TERMS OF REFERENCE FOR ENVIRONMENTAL IMPACT ASSESSMENT OF MINING PROJECT

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ACKNOWLEDGEMENT

Development of these Terms of Reference (ToRs) would not have been possible without the commitment of and contributions from different individuals and institutions. A special note of thanks must go to Centre for Science and Environment (CSE), India for the technical support and guidance provided for developing this important tool.

This tool has come at an opportune time, keeping in mind our government's directions with regard to a National Industrial Development Agenda. The Agenda entails establishment of development projects where their sustainability depends on the incorporation of environmental components and on ensuring that there are always mitigation measures to respond to associated environmental challenges. This Agenda would not be sustainable and possible if environmental issues are not considered in the process, which would primarily include a review of Environmental Impact Assessment (EIA) and Environmental Audit (EA) studies for proposed and existing projects.

I and my entire team at NEMC understand, acknowledge and appreciate the need for this tool, and feel privileged to have played a role in developing it. We also appreciate the efforts put in by members of the Tanzania Environmental Expert Association (TEEA) and representatives from other governing institutions for helping us prepare these ToRs.

The support from the Minister of State (Union and Environment) in the Vice President's Office, His Hon Dr Seleman Said Jafo (MP) has been key to the success of this initiative. NEMC is also grateful to the Deputy Minister, His Hon Khamis Hamza Khamis; the Permanent Secretary, Ms Mary N Maganga; and Deputy Permanent Secretaries Dr Switbert Z Mkama and Mr Abdallah Hassan Mitawi for the encouragement extended to us.

We also wish to thank everybody else who, in one way or another, participated and contributed in the development of these ToRs. The developed ToRs serve an important purpose for environmental experts as well as the team involved directly in the review process -- it is our hope that they will be appropriately used.

Thank you

Eng Dr Samuel G Mafwenga
Director General, NEMC

CONTENTS

ABBREVIATIONS

AMD	- Acid Mine Drainage
BAP	- Biodiversity Action Plan
CSR	- Corporate Social Responsibility
DM	- Demineralization
EIA	- Environmental Impact Assessment
ESMP	- Environmental and Social Management Plan
ETP	- Effluent Treatment Plant
FDM	- Fugitive Dust Model
HAPs	- Habitat Action Plans
IUCN	- International Union for Conservation of Nature
OB	- Overburden
NEMC	- National Environment Management Council
NOC	- No Objection Certificate
R&R	- Resettlement and Rehabilitation
SAPs	- Species Action Plans
STP	- Sewage Treatment Plant
ToR	- Terms of Reference

1. INTRODUCTION

In Mainland Tanzania, the Environmental Impact Assessment (EIA) process is a planning tool governed by The Environmental Management Act, 2004 which gives the National Environment Management Council (NEMC) the mandate to accept applications for environmental clearance, review environmental impact statement(s), recommend projects to the minister for issuance of Environmental Impact Assessment Certificate(s) and undertake monitoring to check compliance with the Environmental and Social Management Plan (ESMP).

Under The recently notified Subsidiary Regulation [*Environmental Management (Environmental Impact Assessment And Audit) (Amendment) Regulations, 2018*] published on 31st August 2018 the NEMC has categorized its projects into four Categories—type 'A', type 'B1' type 'B2' and Special Category.

The projects which fall in type 'A' require a mandatory EIA and such a project is likely to have significant adverse environmental impacts. An in-depth study is required to determine the scale, extent and significance of the impacts and identify appropriate mitigation measures. The projects which fall in type 'B1' require undergoing screening, to decide the requirement of EIA. The projects categorized under 'B2' are small scale projects where no EIA is required; an EIA certificate is issued upon submission of an Environmental and Social Management Plan (ESMP).

For Category A and B1 projects the proponent is required to submit a Terms of Reference (ToR) along with a scoping report to the NEMC and relevant ministries for scrutinizing and approving the Terms of reference for sufficiency of mitigation measures.

2. APPLICABILITY

The subsidiary regulation **The Environmental Management (Environmental Impact Assessment and Audit) (Amendment) Regulations, 2018** has categorized mining sector under 2 categories type 'A' (item number 16) and type 'B1' (item number 14) of first schedule of subsidiary Regulation, 2018. This Terms of Reference is applicable for projects as mentioned in Table below.

