

## Chapter 16

# Impact of mining on plant biodiversity and environment: a review

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**ABSTRACT:-** A review of the impact of mining on plant biodiversity and the environment was made. In which an endeavor has been made to include important work related to the impact of mines on plant biodiversity and the environment. The impact study of mines in and around the globe with special emphasis on the impact of mining in India and in the state of Jharkhand has

been reviewed. The ecosystem and plant biodiversity are significantly and in a variety of ways impacted by mining activities. The effects include loss of habitat, deterioration in soil quality, tainted water, air pollution, and exposure to hazardous chemicals. Plant species are displaced by habitat loss and fragmentation, which reduces biodiversity. Topsoil disruption and exposure to contaminants cause soil degradation, which hinders plant growth. Runoff containing pesticides and heavy metals causes water contamination, putting aquatic habitats and plants in peril. Plant health is impacted by air pollution because it interferes with photosynthesis and metabolism. The reproduction and growth of plants are at risk from exposure to harmful substances. Due to mining activities, endemic and uncommon plant species are more at risk of



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going extinct. The restoration of mining sites is attempted through reclamation and rehabilitation, although full ecosystem recovery is still difficult. To reduce these negative effects, protect plant species, and maintain the integrity of the environment, sustainable mining techniques and conservation efforts are essential.

**Keywords:** biodiversity, mines, India, Jharkhand, pollution, fragmentation, contamination, reclamation, rehabilitation

## **INTRODUCTION**

Mining is a significant economic activity that has the potential to contribute to the development of economies. However, simultaneously it has environmental and health effects surrounding communities. This has been a major concern for the government, policymakers as well as the scientific communities. It is evident that the contributions of mining activities to the economic development of the nation are well acknowledged, others contend that the gains from the mining sector to the economy are achieved at significant environmental, health, and social costs to the country. The research revealed that mining activities have resulted in land degradation leading to limited land available for local food production and other agricultural purposes. In addition, there is pollution, which has affected mainly water resources as well as agricultural land. Air and noise pollution are also apparent in the area.

## **MATERIALS AND METHODS**

The available literature about the impact of mines on plant biodiversity and the environment was reviewed. The impact of mining in some parts of the globe was referred to and compiled in order to make a review of the impact of mining. Only a few literatures were available regarding the impact of mining in the globe which were available before have been referred to in the current review. The impact of mining in the Indian scenario has been also referred to in detail. The maximum effort has been given to include the impact of mining on biodiversity and the environment has been dealt with in detail about the state of Jharkhand. The combined effects of environmental problems due to mining have culminated in health problems with high frequency of diseases like malaria, respiratory tract infections, and skin diseases. As far as the impact of mining is different, workers have done concerned lot of work.

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## **MINING: REGULATIONS AND CHALLENGES**

Talking about the National Mineral Policy<sup>1</sup> Government of India Ministry of Mines explains that minerals are a valuable natural resource and are the vital raw material for core sectors in the economy. Extraction, exploration, and management of minerals need to be guided by national goals and perspectives and to be integrated into the overall Strategy of the economy of the country's development. Efforts shall be to enhance domestic industry, import reduction, and promotion to make in India initiative. Natural resources, such as minerals, are a shared inheritance, where the State is a trustee on behalf of the people and hence it is very important that the allocation of mineral resources be done in a fair and clear manner to ensure equal distribution of mineral prosperity to subserve the common good. Mining is required to be carried out in an environmentally sustainable way keeping the participation of the stakeholders and devolution of Benefits to the persons affected by mining considering the overall objective of maintaining a high level of trust between the stakeholders. It should also be ensured that environmental regulations are conducive to ease of doing business with simple, transparent, and within-time-bound procedures to obtain clearances. As mining contributes considerably to state revenues, there is a need for competent regulatory mechanisms with high penetration of e-governance systems in order to prevent illegal mining. Mining contributes considerably to employment generation, in this way, there should be a keen focus on gender sensitivity in the mining sector at all levels. Efforts shall be made to establish a unified authority at the national level for mines and mineral development and co-ordination to fulfill the objectives of this policy. Jharkhand is a mining place (2017)<sup>2</sup> according to IBEE, Jharkhand is one of the richest mineral zones in the world. The state boasts of 40% and 29% of India's mineral and coal reserves, respectively. With 25.7% of the total iron ore (hematite) reserves, Jharkhand ranks second among the states. During 2015-16, the total iron ore (haematite) reserves in the state were recorded to be 4,596.621 million tonnes. Jharkhand accounts for 20-25% of the total steel produced in the country. During 2015-16, the state produced around 20-25% of total steel produced across the country. The government targets to increase steel production in the state from 14.9 million tonnes in 2015-16 to 25 million tonnes by 2017-18. Jharkhand is

