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Assessing the Environmental and Social Impact of Large Scale Mining Operations in India: An Empirical Investigation

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Abstract

Since the inception of human society, there have been mining activities, and since the Stone Age, minerals have aided in advancing human civilization. The mining sector directly influences the macro economy by enhancing infrastructure, providing employment, fostering rural community development, and opening up new derivatives and downstream industries. Numerous vast deposits of numerous essential minerals and their small- to large-scale mining help India's economy thrive. In the past, with little regard for the environment, the local people, or development mining operations were conducted primarily for the advantage of the mining industry. However, even beyond the actual limits of individual mining leases, the extraction of coal and other minerals has resulted in varied degrees of social footprints through the destruction of the environment, implications for human health, and social displacement. It is the operating miners' duty to make sure that all pertinent problems and effects are recognized from the outset. The primary areas of environmental and social implications include impacts on biodiversity and habitat, problems with waste management, indirect effects, poverty alleviation, and wealth distribution.

Keywords: Environmental Impact, Large Scale Mining, Social Impact, Mining, Mining Industry

Introduction

Around the world, mining is a significant economic activity in many nations. Making rough materials for society is a fundamental human activity. No matter how big or minimal the operation, it always causes a lot of environmental disruption and harm, and it generates a lot of trash that can have long-lasting negative effects. The extraction and commercialization of natural resources have a significant negative impact on the environment. Although mining activities only directly influence a small amount of terrestrial land, their effects on the environment and public health may be felt for a long time and at considerable distances from the source. Mining is accomplished through a number of processes, starting with discovery, moving through exploitation, processing, and ultimately reaching the customer. The environment suffers significant fabricated harm at every stage of the mining activity. Mining operations cause destruction of the environment, deterioration, and ecological harm to water, air, and soil because of faulty planning and disregard for regulations. Land degradation, overburden disposal, forest destruction, cleaning rejects, sinking, and water contamination due to wash-off are major causes of destruction of environment. Apart from this , release of mine water, drainage from acid mines, coal washing operations, air pollution due to

release of gases and dust, noise pollution, mine fires, damage to forest flora and fauna, loss of wildlife habitat, and occupational health risks are some of the issues brought on by mining activities (Singh, Pal, Niranjan, Kumar, 2010 and Javed, Khan, 2012).

Mining has long-term effects on the environment. It contributes to the deterioration of forest zones. Mining is thought to be endangering 38% of the remaining primary forests in the globe, along with oil exploration. The many stages of mining operations each have their unique environmental effects. These steps include in general, deposit prospecting and exploration, mine development and preparation, mine exploitation, and processing of the minerals acquired at the appropriate installations to produce products that may be sold. The effects during the exploitation stage vary on the technique employed. In forest zones, the simple act of clearing the ground and the ensuing loss of flora has short-, medium-, and long-term effects that are larger in the case of opencast mining. A range of endemic species suffers from habitat loss due to deforestation, which also affects the flow of water from the woods to other ecosystems and urban areas. In rainy seasons, floods are caused by the rapid and fluid discharge of precipitation caused by deforestation, since the land cannot hold the water like it does when covered with a forest (Giri, Mahato, Singh, & Jha, (2012 and Ranjan, 2019).

Literature Review

In a study, it was found that mining harms the environment in many ways. Among the various drawbacks of mining, opencast mining's aesthetic effects need particular consideration. Aesthetic, scenic, and landscape elements are visual effects. The visual appeal of restored mined land is the single most crucial factor to take into account when selecting a mix of landforms and revegetation techniques. Although there may be times when switching to an entirely different lands use is advantageous. . Another significant disadvantage of mining operations in India is degradation. The erosion that causes deterioration starts at the source, when rain-splash on overburden dumps creates erosion, which worsens into sheet, reel, and gully erosion. Gully erosion has an influence on both the visual beauty of the land and the stability of the dumps. The nutritional value of the dumps drops, which may help with re-vegetation of the dump's slopes and top. The stuff from the dumps is likewise gone with them. Because of the vast area of land affected by mining activities and the significant volumes of earthen materials exposed at sites, erosion may represent a substantial hazard. As a result, erosion management must be taken into account from the start of activities until reclamation is complete (Singh, 2014 and Singh, Mahato, Neogi, Mondal, & Singh, 2011).

According to one research, one of the most serious environmental concerns confronting the mining industry is the development of acid drainage and the subsequent mobilization of pollutants. The mineralogy of the rocks, as well as the availability of water and oxygen, all have a substantial impact on acid rock drainage, also known as acid mine drainage. Acid mine drainage is caused by the oxidation of metal supplied minerals in mining sites. Prior to mining, weathering processes cause these minerals to slowly oxidize and create sulfuric acid. Except in rare cases, natural discharge from such deposits poses little risk to aquatic habitats. Mining and beneficiation processes considerably increase the rate of these by removing sulphide rock overburden and exposing the material to air and water. One of the concerns that mining activities may generate is the flow of toxins into surface rivers. Because of various dumpsite-related activities and sources, surface waterways may be polluted with hazardous and non-toxic substances. The movement of

pollutants from these sources is accelerated by exposure to rain and snow. Surface runoff, which is caused by precipitation and snowmelt, is one method that pollutants reach surface rivers. Mining activities can have a variety of effects on ground water quality. Mining under the water table, whether in open pits or subterranean workings, is the most obvious. This provides a direct path for aquifers. The quality of ground water is also altered when water seeps into it through surface items. Contamination can also occur when there is a hydraulic connection between surface water and ground water. Any of these might raise the amount of groundwater contamination (Katpatal, & Patil, 2010 and Gupta, Kumar, 2016).

