



**INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH  
TECHNOLOGY**

**Environmental Impact Assessment for the Conservation of Environment and  
Sustainability**

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**Abstract**

Environmental impact assessment is the study that focuses on the effects of a proposed project, plan or a programme on the environment. EIA is a relatively new planning and decision-making tool. It ensures that the potential problems are foreseen and addressed at an early stage in project planning and design. Environmental assessment is taken up in this paper as a rapid assessment technique for determining the current status of the environment and identifying impact of critical activities on environmental parameters. The paper highlights methodology, evaluation of current stage, legal frame work, principles of environmental impact assessment, and case study, for predicting the environmental consequences of any project under consideration for development.

**Keywords:** Environmental impact assessment (EIA), Gujarat pollution control board (GPCB), Central pollution control board (CPCB), Ministry of Environment and Forest(MoEF).

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**Introduction**

Environmental concern has become one of the major global issue that affect all nations in individual or collectively<sup>[1]</sup>. An environmental impact assessment (EIA) is a decision-making process that evaluates the possible significant effects that a proposed project may exert on the environment. The environmental impact assessment(EIA) scoping and reviewing stages often involve public participation<sup>[1]</sup>. Although its importance has long been recognized, public participation in the EIA process is often regarded as ineffective, due to time, budget, resource, technical and procedural constraints, as well as the complexity of environmental information. Sustainable development is built on three basic premises i.e., economic growth, Ecological balance and social progress. Economic growth achieved in a way that does not consider the environmental concerns will not sustain in the long run. "It is necessary to understand the links between environment and development in order to make development choices that will be economically efficient, socially equitable and responsible, and environmentally sound."<sup>[2]</sup>

EIA is an exercise to be carried out before any project or major activity is undertaken to ensure that it will not in any way harm the environment on a short term or long term basis. Any developmental

endeavour requires not only the analysis of the need of such a project, the monetary costs and benefits involved but most important, it requires a consideration and detailed assessment of the effect of a proposed development on the environment.

Environmental Impact Assessment (EIA) can broadly be defined as a study of the effects of a proposed project, plan or program on the environment. The legal, methodological and procedural foundations of EIA were established in 1970 by the enactment of the National Environmental Policy Act (NEPA) in the USA<sup>[3]</sup>. At the international level, lending banks and bilateral aid agencies have EIA procedures that apply to borrowing and recipient countries. Most developing counties have also embraced and are in the process of formalizing EIA through legislation. The paper highlights the evolution to current status, the legal framework, concepts, processes and principles of EIA and associated studies. India has a long history of unplanned developments in many sectors without safeguarding natural resources, social and environmental concerns. The past failure of development planning processes to take adequate account of the detrimental impacts of economic development activities led to the commencement of EIA<sup>[2]</sup>.

The main purpose of EIA is to provide information to decision makers and public about the environmental implications of the proposed project activity before decisions are made. Besides providing information, it also suggests measures for preventing or reducing those impacts and mitigation plans. Overall EIA offers a systematic process of examination, analysis and assessment of planned activities with a view to ensuring environmentally sound and sustainable development. In India, the concept of environmental protection and effective management of resources is emphasized in Eighties.

EIA was extended to other activities. Projects like mining, industries, hydroelectric plants, thermal power plants, atomic power plants, ports and harbours, rail, roads, highways, bridges, airports and communication project, required EIA if:

- 1 Project needed the approval of public investment board/planning commission/central water Commission/central electricity authority, etc.
- 2 Project was referred to Ministry of Environment and Forest (MoEF) by other ministries.
- 3 Project was to be located in environmentally fragile or sensitive areas.
- 4 Project was under dispute.

### Objectives of Environmental Impact Assessment (EIA)

Objectives of EIA include the following<sup>[4]</sup>:

- 1 To ensure that the environmental considerations are explicitly addressed and incorporated into the development and decision-making process;
- 2 To anticipate and avoid, minimize or offset the adverse significant biophysical,
- 3 social and other relevant effects of development proposals;
- 4 To protect the productivity and capacity of natural systems and the ecological processes which maintain their functions; and
- 5 To promote development that is sustainable and optimizes resource use as well as management opportunities.