the sole state in India to create coking coal, uranium, and pyrite. Jharkhand is also a Leading producer of coal, mica, kyanite, and copper. Stroh *et al.* (2009)<sup>3</sup> observed that the negative effects of metals were more pronounced on native soil plots in relatively undisturbed conditions, it shows that elevated metal concentrations affect floristic quality where no other human disturbance is evident. However, even at highly disturbed sites on mine waste, higher Zn concentrations are associated with decreased floristic quality. This case study demonstrates decreased floristic quality above Eco-SSLs (United States Environmental Protection Agency (USEPA) Ecological Soil Screening Levels) for Pb and Zn, and nearly all mine waste plots exceeded these thresholds. This suggests that even if mine waste were otherwise equivalent to native soils, elevated metal concentrations on mine waste would likely be associated with decreased floristic quality. Reviews on the environmental impact of some of the workers are summarized here; important among them are Mahalik and Satapathy (2016)<sup>4</sup>, who worked on the environmental impacts of mining on biodiversity of Angul - Talcher open mining site, Odisha, India: Biodiversity sustains human livelihoods and life itself. Mahalik and Satapathy (2016)<sup>4</sup>- EIA of mining on biodiversity of Angul - Talcher open cast mining area, Odisha, India: Biodiversity sustains human livelihoods and life itself. They were of the opinion that mining has been on the rise in this area for the last few decades covering huge belts of land and ultimately harming the forest cover.

#### **IMPACT OF MINING ON VEGETATION AND DIVERSITY**

Sharma (2005)<sup>5</sup> has studied the impact of coal mining on vegetation in the Hills district in Meghalaya, He explained the substantial damage to landscape and biological communities due to Mining. He also narrated that Plant communities are disturbed by the mining activities and following the mining, the habitats become poor presenting a very meticulous condition for its growth. Kiro *et al.* (2017)<sup>6</sup> assess the impact 2 of activities mining on tree diversity at Limestone and Dolomite mining area - BSLC mines, Biramitrapur, Odisha, because the area of Biramitrapur was very rich in forest, wildlife, and minerals. Widespread open mining has relentlessly damaged the forest and the situation of the area. They studied the vegetation of undisturbed and disturbed sites of BSLC mines, Biramitrapur, using the typical quadrant

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method. Goswami (2017)<sup>7</sup> studied on Impact of Coal Mining on the Environment of Raniganj and Jharia Coal Field in India he explained that Coal mining adversely affects the ecosystem as a whole. Further, they narrated that unrestingly humankind continuously uses a variety of resources for their day-to-day life. The geological condition determines the method of mining. Coal mining is usually linked with the dilapidation of natural resources and the destruction of the habitat. This results in the invasive species taking up the area, resulting threat to biodiversity. Vast amounts of waste materials are generated by a number of mining activities in and around the coal-mining region. If utmost care is not taken in regard to waste disposal, the mining process will degrade the immediate environment. The waste disposal processes affect water, air, and land and the quality of life of nearby people as well. Effect of activities of Mining on vegetation Composition and nutrient status of forest soil in Benue Cement Company, Benue State, Nigeria. They explained that mining is an essential component of the economic development plan for any country gifted with mineral resources. This study has indicated that tree diversity was higher in the adjacent site and also that soil 5 km away from the factory site was healthier than soil within the factory site. Maiti, Shee and Ghose (2007)<sup>8</sup> worked on the Selection of plant species for the reclamation of mine-degraded land in the Indian context realizing the fact that opencast coal mining in India is leading to serious air pollution. They describe the role of 'green belts' while checking the dispersion of air pollutants in surrounding areas. Nelson (2009)<sup>9</sup>, described Adapting to Climate Change: A Guide for the Mining Industry. According to (Frelich, 2014)<sup>10</sup>, mining is been identified as one of the chief environmental impacts on boreal forests worldwide, because widespread presence of ancient rock formations that contain metallic ores. Lloyd *et al.* (2002) prepared a report on the Australian Centre for Mining Environmental Research (ACMER), as part of the Australian regional Mining, Minerals and Sustainable Development (MMSD) project which addresses,

- (1) the impact on the biodiversity of the minerals industry,
- (2) how the modern minerals industry manages its impact on biodiversity,
- (3) the potentiality for enhancing practices of industry to protect biodiversity,

(4) Opportunities for indigenous communities to help the minerals industry in managing biodiversity.

