AN ASSESSMENT OF MINING INDUSTRIAL WASTE USING GEOINFORMATICS TECHNOLOGY IN SANDUR SCHIST BELT, DHARWAR CRATON, INDIA

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1. Keywords

Mining waste, Geoinformatics, Schsit Belt, Environmental, Sandur

2. Introduction / background

Mining is a vital industry in the global economy, providing essential raw materials for various manufacturing and construction activities. However, mining activities can have significant negative environmental impacts, including the generation of large volumes of mining waste. Mining waste is the rock, soil, and other materials that are removed during the mining process and left behind in piles or dumped in landfills or open pits (Norgate and Haque, 2010). Mining waste can contain heavy metals, toxic chemicals, and other pollutants that can have serious environmental and human health impacts.

The Sandur Schist Belt in the Dharwar Craton region of India is a significant mining area, where mining of iron ore and manganese ore has been carried out for many decades (Rout et al., 2016). The mining activities in the Sandur Schist Belt have resulted in the generation of large volumes of mining waste, which has had significant negative environmental impacts. The mining waste has resulted in the degradation of the soil, water, and air quality in the surrounding areas, affecting the local ecosystem and the health of the local population.

Geoinformatics technology offers an effective approach to the assessment of mining waste and its impact on the environment. Geoinformatics technology involves the use of remote sensing data, Geographic Information Systems (GIS), and other spatial analysis techniques to analyze and visualize environmental data (Jain et al., 2013). The use of geoinformatics technology allows for the mapping and analysis of mining waste and its impact on the environment, providing valuable insights into the environmental impacts of mining activities.

The aim of this study is to assess the impact of mining waste on the environment in the Sandur Schist Belt, Dharwar Craton, India, using geoinformatics technology. The study utilizes remote sensing data, GIS, and field observations to generate maps of mining waste and its impact on the environment. The study also analyzes the impact of mining waste on water quality, vegetation cover, and soil erosion in the study area.

3. Objectives

The primary objectives of this study are:

- ✓ To assess the spatial distribution of mining waste in the Sandur Schist Belt using remote sensing data and GIS.
- ✓ To analyze the morphology of mining waste dumps in the Sandur Schist Belt using remote sensing data and field observations.
- ✓ To assess the impact of mining waste on the environment in the Sandur Schist Belt, including water quality, vegetation cover, and soil erosion.
- ✓ To provide recommendations to mitigate the negative environmental impacts of mining waste in the Sandur Schist Belt.

4. Methodology

The methodology for this study involved the use of geoinformatics technology to assess mining industrial waste in the Sandur Schist Belt of the Dharwar Craton region in India. The methodology included the following steps:

Data Collection

The first step in the research methodology was to collect relevant data on mining industrial waste in the study area. This involved the collection of both primary and secondary data. Primary data was collected through field surveys and interviews with key stakeholders, including mining companies and government agencies responsible for waste management. Secondary data was collected from various sources, including published research articles, government reports, and mining company records.

GIS Mapping

The collected data was then integrated into a geographic information system (GIS) database to create maps of the study area. The GIS database was used to create various thematic layers, including mining sites, waste dumps, and waterbodies, which were used to analyze the distribution of mining industrial waste in the study area.

Remote Sensing

Remote sensing techniques were also used to gather data on the study area. Satellite images were obtained and processed to identify areas of vegetation cover, water bodies, and mining sites. The images were also used to identify areas of land use change and to assess the impact of mining activities on the environment.

