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# Impact of Coal Mining on the Environment: An Indian Perspective

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**ABSTRACT:** Activities related to mining, such as exploration, excavation, prospecting, operation, construction, maintenance, abandonment, expansion, and repurposing, can significantly affect the environmental order negatively in many ways, may it be direct or indirect. Mining is a beneficial activity in revenue collection and resource development; it also generates a variety of benefits for society. Nevertheless, it can also change the environmental pattern significantly. India is very subtle to ecological degradation due to irrational mining practices, including climate change and pollution.

**KEYWORDS:** Mining, Environment, Environmental Degradation, Mining Morphosis, Mining Revolution.

## I. INTRODUCTION

Our environment is the total of all the objects, situations, and forces which surround us and by which our activities are governed. Humboldt has described the earth as an inseparable whole – “We are naturally led to consider each organism as part of the entire creation and recognize in the plant or animal, not merely an isolated species, but a form linked to other forms either living or extinct.” The balance of nature is dynamic rather than static and is ever-changing, and the presence of man has caused much change in this regard. Since ancient times the impacts of the environment of human behavior have been major concerns of scientists. Aristotle has also supported the view that physical features, mainly climate, determine the state of health, mind, occupation, and behavior of men. Later on, came the concept of ‘man modifying nature and nature modifying man.’ The interaction between the two is very intricate and it becomes difficult to know when one influence starts and other stops.

## II. DETERIORATING MAN ENVIRONMENT RELATIONSHIP

The man and the environment share a very close and intimate bond. However, this relationship is also continuously evolving and changing. It is a matter of serious concern about how humans have artificially affected the environmental processes, which has, is, and is expected to cause a wide range of harms and a variety of problems on the local, regional and global levels soon. It is quite evident as to how man has been fighting and competing for food, energy, money, and minerals in the past, which was also the main reason and the prime theme behind the Industrial Revolution which severely affected the biological, chemical, physical and even the social environment up to a great extent (refer to Figure 1 Different Activities of Coal and Environmental Disturbances). Therefore, the Environmental Preservation is a topic of great importance and is also greatly emphasized mainly because of the growing ecological imbalance and pollution

