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IMPACT OF MINING INDUSTRY ON THE ENVIRONMENT OF UDAIPUR CITY-A CASE STUDY OF JHAMARKOTRA MINES

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Abstract

Rajasthan is referred to as a mineral wonderland. Minerals come in a wide variety in Rajasthan. More than 81 different mineral species are available in the state and 52 of which are mined for market purposes. Many companies use minerals as raw materials for production. The state is the leader in the production of important minerals like lead zinc, Gypsum, Wollastonite, Calcite, Ochre, Silver, and Rock Phosphate. The mining sector not only sustains thousands of jobs but also supplies raw materials, minerals and metals that are vital to our economy. They lay the groundwork for advancements in engineering, innovation, and modern living. In essence, mining is a development activity but this industry destroys the environment for economic gain. Therefore, mining operations always result in habitat degradation, biodiversity erosion and deforestation. Environmental pollution is produced in large quantities as a result of the mining and processing of ores and minerals. The studied area Jhamarkotra mine is situated 25 kilometers from Udaipur city. It contains the richest resources of phosphorite ore (rock phosphate) in India. The mine has been in operation for the past few years. Jhamarkotra plays an important role by contributing 98% of the rock phosphate production of India. This research paper is about the effect of the Jhamarkotra mines on the environment of the Udaipur district. It is true that this mine is bliss for the Rajasthan economy but it became the curse for the environment.

Keywords: Environment, Pollution, Protection, sustainable mining

Introduction

Mining is a vital industry which supplies raw materials for a number of industries, such as manufacturing, construction and agriculture. Commercial phosphatic fertilizers are made using rock phosphate, which is extracted from the Earth's surface (Leikam and Achorn, 2005). In the latter half of the 20th century, there was a sharp rise in the mining of phosphate rock for use as fertilizer in agriculture. In order to boost crop yields, phosphorus fertilizers are applied, which drives the level of modern food production. Since agriculture makes up the majority of India's economy, the manufacture of fertilizer is essential. Roughly 35–40% of the raw materials needed to produce phosphatic fertilizers come from domestic sources; like phosphoric acid and rock

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phosphate. Jhamarkotra, India's largest phosphate reserve, contributes 98% of the country's rock phosphate production, making it a significant player in this scenario. Jhamarkotra mines is the only commercially exploitable rock phosphate deposit in the country.

About 74.68 metric tons of rock phosphate are found in the mine, which is separated into eleven blocks and occupies an area of 18.44 sq km. After being purchased in the late 1960s, the site was ready for mining. At roughly 74.68 metric tons, the region boasts the nation's greatest phosphate resource. When the Rajasthan State Mines and Mineral (RSMM) Corporation began open cast mining in the region in 1968, the phosphate reserves became available for excavation.

However, it also has serious negative effects on the environment, especially in environmentally sensitive areas. Regardless of the size of the operation, it causes a great deal of disturbance and harm to the ecosystem, generating a lot of trash that can have negative effects for decades. Every operation has the potential to alter the local environment in a number of ways, including mass removal, landscape changes, human settlement displacement, surface drainage, local flora and fauna, and changes in the quality of the air, water, and soil. With an emphasis on the Jhamarkotra mines, one of India's major phosphate reserves, this study investigates the effects of mining operations in Udaipur on the ecosystem.

Study area

Jhamarkotra mines are the largest reserve of phosphate in India. Jhamarkotra, the Kanpur Group of mines huddled in the Aravali range in the southern part of Rajasthan. It is situated 26 kilometres from Udaipur city. These open-cast mines are spread over an area of approximately 14 km^2. The mining process for this mineral requires deep excavation and removal of waste, which is 19 times the amount of phosphate ore mined. Because of their phosphate reserves, a vast area from 13 surrounding villages-including Jhamarkotra, Umarda, Lakadwas and Chansda, where only Adivasis from mainly three tribal communities (Bhils, Meenas and Gharasias) live, was acquired by the RSMML.