Mary Beth Adams (2017) worked on *The Forestry Reclamation Approach: guide to successful reforestation of mined lands*. Lee (2014) who worked on forest and terrestrial ecosystem impacts of mining explains that the ecological footprint of mining activity extends well beyond the area directly impacted. We can divide the footprint of mining into primary and secondary areas. Primary Footprint is the area that is directly impacted due to the mine, processing, and available rock crushing facilities, Tailings areas, buildings, roads, parking areas, as well as energy transmission network built to accommodate the mine as well as workers. The secondary footprint comprises the adjacent areas of mines affected by mining activities and results in the landscape change that may propagate changes in ecology for various distances. This includes items such as fragmentation, changes in forest type, changes in the migration of wildlife, habitat use patterns, light, noise, windblown dust, dispersal among invasive species established towards the mine area, and areas along watershed affected by the withdrawal of water and mine drainage. Holmes (2003), worked on *Mining and Critical Ecosystems: Mapping the Risks*, he explained that like many natural resource sectors, the hard rock mining (metals and precious stones) industry has been under considerable pressure in recent years to improve its environmental and social performance. The financial and reputational costs of mining in sites that are environmentally or socially susceptible are high for both natural resource companies and the companies that insure and finance them. Church *et al.* (2007)<sup>11</sup> worked on *Effects of Mining on the Environment – A National Overview* according to them knowing the geology of the mine site is critical to understanding the environmental impact of mining at any given site. Singh and Singh (2002) explain Plantations as tools for the restoration of mine spoil because of large-scale damage to natural areas due to the operations of mines; a restoration strategy is required as a part of the complete mining management plan. In restoration, emphasis is to be given first to build up Soil organic matter, Nutrients, and Vegetation Cover to speed up the natural recovery process. Tree plantations may be used as a tool for mine spoil restoration as they have the capacity to restore fertility soil and Ameliorate Microclimatic Conditions.

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Patrik Söderholm Project group (2014), Environmental Aspects of Mining presented a report, which forms an integrated part of a larger feasibility study on mining and sustainable development performed at Luleå University of Technology in 2014. The report comprises a review of literature prior to and ongoing activities connected to mining and environmental sustainability, which are further subdivided into the three main topics as, explained:

- (1) National and international environmental objectives, directives, and legislation,
- (2) National and international initiatives, and
- (3) Academic research.

A major aim of the report is to identify gaps in knowledge that indicate important topics for future research on mining and sustainable development. The report is limited to metal mining (excluding uranium mining) and includes environmental issues related to acid mine drainage, circumneutral mine waters, and aquatic-terrestrial linkages in areas affected by mining and dust/airborne emissions. The report focuses on water, soil, and air quality issues in the local-regional surroundings of mine sites. Thus, questions concerning for example mineral reserve management and issues of a more global nature such as energy consumption and climate effects are not included. The report identifies research gaps judged as critical for improved environmental impact assessment of mining. There is a need for more in-depth case studies to clarify the biogeochemical and ecological footprint and environmental sustainability of mining. State-of-the-art analytical techniques and modeling software should be used to study emissions, transport distances, attenuation mechanisms, and ecological effects in the receiving waters downstream of the mine. Studies of environmental sustainability should be integrated with parallel studies of the economic and social sustainability of mining in the same area. Kumar (2013)<sup>12</sup> worked on the mining activity and its impact on plant biodiversity: A case study at Bhiwani open cast mining zones-Haryana, India, he explains that mining is a destructive activity generated by human beings for providing strength and security to the Living standard. The mining area in the concerned zones provides raw materials in the form of crushers, stones; gravel, etc. for use in infrastructures like the construction of roads, railway lines, etc. Since the last few years, the

mining rate has increased several-fold. It is resulting in the loss of biodiversity of both plants and animals and physiographic features of the concerned region. Once the mining operation in the concerned areas is over, the sign of the same lie for decades and maybe everlasting. It creates so many environment-related problems and health hazards. During the study, mining impacts on plant biodiversity at six sites have been evaluated. At the whole site, ninety-six different species of plants of herbs, shrubs, and trees belonging to thirty-six families and eighty-eight genera were identified.

