	1.0 filter	sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon
7	Carbon Monoxide (CO), mg/m^3	8 hours**	02	02	- Non-Dispersive Infra
		1 hour**	04	04	Red (NDIR) Spectroscopy
8	Ammonia (NH_3), ìg/m^3-	Annual*	100	100	- Chemiluminescence
		24 hours**	400	400	Indophenol blue method
9	Benzene (C_6H_6), ìg/m^3 GC analysis	Annual*	05	05 Desorption followed by	- Gas Chromatography based continuous analyzer - Adsorption and
10	Benzo(O)Pyrene Particulate phae only, ng/m^3	Annual*	01	01	- solvent extraction (BaP) – followed by HPLC/GC analysis

11	Arsenic (As), ng/m^3	Annual*	06	06	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni), ng/m^3	Annual*	20	20	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Note:

Whenever and wherever monitoring takes place for two corrective days exceeds and the limit as specified above for the respective category, it shall be considered adequate reason to institute regular/continuous monitoring for further investigations.

(Source: CPCB notification Dated 18th November 2009)

Annexure 6

Noise Ambient Air Quality Standards

Area code	Category of area	Limits in db (A) Leq	
		Day time	Night time
A	Industrial area	75	70
B	Commercial area	65	55
C	Residential area	55	45
D	Silence zone	50	40

Note:

1. Day time shall mean 6.00 a.m. to 10.00 p.m.
2. Night time shall mean 10.00 p.m. to 6.00 a.m.
3. Silence zone is an area comprising not less than 100 meters around hospitals, educational institutions, courts, religious places or any other area, which is declared as such by the competent authority.
4. Mixed categories of areas may be declared as one of the four above-mentioned categories by the competent authority.

* dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

A "decibel" is a unit in which noise is measured.

"A", in dB(A) L_{eq}, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

L_{eq}: It is an energy mean of the noise level over a specified period.

(Source: Noise pollution (Regulation and control) Rules, 2000)

Annexure 7
List of Critically Polluted Industrial Cluster/ area as Identified by CPCB

S. No.	Critically Polluted Industrial Area and CEPI	Industrial Clusters/Potential Impact Zones
1	Ankleshwar (Gujarat) *CEPI-88.50* (*Ac_Wc_Lc*)	GIDC Ankleshwar and GIDC, Panoli
2	Vapi (Gujarat) *CEPI-88.09 (Ac_Wc_Lc)*	GIDC Vapi
3	Ghaziabad (Uttar Pardesh) *CEPI-87.37* (*Ac_Wc_Lc*)	**Sub-cluster A** • Mohan nagar Industrial area • Rajinder nagar Industrial area • Sahibabad Industrial area **Sub-cluster B** • Pandav nagar Industrial area • Kavi nagar Industrial area • Bulandshahar Road Industrial area • Amrit nagar • Aryanagar Industrial area **Sub-cluster C** • Merrut road Industrial area **Sub-cluster D** • Loni Industrial area • Loni Road Industrial area • Roop Nagar Industrial area **Sub-cluster E** • Hapur Road Industrial area • Dasna • Phikua **Sub-cluster F** (other scattered Industrial areas) • South side of GT road • Kavi Nagar • Tronica city • Anand Nagar • Jindal Nagar • Prakash Nagar • Rural Industrial estate
4	Chandrapur (Maharashtra) *CEPI-83.88* (*Ac_Wc_Lc*)	Chandrapur (MIDC Chandrapur, Tadali, Ghuggus, Ballapur)
5	Korba (Chhatisgarh) *CEPI-83.00* (*Ac_Ws_Lc*)	a) Industrial areas and their townships of NTPC, BALCO, CSEB (East) & CSEB (West) b) Korba town
6	Bhiwadi (Rajassthan) *CEPI-82.91* (*Ac_Wc_Ls*)	a) RIICO Industrial areas Phase I to IV b) Bhiwadi town c) Other surrounding industrial areas: Chopanki, Rampura Mundana, Khuskhera Phase I to III.
7	Angul Talcher (Orissa) *CEPI-82.09* (*Ac_Wc_Lc*)	a) MCL Coal Mining Area, Angul – Talcher region b) Industrial Area (60 km x 45 km) Following blocks of Angul District: - Kohina block - Talcher block - Angul block - Chhendipada block - Banarpal block And Odapada block of Dhenkamal District
8	Vellore (North Arcot) (Tamilnadu) *CEPI-81.79 (Ac_Wc_Lc)*	Ranipet, SIPCOST Industrial Complex
9	Singurauli (Uttar Pradesh) *CEPI-81.73* (*Ac_Wc_Ls*)	Sonebhadra (UP) • Dala-Tola • Obra • Renukoot • Anpara • Renusagar • Kakri • Dudhichuwa • Bina • Khadia • Shakti Nagar • Rihand Nagar • Bijpur Sigrauli (Madhya Pradesh) Vindhyachal Nagar and Jayant, Nigahi, Dudhichua, Amlohri & Jhingurdah townships

