

# Mining Engineers' Journal



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*Mining Engineers' Association of India*

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No. 3

MONTHLY

October - 2021



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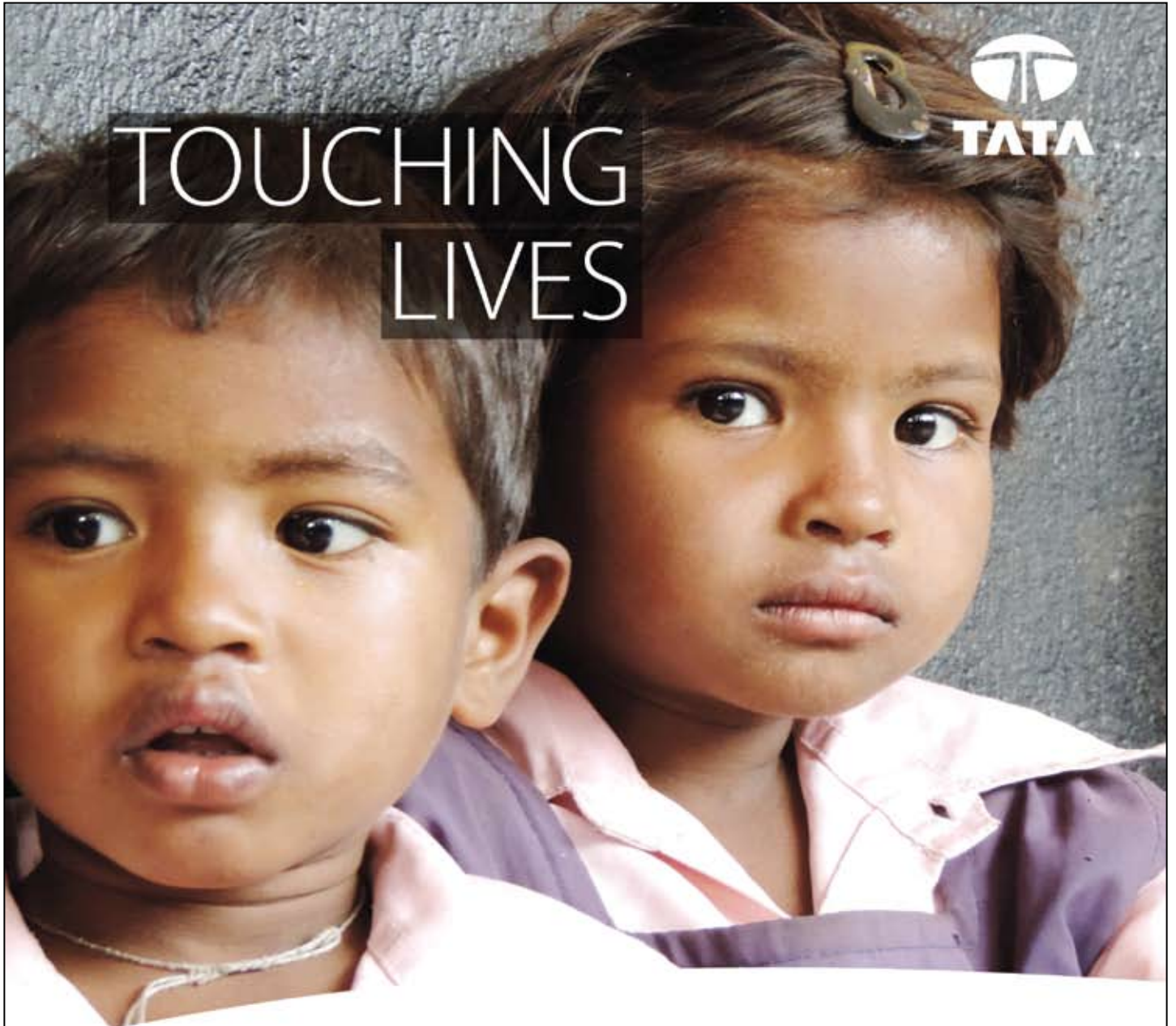
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## *President's Message.....*

Dear members,

I am delighted to share with you that I have attended AGMs of 4 Chapters and Installation ceremonies of new Executive bodies of Belgaum, Bangalore, Bellary-Hospet and Hutti-Kalaburagi Chapters for the period 2021-23. I would like to congratulate all the new teams and wish them a productive and fulfilling tenure. Hope the other Chapters will follow suit.

The Hyderabad Chapter organized a workshop on "Industry Academia Interaction in the Mining Industry" on September 7, 2021 and the New Delhi Chapter organized an interactive session with Sri. Sanay Lohiya, Addl. Secretary Ministry of Mines on September 9, 2021.

