Crucial Factors Influencing Environmental Degradation: A Case Study on Raniganj Coal Mine Belt, West-Bengal India

Subhajit Bandopadhyay
Research Assistant
Indian Institute of Technology Bombay, Mumbai, India

***Abstract* - Environmental pollution is arising from the mining industry in the Western World and from the developing nations is a serious issue in current days. Cross-cultural perception studies are needed to understand similarities and differences, if any, in human response to environmental problems between developed and developing countries. Increasing environmental problems in the mining zones of India is one of the burning issues from last two decades. The Damodar Valley coalfields mainly in Raniganj, share a relatively serious environmental problems. The Damodar Valley coalfields located in the Indian states of Bihar, Jharkhand and West Bengal contain most of the productive coalmines in India. Underground mining, predominantly by board and pillar methods accounts for most of the production for the country.**

***Index Terms* - Environmental degradation, Coal mining, Raniganj coal mine, West Bengal**

I. INTRODUCTION: NATURE OF ENVIRONMENT PROBLEM

Among the multiple adverse impacts of coal mining on the environment, subsidence damages, ravages of mine fires, and air and water pollution are severe in the Lower kenda and very large in the Raniganj coalfield. The fires have pockmarked the coalfield and threaten main railroads and highways in many places.

Acid mine drainage from coal workings and abandoned mines constitutes a serious problem. The effluents from coal washing plants area, the subsidence, which causes loss of agricultural land and damage to surface structures. The extent of land damages due to the caving methods of underground mining without stowing is main issue. The magnitude of mine fire problems form a major pollution source over a many areas. The impact of coal wisterias on water pollution is highlighted by a recent survey, which disclosed that one coal washers alone was discharging about 40 tons of fine coal into the Damodar River each day. The suspended coal particles cause difficulties in water works situated downstream while the deposits of ash and coarse coal particles are having endangered the spawning of fish on the river.

The environmental problems, which are already critical, are being magnified because of the increasing quantum of output, increasing mine size and concentrated production in this area.

The scope of the study includes detailed characterization of exiting status of environment in the study area with respect to various environmental components, viz. Air, Noise, and Land, Biological and Socioeconomic, water components and other parameters of human interest.

II. VARIOUS TYPES OF ENVIRONMENTAL PROBLEMS

A. Air Environment

The range of temperature in winter broadly remains within 7^0C to 15^0C and in summer thetemperature varies from 25^0C to 42^0C. Although, there is a wide variation from year to year, the annual rainfall is around 1300 mm as per data collected (1970 to 1986). Total seven sampling stations have been selected for air quality monitoring on the basis of wind direction and other meteorological parameters. Two air sampling locations have been identified in core zone and five in the buffer zones. The parameters monitored are Reparable Particulate Matters (RPM), Suspended Particulate Matters (SPM), Sulphur dioxide (SO2), Nitrogen Oxides (NOx), Carbon Monoxide (CO) and Lead (Pb).

B. Dust Control

Movement of heavy vehicles on the un-metaled haul roads usually generates a serious dust problem during day and night time. To minimize dust generation, water will be sprinkled regularly on the haul road by the ECL. However, site-specific Precautionary measures will be adopted to mitigate pollutants especially SPM in air.

C. Gaseous Pollutants

Gaseous pollutants like CO, CH4 & CO2 are emitted from the coal yard. Spontaneous heating may also lead to fire in the coal dump releases variety of other toxic gasses like CO. To minimize such gaseous pollutants necessary technological measures will be taken. Not only the lower kenda colliery area but also the total Raniganj coalfield is suffering from a serious gaseous problem.

D. Water Environment

The workers colony and rehabilitation colony will have separate Sewage treatment plant; Sewage treatment works as a menace a facility for treating sewage or human body waste. The treatment works include type of toilet and peak design capacity. The peak design is based on the number of person who would contribute the same quantity of domestic waste. USEPA (United States Environmental Protection Agency) guide line has been considered to work out the average quantity and quality figure for domestic sewage.

E. Ground water conditions/regime

Water levels observed in dug wells in the study area indicate that the ground water depth varies during summer between 4.0 m. to 6.0 m. and 2.5 to 4.0 m during monsoon. Fluid potential fluctuation between the two extreme climates is around 2.5 m.

