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A study on impact of opencast mining on environment: case study of Sonapur Bazari, Raniganj Coalfield

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Abstract

Coal is one of the most important sources of energy since industrialization. The extraction of coal through opencast mining has posed a huge impact upon physical as well as cultural and social environment. In recent years, this impact has been a point of concern. The study highlights the general impact of mining operation on environment and society and their scientific remedial measures. Along with it, environmental management plans in the mining area are taken into concern that will minimize the impact of opencast mining over the environment. Sonapur Bazari Opencast mining area of Raniganj coalfield of Barddhaman district is taken under study to assess the environmental and social impact of mining and suggesting adequate measure to combat with this problem.

Keywords: *Opencast mine, Pollution, Human health, Environment, Migration.*

Introduction

The natural resources that the environment provided human from the starting of the civilization has supported it from the ancient time. Coal is the largest fuel source for the generation of electricity worldwide, fulfilling 63% of the electricity demand in India. Extraction of coal through opencast mining has highly impacted the physical environment that needs to be managed through active participation of people and specialist. The surrounding environment (both physical and socioeconomic) is influenced due to different technologies and methods of extraction of coal i.e. Opencast and Underground. Therefore, effects of Opencast coal mining on physical, economic, social and cultural environment of Raniganj coal belt area of Paschim Barddhaman District of West Bengal have been taken into consideration for the present study. In order to study the overall degradation, the best way is to study some selective coal mines as specific study, and for the present purpose samples of collieries are selected from the coal belt to study them in their totality.

Study Area:

Sonapur-Bazari Open Cast Project (OCP) is located in North-eastern part of Raniganj coal- belt in Barddhaman District of West Bengal bounded between latitudes 23°39'58.62" N and

23°42'37.25"N and longitude from 87°12'01.55"E to 87°16'31.66"E. The mining lease area of Sonapur-Bazari is 2293.98 ha.

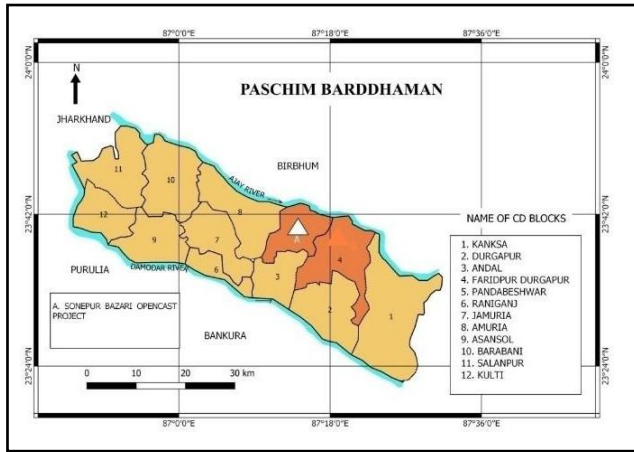


Fig No. 1

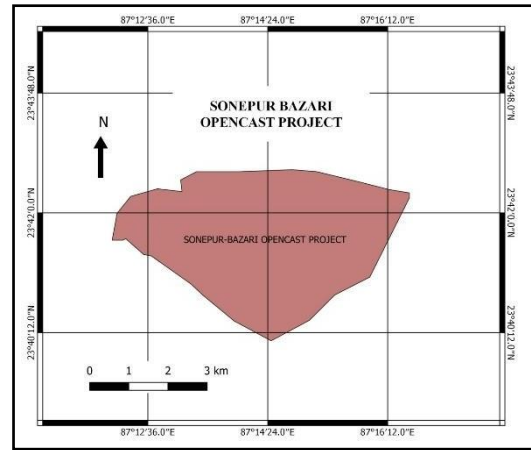


Fig No. 2

Objectives:

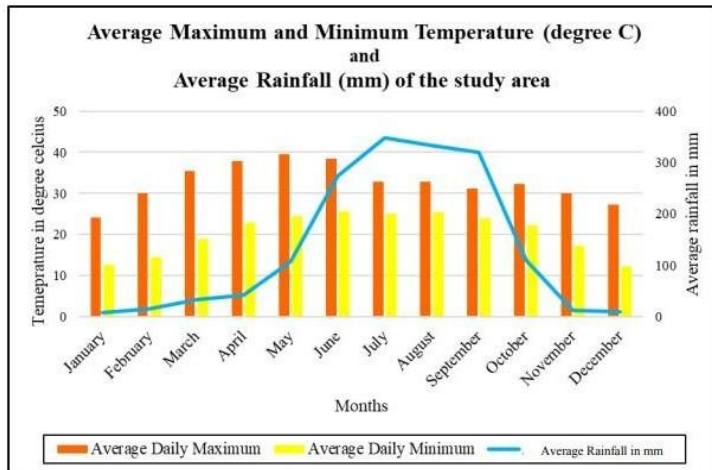
- To study the impacts of OCP on physical environment including land cover. (Air quality. water table and water quality, noise and vibration from mining activities.)
- To study the impact on socio-economic environment including land use of the area.
- To recommend compatible, resilient and environment friendly mitigation measures for a sustainable environment encompassing physical and socio-economic components.

Method:

The work is done in three stages. Collection of data are from secondary sources like websites of Eastern Coalfields Limited, Sonapur-Bazari area, Central Mine Planning and Design Institute, West Bengal Pollution Control Board, Environment and Forest Department, ECL, Census, IMD records, WPCB reports and other reports, literature, maps, imageries etc; preparation of location map, account of study of literature and initialization of design methodology and analysis of the information comprise second stage followed by final creation of content.

Physical attributes of Study Area:

The Raniganj Coalfield is the easternmost depository within the Damodar Basin, which is semi-elliptical, elongated in shape. The study area is an amalgamation of barren, bare rolling plains with scattered hillocks and riverine aggregates of Ajoy and the Damodar rivers. Broadly speaking, the area forms the major part of the convex upland tract of Ajay-Damodar interflue.



Source: Asansol Observatory: IMD

The area under study lies in the humid tropical monsoon regime. The area receives rainfall by South- West monsoon. The average annual rainfall recorded during is about 1554.5 mm. The area being the foothills of the Chhotanagpur Plateau, the soil of this region is primarily lateritic in nature. A large number of species

of Teak, Sal and quickly growing species of Eucalyptus are planted. In Sonepur-Bazari OCP plantation has been done in 105.2 Ha till 2014-2015.

Opencast Mining Open-pit or opencast mining, is the most common surface mining technique. It extracts coal from an open pit in the ground when mineral or ore deposits are found relatively close to the surface of the earth. Benefit of mass production, lower involvement of capital and human resource, lower risk of safety hazards and extensive use of machinery are the remarkable features. But it has a comparatively higher ground footprint compared to underground mining. Decades of unabated coal mining can irrevocably alter the character of an area and that is the story of India's oldest coalfield mining belt. Mining is destroying local ecology and causing irretrievable damage to the environment. It takes toll on air, water, land, land use and land cover, noise level and socio-economic landscape of the area. Mining operation-induced vibration badly impacts the surrounding structural measures, people's physical and mental health. Uncontrolled and illegal mining leads to subsidence, mine fire and so on and so forth.

Discussion and Result:

1) Impact on Air quality:

Ambient air quality of the study area has been assessed by the concentration of SPM, NO_x and RSPM.

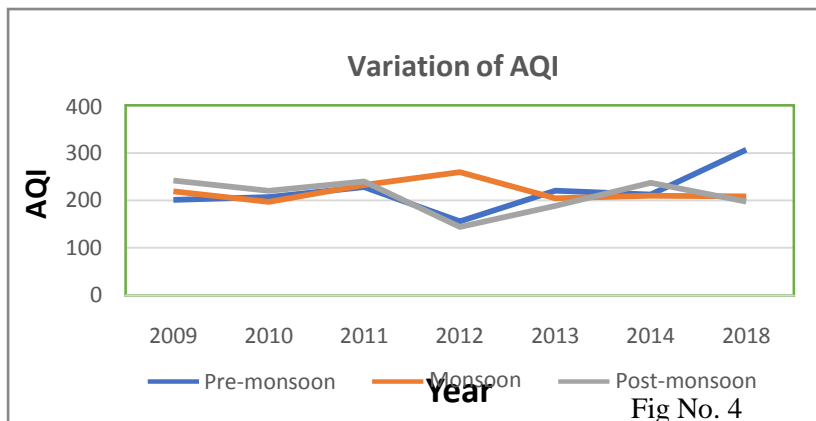
- The concentration of SPM is maximum in the pre-monsoon season for 2013 and in the post monsoon season in 2011. It has exceeded the permissible limit for all the three seasons.
- Presence of RSPM is observed to be highest in the Monsoon season for the year 2009. It remained low for the post monsoon season. It has exceeded the permissible limit for all the three seasons.