### Methodology

The methodology adopted for environmental impact assessment is the combination of both the analytical as well as doctrinal research methodology to facilitate for the discussion and analysis on environmental impact assessment (EIA)<sup>[3]</sup>. In order to evaluate the EIA system of India several criteria are taken from evaluation models proposed by Ahmad

and Wood (2002), Wood (2003) and Fuller (1999). These criteria consist of aims and stages of EIA (screening, scoping, review of EIA reports, public participation, decision making, mitigation of impacts and monitoring)<sup>[4]</sup>

The EIA process of methodology will comprise a number of related activities, as illustrated in Figure 1.

a) **Assessment of Cumulative Environmental Effects** – Cumulative environmental effects of the Project are identified in consideration of other past, present or reasonably foreseeable future projects or activities that have been or will be carried out, for all phases of the Project (*i.e.*, Construction, Operation, and Decommissioning, Reclamation and Closure). A screening of potential interactions is completed to determine if an assessment of cumulative environmental effects is required (*i.e.*, there is potential for substantive interaction) for that specific Project-related environmental effect that overlaps with those of other projects or activities that have been or will be carried out. The residual cumulative environmental effects of the Project in combination with other projects or activities that have been or will be carried out are then evaluated, including the contribution of the Project to those cumulative environmental effects (as applicable)<sup>[5]</sup>.

b) **Determination of Significance** – The significance of residual Project-related and residual cumulative environmental effects', including the contribution of the Project, is then determined, in consideration of the significance criteria<sup>[5]</sup>.

c) **Follow-up or Monitoring** – Follow-up measures that are required to verify the environmental effects predictions or to assess the effectiveness of the planned mitigation, as well as any required monitoring, are recommended, where appropriate and applicable<sup>[5]</sup>.

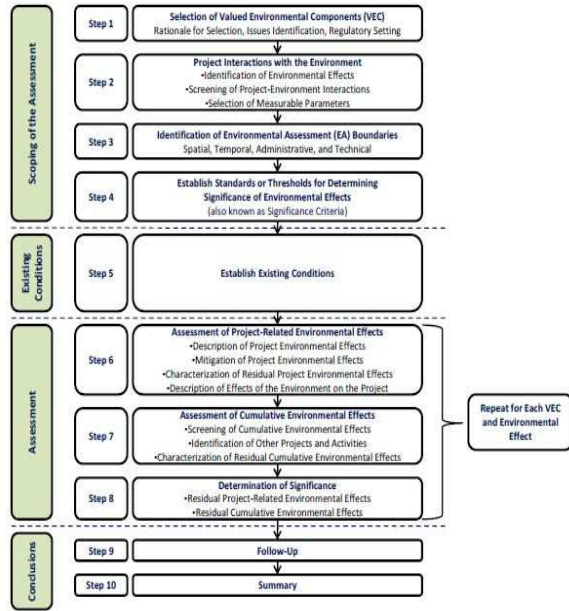


Fig:1 Main stages in the EIA methodology<sup>[5]</sup>

### Basic Principles of Environmental Impact Assessment

By integrating the environmental impacts of the development activities and their mitigation in early stages of project planning, the benefits of EIA could be realized in all stages of a project from exploration, planning, construction, operations, decommissioning and beyond site closure<sup>[4]</sup>.

A properly-conducted-EIA also lessens conflicts by promoting community participation, informing decision-makers, and helps in laying the base for environmentally sound projects. Integrity: The EIA process should be fair, objective, unbiased and balanced.

Following are basic principles of EIA<sup>[4]</sup>

- 1 Utility: The EIA process should provide balanced, credible information for decision-making.
- 2 Sustainability: The EIA process should result in environmental safeguards. Ideally an EIA process should be:
- 3 Purposive - should inform decision-makers and result in appropriate levels of environmental protection and community well-being.
- 4 Rigorous - should apply 'best practicable' science, employing methodologies and techniques appropriate to address the problems being investigated.
- 5 Practical - should result in providing information and acceptable and implementable solutions for problems faced by the proponents.