S. No.	Critically Polluted Industrial Area and CEPI	Industrial Clusters/Potential Impact Zones
10	Ludhiana (Punjab) *CEPI-81.66* (*Ac_Wc_Ls*)	Ludhiana Muncipal limits covering industrial clusters: • Focal Point Along with NH_I_Tota Eight Phase • Industrial Area-B-From Sherpur chowk to Gill road & Gill road to Miller Kotla road (left Side of Road) • Mixed Industrail Area – Right side of Gill road • Industrial area – C (near Jugiana Village) • Industrial Area A & Extension: Area between old GT Road and Ludhiana by pass road • Industrial Estate : Near Dholwal chowk • Mixes Industrial Area (MIA) Miller gunj • MIA-By pass road • Bahdur Industrial Area • Tejpur industrial Complex.
11	Nazafgarh drain basin, Delhi *CEPI-79.54* (*As_Wc_Lc*)	Industrial areas : Anand Parvat, Naraina, Okhla and Wazirpur
12	NOIDA (Uttar Pradesh) *CEPI-78.90* (*Ac_Wc_Lc*)	Territorial jurisdiction of : • Noida Phase - 1 • Noida Phase - 2 • Noida Phase – 3 • Surajpur Industrial Area • Greater Noida Industsrial Area • Village-Chhaparaula
13	Dhanbad (Jharkhand) *CEPI-78.63* (*Ac_Ws_Lc*)	Four blocks of Dhanbad district: • Sadar (Dhanbad Municipality) • Jharia (Jharia Municipality, Sindri Industrial Area) • Govindpur (Govindpur Industrial Estate) • Nirsa
14	Dombivalli (Maharashtra) *CEPI-78.41*(*Ac_Wc_Ls*)	MIDC Phase-I, Phase-II
15	Kanpur (UttarPradesh) *CEPI-78.09* (*Ac_Wc_Ls*)	• Industrial areas: • Dada Nagar • Panki • Fazalganj • Vijay Nagar • Jajmau
16	Cuddalore (Tamilnadu) *CEPI-77.45* (*As_Wc_Lc*)	SIPCOT Industrial Complex, Phase I & II
17	Aurangabad (Maharashtra) *CEPI-77.44* (*Ac_Wc_Ls*)	MIDC Chikhalthana, midc Waluj, MIDC Shendra, and Paithan Road industrial area
18	Faridabad (Haryana) *CEPI-77.07* (*Ac_Ws_Lc*)	• Sector 27 - A, B, C, D • DLF Phase – 1, Sector 31, 32 • DLF Phase – 2, Sector 35 • Sector 4, 6, 24, 25, 27, 31, 59 • Industrial area Hatin • Industrial Model town Ship
19	Agra (Uttar Pradesh) *CEPI-76.48* (*As_Wc_Ls*)	Nunihai Industraial Estate, Rambag Nagar, UPSIDC Industrial Area, and Runukata Industrial Area
20	Manali (Tamilnadu) *CEPI-76.32* (*Ac_Ws_Ls*)	Manali Industrial Area
21 22	Haldia (West Bengal) *CEPI-75.43* (*As_Wc_Ls*) Ahmedabad (Gujarat) *CEPI-75.28* (*Ac_Ws_Ls*)	5 km wide Strip (17.4 x 5.0 km) of industrial area on the southern side of the confluence point of Rivers Hugli and Rupnarayan, covering Haldia Municipa Area & Sutahata Block-I and II • GIDC Odhav • GIDC Naroda
23	Jodhpur (Rajasthan) *CEPI-75.19 (As_Wc_Ls*)	• Industrial areas including Basni Areas (Phase-I & II), Industrial Estate, Light & Heavy industrial areas, industrial areas behind new Power House, Mandore, Bornada, Sangariya and Village Tanwda & Salawas. • Jodhpur city
24	Greater Coach (Kerala) *CEPI-75.08* (*As_Wc_Ls*)	Eloor-Edayar Industrail Belt, Ambala Mogal Industrial areas
25	Mandi Gobind Garh (Punjab) *CEPI-75.08* (*Ac_Ws_Lc*)	Mandi Govindgarh municipal limit and Khanna area
26	Howrah (West Bengal) *CEPI-74.84* (*As_Ws_Lc*)	a) Liluah-Bamangachhi Region, Howrah b) Jalah Industrial Complex-1, Howrah
27	Vatva (Gujarat) *CEPI-74.77* (*Ac_Wc_Ls*)	GIDC Vatva, Narol Industrial Area (Villages Piplaj, Shahwadi, Narol)

