ENVIRONMENTAL MITIGATION AND MONITORING PLANS ON COAL FIELDS IN INDIA: A REVIEW PAPER

Varun Yadav[1], Nitin Rajput[2]

[1]PG Student, Department of Civil Engineering, HBTU, U.P, INDIA
[2]Assistant Professor Department of Civil Engineering, HBTU, U.P, INDIA

---***---

ABSTRACT- *The goal of this research is to give an overview of the challenges associated with particle generation and emission in the mining industry. It contains all of the basic definitions and categories for particulate matter. Dust management, safe working methods, and current research trends are among the more technical issues covered. This report summarises the major elements affecting the environment in coal fields, such as air, water, soil, and noise pollution. These environmental consequences result in the loss of clean land for the construction of recreational amenities, degrading the area's beauty in the process. To achieve preventive and control, mitigation measures and appropriate working practices are employed. In addition, research contributes to a better knowledge and evaluation of solution technologies. The concerns that develop throughout the construction and operational phases of open-pit coal mines in India are examined in this paper, highlighting the difficulties that exist in the Indian context.*

Keywords- Coal fields, Mitigation, Monitoring, Environmental Mitigation and Monitoring Plan (EMMP),

1. INTRODUCTION

Environmental Monitoring is used to verify the influence of each project on the environment during Environmental Impact Assessment (EIA) investigations. Mitigation strategies are in the works. Measures, as well as management activities such as monitoring, are all part of an effective EIA system. Global warming, air pollution, water pollution, and soil contamination are all major concerns these days as a result of coal mining.

Air pollution on coal fields is mostly caused by blasting and drilling, wind erosion from multiple landfills, motor traffic, and coal burns. Erosion from overburden dumps, which increases the sediment load in streams, lakes, and ponds, as well as acidic mine fluids and tailing pond leaching, all contribute to water contamination. Soil quality is impacted by the loss of top soil due to opencast mining, the dumping of overburden material, and the deposition of coal dust due to wind erosion. Apart from that, opencast and underground mining, as well as the construction of coal-related businesses, have a direct impact on the environment (including crops in agricultural land).

Negative outcomes can be mitigated to manageable levels in many circumstances by carefully designing and implementing effective mitigation techniques.

2. LITERATURE REVIEW- Since 1774, India has been mining coal, and it is now the world's second-fastest miner, producing 716 million metric tonnes (789 million short tonnes) in 2018. India's coal reserves were 315.14 billion metric tonnes in 2017. (347.38 billion short tonnes). India's Coal Capital, Dhanbad, is the country's largest coal producer.

Coal India, which was nationalised in 1973, had a monopoly on coal mining from 1973 to 2018. India's industries used 968.25 MT of raw coal in 2018–19, up 7.76% over the previous fiscal year. The main consumers of coal are the electricity generation industry (637.95 MT), the steel and washery industries (69.50 MT), the sponge iron industry (12.23 MT), and the cement industry(8.82MT).

Due to rising demand and poor average quality, India must purchase high-quality coal to meet the needs of steel mills. India imported 73.26 million metric tonnes (0.08076 billion short tonnes) in 2009–10, up from 235.24 million metric tonnes (0.25931 billion short tonnes) the previous year. The most coal reserves are found in eastern and south-central India.

Jharkhand, Odisha, Chhattisgarh, West Bengal, Madhya Pradesh, Telangana, and Maharashtra account for 98.09 percent of India's total known coal reserves. As of March 31, 2019, Jharkhand and Odisha had the most coal deposits, with 25.88 percent and 24.76 percent, respectively.

3. DEFINITION

3.1 MITIGATION-

Mitigation is the execution of actions to remove, minimize, or counteract the negative environmental effects of project operations. At the lowest cost, mitigation has the potential to save and restore the most valuable environmental resources.

3.2 MONITORING-

Environmental monitoring refers to the methods and procedures used to observe, characterize, and establish environmental characteristics in order to correctly measure the influence of a given activity on the environment.

Environmental monitoring's major goal is to manage and reduce the impact of an organization's actions on the environment, either to assure compliance with laws and regulations or to decrease the risk of detrimental impacts on the natural environment and preserve human health.

3.3 ENVIRONMENTAL MITIGATION AND MONITORING PLAN (EMMP)-

Environment mitigation and monitoring plans is a document that outlines the mitigation measures and monitoring procedures for project activities.