- 6 Relevant - should provide sufficient, reliable and usable information for development planning and decision making.
- 7 Cost-effective - should impose minimum cost burdens in terms of time and finance on proponents and participants consistent with meeting accepted requirements and objectives of EIA.
- 8 Efficient - should achieve the objectives of EIA within the limits of available information, time, resources and methodology.
- 9 Focused - should concentrate on significant environmental effects and key issues; i.e., the matters that need to be considered while making decisions.
- 10 Adaptive - should be adjusted to the realities, issues and circumstances of the proposals under review without compromising the integrity of the process, and be iterative, incorporating lessons learnt throughout the project life cycle.
- 11 Participative - should provide appropriate opportunities to inform and involve the interested and affected public, and their inputs and concerns should be addressed explicitly in the documentation and decision-making.
- 12 Inter-disciplinary - should ensure that appropriate techniques and experts in relevant bio-physical and socio-economic disciplines are employed, including the use of traditional knowledge as relevant.
- 13 Credible - should be carried out with professionalism, rigor, fairness, objectivity, impartiality and balance, and be subject to independent checks and verification.
- 14 Integrated - should address the inter-relationships of social, economic and biophysical aspects.
- 15 Transparent - should have clear, easily understood requirements for EIA content; ensure public access to information; identify the factors that are to be taken into account in decision-making; and acknowledge limitations and difficulties.
- 16 Systematic - should result in full consideration of all relevant information on the affected environment, of proposed alternatives and their impacts, and of the measures necessary to monitor and investigate residual effects.

### Types of Environmental Impact Assessment

Environmental assessments could be classified into four types i.e. strategic environmental assessment, regional EIA, sectoral EIA and project level EIA. These are precisely discussed below<sup>[4]</sup>

#### a. Strategic Environmental Impact Assessment

Strategic Environmental Assessment (SEA) refers to systematic analysis of the environmental effects of development policies, plans, programmes and other proposed strategic actions. SEA represents a proactive approach to integrating environmental considerations into the higher levels of decision-making – beyond the project level, when major alternatives are still open.<sup>[4]</sup>

#### b. Regional Environmental Impact Assessment EIA

EIA in the context of regional planning integrates environmental concerns into development planning for a geographic region, normally at the sub-country level. Such an approach is referred to as the economic-cum-environmental (EcE) development planning. This approach facilitates adequate integration of economic development with management of renewable natural resources within the carrying capacity limitation to achieve sustainable development. It fulfills the need for macro-level environmental integration, which the project-oriented EIA is unable to address effectively. Regional EIA addresses the environmental impacts of regional development plans and thus, the context for project-level EIA of the subsequent projects, within the region. In addition, if environmental effects are considered at regional level, then the cumulative environmental effects of all the projects within the region can be accounted.<sup>[4]</sup>

#### c. Sectoral Environmental Impact Assessment EIA

Instead of project-level-EIA, an EIA should take place in the context of regional and sectoral level planning. Once sectoral level development plans have the integrated sectoral environmental concerns addressed, the scope of project-level EIA will be quite minimal. Sectoral EIA helps in addressing specific environmental problems that may be encountered in planning and implementing sectoral development projects<sup>[4]</sup>.

#### d. Project Level EIA

Project level EIA refers to the developmental activity in isolation and the impacts that it exerts on the receiving environment. Thus, it may not effectively integrate the cumulative effects of the development in a region.

From the above discussion, it is clear that the EIA shall be integrated at all levels i.e. strategic,

regional, sectoral and project level. Whereas, the strategic EIA is a structural change in the way the things are evaluated for decision-making, the regional EIA refers to substantial information processing and drawing complex inferences. The project-level EIA is relatively simple and reaches to meaningful conclusions. Therefore in India, largely, the project-level EIA studies take place on a large-scale and are being considered. However, in the re-engineered Notification, provisions are incorporated for giving a single clearance for the entire industrial estate for e.g. Leather parks, etc. which is a step towards the regional approach. As we progress and the resource planning concepts emerge in our decision-making process, the integration of overall regional issues will become part of the impact assessment studies.<sup>[4]</sup>

### Institutional Arrangements for EIA

The EIA process is now well established and Environmental Committee is provided to over 1500 development projects. It rests on three pillars of statutory, administrative and procedural frameworks<sup>[4]</sup>.