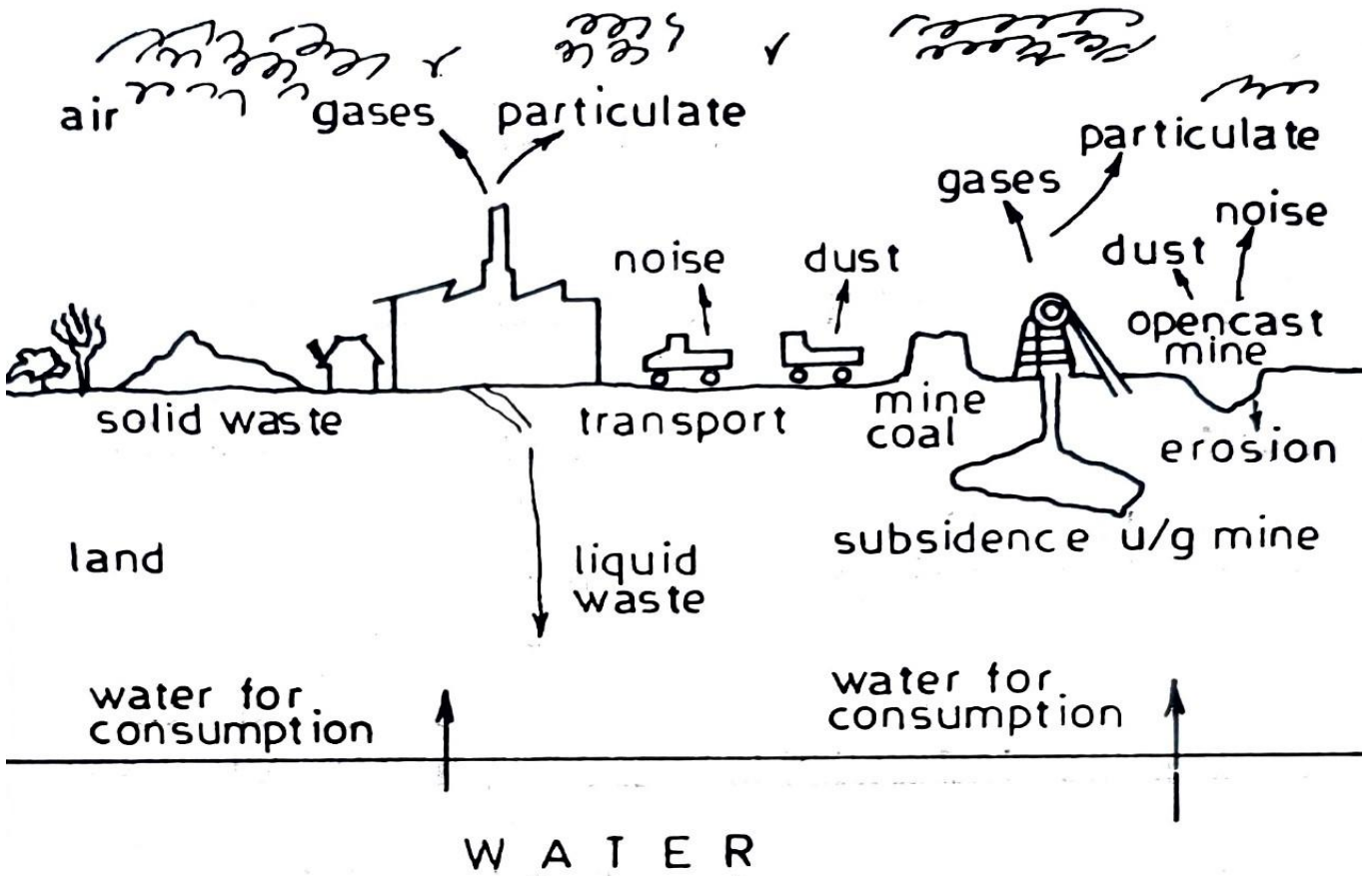


Figure 1: Different Activities of Coal and Environmental Disturbances (Source: National Workshop on Environmental Management of Mining Operations in India- A Status Paper at BHU, Varanasi, India)

The developing and developed countries are causing inopportune, adverse, and hostile effects on the environment by their growth generated activities in different forms by using their sophisticated and advanced technologies.

For instance, if we talk about the overexploitation of the resources, the man has always been greedy to be dominant in terms of money, power, and resources which is quite evident by the fact that he has been exploiting the resources both to meet his requirements and also to export the material and has unknowingly disturbed the resources and the ecology drastically. Thus, it has degraded the environment to a very large extent.

It is the need of the hour to encourage research on the problems related to urbanization, industrialization, and the chaotic use of modern technologies to get rid of the damaging and adverse impacts of the environmental system. We often hear that weak and emerging countries often face environmental problems, generally due to the lack of resources and their development. However, it is also true that the development also causes much more problems with even more



effects.