S. No.	Critically Polluted Industrial Area and CEPI	Industrial Clusters/Potential Impact Zones
28	Ib Valley (Orissa) *CEPI-74.00* (*Ac_Ws_Ls*)	Ib Valley of Jharsuguda (Industrial and Mining area)
29	Varansi-Mirzapur (Uttar Pradesh) *CEPI-73.79* (*As_Wc_Ls*)	• Industrial Estate, Mirzapur • Chunar • Industrial Estate, Chandpur Varanasi • UPSIC, Industrial Estate, Phoolpur • Industrial Area, Ramnagar, Chandaull
30	Navi Mumbai (Maharashtra) *CEPI-73.77* (*Ac_Ws_Ls*)	TTC Industrial Area, MIDC, Navi Mumbai (including Blocks-D, C, EL, A, R, General, Kalva)
31	Pali (Rajasthan) *CEPI-73.73* (*As_Wc_Ls*)	a) Existing industrial areas: Mandia Road, Puniyata Road, Sumerpur b) Pali town
32	Mangalore (Karnataka) *CEPI-73.68* (*Ac_Ws_Ls*)	Baikampady Industrial Area
33	Jharsuguda (Orissa) *CEPI-73.34* (*Ac_Ws_Ls*)	Ib Valley of Jharsuguda (Industrial and Mining area)
34	Coimbatore (Tamil Nadu) *CEPI-72.38* (*Ac_Ws_Ln*)	SIDCO, Kurichi Industrial Clusters
35	Bhadravati (Karnataka) *CEPI-72.33* (*Ac_Ws_Ln*)	KSSIDC Industrial Area Mysore Paper Mill & VISL Township Complex
36	Tarapur (Maharashtra) *CEPI-72.01* (*Ac_Ws_Ls*)	MIDC Tarapur
37	Panipat (Haryana) *CEPI-71.91* (*As_Ws_sc*)	Panipat Municipal limit and its industrial clusters
38	Indore (Madhya Pradesh) *CEPI-71.26* (*As_Ws_Ls*)	Following 09 industrial areas: • Sanwer Road • Shivaji Nagar • Pologround • Laxmibai Nagar • Scheme No. 71 • Naviakha, • Pipliya • Palda • Rau • Indore city • Other surrounding industrial areas : Manglia, Rajoda, Barlal, Asrawad, Tejpur Gadwadi
39	Bhavnagar (Gujarat) *CEPI-70.99* (*As_Ws_Ls*)	GIDC Chitra, Bhavnagar
40	Vishakhapatnam (Andhra Pradesh) *CEPI-70.82* (*As_Ws_Ls*)	Bowl area (the area between Yarada hill range in the south to Simhachalam hill range in the north and sea on the east and the present NH-5 in the West direcdtion)
41	Junagarh (Gujarat) *CEPI-70.82* (*As_Ws_Ls*)	Industrial Areas: • Sabalpur • Jay Bhavani • Jay Bhuvneshwari • GIDC Junagarh (I&II)
42	Asansole (West Bengal) *CEPI-70.20* (*As_Ws_Ls*)	Burnpur area surrounding IISCO
43	Patancheru- -Bollaram (Andhra Pradesh) *CEPI-70.07* (*As_Ws_Ls*)	Industrial Area: • Patancheru • Bollaram

