A SYSTEM DESIGNED BY SPECIALISTS FOR MEASURING IRON ORE MINE'S IMPACT ON THE ENVIRONMENT

Pooja Sharma
Researcher, Govt. Dungar College, Bikaner

ABSTRACT
With a focus on iron ore (hematite & magnetite) mining specifically, an effort has been undertaken to generalize the problems with efficient Environmental Impact Assessment (EIA). The assessment of a project's possible effects on the existing environment, or the prospective environmental impact concerns that may occur owing to proposed mining activities, is of utmost importance. Iron ore, the primary raw material in the building sector and related industries, is produced in India is about 200 MT annually. Without a doubt, both the domestic and international markets have a considerable demand for such deposits. The rate of environmental damage is actually also quite high. Due to the dangers in the mining sites and the environmental deterioration, several iron ore mines have been closed. Lack of suitable environmental management techniques and ineffective environmental impact assessments are the technical explanations given for such abandonment. Iron ore mine EIA must be modified by environmental engineers in order to increase productivity while taking an environmentally friendly approach. The application of artificial intelligence methods and technologies for efficient environmental impact assessments will be discussed in this study. Future research on EIA techniques will go new directions as a result of this conversation.

KEYWORDS: Environmental Deterioration, Environmental Impact Assessment, System Specialists, Iron Ore Industry Status.

INTRODUCTION

The most important element for any social development is iron. The discovery of iron ore in 1904 marked the beginning of the industrial revolution, the basis and source of all subsequent industrial growth. The demand for iron ore is growing more rapidly. Hematite and magnetite ore deposits, with resources of about 14.63 billion tonnes and 10.62 billion tonnes, respectively, are the main iron ore deposits identified in India. There has been a sharp increase in the number of mining projects around the nation, and these ventures frequently come with significant environmental and social costs. The time has come for mining and environmental engineers to consider environmentally friendly methods and tools for the exploitation of iron ore in order to achieve sustainable development. The size and capacity of the mines, the intensity of mining activity, and other factors all affect how much of an influence mining has on the environment and ecology.

Environmental Impact Assessments (EIAs) are currently the most widely used monitoring technique used globally for all kinds of industrial initiatives, both before and after they are initiated. Environmentally responsible mining methods and techniques should be used to prevent environmental damage. Environmental factors must to be taken into account at every stage of mining activities, from planning to mine closure. The EIA process employs the methodical identification and assessment of the environmental effects brought on by a proposed iron ore mining operation. Experienced professionals offer formal procedure and technical guide manuals to compile EIA reports in order to boost the efficacy of the EIA process. All facets of the impact evaluation involve a significant amount of expertise. System Specialists offer guidance on the level of

significance for particular impacts and make recommendations for ways to mitigate or prevent them. They also assist in identifying the activities that have the potential to have significant impacts. Environmental engineering and project management knowledge are necessary for the creation of an EIA.

A serious shortage of environmental scientific skills prevents the implementation of a successful EIA process. Artificial intelligence can be used to help end users access the subject-matter expertise of subject-matter specialists in order to foresee and analyses the environmental implications in order to circumvent such inefficient processes. System Specialists are a type of artificial intelligence that simulates specialists' problem-solving skills, which are human reasoning abilities in the decision-making process. System Specialists also help to prepare EIA reports, support the estimation of potential environmental impacts, and give advice to EIA consultants on how to produce comprehensive and effective EIA reports quickly.

STATUS OF IRON ORE

Metals are the mainstay of social and economic growth in the era of rapid industrialization. Massive amounts of high-quality iron ore are a major factor in the development of the nation's iron and steel sector, which accounts for roughly 11.8 percent of the world's iron ore reserves. According to estimates, India has around 25.25 billion tonnes of total resources, of which the largest explored deposits are hematite and magnetite, with 14.63 billion tonnes and 10.62 billion tonnes, respectively. The majority of hematite deposits are found in the Pre-Cambrian-aged Banded Iron Ore Formations (BIF) in the districts of Goa, Singhbhum in Jharkhand, Keonjhar in Orissa, Bellary in Karnataka, Bastar in Chattisgarh and Bhilwara in Rajasthan. The other main iron ore is magnetite, which is typically formed as an igneous or metamorphic oxide that forms bands of magnetite and silica. Such deposits are restricted to the Salem and North Arcot districts in Tamil Nadu, as well as the Chikmagalur district in Karnataka and Pur-Banera Belt of Bhilwara district in Rajasthan. India produced more than 212.64 million tonnes of iron ore in 2018–19, an increase of 1.63%, and 9.13% of the world's iron ore was produced. Companies in the public (27%) and private (63%) sectors produced a combined total of iron ore. According to statistics, practically all of the iron ore output in the iron ore distribution zones (96%) came from Orissa, Karnataka, Chhattisgarh, Goa, and Jharkhand, with the remaining production in those states (4%) coming from Andhra Pradesh, Madhya Pradesh, Maharashtra, and Rajasthan. Figure 1 shows the total iron ore production during the previous five years and the index of mineral production (base 1993-94=100) based on the general trend to date.