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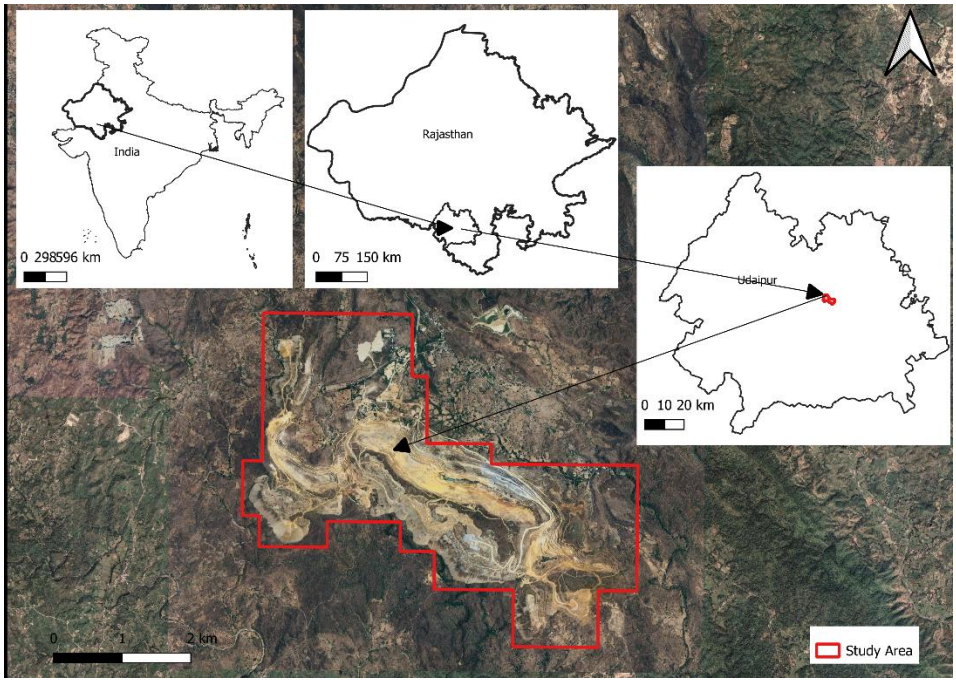
Location Map of Jhamarkotra Mines



Objective

The main objective of the study is to evaluate the environmental impacts of Jhamarkotra mines with a focus on land degradation, water pollution, air quality deterioration, biodiversity loss, health issues and socio-economic factors and to suggest some measures to mitigate environmental risk.

Methodology

Data for the study were obtained from both primary and secondary sources. Primary data were obtained using a combination of methods including interviews, questionnaire study, self-observations, samplings, informal and formal surveys. Secondary data was collected from government website of department of Mines & Geology and Rsmml. The methodology used is descriptive and empirical.

Review of literature

Mining operations in general have adverse environmental impacts (Ghose, 1989). Air quality status in Indian environment is dominated by SPM causing great concern to environmental planners (Ravindra, 1991). Underground mining impacts directly on the health of those working underground, but opencast mining creates wider air quality deterioration due to dust and gaseous pollutants in and around the mining complexes. Mining and, particularly, the extraction of rock and minerals in open mining have always been considered aggressive activities with a high and

negative impact on the environment. Mining is also a major activity causing water pollution (Allen et al.1996; Choubey, 1991; Galero et al. 1998; Ratha and Venkataraman, 1997). The dust can also pollute nearby surface waters and stunt crop growth by shading and clogging the pores of the plants. The effects of dust clouds and deposition are both visible and tangible in communities around industrial activities or construction sites (Hall et al., 1993; Fuglsang, 2002). The environmental consequences of mining operations, with a focus on waste management, tailings, and acid mine drainage Lottermoser, B.G. (2010). Mining can bring economic benefits such as employment and infrastructure development when managed responsibly (Hilson, G., & Garvin, T.,2023).

Impact of Jhamarkotra Mines

The health issues of the workers and those who live close to the mining area might worsen if a number of environmental conditions significantly deteriorated. It is evident that the effects of mining don't end when a mine is closed; they continue to exist even after a mine is built. Because of the particular demands of mining, people who work or live in or near mining areas are frequently addressed differently from people in other industrial environments when considering the health of people involved in industrial activities as a whole. Different forms of mining produce different gasses and each poses a risk to those engaged.

Health issues

Dust is released into the atmosphere by the mining operations. Lung cancer, silicosis, and tuberculosis are among the respiratory conditions that locals near the Jhamarkotra mines have reported. Health professionals believe that extended exposure to airborne particulate matter from mining operations is the cause of many diseases. Women who live close to the mining zones have reported having more miscarriages. Although some people believe that these health problems are the result of divine will, research indicates that mining contamination is linked to poor reproductive outcomes.

“Yeh toh bhagwan ki marzi hai, sahab. Pichhle janam ke kuch Paap honge jo iss janam main samne aa rahe hain” said Lohari Meena, a resident of Jhamarkotra village, while explaining her two miscarriages. Not only Lohari, but many other women in the village also have had miscarriages. This is all happening because of the phosphate mines in the area. There is white dust in the air perennially and it has given rise to many respiratory diseases, gallbladder stones, liver issues and many reproductive issues for women, such as miscarriages, stillbirth and low birth weight.