- The NO_x concentration has been within the permissible limit for all the three time frames taken together which may be due to controlled burn of the fossil fuel in the area.

The high SPM concentration was due to coal mining and associated activities, transportation of coal on roads (uncovered), coal washery, coal loading and unloading, movement of vehicles on unpaved road. High SPM concentration was also reported due to frequent movement and operation of Heavy Earth Moving Machinery (HEMM)

Air quality Index:

Air quality index of the study area is calculated based on the category stated by CPCB by the



surveyor. It shows that the value of air quality index ranges between 150 to 250. Thus, it computed value of AQI of the study area conforms with the possible health impact like Breathing discomfort with lung disease and asthma on prolonged disorder.

2) Impact on Surface water:

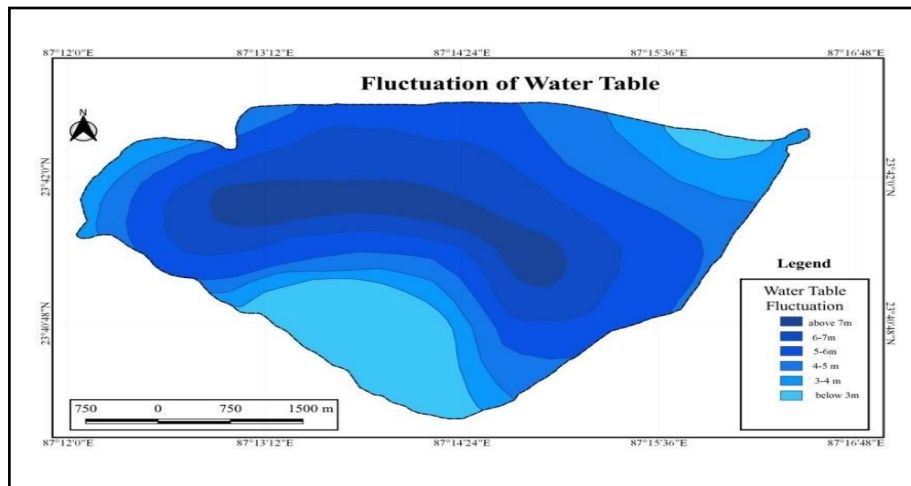
The parameters of the drinking water quality of the Sonapur-Bazari Opencast project are below the Indian drinking water standards except lead. This shows that the drinking water of the study area is not completely pure, but is drinkable to some extent.

3) Impact on Ground water:

Fluctuation of ground water table is observed in the mining area. It is highest in the operational part of the mining area and gradually decreases towards the periphery. But referring to the Ground water Balance of Sonapur Bazari OCP as produced by Hydrology Department, CMPDI, it can be stated that there is a good balance of about 76 million m³ ground water in the study area. Though data about ground water quality is not available but study says that there is deterioration in the quality of ground water.

4) Impact on soil:

Due to drilling and blasting, removal of overburden, loading and unloading and other activities creates a huge impact upon the soil quality. The dust from the soil effects the soil porosity that



hampers the health of soil.

