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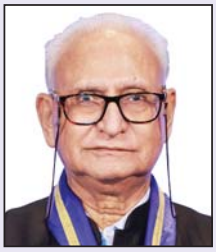

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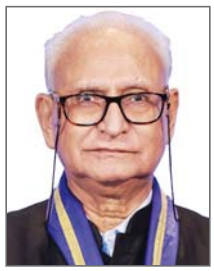
President's Message.....



Dear members..

I am pleased to have the honour of being part of the International Conferences organized "by and for Students" by the Rajasthan Chapter, Udaipur, in February 2025. The Chapter will soon organize another International Conference on "Centre of Excellence in Mining: Continuous Improvement & Asset Optimization" in Udaipur on 26–27 April 2025.

The Rajasthan Government recently announced in the State's 2025 budget that it will set up three organizations for the better utilization of minerals. The Government plans to establish a Centre of Excellence in Jaipur, an Institution of Mines in Udaipur, and a Petrochemical Research Campus in Jodhpur. It also intends to set up a company called Rajasthan Mineral Exploration Ltd.

The International Conference on the "Centre of Excellence in Mining" by the Udaipur Chapter is an effort to support the Rajasthan Government's plans to establish such a Centre, providing facilities like mineral processing laboratories and pilot plants to demonstrate and implement indigenously developed technologies for the successful mining and processing of strategic and critical minerals. The conference deliberations will help guide the development of the Centre of Excellence.

Despite prominent announcements regarding the launch of a new North East MEAI Chapter in Assam and the revival of the Raipur and Mumbai Chapters, no effective actions have been taken, and the matter remains unresolved as it was a couple of months ago. I hope these three Chapters begin functioning within the next two months, i.e., before the next AGM. Likewise, sincere and serious efforts are needed to revive other dormant Chapters, such as Kolkata and Himalaya. Some Chapters are not officially dormant but have been largely inactive, with hardly any activity in the past 6–8 months or more, such as the VP Chapter, Goa Chapter, etc. These need to be reactivated, and their Executive Committees must act promptly in this regard. Similarly, the constitution of new Executive Committees through fresh elections is due in many Chapters where the last elections were held in early 2023, such as Hyderabad, Bangalore, Visakhapatnam, Hutti-Kalaburagi, Ongole-Vijayawada, Bara Jamda, Bailadila, Bhubaneswar, Belgaum, VP Chapters, among others. All such Chapters need to elect and install new Committees before the new Council is installed at HQ.

The election process for reconstituting the new Council for the 2025–27 term has already begun and is expected to be completed as scheduled so that the new Council can be installed sometime in June–July 2025.

With the best wishes,

S.N. Mathur
President

Mining Engineers' Association of India

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EDITOR'S DESK

Dr. P.V. Rao
Editor, MEJ

India's mineral policy initiatives have struggled to achieve the dual objectives of discovering major mineral deposits domestically and acquiring mineral assets overseas. Despite significant geological potential, domestic exploration has been hampered by bureaucratic delays, environmental conflicts, and outdated regulations. Overseas mineral acquisitions, meanwhile, face geopolitical risks and a lack of strategic financial backing. These challenges underscore the need for structural reforms to align India's mineral strategy with global best practices.

The Indian government has adopted a multi-pronged strategy to address the nation's critical mineral needs, recognizing their vital role in clean energy, high-tech industries, and national security. These strategies have led to notable milestones, such as the successful auction of several lithium and tungsten blocks. The centrepieces of this approach is the National Critical Mineral Mission (NCMM), launched in January 2025 with a total outlay of Rs. 34,300 crores over seven years. However, challenges remain: only about 48% of available blocks have been auctioned, and foreign investment is limited due to systemic barriers in exploration and classification. Despite stakeholders' persistent demands, the government has yet to adopt internationally recognized mineral resource reporting and classification systems, such as the Indian Mineral Industry Code (IMIC). While the policy framework is robust and forward-looking, actual progress in scaling up domestic production and securing overseas assets remains gradual.

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India's mineral sector continues to be constrained by protracted license approval processes and land acquisition disputes. Such delays deter private investment, as demonstrated by ArcelorMittal's abandonment of a $12 billion steel project in Odisha after seven years of stalled progress, and South Korea's POSCO scrapping a $5.3 billion project in Karnataka due to land acquisition hurdles and unclear mining rights. Environmental and social conflicts, including tribal rights and forest conservation laws, further complicate mining operations.

To acquire mineral assets overseas, the government has launched several initiatives. A flagship effort is the National Critical Mineral Mission (NCMM), which adopts a comprehensive approach to boost exploration, mining, processing, recycling, and overseas acquisition of critical minerals such as lithium, cobalt, nickel, copper, and rare earth elements—vital for clean energy technologies, electric vehicles, and national security.

Despite stakeholders' persistent demands, the government has yet to adopt internationally recognized mineral resource reporting and classification systems, such as the Indian Mineral Industry Code (IMIC).

A key institutional mechanism for overseas mineral acquisition is Khanij Bidesh India Limited (KABIL), a joint venture formed in 2019 by three Central Public Sector Enterprises: NALCO, HCL, and MECL. KABIL's mandate is to identify, acquire, explore, and develop strategic mineral assets abroad to ensure a resilient supply chain for India's domestic industry. KABIL has secured a lithium exploration and development contract in Argentina's Catamarca province and is actively pursuing opportunities in Australia and Chile through MoUs and NDAs with respective government agencies and state-owned companies. The main obstacles faced by KABIL include lengthy gestation periods for mining projects, complex international negotiations and regulatory hurdles, technical challenges in extraction and refining, global competition and supply chain risks, and a nascent domestic mining ecosystem. The absence of a dedicated sovereign fund for mineral acquisitions exacerbates risks.

While these initiatives mark a strategic shift towards mineral self-reliance, results have been mixed. KABIL's acquisition in Argentina is a significant milestone, but exploration activities remain in the early stages and are facing statutory clearances and operational challenges. The auctioning of critical mineral blocks domestically has attracted inadequate investor interest, partly due to insufficient preliminary exploration data, which increases risk for potential investors. The investor confidence could be improved substantially by adopting a transparent resource reporting system like IMIC aligned with CRIRSCO international Template.

In summary, the Indian government's initiatives through the NCMM, KABIL, regulatory reforms, and international cooperation represent a robust framework to secure critical mineral supplies. However, translating these policies into large-scale production and stable supply chains will require overcoming exploration data gaps, investor hesitancy, and operational hurdles in both domestic and overseas contexts.

While allowing 100% FDI under the automatic route is a positive policy step, attracting substantial foreign investment in India's mining sector will require addressing deep-rooted structural, regulatory, and infrastructural challenges. Continued reforms to streamline approvals, improve exploration data reporting, upgrade infrastructure, and ensure social and environmental sustainability are essential to unlocking the sector's full potential and realizing the government's vision of self-reliance in critical minerals.

- Editor


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NEWS FROM THE MINERAL WORLD

➤ Over half of ₹1-lakh crore collected for the welfare of mining districts not spent: report

Funds are often diverted to activities that are not directly linked to the welfare of mining districts, it says

A first-of-its-kind analysis of the District Mineral Foundations (DMF) shows that despite collecting about ₹1-lakh crore in the past decade, more than half the funds is unspent. Moreover, the funds are often diverted to activities that are not directly linked to the welfare of mining districts — a contravention of the Centre's guidelines. The DMFs are non-profit trusts set up in mining districts, covering coal, lignite, major minerals such as iron, manganese, and bauxite, and minor minerals, and tasked with ensuring that a portion of the revenues generated from mining is spent on the development of the districts. They have been established in 645 districts across 23 States.

The report was prepared by iForest, an independent research group.

In September 2015, the Centre launched the Pradhan Mantri Khanij Kshetra Kalyan Yojana to drive transformational change in mining-affected areas through investments in various developmental projects and activities. The PMKKKY is implemented through funds accrued to the DMFs. Following the setting-up of DMFs and promulgation of the PMKKKY guidelines, State governments have developed and notified the State DMF Rules. These Rules outline the governance structure of the DMFs, fund utilisation priorities, and mechanisms for planning, monitoring, and implementation. Presently, the DMF fund is one of the largest financial resources for immediate, medium, and long-term interventions to improve the lives and livelihoods of people in the mining-affected areas.

The DMF funds come from statutory contributions by mining leaseholders. Companies contribute directly to the district's DMF Trust, paying 10% of the royalty for leases granted after January 12, 2015, and 30% for leases granted earlier. For their decadal assessment, iForest conducted a pan-India review of all 23 States where DMFs have been set up. Further, the assessment looks into the status of the DMFs in the top 21 mining districts. These districts have at least ₹11,000 crores in DMF accrual, and account for over 65% of the DMF funds. Non-coal major minerals account for over 51.5% of the total accruals. The share of coal and lignite is about 37%. Minor minerals contribute about 11.5% of the total DMF funds.

Odisha accounts for the highest share of DMF funds, about 29% (₹30,126 crore) of the country's total. This is followed by Chhattisgarh and Jharkhand accounting for over 14% (14,564 crores) and 13% (13,791 crores) of the funds, respectively. Collectively these three States account for over 56% of the total DMF funds collected in the past 10 years in the country, the report noted.

"Overall, the pattern of infrastructure-heavy investments does not align with the objectives of the DMF. The prime focus of DMF and PMKKKY is to alleviate poverty and deprivation, which requires a balanced investment in human resources and infrastructure. However, this balance has not been achieved in any district. Consider the example of Dhanbad. Out of 1,164 projects sanctioned in Dhanbad till 2024, only ₹1.86 crore have been allocated for skill development and livelihood generation. Similarly, in Kendujhar, project details evaluated until 2022 show that only about 3.2% of the total allocations are for livelihood and skill development projects," the authors noted.

The biggest challenge, however, is in the design of the DMFs themselves. DMFs are practically an extension of the District Collectorate. Their GCs and MCs are dominated by officials and elected representatives. There is minimal representation of the mining-affected communities, such as from the Gram Sabhas of the mining-affected villages, the report underlined. The overall projections done by iFOREST show that the total DMF accruals in the next 10 years (2025-26 to 2034-25) could be as high as ₹2,50,000 crore to ₹3,00,000 crore — two-and-a-half times to three times of the accruals in the previous 10 years. The annual accruals will range from ₹20,000 crore to ₹30,000 crore, it said.

"With a total fund accrual of over ₹1 lakh crore, DMFs have a pivotal role in addressing developmental challenges in India's mining districts, which are some of the most underdeveloped regions of the country. However, sub-optimal institutional design, inefficient fund utilisation, lack of systematic and long-term planning, and lack of people's engagement in identifying and designing intervention measures are hindering their full potential. DMFs need to be redesigned as an independent public welfare fund to fulfill its mandate," Chandra Bhushan, CEO, iFOREST, said in a statement.

Jacob Koshy, HT / March 26, 2025

➤ Geologists Just Discovered One of Earth's Largest Gold Deposit, Worth 78 Billion Euros

The find, located in Pingjiang County's Wangu gold

field, is already being described as a milestone for both the national and international gold industry.

Geologists in China have uncovered one of the largest gold reserves in recent history - copyright Shutterstock

Geologists in China have uncovered one of the largest gold reserves in recent history, a discovery that could significantly reshape the global mining landscape. The supergiant deposit, buried deep beneath central China's *Hunan Province*, is estimated to contain over 1,000 metric tons of gold, valued at around 78 billion or 600 billion yuan.

A Gold-Rich Landscape Revealed Beneath the Surface

According to the *Geological Bureau of Hunan Province*, more than 40 distinct gold veins were identified at depths of approximately 2,000 meters. These initial zones are believed to hold around 300 tons of gold, but further exploration has pushed expectations even higher. Drilling conducted at 3,000 meters revealed additional reserves, boosting the total estimated yield beyond 1,000 tons, placing this site among the most significant ever recorded, according to Chinese state media.

In an unusual development for geological surveys, many of the extracted rock cores displayed visible gold, suggesting extremely high-grade mineralization. Some of the ore from the Wangu site contained as much as 138 grams of gold per metric ton, a density rarely encountered in large-scale operations. "Many drilled rock cores showed visible gold," said *Chen Rulin*, an ore-prospecting expert with the bureau, highlighting the extraordinary richness of the deposit.

Precision Through Advanced Geological Modeling

The Wangu discovery is not just a stroke of geological luck—it was made possible through state-of-the-art exploration technology. The bureau utilized three-dimensional geological modeling, enabling scientists to map the underground gold formations with unprecedented clarity.

These models helped direct drill sites toward the most promising veins, significantly increasing both the accuracy and depth of prospecting. *Liu Yongjun*, vice head of the Hunan Geological Bureau, emphasized that these methods were pivotal in pinpointing gold-rich zones deep below the Earth's surface.

"Gold was also found during drills around the site's peripheral areas," he noted, indicating that the known boundaries of the deposit may still expand with continued exploration.

Technicians of Hunan Province Geological Disaster Survey and Monitoring Institute check rock samples at the Wangu gold field in Pingjiang County, central China's Hunan Province, Nov. 5, 2024. (Xinhua/Su Xiaozhou)

Economic Promise and Environmental Considerations

The discovery holds substantial implications for *Hunan Province* and China's broader economic landscape. With its scale and quality, the Wangu gold field positions the province as a rising force in global gold production. Industry analysts expect it to attract both domestic investment and interest from international mining corporations looking to capitalize on the deposit's commercial viability.

In terms of infrastructure, the reserve could stimulate the development of new transport and energy networks to support extraction activities. The mining and refining processes are also expected to generate thousands of new jobs, extending economic benefits well beyond the immediate site.

Yet this scale of mining does not come without challenges. Experts caution that any long-term development must carefully weigh environmental sustainability. Key concerns include land degradation, water resource management, and carbon emissions, all of which demand stringent regulatory oversight. The discovery, while economically transformative, is a test case

for balancing industrial expansion with ecological responsibility.