Noise pollution

Numerous mining equipment types are linked to noise pollution, but blasting is thought to be the main contributor. A loud noise disturbed the nearby flora and fauna. It also impacts the

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stability of the homes, buildings, and infrastructure of those who live close to these construction sites. The noise produced by automobile engines, the loading and unloading of rock into steel dumpers, chutes, power generation and other sources can all be considered forms of noise pollution.

Soil pollution

The first fertilizer factory to be established close to the mine was Rama Phosphate in Umarda village in 1998, but seven more factories soon followed. Since then, the surrounding ecosystem has deteriorated and what was once a forest or cropland now consists of fallen trees, bare open spaces and heaps of trash. Large-scale land degradation has resulted from mining operations in Jhamarkotra. Land subsidence, topsoil loss and deforestation are all consequences of open-pit mining. The loss of rich land and decreased agricultural productivity in neighbouring communities result from the clearance of vegetation which exposes the soil to erosion.

Air pollution

In mines and quarries, particularly open cast operations, air pollution from mine dust is a common environmental issue. Since particulate dust is produced and detected in the vicinity of such activities, air pollution is seen to be the most significant. The mining sector contributes to poor air quality by releasing large amounts of dust, gaseous pollutants and particulate matter (PM). Dust and Suspended Particulate Matter (SPM), which are produced during drilling, blasting and transporting are major air pollutants that cause respiratory problems for both locals and mine workers. Heavy machinery emits sulfur dioxide (SO_2) and nitrogen oxides (NO_x), which deteriorate Udaipur's air quality by causing smog and acid rain.

Dust not only deteriorates the environmental quality in and around mining areas but also creates the serious health hazards of living being. Given our new understanding of the significance of deposited dust in air quality, it is one of the main causes of complaints about air pollution (Vallack and Shillito,1998). The present investigations have been initiated in response to concerns expressed by local community groups regarding the possible health effects of living near the mine works.

Ramesh Joshi, who is the additional medical superintendent at the Maharana Bhupal Government Hospital in Udaipur said “people living near the Jhamarkotra mines suffer from silicosis because of the dust around them from the blasting of rocks. These particles are quite large in size and affect the lungs of the people. The lung disease develops into silicosis and ultimately into tuberculosis or lung cancer in four-five years.”

Loss of land

Though the *gram sabha's* involvement in leasing land is mentioned in the Panchayats (Extension to Scheduled Areas) Act, 1996, the patwari (local government official) continues to have control over leasing government wastelands. According to a study, one of the main problems is that farmers no longer have the authority to sell their property to industry. In Jhamarkotra area, 500 hectares of forest land were leased to the RSMML in exchange for compensatory afforestation elsewhere. The study emphasizes how the negative effects on the community's health, access to natural resources and means of subsistence have forced and still force people to leave their lands after mining operations or the growth of the fertilizer industries. The villagers sold the land in desperation because their livelihoods had been destroyed.

The study's author, Jagadish Kumar Purohit, explained to Mongabay-India that "the villages, which were entirely covered with forests earlier, now hardly have any trees left". "Owing to the blasting, the village always remains surrounded by dust and smoke and the entire top layer of soil has been lost. The agricultural land, on which the villagers used to sustain has also been removed completely. With mines, other fertilizer companies have also set up in the area releasing fluorine gas. The phosphorus and fluorine have made it impossible to grow the trees, agriculture or vegetation anything in this area," said Jagadish Kumar Purohit.

Loss of wildlife

While JJVS' Ganesh Purohit said that there is no grazing land in the area because of regular blasting and the animals can neither consume grass nor water, as they are potentially poisonous. "We have witnessed the immediate death of many monkeys after drinking polluted water and there have been cases of miscarriages in some other animals as well," he said. He informed that there were nearly 125 crocodiles at the Bagdara Nature Park near the mines in 1989, but now they have reduced to 25. The phosphorus is also detrimental to aquatic life as well.

Udaisagar Lake, one of the five well-known lakes in Udaipur had elevated phosphorus levels, according to a study on the lake. The Jhamarkotra mines have an impact on the local flora and wildlife because they are situated close to environmentally sensitive areas. The main issues are that native animals including leopards, wild boars and several bird species are declining as a result of habitat degradation and deforestation. Fish populations and other aquatic life decline as a result of pollutants from mining operations affecting the water quality of neighbouring lakes and rivers.

Water pollution

The deep excavation to extract phosphate results in colossal amounts of waste. In fact, the ratio of waste overburden to phosphate ore extracted in Jhamarkotra is close to 19 times. Also, these phosphate-bearing rocks contain a lot of groundwater. In order to prevent the water in the pit

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from interfering with mining, the mine usually needs to be dewatered. Heavy pumping is still going on and deep borewells are being drilled in the mine. This water is one of Udaipur's main sources of drinking water. According to locals, there is no phosphate in these deep waters. However, the beneficiation plant's wastewater is dumped into a stream that empties into the Jhamri River, which then flows into the Jaisamand reservoir, which supplies the majority of Udaipur's drinking water. Stated differently, the contaminated waters are diverted to Udaipur. People in Udaipur are aware of the potential negative health effects of this.

