

“Cadastral Maps for Socio-Economic Data Visualization and Integration for Land Use in Raniganj Mining Areas”

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Abstract:- The impact of mining and mineral extraction activities can be significant on the surrounding land, water and air bodies, in any operational area. The environmental degradation ranges from localized surface and ground water contamination to the damaging effects of airborne pollutants on the regional ecosystem; which need the properly designed geospatial database. The monitoring of these environmental impacts requires a user-friendly and cost effective method to quantify the land cover changes over large time periods. Now-a-days, it has become compulsory to use the remote sensing techniques for regular monitoring of these environmental hazards in-and-around the mining areas using cadastral map. This paper provides a case study on the use of geospatial techniques for environmental monitoring in the mining areas.

Keywords:- Mining, Cadastral, Remote Sensing, Environmental Impacts.

I. INTRODUCTION

A **cadastral** map is a map which provides detailed information about real property within a specific area. Real property is property in the form of land, what lies beneath the land, and objects fixed to the land. The principal responsibility of the assessor is to locate, inventory, and appraise all property within the jurisdiction. A complete set of maps is necessary to perform this function. Maps help determine the location of property, indicate the size and shape of each parcel and reveal geographic relationships that affect property value. Maps and map data are important not only for assessors, but also for other governmental agencies, the public at large, and the land information community (such as realtors, title companies, and surveyors). In addition, the assessor must track current ownership of all parcels, so that the proper party can receive assessment notices and tax bills.

II. STUDY AREA:

Raniganj Coalfield covering an.

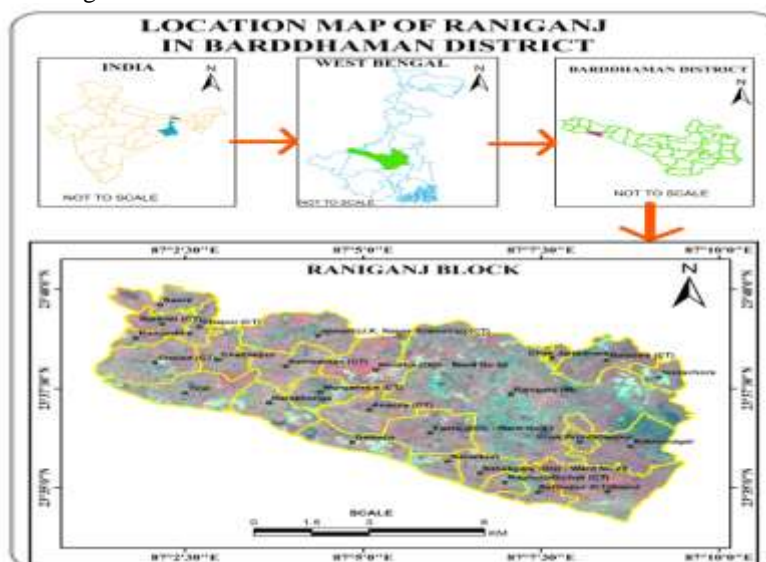


Figure 1: Location map of the study area.

area of about 1652 sq. km. and bounded by Latitude 23°30' & 23° 40'N, Longitude 87°00' & 87°10'E is located in the eastern part of India. It is covered under Survey of India toposheet no. 73M/2 on RF 1:250,000. This coalfield holds a premier position in India for having the largest share of reserve of superior grade non-coking coal and considered as the birthplace of coal mining in the country.

III. AIM & OBJECTIVES OF MY STUDY

- To categories the study area into environmental zones with mining using cadastral techniques.
- To determine the present land used/land cover
- To determine Socio Economic status
- Environmental Management of Mineral Resources.