Arezki.A, IDR News | April 15, 2025

➤ In-Ground Gold Reserves by Country 2024

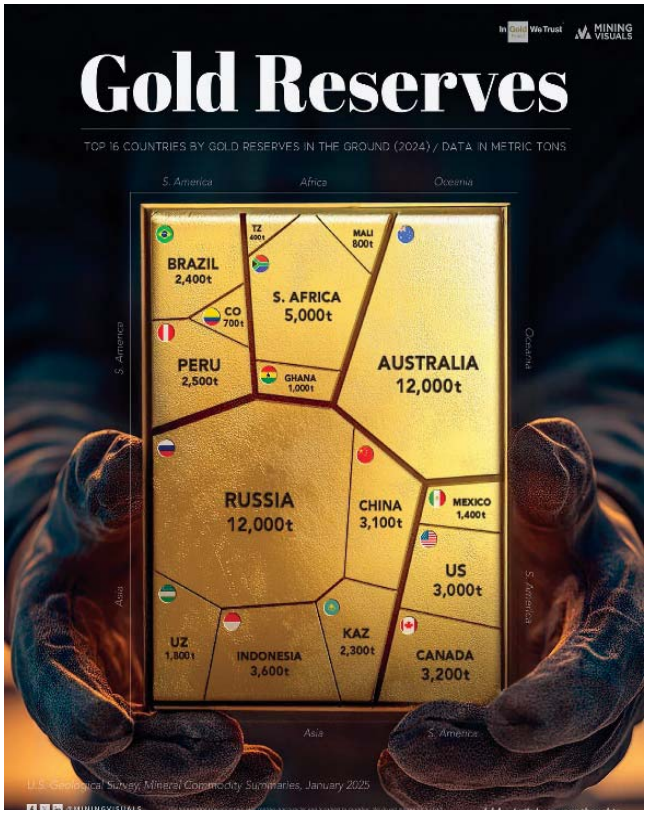
(U.S. Geological Survey, Mineral Commodity Summaries, January 2024)

Gold's allure is timeless, but beyond the bars stacked in vaults, vast treasures remain locked deep within the Earth. Understanding where the largest untapped reserves lie is key to the future of global supply. Recent U.S. Geological Survey (USGS) assessments pinpoint two nations above all others: Australia and Russia are estimated to hold geological fortunes of around 12,000 metric tons of gold each, still waiting underground.

Russia's Largest Gold Deposits

Based on recent estimates from TAdviser (citing Russia's state balance sheet as of March 2025), some of Russia's largest gold reserves include:

- Sukhoy Log (Irkutsk): Over 2,770 tonnes, making it Russia's largest gold deposit.
- Natalkinskoye (Natalka) (Magadan): Around 1,385 tonnes.
- Olympiadinskoye (Olimpiada (Krasnoyarsk): Approximately 949 tonnes.



Gold Reserves in the ground 2024

These three deposits account for a significant share of Russia's total gold reserves, positioning the country as one of the world's top gold-rich nations. However, reserve estimates can vary depending on the source and methodology.

Australia's Largest Gold Deposits

Similarly, Australia boasts some of the largest gold deposits globally. Based on recent reports, key reserves include:

- Cadia Valley (New South Wales): Operated by Newmont, with estimated reserves of approximately 17 million ounces (as of June 2023).
- KCGM / Super Pit (Western Australia): Operated by Northern Star Resources, holding reserves of 13.3 million ounces (as of mid-2023/2024).
- Boddington (Western Australia): Operated by Newmont, with reserves estimated at 10.8 million ounces (as of December 31, 2024).

Other Countries with Major Gold Reserves

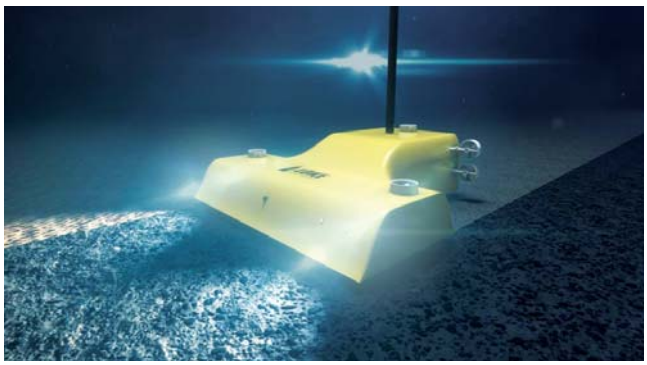
While Russia and Australia lead in total reserves, other countries also hold significant in-ground gold:

- South Africa – 5,000 metric tons
- Indonesia – 3,600 metric tons
- China – 3,100 metric tons
- United States – 3,000 metric tons
- Canada – 3,200 metric tons
- Brazil – 2,400 metric tons
- Peru – 2,500 metric tons
- Kazakhstan – 2,300 metric tons

These reserves represent gold yet to be mined but confirmed through geological surveys and exploration efforts.

USGS | April 1, 2025

➤ UK flags possible security review as deep-sea mining licences go up for sale: FT



Credit: Loke Marine Minerals

Britain may trigger a national security review over the proposed sale of two deep-sea mining exploration licences after the Norwegian parent of UK Seabed Resources (UKSR) filed for bankruptcy, the Financial Times reported. The licences, sponsored by the UK and located in the Pacific Ocean, are held by UKSR, which was acquired in 2023 by Norway's Loke Marine Minerals from US defense contractor Lockheed Martin. Loke filed for bankruptcy earlier this month, prompting an auction for its assets.

The Department for Business and Trade said the transfer of these licences could be assessed under the National Security Investment Act, according to an email sent to Loke's CEO Walter Sognnes and reviewed by the Financial Times. The government official also reportedly suggested restructuring UKSR under a UK holding company to avoid scrutiny, stating that having a Norwegian parent company would be "problematic", according to the the FT.

The Act grants the British government authority to examine and intervene in transactions deemed a threat to national security. The department declined to comment when contacted by FT. The potential sale comes amid heightened global interest in critical minerals used in batteries, such as nickel, cobalt and copper, which are found on the ocean floor.

US President Donald Trump recently voiced support for accelerating deep-sea mining, adding pressure on allies to secure mineral supply chains. Loke, which had been developing seabed mapping technology, said any ownership structure would be discussed by the future owner and UK authorities.

Seabed mining permits in international waters require state sponsorship under the UN Convention on the Law of the Sea. China currently leads in the number of such licences. Norway plans to begin commercial deep-sea mining in its national waters, while the UK, France and Germany remain cautious over environmental concerns.

The Jamaica-based International Seabed Authority (ISA) previously warned Loke that UKSR risked non-compliance with exploration terms. The company has also reportedly fallen behind on licence payments. Sources close to Loke said the company struggled to raise capital, blaming regulatory uncertainty and delays by ISA member states. "No international regulation has taken longer to get into place than this one," one source told FT.

Among the bidders for UKSR's licences was environmental group Greenpeace, which entered the auction as a stunt to protest the commercialization of deep-sea mining. Other bidders include Loke's founders and UK-based TechnipFMC, one of its investors. Duncan Currie, legal adviser to the Deep Sea Conservation Coalition, criticized foreign control of licence-holding firms, stating that it undermines the legal framework that governs seabed access.

Staff Writer, Mining.Com | April 21, 2025

➤ Mining billionaire Agarwal moves closer to breaking up his empire

Indian billionaire Anil Agarwal is inching closer to finishing a long-planned breakup of his metals-to-energy conglomerate Vedanta Ltd., a move aimed at trimming the group's $11 billion debt pile and giving greater attention to different businesses.

While prices of aluminum, zinc, and copper have given up the heady gains of 2024, the 71-year-old tycoon is betting that a simpler structure for the sprawling group and growing demand for critical minerals will add to the allure of his companies even as the specter of a global recession looms.

The overhaul will allow the group to list each of its key businesses: aluminum, oil & gas, power, iron & steel, along with the publicly traded core company Vedanta. The demerger could provide new funding sources and increase financial transparency across the group, according to Bloomberg Intelligence analyst Mary Ellen Olson.

"The time for growth is now as demand is strong, supply is tight, and we're positioned in the right markets," Agarwal said in a recent video interview from his London home, adding that most of the materials mined by his company are locally consumed. The billionaire said that this makes Vedanta less vulnerable to potential disruptions in global supply chains arising from US President Donald Trump's tariff measures.

Vedanta is also expanding the gamut of its operations by winning rights to mine critical minerals like nickel, chromium, platinum, and cobalt in India through November auctions. The global demand for these and other metals that are key to energy transition remains high and will give the group the next fillip of growth, Agarwal said.

Middle East and Africa

Agarwal has long dreamed of building an empire that spans continents and competing with the ranks of the world's largest diversified miners, including Rio Tinto Group and BHP Group Ltd. The group plans to

spend more on overseas projects and is doubling on investments in the Middle East and Africa. Vedanta is set to invest $2 billion in copper-processing facilities in Saudi Arabia — one of the largest by a foreign firm — as the oil kingdom aspires to build its metals and mining industries significantly.

"Saudi not only has good geology but strong local consumption too," Agarwal said, adding that "funding is never a problem for a project like that." According to local government estimates, Saudi Arabia has untapped resources, including phosphate, copper, gold, and bauxite, worth as much as $2.5 trillion. About a third of its investments in the country will be funded through internal accruals, and for the rest, the group will seek project financing, Agarwal said.

The company is currently seeking funds to develop mines in Africa, too. The Konkola Copper Mines in Zambia, which it controls, has a major copper deposit and cobalt reserves, according to Vedanta. The financing options being weighed range from a billion-dollar bond offering, "off-take financing, or sale of a minority stake to global investors, for which there is significant demand," Agarwal said.

Cutting debt

Vedanta shares dropped about 7% this year in Mumbai trading amid a slump in commodities prices. Other than economic growth woes, weighing on investor sentiment is the company's $6.2 billion debt, the upshot of an acquisition spree since the turn of the century that includes stakes in Bharat Aluminium Co. and Hindustan Zinc Ltd.

Over the last two years, Agarwal has been on a drive to cut leverage and push back repayment deadlines on the group's borrowings. The plan is to halve it over the next three years. The group will be cautious about loading up on debt as it chases growth for each demerged unit, he said. All existing shareholders of Vedanta will receive one new share in each of the newly listed entities against each share they own in the parent company.

"There is no need for a stake sale to reduce our debt at the parent company level, and neither are there any plans to sell our stakes in any of the demerged entities," Agarwal, who started as a scrap metal dealer and has weathered cash crunches and government friction, said. Each listed company can look at issuing fresh shares to raise funds for expansion, he said.

The so-called debt to earnings before interest, taxes, depreciation, and amortization ratio — a financial metric that measures a company's ability to pay off its debt obligations — for Vedanta has to be brought down to 1 from the current 1.4 and maintained, according to him. Over the years, Agarwal has been grooming his daughter Priya Agarwal Hebbar to take over from him as the head of the conglomerate. A psychology and film studies graduate from the University of Warwick, the 35-year-old is the chairwoman of Hindustan Zinc and is on the board of Vedanta.

"The group's future is very focused on transition and critical minerals, and that is where the company will go," Hebbar said.

Bloomberg News | April 22, 2025

➤ Ontario promises to cut red tape for critical mining projects

Ontario will cut the time required to approve new mining projects by 50% in an attempt to make the province competitive as Canada faces tariffs and annexation threats from top trading partner the United States, the province's Premier Doug Ford, said on Thursday. In new legislation branded as 'One Project, One Process' the new bill would speed up approvals in strategically important mining projects starting with the Ring of Fire and critical minerals, Ford said.

"Right now it takes 15 years to open a new mine in Ontario," Ford said. "That's 15 years of missed opportunity, 15 years of jumping through hoops… these delays were never acceptable, but today, more than ever, we need to act with President Trump taking direct aim at our economy, it cannot be business as usual." The measure if passed by the Provincial Legislative Assembly, will aim to have a 50% reduction in the time taken for government review for mining projects, including a coordinated consultation with indigenous groups on whose lands these mines will be built.

Ontario is also tightening its norms over the involvement of foreign entities such as China in critical mining projects, Ford said.

Reuters | April 17, 2025

➤ Copper and the new resource spheres of control

MINING.COM and *The Northern Miner* mapped global copper production through a geopolitical lens, dividing the world into five "spheres of control": American, Chinese, Russian, Coalition of the Willing, and Undrafted.

These groupings reflect geographic, social, cultural, and economic ties—as well as potential alignments in an

(Continued on Page 31)

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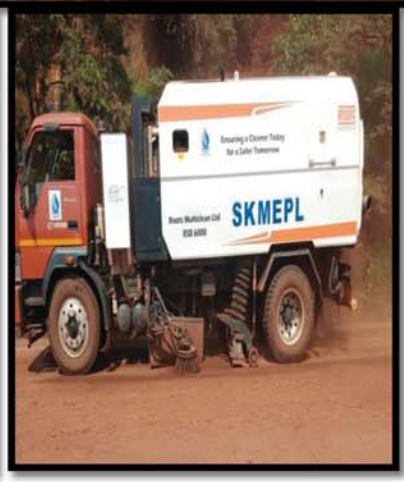

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OPTIMUM PIT DESIGN TO CATER THE NEED OF THE VARIUS TYPES OF IRON ORE PRODUCTS OF A MINE FOR MAXIMIZING PROFIT: AN OPERATION RESEARCH APPROACH

Dr. Shubhra Sharma[1] , Khem Lal Janghel[2]

Abstract

The mineral sector operates within a dynamic global landscape marked by increasing competitiveness, rising production costs, and fluctuating market prices. These challenges, particularly pronounced in developing countries, have strained the industary's ability to sustain unproductive costs, often leading to operational hardship during mineral extraction. Apart from these constraints, mineral deposit is a natural gift to human beings coupled with irregularities in quality and intricating with uncertain quantity available in irregular shapes. Its extraction is stricly guided by stringent grades assessed through prospecting and exploration. Once explored, the minuteness of quality control during production is the prime factor to produce saleable ores types as per demand in the consumer industries. This is achieved by effficient blending of raw ores to prepare ROM enabled by customized mining from different portions of the deposits divided in various blocks . The prepared ROM, as initial feed, also forms the beginning of the Mineral Benificiation Process to ultimately produce different categories of the saleable Ore Products such as as Lump Ore (+10mm), Fines ore (-10 mm) & Powdery Blue Dust Ore (-100 mesh , also rich in Fe content upto 68%) etc. in case of Haematite Ore Deposits. These categories of finished ore products are quite common from Opencast Iron Ore Mining . So, by backtracking form this point of desired products, the customer-oriented designing of mining pits becomes paramount in fostering production that aligns with varying demands. Operation Research techniques, particularly the Simplex method, emerges as a valuable tool in ascertaining the changing quantities of saleable ore types to maximize profit.

