MINING RELATED POTENTIAL ECOLOGICAL IMPACTS: A REVIEW

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ABSTRACT

A comprehensive survey of existing research techniques has been presented in this study. All the articles that were included in the compendium were thoroughly analysed and separated based on the topics and methods presented. Quantitative analyses were used to measure the different locations of the gaps. The results reveal that environmental consequences (air pollution, water pollution, land use pattern, and pollution), all of which are vital concerns, are most adequately documented in the scientific literature, but human health, the next most vital concern, is woefully neglected. The spike in land cover change studies has been somewhat large, but there are relatively few studies focused on the socio-economic and human health implications. the bulk of the investigations used lab procedures, as well as remote sensing techniques, in their experiments. It is imperative to comprehend both the direct and far-reaching environmental and social repercussions of coal mining for a correct and full understanding of mining impacts.

Keywords: Mining, Feasibility, Surface Mining, Open Cast Mining, Abandoned mines

INTRODUCTION

Natural and human activities affect the overall environment of a geographic region over time. An environment that is free of pollution and has undamaged natural resources is best for the overall health of all living things (Woolley *et al*., 2015; Zhang *et al*., 2021; Meraj *et al.,* 2021 a, b). To have a positive impact on the quality of life for everybody, it is vital to ensure that the sustainable use of natural resources, as well as the demands of human settlements, and the well-being of all living beings in the area, are both properly met. Communities and governing agencies have worked to foster community unity and environmental balance in their respective regions (Mishra *et al*., 2012; Pandey et al., 2010; Pandey et al., 2013; Singh and Pandey, 2014; Bhatt et al., 2017; Sharma and Kanga 2020). Land, water, and air are exhibiting pollution today, in the places of the world where people struggle to survive. This also applies to India. When it comes to problems such as pollution and depletion of resources, population growth is certainly a matter of significant worry. The consumption and over extraction of existing resources will only increase in response to the ever-growing human hunger for natural resources. Because finite non-replenish able natural resources are required, mining is one industry that is affected by depleting resources. Nevertheless, mining has also caused damage to the ecosystem and damaged delicate habitats. Studying, understanding, and evaluating the overlapping and mutually-reinforcing effects of mining on the environment, society, and economy in a location that possesses significant mineral deposits alongside rich natural ecology and environmentally sensitive habitats is a must (Goswami 2015; Kanga et al., 2017a, b; Rather et al., 2018; Hassanin et al., 2020; Kanga et al., 2021).

Since independence, the health status of the population has continued to improve through better access to and greater utilization of health, family welfare, and nutrition services. Developments meant to mark the beginning of the country's economic development, however, are invariably harmful (Mesquita *et al*., 2017). Meanwhile, for developing and newly industrialized countries alike, maximizing use of natural resources has emerged as a key objective. Mining is critical to boosting the country's economy. Diverse range of issues is occurring as the purpose for mining (Choubey 1971; Singh et al., 2017b; Kanga et al. 2020a, b). Environmental factors continue to be a significant source of disease and mortality globally, even though there has been substantial improvement in medical knowledge and health. Climate change is even occurring thanks to the continual emission of pollutants. Another feather is added to the pollution picture because of ecological imbalance (Bala 2008; Bera et al., 2021; Tomar et al., 2021; Joy et al., 2021; Chandel et al., 2021; Kanga et al., 2021). It is, therefore, possible to argue that in its purest form, the economy cannot be strengthened, but that mining activity has a wide-ranging impact on the environment (Dabhadker *et al*., 2013; Gujree et al., 2017; Pall et al., 2019; Romshoo et al., 2020).

In light of this complex and dynamic context, this research concludes that environmental and community impacts of mining need to be studied in order to

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control mining and conform to ethical norms. It is important to consider both environmental issues and the economic and political realities when developing regulations and policy initiatives (Bhattacharya *et al*., 2012; Farooq and Muslim, 2014; Nathawat et al., 2010; Kumar et al., 2018; Joy et al 2019). With current mining operations, there must be a research and scientific documentation to ensure that environmental issues are taken care of without causing harm to the well-being and economic security of the communities that depend on mining (Epps 1996; Ranga et al., 2020 a, b; Meraj et al., 2020 a, b; Kanga et al., 2020a, b). Such an undertaking has a lot of promise to help discover the magnitude and type of mining impacts as well as to discover and refine a sustainable course of action.