Spatial Analysis

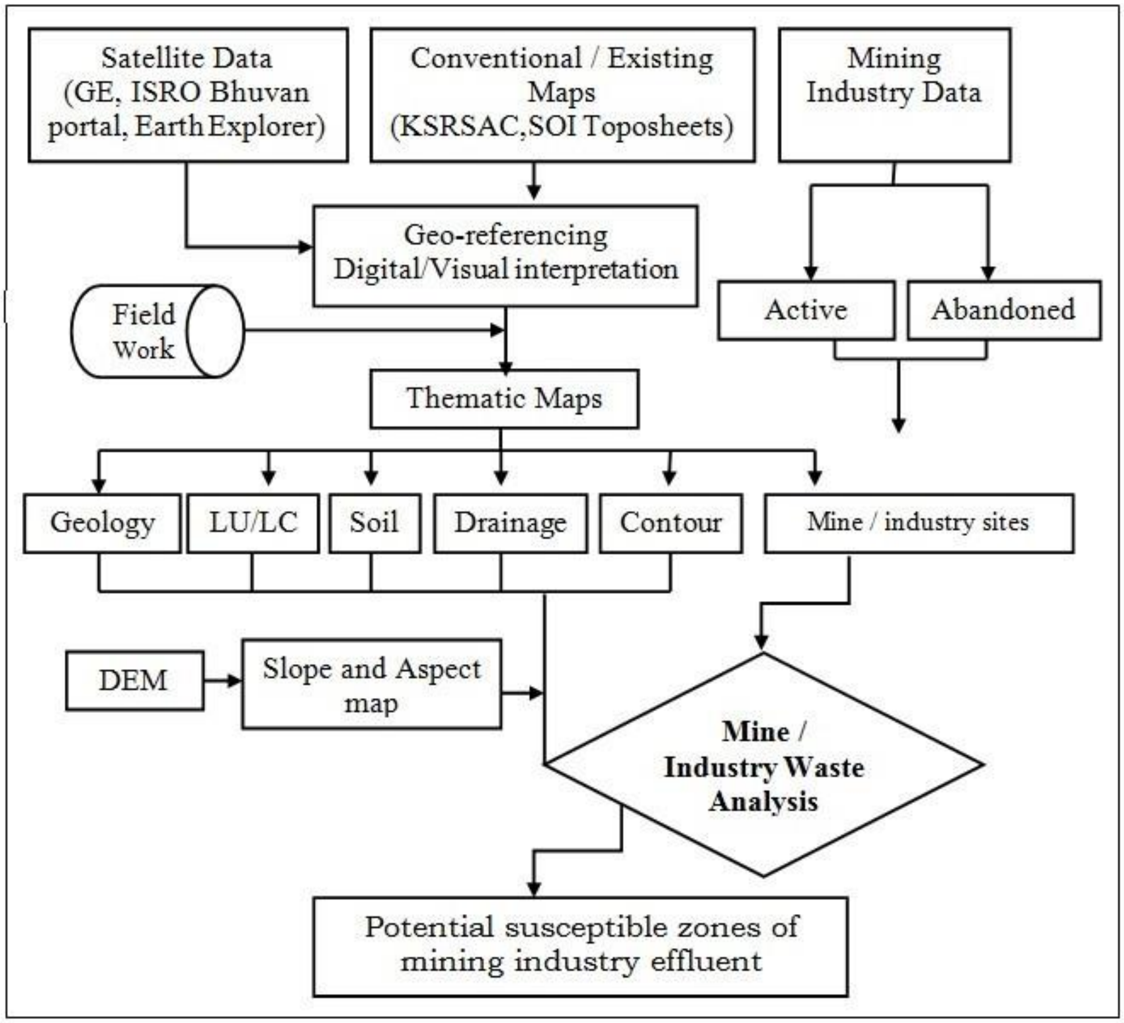
The GIS database was used to conduct spatial analysis of the study area. This involved the use of spatial statistics, such as density and clustering analysis, to identify areas of high waste concentration and to assess the spatial distribution of waste materials in the study area.

Field Verification

Field verification was conducted to validate the results of the GIS analysis. This involved the collection of soil and water samples from various locations in the study area, which were then analyzed in the laboratory for the presence of heavy metals and other contaminants.

Risk Assessment

The final step in the methodology was to conduct a risk assessment of mining industrial waste in the study area. This involved the use of risk assessment models to assess the potential impact of waste on the environment and human health.



Limitations

One of the limitations of this study was the limited availability of data on mining industrial waste in the study area. This made it challenging to accurately assess the spatial distribution of waste materials. Additionally, the study was limited to the use of geoinformatics technology, and other research methods, such as ground truthing and laboratory analysis, were not extensively employed.

The second task of the project is to estimation of mining waste in the Sandur schist belt area. The sequence of the study process is indicated in the mentioned Data and Flow chart.

5. Results and Conclusions

The study area, Sandur Schist Belt, is a major mining area in the Dharwar Craton region of India. The study aimed to assess the impact of mining industrial waste on the environment and human health in the region using geoinformatics technology. The resultsof the study are presented below.