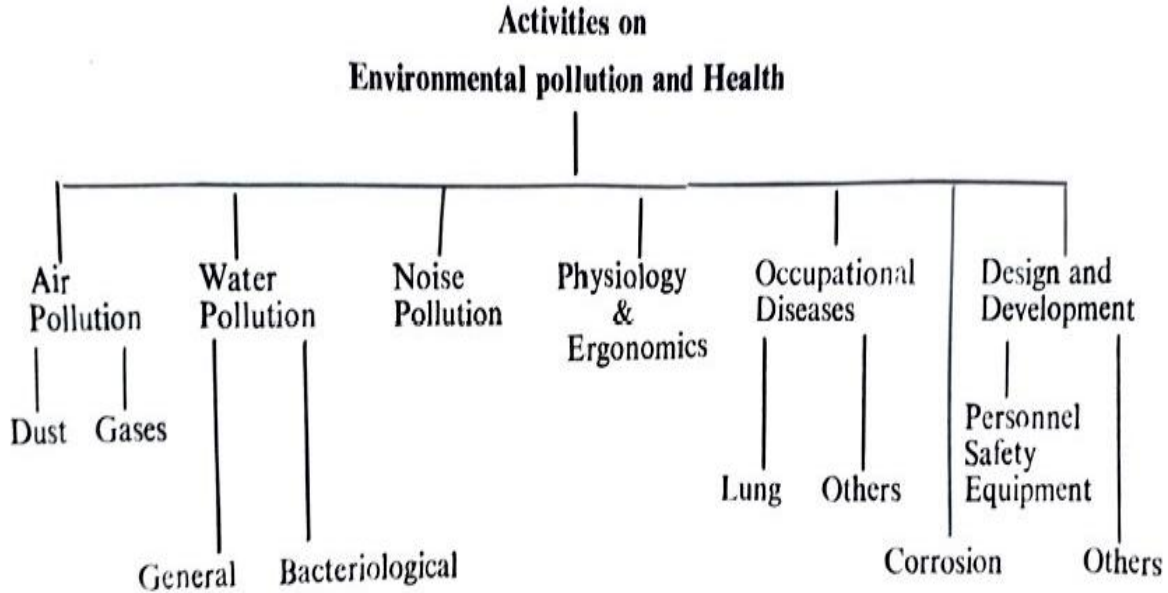


Figure 2 Activities on Environmental Pollution and Health

(Source: National Workshop on Environmental Management of Mining Operations in India- A Status Paper at BHU, Varanasi, India)

From this perspective, it is important to note that a rapidly exploding economy such as India, where most of the attention is focused primarily on opencast coal mining, industrialization appears as the major source of technological hazard by contaminating the environment (refer to Figure 2 Activities on Environmental Pollution and Health) (by excessive emission of smoke, dust and hazardous gases), the hydrosphere (through harmful effluent being discharged into the water bodies without being treated properly), and the lithosphere (through improper solid waste and effluents disposal). There are a lot of environmental hazards caused by the mining industries and the utilization of coal, which are extremely difficult to classify and characterize.

This rapid exploitation of coal resources due to the increasing demands is now affecting the man-environment relationship. Moreover, the quality of the atmosphere is also deteriorating at the same pace.

### III. ENVIRONMENTAL DEGRADATION AND DIMENSION OF PROBLEMS

Studying pollution in India began very late, and presently, it is a problem that cannot be ignored. Concern regarding air quality (refer to Figure 3 Parameters of Air Pollution) was addressed by international scholars, with Fedrov (1983) bringing into focus that CO<sub>2</sub> was released into the atmosphere when fuel was burnt, raising the Earth's equilibrium temperature, a phenomenon we today refer to as the greenhouse effect. Thus, pollution, specifically pollution related to mining and coal usage, is not a contemporary problem. Coal is (still) being used in large amounts and even now serves as the 2nd highest energy fuel after oil. A 2011 estimate reports U.S. power plants emitted half of the nation's mercury air pollutants. Traces of pollutants from coal are found to be higher in developed countries. However, then again, the spot for the countries which mine the highest amount of Coal is occupied mostly by developed (and rich) countries. Acid rain, which was first discovered in the 1850s, is one of the problems arising due to Coal Usage.

Another prominent example is the Great Smog of 1952, which killed more than 4000 people in London was primarily due to the usage of Coal in Power Generation and Transportation. In India, about 97,000 people died from pollutants due to Coal usage (2019 Lancet Countdown). The problem does not just stop at water and air. A lesser-known fact is that Coal fired plants contribute to nuclear radiation too. Like any other substance on Earth, Coal contains traces of 40K, 238U, and 232Th and their decay products. Coal leads to radiation exposure in its 3-step fuel cycle: Mining, Usage of Coal, and fly ash. In opencast mining, the entire ecology is exposed to the radiation from the



particles trapped when the Coal is extracted. Coal power plants and usage of Coal in household activities lead to the release of the radiation particles in the air.