METHODS AND DEFINITIONS

In commercial mining, mining is the first step in finding and extracting the mineral resource. Tunneling and excavating to find component minerals is known as "mining." As you may expect, a lot of processes are required to harvest minerals and return the land to its natural state. The process is:

Start: the process of prospecting or investigating new potential customers or clients. The location and size of the ore body are identified in this step.

In the second step, estimates of the relevant mathematical resources are required. The deposit size and grade are estimated in this step. This pre-feasibility study is done to predict the economic feasibility of the mineral deposit. Investing in more estimation and engineering research indicates that the further investment has been warranted, and identifies the most significant risks and opportunities.

In the Step 3: Feasibility study. When looking at these factors, it is important to consider financial viability, the technical and financial hazards, and the resilience of the project. This analysis allows the mining business to determine whether or not to proceed with development of the mine or to scrap the project altogether. This study offers an in-depth look at mine planning, mine economics, marketability, and price ability. The relative abundance of a mineral's precious content also determines the amount of economic recoverable material. As well as a more in-depth breakdown of the waste materials and associated costs for removal, storage, and dissemination, several other aspects are included.

In the Fourth Step: Once the study concludes that a given ore body is profitable to recover, the development phase begins. This is the stage in which the mine building and equipment procurement is done to create access to the ore body.

During the operation phase, when it is no longer profitable for the mine to continue, the ore recovery will end. Reclamation is the last step/phase. Once the profitable portion of the mine's remaining ore has been collected, reclaiming the land surrounding the mine begins to make it suitable for future usage.

Mining broadly breaks down into three different categories: surface, underground, and in-situ (solution mining). Open-pit surface mining is the predominant form of surface mining. While open pit mining only occasionally occurs in regions where the geology is already partly exploited by subterranean methods, surface and underground mining operate independently of one another. Factors like as size, form, dip, continuity, depth, and grade all influence the mining method chosen.

Surface mining: Surface is stripped to the ground surface in order to gain access to a resource that may be underground. This mining method can be broken down into three main categories: It is possible to get coal from an open pit, as well as from a mine whose face is situated at ground level. With respect to depth and width, these deposits are located far from the surface. A strip or open-cast mine having shallow deposits. Surface layers are stripped off to reveal the ore/leaks that lie beneath. Unconsolidated near-surface deposits on land or beneath water, for alluvial mining. More advanced mining operations combine different techniques for tunnelling, ventilation, electric power, water, and elevators. Access shafts can be used for classifying sub-surface mining in terms of whether they are shallow or deep, whether the extraction method or technique is used, or what type of deposit is accessed. Horizontal tunnels are used in drift mining, whereas diagonally sloping tunnels are employed in slope mining. Vertical tunnels are only used in shaft mining. In soft and hard rock formations, the varied mining procedures must be employed.

In situ: The use of an appropriate leaching agent is applied in porous and permeable mineral deposits to perform in situ mining. The leaching agent dissolves the metals of interest while the material passes through it. After filtering out the impurities, the metal-laced leachate is pumped to the surface where it is cleansed and refined to produce a saleable product. The in situ leaching process provides a number of distinct advantages, including lower investment and operational costs, and a quicker time to operation.

OPEN CAST MINING AND ITS IMPACTS

Open-cast mining, or mining done at the surface of the Earth. Thus, this section seeks to comprehend the amount of mining using this form, and the issues associated with it. Open-cast mining has an edge over conventional mining because extraction occurs first horizontally, the part of vertically. This makes open-cast mining better for shallow and surface resources. Before stripping the overburden, the underlying deposit is defined in 3D. In the next stage, the deposit is calculated, and another strip is constructed with the overburden being placed ahead of the calculated deposit. With only two active strips in the middle (as in case of iron ore dust mining), restoration occurs in a rolling pattern, with the strip stripped and then backfilled. Open-cast mining damages the soil because of the landscape scars it generates. Therefore, because of the loss of forest and vegetation, species (humans and animals) that are dependent on these lands are badly impacted. Not only are economic and ecological functions of forest and vegetation destroyed, but other functions are, as well. At surface mining, we can often count on certain things: creation of contaminated waters, air borne particles and over burden coupled with minerals wastes.