The EMMP purpose is to present and describe the project's objectives, activities, strategies, and responsibilities, as well as to reduce any negative consequences and improve positive ones.

4. OVERVIEW AND MITIGATION STRATEGIES-

4.1 MITIGATION INCLUDE-

1. Keeping the impact at bay.

2. Limiting the degree or magnitude of the action to reduce the impact.

3. Repair, rehabilitate, or restore the harmed environment to mitigate the impact.

4. Over time, reducing or removing the impact.

5. Replacing or supplying substitute resources or environments to compensate for the damage.

4.2 MITIGATION STRATEGIES-

Avoidance, reduction, and remedy are the three established measures for impact mitigation. The effectiveness of each is directly proportional to the stage in the design process at which environmental factors are incorporated (i.e. impact avoidance can only be considered at the earliest stage, while remedy may be the only option available to fully designed projects).

4.2.1 Mitigation by Avoidance-

The fastest, cheapest, and most successful method of impact mitigation is to avoid it. Environmental effects and alternative considerations were taken into account from the beginning of the project design process.

4.2.2 Mitigation by Reduction-

This is a frequent method for dealing with unavoidable consequences. It focuses on the emissions and their consequences. As a result, this is seen as a less long-term, but nonetheless effective, strategy.

4.2.3 Reducing the Effect-

This technique aims to stop pollutants, side effects, and trash from entering the environment. It keeps an eye on them and keeps them under control to ensure that acceptable criteria are not surpassed. Wastewater treatment, air emission filtering, and noise attenuation are just a few examples.

4.2.4 Reducing Exposure to the Impact-

This method is utilized when an impact occurs over a large, indeterminate area. Noise, visual effects, and danger exposure are examples of such effects. The mitigation is accomplished by erecting barriers between the likely receptors' location(s) and the source of the impact (e.g. sound barriers, tree screens or security fences).

4.2.5 Mitigation by Remedy-

This is a method for dealing with residual affects that cannot be avoided from entering the environment and causing harm. Remedy aims to alleviate existing problems by carrying out additional work aimed at restoring the environment to a state that is close to its prior state or a new equilibrium.

5. ENVIRONMENTAL IMPACTS AND THEIR CAUSES IN COAL FEILDS-

Environment Parameter	Cause/activity in mining field	Pollutant	Impact of mining activity and pollutants
AIR	Blasting, Drilling, Wind erosion from Over burden dumps etc. Loading/unloading of coal, Erosion from coal heaps, Transport through conveyor belts , Coal fires, Burning of coal in industries	Suspended particulate matter, Respirable particulate matter, Oxides of nitrogen and sulphur, CO, CO_2, Greenhouse gases like CH_4, Heavy metals.	Decrease in amount of sunlight, decreased photosynthesis as dust settles on leaves, acid rain, health problems, greenhouse effect, formation of smog due to photochemical reaction.
WATER	Erosion from over burden dumps, drainage from mining sites, acid mine drainage, effluents from coal related industries	Sediments and soluble components, acidic waters, heated effluents, effluents containing heavy metals	Increase in TDS in local water bodies, alteration in drainage pattern of local streams, lowering of regional water table, pollution of local streams with acids.
SOIL	Wind erosion from over	Coal dust and fly ash	Complete loss of topsoil

	burden dumps, spoil heaps and dried tailing dumps, use of heavy machinery for extracting coal, loading and unloading of coal, burning of coal.		and vegetation, soil pollution as dust and fly ash settles on land, baking of soil due to fire below making it biologically sterile .

6. EMMP (Construction & Operation Phase)-

Construction Phase		
Activity	**Environmental Impact**	**Mitigation Measures**
1-Emission from construction vehicles and machinery	Decrease of ambient air quality and adverse health impacts.	Vehicles delivering dust-emitting building materials should be covered. Tarpaulin sheets should be provided to trucks transporting sand to protect the top and sides of the trucks. All construction trucks must meet air emission regulations and be properly maintained. When utilising fuel for construction trucks and machinery, the quality of the fuel should be good.
2-Dust generation due to material handling, operation of construction equipments, movement of construction vehicles and construction activities	Deterioration of ambient air quality and adverse health effects on construction workers	Water sprinkling should be done on a regular basis during the building period. Monitoring of air quality should be done in accordance with the Environmental Monitoring Plan. A sufficient stack height will be supplied for releasing emissions from the DG sets that will be used for building power on a limited basis. Roads should be well-maintained to provide for easy and seamless vehicle traffic.
3- Surface runoff from the construction site and labor sheds.	Deterioration of water quality of community water sources.	There should be no labour camps or other heavy machinery near water bodies. There should be no discharge from such establishments onto neighbouring water bodies. Debris dumped in or near water bodies must be avoided at all costs. Waste products must be collected, stored, and disposed of in a scientific manner. Water quality testing should be done on a regular basis.
4- Disposal of construction wastes,	Soil contamination results in	The construction waste will be

