RISK & HAZARD ASSESSMENT & MANAGEMENT PLAN (RHAM)

The lease area is 69.93Ha. & production capacity 40,000 MTPA. Hazard is a condition, inventor circumstance that could level to on contribute unplanned on undesirable event, Hazard leads to risk.

The Project is exposed to risk of various types of hazard including technological, industrial, tectonic & atmospheric which have potentiality of causing disaster that may cause loss of human life, property & environmental pollution. In order to prevent occurrence of such disasters immediate response to disaster to minimize after effects, a Risk Assessment & Management Plan has been drawn. Salient features of this plan are given below.

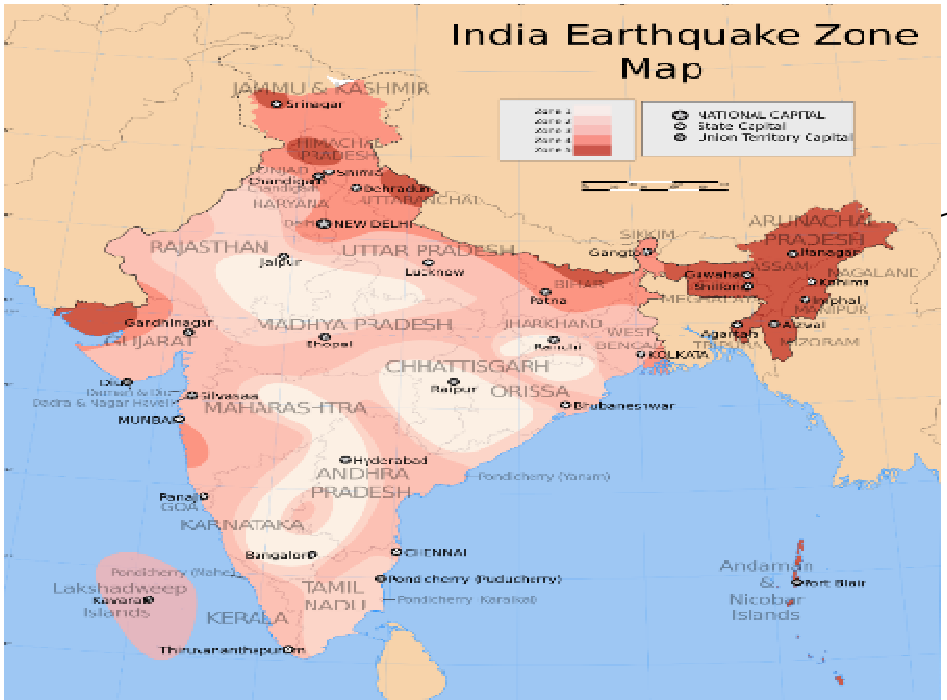
In the present context, hazard risk has been defined as the likely adverse impacts of a particular hazard on different aspects of society including safety & health issues of people living in the area, Project operations, economic activities, etc.

The Plan has following elements:

7.12.1 **Risk Identification & Consequence: -** Hazard / risk to which the Projectis exposed have been identified below on the basis of Causative factors:

a) **Tectonic Hazard**

a.1) Earthquake - Kindly refer to Fig.-7.12. Showing earthquake zone in India. This Project is located in **Zone-III** which means, the area is situated in a zone which is not prone to frequent earthquake having low value on Richter scale. Historically also, there is no record of severe earthquake causing loss of human life & property in this area.



Project Site

Chandula – Simalgoda Lease Area

Fig. 7.12: Earthquake Zone Map

a.2) Landslides- Landslides are mass movement of rock wastes and soil generally caused by excessive water & i.e.They occur mostly in hilly & mountainous area & triggered by earthquake associated with incessant heavy rainfall, quarrying at the base of hills slope, etc. Geological formation of the area, land form & intensity of rainfall are the factors that contribute to occurrence of landslide.

Fig- 7.13 shows the geological map of the state. Project is located in which geological formation. The project area has undulating topography, but there is a small hillock but not prone to landslide.