F. Noise Environment

Noise, often defined as unwanted sound, interferes with speech communication, causes annoyance, distracts from work, disturb sleep thus deteriorating quality of human environment. Noise levels were measured at several locations in the human settlements around the proposed mining site by using precision noise level meter. Detailed analysis of noise has revealed that there is no noticeable impact of noise in the surrounding environment. All the study sites in the residential areas exhibited a noise level well within the corresponding threshold limit value as prescribed by CPCB, both during the day and night time.

G. Land Environment

For the proposed lower kenda underground coal mine, the total area is large, and requirement of land for opening the underground mine is estimated as 34.37Ha. There is some forest landin this area. Some wasteland, agricultural field and forest area have been analyzed for their physicochemical properties. Analysis of soil samples reveals that there is no wide variation in the natural material. Particle size analysis shows that the texture of the soil is of sandy loam in nature.

H. Biological Environment

The core & buffer zone has no endangered floral & faunal species. As, there are several floral species and faunal species area found.

I. Socio-economic Environment

The main occupation of the people in the area is service Industry likely to come up in the study area, welfare facility to be provided by the project proponent etc.

J. Plant Emissions

The stacks are major sources of air pollution from the proposed plant. The proposed plant is to be provided with necessary air pollution control devices like Electro Static Precipitators (ESP), bag filters, dust catchers etc. to control dusts and gases and also limit emission within the prescribed standard. The emission factors, air handling capacity of the proposed installation and emission norm has been used to estimate amount of emission from the proposed plant with the height of emission.

III. PRO-ADVERSE IMPACT

1. *Impact on Noise Environment*- During the normal operation of various plants, boilers, turbines, compressors, crushers, blowers, purging and blow downs, the ambient noise levels are expected to increase significantly with the attributes of the respective equipment, but these noise will be restricted close to the concerned equipment. Therefore all the equipment in the area will be designed/operated in such a way that the noise level shall not exceed 85 db.
2. *Impact on Water Environment*- Most of the local water comes from DVC & by the artificial pond, locally called 'quarie'. The ground water availability and the ground water regime in and around the plant due to the setting up this Area will not be affected. Water & wastewater management & hence no adverse impact is anticipated on nearby water bodies.
3. *Impact on Solid Waste Disposal*- There will be practically no solid waste except SMS slag for disposal purpose. There will be no generation of process hazardous waste, A small amount of non-hazardous waste like used oil & exhausted battery to authorized recycler. Hence there will be minimum adverse impact with respect to solid waste disposal.
4. *Impact on Ecology*- There is little forest cover found in the project site as most of the lands acquired by ECL are either barren or agricultural land. There will not be any further acquisition of land for expansion purpose. So there will be no removal of vegetation cover during the constructional phase. There are no ecologically sensitive area like reserve forests, wild life sanctuary, elephant corridor etc. within the 10 km radius of the site. However, any negative impact the project sites during construction and operation of plants will be compensated by massive green belt plantation in and around the plant sites.
5. *Socio Economic Impact*- The proposed project will have positive impacts on the following socio economics:
   • Employment and Income Effect • Educational Status and Health impact

IV. EVALUATION OF IMPACTS

Majority of activities, which occur during the construction phase have impacts, which are temporary in nature, but the activities during normal operational phase have little or no impacts. In order to have meaningful evaluation, a matrix comprising project activities during construction as well as operation and maintenance phase versus environmental components namely human, biological and physicochemical has been prepared.

V. ENVIRONMENTAL MANAGEMENT PLAN

The establishment of an integrated plan in the study area is going. . Without any pollution control measures & comprehensive environment management plan, the existing environment parameter will be affected and will exceed the statutory limits. However with suitable comprehensive process, these can be alleviated and positive impacts of the development will considerably nullify the negative impact caused by waste generation & environmental degradation.

Some Environmental management plans have been proposed here-

V1. Green Belt Development

Comprehensive greenbelt/plantation program will be undertaken in and around the project. The species selection will depend upon crown shape, surface of bark and leaves, flower, color, capacity of growth in the wide variations of ecological conditions etc. A mixture of soil should be prepared by mixing commercial fertilizer, cow dung, bhc (benzene hexachloride) powder in the topsoil.

