

Effect of Mining on the Plants of Asansol Raniganj Coalfield Area of West Bengal

Abstract

Changes in long term environmental conditions due to mining have great impact on plant diversity pattern. Mining is an important economic activity but it creates environmental hazards. Asansol Raniganj Coalfields area in West Bengal, India is endowed with rich biodiversity and is an important mineral resource area with large number of ethnomedicinal plants. But gradually these natural life forms are disappearing due to the impact of climate changes, global warming, environmental pollution, prolonged mining, industrial and urban developments. These natural resources should be conserved and used sustainably to overcome the challenges of environmental changes so that they do not become extinct.

Keywords: Environmental Changes, Mining, Asansol Raniganj Coalfield Area, Pollution, Biodiversity.

Introduction

Asansol Raniganj coalfield area of West Bengal is one of the important coal mining areas of India since eighteenth century. This area is also called as Shilpanchal of Burdwan district. Coalfields in this area represent a part of Eastern Coalfields. Eastern Coalfields are the major coal producing area of the country which caters the prime need of the nation. It is an inevitable fact that nature has made it one of the richest regions of the Earth. Among its various natural endowments, vegetation is the most essential bioresource for mankind. The mines in this area are still operating causing a huge damage on soil, water and air. Mining is an important economic activity of this region but it causes environmental hazards. Coal mining activity disturbs the growth and development of plants and makes the land unfit for cultivation process. Mining creates environmental pollution which affects the growth of flora and fauna. It also causes various types of health and infrastructure problems like land subsidence or downward movement of ground surface in Asansol Raniganj coalfield area. The different operations in mining like drilling, loading, dumping changes the chemical and physical properties of the soil. It removes the developed soil which has nutrients for the growth of the plants and affects seed germination.

Review of Literature

The geological history of Asansol Raniganj can be divided into five periods. These are the Ancient or Precambrian era, primary or Paleozoic era, secondary or Mesozoic era, tertiary or Cenozoic era and recent or Quaternary times. During these geological periods, the rocks of the earth were formed^{1,2}. The active coal mining over the centuries also accelerates the change in the land form in Asansol Raniganj area. This change is made visible on climatic elements especially rainfall, temperature and relative humidity³. In Asansol Raniganj coalfields area mining is running since hundred years back and so human rehabilitation becomes necessary for strengthening the social structure. Loss of biodiversity is an important parameter due to coal mining⁴. Mining in this area is carried out in two methods a) Open cast method and b) underground method. Both the process creates land degradation which affects the plant's growth but open cast mining is more harmful⁵. The issue of land loss and land degradation is considered along with the declining productivity in agriculture contributed by the side effects of mining. During the process of research, the paddy plants were collected from different polluted control sites in the mining areas of Raniganj coalfields. Paddy plants showed considerable accumulation of coal dust and suspended particulate matter, reduction in grain size, reduction in number of grain per spike. The weight size and volume of grain produced of all paddy plants were also reduced⁶. Coal mining is usually associated with the degradation of natural resources and



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the destruction of habitat. Huge quantities of waste material are produced by several mining activities in the coal mining region. If they are not disposed with care, mining degrades the surrounding environment. However, in India, coal companies are working towards "clean coal" strategies, which aim to reduce the environmental impact⁷. The method of waste disposal due to mining affects land, water, air and the quality of life of the inhabitants especially colliery workers, tribal and rural people in Asansol Raniganj coalfield area of West Bengal.

Objective of the Study

To assess the impact of environmental pollution due to mining on the vegetation of Asansol Raniganj coalfield area of West Bengal, India.

Material and Methods

The methodology of the study includes collection of research material through field study and observational methods. Asansol Raniganj coalfield area in West Bengal was selected as the study area as it is one of the most important coalfields of Eastern India. This region in Burdwan district lies in the Damodar Valley region surrounded by Durgapur-Asansol industrial belt. It is bounded by latitude 23° 55' N and longitude 86° 45' E to 87° 20' E.