IV. PHYSIOGRAPHIC SETTING

The district Bardhaman is the second largest district of West Bengal having an area of 7,024 sq. Km. it is located between the fertile and of Hugli flood plain in east, and lateritic uplands of west – the land that is locally known as Rarh Bhumi. It extends from 22°56' to 23°53' north latitude and 86°48' to 88°25' east longitude. The district is bounded on the north by Santal Parganas of Jharkhand, Birbhum and Murshidabad on the east by Nadia; on the south by Hooghly, Bankura and Purulia and on the west by Dhanbad of Jharkhand Purulia. Rivers Ajay and Damodar separate the district form Birbhum on the north and form Bankura on the south & west, respectively. The River Bhagirathi traverse through the eastern edge of the district thus separating Nadia on the east.(ref. District Environmental Atlas, 2005)

Continuous use of land over a long period of time out taking appropriate measures to conserve and manage it. But very little work has been done previously on the pre history of this area, and fieldwork reported here ,carried out in part fulfillment of my doctoral work, here the initial aim of locating stone age sites through intensive exploration and then making a detailed study of their associated environment and land use pattern.

V. METHODOLOGY

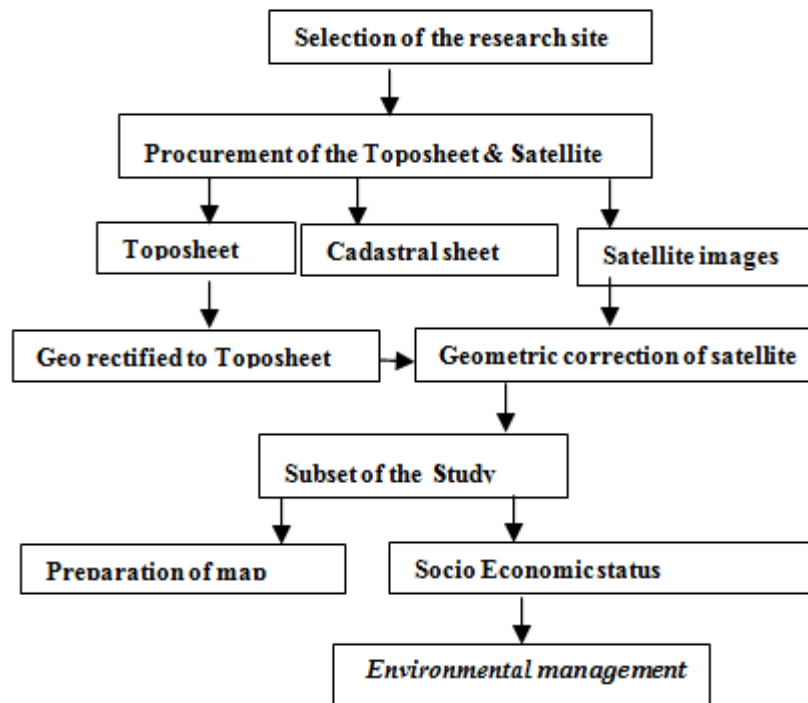


Figure2: Flowchart showing methodology.

Selection of the study area and get to the all the primary details. Digitized the mining boundaries by the geo rectified top sheets and superimpose the Environment planning. The buffering zone is prepared in the Arc GIS software. Prepared the area of interest (AOI) from the satellite images

The Division zone form the satellite images are to be classified by the ERDAS SOFTWARE using. By the field verification /ground tooth prepared map with scientific. Final attribute are prepared for a land use and verified the classes by the field verification, spatial and spectral matching also.

VI. DATA USED

Remote Sensing Data	Landsat ETM⁺ Satellite image
	LISS-IV from NRSC
Co-lateral Data	Toposheet
	Regional maps

1. Primary data collected from the mining Agency(Mine Planning, local /regional maps)
2. Toposheet have collected from the Geological survey of India in 1:50,000 scale.
3. Regional maps (Geology, Geo morphological and previous land use maps).
4. Cadastral sheets from survey building, Kolkata
5. Satellite image collected glcf site.
 - a. Land sat ETM⁺ Satellite image (date, 26-10-2001).
 - b. Google image.

VII. CADASTRAL CONCEPTS

The word "cadastre" came into English through French from Late Latin "capitastrum", a register of the poll tax, and the from the Greek "katastikhon", meaning, a list or register.

Cadastre is a scientific term for a set of records showing the extent, value and ownership of land. Particularly, a cadastre is a record of areas and values of land and of landholders that initially was accumulated for purposes of taxation. The cadastre serves two other equally significant purposes. It offers a ready means of accurate description and recognition of specific pieces of land and it performs as a continuous record of rights in land. A **cadastral** map is a map which provides detailed information about real property within a specific area. Real property is property in the form of land, what lies beneath the land, and objects fixed to the land.