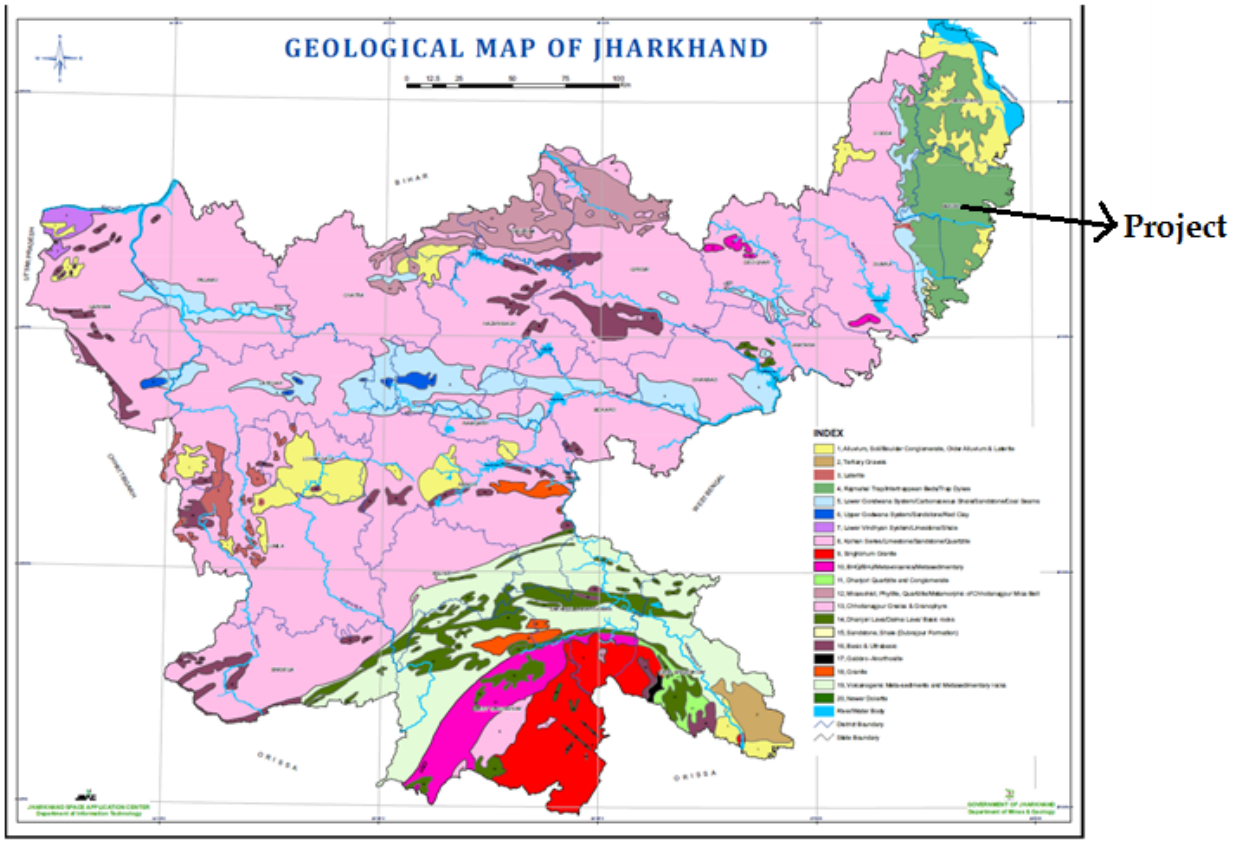


Fig7.13 :Geological Map of Jharkhand

An examination of IMD data on rainfall of this region also shows that rainfall is evenly distributed & there are no incidence of heavy downpour in the area. Mostly the Topography is undulating with a small hill within the lease area. Historically also, there has not been incidence of landslide in this area.

b) Atmospheric Hazards

b.1) Tropical Cyclones – As the project area is not near coastal zones it does not experiences tropical cyclone, but however occasioned mild moderate typical cyclones are expansible. But loss caused by such occasional mild tropical cyclones are moderate. There is no record of heavy causality in terms of loss of life or loss of property on account of cyclones in this area.

b.2)Flood- There is an inland perennial river flowing through the study area. Also several seasonal nala flow in the study area and joins the Subarnarekha River. The

HFL of the Gumani River is 52 m amsl. The maximum contour of the lease area is 200m amsl. Thus, there is no chance of flood of mine. Also, on local enquiry, it has been gathered that the study area has not experienced flooding in the past causing loss of life and property.

c) Technological Hazard

It is proposed to transport mined out stoneby road. A stretch of 5 km long link road (Partly black top & partly kacha) that passes through few numbers of villages located near the project on both sides of link road. Projected road traffic volume on the link road is approx7 Truck / day. Probability of road accidents on this stretch of road is rather low. The NH to which this link road is connected is a 4-lane highway (NH 80). The traffic generated by this project is only 7trucks / day having marginal effect on traffic on NH.

d) Industrial Hazard

Some of the project related activities are hazardous. Such hazardous project activities include following:

d.1Drilling - Hard mineral mass are to be removed by blasting using explosives. For carrying out blasting, blast hole will be drilled using wagon drills or jack hammer drill.