sewage on land.	infertility of the soil	used to level the road and pave the driveway. The topsoil that has been excavated will be used in the landscaping. No sewage or other waste disposal waste on the ground. Soil quality monitoring should be carried out on a regular basis

Operation Phase		
1-Operation of D.G. sets	change in ambient air quality and noise quality	The generators will run on low-sulfur fuel. For D.G. setups, acoustic enclosures must be provided. For pollutant dispersion, sufficient stack height will be given for generators. Personnel working in close proximity to noise sources will be given ear muffs or plugs. A green belt will be created that will act as a noise and pollution absorber.
2-Vehicular movement inside the campus.	change in ambient air quality and noise quality	Reducing the speed limit for vehicles on campus. Internal roadways will be appropriately maintained to allow for unfettered vehicle movement. The restoration and maintenance of a roadside tree planting is required. Separate Entrance and Exit. Pedestrians have their own path. Parking is plentiful, with an additional 10% set aside for guests.
3-Sewage generation	Affect land and water bodies if not properly disposed.	Sewage will be transported to the sewage treatment facility from the various buildings. The sewage treatment plant's treated water will be used for green belt development, toilet flushing, and home functions.
4-Solid waste generation	Affect land and water bodies if not properly disposed	Waste will be separated and collected in a proper manner. Solid garbage will be collected and separated into different categories. Organic waste is transformed to manure with the help of an organic waste converter, while inorganic trash is recycled. The non-biodegradable solid wastes are sold to vendors, and the waste is transported in

		vehicles that are securely covered to prevent spills.

7. CONCLUSIONS-

For supplying our energy demands, coal is the most significant fossil fuel. Due to the ever-increasing demand for energy, attempts are being made to extract it. Coal is becoming increasingly popular as a low-cost energy source. Coal mining has long been associated with serious environmental repercussions. Coal mining has a direct effect on geo-environmental parameters as air, water, soil, agricultural lands, flora, LULC, and landforms.

This study found that doing environmental impact assessments in mining sites with a combination of field measurements and expert opinions can be advantageous. Depending on the nature, origin, and seam arrangement of a coal deposit, the mining procedure utilized on the site differs. These elements determine the cumulative effects of coal mining on the ecosystem. Many successful strategies for reducing the level of damage or addressing various environmental difficulties caused by mining were discussed. However, not all of the processes are universally applicable. As a result, the current study provided a comprehensive evaluation of the coal mining environment, associated damages, and global preventive, mitigation, and repair strategies. Overall, the current study demonstrates the application of appropriate global methodologies to design successful coal-field-related measures.

8. REFERENCES-

1. Jabrinder Singh, Naveen Singhal, Shailey Singhal, Madhu Sharma, Shilpi Agarwal and Shefali Arora, "Environmental Implications of Rice and Wheat Stubble Burning in North-Western States of India", January 2018.

2. Luis Enrique Sánchez & Amarilis Lucia Casteli Figueiredo Gallardo, "On the successful implementation of mitigation measures", 20 Feb 2012.

3. HIREN B. SONI, V. VIJAY KUMAR and PANKAJ N. JOSHI, "Environmental Impact Assessment and Environmental Management Plan: A Case Study of Kachchh, Gujarat, India", Published by Enviro Research Publishers, ISSN: 0973-4929, Vol. 14, No. (1) 2019, Pg. 99-127.

4. Varinder Saini, Ravi P. Gupta and Manoj K. Arora," Environmental impact studies in coalfields in India: A case study from Jharia coal-field", 2015 Elsevier Ltd.

5. Chapter 14 – Summary of EIA Mitigation & Monitoring Measures, Clay Farm, Phase 2, Ballyogan Road, Dublin 18 Environmental Impact Statement.

6. ENCAP FACTSHEET ENVIRONMENTAL MITIGATION & MONITORING PLANS (EMMPs), US Aid, Review DRAFT: 22 July 2011.