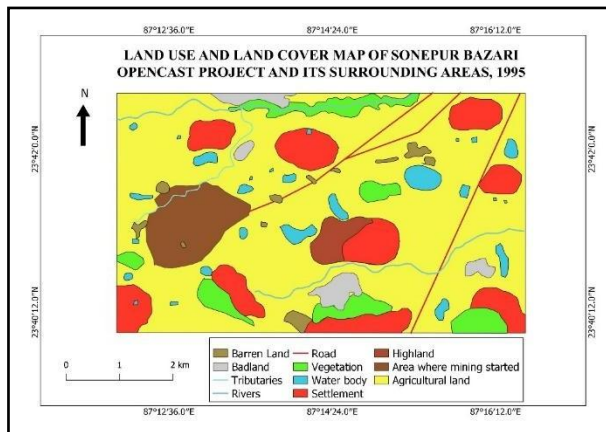


Fig No. 6

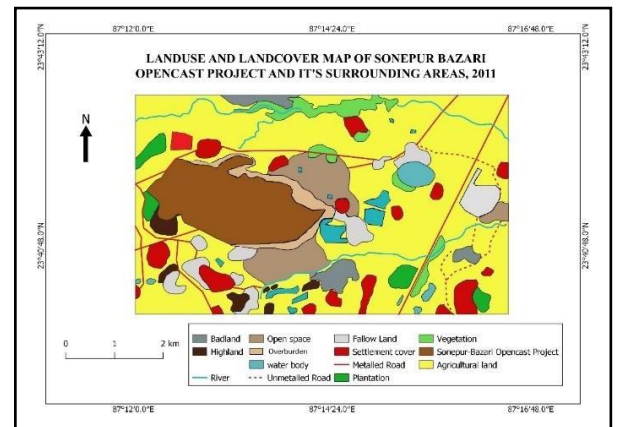


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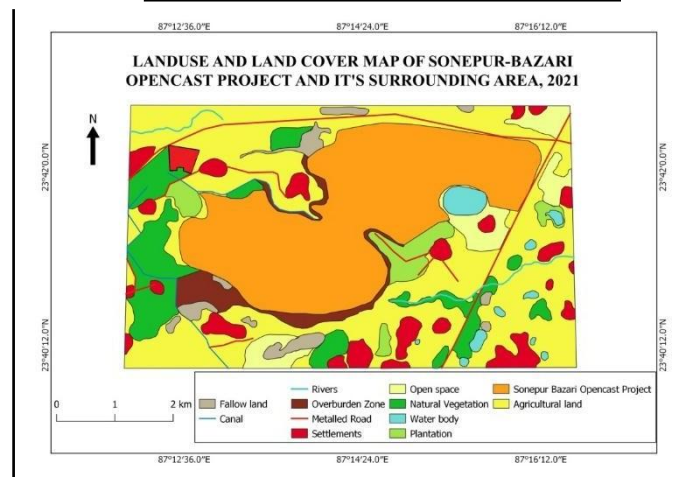


Fig No. 8

Fig No. 5

5) Change in Land use and Land cover

- Environmental degradation in the mining area is reflected by the change in the land use and land cover of the study area and its surroundings. It is found that opencast mining is the biggest contributor to changes in land use and land cover in the region.
- Mining area expanded from 2.38 sq km in 1995 to 7.42 sq. km in 2021.
- Parallely overburden increased to 1.23 km sq by 2021 resembling hillocks and plateaus from distant places.
- Agricultural land has been reduced by 18.66 sq. km in 2021.
- Settlement of the mining area decreased from 1995 to 2011 and ultimately increased to some extent in the recent year. Plantation in and around the mining area increased to 5.98 sq. km in 2021.
- All types of land cover have been decreased drastically except vegetation cover that increased by 2.03km² in 2021 by the initiative of ECL though not comprehensive.

6) Impact on Noise:

- Noise is an occupational hazard. Sound that is harmful for human ears are termed as noise that is emitted from various sources in a mining zone. In open cast mining noise is produced from huge vehicles that are used in transportation, loading and unloading purposes, detonates, drilling activity.
- Though being an opencast mining area, the noise level is within the permissible limit that points towards the fact that the mining in that area involves the utilization of new and improved machineries with silencers and other noise absorbent techniques.

7) Impact on socio-cultural environment:

- Remarkable change in the demographic composition from 2001 to 2011 has taken place in mouzas in and around the Sonepur Bazari OCP.
- Haripur, Nabagram and Hansdiha has been negatively impacted. Whereas the others have shown an increase.
- Hansdiha records 0 population in 2011 that indicates, in between these 10 years inhabitant of Hansdiha has been totally displaced and has been transformed into the core of mining area.
- There is a remarkable increase of population in Kumarkhala that indicates that displaced persons are resettled in this mouza.