Key Words: *Pits, Lump Ore, Fines Ore, Blue Dust, Profit Maximization, Simplex Method, Sale Quantity, Customer demands etc.*

1. INTRODUCTION

Production planning at one level of detail or another, is concerned with a high proportion of the decisions taken by the management. To apply operational research to this widespread and important function is a very highly skilled task indeed - one which will occupy the minds of many good field managers and engineers for several years to come [2]. More so, when the system of calulation and integrated decision making comes in regular practice after being accepted by them in the field.

Through a genuine attempt to illustrate the applicability of Operation Research techniques in optimizing ore product sales, this study aims to contribute to the sustainable development of the mining sector. By aligning production with market demand and maximizing profitability, the study seeks to address critical gaps in current mining practices, fostering efficiency and environmental stewardship in mineral extraction operations to comply with MINING PLAN & subsequent MINING SCHEMES as per the directives of Mineral Conservation & Regulating departments of Govt. of India[6,7].

Ultimate saleable product (finished ore) is only the source of income for mine owners. So, direct focus on this topic is covered by illustrative example here so that acceptability level of the paper is enhanced in the realistic conditions of field. In the past , only theoretical approaches have been proposed by the various authors[2,3]. So, an attempt has been made here to advance these theories in the in real scenario of Iron ore opencast mining where there are more than one pit to cater the varieties of naturally occuring iron ore such as HARD ORE (primary contributor to production of Lump Ore), FINES ORE & BLUE DUST.

2. DATA SELECTION

Let us assume[1] that there are two pits (Figure 1) available for mining, having total producing capacities of 3- types of iron ore, to the tune of 150000 tpm & 130000 tpm respectively. The demand & scope of sale details are as below functionally

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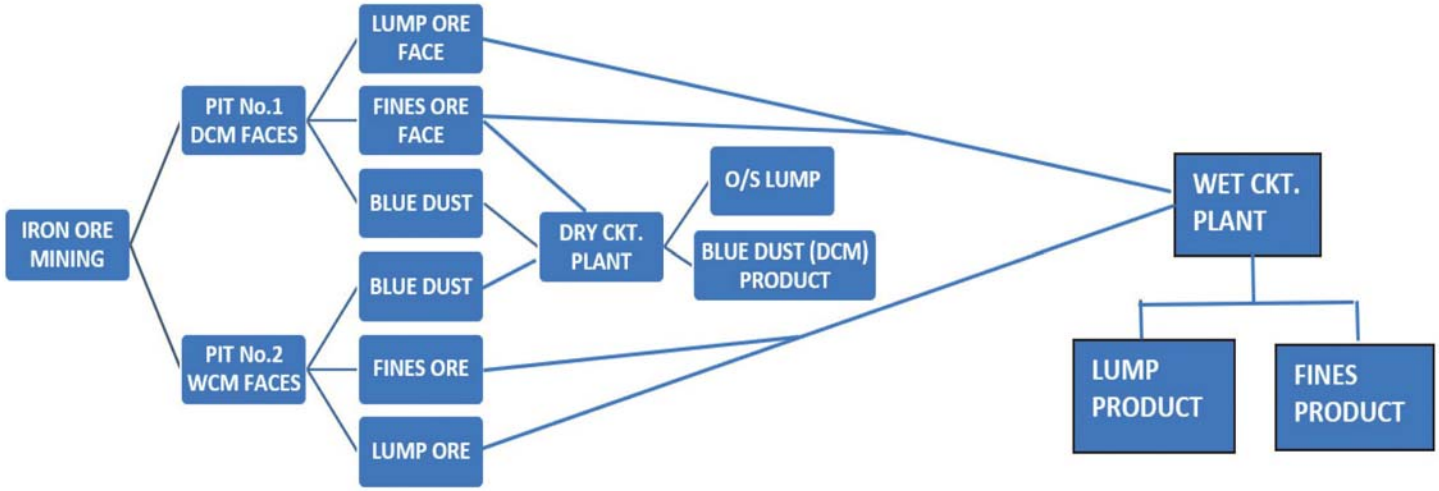

NOTE: DCM: Dry Ckt. Material; WCM: Wet Ckt. Material

Figure 1 : Schematic Diagram of Mine Productio Operation

1.1. Data Assumptions made based on field data averages [4,5,6,7]

Pit Nos.	Types of products	Unknown Quantity Demand (T)	Sale Price (Rs./ T)	Cost of production (Rs./T)	Royalty (Rs./ T) @10 % of Sale price	Profit (Rs./T)
I	Lump	X1	6000	700	600	4700
	Fines	X2	4500	900	450	3150
	Blue Dust	X3	5500	600	550	4350
II	Lump	X4	6000	620	600	4780
	Fines	X5	4500	840	450	3210
	Blue Dust	X6	5500	560	550	4390

& qualititavely whereas exact economic saleable quantities are to be deciphered:

Other given constraints are Total Minimum demad of Fines is 55000 T, which is an open ended demad as fines are generated in abundance from Ore Processing Plant and also directly from Mining faces. Thus fines quantity is available in suplus for sale to have the flexibilty to earn profit. On the pther hand, the maximum demand of Lump & Blue dust ore are restricted to 90000 T & 75000 T respectively every month.

3. DATA COMPUTATION

With the given condition, the authors framed the equations & constraints[1,2] which were fed to the software **A to Z Simplex Method Calulator** from Internet and following results were obtained.

Find the solution using Simplex method (Big M method)

$$\text{MAX } Z = 4700x_1 + 3150x_2 + 4350x_3 + 4780x_4 + 3210x_5 + 4390x_6 \text{ subject to}$$

$$x_1 + x_4 \leq 90000$$

$$x_2 + x_5 \geq 55000$$

$$x_3 + x_6 \leq 75000$$

$$x_1 + x_2 + x_3 \leq 150000$$

$$x_4 + x_5 + x_6 \leq 130000$$

and $x_1, x_2, x_3, x_4, x_5, x_6 \geq 0$

Solution:
Problem is

$$\text{MAX } Z = 4700x_1 + 3150x_2 + 4350x_3 + 4780x_4 + 3210x_5 + 4390x_6 \text{ subject to}$$

$$x_1 + x_4 \leq 90000$$

$$x_2 + x_5 \geq 55000$$

$x_3 + x_6 \leq 75000$

$x_1 + x_2 + x_3 \leq 150000$

$x_4 + x_5 + x_6 \leq 130000$

and $x_1, x_2, x_3, x_4, x_5, x_6 \geq 0$

The problem is converted to canonical from by adding slack, surplus and artificial variables as appropriate

1. As the constraint-1 is of type '≤' we should add slack variable S_1
2. As the constraint-2 is of type '≥' we should subtract surplus variable S_2 and add variable A_1
3. As the constraint-3 is of type '≤' we should add slack variable S_3
4. As the constraint-4 is of type '≤' we should add slack variable S_4
5. As the constraint-5 is of type '≤' we should add slack variable S_5

After introduction slack, surplus, artificial variables

$$MAX\ Z = 4700x_1 + 3150x_2 + 4350x_3 + 4780x_4 + 3210x_5 + 4390x_6 + 0S_1 + 0S_2 + 0S_3 + 0S_4 + 0S_5 - MA_1$$

subject to

$x_1 + x_4 + S_1 = 90000$

$x_2 + x_5 - S_2 + A_1 = 55000$

$x_3 + x_6 + S_3 = 75000$

$x_1 + x_2 + x_3 + S_4 = 150000$

$x_4 + x_5 + x_6 + S_5 = 130000$

and $x_1, x_2, x_3, x_4, x_5, x_6, S_1, S_2, S_3, S_4, S_5, A_1 \geq 0$

Iteration-1		C_j	4700	3150	4350	4780	3210	4390	0	0	0	0	0	-M	
B	C_B	X_E	X_1	X_2	X_3	X_4	X_5	X_6	S_1	S_2	S_3	S_4	S_5	A_1	Min Ratio $\frac{X_B}{X_5}$
s_1	0	90000	1	0	0	1	0	0	1	0	0	0	0	0	-
A_1	-M	55000	0	1	0	0	(1)	0	0	-1	0	0	0	1	55000/1 = 55000 →
S_2	0	75000	0	0	1	0	0	1	0	0	1	0	0	0	-
S_4	0	150000	1	1	1	0	0	0	0	0	0	1	0	0	-
S_5	0	130000	0	0	0	1	1	1	0	0	0	0	1	0	130000/1 = 130000
Z= -55000M		Z_j	0	-M	0	0	-M	0	0	M	0	0	0	-M	
		$Z_j - C_j$	-4700	-M -3150	-4350	-4780	-M -3210 ↑	-4390	0	M	0	0	0	0	

Negative Minimum $Z_j - C_j$ is -M-3210 and its column index is 5. So, the entering variable is X_5.

Minimum ratio is 55000 and its row index is 2. So, the leaving basis variable is A_1.

∴ The pivot element is 1.

Entering = X_5, Departing =A_1,Key Element=1

$+R_2$ (new) = R_2 (old)

$+R_1$ (new) = R_1 (old)

$+R_3$ (new) = R_3 (old)

$+R_4$ (new) = R_4 (old)

$+R_5$ (new) = R_5 (old) - R_2 (new)

Iteration-2		C_j	4700	3150	4350	4780	3210	4390	0	0	0	0	0	
B	C_B	X_B	X_1	X_2	X_3	X_4	X_5	X_6	S_1	S_2	S_3	S_4	S_5	Min Ratio $\frac{X_B}{X_4}$
S_1	0	90000	1	0	0	1	0	0	1	0	0	0	0	90000/1 = 90000
X_5	3210	55000	0	1	0	0	1	0	0	-1	0	0	0	-
S_3	0	75000	0	0	1	0	0	1	0	0	1	0	0	-
S_4	0	150000	1	1	1	0	0	0	0	0	0	1	0	-
S_5	0	75000	0	-1	0	(1)	0	1	0	1	0	0	1	75000/1 = 75000 →
Z=176550000		C_j	0	3210	0	0	3210	0	0	-3210	0	0	0	
		$Z_j - C_j$	-4700	60	-4350	-4780 ↑	0	-4390	0	-3210	0	0	0	

Negative Minimum $Z_j - C_j$ is -4780 and its column index is 4. So, the entering variable is X_4.

Minimum ratio is 75000 and its row index is 5. So, the leaving basis variable is S_5.

∴ The pivot element is 1.

Entering = X_4, Departing = S_5, Key Element=1

$+R_5$ (new) = R_5 (old)

$+R_1$ (new) = R_1 (old) - R_5 (new)

$+R_2$ (new) = R_2 (old)

$+R_3$ (new) = R_3 (old)

$+R_4$ (new) = R_4 (old)

Iteration-3		C_j	4700	3150	4350	4780	3210	4390	0	0	0	0	0	
B	C_B	X_B	X_1	X_2	X_3	X_4	X_5	X_6	S_1	S_2	S_3	S_4	S_5	Min Ratio $\frac{X_B}{X_2}$
S_1	0	15000	1	(1)	0	0	0	-1	1	-1	0	0	-1	15000/1 = 15000 →
X_5	3210	55000	0	1	0	0	1	0	0	-1	0	0	0	55000/1 = 55000
S_3	0	75000	0	0	1	0	0	1	0	0	1	0	0	-
S_4	0	150000	1	1	1	0	0	0	0	0	0	1	0	150000/1 = 150000
X_4	4780	75000	0	-1	0	1	0	1	0	1	0	0	1	-
Z=535050000		Z_j	0	-1570	0	4780	3210	4780	0	1570	0	0	4780	
		$Z_j - C_j$	-4700	-4720 ↑	-4350	0	0	390	0	1570	0	0	4780	

Negative Minimum $Z_j - C_j$ is -4720 and its column index is 2. So, the entering variable is X_2.

Minimum ratio is 15000 and its row index is 1. So, the leaving basis variable is S_1.

∴ The pivot element is 1.

Entering = X_2, Departing = S_1, Key Element = 1

$+R_1$ (new) = R_1 (old)

$+R_2$ (new) = R_2 (old) - R_1 (new)

$+R_3$ (new) = R_3 (old)

$+R_4$ (new) = R_4 (old) - R_1 (new)

$+R_5$ (new) = R_5 (old) + R_1 (new)

Iteration-4		C_j	4700	3150	4350	4780	3210	4390	0	0	0	0	0	
B	C_B	X_B	X_1	X_2	X_3	X_4	X_5	X_6	S_1	S_2	S_3	S_4	S_5	Min Ratio $\frac{X_B}{X_3}$
X_2	3150	15000	1	1	0	0	0	-1	1	-1	0	0	-1	-
X_5	3210	40000	-1	0	0	0	1	1	-1	0	0	0	1	-
S_3	0	75000	0	0	(1)	0	0	1	0	0	1	0	0	75000/1=75000 →
S_4	0	135000	0	0	1	0	0	1	-1	1	0	1	1	135000/1=135000
X_4	4780	90000	1	0	0	1	0	0	1	0	0	0	0	-
Z=605850000		Z_j	4720	3150	0	4780	3210	60	4720	-3150	0	0	60	
		$Z_j - C_j$	20	0	-4350 ↑	0	0	-4330	4720	-3150	0	0	60	

Negative Minimum $Z_j - C_j$ is -4350 and its column index is 3. So, the entering variable is X_3.

Minimum ratio is 75000 and its row index is 3. So, the leaving basis variable is S_3.

∴ The pivot element is 1.

Entering = X_3, Departing = S_3, Key Element=1

$+R_3$ (new) = R_3 (old)

$+R_1$ (new) = R_1 (old)

$+R_2$ (new) = R_2 (old)

$+R_4$ (new) = R_4 (old) - R_3 (new)

$+R_5$ (new) = R_5 (old)

Iteration-5		C_j	4700	3150	4350	4780	3210	4390	0	0	0	0	0	
B	C_B	X_B	X_1	X_2	X_3	X_4	X_5	X_6	S_1	S_2	S_3	S_4	S_5	Min Ratio $\frac{X_B}{S_2}$
X_2	3150	15000	1	1	0	0	0	-1	1	-1	0	0	-1	-
X_5	3210	40000	-1	0	0	0	1	1	-1	0	0	0	1	-
X_3	4350	75000	0	0	1	0	0	1	0	0	1	0	0	-
S_4	0	60000	0	0	0	0	0	0	-1	(1)	-1	1	1	60000/1 = 60000 →
X_4	4780	90000	1	0	0	1	0	0	1	0	0	0	0	-
Z=932100000		Z_j	4720	3150	4350	4780	3210	4410	4720	-3150	43500	0	60	
		$Z_j - C_j$	20	0	0	0	0	20	4720	-3150 ↑	4350	0	60	

Negative Minimum $Z_j - C_j$ is -3150 and its column index is 8. So, the entering variable is S_2.