Item number of the First Schedule of 2018 Regulations	Categorization of project	Type of projects
ITEM NO. 16. EXTRACTIVE INDUSTRY	'A' (EIA is mandatory)	Mining (Large and medium scale mines). (Whose capital investment is more than US$100,000 or its equivalent in Tanzanian shillings)
ITEM NO. 14. EXTRACTIVE INDUSTRY	'B1' (Screening to decide requirement of EIA)	Mining (small scale mines). (Whose capital investment is less than US$100,000 or its equivalent in Tanzanian shillings)

Source: The Environmental Management (Environmental Impact Assessment and Audit) (Amendment) Regulations, 2018 and Mining Act, 2010

3. OBJECTIVE

The primary function of scoping also referred to as setting the Terms of Reference (ToR) of an EIA, is to establish the environmental priorities and to set the boundaries for the study. The objective of the ToR is to make the assessment process concise and focused, and avoid creating a voluminous or data deficient report. The ToR provides the benchmark for data collection and limits the possibility of inefficiency in the EIA process. It also acts as a benchmark to be used by the National Environment Management Council (NEMC) to decide whether the Environmental Impact Statement has been compiled after meeting all the requirements or not.

There are various tools that can be used for scoping, such as *questionnaire checklists, network method, comparison with other similar projects, matrix and ad-hoc methods, etc.* The selection of scoping tools largely depends on the size of the project and the existing environmental and social characteristics of the project area.

The ToR given below is a generic one and can be framed as per the project requirements. While framing the ToR, ground realities, background information of the study area (such as population in and around the project site), project-specific peculiarities, applicable laws, rules, guidelines and policies need to be considered to make the ToR relevant and precise. There may be a possibility that some parts of ToR are not applicable for a given project. A site visit is also recommended before framing the ToR; this enhances the scope of the EIA process and makes it more efficient.

4. TERMS OF REFERENCE (TOR) FOR A MINING PROJECT

The ToR should include the following conditions, details and components:

4.1 GENERAL INFORMATION

1. Executive summary of the project, which summarizes the project characteristics, environmental and social issues, and the proposed mitigation measures

2. Information about the project proponent and his / her experience with following details
   - o Name of the project
   - o Name of the applicant
   - o Present mailing address including telephone number, fax, and email (if any)
   - o Name of the environmental focal person (responsible environmental personnel)
   - o Telephone number of environmental focal person (responsible environmental personnel)

3. The justification for the project

4. Project financial statement, project benefits and the project activity schedule

5. Name of organization / consultant preparing the Environmental Impact Statement, qualifications and experience of experts involved in the Environmental Impact Statement and its preparation

6. List of all regulatory approvals and No Objection certificate (NOC) required for the project and the status of these approvals

7. A declaration from the consultant stating that the information disclosed in the Environmental Impact Statement is correct

4.2 ESSENTIAL MAPS FOR EIA OF A MINING PROJECT

1. A map specifying the location of the project

2. A study area map indicating features such as locations of human settlements, locations of other industries or other air and water polluting sources

3. A map indicating number of villages getting affected due to land acquisition, if applicable

4. A map specifying the land use patterns of the project site and study area

5. A map marking the sensitive zones in the study area, such as forests, defence installations, international border, protected area etc.

6. A contour map along with the site plan of the mine, showing the various proposed operations such as quarry area, overburden (OB) dumps and buildings such as mine offices,

workshops, stockyards and townships / colonies (if applicable).

7. A map clearly delineating the locations of various monitoring stations (ambient air, water, noise and soil)

8. The layout map of the mine showing the project site, storage of raw materials / products, stacks, wastewater treatment plant, administrative buildings, canteen, proposed green belt, transportation route, roads, parking spaces and infrastructure including all utilities, such as fuel-filling station, power supply, water supply etc.

9. Diagrammatic sketch and layout of the effluent treatment plant (ETP) and the sewage treatment plant (STP), if any

10. A map indicating the flood ability of the project site and study area, if applicable

11. A map indicating high tide and low tide, if applicable in case project is coming along a river or coastal belt

12. A layout map showing the solid and hazardous wastes disposal site, if applicable

13. A map showing the wastewater discharge points

Note: Depending upon the type, size and location sensitivity, a competent authority can decide the study area and recommend appropriate scale for Environmental Impact Assessment for an in depth study.

