International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 5 May 2023, pp: 538-543www.ijaem.net ISSN: 2395-5252

Planning For Mining Industrial Areas: To Develop A Comprehensive Framework

Ajmi Shajahan S, Anjana Murali

Student, Department of Architecture, TKM College of Engineering, Karicode, Kollam
Professor. Anjana Murali, Department of Architecture, TKM College of Engineering,

---

Date of Submission: 05-05-2023 Date of Acceptance: 15-05-2023

ABSTRACT
Mining is an important activity for India.Mining contributes to 2.5 per cent of the Gross Domestic Product (GDP). The total mineral production is valued at 1,299,500 million, and 18,963,480 million of mineral exports in 2020 [1]. Unplanned mining industrial zones are among the main contributors to industrial pollution. As a result of their pollutant releases, these industries end up contaminating the environment. People living in the surrounding communities saw a significant decline in quality of life as a result.In planning for mining industrial regions, this report seeks to create a thorough framework.Value creation through the development and efficient implementation of an optimal mine plan is a major opportunity within the mining industry today [2].The set of parameters and standards is computed from the research to develop a comprehensive framework for mining industrial areas. Based on the derived parameters, the case studies for mining industrial zones are reviewed, and the best strategies to address the effects of the industries they utilized are adopted. Indicators that should be emphasized when planning an industrial area are identified by the study. A model of the framework for an ecologically sustainable industrial region is developed after identifying the key indicators that should be focused on the research area.

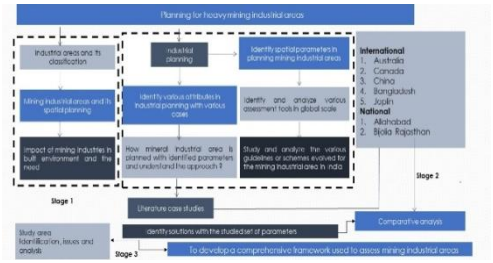
I. INTRODUCTION

Mining extracts useful materials from the earth. Although mining provides many valuable minerals, it can also harm people and the environment. The top 40 mining corporations in the world, which make up the great majority of the sector, generated about 656 billion dollars in revenue in 2020. In the mining sector, the net profit margin dropped from 25% in 2010 to 11% in 2020.China is emerging as the world's leading producer of minerals, particularly the highly sought-after rare earths, of which China produced about 58 percent of the world's supplyin 2020. Furthermore, China is the world's top producer of gold from mines**.** The mining sector's contribution to the GDP is 2.3-2.5 %at present. Mineral production in India grew at a compound annual growth rate (CAGR) of 5.72% between 2013-14 and 2017-18.[3]

II. AIM AND OBJECTIVES

A)Aim
To develop a comprehensive framework in planning for heavy mining industrial area.
B) Objectives
1.To study the various impacts of mining industries in surrounding built environment
2.To identify the parameters considered in planning for mining industrial area
3.To identify and analyse various assessment tools applied for the evaluation of mining industrial areas
4.To compare the identified indicators with best practices and cases and determine appropriate measures in planning for mining industrial areas
5.To evolve a comprehensive framework in planning for heavy mining industrial area

III. METHODOLOGY



IV.NEED, SCOPE, AND LIMITATION

A) Need

Large-scale land disturbance and alteration can result from mining and related processes. The intensity of such disruption varies depending on the site's natural features, including its geology, vegetation, topography, climate, and its proximity to and characteristics of surface water.The 4 to 7 percentof the world's greenhouse gas (GHG)emissionsare related to mining.The over exploitation of resources is a threat to biodiversity. It implies the need for proper planning and

International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 5 May 2023, pp: 538-543www.ijaem.net ISSN: 2395-5252

management. A healthy environmentis important for sustainable developmentand future generations must be assured that these resources will be available because any society will need them in a similar or greater amount than we do today.

B) Scope

The Indian mining industry has come under heavy fire for several issues linked to how it is performing in terms of sustainable development. The magnitude and duration of the environmental impact can be studied. The reversible capabilityof nature can be evaluated.Sustainable planning framework for mining industry can be developed. The future scope of implementation of identified planning approach in heavy mineral mining industry.