MOUZA MAP A IN FULL SHEET



Figure 3: cadastral sheet of the study area

Geo-referencing of cadastral sheet:

To geo-reference something means to define its existence in physical space. That is establishing its location in terms of map projections or coordinate systems. The term is use both when establishing the relation between raster and vector images and coordinates but also when determining the spatial location of other geographical features. Examples would include establishing the correct position of an aerial photograph within a map or finding the geographical coordinates of a place name or street address. This procedure is thus imperative to data modelling in the field of geographic information system and other cartographic methods. When data from different sources need to be combined and then used in a GIS application, becomes essential to have a common referencing system. This is brought about by using various geo referencing techniques. Most geo refereeing tasks are under taken either because the user wants to produce a new map or because they wants to link two or more different datasets together by virtue of the fact that they relate to the some geographic locations.

VIII. THE ROLE OF LAND-USE

Human systems depend critically on the state of the environment. Managing a sustainable evolution of land-use systems at the regional scale concerns various themes of vital importance:

- Land-use/cover changes affect the hydrological cycle both qualitatively and quantitatively by influencing how precipitation is intercepted, evapotranspired, and retained in soils, which in turn determines the amount and speed of runoff. Land-cover change also influences local soil erosion and nutrient losses. At the scale of river basins, it determines water availability and the intensity and frequency of flooding;
 - Ecosystems and land in general store waste materials and provide critically important purification functions. The ability to provide these services is threatened by pollution and land degradation due to inappropriate land use, or over-exploitation that transgresses capacity thresholds. (options summer, 1999)
- So SCIENTIFIC INVESTIGATION is the important part of my research work, I highly indicate the investigation of mining area with respect to satellite images and demark the effected of surrounding area and finally there sustainable environmental management.

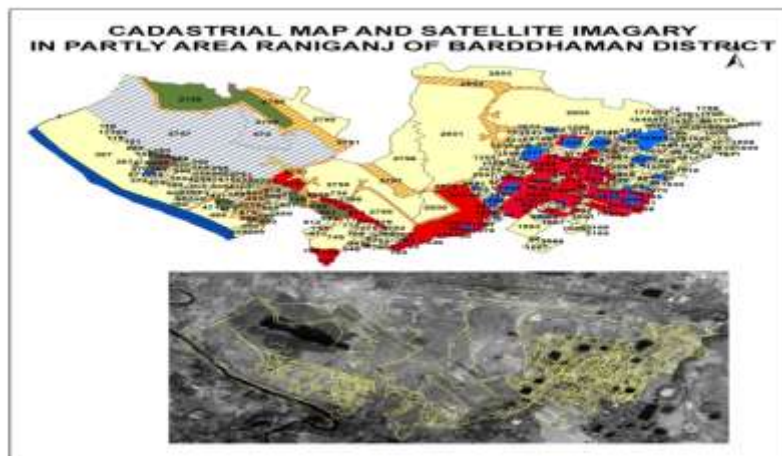


Figure 4: Map showing for parcel wise land used/land cover map & plot No. and Spatial adjustment in satellite images

XI. IMPACTS ON LAND USE

There might be a considerable impact on the land in my study area but the mining activities as there are a lot of mines in and around this area. However, the economic needs of the local people who are economically backward are being met to a large extent. Considering the existing Agro-climatic conditions, in future there may be very little possibility for any change in the present land use pattern.