Handling of drill machine & drilling operation may cause personal injury to the operators. Such injuries are normally not fatal.

d.2Blasting - Explosives will be used for blasting of hard strata. Blasting operation have two effects namely generation of Fly rock &Ground Vibration. Normally blasting is done once a day preferably at noon. A detailed blasting study has been carried out by CSIR-CIIMFR, Dhanbad. Summary of the report have been discussed earlier.

Fly Rock -Fly rock means that fragmented rocks of different size broken by blasting may fly from the blasting zone to varying distance depending upon charge weight. If fly rock hits human being or animal it can cause serious injury or it may even be fatal.

Ground Vibration - Blasting induces ground vibration around the blasting site. Ground vibration caused by blasting is measured in terms of PeakParticleVelocity (PPV). PPV in excess of value prescribed by DGMS may cause damage to dwelling

houses & other civil structures. Value of safe PPV corresponding to various types of structures prescribed by DGMS is given in table below:

Table:7.3
Value of safe PPV

Soil, weathered or soft rock conditions	70 mm/s
Hard rock conditions	100 mm/s

PPV at a certain distance from blasting area depends on:

- Nature of geological formation
- Charge weight of explosives
- Distance of the location from blasting site.

Ground vibration may produce cracks in buildings, damage pipelines, roads, etc. Usually such damages are not fatal. It may cause injury to people.

d.3 Mining & Allied Activities

Project activities include handling of mining machineries loading of overburden & minerals into tippers. These activities may cause minor accidents.

- **Electrical Shocks**

  Project activities involve use of electrical equipments operating on high voltage. Use of electrical equipments may cause electrical shock to workers. These electrical shock may prove fatal.

- **Electrical fire**

  Use of electrical equipment may cause electrical fire in the project area. These electrical fires may cause loss of human life and property.

7.12.2 Vulnerability Analysis

Analysis has been carried out to identify and map the areas which are likely to be affected by such hazards so that proper preventive and mitigation measures may be

planned. Based on this analysis hazards have been grouped into following categories. These categorization is based on basis of type of hazards to which an area is exposed to.

Category Hazards, the effect of which would be limited to lease area. These hazards include following:

Industrial Hazards

- Drilling
- Blasting
  Ground Vibration& Fly Rock
- Electrical Shock
- Electrical Fire
- Other Project Activities

Category II: Hazards under this category are likely to affect the area outside the lease area but close to it.

- Ground Vibration caused by Blasting
- Fly Rock caused by Blasting

Category III: Hazard under this category are likely to affect the area on either side of link Road.

Technological Hazards

Road accidents on the Link Road.

7.12.3 Disaster Management Plan:-

This plan has three components. Each component is described below:

Pre-Disaster Phase

Disaster Preparedness

There are certain hazards & disasters associated with Project whose occurrence time can be known well in advance. Blasting operation is one of such hazards.
Area close to the leasehold are exposed to this hazard. It can affect human being, cattle, buildings, etc.

Aim of disaster preparedness is to take such steps & measures, pursue such activities and adopt such action plan which can reduce adverse impacts of disasters in terms of loss of life, personal injury & loss of property. In fact disaster preparedness refers to gear up all govt. & non-govt. agencies within area of Project. The district Level Disaster Management unit has to be alerted of the hazards that the project is exposed to be fully ready & equipped in the event of occurrence of disaster. Following steps have been taken by the proponent to minimize probability of occurrence of disaster.

A blasting stud has been carried out by CM & FRJ objectives of study was to :

(i) Fix design parameters for blasting to keep the ground vibration or within limits so that structures are not damaged. Also to limit the fly rocks within lease area.
(ii) Speed breakers provided before entering village area.
(iii) Speed limit has been prescribed on link road.
(iv) Washing signs have been provided on sides of roads.

a) Blasting study

b) On / Off Site technological Hazards (Road Accidents):-

Trucks/Tippers will transport mineral from project & ply through the link road. Villages on both sides of the link road is vulnerable area. In order to prevent road accidents on this road following steps have been taken-

i. The link road has been designed to handle the anticipated peak traffic density generated by the project. The road has been designed based on norms prescribed by IRC.

ii. Off Site Regulatory Information

Road signs relating to speed limit location of school, densely populated area along the road have been provided along road alignment. These sign boards have been provided to caution the driver of accident hazards.

c) On Site Electric Shock – Workmen working for the project would be exposed to this hazard. All the safety measures as prescribed in the electrical rules in this regard are strictly followed in the Project.
Regular maintenance of electrical system would be carried out as preventive measures.

d) On Site Project Activities - This project relates to mining of stone by opencast method of mining. The safety in mining operations in India are regulated by DGMS. DGMS has laid down regulations to ensure safety in mining operations. The mining operations have been planned complying to all safety norms prescribed by DGMS.