4.3 DESCRIPTION OF PROJECT SITE AND STUDY AREA

A. Information on existing land use pattern of the project area:

1. Describe the total land required for the project including land use pattern of acquired land and the study area (note: study area needs to be defined by the council, it may change from project to project)

2. Description on areas vulnerable to erosion or areas prone to landslides, wherever applicable

3. If forest land or agricultural lands are likely to be diverted, then provide the information listed in table given below. If grazing land is used for setting up a project, information on the cattle pressure on the land needs to be provided.

Table: Information required if forest or agricultural land is being diverted

Agricultural Land	**Total Area in hectares (ha)**	**Types of crops grown in a year**	**Number of crops grown in a year**	**Crop productivity (TSH./ ha)**
Forest Land	**Total area required (ha)**	**Type of forest**	**Actual area to be diverted (ha)**	**Types of activities on diverted forest land**

4. If land acquisition is involved, the report should give the extent of land to be acquired for a project along with name of affected people village-wise with the following information:
   a) Village-wise list of the affected persons and properties

b) The extent and nature of land and immovable property to be acquired including list of common and government properties, which are affected or likely to be affected
c) A list of persons likely to lose their employment or livelihood or likely to be alienated wholly or substantially from their main sources of trade, business or occupation due to land acquisition, if applicable
d) Socio-economic importance of the site e.g. recreational, any public beach, public access, any agricultural activity; fishing activity, etc.
e) Resettlement Action Plan, if applicable

5. Seismic characteristic of project area or proposed site close to volcanic area. If the site is falling in seismic zone, as per the seismic zoning map of Tanzania, the foundation design of a project must consider the seismic factor

6. Demonstrate the risk associated with the project based on geo-technical and hydrology of the project area

7. Catchment area characteristics of the study area, such as water recharge potential and drainage pattern

8. Identification of areas vulnerable to erosion in the core area and buffer area separately

9. Justification for the site selection, with explanatory notes

10. Details of the topography of the study area

11. Details of water bodies such as lakes, streams, natural drains and rivers in the study area and their distances from the project site

12. The flood plain boundary and flood ability of the area: The project proponents should prepare flood hazard zonation mapping (scale 1:5000 to 1:10,000) scale indicating the peak and lean river discharge as well as flood occurrence frequency, if applicable

B. Baseline data

1. Surface and surface water characteristics in core and buffer areas

2. Characteristics of topsoil and its thickness

3. Characteristics of overburden with respect to pollution potential

4. Baseline data on ambient air quality (PM10, PM2.5, SOx, NOx) and generation of site-specific information on existing meteorological conditions such as temperature, humidity, rainfall, and wind speed, wind direction, wherever it is applicable

5. Generation of ambient noise data by considering noise-prone areas and sensitive receptors

6. The Environmental Impact Statement should provide an overview of the existing hydro-geological setting of the study area, describing the aquifers, hydraulic characteristics, groundwater quality and the interaction of surface water, if applicable

7. Information on number and distances of water-bodies such as rivers, lakes, streams, springs, wells, etc. present in core and buffer zones

8. Existing socio-economic status of the population (demographic characteristics and local amenities, livelihood patterns, income levels, literacy and the presence of indigenous and vulnerable groups) in the study area

9. Data on the health status of local communities and common diseases prevailing in the area, if applicable

C. Information on sensitive areas at project site and in the study area, if any:

1. Distance of the project from key installations such as airports, defence installations, highways, wetlands, national parks and sanctuaries, ecologically sensitive biological corridors, archaeological sites, critical watershed areas or any other important installations and sites of religious importance and others from the mine lease area

2. Discuss, if the project site or study area supports any unique habitats or any endemic, threatened or declining species or species of high economic and / or ecological value

3. List of flora and fauna in the project area, duly authenticated by a government approved organization or by an independent body such as a university. The findings should be annexed with the report

4. Discuss if the project site or adjoining areas (such as the buffer zone) support any unique habitat, endemic, threatened or declining species or species of high economic / ecological value

5. Presence of any wildlife corridors or nesting, breeding, foraging site for resident and transient bird species or bat or animals, locations favoured by migratory birds either in project area or in immediate neighbourhood or in the buffer zone, if any