Minimum ratio is 60000 and its row index is 4. So, the leaving basis variable is S_4.

∴ The pivot element is 1.

Entering = S_2, Departing = S_4,Key Element=1

$+R_4$ (new) = R_4 (old)

$+R_1$ (new) = R_1 (old) + R_4 (new)

$+R_2$ (new) = R_2 (old)

$+R_3$ (new) = R_3 (old)

$+R_5$ (new) = R_5 (old)

Iteration-6		C_j	4700	3150	4350	4780	3210	4390	0	0	0	0	0	
B	C_B	X_B	X_1	X_2	X_3	X_4	X_5	X_6	S_1	S_2	S_3	S_4	S_5	Min Ratio
X_2	3150	75000	1	1	0	0	0	-1	0	0	-1	1	0	
X_5	3210	40000	-1	0	0	0	1	1	-1	0	0	0	1	
X_3	4350	75000	0	0	1	0	0	1	0	0	1	0	0	
S_2	0	60000	0	0	0	0	0	0	-1	1	-1	1	1	
X_4	4780	90000	1	0	0	1	0	0	1	0	0	0	0	
Z=1121100000		Z_j	4720	3150	4350	4780	3210	4410	1570	0	1200	3150	3210	
		$Z_j - C_j$	20	0	0	0	0	20	1570	0	1200	3150	3210	

Since all $Z_j - C_j \geq 0$

Hence optimal solution is arrived with value of variables as: $x_1 = 0$, $x_2 = 75000$,$x_3 = 75000$,$x_4 = 90000$,$x_5 = 40000$,$x_6 = 0$

Max Z=1121100000

Totally , 6- stages of Matrices iterations were obtained to give the aforesaid values of initial six unknown quantities to maximize the profits.

In all, 6- stages of Matrices iterations were obtained to give the aforesaid values of initial six unknown quantities to maximize the profits.

4. DATA ANALYSIS & RESULTS

The quantities, as derived through Simplex method described above, fulfills all the conditions of Constraints & Eqautions . So, the result shown holds good. For example, Lump ore quantity X_4 form Pit 2 fetches higher value than that of from Pit 1 i.e. by quantity X_1. So, $X_1 = 0$ wheras the $X_4 = 90000$ Tonnes, satisfying $(X_1 + X_4) \leq 90000$ Tonnes.

5. CONCLUSION

1) The result shows that the Pit No. 1 needs to be designed for despatch of Blue dust & Fines & Pit no.2 needs to be geared up for despatch of Lump ore to get maximum benefit of Rs. 112,11,00,000 (i.e. Rs. 112 .11 Crores). In fact, the deposit is also found in nature in such a way that Blue dust is found with abundance of Fines ore and Lumpy ore is found with rare quantity of Blue dust. Thus actual trend of formation has been cited as example to apply the technique of Simplex method chosing different pits accordingly in the opencast mining field. In otherwords, The result shown is helpful in desgning the pit depending upon varibilty in products demad from time to time.
2) The solution helps in maximizing the profits from the given conditions in the mines enabling the mine owner

to fix sale prices accurately, thus giving him competitive edge in the market.

3) A to Z Simplex Method Calulator is an easily available software on internet which can be used in remotely located mines to optimise several such solutions on daily basis as determinants are derived fast and easily through this effective tool.

6.0. ACKNOWLEDGEMENT

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7.0. REFERENCES

1. Gupta, P. K., & Hira, D. S. (1995). Operational Research. S. Chand & Co.
2. Mukhopadhyay, M. K., & Sinha, I. N. (2006). A techno-economic model for optimum regeneration of surface mined land. In Overburden removal & associated economic angle of analysis (pp. XX-XX). Springer-Verlag.
3. Lawrence, J. R., & Flowerdew, A. D. J. (1963). Economic models for production planning. Journal of the Operational Research Society, 14(1), 11-29.
4. Mines & Minerals Development & Regulation Act. (1957).
5. The Gazette of India. (2015, March 26). Amendments to MMDR Act in 2015 (Regn. No. DL-(N)04/0007/2003-15).
6. 5. The Gazette of India. (2021, March 28). Amendments to MMDR Act in 2021 (Regn. No. DL-(N)04/0007/2003-21).
6. Mineral Concession Rules (1960).
7. Amendment to Mineral Conservation and Development Rules (MCDR) in 2022. (2022, April 11).

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Secretary General, MEAI

OBITUARY

Shri. Shrikant Vasant Karnik
(LM No, 1330)

Shri. Shrikant Vasant Karnik, an active Life Member of MEAI (LM No, 1330) for nearly three decades from Ahmedabad Chapter, breathed his last at Vadodara on 5th April 2025. He was in very good health till his very last, and passed away due to a massive cardiac arrest. Only about a week back, he had visited Shri S N Mathur, President MEAI at his residence at Ahmedabad.

He was born on 03-01-1940, spent most of his childhood and adolescence in Gujarat in different towns and cities. Professionally, he studied Automobile Engineering from Ahmedabad. His specialization was in Heavy Earthmoving Equipment.

He started working with Ahmedabad Municipal Transport Service (AMTS) in the mid-60s. He then moved to Kesoram Cement in Basantnagar, Andhra Pradesh, in 1968 and worked there till 1975. He joined Rajasthan State Mines and Minerals (RSMM), Udaipur, in 1975 and worked there till early 1980. He joined Gujarat Mineral Development Corporation (GMDC) at their Lignite Project, Panandhro, in 1980 and was transferred to the Flourspar Project, Kadipani, in 1985, where he worked as Dy. General Manager till his Voluntary retirement in 1995.

He then joined Automotive Manufacturers Ltd. in Vadodara and worked there till his early 60s, after which he quit a very active automobile engineering career of over 40 years.

On the personal front, he got married to Charu in 1969. He was bereaved in 2017, when she passed away from prolonged illness. He is survived by his 3 sons, Nikhil and Harish, both living in Vadodara and Niraj, who lives in Kuala Lumpur, Malaysia.

Late Shri Karnik was a very active member of Ahmedabad Chapter and participated in almost all events organized by the Chapter. He was also felicitated as an active Veteran Member on completion of 75 years of age by the Chapter in the year 2015.

The members of MEAI wish the pious soul rest in peace and his family is blessed with courage to bear this irreparable loss.

HUMAN ERROR AND ITS IMPACT ON MINING ACCIDENTS: AN ANALYTICAL STUDY

Suman Kanjilal[1], Dr. S C Jain[2]

Abstract

This research paper dives into the critical analysis of two significant mining incidents includes the Lalmatia Open Cast Coal Mine disaster and the Palaspani Manganese Mine incident. Using a variety of analytical techniques such as Human factors Analysis and Classification System (HFACS), Analytical Hierarchy Process (AHP), Bow Tie Risk Management, and Fault Tree Analysis (FTA). The study aims to identify and analyse the human factors that contributed to these accidents.

The Lalmatia Open Cast Coal Mine disaster resulted in multiple fatalities due to the collapse of a mine face. It worsened by inadequate safety measures and failure to act on evident hazards. In the Palaspani Manganese Mine incident, a mine roof collapsed during mucking operations, leaving two workers seriously injured and one worker deceased. Both scenarios illustrate the lapses in safety culture, regulatory oversight, and human decision-making processes.

This study pinpoints critical human factors that were crucial in these disasters through in-depth analysis. These factors include poor supervisory actions, a lack of risk awareness, and inadequate training. The results highlight how important it is to promote a culture that prioritizes safety. In the end, this research helps to prevent such accidents by providing insightful analysis and suggestions for raising safety standards in the mining sector.

Keywords: *Mining accidents, safety culture, Analytical Hierarchy Process (AHP), Human Factors Analysis and Classification System (HFACS), Bow-Tie Risk Management, Fault Tree Analysis (FTA).*

1. INTRODUCTION

Mining is still among the most hazardous occupations due to the high number of accidents. This results in serious injuries, fatalities, and large financial losses. Human aspects are essential in addition to the many other factors that contribute to these accidents. Mining operations are complicated and high-risk, therefore in order to reduce possible hazards, strict security procedures, ongoing supervision, and a strong safety culture are required. This research paper focuses on a detailed analysis of two major mining accidents, i.e. the Palaspani Manganese Mine event and the Lalmatia Open Cast Coal Mine tragedy.

Mining has an existence which runs back thousands of years. It has influenced economies, communities, and landscapes while promoting global industrialization, urbanization, and technical developments. But in addition to its proven benefits to human advancement, the mining sector has hazards and challenges of its own & the most significant of which is the likelihood of mining accidents.

1.1Types of Mining Accidents

The term "mining accident" describes a broad range of events and situations. Several general categories of accidents are frequently seen in the mining business. Causes of mining accidents can vary greatly based on factors such as geological conditions, technological complexity, and regulatory oversight:

i. *Structural failures*: Some of the most critical and real risks that miners encounter when working underground are structural failures. It includes cave-ins, roof collapses, and tunnel collapses.

ii. *Explosion & fires*: Mining activities are at serious risk from explosions and fires. Risks increases in areas where combustible gases, dusts, and vapours are present. The most frequent causes of explosions and fires are methane explosions, coal dust explosions, and spontaneous combustion of coal seams in underground coal mines.

iii. *Equipment malfunctions*: The safety and productivity of mining operations also depends on the machinery and

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equipment that operates effectively. Problems includes poor maintenance, incorrect use, and design defects. This can cause equipment to malfunction, break down, or fail.

iv. *Toxic gas exposure*: Underground mining operations pose a considerable risk of exposure to poisonous gases. Gas includes methane, carbon monoxide, and hydrogen sulphide. This can lead to diseases such as respiratory distress, asphyxiation, and other harmful health impacts.

v. *Chemical spills & contamination*: Hazardous material handling, transportation, and storage can result in chemical spills and contamination events. It threatens public health, the health of the environment, and the well-being of local communities. As a result, management including cleanup measures must be taken quickly.

vi. *Transportation accidents*: Vehicles such as Dump truck, Man hauler, trains, conveyor belts, etc. are used in this process. These accidents can be caused by a variety of factors such as poor road design, mechanical failure, severe weather, and driver mistake.

1.2 Importance of study Mining Accidents

The importance of researching on mining accidents will give us the broad view on cause and remedy for any accident that occur during mining activities. Following are the reasons which will emphasize the importance of the necessity for careful study:

i. *Protection of human life*: Miners' safety and well-being are important factors that go beyond practical and financial issues therefore, protection of human life is the first priority in any mining operation.

ii. *Safeguarding economic viability*: The financial stability and operational continuity of mining companies can all be negatively impacted by mining accidents. The impact happens on larger economies as well as on the communities that depends on mining for jobs and economic development.

iii. *Enhancement of safety culture*: Mining disasters frequently act as wake-up calls for industry participants after which they review their organizational cultures, safety protocols, and processes.

A multidisciplinary strategy which integrates ideas from psychology, ergonomics, sociology, organizational behaviour, and safety research is necessary for understanding the significance of human factors in mining accidents.

1.3 Analytic Hierarchy Process (AHP)

The Analytic Hierarchy Process (AHP) is a method for organizing and analyzing complicated choices using mathematics and psychology. It was developed in the 1970s by Thomas L. Saaty and has since been improved. It can be broken down into three sections:

- The primary goal
- All possible solutions or alternatives
- The criteria.

AHP provides a logical framework for making significant decisions. It is done by quantifying the criteria and other options involved in a decision. The criteria are then related to the primary goal. In decision theory, the AHP model is frequently used. Generally, it accounts for competing, measurable, and abstract criteria.

1.4 Human Factors Analysis and Classification System (HFACS)

The Human Factors Analysis and Classification System (HFACS) was designed by Dr Scott Shappell and Dr Doug Wiegmann. To examine and assess aviation-related human factors issues this comprehensive human error framework was first used by the US Air Force. HFACS was largely inspired by James Reason's Swiss cheese concept (Reason 1990) as shown in Plate 3.1. The HFACS framework provide a means of aiding in the investigative process as it helps to concentrate training and preventive efforts. Investigators can systematically identify organizational issues, both inactive and active that caused an accident. The goal of HFACS is to understand the underlying reasons of an event rather than assigning blame.

1.5 Fault Tree Analysis (FTA)

Finding the potential causes of a system failure is feasible through fault tree analysis (FTA). It is sometimes referred to as event tree analysis at times. A fault tree is a diagram that is used to visually represent the various potential causes of a failure. FTA can assist maintenance teams in setting a priority list after identifying and addressing the primary causes for corrective measures. FTA illustrates the various circumstances or events that could result in an unfavorable result. These results may include equipment failure, using a fault tree analysis graphic.

1.6 Bow-Tie Diagram

A Bow Tie diagram is a risk management tool that shows the preventive and mitigating measures. These measures are being taken by visually representing the path from potential hazards to their possible consequences as. The danger is positioned in the middle of the diagram, then followed by threats on the left and consequences on the right.

2. LALMATIA OPEN CAST COAL MINE DISASTER

2.1 Accident summary

The accident occurred in the Maintala Dip Mine, also known as Mahalaxmi Patch, within the Rajmahal Project. The mine had been closed for two months due to unsafe mining conditions. on 26th December 2016 mining resumed

with permission from the Director General of Mines Safety (DGMS). The height of the overburden was around 700 -800 feet and is surrounded by three sides of the working face of the mine. The overburden was dangerously close to the working face that violates the basic safety norm of maintaining a 60-meter distance. The accident occurred on 29th December 2016, during the second shift at about 07:30 PM. A large quantity of overburden slid down onto workers below. At the time of the accident, 35 to 40 dumpers and one shovel were in operation that suggests that 70 to 80 workers were present.

2.2 Analytic Hierarchy Process (AHP) on the incident

Applying the Analytic Hierarchy Process (AHP) method to prioritize risk factors, decision-making criteria, and intervention options relevant to safety management within the context of this accident.

2.2.1 Establishing Criteria

For AHP analysis criteria are establish that are relevant to safety management in mining accidents.

Based on the information provided, following criteria are identified:

- Unsafe mining conditions (UMC)
- Ignored safety warnings (ISW)
- Violation of safety norms (VSN)
- Inadequate safety measures (ISM)
- Poor emergency response (PER)

Compare each criterion against the others and assign values based on their relative importance. The ratings for the criteria and the performance are determined by the expert judgments from professors and professionals in the sector of mining.