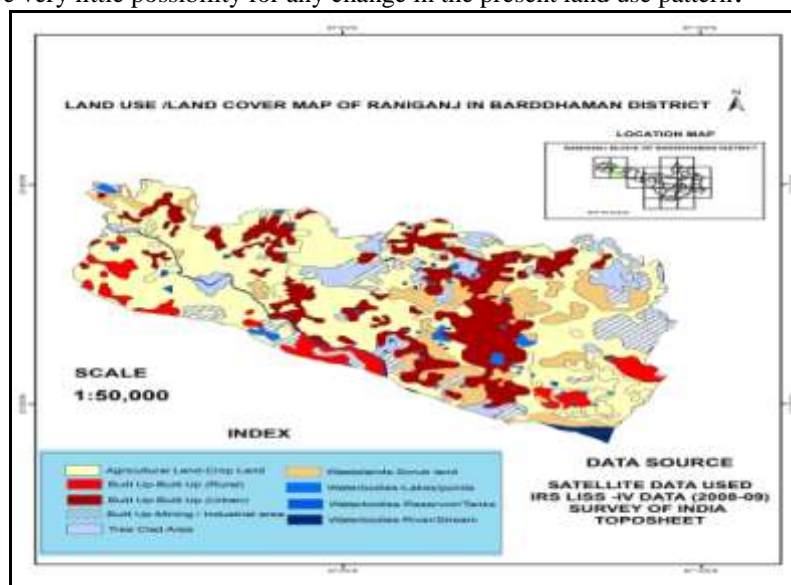


Figure 5: land used /landcover map of the study area

Remote sensing data with its various spectral and spatial resolutions, offers comprehensive and accurate information for mapping and monitoring of land use/cover over a period of time. By analyzing the data of different cut-off dates, impact of coal mining on land use and vegetation cover can be determined.

Land use/ cover map was prepared on the basis of image interpretation carried out based on the satellite data for the year 2009- 2010. Following land use/cover classes are identified in the Raniganj coalfield region.

Feature class	Area(sq.km)
Agricultural Land-Crop Land	50.33
Built-Up Mining/ Industrial area	7.14
settlement	7.8
Tree Clad Area	3.13
Transportation	0.53
Westland-Scrub land Open	0.9
Water bodies- Lakes/Ponds	3.23
Water bodies- River/Stream	0.53

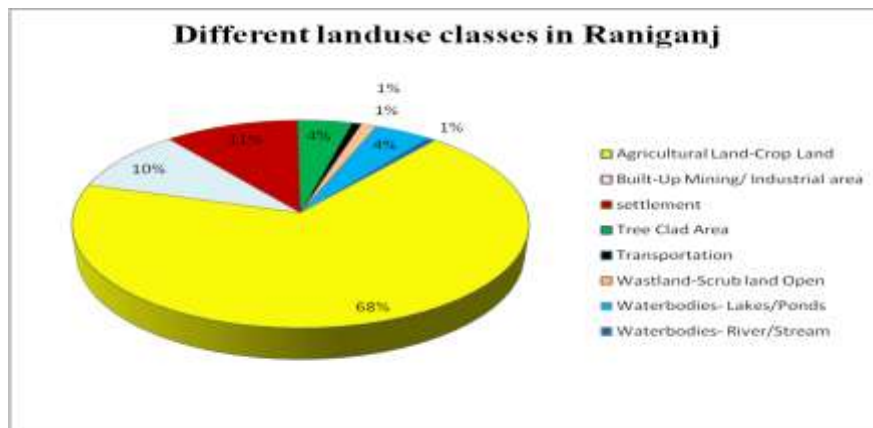


Figure 6: Pie graph showing area of land used /land cover classes

The figure used above is a replica Raniganj in Bardhaman district which represents a land used/ land cover mapping. There are eight classification in the figure, namely Agricultural Land-Crop Land, Built-Up Mining/ Industrial area, Settlement, Tree Clad Area, Transportation, Westland-Scrub land Open, Water bodies-Lakes/Ponds, and Water bodies- River/Stream.

In that region agricultural land crop area holds maximum 50.33 % which other like Built-Up Mining/ Industrial area 7.14 %, Settlement 7.8 %, Tree Clad Area 3.13 %, Transportation 0.53 %, Westland-Scrub land Open 0.9 % , but making water bodies 3.23 % and River/stream minimum area covered 0.53 % recorded finally I have used a Bar graph to represent the classification in a diagram.