6. If the site preparation requires cutting trees, then provide the following information:
   a. How many trees are proposed to be cut down?
   b. Plant species and age of trees
   c. Are they protected / endangered / endemic species? If yes, provide details

D. Identification of the presence of vulnerable, endangered and critically endangered plant and animal species

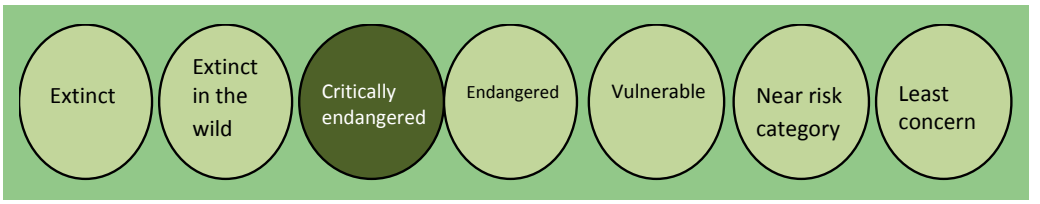
While preparing a biodiversity conservation plan, the focus should be on safeguarding biodiversity and the ecosystem as far as practicable. As a general rule, if impacts are irreversible and cannot be compensated by any means, it is better to avoid the site. If impacts are manageable, then minimize the impacts by creating a Biodiversity Action Plan (BAP). Similarly, Conservation Plans incorporate Species Action Plans (SAPs) where the mitigation is targeted for the protection of a specific species and Habitat Action Plans (HAPs), which aim at protection of habitats of rare, critically endangered, endangered and vulnerable species. Some key components that must be provided for reviewing the conservation plan include financial requirements for conservation, responsible authorities and monitoring schedule.

One of the essential components of biodiversity assessment is the identification of the presence of vulnerable, endangered and critically endangered plant and animal species including avian species. The assessment takes place at the project site or in adjoining areas, if either or both are categorized as highest risk category (see Figure: Risk category) as assigned by the International

Union for Conservation of Nature (IUCN). There are five quantitative criteria normally used to determine whether a taxon is threatened. They are:

- Populations have declined or will decrease, by greater than 80% over the last 10 years or three generations
- A restricted geographical range
- Small population size of less than 250 individuals and continue to decline at 25% in 3 years or one generation
- Very small or restricted population of less than 50 mature individuals. High probability of extinction in the wild

Figure – Risk category



Source – Zoological Survey of India, Ministry of Environment and Forests, Government of India, 2011

While doing biodiversity assessment—the option for 'site alternative' and 'Preventive Approach' is the best method to reduce the impact on biodiversity. There are some methods, which can be very useful to assess the likely impact of project at the conceptualization stage.

Approach to Assess the Potential Impact at the Initial Stage

Issues	Significance and method of preliminary assessment
Proximity to park/sanctuary/ forest	Closeness to the project site and high abundance of fauna means high impact is anticipated and thus project proponent must do preliminary site investigation to ensure significance of impact
Encroachment of park/ sanctuary/forest	Decision can be either 'Yes' or 'No' based on species richness, species-specific impact, threat to inhabitants and economic value offered by the forest
Location of the project affects the foraging/ breeding / nesting/ migration routes of animals	Anticipated impact would be high and preliminary flora and fauna assessment is a prerequisite for site feasibility and thus decision can be taken either 'YES' or 'NO' Method—Interaction with forest officials, local villagers and reconnaissance survey
Presence of vulnerable, endangered and critically endangered plant and animals species including avian species at the project site or in adjoining areas	Anticipated impact would be high and preliminarily assessment is a prerequisite for site feasibility and thus decision can be either 'Yes' or 'No' Note: Local stakeholders and the forest officials can provide valuable information on species' inventory and provide sound information on environmental and economic importance of species
Proposed project is close to waterholes or to wetlands or / and fish breeding grounds	Set back distance should be maintained to reduce impact due to human interference

Issues	Significance and method of preliminary assessment
Proposed project activities would increase siltation that would affect surrounding biodiversity	Method—By studying the rainfall, site elevation and flow pattern If runoff originates from the site following the direction of biodiversity area, then the impact would be high
Does the project likely affect the fauna of an area, which has economic/ medicinal value?	Detailed assessment of flora by a taxonomist is the best method. Moreover, local stakeholder input is vital in identifying the medicinal value of plant species

