

Environmental issues of coal mining



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The mining operations like drilling, blasting, extraction, transportation, crushing and other associated activities are carried out in underground and opencast mines. Mining operations damage the environment and ecology to an unacceptable degree, unless carefully planned and controlled. There is a need for balance between mining and environmental requirements. The various impacts of mining on environment and their mitigation measures are as follows:

(I) Impact of Mining on Air Quality

Air pollution in mines is mainly due to the fugitive emissions of particulate matter and gases including methane, sulphur dioxide, oxides of nitrogen and carbon monoxide. Most of the mining operations produce dust. The major operations producing dust are drilling, blasting, hauling, loading, transporting and crushing. Basically, dust sources in mines can be categorized as primary sources that generate the dust and secondary sources, which disperse the dust and carry it from place to place called as fugitive dust.

Opencast mining is more severe an air pollution problem in comparison to underground mining. High levels of suspended particulate matter increase respiratory diseases such as chronic bronchitis and asthma cases while gaseous emissions contribute towards global warming besides causing health hazards to the exposed population.

The uncontrolled dust not only creates serious health hazard but also affects the productivity through poor visibility, breakdown of equipment, increased maintenance cost and ultimately deteriorates the ambient air quality in and around the mining site. The dust can also pollute nearby surface waters and

stunt crop growth by shading and clogging the pores of the plants. Besides polluting the environment, the generation of dust means the loss of fines, which act as road surface binders.

Problem with greenhouse gases, acid rain and ground level ozone The key environmental challenges facing the coal industry are related to both coal mining and the use of coal – greenhouse gases, acid rain and ground level ozone, issues which can be local, regional and global in their impacts.

The greenhouse effect is a natural phenomenon which refers to the increase in the earth's surface temperature due to the presence of certain gases in the atmosphere. There is concern that this natural phenomenon is being altered by a greater build up of gases caused by human activity. This is known as the enhanced greenhouse effect. The combustion of coal, like that of other fossil fuels, produces CO₂, a gas that is linked to global warming through the greenhouse effect.

The combustion of coal produces gaseous emissions of sulphur dioxide (SO₂) and nitrous oxides (NO_x) that are responsible for the production of 'acid rain' and 'ground level ozone'. Acid rain occurs when SO₂ and NO_x gases react in the atmosphere with water, oxygen and other chemicals to form acidic compounds. Ground level ozone (O₃) is mainly responsible for smog that forms a brown haze over cities. Ground level ozone is formed when NO_x gases react with other chemicals in the atmosphere and is enhanced by strong sunlight. Emissions of SO₂ and NO_x are termed trans-boundary air pollution because the environmental impacts from the production of these gases are not restricted by geographical boundaries.

(II) Impact of Coal Mine Fires

A number of coal mines in the country are affected by fires leading to steady destruction of precious energy resource. The reason for mine fires presumably involves the phenomenon of spontaneous heating through two interrelated processes viz., the oxygen coal interaction or oxidative process and the thermal process. If remains uncontrolled, the fire could spread further through interconnected pathways and fissures in the strata. It is estimated that about 10% of total national coal resources are in the fire-affected areas.

Mine fires give rise to several environmental problems besides safety hazards and economic losses. Apart from direct losses due to burning of coal, the other associated hazards encountered are: i) gas poisoning, ii) difficult geo-mining conditions, iii) sterilization of coal, iv) hindrance to production v) explosions, vi) damage to structure and adjacent properties, etc.

(III) Impact of Mining on Water regime

Disturbance to hydrologic regime

Mining and its associated activities not only uses a lot of water but also affects the hydrological regime of the district and often affects the water quality. Large and deep opencast mines usually have great impact on the hydrologic regime of the region. The major hydrological impact of a large and deep opencast mine, however, is on the ground water regime of the region. The water seeping into the mine and collected in the mine sump is

partly used up in the mine and the excess amount is discharged into the surface drainage system.

The water used up in the mine for spraying on haul roads, conveyors, at loading and unloading points, bunkers etc. are lost by evaporation. A deep mine is likely to have longer haul roads requiring more spraying water. The water used for green belts and plantation areas are also lost by evapo-transpiration. . Many areas of the country are faced with the problem of over exploitation of ground water resources resulting in alarming lowering of water table. Therefore a lot of care has to be taken in estimating the water need and the mines of future are likely to be subjected to a lot of constraints on water use and discharge.

Acid Mine Drainage

Acidic water results in severe water pollution problems. Acid Mine Drainage (AMD) refers to distinctive types of waste bodies that originate from the weathering and leaching of sulphide minerals present in coal and associated strata. Environmental effects of AMD include contamination of drinking water and disrupted growth and reproduction of aquatic plants and animals. Effects of AMD related to water pollution include the killing of fish and loss of aquatic life and corrosion of mining equipments and structures such as barges, bridges and concrete materials.

AMD is the most persistent pollution problems in mines of North Eastern Coalfield. Generally, water quality characteristics of acidic mine water reflect high acidity and high hardness along with high iron and sulphate contents. Various toxic trace/ heavy metals become soluble in acidic water and may be

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presenting significant to concentration levels depending upon their availability in the source material. Fortunately the considerable majority of coal mining areas are safe and only in a few localized areas problem of AMD exists. AMD cripples the economy of mines due to compliance of stringent environmental standards and involves huge cost burden in its management.

(IV) Impact of Mining on Land

Irrespective of the type of mining used for extracting coal, mining invariably results in enormous land disturbance- e. g. large scale excavation, removal of top soil, dumping of solid wastes, cutting of roads, creation of derelict land etc. The mining industry, in general, is reluctant to rehandle overburden material for economic reasons but in a few cases it has been planned to rehandle the material to fill the voids created at the end of mining, and it is expected that the practice will become more widespread in future.

Opencast mining has more potential impact on land than underground mining. With improved technology, opencast coal mining is being used extensively because of its cost effectiveness and productivity though it results in large-scale land disturbance. Although underground mining has considerably less impact than opencast mining on land, it causes enough damage through subsidence as observed in Jharia and Raniganj Coalfields. The surface subsidence inflicts severe damages to engineering structures such as highways, buildings, bridges and drainage besides interfering with ground water regime.

(V) Impact of Noise and Vibrations from Mining

A cumulative effect of all mining activities produces enormous noise and vibrations in the mining area, which constitutes a source of disturbance. The availability of large diameter, high capacity pneumatic drills, blasting of hundreds of tonnes of explosive etc. are identified as noise prone activities. Inpit crushing system with mobile crusher and large capacity materials handling plants are being installed to facilitate speedy handling of large quantities. All these activities are major sources of noise & vibrations in and around the mining complexes.

The obvious implication of noise is, of course, the potential for noise-induced hearing loss. 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 effected by noise and it has generally been believed that wildlife is more sensitive to noise and vibrations than the human beings.