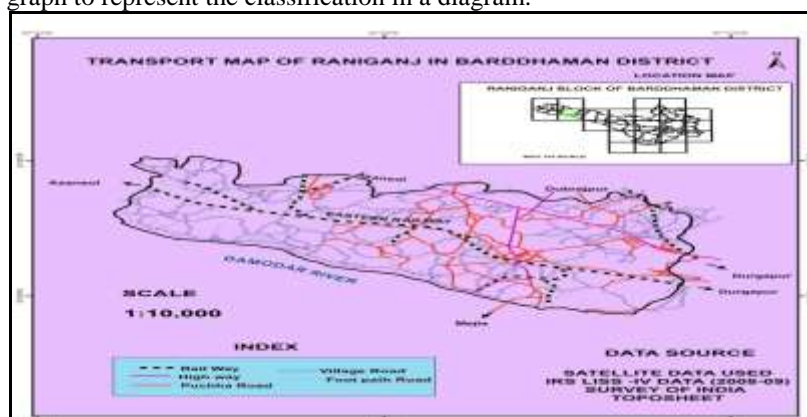


Figure 7: Transportation map of the study area

X. TRANSPORT NETWORK

Here I prepare a transport map. Here mainly found the road transport. To create this map I used the LISS -iv imagery. There showing the connectivity of every each settlement. In this map just found a National High Way (NH2) and beside these found some district road which are also metalled road. There is some village road, this is unmetalled road or kuchha road and some extent of cart track and footpath road found.here a good transportation or road network is created . network is growing to develop these Raniganj area .

The major corridor of the district is a part of the Grand Trunk Road (NH-2), which runs along the entire length of the district from east of west. The total length is 157 km. another important road is Durgapur Express way. The total length is 64.59km, out of which a length of 19 km falls within the district of Bardhaman. But if we see that in Raniganj, there transportation system is better than in district condition. In small places there Eastern Railway connective from Durgapur to Asansol and other hand NH2 road is there