#### 1) Role of Impact Assessment

Impact Assessment, in consent with relevant state and central authorities, is responsible for setting guidelines for the preparation of the (EIA) reports, questionnaires and checklists for major sectors<sup>[12]</sup>. It prepares and issues various notifications and amendments pertaining environmental laws. Impact Assessment has constituted six multi-disciplinary expert committees known as Environmental Appraisal Committee (EAC), as specified in the EIA Notification, to carry out review for the mining, industries, thermal power plant, river valley and hydro-electricity project, nuclear power plant, infrastructure and miscellaneous activities. The appraisal process of Environmental Committee (EC), involving review of the EIA report and various documents submitted by the project proponent, is the leading responsibility of Impact Assessment. Impact Assessment may also seek clarification from the proponent and conduct site visits if it feels necessary during the review procedure. Based on the documents submitted and clarification presented IA either grants or rejects the environment clearance of the developmental project<sup>[12]</sup>. This division also carries out follow-ups of the litigation in the various courts regarding Environmental Committee decisions, notifications and amendments issued.

#### 2) Role of CPCB

The CPCB is an autonomous organization under administrative control of MoEF. Initially it was known as Central Board for Prevention and Control of Pollution of Water, which came into being as a

statutory organization in 1974, with the enactment of Water (Prevention and Control of Pollution) Act, 1974. Later in 1981, board was renamed and assigned the powers and functions specified under Air (Prevention and Control of Pollution) Act, 1981 too. CPCB primarily has powers explicit to Water and Air act, but now it is an umbrella organization with legal strength of several acts that came afterwards. CPCB has no direct role in environmental clearance process, though it acts as a research organization, which by collecting, analysing and disseminating information pertaining to pollution prevention and abatement, benefits the MoEF, SPCBs and several other stakeholders of environmental clearance process. It is a common practice that technical staff and experts of CPCB are designated in the expert committee constituted by IA. Member secretary of CPCB or his representative in particular is appointed in all the sector specific committees<sup>[12]</sup>.

### 3) Role of state department of education (DoE) and SPCB

Environmental matters of any state ranging from the execution to formulation of guidelines have been entrusted to the state department of education (DoE). A cabinet minister heads these departments. To carry out its functions many State Governments have set up framework to accomplish EC at state levels, within state DoE. The SPCBs work under DoE having different structures for project appraisals. Andhra Pradesh has Environmental Appraisal Committee (EAC) under SPCB, which appraises the report submitted by project proponent before issuing No Objection Certificate (NOC). The states of Maharashtra, Gujarat, West Bengal and Karnataka have created EAC under DoE, which issues NOC. For the rest, member secretary or chairman of the pollution control board issues NOC. Earlier these departments had no role in EC process but the amendment in EIA notification defined the role of state departments for EC of co-generation plants of any capacity, certain captive plants and small utility projects. Sometimes SPCBs instruct project proponents to submit rapid EIA on one season data, considering the size and type of industry. SPCBs issue NOC to establish for the project requiring EC from either state or central government if the water and air pollution loads are acceptable for the area in which project is to be located. The IA has conferred the responsibility of public hearings to SPCBs. The minutes of the meeting and major findings are to be furnished to IA within 30 days. SPCBs are also involved in the national EC, in case of non-compliance of industries. The Ministry may direct SPCBs to look into the matter and take up desired measures<sup>[12]</sup>.