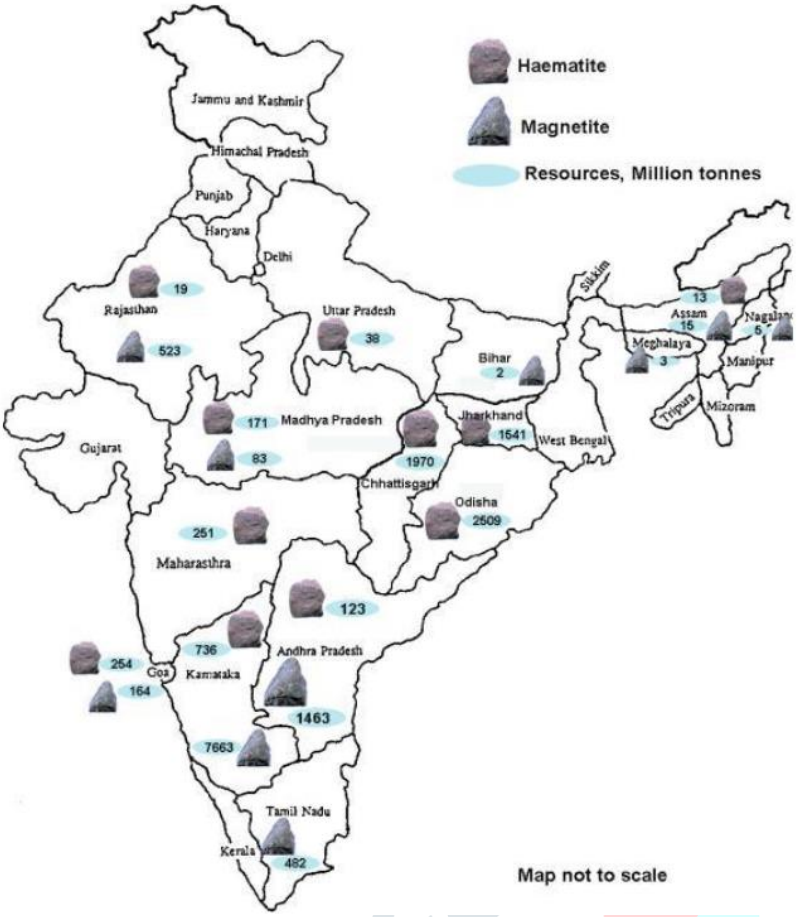

Figure 1: Details of Iron Ore Resources in India

There are currently 577 issued iron ore mining leases, and a total of 319 (approximately) mines, of which 34 are controlled by public sector companies and 285 by the private sector, produce the ore. The majorities of mines operated by public sector businesses are large and use advanced mechanised techniques, whereas those operated by private sector businesses are smaller and use only semi-mechanized techniques. Domestic steel output in the nation has just surpassed 66.01 million tonnes, and during the past five years, growth in steel consumption has only increased by 9 to 13%, or 53 kg per person. By 2023–24, 95% of the available capacity, or 305 million tonnes per annum (MTPA), must be used. This capacity can be increased by combining leases, enhancing the operational efficiency of current mines, opening up new deposits, etc.

Iron ore mining affects social and environmental circumstances directly or indirectly at every level, from prospecting through mineral processing. Numerous environmental issues are linked to the extraction of iron ore. Therefore, in order to successfully reduce any negative effects, environmental considerations and concepts must be incorporated into the design stage of mining operations.

ENVIRONMENTAL EFFECTS & THEIR MANAGEMENT

The planet is rich in non-renewable mineral resources thanks to nature. In actuality, the country exploiting minerals is essential to progress. Additionally, mining operations always affect the ecosystem. The degradation of forest ecology, modification of land use patterns, and modification of the local drainage system as a result of insufficient landscape management are the most severe environmental harms caused by iron ore mining. The size and scope of mining activities in conjunction with other factors determine the extent and severity of the effects on ecology and the environment. The topography and climate of the region, the types of mineral deposits, the mining process and mining capacity, agricultural operations, forest reserves, etc. The

ecosystem is impacted in many different ways by the mining and processing of iron ore. Figure 2 illustrates a number of unit operations of mining for iron ore and the surrounding environment.