C) Limitation

The study of the components to plan for mining industrial area is limited to secondary data and the derived indicators are further to be validated with primary study for the identified area.

V. IMPACTS OF MINING INDUSTRY

Environmental problems might include erosion, sinkhole development, biodiversity loss, and chemical contamination of soil, groundwater, and surface water resulting from mining processes.If contamination brought on by chemical leaks is not properly regulated, the nearby population's health may also be affected. Dust from blasting operations and haul routes may be produced by surface mines. Several coal mines release the greenhouse gas methane. Heavy metals, Sulphur dioxide, and other pollutants may be released into the air because of inadequate precautions at smelter operations. Numerous accidents that occurred in coal and stone mines, both underground and on the surface, in recent years have resulted in the deaths of many mineworkers.[4]

VI.LITERATURE REVIEW

Industrial planning is a conceptual and strategic process for creating a plan to support or develop any industrial region in a way that makes it easier to produce, manufacture, and process commodities and goods.

The industrial areastructure plan and the major area structure plan must be congruent with one another if the city's major area structure plan covers the area for which the industrial area structure plan is being created.The structure plan for the industrial area offers flexibility to adapt to shifting trends in the spatial requirements of diverse industries. Industrial area planning scale varies according to the types of industrial area.

1) Industrial Park

A designated area for industrial use at a suitable location that ensures sustainability by including social, economic, and environmental quality issues into its siting, planning, operations, management, and decommissioning is known as an-industrial park.

2) Industrial estate

Industrial estates are locations allocated for industrial activity where infrastructure like roads, power, and other utility services are offered to support the growth of enterprises and to limit environmental effects.

3) Industrial city

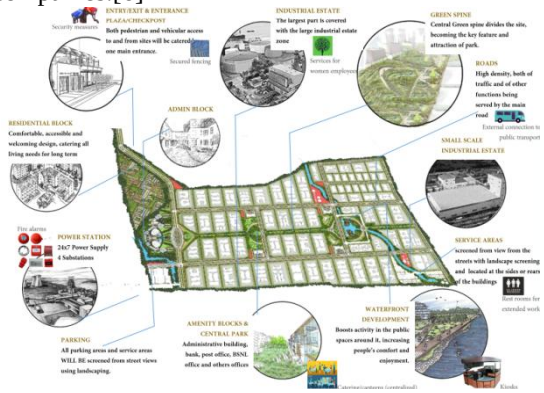
A zone or territorythat contains a collection of independent industrial facilities that are all active at the same time is known as an industrial city.

4) Industrial region

Industrial regions emerge when several industries locate close to each otherand share the benefits of their closeness.[5]

A) Scale of Industrial area planning

Industrial Areais around 64 Kms from Indore (Commercial Capital of Central India) with an area of 478 hectares. Out of the total 478 hectares of industrial land, the state has declared an Industrial Township of 206hectaresfor SEFEAN's companies.[6]



Smart Industrial Park is in Dhar district in the Indian state of Madhya Pradesh.

B) Main parameters for Industrial area

International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 5 May 2023, pp: 538-543www.ijaem.net ISSN: 2395-5252

SL.NO	PARAMETERS	INDICATORS	STANDARDS
1	Land use	Land and agriculture	Buffer zone in case of Mining Lease (ML) area up to 25 ha is to be considered as 5km all around the periphery of the core zone and for ML area above 25 ha - an area 10 km all around the periphery of the core zone
2	Quality of life	Health and safety	Life expectancy at birth (years)Age adjusted mortality rate (per 1 000 people) Health impacts through air, water, soil, and noise pollution. Homicide rate (per 100 000 people).
3	Environment	Pollution and Biodiversity	Control of water, air, and noise pollution. Control and regulation of activities which have impact on environment.
4	Industrial infrastructure	Transportation	Regulatory requirements for packaging, labelling, and transportation of hazardous waste
5.	Social factors	Social cohesion Population density Labour welfare	Labor force and population shift, displacement and relocation effects and the population make-up
6	Environmental infrastructure	Industrial waste collection	Slag wastes, sludges from effluent treatments.
7.	Social infrastructure	Institutional developments and housing	Social services NGOs in the area. The social integration of community and the mechanisms by which individuals and groups within the area. Social services NGOs in the area. The social integration of community and the mechanisms by which individual and groups within the area

C) Assessment tools

1.Environmental Impact Assessment: -EIA is defined as "a planning tool used for the identification, evaluation and mitigation of potential impacts positive and negative of proposed plan / policy / program on physical/ biological /social/cultural / economic factors prior to decision making".