As per a study of the water chemistry and sediment core samples from Udaisagar lake in Udaipur, "the lake water have high phosphate contents. Such a situation is developing due to the discharge of pollutants from phosphorite mines, chemical factories, distilleries, sewage and domestic waste from settlements and hotels throughout the length of river Ahar. This renders the water unhygienic for human consumption and is deleterious to aquatic life".

Back in Jhamarkotra, the water removal rate in is very high and has led to a decline in the groundwater table in the villages nearby according to Laxmilal of Hanuman Van Vikas Samiti, an NGO working in the area. The deep groundwater so lost is difficult to replace. According to a study "the accumulated groundwater is certainly not recent rainwater which has directly infiltrated underground. A great deal of research is needed to clearly understand the mode of occurrence and identify the recharge basin of groundwater in agricultural land and mining areas." Studies have also shown adverse effects on springs. Owing to the mines, "natural springs stop flowing because of the change in landscape caused by deep excavation and dumping of overburden material disturbing the surface and underground drainage network". There is also general drying of the river Jhamri because of the mine dewatering. A study indicates that "the (*underground*) base flow is also diverted towards the deep mines affecting the flow of the river. Also, less flow in the river has affected the yield of wells in the sample villages at varying intensity".

Elevated phosphate levels in water bodies can lead to eutrophication, causing excessive growth of algae and subsequent depletion of oxygen. Research on Udaisagar Lake in Udaipur revealed high phosphate concentrations, attributed to discharges from phosphorite mines and other industrial activities. This condition renders the water unsuitable for human consumption and harms aquatic life.

Acid Mine Drainage (AMD): Oxidation of sulfide minerals in waste dumps leads to acidic water discharge, increasing the toxicity of local water sources.

In Jhamarkotra, the slurry is placed in the Bhekda tailing dam, a 50-metre-high dam made of concrete. Tribal communities such as the *Bhils*, *Meenas* and *Gharasias* dwell in scattered hamlets in the area. They say that the tailing dam is completely filled with silt and that the water spills over is perhaps, not so surprising. According to a study in the area by Jagdish Purohit of SPWD, an NGO which studied the issue, "polluted water normally leaks out through many cracks

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in the dam's wall. The base spread area of the dam is porous because of which polluted water contaminates the fresh groundwater of nearby areas. Villagers are experiencing harmful effects of the polluted water. "

Suggestions

- A post facto environment impact assessment is needed.
- The ratio of mineral ore to overburden is typically greater than one and can be significantly higher. These large volumes of debris which occasionally contain high concentrations of hazardous materials, are typically dumped on-site as backfill in open pits, underground mines or piles on the surface. As a result, the management choices and related effects of overburden disposal must be thoroughly evaluated in the EIA for a proposed mining project.
- Plans for mine reclamation and closure must adequately outline how the mining company will return the site to an environmental quality that is most similar to that of the pre-mining state; how it will permanently stop the release of harmful contaminants from different mines facilities; and how money will be set aside to guarantee that reclamation and closure expenses are covered.
- Implement tree plantation programs to restore degraded land. Convert exhausted mining pits into water reservoirs or agricultural land.
- Develop proper drainage systems to prevent acid mines drainage. Implement wastewater treatment plants to remove heavy metals and phosphates before discharge.
- Use dust suppression techniques such as water sprinklers and vegetation barriers. Enforce strict emission norms for mining machinery and transport vehicles.
- Establish conservation zones around mining areas to protect native flora and fauna. Implement ecological restoration programs to rehabilitate disturbed ecosystems.
- Improve health and safety standards for mine workers. Provide alternative livelihood opportunities for displaced communities.

Conclusion

Although the Jhamarkotra phosphate mines are essential to India's agriculture industry, it is impossible to ignore their effects on the environment. Due to inadequate planning and disregard for rules, mining operations cause significant ecological harm as well as environmental degradation. Both the environment and human health have been impacted by the mining operations' effects on biodiversity loss, water - air pollution and land degradation. To lessen these negative effects, sustainable mining methods must be used, such as biodiversity preservation, water management, air pollution reduction and land reclamation. So that the ecology and communities of Udaipur to remain healthy over the long term, economic development and environmental sustainability must be balanced. To guarantee the least amount of ecological

disturbance, future studies should concentrate on long-term environmental monitoring systems and cutting-edge technologies for sustainable mining. The study suggests sustainable mining procedures that guarantee financial gains without endangering Udaipur's natural purity.

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