### 4) Role of ministry of environment and forest (MoEF) Regional Offices

The MOEF has set up six regional offices with a head quarter (HQ) unit at New Delhi. These centers have been set up especially for monitoring and implementation of stipulations under Forest (Conservation) Act, 1980 and provisions for environmental clearance, whereas office at Delhi coordinates with all regional offices. Post Project Monitoring (PPM) of the cleared projects in particular is the major responsibility of these offices. Project authorities are required to submit monitoring reports to these ROs every 6 months, detailing progress of implementation of the conditions, detailed while granting EC to the projects. These offices are directed to follow up pollution control measures adopted by industries and in this concern; they are allowed to take up site visits. If any violation of environmental standards is noticed, ROs inform HQ to take necessary actions<sup>[12]</sup>.

### EIA Process

EIA process in India involves following basic steps<sup>[3],[5]</sup>:

1. Screening.
2. Scoping.
3. Baseline analysis.
4. Impact prediction.
5. Impact mitigation measures.
6. Documentation.
7. Public hearing.
8. Review and decision-making.
9. Post Project Monitoring (PPM)

#### 1 Screening

The screening component of EIA process in India has evolved considerably over past decade.

Screening determines whether EIA is required or not. In India, 32 activities listed in schedule I (Appendix A), any project in ecologically fragile areas<sup>4</sup> and any project falling under coastal zone regulation, requires an EIA. The investment clause has also been formulated to streamline screening process. It specifies that new projects with investment more than 100 crores and modernisation projects involving investment more than 50 crores require EIA. This clause is not applicable to industries involving hazardous chemical processes.

#### 2 Scoping.

Scoping identifies the concerns and issues to be addressed for a particular project. MoEF has set guidelines and review checklists for relevant issues for different project types and provides general questionnaires for all the sectors. Study of alternatives and public hearings are undertaken at this

stage only. Alternate scenario must account for no project condition along with project scenario employing best-suited technology or processes.

### 3 Baseline analysis

A comparison of project-induced environmental changes with the expected environmental changes without proposed project is assessed through baseline analysis. The quality of the baseline analysis establishes the viability of the appraisal of the impacts, and therefore of the EIA itself. In India, data is collected on both project engineering and environmental aspects. Project engineering deals with process technology, raw material, water and energy requirements, whereas data on air emissions, wastewater, noise, solid waste and hazardous/toxic waste is required for the environmental study. Project proponent conducts monitoring for various required environmental quality parameters or data available with the local monitoring stations of SPCBs and CBCP may also be used. MoEF provides the detailed guidelines on the procedures of monitoring and analysis of the baseline data.

### 4 Impact prediction.

Once collecting the relevant environmental information, consequences of the project are outlined. The prediction analysis should forecast the nature and significance of the expected impacts, or explain why no significant impacts are anticipated. Several mathematical models are listed in the manual of MoEF for environmental and socio-ecological impacts predictions. Suggestions have also been made on the kind of conditions where they could be used. Socio-economic and ecological impacts are essential to be covered in this analysis.

### 5 Impact mitigation measures.

In an EIA, mitigation measures are proposed to avoid or reduce environmental and social impacts. Environmental Management Plan (EMP), risk assessment report and disaster management plan (if hazardous substances are involved in the project), rehabilitation plan (if displacement of people is anticipated) are prepared to suggest remedial measures. EMP in particular should entail following aspects<sup>[6],[7]</sup>

- Pollution prevention
- Waste minimization
- End-of-pipe treatment
- Mitigation measures
- Protection of the sensitive receptors

In addition to this EMP must be supplied with the work plan, time schedule, place and cost of implementing the mentioned measures.

### 6 Documentation.

At the end of all the above-mentioned steps, a concise but comprehensive report is prepared. It summarises the description of the project, regional settings, baseline conditions, impact prediction and important findings of the study. Project proponents hire consultants to carry out the EIA and preparation of report for them.

### 7 Public hearing.

The Indian system provides an opportunity to involve affected people and vulnerable groups to develop terms of references for EIA thus incorporating their concerns into decision-making process. The SPCB is required to publish notices for public hearing in two local newspapers and one of which should be in vernacular language of the concerned locality. The date, time and place of the hearing should be mentioned in the notice. EIA notification also makes provision for access to the executive summary of the project at the offices of district collector, district industry centre, commissioner of the municipal corporation/local body, SPCB and state DoE. The composition of the public hearing panel has also been specified by the law, which may consist of members of local authorities and representatives of the public nominated by the district collector.