2.Environmental Management System -It maps out a framework that a company or organization can follow to set up an effective environmental management system.

3. Life cycle Assessment -It is an environmental management tool which helps to determine the environmental impact of an activity throughout the entire life.

4.Environmental auditing: - It is simply a tool used in environmental management to assess how particular activities affect the environment in comparison to predetermined standards or criteria.

5.Mine site Assessment tool: -The MSAT has a survey-like format, with questions that can only be answered with a yes or no. The resource addresses 15 different subjects on a variety of economic, environmental, social, and governance (EESG) challenges [7]

VII. LITERATURE CASE STUDIES

The case studies in Indian and international level are selected. The case studies are chosen based on the measurable indicators of industrial planning derived based on the literature study and primary observation of site.

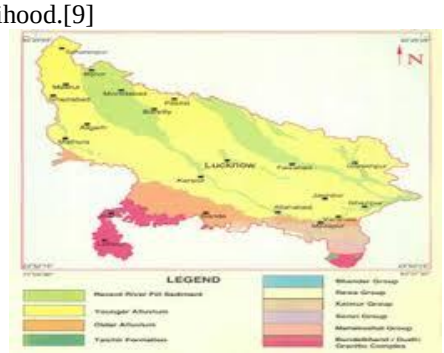
1)Bijolia Rajasthan – Socioeconomic impact

One of Rajasthan's main mining regions is Bijolia, where large-scale mining first started almost thirty years ago. Since then, the environment has been negatively impacted, but no systematic assessment has been made to determine how it has influenced the nature and socioeconomic structure of the people who work in and near the mines. [8]

Sandstone Mining in Bijolia

2) Allahabad – Environmental impact

Small-scale cluster mining, a type of mining that has been practiced in Allahabad for decades, developed gradually through time. The residents claimed that traffic caused additional dust to be produced, some of which ended up in the surrounding field and reduced the soil's fertilityThe quality of soil (both physical and chemical) has obviously been impacted by mining activity, which has a negative impact on human production & livelihood.[9]

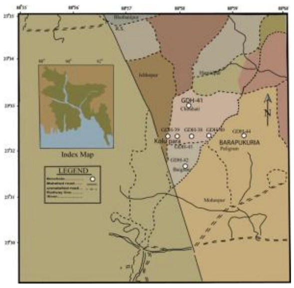


Vindhyan region

3) Bangladesh -Land use and Landcover

The conducted study is pertinent to the changes of Land use and land coverin the Barapukuria Coal Mine under the district of Dinajpur, Bangladesh. The mining activities caused subsidence in a broader area, causing resettlement. The research work was conducted incorporating GIS and remote sensing techniques and open-sourced Landsat imageries to reveal the surface.[10]

International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 5 May 2023, pp: 538-543www.ijaem.net ISSN: 2395-5252



Coal Mining affects water body of Barapukuria

4) Joplin mine sites -Land pollution

Located close to the city of Joplin in southwest Missouri. Here, mining waste, or chit as it is known locally, is prevalent across the city's open areas and is highly contaminated with cadmium, lead, and zinc. Wind and rain can carry soil particles contaminated with heavy metals away from the original polluted locations. Remedial measures adopted.[11]

1. Excavation
2. Stabilizing metals in soil
3. Use of plants – Phyto- remediation, Rhizo-filtration


Mine spoils called chat.