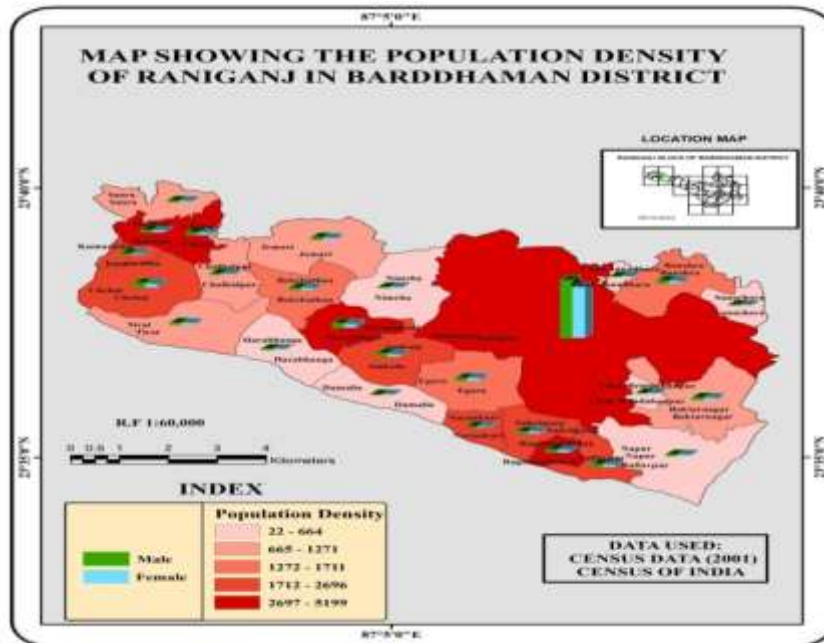


Figure 8: population density map (2001) of the study area

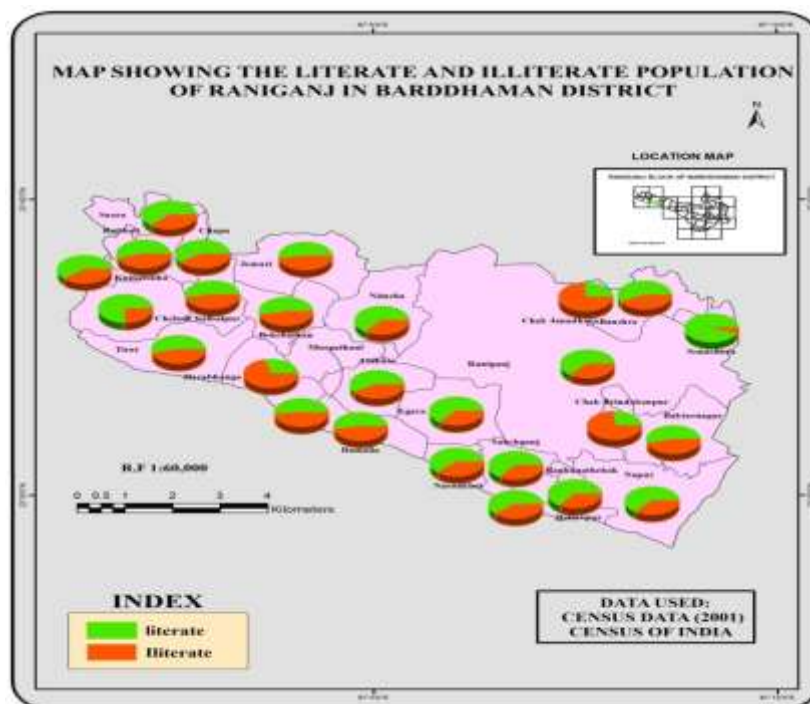


Figure 9: Literate and illiterate map of the study area

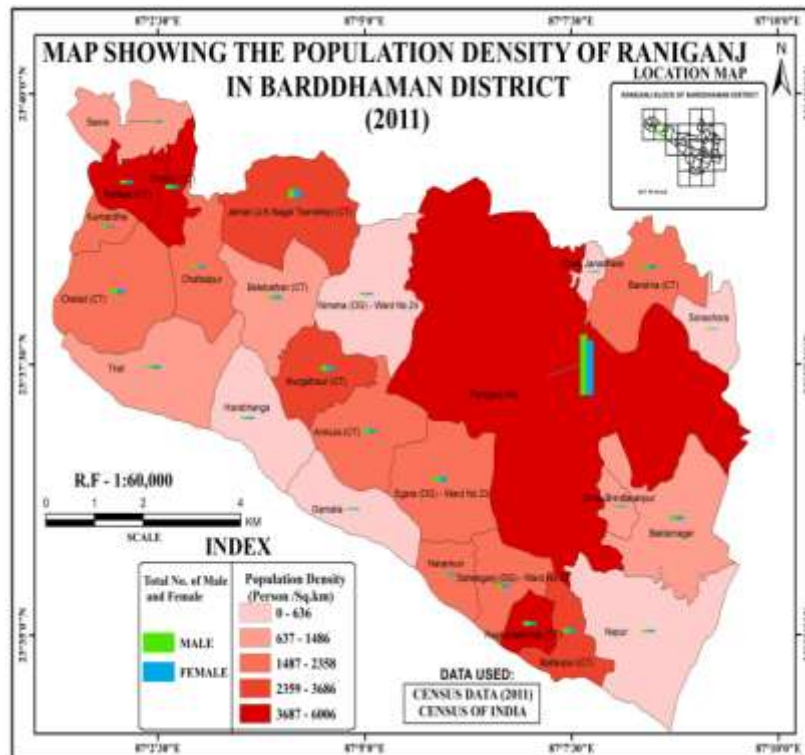


Figure10 : Population density map (2011) of the study area

XI. IMPACTS DUE TO TRANSPORTATION OF THE MINERAL

Impact on existing environment & Local infrastructure

- Major impact is Dust Generation
- Increase in Gaseous Pollutants like SO₂, NO_x Noise Pollution Control measures
- Installation of Dust Suppression System & Regular Water Sprinkling on haul roads
- Proper maintenance of Transportation vehicles
- Checking up for overloading of Transportation vehicle.
- Regular Air Quality Monitoring to check increment of pollutants.

Open cast mechanized method of mining is being adopted with the benching pattern of 6m height x 6m width. It involves deployment of machines like Wagon drill, excavator and development also followed by drilling, blasting, excavation, transportation, communication, sorting, sizing blending and dispatch.

XII. EXISTING MANPOWER

The mine is working with adequate number of management and technical personnel with the anticipated production of next five years. There is scope of further increase in the management and supervising manpower along with the miners and the hazri workers. Including Managerial, Skilled, Unskilled Personnel & laborers.