Many reports estimate the amount of radiation released from Coal powered plants to be 100 times more than nuclear power plants. Coal ash, which is almost 13% of the total coal content, is used for fertilizer, cement, and road stabilizers. Flyash contains almost six times more  $^{238}\text{U}$  and  $^{232}\text{Th}$  than normal soil does, but contains almost similar amounts of  $^{40}\text{K}$ . All these factors mandate the requirement for proper monitoring, which is still absent in India. equilibrium temperature - A phenomenon we know as Global Warming.

#### IV. COAL AND ENVIRONMENT

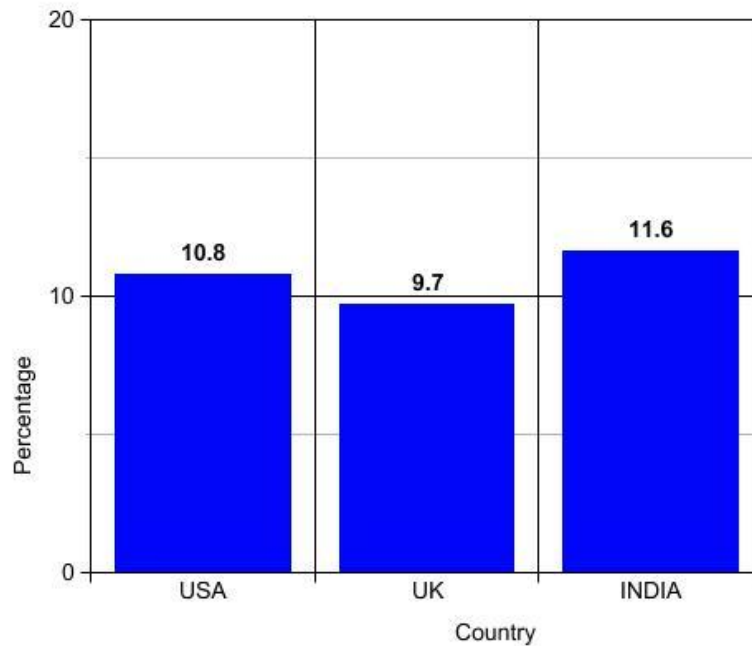
Coal is one of the most stable and efficient forms of energy. Nevertheless, its exploitation is very deeply associated with some of the most significant environmental problems. On the one hand, if there is a need to expand the coal mining industry, on the other hand, there is also a great need for environmental management plans, research, and assessment to tackle the consequences of its indiscriminate usage on our rapidly decaying environment.

The strategies to deal with different environmental problems are directly proportional to the nature and degree of those problems. For instance, we can have good control over the quality of Air if we are well educated about the meteorological conditions. Different departments should be made with good training, education, and facilities to formulate policies like the 'Air Prevention Act' and 'Control Bill, 1981' to tackle different issues related to the environment. Mass movement should be started to make different people from different walks of life aware of the types of pollutions, their causes, and potential effects on them and the environment as a whole. Different policies as a controlling measure should be proposed to minimize the pollutants from different industries. Large power plants must be fitted with Flue gas scrubbers with advanced technologies to reduce pollution.

Literature shows that in the last few decades, people have started to take the issue of Man-Environment relationship seriously and minimize the harm caused to the environment due to chaotic human practices. Different programs have also been started such as- "International Biological Program" (IBP: 1964-74), "Man and Biosphere (MAB) Programme, 1970", "Scientific Committee on the problems of the environment (SCOPE 1969)", "U.S. National Environment Policy Act (NEPA, 1969)", "Global Environmental Monitoring System (GEMS)", "Global Atmospheric Research Programme (GARP)", "Monitoring and Assessment Centre (MARC)", "Scientific Committee on Problems of the Environment (SCOPE 1969)", "U.S. National Environment Policy Act (NEPA, 1969)", "Global Environmental Monitoring Systems (GEMS)", "Global Atmospheric Research Programme (GARP)", "Monitoring and Assessment Centre (MARC)" etc. In India – "The National Committee on Environmental Planning (NCEP, 1972)" and "Department of Environment (DOE, 1980)" have emerged, which have shown some exponential results.