The whole site was considered biodiversity-rich and has the great threat of loss due to mining and its related activities. Gupta and Singh (2017), worked on impacts of coal mining: a review of methods and parameters used in India. This review presents a systematic synthesis of the various methods and measures that have been used to investigate the effects of coal mining in India. 5 Results indicate that research concerning pollution of air, pollution of water, land use patterns, and environmental impacts are best represented at the same time as soil, forest, and human health are very poorly represented. Changes in land cover have experienced a quick Surge however; studies on socio-economic and human health impacts are extremely few in numbers. Maximum studies used laboratory as well as remote sensing-based techniques. For a genuine and thorough interpretation of the impacts of coal mining, it is quite important to understand the direct and far-reaching environmental and social consequences of coal mining. This piece of writing identifies the areas that are well documented and primarily it emphasizes the sites that needed further research in the Indian scenario.

Geelani *et al.* (2013)<sup>13</sup>, Mining and its impacts on the environment with special reference to India explained that Mining is the extraction of valuable minerals or geological materials from the earth, usually from an ore body, vein or coal seam materials recovered by mining include bauxite, coal, copper, gold, silver, diamonds, iron, precious metals, lead, limestone, magnesite, nickel, phosphate, oil, shale, rock salt, tin, uranium, and molybdenum. Adjei (2007), explained the impacts of Mining on Livelihoods of households of Rural people.

A case study of farmers in the Wassa Mining Region, Ghana. Radical reforms and liberalization in the mining sector of the Ghanaian



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economy stimulated an increase in mining sector investment with new multinational mining companies coming on board as well as the rehabilitation of old mines. The cumulative effect was the intensification of mining and the expansion in the operation of mines across the mining zones in the country. The livelihoods, of households in the rural communities in the catchments of the mines were threatened by the expansion of concessions to the mining companies. Pradeep S, Mehta (2002), worked on The Indian Mining Sector: Effects on the environment and FDI inflow. Yeboah (2008)<sup>14</sup>, explained the Environmental and Health Impact of Mining on Surrounding Communities: A case study of Anglo gold Ashanti in Obuasi he explained that mining is viewed as one of the important economic activities, which have the potential to contribute to the development of economies. 30 At the same time, the environmental and health impacts of mining on surrounding communities have been a major concern to governments, the public, stakeholder organizations, and individuals. Whereas the contributions of mining activities towards the economic development of Ghana is well recognized, Others contend that the gain from the mining sector towards the economy is well achieved at Significant environmental, social, and health costs to the country. Geelani *et al.* (2013)<sup>13</sup> Mining and impact of mining on the environment with special reference to India. Sloss (2017), worked on environmental and other effects of coal mining and transport he narrated that coal mining is associated with damage to natural landscapes and the rise and fall of the mining communities that grow up around mine sites. However, the sector has grown and most mining companies now act with forward planning and responsibility to minimize potential negative effects on mining land and, in some cases, to leave behind a positive legacy. The study addresses the effects on the environment of coal mining and associated transport, reviewing the possible environmental impacts arising at all steps of the coal chain.

Chimange (2009), worked on one Landless - Impacts of mining on the environment and local population. In the case of Bumbuna and Lunsar in Sierra Leone mining is viewed as one of the main backbones of the economy of a mineral-rich country and yet the exploitation of Iron ore and other valuable minerals in the communities of Bumbuna and Lunsar in the Northern part of Sierra Leone has not anything to write home about excluding severe environmental degradation and

poverty. However, the taking out of such minerals has Greater potential for the development of the economy, growth of industry, social progress, and the Prosperity of the nation. These minerals are necessary for basic human needs and economic Opulence. In this regard, proper schemes and mechanisms of exploitation, utilization, development, and utmost use of minerals are to be adopted for the benefit of the present Generation reserving a portion for the generations. However, the exploitation of forthcoming Iron ore in Bumbuna and Lunsar has done more harm than good both to the environment and to the local people. This article examines the reality on the ground pertinent to the Social and environmental impacts of Iron ore mining activities in the Northern region of Sierra Leone particularly for Lunsar and Bumbuna.