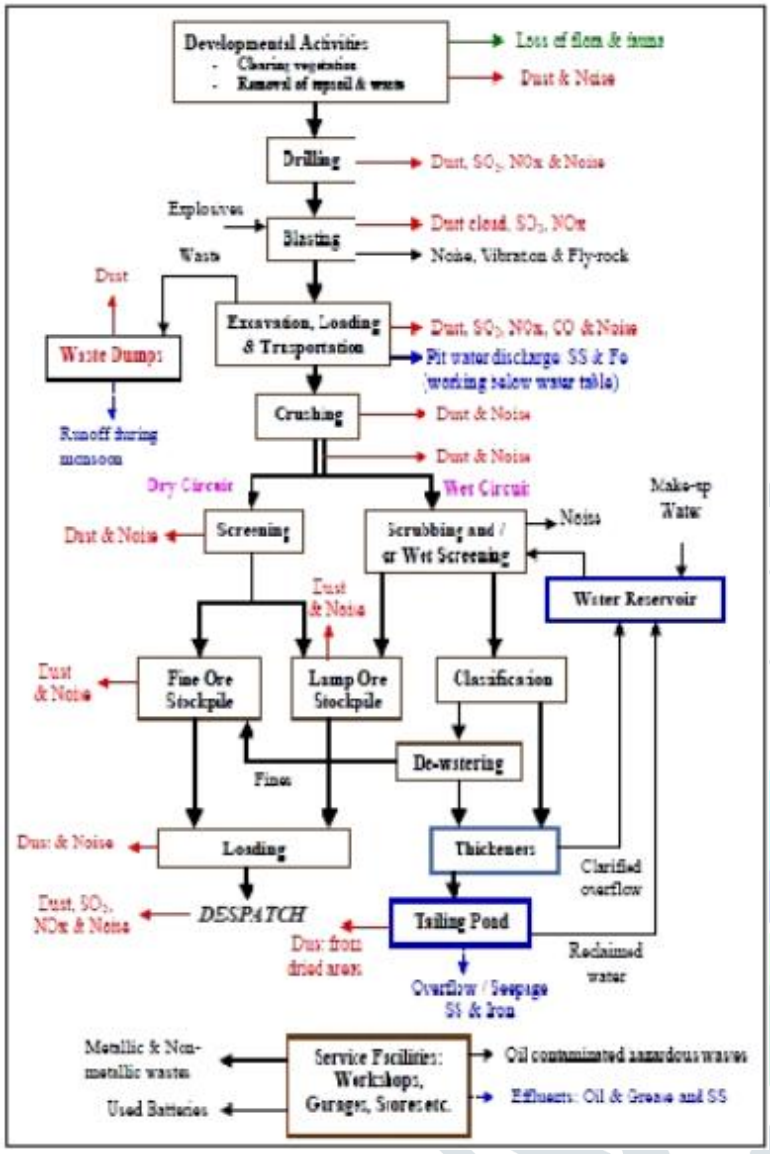

Figure 2: Environment & Iron ore extraction

Even if mining activities momentarily deplete an area's ecosystem and ecological resources, they have long-lasting effects that can be categorized as:

(a) Land degradation and alteration of land use.
(b) Effect on the flora and wildlife.
(c) Impact of dust and toxic fumes on air quality.
(d) Ground vibrations and noise pollution.
(e) Impacts on drainage patterns and water quality.
(f) Socioeconomic effects.

The iron ore sector needs to embrace better operational procedures and cleaner technologies more than ever in order to protect the environment. Mining during the pre-mining, active mining, and post-mining stages, techniques and the appropriate mitigation measures should be carefully chosen, not only to generate the best potential production and profitability, but also to improve the environment and have beneficial socioeconomic effects. suggestions for Integrating Environmental Concerns with Mineral Resource Exploitation helps to identify and emphasize the key features of the various issues and quickly outlines some of the procedures that must be taken during the planning and different phases of the mining operations. According to the 2008 National Mineral Policy, “A framework of sustainable development will be established to address biodiversity

challenges and for ensure the ecological equilibrium is restored. Sustainable development should give equal weight to environmental conservation and mineral development. The overarching rule is that miners should make an effort to leave mining areas in better condition than when they found them".

The most preferable alternative to keep the environmental consequences within the set parameters would be to use environmentally friendly mining and zero waste exploitation practices.