Expert opinions can be obtained by having participants compare the relative merits of alternatives of certain criteria in pairwise comparisons as shown in table 1.

Table 1: Normalised Matrix based on the rating

CRITERIA	UMC	ISW	VSN	ISM	PER
UMC	1	4	6	7	5
ISW	1/4	1	4	5	3
VSN	1/6	¼	1	3	2
ISM	1/7	1/5	1/3	1	3
PER	1/5	1/3	1/2	1/3	1

To normalize the matrix, divide each element by the sum of its column as shown in table 2.

- UMC: 1 + 1/4 + 1/6 + 1/7 + 1/5 = 1 + 0.25 + 0.1667 + 0.1429 + 0.2 = 1.7596
- ISW: 4 + 1 + 1/4 + 1/5 + 1/3 = 4 + 1 + 0.25 + 0.2 + 0.3333 = 5.7833
- ISM: 6 + 4 + 1 + 1/3 + 1/2 = 6 + 4 + 1 + 0.3333 + 0.5 = 11.8333
- PER: 7 + 5 + 3 + 1 + 1/3 = 7 + 5 + 3 + 1 + 0.3333 = 16.3333
- ES: 5 + 3 + 2 + 3 + 1 = 5 + 3 + 2 + 3 + 1 = 14

Table 2: Normalized pairwise comparison matrix

CRITERIA	UMC	ISW	VSN	ISM	PER
UMC	0.568	0.691	0.507	0.428	0.357
ISW	0.142	0.338	0.173	0.307	0.214
VSN	0.095	0.043	0.084	0.204	0.143
ISM	0.081	0.034	0.028	0.061	0.214
PER	0.114	0.058	0.042	0.020	0.071

To find the priority vector, average each row of the normalized matrix as shown in table 3. Multiply priority vector to respective column of normalized matrix and sum it to obtain values as shown in table 4.

Table 3: Priority Vector

CRITERIA	PRIORITY VECTOR
UMC	(0.568 + 0.691 + 0.507 + 0.428 + 0.357) / 5 = 0.5102
ISW	(0.142 + 0.173 + 0.338 + 0.307 + 0.214) / 5 = 0.2348
VSN	(0.095 + 0.043 + 0.084 + 0.204 + 0.143) / 5 = 0.1138
ISM	(0.081 + 0.034 + 0.028 + 0.061 + 0.214) / 5 = 0.0836
PER	(0.114 + 0.058 + 0.042 + 0.020 + 0.071) / 5 = 0.061

Table 4: Ratio of weighted sum value and Criteria Weights

CRITERIA	weighted sum value	Criteria Weights	λ_{max}
UMC	3.4536	0.5102	6.77
ISW	1.1828	0.2348	5.04
VSN	0.5115	0.1138	4.49
ISM	0.3774	0.0836	4.51
PER	0.3592	0.061	5.89

Average λ_{max}: (6.77+5.04+4.49+4.51+5.89)/5=26.7/5=5.34
Consistency Index (CI) for Main Criteria

CI = (λ_{max} - n) / (n - 1), where n = 5

CI = (5.34–5)/ (5 – 1) = (0.34)/ (4) = **0.085**

Consistency Ratio (CR) for Main Criteria

Random Index (RI) for n=5 is 1.12 (standard value for RI)

CR = CI / RI = 0.085/1.12= **0.076**

The CR is less than 0.10, which is acceptable.

i. Unsafe mining conditions is identified as the most critical factor contributing to the accident as this has the highest priority weight of 0.5102. This highlights how important it is to manage risky situations in mining operations. This is very important factor to study in order to stop incidents like this from happening again.

ii. Ignored safety warnings is the second most critical factor with a priority weight of 0.2348. Employees' failure to pay attention to safety warnings. Also it highlights the need for improved response to safety concerns and communication.

iii. Inadequate safety measures has a priority weight of 0.1138. This highlights the importance it is to provide proper security measures. Also improve precautions to keep employees safe in high-risk situations.

iv. Poor Emergency Response is the fourth most critical factor and have priority weight of 0.0836. The analysis highlights how important it is to have efficient emergency response strategies in place. This is to lessen the effects of mishaps when they happen.

v. Electrical Safety with a priority weight of 0.061 and is the least critical factor among those considered. Though it's not as critical as the other reasons in this specific instance but it is essential.

2.3 Human Factors Analysis and Classification System (HFACS) on the incident

2.3.1 Level 1: Unsafe acts

- *Routine violations*: Workers continued working despite noticing and reporting cracks in the overburden. The threat of termination was the driving force behind this regular violation.
- These are the situational, psychological, and environmental elements that affect risky behaviour.

2.3.2 Level 2: Preconditions for unsafe acts

- *Environmental factors*: The presence of unstable overburden creates unsafe mining conditions.
- *Physical environment*: The overburden violated safety regulations as employees stands between 700 and 800 feet high. It is very dangerous to work near face.
- *Adverse mental states*: The contractor threatened to dismiss the workers if they didn't work in those unsafe conditions. This made employees worried and less cautious about their safety.

2.3.3 Level 3: Unsafe supervision

- *Inadequate supervision*: The management failed to act on the reported cracks and safety concerns raised by the workers.
- *Anticipated improper activities:* The decision to carry on with mining activities without addressing the dangerous circumstances that were previously reported.

2.3.4 Level 4: Organizational influences

- Resource Management: exporting to an insufficiently safe contractor.
- Organizational Climate: a mentality that values output over worker safety and ignores safety alerts will result in systemic safety problems.

2.4 Bowtie diagram of the Lalmatia open cast coal mine Disaster

Figure 1 shows the Bow-tie diagram for Lalmatia open cast coal mine Disaster which includes following important terms:

- *Hazard:* Unstable mine overburden is the primary hazard.
- *Top Event*: The crucial incident is the overburden's fall.
- *Threats*: The continuation of hazardous mining conditions and the failure to address apparent cracks increases the chances for hazard to occur. Labor was forced to work in dangerous conditions and excessive amounts of material too close to the working face led to the top event.
- *Mitigative controls*: Effective emergency response and rescue plans, sufficient dewatering systems, and staff education are important to lessen the effects.

2.5 Fault Tree Analysis (FTA) of the Chas Nala Colliery Disaster

Figure 2 shows the Fault tree analysis for Chas Colliery Disaster which includes following important terms:

- *Top event:* This is represented by a rectangular shape with the label " rajmahal mine accident".
- *Basic events (BE):* These are represented by circular shapes and the label "inadequate safety protocols, cracks in overburden, unsafe overburden height, resumed work without safety, Lack of Training, management inaction, and emergency resources insufficient".
- *Intermediate events (IE):* These are represented by rectangular shape with the label "unsafe mining conditions, ignored safety warnings, and poor emergency response".

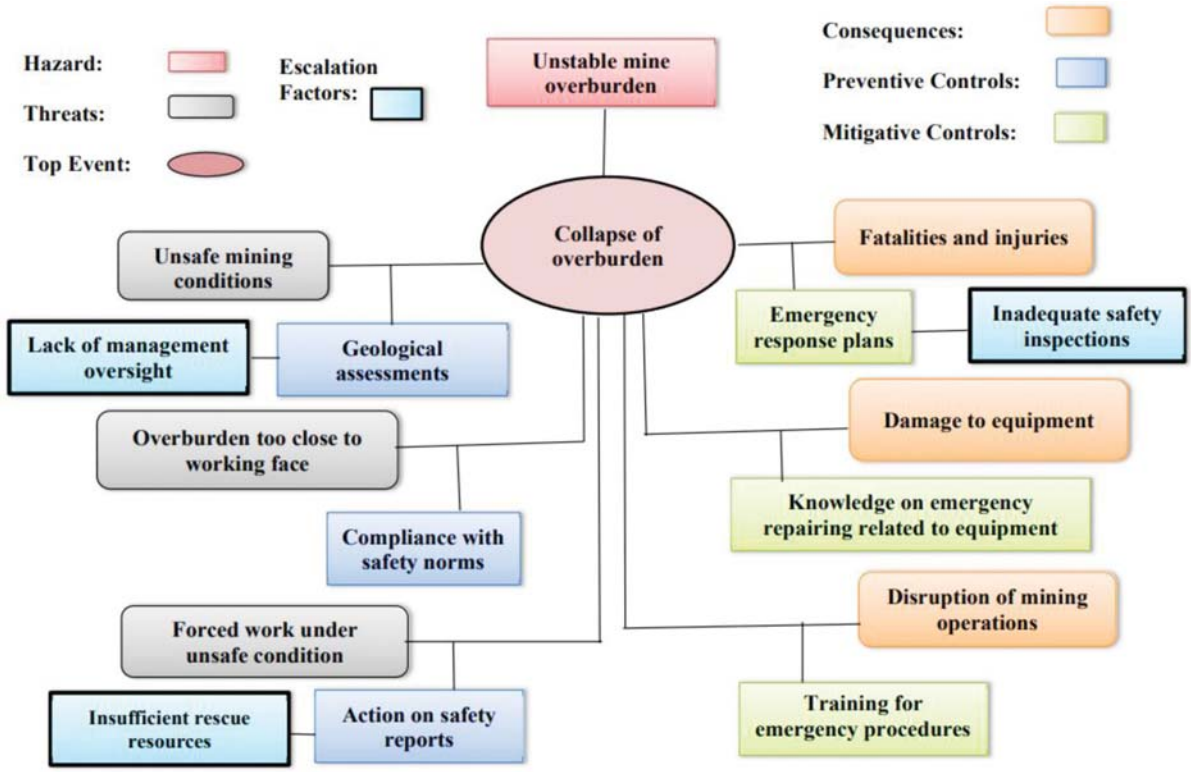


Figure 1: Bowtie diagram of the Lalmatia open cast coal mine Disaster

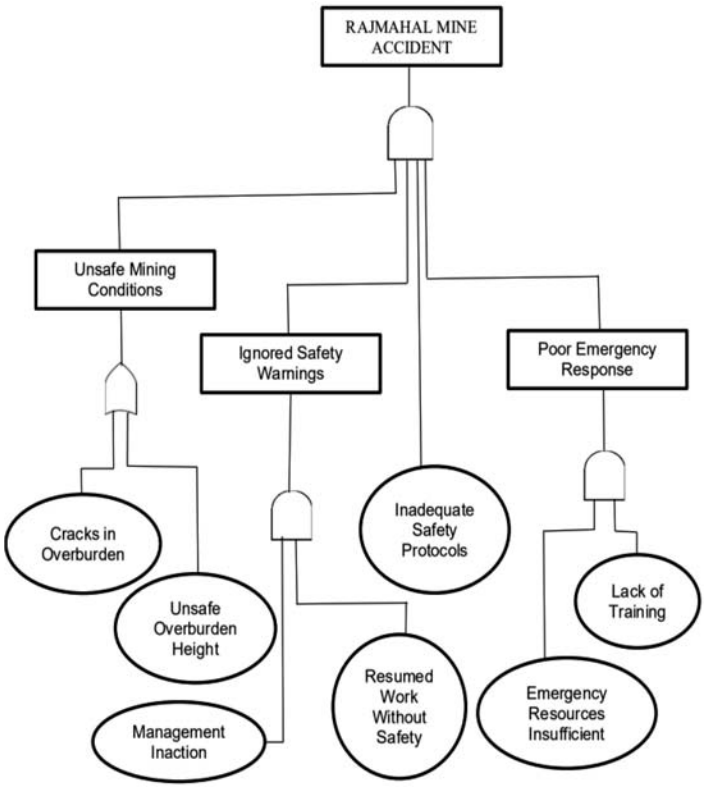


Figure 2: Fault Tree Analysis (FTA) of the Chas Nala Colliery Disaster

3. PALASPANI MANGANESE MINE INCIDENT

3.1 Accident summary

A fatal disaster happened at M/s Krishnaping Alloys Limited in Palaspani Manganese Mine in Chhindwara, Madhya Pradesh. This happened on March 13, 2024 at a subsurface level of 292.00 meters. The incident happened at 18:15 hours on Hangwall West Ore Drive between West X-Cut 1 and West X-Cut 2. A portion of the mine roof fell during mucking operations. It was about 1.8 meters long, 2 meters wide, and 0.20 meters thick. The portion of mine roof collapsed on top of a crew of four miners. This includes assessing potential hazards before deploying personnel or machinery. To understand the importance of teaching and training to all staff members on the risks of roof and side collapses. Also, crucial safety measures are required to prevent such occurrences was highlighted.

3.2 Analytic Hierarchy Process (AHP) on the incident

3.2.1 Establishing criteria

- Support of mine strata (SMS)
- Geological assessments (GA)
- Training and education (TE)
- Safety protocol adherence (SPA)

Expert opinions can be obtained by having participants compare the relative merits of alternatives of certain criteria in pairwise comparisons as shown in table 5.

Table 5: Normalised Matrix based on the rating

CRITERIA	SMS	GA	TE	SPA
SMS	1	2	3	5
GA	1/2	1	2	4
TE	1/3	½	1	3
SPA	1/5	¼	1/3	1

Calculate the sum of each column to obtain normalized matrix as shown in table 7:

- SMS: 1+1/2+1/3+1/5 = 2.033
- GA: 2+1+1/2+1/4 = 3.75
- TE: 3+2+1+1/3 = 6.333
- SPA: 5+4+3+1=13

Table 7: Normalized pairwise comparison matrix:

CRITERIA	SMS	GA	TE	SPA
SMS	0.492	0.533	0.474	0.385
GA	0.246	0.267	0.316	0.308
TE	0.164	0.133	0.158	0.231
SPA	0.098	0.067	0.053	0.077

To find the priority vector, average each row of the normalized matrix as shown in table 8. Multiply priority vector to respective column of normalized matrix and sum it to obtain values as shown in table 9.