These programs must be supported massively by all the Industrial Sectors to minimize pollution's causes and effects. In this context, intellectual and intelligent ideas should be taken from professionals of various disciplines such as Geology, Geography, Ecology, Oceanography, Economics, Meteorology, and Environmental Engineering to develop efficient models. It is of utmost importance to manage pollution hand in hand with the development of Mining processes in an area. Therefore, the planning of economic provisions must be done accordingly.

It is true that coal mining is a dangerous activity, and many thousands of coal miners have died in accidents. As many or more have died from the effects of coal on the lungs of miners (refer to Figure 4 Percentage of Coal Miners suffering from Pneumoconiosis). Although, mine safety has greatly improved in recent years, but deaths from accidents are still in the thousands each year.



1. Proceedings of Sixth International Pneumoconiosis Conference 1983,  
 2. NCB Annual Report 1970-71, 3. Environmental Pollution in Mines  
 and Mining Areas & Miner's Health

Figure 4 Percentage of Coal Miners suffering from Pneumoconiosis

Coal is always associated with methane. Laws govern the safe management of methane, open pit mines and deep mines, wherein they are supposed to be drilled and vented before and after their time as a productive mine. The methane is supposed to be captured and flared or used commercially, but that is an imperfect process. It pales in comparison to the leakage and loss of methane from fracking for oil and natural gas. However, it is an impact.

Coal is seldom pure coal. In many cases, coal and rock come out of the ground together, and vast heaps of waste rock, often with enough coal to be combustible, exist everywhere that coal mining has ever happened. These tailings can also be sources of the acid runoff.

We should include the fact that coal plants with scrubber systems use limestone to capture and neutralize the sulfuric acid in coal combustion emissions, whenever we talk about common pollutants in coal mining. This results in scrubber sludge (it comes out of the power plant wet because of the water used in the process), which is a very large volume. The two largest coal power units in Ohio at the Gavin plant were scrubbed in the early 1990s. They are nearing the end of their expected life, and have created a pile of sludge which is the same volume as the distance between the U.S. Capitol and the Washington Monument, to the buildings on both sides of the Mall, 800 feet deep. Fortunately for the plant owners, the land surrounding the plant has hundreds of pre-reclamation strip mines, and just one large hole was large enough for this scrubber waste. It is acidic, although not much compared to the bottom ash from a plant like that, and laced with toxic metals and chemically active particles.

Coal is a major pollutant and carbon producer that leads to global warming. This is likely to have major environmental effects in the future. The effects of coal mining in the past have been accompanied by the human population and industrial growth that has many natural environments.

One effect noted by naturalists was the change of color of butterflies in coal polluted areas. For instance, white species of butterflies changed to black ones. They were possibly adapting camouflage to changes in the environment.

Though coal is not very toxic, burning of such large amounts of it means heavy metals and radioactive material are pumped into the air. Coal power stations produce more radioactive waste into the atmosphere than most nuclear



reactors, mainly because nuclear plants have strict limits on radioactive emissions. In contrast, coal plants do not need to have radiation restrictions.

The primary impacts of mining on the environment are-

1. Mining requires the clearing of large parts of the land. Often, the area is completely deforested.
2. Along with deforestation, mining activities require transportation facilities. Construction of roads can cause serious habitat fragmentation.
3. The noise caused by mining activities contributes to immense noise pollution in the vicinity.
4. Dust coming from mine sites can cause air pollution.
5. The dust from mine sites can seriously affect vegetation around the area by coating the leaves and preventing air exchange. The plants can even be suffocated to death due to this.
6. Open-cast mining is more dangerous to the environment than deep mining because huge amounts of land and soil are excavated. This causes the loss of precious soil.
7. Land degradation goes hand in hand with mining because the land used cannot be used for anything else for many years to come.
8. The waste products of mines (called mine spoils) are dumped in a place nearby. These spoils are often toxic and can cause serious water pollution, groundwater contamination, kill soil organisms, cause biomagnification, etc.
9. After mining is over, the land is left as barren land.