### 8 Review and decision-making.

The review and decision-making starts as the proponent files an application accompanied by the documents i.e., EIA and EMP report, NOC, risk assessment and emergency preparedness plan, rehabilitation plan, details of public hearing, clearance from airport authority and state forest departments, etc., to IA. The IA reviews the report with reference to the guidelines provided by MoEF in its manual. The IA is free to conduct site visits if considers necessary. Based on the EIA review and other information, the IA either grants or rejects the environment clearance to the project. The assessment has to be completed within a period of 90 days from the receipt of the requisite documents from the project authorities and completion of public hearing. The decision has to be conveyed to the proponent within 30 days thereafter.

### 9 Post Project Monitoring (PPM).

THE PPM AIMS TO ENSURE THAT AN ACTION HAD BEEN IMPLEMENTED IN ACCORDANCE WITH THE MEASURES SPECIFIED WHILE PROVIDING THE EC. THUS, IT PERFORMS A DUAL TASK OF IDENTIFYING THE ACTUAL ENVIRONMENTAL IMPACTS OF THE PROJECT AND CHECKS IF THE EMP IS HAVING THE DESIRED MITIGATION MEASURES. POST-IMPLEMENTATION MONITORING IS THE RESPONSIBILITY OF MOEF'S SIX REGIONAL OFFICES AND SPCBS

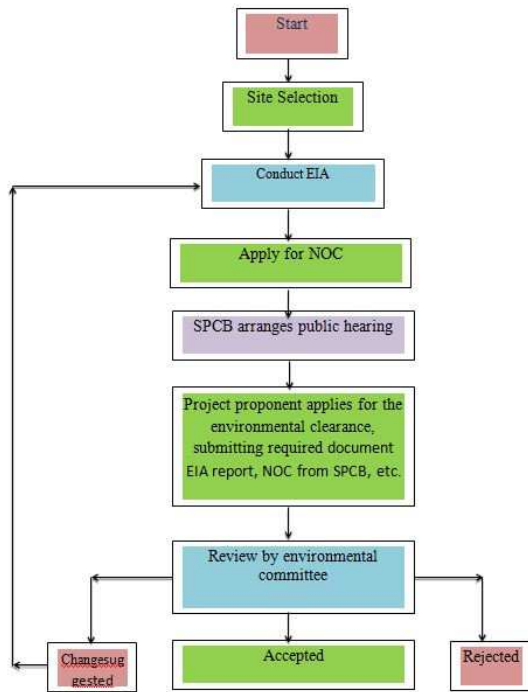


Fig: 2 process of EIA

**Case Study -Jhansi Open Cast Mining Site - Uttar Pradesh, India**

Mining and its allied activities have taken big strikes during the last century contributing significant infrastructure development and raising the living standards of mankind. The geographical location of Bundelkhand regions is such that it acted as gateway between north and south India. Administratively, it covers seven district of Uttar Pradesh. Mining and exploitation of mineral resources generally have a considerable impact on the land, water, air, and biological resources as well as socio-economic setting of the local population. Cast mining, widely prevalent in the Bundelkhand region, though cheaper are known to have more environmental consequences [8],[9].

Field surveys were carried out in some selected mine areas (Figure. 3) in Jhansi district to collect relevant information. Data and literature pertaining to the mineral deposits in the region was gathered from various sources.

The information related to the status of health and socio-economic impacts were extracted by using structured questionnaires. The respondents include randomly selected mine workers and head of families residing in mine areas.

The ambient air quality assessments were carried out in GoraMachiya granite mine area. High volume air samplers (HVS –Envirotech Ltd., New Delhi) were used with an average flow rate between 1.1 – 1.3 m<sup>3</sup>

m-1. The air samplers were kept at a height of 6m. Sampling was done for 24 h in 8 h intervals. SPM and RSPM were computed after weighing the glass fibre filter paper (Schleicher and Schüll, Germany) before and after sampling. Analyses of water quality (APHA 2005) were done by collecting ground water from hand pumps, ponds samples from in and around mining area during pre-monsoon, monsoon and post-monsoon. The information collected include, respiratory, eye, hearing loss, skin, accident and others. Various informal interviews with miners, mining officials, government officials, and local community members (around the source of air pollution) were conducted during the study period.