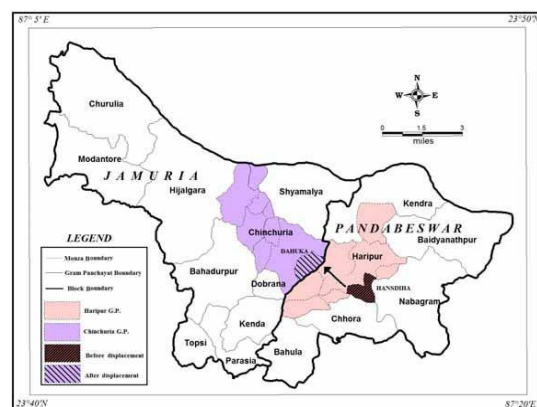


Fig. no.9 Hansdiha before and after displacement

- Opencast mining directly impacts the local inhabitant by mine induced displacement and resettlement. Though it is a physical activity, but it affects the mental health as well as the socio-economic structure of the families.
- This impacts the occupational condition of the people. Being solely engaged in agricultural work, they lack the skill to cope up with the mine workers from adjacent states of West Bengal.
- Income from agricultural products is decreased. Social bonding as well as family structure declines through course of time

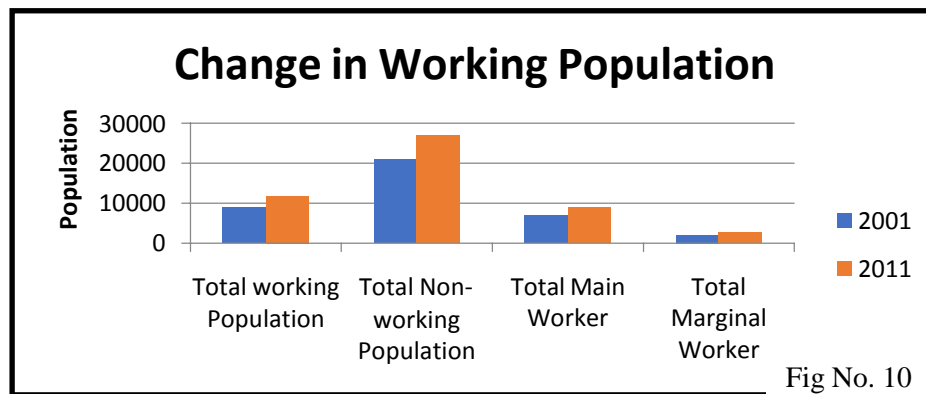


Fig No. 10

Recommendations

Sustainable environmental management plan should be adopted in the mining process.

- 1) In Sonepur Bazari Opencast area, mining machineries should be technologically improved. Sprinklers and water loaded trucks should be used to avoid the mixing of dust in the ambient air during drilling and mining operations.
- 2) In Sonepur-Bazari Opencast Project, sites for overburden dump should be carefully planned. While selecting dumping sites for overburden, serious considerations should be given to topography of the area, drainage systems, water bodies, ground water table, residential areas, etc.
- 3) Tree plantation is necessary to minimize the instability of overburden dumps near the mining area.
- 4) To reduce vibration in the mining area, silencers and noise absorbent machineries should be implemented.
- 5) The displaced population should be given proper training so that they can get at par with the migrant labourers from various states of India.
- 6) As coal mining is responsible for recession of ground water level of the study area, Eastern Coalfield Limited should take initiative to provide drinking water supply through pipeline

to households of surrounding villages especially Sonpur, Bhaluka and Bhatmura.

- 7) Proper initiative should be taken so that actual plantation of trees occur maintaining their growth so that the level of pollutant remains naturally low.
- 8) Training is always necessary for improving the mine worker's efficiency. A low accident rate can be achieved through comprehensive vocational safety-oriented training and education to the workers.

Strengths

- Significant numbers of geo-tourist attractions are present.
- Provision of watching in situ mining activity from within or outside the mine.
- Well-connected to major towns and cities through rail, road and airways
- Pre-existing trails to reach the inner parts of the mine.

Opportunities

- Opportunity to develop mining geo-tourism to expand the local economy
- Opportunity to integrate different types of tourism such as education, heritage and adventure tourism.
- Establishment of an in-situ museum to preserve mining equipment and fossils.
- Building geo-trails connecting important sites within the mine.
- Visitation to the locally resettled villages which were previously within the mine premise.
- Installation of information board explaining geo-features and mining technology.
- Re-recruiting retired miners as tour-guide.

Conclusion:

Despite of various plans and programs taken up by the Government and the planning authority, there has been many loopholes that prohibited complete implementation of necessary measures in the affected area. Till now the mitigation measures taken are not comprehensive, but may be termed as cosmetic.

Acknowledgement:

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