Hazra (2013) narrated about the development of the Indian mining industry- The way forward. Good Practice Guidance for Mining and Biodiversity (2006) explains developing a partnership with the International Union for the Conservation of Nature (IUCN), this guide provides an informative, accessible, and extremely practical reference source for biodiversity that may be used by mining companies at all steps of their operations- from Initial exploration to closure of mine planning and implementation. The guide and its practical tools help companies- to Identify and, evaluate biodiversity, Understand the connections between their activities and biodiversity, Assess the likelihood of their activities having negative impacts on biodiversity, Mitigate potential impacts on biodiversity, Develop rehabilitation strategies for affected areas, Contribute to biodiversity conservation, The tools have been divided into three sections according to their main concerns: integration, management and assessment, and mitigation and rehabilitation, Integration provides guidance on managing biodiversity at various operational stages, Management and assessment describes the systems, tools and processes and their practical application in the context of mining operations, Mitigation, Rehabilitation and Enhancement involves Selecting and implementing measures to save biodiversity, the users of biodiversity and Other affected stakeholders from a diverse impact due to mining.

Arag and Rud (2016)<sup>15</sup>, explain about Mining, Pollution, and Agricultural Productivity: Evidence from Ghana, according to the most modern mines in the developing world are located in rural areas, where

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agriculture is the main source of livelihood. These all create the Potential for negative spillovers to farmers by competition for key inputs (like land and labor) and environmental pollution. In order to explore this issue, we inspect the case of gold mining in Ghana. By the estimation of agricultural production function by using Household level data, we locate that mining causes a reduction in agricultural productivity by about 40%. This result is caused by polluting mines, not by input availability. Additionally, we find that mining activity is associated with an increase in poverty, child malnutrition, and respiratory diseases. A simple cost-benefit analysis shows that the actual fiscal contribution of mining will not have been enough to compensate affected populations.

#### **IMPACT OF MINING ON THE ENVIRONMENT**

Mabey *et al.* (2020), explain Environmental Impacts: Local Perspectives of Selected Mining Edge Communities in Sierra Leone, they were of the opinion that despite its contributions to the development of the country, the mining sector in Sierra Leone has been attributed to a huge number of impacts on the environment. As a result of mining activities, the magnitude of deforestation, land degradation and destruction of farmlands, Inadequate availability of fresh water, deteriorated air quality and pollution noise were the main Impacts exacerbated by futile, Iron ore, and diamond mining. Strategies as recommended By the local communities to be put in place, to restore ecological function in the mining Edge communities include, the Environmental Protection Agency (EPA), the Mines and mineral agency, and other answerable authorities addressing weak spots in mining action and Environmental policies, thereby escalation enforcement and monitoring regulations Relating to mining operations; and companies embarking on rehabilitation, reclamation, and Restoration measures to ensure environmental sustainability.

Pekeski (2007), explained about effective use of indicator minerals in India-An exploration case study he wrote that Rio Tinto is a successful, committed, and careful Exploration Company that operates to excellent health, safety, environment, community, and business integrity standards. Rio Tinto has had a presence in India since 1985 and has been exploring diamonds in India since 2000. Since that time, Rio Tinto has accelerated the kimberlite discovery rate, explored over 40,000 km<sup>2</sup>, and in the process discovered over 30 kimberlites, several

diamondiferous. Indicator mineral sampling, largely from gravel samples has been a critical component of the exploration strategy in India. Since 2000, over 6,000 gravel samples have been collected and analyzed. Rio Tinto Discovered 8 Argyle age diamondiferous lamproites in Bunder in 2004. This discovery was made through the effective use of indicator mineral sampling as a first pass and early follow-up tool, followed by detailed ground geophysics and soil sampling. Pipes are currently being evaluated. RT considers diamond prospectively in India quite high. India has been a challenging place to operate, however, seven years of persistence is starting to deliver rewards.

Saini (2018) worked on the impact of coal mining and mine fires on the local environment in Jharia Coalfield, Jharkhand. He explained coal mining although provides a costly Resource is also a process that leads to the degradation of the local environment largely. Jharia coalfield holds unequivocal significance in the Indian context as it is the only Source of prime coking coal in the country. Haphazard mining over nearly a century has led to a change in the environment to a large degree such as dilapidation in the quality of water air and soil, Changes in landform, land use, land cover, and vegetation distribution. Jharia is infamous for the extensive development of surface and sub-surface fires due to indefensible mining Practices. This article outlines the environmental issues related to coal mining in Jharia Coalfield, Jharkhand. Dharmadhikari (2015) worked in coal-related pollution chokes mining towns in Jharkhand he explains that Jharia and Dhanbad regions in Jharkhand, famous for rampant coal mining and its related operations, face grave environmental issues due to the Dumping of pollutants by-products from coal Washeries. Shripad Dharmadhikary reports after making a visit to Dhanbad. When one thinks of coal, and its pollution to coal, most often coalmines or thermal power plants, come to mind with mountains of (OB) Overburden, the release of mine effluents, ash from coal, and smoke loaded with suspended Particulate matter. However, the coal washery is an important, if less known component of the Coal chain. With the number and capacity of coal washeries likely to go up, it is very important to understand the impacts of coal washeries.