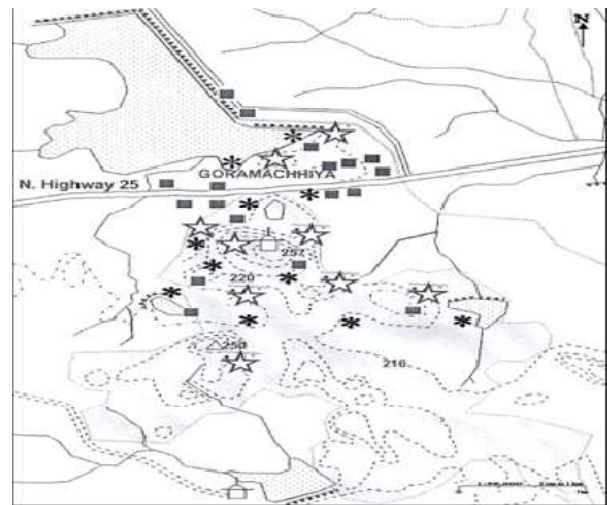


Fig 3 Mining Location [13]

**Result of Mining Activity**

Mining in Bundelkhand region are mainly carried out by open cast extraction method. Open cast mining involves the removal of overburden including the valuable topsoil and plus the natural vegetative cover to meet the ore deposits. These activities are associated with harmful effects to the local environment. Mining activities are carried out in various stages, each of them involving specific environmental impacts. Broadly speaking, these stages are deposit prospecting and exploration, mine development and preparation, mine exploitation, and treatment of the minerals obtained at the respective installations with the aim of obtaining marketable products.

The emerging environmental hazards associated with open cast mining practices are many but the major problems may be summarized as follows

- **Air Pollution**

Open cast mining operation creates enormous quantity of dust of various sizes which passes into

transportation and disperses significant amount of suspended particulate matters (SPM) and gaseous pollutants into the atmosphere. These pollutants not only affect the mine workers but also affect the nearby populations, agricultural crops and livestock. The minimum and maximum value of RSPM and SPM is  $155\mu\text{g m}^{-3}$  to  $234\mu\text{g m}^{-3}$ ; and  $393\mu\text{g m}^{-3}$  to  $541\mu\text{g m}^{-3}$  respectively. The extent of harmful effects depends largely on meteorological conditions prevailing in the region. Depending on the size suspended particulate matter may cause (a) Respiratory disorder in animals and human due to inhalation of fine particles, (b) Ophthalmic disease, as particulates act as carrier of pathogens, (c) Lower agricultural yields due to obstruction of light needed for photosynthesis by the dust cover on surface layer of plants, and (d) Poor visibility near crusher.

- **Water Pollution**

Mining activities are known to affect both the surface and groundwater regime. The local topography and drainage pattern may considerably influence the severity of pollution. The main sources of liquid effluents in open cast mining are: (a) Dewatering of mine water, (b) Spent water from dust extraction and dust suppressing system and (c) Leachate run off from waste dumps. The water composition of the mine water primarily depends upon the host rock composition as well as the mineralization process.

- **Noise Pollution**

In open cast mining blasting is a common practice which produces high intensity of noise. Deafness is brought about by slow but progressive degeneration of neuro-sensorial cells of the inner ear. Besides, noisy working environment in the mining sites are known to result into communication impairments, task interference, sleep interference, change in personal behavior, etc. of the mine workers. In addition, noise produces other health effects, influences work performance and makes communications more difficult. Besides, the fauna in the forests and other areas surrounding the mines/industrial complexes is also affected by noise and it has generally been believed that wildlife is more sensitive to noise and vibrations than the human beings. The noise level is comparatively high in the active zones in the granite quarries due to drilling, blasting and the mine service stations. It was found to be in the range of 96 to 125 dB. These are much above the limits of 75 dB prescribed by WHO for day time industrial areas (WHO 1980).