Results and Discussion

Here, the biodiversity has dwindled under the heavy impact of coal exploration in the area both directly and indirectly. Mining of coal has affected the cultivation of existing vegetation especially ethnomedicinal plants, destroyed genetic soil profile, degraded air quality, altered current land uses and in some areas it has permanently changed the general topography of the area mined. Changing climatic variables relevant to the function and distribution of plants include increasing CO₂ concentrations, increasing global temperatures, altered precipitation patterns and changes in the pattern of 'extreme' weather events such as cyclones, fires or storms. Because individual plants and therefore species can only function physiologically, and successfully complete their life cycles under specific environmental conditions, changes to climate are likely to have significant impacts on plants from the level of the individual right through to the level of the ecosystem or biome. Some of the effects of mining are as follows

1. Release of carbon dioxide and methane, both of which are greenhouse gases causing climate change and global warming. Coal is the largest contributor to the human-made increase of CO₂ in the atmosphere.
2. Waste products including uranium, thorium, and other radioactive and heavy metal contaminants
3. Acid rain
4. Acid mine drainage (AMD) – Breaking of coal and leaching of pyrite of sulphur content from the coal leads to acid mine drainage. Oozing out of yellow sludge, smell of hydrogen sulphide and increase in pH value are some physical symptoms of acid mine drainage⁸.
5. Interference with groundwater and water table levels

6. Impact of water use on flows of rivers and consequential impact on other land-uses⁹.
7. Dust nuisance
8. Rendering land unfit for the other uses especially agriculture and cultivation of medicinal plants.
9. Heavy metal pollution- Traces of heavy metals such as Lead, Zinc, Arsenic and Cadmium etc., are detected in the mine water because of leaching of aquifer and effluent of oil and grease from the underground machines used in collieries during various mining activities¹⁰.

Some plants at risk in Asansol Raniganj coalfield area are

Ipomoea fistulosa Mart ex Choisy, *Adhatoda vasica* L., *Calotropis gigantea* (L.) W.T. Aiton, *Cassia fistula* L., *Rauvolfia serpentina* Benth ex Kurz, *Ficus religiosa* L., *Terminalia arjuna* Wight & Arn, *Euphorbia tirucalli* L., *Hemidesmus indicus* L. R. Br., *Aegle marmelos* (L.) Corr. Serr., *Dillenia indica* L., *Dendrobium pauciflorum* King & Pantl.

Mining is also responsible for groundwater problem. In open cast mining, the mine dewatering drains out due to continuous gravity drainage around the mine with decline in ground water levels. The ground water level in dug wells has significantly decreased¹¹. The fall of ground water level is also due to subsidence of land which has affected the growth of the plants in the study area.

Overburden dumps are usual hazard to environment due to open cast mining which can be seen as hillocks near the mines. The rainwater comes down through the water gullies found on dumps resulting in loosening of the particle and affects the agricultural land. Mine fire causes massive thermal pollution and releases polluting gases and hydrocarbons to the air. Mine fire affects the environment by polluting air, water and land¹².

The various operations associated with coal mining result in the generation of significant amount of dust due to following reasons

1. Open burning of coal for making soft coke is one of the major sources of air pollution in this belt.
2. Removal of top soil and sub soil and their handling.
3. Drilling and blasting
4. Handling of coal through coal handling plants and over burden dumps.
5. Wind erosion from coal stock piles
6. Solid waste disposal
7. Mine fires discharge polluting gases like oxides of carbon, sulphur and suspended particulate matter.

The mine water is contaminated by suspended solids, iron compounds, chloride, acidic sulphates etc. and has high BOD which affects the growth of the aquatic plants in the study area. Nitrate content in the water is high due to the use of high nitrate based explosives used in blasting of overburden rocks¹³. Oil and grease which is produced due to operation of heavy earth moving machines gets mixed with the rivers like Damodar, Ajay and Barakar due to effluents from mine discharges which

disturb the aquatic ecosystem. Water scarcity due to the impact of open cast mining affects the growth of plants in this area. A high level of dissolved solids such as bicarbonates, chlorides and sulphur of Sodium, Calcium, Magnesium, Iron and Manganese are introduced into water while passing through aquifuge and aquiclude which are made permeable due to sagging and industrial usage without treatment. This makes the water hard and unfit for drinking in mines of Asansol Raniganj coalfield area. However, low level of nitrates and phosphates serve as nutrients to algae; rapid growth of which causes deoxygenating of water and the lowering of dissolved oxygen¹⁴.