Source – Centre for Science and Environment, 2013

Guiding parameters for effective assessment

There are some key guiding parameters, which need to be carefully examined while dealing with a sensitive project or when the project is launched in a park / sanctuary / forest. These parameters are as follows:

- In case of a very sensitive area, biodiversity assessment must be comprehensive
- Option for a 'site alternative' in case of areas which have a unique habitat or are populated with endemic, threatened or declining species, or species of high economic and cultural value to society or an ecosystem
- Type of forest and area of forestland diverted for non-forest use
- Biodiversity should be assessed on the basis of parameters mentioned below:
  - **Composition:** What biological units are present and how abundant are they?
  - **Structure (or pattern):** How biological units are organized in time and space?
  - **Function:** The role different biological units play in maintaining natural processes and dynamics
  - Number of trees to be cut down with age and name (both scientific and local)

- Details of flora, fauna and avian fauna present in the area, their abundance and the season in which abundance is high. Also, for fauna assessment the following details should be furnished:
  - Types of animals, birds and bird activities across the project and surrounding areas
  - Identify animal species listed as threatened or migratory or any specific species coming in a specific season
  - Record the location and extent of animals and bird habitat with reference to significance to conservation
  - Identification of resident and transient animal and bird species
  - Animals and birds utilization status—determine all the species present across different seasons and how they utilize the site

E. In case the site is in close proximity to the coastline then the following need to be considered

1. Wherever applicable, description of the shore types (sandy, muddy, rocky, cliffs, mixed, calcareous lime stone shore), length of the shoreline, beach front and their characteristics, landform, topography, elevation, magnitude of slope, slope stability, erosion, escarpments and landslide risks supplemented by interval contour map;

2. Wherever applicable, description of the hydrographic conditions to include wave regime (patterns, height, frequency and direction), distance from project site, currents direction and speed, tidal water levels including the probability of extreme conditions and potential for waves and surges;

3. Vulnerability of the site to natural hazard, sea surges or climate change impacts like sea level rise, inundation or flooding, if applicable

4.4 THE MINING PROCESS AND RESOURCE CONSUMPTION

A. Information on the geological setting, mineral resource and mining plan

1. Mineral reserves (indicated, inferred, proven) in the mine lease area

2. Characteristics of the mineral deposit (physical and chemical characterization)

3. Geological characteristics of the mining area. The project should undertake detailed geological investigation and highlight the technical and environmental issues arising from this investigation

4. Details of the mine excavation plan

5. Details including the working depth, final working depth, and mineral recovery potential and progressive stage-wise working scheme until the end of mine life

6. Details of mineral production schedule

7. Details of waste generation (overburden, topsoil), as per the calendar plan as well as during the entire life of the mine. Overburden dump heights and terracing should be based on slope stability studies. The Environmental Impact Statement should discuss the dumps section (in both longitudinal as well as cross section) with relation to the adjacent area

8. Provide a schedule for each phase of construction and operation for the entire project and ancillary facilities. Include the environmental issues associated with each ancillary activity, wherever possible:
   a. Mobilization
   b. Land clearing
   c. Construction of road
   d. Blasting, if applicable
   e. Borrow and spoil disposal
   f. Excavation and sub-grade preparation
   g. Foundation preparation
   h. Concrete work
   i. Construction and installation of each project facility
   j. Stabilization of disturbed areas

B. Information on technologies and resource requirement

1. Description on type of mining, technology to be adopted, including details of equipments to be used and their potential impacts. The project should also examine the possibility of use of other technologies, which are environmental friendly

2. The Environmental Impact Statement should justify the selection of the mining technology and mining method with reference to mine safety, productivity and environment

3. Details on method of mining (manual, semi-mechanized, mechanized) and mode of transportation (dumper, conveyer, ropeways, etc.)