#### V. CONCLUSION

To formulate development objectives, knowing the type of mine (underground/open cast), annual production, number of coal seams to be worked, and requirements for coal preparations. For a correct formulation, all the information is required, including those for the exploration methods, site geology, coal grade, and potential future leases. Also, data is required regarding the thickness of the mine cover, and if mining is sustainable in the site for more than 20 years. Town planning and infrastructure development plans are also required and, in fact, made based on the information obtained. Also, other facilities like schools, hospitals, communication equipment, and transportation facilities are laid out, depending on the mining's longevity. Thus, the environmental effect of Coal Mining is not just limited to the mine but also depends on the impact of the supporting facilities for the workers, their families, and more.

With the Mineral laws (Amendment) Bill having been passed in the Upper Legislature, private companies would now be moving in the scene. This mandates for regulations and recommendations, which benefits not only the environment but also the companies from corporate greed. One of these is making the surrounding roads sealed, i.e., covering the roads with bitumen. This will help reduce dust levels, increase the longevity of the machine tires and the roads. Besides, monitoring has to be beefed up by setting a weather station, monitoring pH level, record dissolved solids in groundwater, and have data for a comparison for both normal, dry and wet weather in the region. With the advancement of satellite imagery, most of the weather of a mine and surrounding mines can be recorded economically. In addition, on the ground, close inspections can use drones and other automated robotic methods.

In the case of habitation for mining workers and their families, the possibility of a city developing (which is a common positive effect) also must be considered. Due to this, not only will the pollution from the city have to be taken into consideration, the pollution like dust and noise levels which are normally flouted must be rectified. The best method, of course, remains to have a green cover around the mine, which solves the problems of dust, noise and helps increase the greenery.

Having adequate water available for various purposes is very important. An estimated 250 liters of freshwater is required per tonne of coal. In addition, more water is required for coal washing if the coal is not of very high quality. This usage of water for machinery and coal washing creates much-wet refuse, which has to be disposed of carefully because not only does it contain heavy particles, it also may be poisonous. In addition to this, the surrounding housing situation has to be taken into consideration as the water discharged can contaminate the drinking water and may also be toxic enough that it cannot be used even for gardening without proper treatment first.

After mining, i.e., after the mine has been exhausted, the area has to be treated properly by re-growing vegetation and help restore the ecological balance. Besides, rehabilitation will take place, and flora and fauna must be restored in a form that is not dependent on human contact/intervention. This is why maintaining information on environmental data, including soil type, flora, and fauna, and others must be done before the process of mining is started.



**REFERENCES**

- [1] Arvill, R. and Arvill, R., 1976. Man And Environment. Harmondsworth: Penguin Books.
- [2] Brubaker, S., 1972. To Live On Earth. Man And His Environment In Perspective. The Johns Hopkins Press.
- [3] D'Monte, D., 1985. Temples Or Tombs?. New Delhi: Centre for science and environment.
- [4] Detwyler, T., 1971. Man's Impact On Environemnt. New York: McGraw-Hill.
- [5] Duprey, R., 1968. Compilation Of Air Pollutant Emission Factors. Durham, N.C.: U.S. Department of Health, Education, and Welfare, Public Health Service, Bureau of Disease Prevention and Environmental Control, National Center for Air Pollution Control.
- [6] Hamilton, D., 1973. Technology, Man And The The Environment. London: Faber and Faber.
- [7] Leopold, L., Clarke, F., Hanshaw, B. and Balsley, J., 1971. A procedure for evaluating environmental impact. Circular,.
- [8] Rai, K., 1993. Environmental Issues In Mineral Resource Development. New Delhi: Gyan Pub. House





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