e) On Site Awareness Programmes -The proponent on regular basis would display& distributes leaflets& handouts for creating awareness among the workmen on importance of complying to safety rules for avoiding disasters, types of disasters to which project is exposed to & what has to be done if disaster occurs.

f) On Site Vocational Training -One of the effective method to prevent occurrence of disaster in a project is to impart vocational training to workmen. Such trainings improve their professional skill leading to prevention of disaster. The proponent wouldsponsor such training programmes for its operators.

g) On Site Contingency Plan - A contingency plan as a part of disaster preparedness, has been drawn to manage the impact of disaster at post disaster stage. It includes detailing of procedures to be followed and identification of infrastructures required for various post disaster activities including:
- Rescue operation
- Drinking Water
- Food
- Power Supply
- Medical Attendance

h) On Site Support System – For carrying out above operations necessary support system that includes following supports have been provided.
    - Financial Support – To be provided by the Project Proponent.
    - Material Support –In the terms of necessary equipment, vehicle,etc to be made available by proponent.

i) On Site Disaster & Awareness - Technological & Industrial Disaster can be prevented & managed more effectively if project operators are aware of the causes of disaster & appropriate response of disaster occurs. For this purpose Project Proponent distributes relevant information leaflets to workmen, puts up signboards at different work places to raise awareness among workmen.

j) On Site Education & Training - Regular training programmes will be organized for various categories of operators to train them to operate their equipments/machinaries safely & efficiently with stress on prevention of technological & industrial disasters.This has been discussed at para above.

k) On / Off Site Rescue Team - In this project rescue operation will be limited to rescue of operators involved in industrial accidents or people involved in road accident. There is no hazard of earthquake, landslide, flood or similar situation where people are trapped. Person involved in accidents may need to be moved to a hospital for medical attendance. This will require services of Ambulance with paramedical staff. Arrangement will be made to tie-up with nearest hospital for providing such services as and when required.

Off Site Post Disaster Management

Possible disasters that can occur in the study area include:

A. Disasters that affect project employees

- Industrial Accidents
- Blasting

B. Disasters that affect outside Project Area

- Ground Vibration
- Fly Rock
- Road Accident

Once disaster occurs following actions are to be taken to mitigate the adverse effects of disasters on the Community.

The first step is to assess correct picture of nature, magnitude & severity of disasters & assessment of necessary requirements on analysis of disasters.

Off Site Administrative Support for Handling Disaster

To be provided by the proponent.

Medical Support – The leaseholder, M/s JSMDC Ltd. will establish a tie up with a nearest hospital having necessary infrastructures, equipment needed to attend to disasters. This hospital will provide ambulance & cater to medical attendance to affected people. Also, a first aid facility will be provided by the proponent side.

Disaster Prediction – Disaster Prediction is made on basis of following

- Past History in terms of
  - Disaster Occurrence frequency
  - Magnitude of disaster.

- Pre cursor event that heralds the occurrence of major events
- Causative Factors

The Project Area does not fall in a region which is exposed to natural hazards including flood, earthquake, cyclone, landslide, etc.

The Project is exposed to technological & industrial hazards only.

In this situation, it is not possible to predict the hazard precisely. Project hazards are more of accidental nature.

Risk of hazard caused by Blasting is known. Fly Rock & Ground Vibration will be associated with blasting. Blasting operation are fixed. Hence hazard caused by blasting can be predicted.

On Site Disaster Warning System (DWS)

This system comprises of effective measures to communicate with the community exposed to hazards. In this project, Disaster Warning System has been provided to warn the community of blasting. System consists of following elements

Fixed Timing – Blasting is to be done only once in a day. It is to be done at noon. Sothe community are aware of the Blast timing.

Hooter – A hooter has been provided. The siren is blown just before blasting operation is started. This gives warning to people not to venture into vulnerable area.

Control Room

A separate cell will be established and function as control room for disaster management. The disaster management cell will function under the officer of the project office. The control room has following function :

1) **Communication System** – Telephone line for establishing contact with relevant agencies on occurrence of disaster.

2) **P. A. System**
   - For making announcement for informing the project workers.
   - Occurrence of any disaster that has occurred in the project.
   - Announcement will be clear in terms of type of accident, area of occurrence of disaster & directive for further action clear message will minimize the confusion & prompt appropriate action.

Control Room will have following information readily available.

A. Detailed Plan of lease area showing location, quarry, OB Dump, infrastructures, roads, office, etc.

B. On Site Telephone No.

- Corporate HQ
- Project Executives
- District Level Hazard Management Unit
- Hospital
- Fire Station
- Sub- Station

- Police

At Corporate Level, arrangement will be made to establish a safety cell devoted to co-ordinate the efforts in case of occurrence of a disaster in any of its projects.