4. If a Demineralization (DM) plant is used, then details of quantity of DM water produced should be provided, chemical requirement, its handling and management, quantity and characteristics of DM plant wastewater and the treatment method for the same, if applicable

5. List of hazardous chemicals, toxic or inflammable substances (including carcinogenic materials) to be used in the process, their quantities and storage methods. The material safety data sheet of each individual hazardous chemical / solvent should be annexed with Environmental Impact Statement. Justification for use of any known carcinogenic or toxic chemicals / solvents in the process. If substitution / alternatives are not possible, then the detailed mitigation plan to reduce exposure risks should be provided

6. Description of utilities and services, their capacities, raw material requirement and pollution potential

7. Details of water balance: This will include sourcing of water, quantities sourced, daily water consumption in kilolitres per day

Table: Water requirement (m^3/day)

Purpose	Average demand	Peak demand
A. MINE SITE 1. Mine operation 2. Land reclamation 3. Dust suppression 4. Drinking 5. Green Belt 6. Fire Service 7. Community supply 8. Others (specify) **B. TOWNSHIP (if applicable)** 1. Green Belt 2. Domestic 3. Other (specify)		
TOTAL		

8. Details of the workforce (administrative, production and environment and safety) to be employed in the project and the factory operating hours

Table: Workers employed by the project

	Numbers	Nationality
Project construction period		
Project operation stage		

9. Provide following details
   a) the quantity of explosives that the mine will require per day or per annum
   b) type of blasting techniques that the project intends to adopt

10. Fuel, oil and electricity requirements

C. Impact on land and water resources

1. Impact of mining on land use and people

2. Impacts on biodiversity, if applicable

3. Impact of mining operation on social and economic setting of an area

4. The impact of modification of natural drainage and diversion of existing water courses flowing through the mine lease (rivers, streams, springs, drains, etc.), or important water resources originating in the mine and adjoining areas on local hydrology, if applicable

5. The impact of run-off due to mining and associated activities (as from the stockyard and waste storage areas, etc.) on water bodies, forest and agricultural land

6. If applicable, the impact of mining on the groundwater regime due to mine seepage within the study area. Hydrological and rock characteristic data should be collected and a hydrological model should be prepared for predicting the cone of depression at various stages of mine life. The Environmental Impact Statement should provide the impact of the area of influence of draw down caused by mine seepage (that is, the impact on shallow, deep wells and surface water bodies). Also, mention the total population likely to be affected by the fall in the groundwater level

7. If the mine proposes to discharge effluents into the water body (a river, natural drains etc.), then, the impacts of the mine discharge on that water body; Acid Mine Drainage (AMD) potential and identification of areas which might get affected by AMD, if applicable

4.5 MITIGATION AND ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The ESMP should discuss the mitigation measures to be taken against each impact, the timeline for completion, the responsible departments for implementation, the budget for the ESMP, post monitoring provisions and reporting to the concerned regulatory authority.

Note: The mitigation measures given below are generic for all types of mines; ground realities and peculiarities of the project as well applicability need to be considered before preparing ESMP for the Environmental Impact Statement. There may be a possibility that some of the given mitigation measures are not applicable.

The generic mitigation measures are also applicable for quarries, but the size of the quarry, location sensitivity and its relevance needs to be carefully examined before framing ESMP plan for quarry project. For small mines and quarries (whose capital investment are less than US$100,000 or its equivalent in Tanzanian shillings), the environmental clearance should be given after carefully examining the ESMP.

A. Mitigation measures for land

1. A mine closure plan including year-wise backfilling programme and final land use. The ESMP shall discuss the financial requirements for the detailed activities proposed to

achieve final mine closure. It should also discuss the benefit sharing and ownership of the reclaimed lease area

2. A detailed management plan, with explanatory notes, for overburden. This should include provisions to control run-off and erosion from overburden dump sites and the impact on ambient air and water

3. Mitigation measures for control of erosion and run-off from the mine lease area and open pit, especially if there is a river or agricultural land adjoining the mines

4. Management plan for topsoil utilization and conservation

5. Progressive year-wise green belt development inside and outside the lease area

B. Mitigation measures for water

1. Proposed mitigation measures to reduce drainage diversion within the mine lease area, if any

2. Detailed mitigation measures for local catchment area improvement

3. In case of identification of acid mine drainage (AMD), then detailed long-term plans to mitigate the same

4. Details of sewage treatment plant (STP) in the colony and effluent treatment plant (ETP) in the mine. The ESMP should also mention the treatment technology, layout plan and final disposal of treated wastewater

5. Information on design and dimensions of settling / sedimentation pond for handling run-off and mine seepage, if applicable

6. Detailed mitigation measures for the areas affected due to drawdown, if applicable

7. A water assistance plan for the local community, if affected by water scarcity due to the mine's operation. The project developer should form a monitoring committee to oversee the execution of this plan