XIII. LAND DEGRADATION

Open cast mining causes various types environmental pollution. It is predicted that the process of mining have little impact on the existing ecological conditions of the project area. The increase in production in mine and other allied activities in the area shall have additional impact on abiotic and biotic environment of the area (although not significant) various environmental safe guards have been proposed to implement in the form of my study area report.

XIV. ENVIRONMENTAL CONCERNS

Open cast mining causes various types environmental pollution. It is predicted that the process of mining have little impact on the existing ecological conditions of the my study area .The increase in production in mine and other allied activities in the area shall have additional impact on abiotic and biotic environment of the area (although not significant) Various environmental safe guards have been proposed to implement in the form of my study area report.

XV. DESCRIPTION OF THE ENVIRONMENT

Meteorological data have been collected at the pre-defined station located in the study area. Meteorological data such as Rainfall, Temperature, Humidity, Wind speed & Wind Direction have been generated as the primary data. Secondary data on meteorology have also been collected from the nearest station i.e. Keonjhar.

XVI. ENVIRONMENT MANAGEMENT PLAN

☉ Measures for controlling air pollution

Regular water spraying on haul roads. The volume of dust rising from waste dump areas & ore, roads, etc. by action of wind shall be checked by planting grasses and broad leaf trees. Ensuring transporting vehicles not to cross stipulated speed. Exhaust fumes in the internal combustion engines used in excavators, dumpers, dozers and other machinery shall be minimized by ensuring vigorous maintenance and stringent overhaul schedules.

☉ Measures for controlling water pollution

Proper drainage system shall be done within the study site. There will be no effluent discharge from the project site, so the chance of water pollution is negligible. Appropriate measures shall be taken to ensure that the surface water quality in the project area is within permissible limits. Before water is supplied for consumption particularly for drinking purpose it has to be ensured that the water is free from any pathogens.

☉ Occupational safety and health

To avoid any adverse effect on the health of workers due to dust, noise and vibration etc. extensive measures has to be adapted related to safety aspect. Regular maintenance and testing of all equipments & machineries as per manufacturer’s guidelines. Periodical medical examination of all workers by medical specialists shall be conducted.

☉ Socio economic measures

The work, does not involve any displacement of human habitation, hence no habilitation package is needed for displacement. The activity envisages the deployment of local laborers. So, it is likely that the general economic condition of the local people will improve. The peripheral development package will also improve their health and sanitation. Health and education facilities created in the project shall be extended to villagers also. Roads development in the project shall be utilized by the villagers. Providing employment to local people will be the major factors for upliftment of the society.





Figure 11: Photographs collected from different places in the study area.

XVII. RESULTS AND DISCUSSIONS

A rapidly changing economic profile in mineral sector is putting a two-way pressure on environmental and social changes on the ground. This is leading a two way pressure on environmental institution. On one hand there is a growing public awareness demand for better environment management, while the level of non compliance of polluted industries is increasing. Rapid growth in industrial & mineral sector is increasing workload for the environmental regulators to process the application, proper monitoring & enforcing compliance and to respond to large number of public complaints. The ability of state institutions to manage the environmental & social impacts of mining is also lacking.

The study area showing that total coverage of the land like vegetation, forest, mining activity zone and drainage cover area .but deeply see the total area is mining activity .that for the results is show the forest and vegetation land is going to decrease from previous production or planting and also the increased mining activity. Other part of the way is shown that pollution is so much speeded that surrounding area is cover by dust .So the environment is highly polluted and not suitable for habitation. Malaria and other vector borne disease are spreading in that area

XVIII. CONCLUSION

The present study will be very useful in assessment of some change in land use pattern due to mining activity. The change in agriculture and forest land due to this activity will further help in actually finding out the adverse effect on vegetation of the area. This result of study will certainly be helpful in designing the mining or land use management plan and conservation of the study area which is a vital step in ecological planning .The proposed infrastructures facility shall be of use to people of the area. The roads, transportation facilities and rest sheds can be utilized by the community of the area. The revenue of the State Govt. shall be definitely increasing due to the enhanced production. The study area is surrounded by industries from all sides.

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