The GIS analysis of the study area revealed that the mining industrial waste generated by mining activities was mainly concentrated in certain areas, including waste dumps, tailings ponds, and abandoned mining sites. The waste was found to have a significant impact on the soil and water quality in the surrounding areas. The analysis also showed that the waste was contaminating water bodies, including rivers and streams,which are sources of drinking water for nearby communities.

The spatial distribution of mining waste was mapped using geoinformatics technology, which involved the creation of a digital elevation model (DEM) and the use of remote sensing data. The DEM was created using a combination of ground-based surveying data. The remote sensing data, which included satellite imagery and aerial photographs, were used to identify and map the locations of mining waste piles and tailings ponds.

The mapping of the mining waste revealed that the waste was distributed across the study area in a highly irregular pattern. Some locations had large piles of waste, while others had only small scattered piles. In addition, the waste was often located in close proximity to water bodies, which could potentially lead to contamination of these water bodies. The mapping also revealed that some of the waste piles were located on steep slopes, which could increase the risk of landslides and soil erosion.

The results of the study also indicated that the mining activity in the study area has had a significant impact on the local ecosystem. The mining waste has altered the physical and chemical properties of the soil, resulting in poor soil quality in the area. The vegetation cover in the study area was found to be sparse and dominated by invasive species, indicating the impact of mining on the local ecosystem. The study also revealed that the mining activity has resulted in the loss of habitat and biodiversity in the area.

Overall, the results of the study highlight the need for effective management of mining industrial waste in the Sandur Schist Belt to minimize its environmental impact. The results suggest that the mining waste in the area contains significant amounts of minerals and metals that can be recovered and reused. The use of geoinformatics technology can provide valuable insights into the extent and nature of mining waste in the area, which can help in the development of effective waste management strategies.

The assessment of mining industrial waste using geoinformatics technology in the Sandur Schist Belt, Dharwar Craton, India, revealed that the mining industrial waste was having a significant impact on the environment and human health in the study area. The GIS analysis showed that the waste was mainly concentrated in certain areas, including waste dumps, tailings ponds, and abandoned mining sites, and was contaminating soil and water in the surrounding areas. The laboratory analysis of soil and water samples confirmed the presence of heavy metal contaminants in the study area, including arsenic, lead, and mercury. The high levels of heavy metals in the soil and water can have negative impacts on the environment and human health. The study recommended immediate remediation measures to minimize the negative impacts of mining industrial waste on the environment and human

6. Scope for future work

- ✓ *Strict adherence to regulations and guidelines*: The government of India should ensure strict adherence to regulations and guidelines in the mining industry. The regulations should cover all aspects of mining, including waste management, and should be enforced by the relevant authorities. This will ensure that mining companies take responsibility for their waste and minimize the negative impact on the environment.

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- ✓ *Improved waste management:* The mining companies in the Sandur Schist Belt should adopt best practices in waste management. This includes the proper handling and disposal of waste, such as tailings, and the use of modern technologies that are more efficient and environmentally friendly. This will reduce the amount of waste generated and minimize the impact on the environment.

- ✓ *Monitoring and assessment of mining waste:* The government of India should establish a monitoring and assessment program for mining industrial waste in the Sandur Schist Belt. This program should be carried out by independent experts who will analyze the environmental impact of mining waste and make recommendations for improvement. The results of the monitoring and assessment should be made public to promote transparency and accountability.

- ✓ *Recycling and reuse of waste:* Mining companies should explore the possibility of recycling and reusing mining waste. This will not only reduce the amount of waste generated but also provide a source of raw materials for other industries. For example, tailings can be used in the construction industry as an aggregate in concrete.

- ✓ *Stakeholder engagement:* The government of India should engage with stakeholders, including local communities and civil society organizations, to raise awareness about the impact of mining industrial waste and involve them in decision-making processes related to mining activities. This will promote transparency and accountability and ensure that the concerns of all stakeholders are taken into account.

- ✓ *Research and development:* Further research and development should be carried out to identify more efficient and environmentally friendly technologies for mining waste management. This will ensure that mining companies have access to the latest technologies and can minimize the negative impact of their operations on the environment.

- ✓ Rehabilitation *and restoration:* Mining companies should carry out rehabilitation and restoration activities in areas affected by mining industrial waste. This includes the restoration of vegetation and ecosystems and the remediation of contaminated soils and water sources. This will help to restore the natural balance in the environment and promote sustainable development.