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Rai and Paul (2011), 1 Degradation of Soil Quality Parameters Due to Coal Mining Operations in Jharia Coalfield, Jharkhand, India explain that coal mining for an area is an economic activity but may lead to degradation of soil quality. Open-cast coal mining operations involve the displacement of a large amount of overburden/rock mass materials to excavate the coal for many purposes. In mining areas, the soils are affected by various coal mining operations i.e., 12 drilling, blasting, storage of (OB) overburden dump Materials, land clearing, ancillary construction facilities, and movement of vehicles. Various wastes such as heavy metals, inorganic substances, toxic materials, and organic substances are released from different processes of coal mining operations. The study was conducted in 2009 in six sampling locations of the Jharia coalfield, Dhanbad, Jharkhand state. The study revealed that major variation in the physicochemical Parameters of soil is due to coal mining operations. The information obtained from this article helps to know about the quality of soil and its status in the Jharia coalfield area, in the state of Jharkhand. This paper will focus on the characterization of soil and will discuss the significance of these parameters with an emphasis on N, P, and K. Nagar (2015) submitted a report to the Gujarat Biodiversity Board, Gandhinagar. The report says that the districts of the state of Gujarat were extensively surveyed and data was compiled in which 23 plants were placed under appropriate IUCN threat categories. The data reflects that 19 species are categorized as critically endangered, under endangered, and 1 regionally extinct. Further, the survey explains that the most significant threat to our flora is the loss of habitat to agriculture and grazing. Besides, other threats include road works, weed competition, industrial and urban development, changed fire regimes, collecting, mining, and forestry. Kiro *et al.* (2017)<sup>6</sup> found that The Biramitrapur area was once covered with rich forest, wildlife, and minerals. Presently the town is fully developed above the limestone, dolomite, and dolomite ore. Widespread open mining has destroyed the forest and the scenario of the Region largely. The mining sites adversely affected the species of the tree and reproduction was very poor. However, the result of data shows that the regeneration of plantation status in the passive dump area, beside the lively dump, crusher area, and lease pillar area is Maximum and may be further sustainable in the future from more potential efforts to

the plantation. The result of this study can be helpful to the mining sites to fight the Pollution and Contamination and to increase the number of tree species in the mining area. The diversity of the trees shows a drastic decrease in their number and richness in disturbed Sites with of undisturbed sites. Therefore, the development of the species of the tree is important in order to maintain the environment and ecosystem safely. Guha (2014)<sup>16</sup>, states in his journal published in the International Research Journal of Social Sciences that due to long coal pit mining the complete natural environment has been degraded together with the soil, water, and air. Their agricultural practices have been completely lost due to low precipitation and the non-fertility of the soil. Goswami (2015)<sup>7</sup> found that coal mining adversely affects the ecosystem as a whole. Coal mining is typically linked with the degradation of Natural Resources and habitat destruction. As a result, invasive species occupy the area, thus posing a threat to Biodiversity. Vast quantities of waste materials are produced due to several activities of mining in the coal-mining sites. If proper care is not given for the disposal of waste, the mining activities will degrade the adjacent environment. The waste disposal methods affect water, air, and land and in turn the life quality of the people in the neighboring areas.

Singh, Phukan, and Sinha (2012), state in their journal published in the Indian Journal of Plant Sciences, that In the Northeastern state of India, the population of *Aeschynanthus gracilis* is increasingly exposed to disturbance due to forest clearance for Jhum cultivation, mining, and small timber purposes. These factors altogether are bullying habitat and the Existence of the species in the wild areas. In view of the high intensity of disturbance to its natural habitat, the species might become extinct in the near future, unless adequate conservation measures for the species are taken. Biswas, and Anirban, (2018)<sup>17</sup>, did a study that emphasized the biodiversity assessment in one of the leading Iron ore mining areas of Bailadila- Kirandul Iron ore Mines (KIOM) of Dantewada District, South Bastar of Chhattisgarh. The major impact of mining on the flora and fauna of Kirandul Iron Ore Mine shows the total destruction of forest areas within the core zone. A detailed floral account only provides supportive evidence to ensure the survival of the herbivores and the carnivores, once the adjacent habitat can offer an ecological niche for maintaining a prey-predator base. The undulating mountain forest is

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expected to have the distribution of the recorded species over a wider area. It is evident from the study that there are few plant species of rare occurrence in the buffer zone of Kirandul complex and few animal species within Schedule- I of the Indian Wildlife (Protection) Act, 1972. These species are likely to be affected by mining projects and related construction and other related activities like road construction, blasting, excavation for mining, and dumping of excavated material. The existing natural ecosystems in areas constituting a rich bio-diverse region need protection and further strengthening of conservation efforts.