V2. House-keeping

- Regular cleaning of plant roads to avoid accumulation of dust.
- Regular water spraying on transportation road to avoid dust propagation.
- Keeping all deducting systems in perfect working conditions.
- Encouraging gardening in township and inside plant and setting up of Nurseries.
- Greenbelt development and maintenance for suppression of noise and Pollutant containment and better.
- Avoiding accumulation and dumping of wastes and damaged equipment and items anywhere inside plant.
- Maintaining hygienic conditions in areas like canteens, near drinking Water & Sources and toilets.

V3. Occupational Health Programs

The occupational health center will be well supported part with pathological & microbiological lab for all vital facts and analysis. In addition it will have a health education & counseling section where one trained health educator will counsel people to adopt healthy practices. OHS will also conduct regular occupational health training programs for employees. Periodic health status of all the employees will be monitored & indexed by a statistics group attached to OHS. A dispensary is set up by ECL for the treatment of the local people & the employees of the lower kenda colliery.

V4. Socio-Economic Development

The proposed plant site has been chosen primarily because of its proximity to the raw material source and infrastructure facilities. The project will have a major positive impact on the state of West Bengal in general and the Bardhhaman (Burdwan) district in particular.

V5. Rain water harvesting

The mine will have sufficiently large capacity sump, which will help in recharging the ground water of the area.

V6. Disaster management plan

Underground mining itself is a very hazardous project due to underground fires, surface fires, inundation, explosions etc. All necessary measures will be provided in preventing any type of disaster during the mine operation. So a proper disaster management plan must be implemented in locality of lower kenda colliery area.

V7. Environmental Monitoring Programme

The scope of environmental management includes plantation, surface drainage, subsidence monitoring and air, water and noise pollution checks etc. For air, water and noise pollution control measures, samples will be collected and tested. So a proper monitoring programing must be held in the study Areas.

V8. Plantation Monitoring

The project authority at field level will continuously monitor the growth and survival/mortality rates of the plantations till the end of 3 years or so. Once trees attain desired growth, no further monitoring will be required.

V9. Health Monitoring

A regular schedule will be programmed for monitoring health of the workers and staff associated with the mining operations and other connected industrial activities for identifying occupational diseases etc. in time and initiating remedial measures. Mobile ambulance will also be used for such programmers to monitor the health of the population around the area.

V10. Mine Closure

Mine closure planning needs to be done before the commencement of mine operation and requires periodic reviewing and modification, if needed, during its life cycle to ensure safety and to cope up with social & environmental challenges.

VI. CONCLUSION

The rate of pollution increases should be checked with an alarming aware ness among the people. The native people on the other hand must be made aware of the consequences of polluting the natural habitat and cultural environment of their own. On the

other hand it is the responsibility of the outsiders to keep the natural beauty of this area intact. Govt. can help to open more number of private shops in each of the area to make the tough condition of collection daily commodities easier for the people. Besides; with Governmental help they can open private shops of their own.

VII. ACKNOWLEDGMENT

The learning of Environmental Geography and its application on real world has been accomplished through the overwhelming support and encouragement from all around. I would like to thank Department of Geography, Visva-Bharati University, Santiniketan, West-Bengal India.

First and Foremost, I would like to thank Dr. Krishnendu Gupta (Assistant Professor) of Visva-Bharati University, Department of Geography to providing me an opportunity to work under his serious guidance, Valuable suggestions, and assistance leads to completion of this work.

I express my thanks to Eastern Coalfields Limited (ECL) and Coal India for providing me the data and permission of work freely for my investigation.

Special thanks to my all masters classmates for giving me lots of supports during my work period.

Last but not least my deep seen of gratitude goes to my beloved parents for their love, support, inspiration and prayers.

Dedicated to the peoples of Raniganj area, who are surviving with these serious issues day by day without a single word, without caring about life.

REFERENCES

[1] D N Wadia, "Geology of India".
[2] R.L.Singh, "Regional Geography of India"
[3] L.S.S., O' Mally, 'Bangal District Guzettery'
[4] Asansol urban area- City development plan, Asansol Durgapur Development Authority (ADDA), May 2006
[5] Akkori Chattopadhyay, 'Bardhaman Jeler Itihas o Lok Sanskriti' (2001)

WEB REFERENCES

[1] www.easterncoal.gov.in
[2] https://www.coalindia.in