According to a study, significant changes to the landscape result from opencast mining activity. Overburden dumps are man-made habitats that contribute to a variety of environmental issues, including habitat fragmentation, dust pollution, erosion, and an increase for silt that enters receiving water bodies, as well as harm to aesthetics and visual appeal. The rise in total solids, other minerals, and leachates from the dumps is to blame for the water contamination. As a result, the water's dissolved oxygen level decreases. This also impacts the aquatic life. Another aspect of pollution from an aesthetic standpoint is the discoloration of water. The fertility of land is also decreased as the Runoff water that instantly flows into or passes through nearby fields alters the salt content of the soil and subsoil layers. The consequence of this is a reduction in agricultural production. In addition, the damaged environment in the adjacent communities affects their produce from the farms as well as their health due to water and air pollution. Noise levels in the neighboring residential areas also rise because of the use of noisy earth moving equipment in overburden handling. However, during the planning stage, choosing the right dumpsite can reduce or eliminate noise consequences on the locals (Nand, Paul, & Ghose, 2015 and Geelani,Baht, Geelani, Haq, Mir, Qazi, Wani, 2013).

According to a research, mining has negative societal repercussions. One of the most significant negative impacts of mining is the real displacement of thousands of individuals owing to mining activity in their neighborhood. Both social damage and a serious threat to human rights are present here. Communities are displaced and uprooted, losing not just their homes but also their land and means of survival. The majority of the displaced communities are being relocated in areas with exhausted natural resources and places close to dirty and toxic mining operations. Indigenous populations that have deep links to the lands and forests of their ancestors and may struggle to live when these ties are severed might suffer particularly badly from forced resettlement. Additionally, because there are insufficient programmers for rehabilitation and resettlement, migrants continue to lack access to appropriate means of meeting their fundamental needs and improving their standard of living. Health problems and access to clean water are related issues. Additionally, mining has health risks. The incidence of respiratory illnesses among mineworkers is a result of mining (Dontala, Reddy, & Vadde, 2015).

According to a study, both positive and negative economic effects are observed at the municipal and federal levels. Mining typically boosts the local economy, which raises population income and expands business prospects in other sectors. Despite this, societal discontent may be brought on by income inequality, the allocation of resource extraction profits unequally, corruption brought on by careless management of natural resources, and other factors. Conflicts between businesses, illegal miners, and anti-mining activists are possible. The loss of local communities' traditional sources of

income as well as governments' failure to reinvest mining earnings might both contribute to increased poverty. Many studies have demonstrated that mining activity has a positive impact on the creation of employment in the mining sector, both locally and nationally. Employee skill development and educational opportunities offered by the firm are other potential advantages. In addition to the standard of employment, which includes risky and unsafe working conditions, poor earnings, health consequences, accidents, and deaths, as well as the impossibility to freely organize trade union activities, there are a number of negative repercussions that may be noted. In one case, the increasing mechanization of mining operations is cited as the cause of rising unemployment (Ahmad, Sharma Ahmad, Rao, 2014).

Methodology

This study is descriptive in nature in which data is obtained from 220 respondents who have worked in various mining fields of India. In the study, labors and employees has been covered. A checklist question was used to analyze and interpret the data. In a checklist question respondents choose "Yes" or "No" for all the questions.

Table 1 Assessing the Environmental and Social Impact of Large Scale Mining Operations in India

SL. No.	Assessing the Environmental and Social Impact of Large Scale Mining Operations in India	Yes	%Yes	No	%No	Total
1	Mining activity in India impacts the accessibility and quality of water	191	86.82	29	13.18	220
2	Mining activity in India increases the air pollution	184	83.64	36	16.36	220
3	Mining activity in India contributes in waste generation	189	85.91	31	14.09	220
4	Mining activity in India results in displacement of people	178	80.91	42	19.09	220
5	Mining activities in India impacts the health and safety of people living nearby	175	79.55	45	20.45	220
6	Mining activities in India increases forced and child labors	182	82.73	38	17.27	220
7	Mining activities in India results in deforestation	174	79.09	46	20.91	220
8	Mining activities in India causes frequent floods	172	78.18	48	21.82	220

Table and Figure 1 shows that 86.82% respondents agree that Mining activity in India impacts the accessibility and quality of water while 85.91% respondents agree that Mining activity in India contributes to waste generation. 83.64% respondents agree that Mining activity in India increases the air pollution while 82.73% respondents agree that Mining activities in India increases forced and child labors. 80.91 % respondents agree that Mining activity in India results in displacement of people while 79.55% respondents agree that Mining activities in India impacts the health and safety of people living nearby. 79.09 % respondents agree that Mining activities in India results in deforestation while 78.18% respondents agree that Mining activities in India causes frequent floods.