ENVIRONMENTAL IMPACT ASSESSMENT

The iron ore industry is about to expand through the establishment of new mines and the development of existing mines. The mining of iron ore has contributed to the improvement of social and economic growth. Environmental degradation has, however, gotten worse due to expanding automation, a lack of environmental awareness, and unlawful mining. By carefully planning the surface layout of the mining lease area and incorporating environmental considerations into each and every unit operation of mining activities, the environmental consequences can be reduced. Environmental Impact Assessment is one technique to guarantee that development occurs at the lowest possible environmental cost (EIA). The goal of environmental impact assessment is to determine and foresee how changes in the environment may affect human health and wellbeing to interpret and convey information regarding the effects of development efforts. In the latter half of the 20th century, the United States is where the EIA process first emerged. The systematic identification and assessment of the possible effects of planned projects can be used to define it broadly.

The potential effects of iron ore extraction on the environment must be carefully considered. The EIA process has been enhanced or expanded to increase transparency and social acceptance. Such an impact assessment research should consider future environmental effects of present mining operations in addition to the immediate effects. The EIA process often starts with screening to make sure that time and resources are focused on the proposals that matter to the environment and ends with some kind of follow-up on the implementation of the choices and actions taken as a result of an EIA report.

The outcomes of the EIA process are meant to:

(a) Identify the current environmental situation in light of numerous physical and biological environmental indicators, such as demographics.
(b) Evaluation of the potential effects of the proposed mining and related operations. This includes identifying the effects of a mine's activities on numerous environmental parameters. The likely effects have been quantified and qualitatively recognised.
(c) Give examples of strategies and actions being considered to reduce environmental harm.
(d) Organization and personnel are in place to carry out environmental control actions.
(e) A plan for carrying out and tracking the environment management plan and
(f) An approximate cost estimate for environmental management

Although it is generally acknowledged that EIA plays a significant part in decisions impacting the environment, concerns remain over the usefulness of EIA and its ability to influence decision-making. When something is said to be "effective," it means that it operates as intended and serves the intended goal or purposes. When even preliminary results are made available early in the planning process, the EIA process is most effective. At that time, potential environmental alternatives (sites, technologies, mitigation strategies, etc.) can be realistically assessed, and implementation and operating plans can be created to address urgent environmental challenges in the most economical way. Making a significant design change, choosing an alternative plan, or abandoning a project altogether can end up costing a lot of money. Delays in project implementation caused by environmental concerns that were not taken into account during design are even more expensive. The legislation of particular jurisdictions, policies, the notification period, public involvement, and the influence of members of environment committees all have a significant impact on how

effective EIAs are. EIA tools should be based on a thorough description of the current environmental situation as well as on a methodical analysis of each potential effect resulting from a proposed project or action in order to improve EIA decision-making. The accuracy of the baseline data is one aspect that matters in regulating the efficiency of EIA. Due to the various interferences and interactions between the various environmental factors, complex processes should involve specialist's knowledge and scientific disciplines in such areas of EIA.

SYSTEM SPECIALISTS

When it comes to putting into practice efficient EIA processes and exchanging information and knowledge, there is a serious dearth of environmental scientific skills. There is no automated mechanism to prepare Environmental Impact Assessment reports, notably in India, according to a survey of recent literature and interviews with environmental specialists. In actuality, the EIA reports that were submitted to the members of the specialists Appraisal Committee did not follow the format and instructions outlined in the MoEF manual or notification. Therefore, having system specialists for creating EIA reports would be helpful. When a personable specialist is not available, system specialists are employed to assist end users in gaining access to that specialist's topic knowledge. It simulates the problem-solving skills of specialists, which are based on human thinking. The EIA-Specialist System is a useful tool for aiding decision-making and determining the viability of a project. Such a system specialists includes a user interface, knowledge base, and inference engine that are utilized in the creation of EIA reports and are constructed with efficient EIA techniques to foretell the effects that iron ore extraction activities would have on the surrounding environment.