Note: Names of identified industrial clusters/ potential impact zones are approximate location based on rapid survey and assessment and may alter partially subject to the detailed field study and monitoring. Detailed mapping will be made available showing spatial boundaries of the identified industrial clusters including zone of influence/buffer zone, after in depth field study.

Aggregated Comprehensive Environmental Pollution Index (CEPI) scores of 70 and above are considered as critically polluted industrial clusters/ areas.

Source: Ecological Impact Assessment Series: EIAS/5/2009-10
Details of Critically Polluted Industrial Areas and Clusters/ Potential Impact Zone in terms of the Office Memorandum no. J-11013/5/2010-IA.II(I) dated 13.1.2010

Annexure 8

Socio-Economic Impact

Sl.	Socio-Economic Issues	Impact Due to Mining
1.	Human Habitations	a. Habitation(s) in core zone (Displacement) b. Habitation(s) in buffer Zone
2.	Pollution	a. Air Pollution b. Water Pollution c. Leachate d. Land Degradation
3.	Livelihood	Higher the percentage of landless people, higher impact on livelihood
4.	Economic Loss	Calculated on the basis of existing landuse pattern with marks. • Double Crop Agricultural land – 01 • Single Crop – 2.5 • Forest Land – 0 • Waste Land for grazing – 5 • Non Productive Waste land – 10 Calculation Percentage double crop x 0 + percentage of single crop x 2.5 + percentage of productive waste land x 5 + percentage of unproductive wasteland x 10/100 Lower the score, higher will be economic impact
4.	Infrastructure	Better communication, health care, education facilities

Annexure 9

Guidance for Assessment Relevance and Reliability of Analytical Methods and Framework used for Impact Prediction: Risk Assessment

	Relevance	
Name	**Application**	**Remarks**
EFFECT WHAZAN	• Consequence Analysis for Visualisation of accidental chemical release scenarios & its consequence • Consequence Analysis for Visualisation of accidental chemical release scenarios & its consequence	Heat load, pressure wave & toxic release exposure neutral gas dispersion
HEGADIS	• Consequence Analysis for Visualisation of accidental chemical release scenarios & its consequence	Dense gas dispersion
HAZOP and Fault Tree Assessment	• For estimating top event probability	Failure frequency data is required
Pathway reliability and protective system hazard analysis	• For estimating reliability of equipment and protective systems	Markov models
Vulnerability Exposure models	• Estimation of population exposure	Uses probit equation for population exposure
F-X and F-N curves	• Individual / Societal risks	Graphical Representation

Source: http://envfor.nic.in/dimensions/iass/eia.annexure10.html EIA manual, MoEF- GOI, 2001

QUESTIONNAIRE

QUESTIONNAIRE FOR ENVIRONMENTAL APPRAISAL FOR MINERAL BENEFICIATION PROJECTS

Note 1	: All information must be given in the form of Annexures and should be properly numbered and form part of the reply to this proforma.
Note 2	: Please enter v in appropriate box where answer is Yes / No
Note 3	: No abbreviation must be used. Not available or Not applicable should be clearly mentioned.

1. General Information

1.1 Name of the Project :

a. Name of the authorized signatory :

b. Mailing Address :

E-mail :

Telephone :

Fax Number :

c. Does the project related to new project / expansion project / modernization project :

d. If existing / expansion / modernization project :

1.2 Location of Mine (s)

Village(s)	Tehsil	District	State

1.3 Site Information

(i) Geographical Location

• Latitude	
• Longitude	
• Survey of India Topo sheet number	
• Elevation above Mean Sea Level	
• Total mining lease area (in ha.)	