Kumari and Sahu, (2010)<sup>18</sup>, explained in the case study about the "Biodiversity loss due to mining activities at Chiria mines, Dist. W. Singhbhum, Jharkhand" they found that the surrounding area of Chiria mines is highly disturbed by mining activities, which produces solid, liquid and gaseous pollutant and contaminate the air, water, and soil. Close observation of the plant species reflects deformed morphology with the change of color of the plant as reddish green, the coiling of branches and folded leaves with inconspicuous venation, abnormal growth of nodes and internodes, the branches bend downwards due to the dust particle deposited on the whole surface of the plant, the size of flowers are very small, sour in taste and its production is very much reduced. The plants species which have lost their existence due to unfavorable environmental conditions are *Mentha viridis*, *Mimosa pudica*, *Ocimum sanctum*, *Polygonum glabrum*, *Pongamia pinnata*, *Salmia malabaricum*, *Sonchus oleraceus*. Some plants species are on the verge of disappearance are *Acacia nilotica*, *Achyranthus aspera*. The Solid dust particle generated during the different mining activities in the different sites of Chiria mines has a hazardous effect on the environment and the vegetation of the area in the whole ecosystem. Belay *et al.* (2020)<sup>19</sup>, made a case study on "Effects of stone mining on woody plant species diversity and selected soil properties in northern Ethiopia", they found that stone mining significantly affected woody species diversity and selected soil properties. Stone mining showed a negative impact on both the density as well as the diversity of woody species. Considerably, lower Shannon Diversity, Species Richness, and Abundance were found in the Quarry area as compared to the Non-Quarry areas. Significantly, lower available N<sub>2</sub> and P were recorded in the Quarry sites as compared to the Non-Quarry areas. However, higher value of bulk density, organic carbon,

and pH was found in the Quarry areas as compared to the Non-Quarry areas. Biswas, Mishra, and Mukherjee (2013), observed that the Open cast coal mining leads to massive damage to landscape and biological communities sustained in Sonepur Bazari coalmines in Raniganj coalfields. Plant communities in the nearby areas also get perturbed. The associated landscape is overburdened with large heaps of spoil. The plants themselves tend to revegetate the overburdened spoils and undertake their remediation. The present work reveals in all Sixty Nine species belonging to Fifty-Seven genera of Twenty-Five families of Angiosperms on the different age Series (0, 4, 8, 12, 16, and 20 years) of overburden dumps in the Sonepur Bazaricoal mines in Raniganj coal fields of West Bengal state in India.

Weiersbye *et al.* (2006)<sup>20</sup> found in the study the floristic Composition of Gold and Uranium tailings dams, and adjacent polluted areas, in South Africa's deep-level mines, in this study Gold and uranium tailings 'slimes' dams and the polluted soil in the deep-level mining region of South Africa (Carletonville, Klerksdorp and Welkom) were surveyed for the frequency of occurrence of naturally colonizing, actively introduced and persisting species of plants. 56 tailings dams with a combined area of 5864 ha, and a similar area of tailings-polluted soil, were surveyed between July 1996 and March 1997. Rohitashv and Jaipal (2020)<sup>1</sup>, mining is a dangerous action produced by humans to give indispensable quality and security to their expectations for Day-to-day comforts. The mining in the concerned zones provides crude materials such as gravel, crushed stones, etc. for the development of, railroad lines, roads, and other infrastructure. Over the last couple of years, the rate of mining has expanded a few times. It brings about the loss of biodiversity of both vegetation and fauna and landform changes in the concerned zone. After the mining activity in any territory is over, the indication of the same lean back for quite a long period might be until the end of time. It brings about the Formation of such large numbers of environmental issues and health risks.