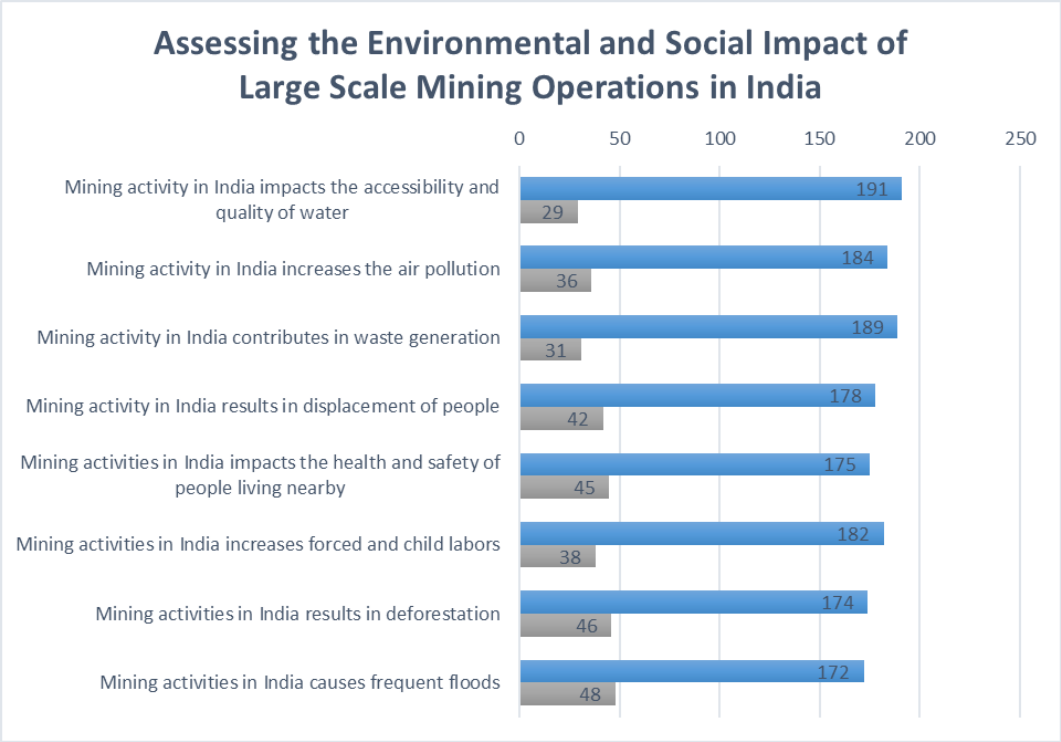

Figure 1 Assessing the Environmental and Social Impact of Large Scale Mining Operations in India

Conclusion

Mining can harm the ecosystem, especially because of its aesthetic impacts, aesthetic appeal, degradability, and nutritional value. As a result of the extensive area of land disturbed and the substantial amount of earthen materials exposed, erosion is a severe problem in hard-rock mining sites. One of the biggest environmental problems the mining industry faces is acid drainage and the related mobilisation of pollutants. The mineralogy of rocks, as well as the accessibility of water and oxygen, are major determinants of accelerate rock drainage, also known as acid mine drainage. Mining and beneficiation processes may release pollutants into surface rivers, which may then become contaminated with toxic and non-toxic substances. Mining operations may have a variety of effects on ground water quality. When mining occurs below the water table, whether in open pits or underground workings, it is the most obvious. Surface runoff from mining operations, precipitation, snowmelt, and hydraulic connections between surface and ground water can all have an influence on this. These may lead to higher amounts of groundwater contamination. As a result of opencast mining, mining activity has a substantial influence on the terrain. Overburden dumps are artificial habitats that cause habitat fragmentation, dust pollution, erosion, and a rise in the amount of silt that gets into receiving water bodies. Runoff water that enters or travels through nearby fields, reducing the fertility of the soil and causing a decline in water and aquatic life, is what constitutes pollution from an aesthetic aspect. The use of loud earth moving equipment causes noise levels in nearby residential areas to increase as well. A negative social consequence of mining includes health issues, access to clean water, and the eviction of thousands of people. Additionally, it makes respiratory infections more common among mine employees. Both good and negative economic effects of mining are seen locally and nationally. However, it may also result in income inequality, corruption, and increasing poverty. It can also enhance population income and commercial

prospects. According to studies, the mining industry contributes to the creation of employment, employee skill growth, and educational possibilities. Negative repercussions include the inability to freely organise trade union activities, child, forced, and involuntary work, poor salaries, health problems, accidents, and fatalities. Growing unemployment can be explained by increased mechanization of mining operations.

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