Table 8: Priority Vector

CRITERIA	PRIORITY VECTOR
SMS	(0.492+0.533+0.474+0.385)/4=0.471
GA	(0.246+0.267+0.316+0.308)/4=0.284
TE	(0.164+0.133+0.158+0.231)/4=0.171
SPA	(0.098+0.067+0.053+0.077)/4=0.074

Table 9: Ratio of weighted sum value and Criteria Weights

CRITERIA	weighted sum value	Criteria Weights	λ_{max}
SMS	2.059	0.471	4.373
GA	1.097	0.284	3.863
TE	0.663	0.171	3.876
SPA	0.366	0.074	4.946

Average λ_{max}: (4.373+3.863+3.876+4.946)/4 = 4.2645

Consistency Index (CI) for Main Criteria

CI = (λ_{max} - n) / (n - 1), where n = 4

CI = (4.2645–4)/(4-1) = 0.2645/3 = 0.088

Consistency Ratio (CR) for Main Criteria

Random Index (RI) for n=4 is 0.90 (standard value for RI)

CR = CI / RI = 0.088/0.90 =0.097

The CR is less than 0.10, which is acceptable.

i. *Support of mine strata*: This criterion was given the highest priority that reflects its critical importance in preventing accidents. It has a weight of 0.471. Effective support of mine strata can greatly lessen this risk of roof collapses which was the main cause of the disaster.

ii. *Geological assessments:* It has a 0.284 priority weight which indicates geological assessments are essential. It is to understand and minimize possible risks associated with the geological characteristics of the mine.

iii. *Education and training:* This criterion has a weight of 0.171 that highlights the significance of teaching and training mine workers. Appropriate instruction can improve the employee's ability to identify and respond to unsafe condition.

iv. *Safety protocol adherence*: Although it has lower priority but still it contributes a significant factor in maintaining overall safety. Following to strict safety procedures can lower the probability of accidents.

3.3 Human Factors Analysis and Classification System (HFACS) on the incident

3.3.1 Level 1: Unsafe acts

- *Skill-Based Errors*: The crew could have experienced insufficient skills to identify early warning signs of a potential collapse of the roof. By this crew can take immediate corrective actions.
- *Routine Violations*: There may have been a routine disregard on the importance of safety regulations. This is done by paying close attention to understand the necessity to support the mine roof and frequent geological inspections.

3.3.2 Level 2: Preconditions for unsafe acts

- *Environmental factors physical environment*: A dangerous working environment has resulted due to the mine roof's damaged structural integrity. The measurements taken of the collapse region shows that the roof had insufficient support.
- *Inadequate training:* The workers particularly involved in the accident have only nine months of experience. That indicates that they weren't given adequate instruction on the risks and safety measures related to roof collapses.

- *Communication and teamwork*: Errors in communication and teamwork could have prevented timely reporting. This further delayed the response to early signs of instability.

3.3.3 Level 3: Unsafe supervision

- *Inadequate supervision*: Geological studies were not carried out before mucking activities. This resulted in ineffectively support of the mine roof. It's possible that supervisors ignored their duty to strictly follow safety procedures.
- *Planned inappropriate operations*: There may have been pressure to continue operations without adequate safety measures in place. It also reflects on how planned decisions prioritized productivity over safety.

3.3.4 Level 4: Organizational influences

- *Resource management*: The organization potentially lacked sufficient resources for proper mine roof support and safety training.
- *Organizational processes:* The processes may have not been followed for regular geological assessments.

3.4 Bowtie diagram of the Palaspani Manganese Mine Incident

Figure 3 shows the Bow-tie diagram for Palaspani Manganese Mine Incident which includes following important terms:

- *Hazard:* The unstable mine roof poses a major risk.
- *Top Event*: The crucial incident was the mine ceiling collapsing.

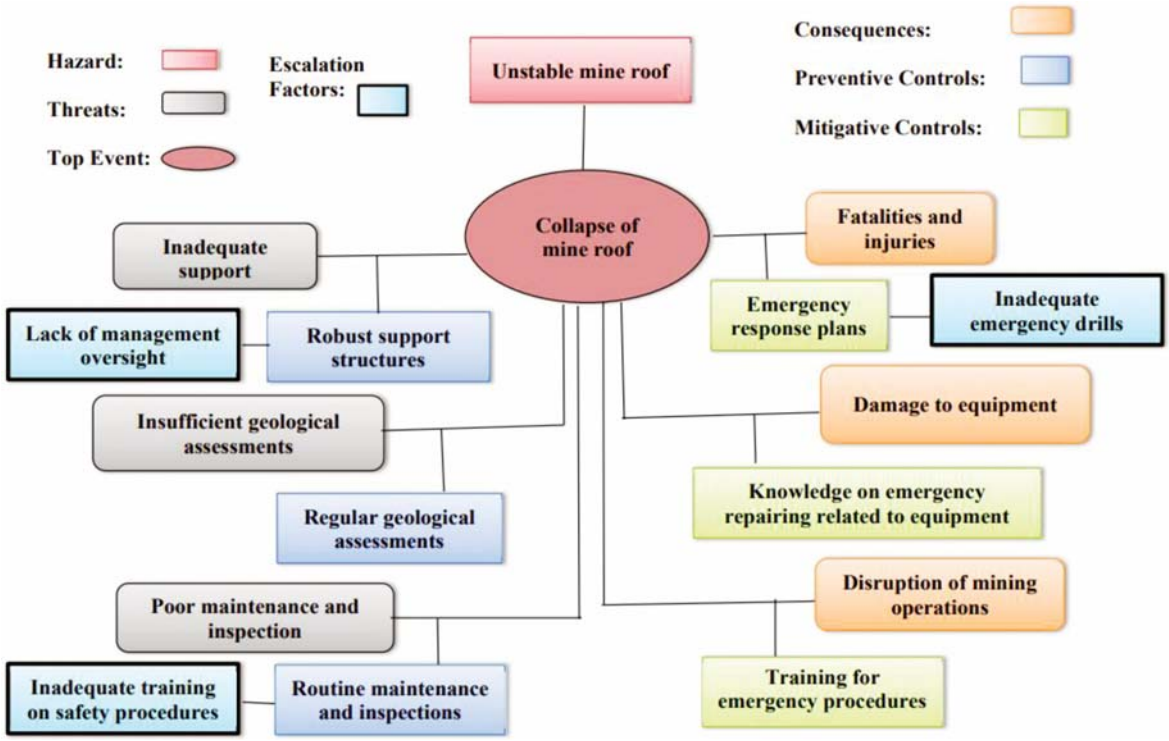


Figure 3: Bowtie diagram of the Palaspani Manganese Mine Incident

- *Threats:* Insufficient structures of support, poor geological evaluations along with unsuitable procedures for inspection and maintenance are the major threats.

3.5 Fault Tree Analysis (FTA) of the Ruchayan Village Coal Mine Incident

- Figure 4 shows the Fault tree analysis for Chas Colliery Disaster which includes following important terms: *Top event*: This is represented by a rectangular shape with the label "roof collapse in underground mine".
- *Basic events (BE):* These are represented by circular shapes and the label "unsupported strata, inadequate safety training, weak geological formations, failure to assess geological conditions, non-compliance with support, and insufficient Safety Measures".
- *Intermediate events (IE):* These are represented by rectangular shape with the label "inadequate geological conditions, and ignored safety procedures".

4. CONCLUSIONS

The research highlights important areas that requires attention and improvement by applying comprehensive analytical methods. The analysis of the Lalmatia Open Cast Coal Mine disaster and the Palaspani Manganese Mine incident provided critical insights into the following human factors contributing to mining accidents:

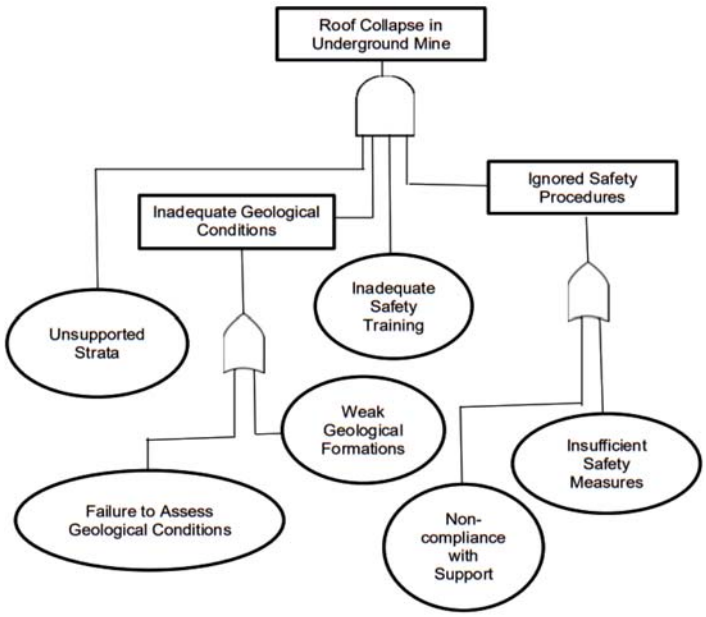


Figure 4: Fault Tree Analysis (FTA) of the Ruchayan Village Coal Mine Incident

i. *Inadequate Safety Culture:* These two events highlight the widespread absence of a strong safety culture in mining operations. Sufficient preventive measures were not taken in the Lalmatia accident despite of visible cracks and regular worker warnings. The Palaspani incident's fatal collapse was caused due to insufficient routine inspections.

ii. *Failure to Act on Identified Hazards*: A major factor in both accidents was lack of action regarding known threats. Lalmatia employees noticed fissures in the overburden days before collapse, but no remedial work was done. The absence of regular inspections in Palaspani allowed dangerous circumstances to continue unnoticed.

iii. *Inadequate Training and Awareness*: Significant problems in worker awareness and training were found in both occurrences. In Lalmatia, workers persisted to labour in unsafe conditions. This happened because they were unaware of the dangers or were afraid of losing their jobs. At Palaspani was partially triggered by insufficient training in hazard recognition and reaction.

iv. *Supervisory and Organizational Failures*: In each case, there were clear supervisory failures. Although obvious warning indications were given in Lalmatia, supervisors failed to implement safety procedures or take preventative action. Production was given priority over safety in organizational decision-making. Prioritizing safety in organizational decision-making and enhancing supervisory roles and responsibility are important.

It is feasible to drastically lower the frequency and seriousness of mining accidents by addressing these crucial areas. It will guarantee a safer working environment for all employees engaged in mining activities. In addition to offering insightful advice for enhancing safety in the mining sector, the conclusions also further reinforce the primary goal of avoiding further fatalities.:

5. REFERENCES

1. Dursun, A. E. 2024. Fatal Accident Analysis and Hazard Identification in Turkish Coal-Extracting Industry Using Analytic Hierarchy Process. *Mining, Metallurgy & Exploration* **41(1)**: 149-172
2. Fu, G., Xie, X., Jia, Q., Tong, W., & Ge, Y. 2019. Accidents analysis and prevention of coal and gas outburst: Understanding human errors in accidents. *Process Safety and Environmental Protection* **122**: 157-168
3. Kumar, P., Gupta, S., & Gunda, Y. R. 2020. Estimation of human error rate in underground coal mines through retrospective analysis of mining accident reports and some error reduction strategies. *Safety science* **123**: 104555
4. Kumar, R., & Ghosh, A. K. 2014. The accident analysis of mobile mine machinery in Indian opencast coal mines. *International Journal of Injury Control and Safety Promotion* **21(1)**:54-60
5. Li, M., Wang, H., Wang, D., Shao, Z., & He, S. 2020. Risk assessment of gas explosion in coal mines based on fuzzy AHP and Bayesian network. *Process Safety and Environmental Protection* **135**: 207-218
6. Liu, R., Cheng, W., Yu, Y., & Xu, Q. 2018. Human factors analysis of major coal mine accidents in China based on the HFACS-CM model and AHP method. *International Journal of Industrial Ergonomics* **68**: 270–279
7. Maiti, J., Khanzode, V. V., & Ray, P. K. 2009. Severity analysis of Indian coal mine accidents – A retrospective study for 100 years. *Safety Science* **47**: 1033-1042
8. Matsimbe, J., Ghambi, S., & Samson, A. 2020. Application of the bowtie method in accident analysis: Case of Kaziwiziwi coal mine. *Engineering and Technology Quarterly Reviews* **3(2)**
9. Mirzaei Aliabadi, M., Aghaei, H., Kalatpour, O., Soltanian, A. R., & Nikravesh, A. 2020. *Analysis of human and organizational factors that influence mining accidents based on Bayesian network. International journal of occupational safety and ergonomics* **26(4)**: 670-677
10. Mandal, A., & Sengupta, D. 2000. The Analysis of Fatal Accidents in Indian Coal Mines. *Calcutta Statistical Association Bulletin* **50**: 197-198
11. Niu, L., Zhao, J., & Yang, J. 2023. *Risk assessment of unsafe acts in coal mine gas explosion accidents based on HFACS-GE and Bayesian networks. Processes* **11(2)**: 554
12. Qiao, W., Li, X., & Liu, Q. 2019. Systemic approaches to incident analysis in coal mines: Comparison of the STAMP, FRAM and "2–4" models. *Resources Policy* **62**: 1-10
13. Sherin, S., Z.-Ur-Rehman, S. Hussain, N. Mohammad, S. Raza. 2021. Hazards identification and risk analysis in surface mines of Pakistan using fault tree analysis technique. *Mining of Mineral Deposits* **15(1)**: 119-126
14. Shi, S., Jiang, B., Meng, X., & Yang, L. 2018. Fuzzy fault tree analysis for gas explosion of coal mining and heading faces in underground coal mines. *Advances in Mechanical Engineering* **10(8)**: 1-9
15. Sinha, Arun., 1976. Continuing Violation of Safety Rules. *Economic and PoliticalWeekly* **11(44)**: 1717-1720

MEAI NEWS

AHMEDABAD CHAPTER

One half-day seminar on "Diversified Transportation Infrastructure in Kachchh Region for Proliferation of Mining Industry and Best Practices in Mining" was organized by Ahmedabad Chapter (Kutch Local Centre) on 26.03.2025 at Sewagram Cement Works (Ultratech Cement Ltd) Dist. Kutch Gujarat.

The seminar was jointly hosted by Sewagram Cement Works, Ultratech Cement Ltd, Gujarat Mineral Development Corporation Ltd. (GMDC), Adani (Sanghi) Industries Ltd at Club house of Ultratech Cement, Sewagram.

Around 80 participants from Sewagram Cement Works, Ultratech Cement Ltd, Umarsar Lignite Mine, Mata No Madh Lignite Mine, Panandhro Lignite Mine & Gadhasisha Group of Bauxite Mines of Gujarat Mineral Development Corporation ltd, Adani (Sanghi) Industries Ltd have participated in the seminar.

The event was inaugurated with the Lighting of Lamp and Aditya Vandana by Shri. S N Mathur- President, MEAI, Shri. A K Makadia- National Council Member, Shri. Swagat Ray and Smt. Gunjan Pande- Chairman and Secretary of the Chapter respectively, and other distinguished guests from Sewagram Cement Works, GMDC, Adani Cements, Ashapura Minerals and Govt. Polytechnic Bhuj.