A)Comparative analysis of case study

Parameters	Bijolia Rajasthan	Bangladesh	Allahabad
Land use	Thick green belts act as acoustic screens and reduce noise levels along roadsides and settlements. Wide-leaf trees should be planted all around the mines	A thorough and effective approach for mapping an area's land use and land cover, including agricultural, built-up, and other forms, has been made available through geographic information systems (GIS) and remote sensing techniques.	Buffer zone/Biological Filter Zone at the periphery (at least of 10m width) of mining area should be kept mandatory. Buffer zone/Biological Filter Zone should be established by planting suitable plant species which can absorb/adsorb this dust and particulate matter borne air pollution created by mining activity and consequently reduce its adverse effects on agriculture and forest environment
Quality of life	Plantation of wide-leaf trees around the mines, on waste dumps, in mine worker villages and on both sides of the mine as well as village roads should be undertaken. Wide leaf trees intercepts dusts more rapidly. Sprinkling of water on the mine roads settles dust and reduce dust particles in the air. If such measures are adopted SPM in air which affects the health of mine worker, would be considerably reduced, and have positive impact on the health of mine workers	Access to services–managing pressures and utilizing revenues to attractiveness. Health in mining regions is impacted through environmental and non-environmental exposures.	Medical Camps should be organized by the mine owners, at least fortnightly, for the general medical health check-up of mine workers and surrounding populations. They should be educated to take preventive health precautions during mining activity.
Environment	Control strategies include designing equipment that is naturally quiet or installing noise control treatments on existing equipment All dump hills should be vegetated by native plant species like (bamboos) which are of high economic value and can thrive on all kinds of habitats.	Environmental quality such as cleanliness of air and water, but also the availability of green spaces and beauty of spaces impact individual health status	Regular inspection of the mining areas is recommended and scales of extraction with permitted specifications especially, in terms of the depth of mining, should be regularly inspected and monitored for each sanctioned mine lease to prevent environmental hazards and, to check illegal mining.
Industrial infrastructure	Dump material should be taken away for construction purposes. Even some subsidy in transporting the material to construction sites may be given.		
Social infrastructure		Dealing with fluctuations in housing affordability – balancing boom and abandonment. To reduce conflicts and disagreement related to mining ventures, the concept of 'social license to operate' was introduced.	
Environmental infrastructure			Their dependency on mining was mainly as labour work in mining, rest were engaged in mining related works, like mineral and mine waste handling, transportation and trading of minerals and mining products and petty mine owners.
Social factors		Local job creation and good salaries are one of the key elements that determine the support for local mining activities	Since the livelihoods of majority of people will be affected by the closure of the mining activity, a provision should be kept for alternative employment after the closure of the mining activity

B) Sustainable mining

5) Austrade

Environmental responsibility, social responsibility, and commercial successare now concepts that cannot be separated, the Australian mining industry is at the forefront of the global movement toward sustainable mining.Biodiversity management to minimize long-term impacts from operations, including opportunities for improvementin the lease and adjacent areas by introducing innovative and sustainable land management practices.[12]

Sustainable mining

6) Canada

The Towards Sustainable Mining (TSM) initiative is the Canadian mining industry’s commitment to responsible mining. Established in 2004 by the Mining Association of Canada (MAC), TSM’s objective is to enable mining companies to meet society’s needs for minerals, metals, and energy products in the most socially, economically, and environmentally responsible way.[13]

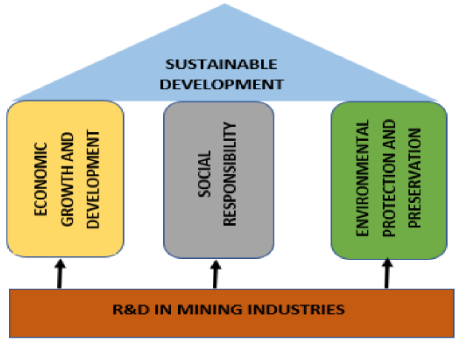
Towards sustainable mining

7) China

Bauxite mining in Kuantan, Pahangstarted in early 2013 with small-scale mining in Balok and later expanded to Bukit Goh, Bukit Sagu and Sungai Karang. HumanHealth ImpactUnregulated mining activities in Kuantan have resulted in severe health impact to the surrounding residents. Long

International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 5 May 2023, pp: 538-543www.ijaem.net ISSN: 2395-5252

term health impactcan be expected due to dust and the presence of toxic heavy metals.[14]