(ii) Dominant nature of terrain

• Flat	Yes		No	
• Undulated	Yes		No	
• Hilly	Yes		No	

1.3 Current land use of the proposed project site (in ha.)

a. Built-up land
b. Agricultural land
c. Forest
d. Mangroves
e. Wastelands
f. Water bodies
g. Others
h. Total

1.4 Environmental sensitivity details within 10 km from the boundary of the project for applicability of "**General Condition (GC)"** as per EIA notification dated 14.9.2006.

S.No	Item	Name	Aerial Disance (in Km)
1	Protected areas notified under the wild life (Protection) Act, 1972		
2	Critically polluted areas as notified by the Central Pollution Control Board from time to time		
3	Notified Eco-sensitive areas		
4	Inter-state boundaries and international boundaries		

1.5 Environmental sensitivity areas as mentioned at column 9(III) of EIA Notification 2006

Areas	Name / Identity	Aerial distance (within 15 km) Proposed project location boundary
Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value		
Areas which are important or sensitive for ecological reasons – Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests		
Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration		
Inland, coastal, marine or underground waters State, National boundaries Routes or facilities used by the public for access to recreation or other tourist,		

pilgrim areas Defense installations		
Densely populated for built-up area Areas occupied by sensitive man-made land uses *(hospitals, schools, places of worship, community facilities)*		
Areas containing important, high quality or scarce resources *(ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)*		
Areas already subjected to pollution or environmental damage *(those where existing legal environmental standards are exceeded)*		
Areas susceptible to natural hazard which could cause the project environmental problems *(earthquakes, subsidence, land slides, erosion, flooding or extreme or adverse climatic conditions)*		

Description of the flora / vegetation in the project area

Description of fauna (non-domesticated) in the project area

1.6 Baseline Data

Meteorological data

Ambient air quality data

Water quality data

Biological data

2. Land usage of the Mining Lease Area (in ha.)

(a)	Agricultural	
(b)	Forest	
(c)	Waste land	
(d)	Grazing	
(e)	Surface water bodies	
(f)	Others (Specify)	
	Total	

3. Indicate the Seismic Zone in which ML area falls. In case of Zone IV & V, details of Earth Quakes in last 10 years.

(a) Severity (Richter Scale)

(b) Impact i.e. Damage to

• Life	Yes		No	
• Property	Yes		No	
• Existing mine	Yes		No	

4. Break-up of Mining Lease Area (in ha.) as per Approved Conceptual Plan :

Purpose	Mining Lease Area				Total	Area acquired				Area to be acquired			
	Government		Private			Government		Private		Government		Private	
	Forest	Others	Agri.	Others		Forest	Others	Agri.	Others	Forest	Others	Agri.	Others
1. Area to be excavate													
2. Storage for top soil													
3. Overburden / Dumps													
4. Mineral storage													
5. Infrastru cture (Workshop, Admini strative Building)													
6. Roads													
7. Railways													
8. Green Belt													
9. Tailings pond													
10. Effluent treatment plant													
11. Coal handling plant / mineral separation plant													
12. Township area													
13. Other (Specify)													
TOTAL													

5. Details of Ancillary Operations for Mineral Processing

(a) Existing

(a) Additional

6. Surface Drainage Pattern at Mine Site

(a) Whether the pre-mining surface drainage plan submitted? Yes ☐ No ☐

(b) Do you propose any modification / diversion in the existing natural drainage pattern at any stage? If yes, when. Provide location map indicating contours, dimensions of water body to be diverted, direction of flow of water and proposed route / changes, if any i.e. realignment of river / nallah / any other water body falling within core zone and its impact. Yes ☐ No ☐

7. Embankment and / or Weir Construction

(a) Do you propose, at any stage, construction of

(i) Embankment for protection against flood? Yes ☐ No ☐

(ii) Weir for water storage for the mine? Yes ☐ No ☐

(b) If so, provide details thereof.