Mondal *et al.* (2020)<sup>21</sup>, in a study on "Impact of mining on tree diversity of the coal mining forest area at Raniganj coal field area of West Bengal, India" found that Mining triggers landscape and natural ecosystems to suffer significant damage. Plants Population are impacted by mining practices and the ecosystems become devastated following



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the mining process, creating a very stringent situation for their production. Nutritionally deficient 14 Sandy Spoils resulting from extraction are sensitive to it and very late activities are Revegetation and reclamation method other than natural colonization. Since ages, the coal has been extensively mined in West Bengal's Paschim Bardhaman District. The Forests are the major victims of these operations, which can be measured in all mine belts from the depletion of the forests. Consequently, most of the areas of the district were turned into mine spoils from the unique lush green setting.

Jamra and Mehta (2002)<sup>22</sup>, found that in the mining process, dust is released during crushing and transportation and its effect was observed on plant growth and physiological process was studied on *Madhuca longifolia* (L.) J.F. Macbr., *Cajanus cajan* (L.) Mill sp. *Gossypium hirsutum* L., *Mangifera indica* L., *Capsicum annum* L. within Ten km and Ten km+ of mining sites of Kund, Agoni, Behadwa, and Panwani. Low SPAD value was recorded in the zone of dust fall, which are 30.2-30.8 in cotton and high SPAD in *Cajanus cajan* (L.) Millsp. (Pigeonpea) 33.8-38.2, in *Capsicum annum* L. (chilies)60.3-63.4 of the dust fall zone respectively and *Madhuca longifolia* (L.) J.F. Macbr. (Mahua) 32.6-32.8 and *Mangifera indica* L.(Mango)37.2- 40.2 was recorded respectively. Plants' height decreased which showed that it is an effect of dust fall on plants founding on mining sites. Height of *Madhuca longifolia* (L.) J.F. Macbr. (Mahua) Plant was also reduced within a Ten km area, which is Kund, dust fall zone of the industries. *Cajanus cajan* (L.) Millsp. (Pigeon pea) plant node numbers are decreased from 27-25 and *Gossypium hirsutum* L. (Cotton) plant node numbers are decreased from 20-15, which is Agoni from 18 km+ area of the dust fall zone respectively.

Temperature of leaves varies from distance of mining site. Crop leaves of the nearest zone are recorded high temperature compare to fore away site of mining in irrespective of the daytime. Aldhebiani and Howladar (2015), in astudyon "Floristic Diversity and Environmental Relations in Two Valleys, South West Saudi Arabia", Vegetation of the study revealed the dominance of members of the family Asteraceae, Fabaceae and Solanaceae in the different habitat. The life-form spectrum of the study areas exhibited predominant of phanerophytes and therophytes. Species diversity and dominance is related to soil physical characteristics and variation of habitat types. Vegetation groups

in Baida habitats are more diverse than the complex environmental factors such as soil, and geology, which decide those in Ben Amir. Vegetation of any area and the vegetation of adjoining regions also affect it. Mahalik *et al.* (2014)<sup>4</sup>, in their study they concluded that Angul – Talcher mining area harbours a rich diversity useful plant but it is matter of concern that the anthropogenic activities such as deforestation, habitat destruction, Urbanization and mining activities cause a serious threat to the existence of valuable plant species. Sarma (2005)<sup>5</sup>, studied on “Impact of Coal Mining on Vegetation: A Case Study in Jaintia Hills District of Meghalaya” found that the different vegetation community characteristics, tree population structure, distribution pattern, land use/land cover distribution and changes, change analysis of different land use related to forest and mining and forest fragmentation were analyzed to achieve the objectives of the study. Recently, Archana Kumari Jha (2022) published her thesis on the topic “Angiospermic Diversity in and around Black Stone Mines of Pakur with Special Reference to Their Impact on Plants and Environment”.

#### CONCLUSION

Mining activities are imperative for the growth and development of the nation. Nevertheless, in this process, the land is damaged. The mining process greatly affects vegetation and biodiversity because, before the removal of the topsoil, plant cover is required to be removed. It also affects ground as well as surface waters. Mining activities damage the ecosystem both physically as well as chemically in a way that is incurable. The mining activities are causing air, water, soil, and noise pollution. This is also because soil erosion and alters the topography, landscape, and deteriorates the aesthetic beauty. An environmental management plan to save the above-said situations is strongly recommended to fight against the spurious impact of mining. However, besides the negative impact, the mining activities have some positive activity too, as they provide employment to thousands of local people. The revenue generated from black stone mines helps in strengthening the economy of the district, state, and nation. Considering the state of Jharkhand, which is a mineral-rich state, legal and illegal mining is also in action. Utmost care is to be given in the mining process; the scientific should be followed to mine judiciously to conserve our resources for future generations.

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