8. The ESMP should discuss the disposal or usage of mine seepage water in detail, if applicable

C. Mitigation measures for air quality

1. Management plan to reduce fugitive emissions during material handling, excavation, loading / unloading, transportation, and storage. The project should also discuss the level of mechanization incorporated in mine management

2. A mitigation plan for controlling dust during drilling and blasting

3. A mitigation plan for controlling dust during transportation outside the lease area and for minimizing the impacts on people

4. Impact of mining and allied activities on air quality by using any well established models like ISCST or Aeromod, Fugitive Dust Model (FDM), etc. The report should include

assumptions used for the model and input and output data of modeling as an annexure

D. Mitigation measures for socio-economic impacts

1. Preparation of a Resettlement and Rehabilitation plan (R&R), if displacement is involved. The plan should include details of the compensation provided, including land-for-land compensation, employment or money; provisions at the resettlement colony (such as basic amenities including housing, educational facilities, infrastructure and alternate livelihood potential); a clear timeline for implementation; responsibility; budgets; grievance mechanism, etc.

2. The R&R plan should analyze and take into consideration the impact of displacement on women and vulnerable communities such as landless labourers, etc, and prepare a detailed management plan to improve their status

3. A detailed compensation package for the community likely to lose their livelihood due to diversion of forest or agricultural land

4. A detailed mitigation plan for improving and enhancing socio-economic condition in and around the project site and discuss the budgetary provision for the same

5. A management plan for occupational health and safety of the workers and nearby local community

6. The ESMP should also discuss the provision for compensation in case damage to building and infrastructures

7. Socio-economic impacts of project including impact on visual aesthetics and health, wherever applicable

E. Others

1. Environmental Impact Statement should assess the impact of noise due to mining and allied activities such as transportation, crushing, loading and unloading on the local community and wildlife (if applicable), and provide detailed mitigation measures for the same in the ESMP

2. Impact of ground vibration on local habitation

3. Environmental Impact Statement should assess the potential risks associated with various mining operations (such as risk during drilling, slope failure, fly rock and vibration due to blasting, storage of explosives, toxic fumes from blasting, slope destabilization, transportation, etc.) including natural calamities

4. A detailed mitigation plan for biodiversity protection and conservation (if the project is likely to impact biodiversity)

5. A disaster management plan for explosive warehouse, landslides, flashfloods, cloud-bursts, earthquakes, wherever applicable

6. Provisions for various facilities to be provided in terms of parking, rest areas and canteens for workers and drivers

7. Road safety measures planned to reduce road accidents

8. The organizational set-up and requirement of manpower for environmental, health and safety management, including monitoring and clear responsibilities

9. The frequency of training and awareness programmes on mine safety, and the annual budget allocated for them

10. Provision for annual environment and social audit of the project, including status of compliance with different statutes
11. ESMP should also discuss the Corporate Social Responsibility (CSR) and annual budget for CSR

F. Tailing pond

1. Management and disposal of tailings and closure plan of the tailing pond, if any, after the project is over, should be provided

2. Adequacy of the tailing pond for the life of the beneficiation plant should be provided with supporting data and documentation. Design and capacity of tailing pond should be such as to guard against overflow from the tailing pond during heavy rainfall. The provision of lining, nature of lining with supporting permeability studies should also be provided

3. Monitoring provisions should include:
   a) The installation of piezometers to monitor groundwater mounding beneath and surrounding the facility
   b) Surface and groundwater quality sampling both upstream and downstream of the facility, the trialing and monitoring of closure strategies, including slope treatments and covers
   c) Monitoring reports prepared at appropriate intervals which are accessible, easily understood and transparent to stakeholders
   d) The wastewater from tailings pond and other activities may contaminate the water of nearby natural stream or watercourse / lake / reservoir, which is used for drinking and bathing or any other purposes
   e) The tailing ponds overflow water, which are likely to be contaminated with process chemical and other leachable contaminants, and may adversely affect the surface / ground water quality
   f) 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, tailing 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 most climatic conditions should be examined & accordingly addressed in detail in the Environmental Impact Statement

g) The 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

h) Mitigation Measures: Lining of tailing ponds. Tailings dam and process wastewater

i) Afforestation plan in reclaimed tailings pond