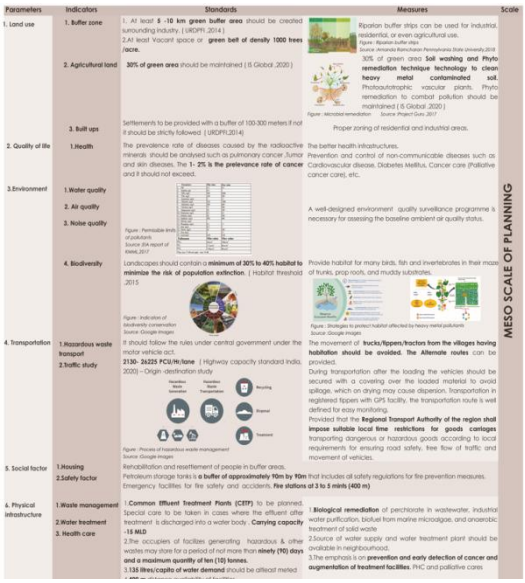


Sustainable mining China

C) Comparative analysis of Sustainable mining case study

Comparative case study analysis using the derived parameters for industrial planning is carried out. It is analysed what steps were taken in each situation to address the problems with industrial pollution. This is used to develop the study area's framework.Rehabilitation of affected people and community engagementactivities leading to sustainability. In better land use they adopted thickgreen belts surrounding the industry, buffer, and biological filter zones. GIS and remote sensing tools for the analysis of the study area. The plant species that absorb dust particles is promoted in buffer areas.Regular medical campsare organised by the mining industries for the human settlement surrounding the industry.Regular inspection of industrial area**s** to monitor proper environmental management plans are followed or not.Planning for industrial areas focuses the neighbourhood and environment around the industry. to promote a healthy and sustainable development. The concept of social license to operatehazardous industries should be adopted. Better waste management systemshould be installed that prevents the toxic effluent flow to the water bodies and surrounding land parcels.

VII. FRAMEWORK FOR INDUSTRIAL AREA



Based on the literature examined, the planning criteria for industrial areas are developed in this study. The case studies selected based on the obtained criteria are used to guide the remedial procedures for the effects of heavy industries on the surrounding region. Using these corrective actions, a framework for heavy industries is developed. After studying the impact assessment tools, it is determined that EIA is the most useful one for evaluating the study area. The research derives the planning elements to be concentrated in the study area based on the secondary and primary examination of the site. The outcome of the research and the validation of the site using the developed framework is the framework suitable for heavyindustry. This helps to give better planning interventions in the heavy industry affected areas.

VIII.CONCLUSION

By provision of better hazardous waste management, green buffer area, unpolluted physical infrastructures such as drinking water facility, health care facilities and planned residential areas can revitalize area to a better industrial town. Inclusive and sustainable development **is** the primary source of income

generation, allows for rapid and sustained increases in living standards for all people, and provides the technological solutions to environmentally sound industrialization. Sustainable industrial development works to minimize its environmental footprint while maintaining economic growth, social advancement, and quality of life.

REFERENCES

[1]. Abraham Mary,2022, India's Mining sector: Towards a sustainable and equitable future.
[2]. Bulletin ,2022The role of mine planning in high performance.
[3]. M. Garside,2022, Mining industry worldwide - statistics & facts
[4]. Pradeep S Mehta,2002, The Indian Mining Sector: Effects on the environment and FDI Inflows
[5]. 2022,The Ketchikan Gateway Borough Code
[6]. 2022, Industry Experts
[7]. Shibu Krishnan,2017, Sustainable Engineering
[8]. Chauhan, 2010, Mining, Development and Environment: A case study of Bijolia Mining area in Rajasthan, India.
[9]. Niti Aayog ,2017 Socio Economic Impact Study of Mining and Mining Polices on the Livelihoods of Local Population in the Vindhyan Region of Uttar Pradesh
[10]. Hossain Arifeen,2021, Role of mine in changing its surroundings-Land use and landcover and impact on the natural environment in Barapukaria, Bangladesh
[11]. M. Lambert,2021, New methods of cleaning up heavy metal in soils and water
[12]. IGF,2022, Mine waste management
[13]. 2013, Towards sustainable mining
[14]. Huan Cai,2013, Sustainable mining

.