(a) Impact of embankment on HFL and settlement around.

(d) Impact of weir on down stream users of water.

8. Vehicular Traffic Density (outside the ML area)

		Type of vehicles	No. of vehicles per day
(a)	Existing		
(b)	After the proposed activity		

(c) Whether the existing road network is adequate? Yes ☐ No ☐

If no, provide details of alternative proposal?

9. Loading, Transportation and Unloading of Mineral and Waste Rocks on Surface:

(a) Manual Yes ☐ No ☐

(b) Tubs, mine cars, etc. Yes ☐ No ☐

(c) Scraper, shovels, dumpers / trucks. Yes ☐ No ☐

(d) Conveyors (belt, chain, etc.) Yes ☐ No ☐

(e) Others (specify). ☐

10. Mineral(s) Transportation Outside the ML Area

		Qty. (in TPD)	Percentage (%)	Length (in km)
(a)	Road			
(b)	Rail			
(c)	Conveyors			
(d)	Rope way			
(e)	Water ways			
(f)	Pipeline			
(g)	Others (Specify)			

11. Waste Water Management

Mine

(a) Daily average discharge (m^3/day) from different sources

(i) Mine water discharge during

- Lean period
- Monsoon period

(ii) Workshop

(iii) Domestic (mine site)

(iv) Beneficiation / Washeries

(v) Coal Handling Plant

(vi) Tailings pond

(vii) Others (Specify)

Total

(b) Waste water treatment plant; flow sheet for treatment process attached. Yes ☐ No ☐

(c) Quantity of water recycled / reused / to be recycled in

(i) Percentage

(i) m^3 / day

(d) Point of final discharge

	Final Point	Quantity discharged (in m^3/day)
1.	Surface (i) Agricultural land (ii) Waste land (iii) Forest land (iv) Green belt	

2.	River / nallah	
3.	Lake	
4.	Sea	
5.	Others (specify)	
	Total	

12. Solid Waste

Tailing Dam activity details

13. Human Settlement

	Core Zone	Buffer Zone
Population*		
No. of villages		
Number of households village-wise		

[* As per 2001 census record or actual survey]

14. Environmental Management Plan

14.1 Capital cost of the project (as proposed to approved by the funding agency)

Rs. Lakhs

14.2 Cost of environmental protection measures

S.No		Capital cost		Annual recurring cost	
		Existing	Proposed	Existing	Proposed
1	Pollution control (provide break-up separately)				
2	Pollution monitoring (provide break-up separately)				
3	Fire fighting & emergency handling				
4	Green Belt				
5	Training in the area of environment & safety				
6	Others (specify)				

15. Rehabilitation & Resettlement Plan including Vocational Training and Other Avenues of Employment

a. Population to be displaced

S.No	Name of village	Population		
		Land oustees only	Homestead oustees only	Land+Homestead Oustees

b. Rehabilitation Plan for oustees

c. Site where the people are proposed to be resettled

d. Compensation package

e. Agency / Authority responsible for their resettlement

16. Compliance with Environmental Safeguards (For existing Units)

a. Status of the compliance of conditions of Environmental clearance issued by MoEF, If any, enclosed — Yes ☐ No ☐

b. Status of the compliance of 'Consent to Operate' issued by SPCB, if any, enclosed — Yes ☐ No ☐

c. Latest 'environmental statement' enclosed — Yes ☐ No ☐

17. Public Hearing

a. Date of Advertisement

b. Newspapers in which the advertisement appeared

c. Date of Hearing

d. Panel present

e. List of public present

f. Summary of public hearing details

S.No	Summary / issues raised by the public	Response of project Proponents

g. Observations made by the public hearing panel

Date ..... Name and Signature of the Competent Officer / authority

E-mail:

Phone and Fax nos:

Given under the seal of organization on behalf of whom the applicant is signing

Note:

The project authorities are earnestly advised in their own interest to provide complete information on points, which they think are relevant to their proposal. Non-supply of required information may result in considerable delay in according environmental clearance.