Water in mine workings is generated by surface water input, ground water seepage, and rainwater infiltration. To ensure the mine stays dry and open to the ore body, water is pumped out during the mining process. Land and water resources near this waster could be compromised if it is not disposed of properly. Water can be prevented from flowing into the mining pit by employing several engineering solutions to manage surface water in the pit. The water in this situation is contaminated with metals when exposed to sulfur-bearing minerals in an oxidising environment, such as an open pit or subterranean workings.

SCOPE OF THE STUDY:

The benefits because ore mining provides jobs and cash and citizens benefit because work opportunities are created. Environmental damage results from open-cast ore mining are multi-dimensional and multifaceted, where mining is done. Additionally, the event also affects the flora and wildlife, as well as agricultural lands and settlements that are located around the location. Minimizing mining's impact on forest and agricultural land is a must. Also, residents living near the mining site must be compensated in some way. Recently GOI has introduced District Mineral Foundation Trust under mineral Law to support and mitigate the ill effects of mining especially Socio Economic and creation of infrastructures for affect population of the area.

The following points are noteworthy:

- It is also necessary for the mining industry to bear a share of the duty to preserve and safeguard the water and aquatic ecosystems that serve these populations, especially because mining creates significant volumes of toxic waste.

- To dispose of tailings, mining companies and governments should take a methodical strategy while avoiding dumping mine waste into surface water bodies, including rivers, streams, lakes, wetlands, and intertidal, estuarine, and marine habitats.

- Company should embrace better technologies to reduce the amount of waste we produce.

- The safest practice is to not build mines where land disposal is not practicable. In a methodical fashion, the technique of dry stacking and backfilling should be employed.

- To cover the job shortage in places that have yet to benefit from new mining opportunities, international cooperation on sustainable development projects can help improve the quality of life for the community as desired and expected.

- In order to preserve water supplies from tailings dumping, governments should also act proactively.

- To preserve our seas, rivers, streams, and wetlands from mining contamination, governments should allow mining enterprises that provide complete financial guarantees for cleaning up, rehabilitation, and restoration of tailings storage areas.

- Along with regulating the oceans, governments must also be proactive in working on ways to preserve natural water bodies from mine waste contamination by implementing ‘The Law of the Sea' and other mechanisms.

- It is imperative that mining firms come to a stop with the practice of dumping waste into water bodies in order to safeguard both community and ecological health.

CONCLUSION & RECOMMENDATIONS

The suggestions that follow expand on the successes of the current official strategies, acts, and initiatives. Proper and accurate legislation and tracking mechanisms. However, a lot of these concepts are lumped together. These proposals are only a few of the many different recommendations available. Multi-faceted solutions needed for widespread implementation and effective enforcement, legislations. specific constraints specifically around the application of the requirement to establish carrying capacity and holding capacity has been made stricter monitoring cells and expert committees administrative procedures. Permitting mining before calculating the carrying capacity of the mining region is irresponsible. For each year, the extraction is limited according to the region's holding capacity and the region's transportation capability, plus a range of settlement sites. Capacity in excess of which will be reserved to account for overproduction. A region, its carrying capacity, and the time of mining that will ensure its sustainability. The impacted community has a need to conduct research and implement safety and compensatory measures to prevent pollution in the settlement areas, as well as provide adequate compensation to people who have been negatively affected by mining transport. Used for water storage and agriculture following treatment, if necessary, abandoned mining pits could be transformed into water bodies. Since abandoned mining sites could be considered for eco-tourism resorts, eco-sensitive habitats, and landscape regeneration, they may also be used as potential locations for species conservation efforts, indigenous plantings, and the growth of native flora. The area has seen agricultural activity drop in the past. Declining productivity of the fields, coupled with a drop in the number of farmers and agricultural laborers, illustrate this phenomenon. To sustain the workers in the non-mining sectors, agriculture and associated activities must be revived so that people can work in them. It is imperative to foster cooperation in farming so as to increase agricultural activities' monetary and long-term viability. Siltation, flooding, damage, loss of fertility owing to polluted water from the mining pits necessitate the necessity of a survey and analysis of the farms that are impacted by mine. Comparable compensating measures must be in place as part of the monitoring framework. In any mining plan, the rehabilitation of paddy fields and tribal population that are dependent on such agriculture land must be made compulsory. The following conclusions are based on primary research and findings, and the following ideas are proposed for consideration. Each of these issues pertains to leases, buffer zones, agricultural operations, compensation for alternative economic activities, and abandoned mines.

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