- **Occupational Human Health Problems**

Open cast mining is more severe an air pollution problem in comparison to underground mining. In active mining sites, miners are persistently

exposed to large concentrations of dust, gaseous pollutants, high levels of noise and last but not the least accidents, which constantly pose a severe threat to miner's life.

The most prevalent occupational diseases among the mine workers in Bundelkhand are: (a) Hearing problems: Effect of heavy noise from use of heavy machineries and rock blasting causes auditory effect as well as non-auditory effects in mine workers and surrounding people, (b) Auditory impact: Auditory effect of noise causes impairing of hearing, (c) Non-Auditory impacts: These type of effect cause loss of working efficiency due to the physiological disorders like hypertension, cardiovascular disease and so on, (d) respiratory problems: Mineral dust particles originating from mining activities on inhalation by lungs and thereby causing a number of concerned problems like silicosis. These diseases are common in Goramachiya and Dagara village of Jhansi. (e) Eye problem: Dust particle from mining activities contribute to cause of certain eye problem like conjunctivitis and kerato conjunctivitis and (f) Skin problem: Deposition of dust particles on skin interrupts U.V. radiation, which causes different skin diseases.

### Remedial Measures

- **An environmental management plan (EMP) for sustainable mining activities**

It is mandatory to draft an environmental management plan (EMP) before commencing such projects in India. Several countries have adopted different strategies for tackling pressing environmental problems in the industry. For effective implementation of an EMP, a mid-term corrective measure is essential, such as a time bound action plan, this includes a programmed for land reclamation, afforestation, mine water treatment, surface drainage and check dams, and sewage treatment.

- **Environmental impact assessment**

Environmental Impact Assessment (EIA) is one of the proven management tools for integrating environmental concerns in development process and for improved decision making. As EIA and EMP have been made statutory requirements for starting new mining ventures as well as for existing mines, (at the time of renewal of mining plans) measures to prevent environmental degradation have become a subject of priority with the mine managements. The minerals reserves in the Bundelkhand region are varied and huge in quantities, it is expected that the mining activities may be intensified in future further deteriorating the environmental quality. Proper environmental impact assessment and sometimes a



socioeconomic impact assessment should be carried out. Baseline data should be effectively incorporated in management of the mining sites in Bundelkhand region. For proposed mining projects, it is necessary to address the potential environmental impact issues that may arise due to proposed mining activities<sup>[13]</sup>.

- **Afforestation**

Afforestation practices help in restoring and enhancing the vegetative cover in mine areas in various ways. For reclamation through Afforestation following inventories are the prerequisites such as area to be planted, slope gradient, quality of soil, climate conditions and nature of biotic pressure<sup>[13]</sup>. For plantation priority must be given to native species in the following order, mining sites, overburden sites and abandoned sites. Those species have to be selected having fast growing tendency to enable to maximum canopy in short time as well as hard woody and ability to fix direct atmospheric nitrogen.

### Conclusion

Mining activities are unsustainable not only because they exploit non-renewable resources, but also because they leave behind them destruction of the environment and society, which is very often irreversible. Because of its impacts, mining is one of those activities that need to be strictly controlled at all stages, from prospection and exploitation to transportation, processing and consumption.

After abandoned of mines, there is no proper closure of mines; waste dumps will be there, no rehabilitation of the area, no compensation for the labors. There will be always question of that whether land will be given back to the landholder or not. It has been suggested that after closure of mine lands should be given to the landholders, after proper rehabilitation of land. Then they can start to earn his livelihood from the cultivating their own land. Environmental quality must be sustained in areas affected by surface mining. This requires designing and developing environmentally sensitive strategies for extraction and land reclamation. It demands a more rigorous control of environmental impact assessment and more attention to ensuring reductive and sustainable land restoration. Mine rejected granite waste stone materials should be distributed to the local people who are inhabitant the satellite village and also initiate for the manufacture of brick in house purposes and roads. Filter masks should be provided to the workers and plants crushers and mine areas.

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