Shri. Gaurav Taluja, SVP UTCL & convenor Kutch Local Centre welcomed the guests.

In the technical session, six papers were presented by the following members:

1. Shri Amit Raj, HOD Mines Ultra Tech Cement Ltd, Sewagram Unit
2. Shri Umesh Pampaniya, Assistant Manager (Mines), GMDC Ltd, Mata No Madh
3. Shri S J Matariya Assistant Manager (Mines), GMDC Ltd Gadhsisha
4. Shri Kevin Vara, Assistant Manager (Mines), GMDC Ltd Umarsar
5. Shri Ishan Sur, Assistant Manager (Geology), GMDC Ltd, Panandhro
6. Shri Dilip Gor, Adani Cement Ltd

The presentations mainly highlighted the overview of the Kachchh region, its geography, natural resources, economy, Importance of mining in regional development and the need for a diversified and integrated transportation system for resource mobilization. The status of Current Transportation Infrastructure like Road Network, Railways, Ports and Airports was deliberated.

The speakers also figured out the Gaps and Challenges like Bottlenecks in last-mile connectivity to mining sites, Over-reliance on road transport — high cost, environmental issues, Inadequate rail infrastructure for bulk cargo, Limited multimodal logistics integration.

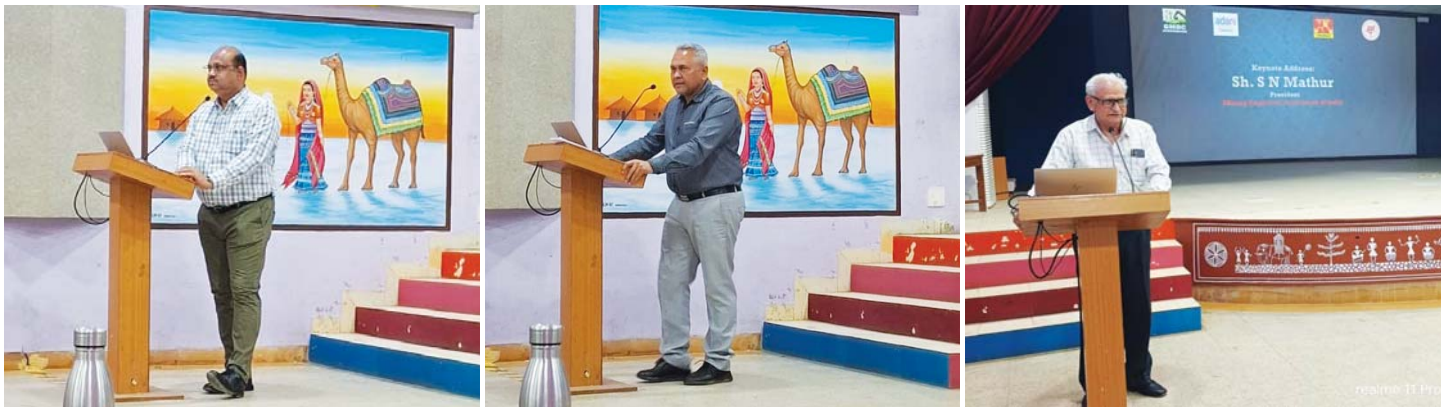
Presenters have also proposed a Diversified Infrastructure Development along with the Economic & Strategic Benefits.

Shri A K Makadia, Council Member, MEAI conveyed the details related to the subject of the seminar and specially focused on safety of the man, machineries and mines. The Seminar was addressed by Shri Swagat Ray, Chairman of Ahmedabad chapter, who suggested deliberation on the sustainable front of logistics. He also appealed to the participants to become life members of MEAI.

Shri S N Mathur graced the occasion and bestowed his insightful thoughts on the participants of the seminar and conveyed his wishes for bright a future of mining in India. He emphasised the importance of the topic of the seminar which is both relevant and significant, especially considering the region's rich mineral resources like lignite, bauxite, Limestone and bentonite. Developing a robust, diversified transportation network is crucial for unlocking the economic potential of mining in Kutch, Gujarat.

The program was concluded with a vote of thanks by Shri S C Jhagrawat Secretary, Kutch Local Centre followed by dinner.

Lighting of Lamp by Shri. S N Mathur and other dignitaries



Shri. Swagat Ray, Shri. A K Makadia, Shri. S N Mathur addressing the Audience

Delegates of the seminar

Felicitation to Shri. S N Mathur

Vote of Thanks by Shri. S C Jhgrawat

BELLARY-HOSPET CHAPTER

Felicitation Event

In the absence of the MEAI BH Chapter-conducted event for the National Surveyors' Meet-2025 originally scheduled on 08.03.2025, a special gathering was organized on 13.04.2025 at Kolar by MEAI in collaboration with former BGML personnel.

During this event, Smt. & Shri. Nanjundappa were felicitated in recognition of their distinguished service and contribution to the surveying and mining community.

The organizers express their sincere gratitude to all individuals who extended their support—both directly and indirectly—for the grand success of this occasion.

JABALPUR CHAPTER

Jabalpur Chapter and its Students Chapter organised a One-Day Workshop at AKS University Satna Campus on March 4, 2025.

Sri B.P. Soni, Chancellor of AKS University was the president of the function and Chapter Chairman Dr Pukhraj Nenival was the Chief Guest and Chapter Secretary Sri Pratyendra Upadhyay was the Guest of Honour at the inaugural function. Attended by over fifty MEAI members, the function also coincided with the presentation of Ph.D in Mining Engineering to Dr Pukhraj Nenival. Dr Nenival received the certificate from Sri B.P. Soni and Dr B.A. Chopade, Vice Chancellor of AKS University. Sri B.P. Soni in his presidential address stressed on the role of Mining engineers in nation building. Dr Nenival accompanied by his wife Dr Ms Nenival also addressed the gathering. Sri P. Upadhyay proposed a vote of thanks. In the technical session four papers were presented.

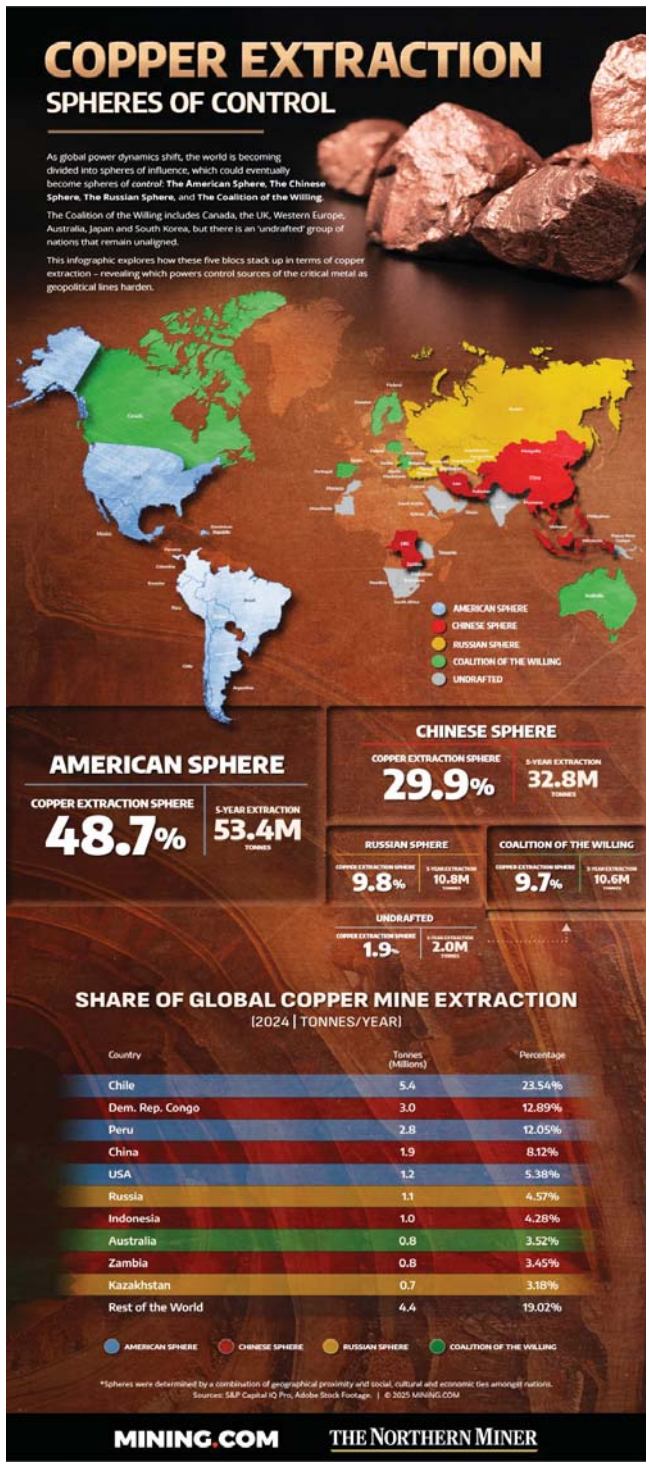
1. Use of computer for coal mine safety in India by Ashish Kumar Bais & Mohan Pratap Singh
2. Use of computer in blasting in Indian Mines by Shivank Mishra & Ankush Kushwaha
3. Use of computer application in underground coal mine ventilation by Ashish Kumar Chaturvedi (Chairman MEAI JABALPUR CHAPTER) & Mayank Kumar
4. Optimization of blasting operation using Opit blast software by Manojkumar S & Harsh Bhola

The new office bearers of the student chapter were introduced to the gathering. In this function MD of M/s A.P. Trivedi of Balaghat Sri Sudhir Bhai Trivedi was felicitated for developing an underground manganese mine in ecologically sensitive zone by transition from opencast mine.

(Continued from Page 13)

increasingly polarized world. In this interview, Anthony Vaccaro, the author of the graphic and president of The Northern Miner Group, explains how the five blocs compare in terms of copper extraction.

Explore the full infographic:



Mining.com | April 17, 2025

NOMINATIONS FOR MEAI AWARDS 2025

The Mining Engineers' Association of India presents awards Instituted by the Industry/individuals during the Annual General Meeting in July - August every year. Nominations for the following Awards are invited in the prescribed form, so as to reach the Secretary General by **31st of May 2025 (deadline extended from April)**. Nomination can be submitted by a member for one award only.

1. MEAI - Sitaram Rungta Memorial Award for the best paper on Mining-related issues during the year 2024.

Award Bylaws:

a. The award is known as MEAI – Sitaram Rungta Memorial Award, instituted by M/s Rungta Group of Mines.
b. The award is presented to a Mining Engineer/ Geologist or any other qualified person involved with Mining Industry, who presented a paper on mining related issues during the previous calendar year/ financial year.
c. The papers presented in any of the paper meetings, seminars or workshops organized by the Association/ Chapter during the calendar year are eligible for the award, provided
   1. *The paper was not published in any journal/ magazine in India or abroad other than the MEJ*
   2. *The author did not deliver lecture/ talk related to this paper on any other forum other than in the Seminars / Workshops etc., organised by MEAI.*

2. MEAI NMDC Excellence Gold Medal Award for significant contribution to Mineral Industry during the year 2024.

Award Bylaws:

a. The award is known as NMDC Excellence Gold Medal Award instituted by M/s NMDC Ltd.
b. The award is presented to a Mining Engineer/ Geologist or any qualified person involved in Mining Industry for the meritorious services rendered by him/ her to the Mineral Industry of India.
c. The award consists of Gold Medal and a certificate.
d. The Awardee shall be at least 50 years of age and shall have at least 20 years of experience in the Mining Industry.
e. The applicant shall submit required proofs/documents if any for his contribution to the Mining Industry.
f. The Jury for the Award shall consist of CGM and above rank officers from NMDC and two other senior members from MEAI.

3. MEAI Simminds Award for significant contribution to the limestone industry during the year 2024.

Award Bylaws:

a. The award is known as MEAI – SIMMINDS award instituted by M/s SOUTH INDIAN MINES AND MINERALS INDUSTRIES Ltd.,
b. The award is presented to a Mining Engineer/ Geologist or any qualified person involved in Mining Industry for his/ her significant services rendered to the Limestone industry.

4. MEAI Smt. Bala Tandon Memorial Award in recognition of contribution to Mining Industry for improving ecology, environment and forestation during the year 2024.

Award Bylaws:

a. The award is known as MEAI - Smt. Bala Tandon Memorial Award was instituted by Padma Bhushan G.L. Tandon in memory of his late wife.
b. The award is presented to a Mining Engineer/ Geologist or any qualified person associated with the Mining Industry, in recognition of his/ her meritorious services for improving ecology, environment and afforestation in mining and mineral industries.

5. **MEAI Abheraj Baldota Memorial Gold Medal Award** (Mining Engineer of the year 2024) in recognition of significant contribution to Mining Industry by a Mining Engineer with 20 years of experience in the Industry.

Award Bylaws:

a. The award is known as MEAI – Abheraj Baldota Memorial Gold Medal Award (Mining Engineer of the year) instituted by M/s MSPL Ltd., in memory of its founder late Abheraj Baldota.
b. The award is presented to a Mining Engineer with a Degree or Diploma in Mining Engineering and Mine Manager's Certificate of Competency with 20 years of experience in mining and allied disciplines as on the date the nomination is forwarded and the nominee should have completed 45 years of age and contributed substantially to the mining and mineral industries in the areas of management performance, production, mining technology, human resource development, protection of environment, mineral conservation, beneficiation etc.

6. MEAI Abheraj Baldota Memorial Gold Medal Award (Young Mining Engineer of the year 2024) in recognition of significant service to Mining Industry by an Young Mining Engineer who has not completed 35 years of age as on 2025.

Award Bylaws:

a. The award is known as MEAI – Abheraj Baldota Memorial Gold Medal Award (Young Mining Engineer of the Year) instituted by M/s MSPL Ltd., in memory of its founder late Abheraj Baldota.
b. *The award is presented to a Young Mining Engineer with a Degree or Diploma in Mining Engineering or a Manger's Certificate of Competency with five years' experience in mining industry and the nominee should not have completed* ***35 years of age as on the date of filing his nomination for the award.***

7. MEAI-SRG Informational Technology Award for the year 2024, In recognition of significant contribution to Mining Industry adopting Information Technology during the year 2024.