Majority of mining operations like heavy earth moving machines, deep hole blasting, drilling, loading and dumping are the main source of noise and vibration. They produce noise levels above 110 decibels as against safe limits of 85 decibels. Along with other problems, water logging due to the overburden waste materials from the collieries is washed off the rivulets, choking their movement which affects the cultivable areas.

Coal mining in Asansol Raniganj coalfield area puts great pressure on local flora and fauna. The effect of mining on ground water level, silting of water bodies and land are of great concern. Due to underground mining, the top soil in tensile zones loses its vegetation supporting capability. Coal mining is associated with the degradation of natural resources and destruction of habitat which causes invasive species to occupy the area which poses a threat to the ecosystem. Huge quantities of waste material are produced due to mining and if they are not disposed with care it affects the environment of the region¹⁵. Mining is an important economic activity of this region but it creates environmental hazards. Although both mining and agriculture are primary activities of the people in this region but mining is preferred as it yields quicker returns. However, mining has destroyed the agricultural potential of Asansol Raniganj coalfield area. The effect of mining on groundwater level, silting of water bodies are of great concern. It causes land degradation that affects the development of the plants¹⁶. Coal mining undoubtedly contributes towards the economic development of the nation, but it has great impact upon the growth of the plants. The burning of coal releases harmful substances such as sulphur dioxide, nitrogen dioxide, carbon dioxide, particles of dust and ash. Mining adversely affects the local environment and causes extensive soil erosion, destroys vegetation and alters microbial community. Coal mining also affects the global environment through the release of coal bed methane, which is about 30 times as powerful as a greenhouse gas such as carbon dioxide and affects the air quality standards of the area¹⁷. Mining affects the ecosystem and has great impact on the social, economic and environment of the area. It improves the economic condition by giving employment to the people of the area but the mining region is gradually transformed into an abandoned field which is unsuitable for agriculture. There is massive dust and

noise pollution in surrounding area. A layer of thick coal dust is noted on the leaves of the plants in this region which affects crop productivity. Due to mismanagement and natural heating, sometimes fires may occur in the mines, which results in huge emissions of gases and burning of coal seams.

Mining operation has produced water filled potholes, treeless barren areas due to deforestation. The rate of deforestation has reached an alarming rate due to increased population growth, mining, industrialization, urbanization etc. The non mining activities like burning of coal in open stock, active fires and road transport of the coal have added a new dimension to the atmospheric pollution of the region.

Conclusion

Mining affects the ecosystem and has great impact on the economic, social and environment of the study area. Environmental changes and mining will remain one of the major drives of biodiversity patterns in this region in the future. So, it is important to conduct suitable assessments to understand the impact of mining on vegetation of Asansol Raniganj coalfield area. The impact must be identified at the planning stage and corrective measures should be taken in advance to save the biodiversity so that the ethnomedicinal plant of this region does not become extinct. The agricultural practices have been lost due to infertility of the soil and very low precipitation. Subsidence of land due to mining disrupted the cultivation of crops by destruction of agricultural lands. These lands become unsuitable for all uses unless reclaimed. Afforestation will help to conserve the biodiversity of the Asansol Raniganj coalfield area. West Bengal Pollution Control Board should regularly monitor the activities to reduce the level of environmental pollution in the region. Vegetation barriers should be raised along the contours in the hilly areas to prevent soil erosion. The bank of streams in the mining region should be vegetated to prevent the discharge of sediment into the streams. After mining activity is complete, the land should be rehabilitated for productive uses such as agriculture, forestry and sanctuaries etc. Steps should be taken to adopt preventive measures to save the natural vegetation and environment of the area. Thus, we should all work together to restore the stability of the region due to mining.

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