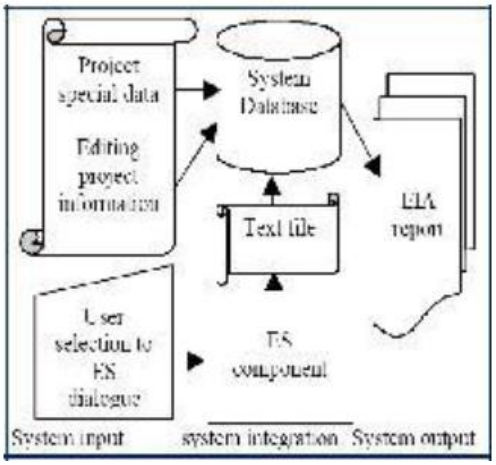

Figure 3: System Operating Stage

The methodologies use a step-by-step process for effect assessment and EIA report generation. The subject matter specialists follows the instructions written in the system and determines whether a given project is viable. The system must draw the appropriate conclusions regarding the execution of EIA approach stages. The specialist database system stores data regarding EIA components such the current environment, project description, prospective impact, mitigation strategies, and residual impact. Consistent question formulation would enhance the system's user interface. By responding to the questions posed by the system specialist's interface, the user can specify the different types of environmental component and prescribed activity. The algorithm makes inferences in between these question periods and offers guidance on practical means of mitigating measures. The technology makes it easy for the user to modify, remove, or add data to the generated EIA report, among other things. The system then transmits the report to the destination the user has chosen, such as a printer, file, or screen (Figure 3). The following are some benefits of using system specialists for EIA:

(a) System specialists assist users in managing heavy EIA workloads,
(b) It provides non- specialists with EIA expertise.
(c) Improves user accountability for decisions that imitate the capacity of human specialists to reason,
(d) Offers an organized approach to EIA and more possibilities for thought.

CONCLUSION

With the aid of current technology, the level of iron ore production and export will achieve the predicted or projected scale of the specialist/analyst. Due to the extraction of iron ore, there is not only an increase in the iron, steel, and related industries, but also environmental damage. Lack of environmental concern when planning mining operations and illicit extraction of iron ore deposits are the main causes of environmental deterioration. As evidence, the Supreme Court recently ordered that practically all of the iron ore mines in Goa and Karnataka be closed, and that EIA studies for the mine lease area be submitted. A lot of fresh ideas are required to suggest strategies and actions aimed at reducing environmental harm. Future technology should contain true eco-friendly operation concepts in addition to fewer maintenance costs and more productive concepts. The government created policies, procedures, an EIA notification format, and environmental committee members in order to preserve the environment. Even the submission of EIA studies is now required for all mines, particularly iron ore mines, in order to receive approval for new, renewed, and expanded mining lease areas. The preparation of EIA studies lacks environmental scientific knowledge, and project proponents are unaware of environmental concerns. In this situation, the reports that are given to the environmental committee members for approval do not adhere to any of the standards set forth by MoEF. An approach to improve ineffective report production and environmental impact prediction is to use system specialists. Government policies must change, but so too must project proponents' and consultants' mindsets in order to make iron ore mining sustainable.

REFERENCES

[1] “Comprehensive Industry Document on Iron ore mining”, Central Pollution Control Board, MoEF, August 2007
[2] Environmental Assessment Sourcebook 1999, Chapter 1
[3] Ericsson, M., “Iron ore corporate concentration”, Journals of Mines, Metal & Fuels, 2010
[4] Ghani, AA, Aljack, EA, “Development of Expert Database System for Environmental Impact Assessment”, Malaysian Journal of Computer Science, Vol. 12 No.1, June1999,pp. 19-27
[5] Hakansson, A, “An Expert System for the Environmental Impact Assessment Method”,Division of Computer Science, Department of Information Science, Uppsala University, Sweden
[6] “Iron ore pricing emerges from Stone Age”, Financial Times, October 2009
[7] Jackson .P,“Introduction to Expert Systems”, Addison Wesley England, 3rd Edition
[8] Jazzar, M, Daud, M, Bardaie, MZ, Ramli, AR & Said, S, “A Knowledge Based Expert System for EIA Using Blackboard Approach” MJCS, Malaysian Journal of Computer Science, Vol 11, No. 2. pp 15-22.
[9] Kruopiene, J. &Zidoniene, S., “Evaluation of Environmental Impact Assessment Effectiveness in Lithuania”, Environmental Research, Engineering and Management, 2008. No.2 (44), pp. 28-33
[10] Kumar, E., 2014, Environmental Impact Assessment for Iron Ore Mines – An Expert System
[11] Lumpur, K., “A Handbook of EIA Guideline”, Department of Environment, 1995
[12] Lohani, BN., Evans JWl, “Environmental Impact Assessment for Developing Countries in Asia”, Asian Development Bank 1997, Vol 1, pp. 356
[13] “Mineral and Metal Scenario”, Annual Report 2010-2011, Ministry of Mines.

[14] Singh, G., "Environmental Impact Assessment of Mining Projects", Proceedings of International Conference on TREIA-2008 at Nagpur, Nov.23-25, 2008
[15] Sengupta, S., "Indian Iron ore industry in Global Perspective", Steel world, October 2006, pp. 10-17
[16] Sharma, R K., "Iron Ore Exports", Federation of Indian Mineral Industries, New Delhi