Award Bylaws:

a. The award is known as S.R.G. Award for Information Technology, instituted by M/s S.R.G. Consulting Mining Engineers (P) Ltd. in memory of late Sriram Srinivasan and late Pradeep Kumar Bhattacharya both founder directors who lost their lives in Train (Rajdhani Express) accident in the year 2002.
b. The award is presented to a qualified Mining Engineer/ Geologist/ any qualified person for his significant contribution in Information Technology to Mining and Mineral Industries and the nominee should be a Life Member of the MEAI.

8. MEAI Master Tanay Chadha Memorial Geologist Award for the year 2024 in recognition of the significant contribution by a geologist in the field of Mineral Exploration, quality control, and production, mine planning, etc. during the year.

Award Bylaws:

a. The award is known as MEAI – Master Tanay Chadha Memorial Geologist Award instituted by Shri G.L.Tandon (Padma Bhushan) in the name of his late grandson (S/o Smt. Sunita Chadha and

Shri Sudhanshu Chadha). The award is presented to a geologist with a Master's Degree in Geology/ Applied Geology/ Geophysics with at least five years' experience in Mining and Mineral Industry who had contributed significantly in the areas of mineral exploration, quality control and production, mine planning, etc.

9. **MEAI- Smt Veena Roonwal Memorial Award** for the year 2024 to a Mining Engineer/Geologist/a qualified person involved with the Mining Industry with 10 years of experience for presenting a paper during the year in a seminar/ symposium workshop organized by MEAI on "Water Management in and around a working mine" or "Implementation of New/Latest Technology in Mining and allied subjects.

Award Bylaws:

a. The Award is known as Smt. Veena Roonwal Memorial Award instituted by Prof. G.S. Roonwal in memory of his late wife and is presented to a qualified Mining Engineer/ Geologist/ any qualified person involved with Mining Industry with 10 years' experience, for presenting a paper during the year in a seminar/ symposium/ work shop/ technical paper meeting organized by MEAI/ MEAI Chapter on "Water Management in and around a working mine or implementation of New/ Latest Technology in mining.

10. **MEAI- Smt Kiran Devi Singhal Memorial Award** for the year 2024 only to a person (MEAI Member/Non-member- need not necessarily be from mining discipline) for his/her contribution in the field of "Development and Conversation of Minerals and Environment" in and around Metalliferous mines (excluding Coal and oil) during the year 2024.

Award Bylaws:

a. The award is known as MEAI - Smt. Kiran Devi Singhal Memorial Award instituted by Dr. Suresh C. Singhal in memory of his late mother.

b. The award is presented to a member or non-member of MEAI for his/ her outstanding contribution in the field of "Development and Conservation of Minerals and Environment in and around metalliferous mines.

11. **MEAI Award to a best paper in Mining article published in the Mining Engineers' Journal in the financial year 2024 Instituted by Dr. M.L. Jhanwar**

Award Bylaws:

a. a. The Award will be known as Eco-friendly Mining Award.

b. The award consists of a Plaque/ Medal and a Certificate. The cost of the Award will be met from the interest received on the donation of Rs. 1 lakh from Dr. M.L. Jhanwar.

c. The Award will be given to a person for contributing the best paper on Eco-friendly Mining in Mining Engineers' Journal published by MEAI.

d. The Award is presented to a member or non-member of MEAI.

The paper should not have been published in any of the journals in Magazines India/ Abroad other than MEJ on Eco-friendly Mining.

12. **MEAI-SCCL Coal Award** for the year 2024 to a Mining Engineer, a Geologist, a Mechanical Engineer and a Foreman/Over man for meritorious contribution to the Coal Industry.

Award Bylaws:

a. The Awards are known as MEAI- SCCL Coal Awards instituted by M/s SCCL Ltd.

b. The Awards are presented to a Mining Engineer, Geologist, Mechanical Engineer, Overman/ Foreman or any qualified person involved in Coal Mining Industry for the meritorious services rendered by him/ her to the coal industry or papers published.

➤ ***For detailed guidelines please visit the website www.meai.org and the memorandum of association and rules and regulations (as on 26.08.2022)***

Applications and Guide Lines

The application (Hard Copy) shall be forwarded/sent to Secretary General MEAI NHQ in Prescribed Format (Copy Enclosed) to reach before ***30th April 2025*** *(**MEAI NHQ Address: Mining Engineers' Association of India, F-608&609, VI Floor, Raghava Ratna Towers 'A' Block, Chirag Ali Lane, Abids, Hyderabad – 500001. Mob - 7780117320)** **and the Soft copies should be enclosed in PDF format with the subject. MEAI Awards 2025 and shall be sent to email - meai1957@gmail.com***

Applications are to be sent along with enclosed Award Format

MEAI Award Format

1.	Name of the Award Applied for	:
2.	Name of the Applicant	:
3.	Date of Birth	:
4.	Academic Qualification	:
5.	Professional Qualification	:
6.	Whether a Member/Life Member of MEAI	:
7.	Specific details of the award applied for as per requirement of bylaws (Enclose relevant documents)	:

Date: Certify that the information/details submitted for the above Award are true to the best of my knowledge

Name: Signature:

Enclosed copies of documents on experience and achievements.

i. ii. iii.

CONFERENCES, SEMINARS, WORKSHOPS ETC.

ABROAD

4-7 May 2025: **CIM CONNECT**. Montreal, QC, Canada. Organised by The Canadian Institute of Mining, Metallurgy and Petroleum. Contact Chantal Murphy, Conference Planner (Technical Program) at cmurphy@cim.org or +1-514-939-2710 ext. 1309.

6-7 May 2025: **Mineral Resource Estimation Conference 2025**. Perth, Australia. Contact: 1800 657 985 or +61 3 9658 6100 (if overseas).

20-22 May 2025: **Global Resources Innovation Expo 2025**. Brisbane, Australia. Contact: 1800 657 985 or +61 3 9658 6100 (if overseas)

21-22 May 2025: **AUSTMINE 2025**. Brisbane Convention and Exhibition Centre. Contact: Jason Berman, Event Director, jberman@etf.com.au, +61 2 9556 7991

10-12 Jun 2025: **Coaltrans China 2025**. Beijing, China. For more details Contact conferences@fastmarkets.com.

11-12 Jun 2025: **UK Mining Conference in Cornwall**. Organised at Princess Pavilion, 41 Melvill Road, Falmouth, Cornwall, TR11 4AR, United Kingdom. Contact: +44 7885 131097 or info@ukminingconference.co.uk.

21-22 Jun 2025: **International Conference on Oil, Gas and Petroleum Geology ICOGPG 2025**. Vienna, Austria. Website URL: https://waset.org/oil-gas-and-petroleum-geology-conference-in-june-2025-in-vienna. Organised by World Academy of Science, Engineering and Technology.

22-23 Jul 2025: **International Conference on Mining and Economic Geology ICMEG**. Berlin, Germany. Website URL: https://waset.org/mining-and-economic-geology-conference-in-july-2025-in-berlin

29 - 30 Jul 2025: **Life of Mine | Mine Waste and Tailings Conference 2025 (#LOMMWT2025)**. Brisbane Convention & Exhibition Centre. Contact by phone at T: 1800 657 985 or +61 3 9658 6100 (if overseas). Po Box 660 Carlton, VIC 3053, Ground Floor, 204 Lygon St, Carlton VIC 3053.

7-9 Aug 2025: **2025 China International Coal & Mining Exhibition**. China International Exhibition Center (CIEC) No. 6 North Third Ring Road East, Chaoyang District, Beijing , 100028, China.

10 - 13 Aug 2025: **Application of Computers & Operations Research in the Mining Industry**. #APCOM2025. PCOM Conference 2025, Perth Convention and Exhibition Centre, Perth, Western Australia. AusIMM T: 1800 657 985 or +61 3 9658 6100 (if overseas). Po Box 660 Carlton, VIC 3053, Ground Floor, 204 Lygon St, Carlton VIC 3053.

19-21 Aug 2025: **International Conference on Mining, Material, and Metallurgical Engineering**. Paris, France. Website URL: https://mmmeconference.com/. Organised by International ASET Inc.

2 - 4 Sep 2025: **Critical Minerals Conference 2025 (#CMC2025)**. Perth Convention & Exhibition Centre. Contact by phone at T: 1800 657 985 or +61 3 9658 6100 (if overseas). Po Box 660 Carlton, VIC 3053, Ground Floor, 204 Lygon St, Carlton VIC 3053.

25-26 Oct 2025: **International Conference on Hydrometallurgy and Mining ICHM**. Istanbul, Turkey. Website URL: https://waset.org/hydrometallurgy-and-mining-conference-in-october-2025-in-istanbul.

28-31 Oct 2025: **China Coal & Mining Expo 2025**. Organised by China International Exhibition Center (Shunyi Hall), 88 Yuxiang Road, Tianzhu Airport Industrial Zone, Shun Yi District, Beijing, China. Contact 852 28815889 or katherinelee@together-expo.com.

11-13 Nov 2025: **Environmental Integration on Sustainable Perspective and Beyond**. Manila, Philippines. Website URL: https://www.ierek.com/events/environmental-integration-on-sustainable-perspective-and-beyond-eispb#introduction.

25-26 Jan 2026: International Conference on Geological and Earth Sciences ICGES (ICGES 2026). Paris, France. Website URL: https://waset.org/geological-and-earth-sciences-conference-in-january-2026-in-paris. Organization: World Academy of Science, Engineering and Technology.

25-26 Feb 2026: **International Conference on Earth Science (ICES 2026)**. Buenos Aires, Argentina. Website URL: https://waset.org/earth-science-conference-in-february-2026-in-buenos-aires.

3-7 Mar 2026: **CONEXPO-CON/AGG 2026**. Las Vegas Convention Center, 3150 Paradise Rd, Las Vegas, NV, 89109, United States. North America's largest construction trade show happens once every three years.

25-26 Mar 2026: **International Conference on Geosciences, Mineralogy and Petrology (ICGMP 2026)**. Madrid, Spain. Website URL: https://waset.org/geosciences-mineralogy-and-petrology-conference-in-march-2026-in-madrid. Contact international@conexpoconagg.com.

24-25 May 2026: **International Conference on Mining and Economic Geology (ICMEG 2026)**. in London, United Kingdom. Website URL: https://waset.org/mining-and-economic-geology-conference-in-may-2026-in-london.

REQUEST TO READERS/ MEMBERS OF MEAI

The Editorial Board of the Mining Engineers' Journal (MEJ) requests our esteemed Readers/ Members of MEAI to share their valuable Research work in geosciences/ mining or Best practices developed/ adopted while employed in the mineral industry, for publication in our Mining Engineers' Journal (MEJ), for the benefit of the mineral industry fraternity.

Interested professionals may please contact the Editor, MEJ for obtaining "Author(s) guidelines" for submitting technical papers at **editor.mej.meai@gmail.com**.

Editor, MEJ

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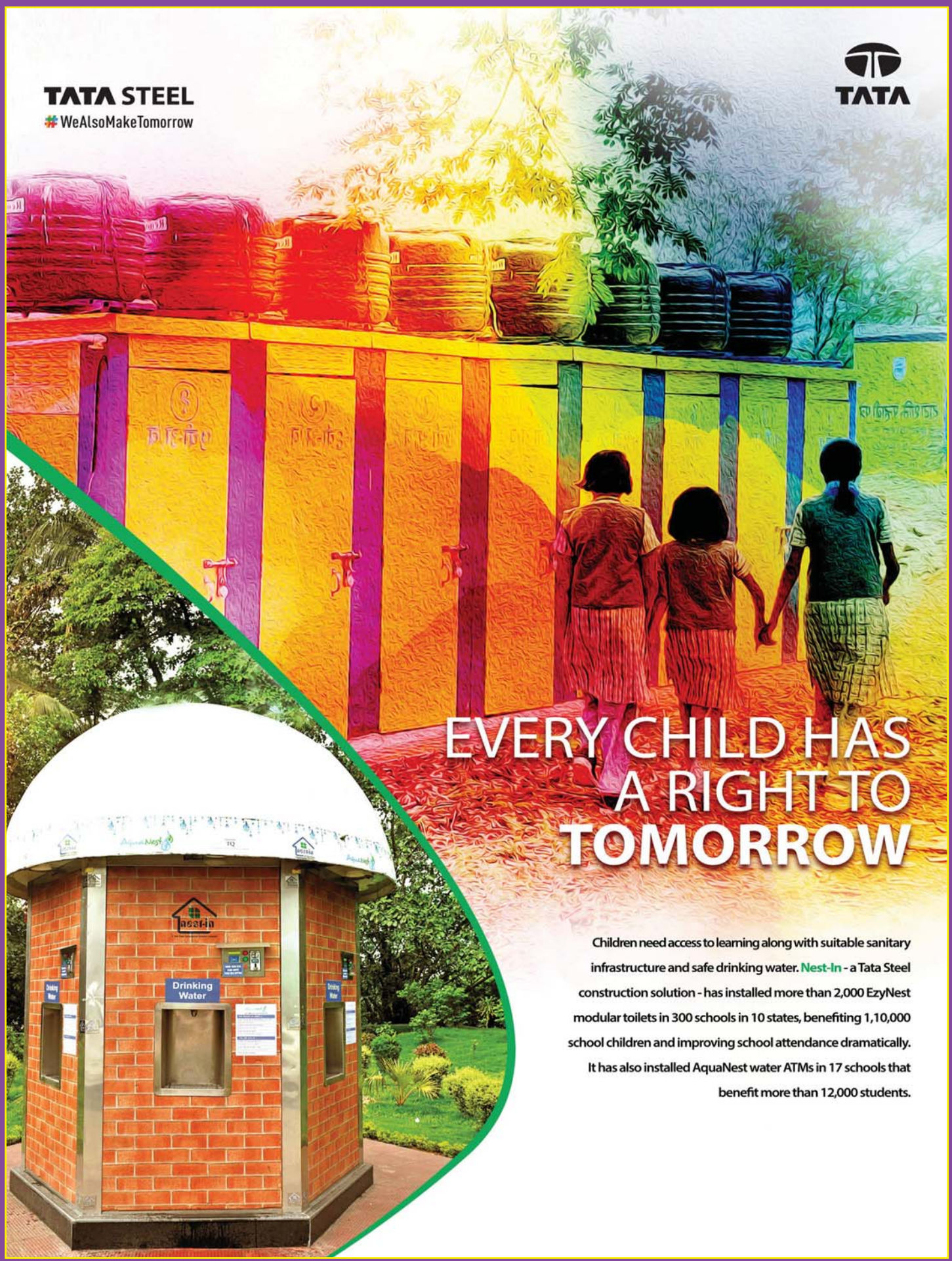

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