The Office bearers of Chapters and Members of MEAI had received invitation for attending the "The Handing over of 100 G4 Mineral Blocks by GSI to the State Governments on September 8, 2021, at 3:00 pm". It was a strategic move of the Government of India to handover the blocks to State governments for further exploration and auction. Hoping that respective State governments will accelerate the process of exploration and bring the blocks to auction stage within a short period. This will generate employment in the areas of exploration, mining and other allied industries and ensure uninterrupted supply of raw materials to the Industry.

Recent times have seen many changes in legislation pertaining to mining. The important ones to note are the formation of a committee to examine the issues of "misclassification of iron ore and other minerals" which in turn sought suggestions, changes in Ammonium nitrate Rules, Digitalization of MOEF & CC, and EC cell for getting timely compliance reports from users on the web platform.

Notification & Notice Inviting Tenders (NIT) were released for auctioning mineral blocks pertaining to different minerals such as iron Ore, manganese ore, bauxite, limestone in large numbers in the states of Odisha, Karnataka, Rajasthan, Andhra Pradesh, Jharkhand and Chhattisgarh. It is a welcome move after a long gap and would propel the mining industry towards better days.

From this platform, I would like to request all the Council members, Chairman & Secretary of Chapters and the Members to focus on

- Inducting New Members
- Visiting nearby colleges/institutes by all senior members to share their knowledge to improve the skills of mining, geology and allied students. This will create industry-institution bonding, also improve the skills of budding engineers, and prepare them industry ready.

I also request our Members that are in decision making positions in their respective organizations to provide opportunities for one-year apprenticeship/ training for young mining engineers/ geologists to build their careers. Arrange for young employees from their respective organizations to visit other mines as a part of "Knowledge enhancement program" so that they can learn different skills sets, methods of workings of other organizations. This will also help in building their social networks.

I wish the Chapters' Chairmen and Secretaries plan for worthy activities and involve the majority of Members in the upcoming "**INDIAN MINING DAY CELEBRATIONS**".

With regards.

**K. MADHUSUDHANA**  
President



# Mining Engineers' Association of India

Regd. Office : Rungta House, Barbil (Odisha)

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## EDITOR'S DESK



**Dr. P.V. Rao**  
Editor, MEJ

The Government of India, which is determined to supplement its financial resources through auctioning of national minerals assets, put on block many mineral and coal blocks in several tranches and has been successful in auctioning some of them to domestic investors. The reluctant foreign investors however stayed away from bidding, largely due to absence of appropriate info in the Geological Reports (GR). Initially, the domestic investors were excited to bid in excess of 100%-150% over the base price, signalling desperation to win the brownfield blocks in supplementing their mineral resources base. The industry leaders, while hailing some of the favourable amendments made to the Mineral Act and Rules & Regulations were equally critical on few other aspects that are linked to the classification and reporting of Mineral Resources and Reserves that evidently not satisfied the vital principle of 'reasonable prospects for eventual economic extraction'.

By expounding in the offer documents that the GR, optional site visit and independent economic evaluation by the bidders etc. as the basis to arrive at the likely bidding price, the auctioneers have cleared themselves from any future claims. Nevertheless, for any auction to sustain it should be a win-win proposition for

both the successful bidder and the auctioneer; but sadly this vital norm seems to be missing in the current auctioning. The data/ information espoused in the offer documents were too little and scanty to assist the prospective bidders to make conclusive preliminary economic assessment ahead of bidding.

Some successful bidders surreptitiously expressed that the exploration data and resource estimates cited in the GR are hard to bank up on and perhaps led some successful bidders to seek either intervention for justice or surrender the leases even after making considerable investments in further exploring and developing them. The news recently published in the print media are to be quoted, the JSW Limited has proposed to surrender Gouma iron ore lease in Odisha, citing poor quality of ore, 130% premium commitment, serious logistics issues due to space constraints and mandatory production of a minimum quantity of iron ore annually as the main reasons. There is a lot to learn for all the stakeholders from such a distressed move made by a successful bidder. The lawmakers shall deliberate immediately on the underlying reasons in this pertinent matter and suggest remedial measures.

Publicising the handing over of 100 geologically potential mineral blocks to state governments by the GSI on September 7, 2021 for further exploration and auction, in the presence of Union Minister for Mines and Coal minister, guises the hype created to endorse the current functioning of government exploration agencies. Is it the first and only time that the Indian government auctioned mineral blocks or the GSI handed over mineral blocks to state governments for auction? – and more so - blocks with estimated quantities based primarily on indirect evidence (G4 category). How can one estimate and classify the mineral resources, based on G4 category exploration inputs into any of the three Mineral Resources categories as outlined in the MEMC Rules, even while disregarding the internationally recognised public reporting standards? Moreover, when majority of the DMGs are not equipped with the desired technical skills and infrastructure, how can the government expect them to undertake further scientific exploration fruitfully!

When the foreign investors barely understand and follow the EFG based UNFC system, why is the government insisting upon adopting such an untenable public reporting system that would benefit neither the investors nor the government; and only works contrary to the objective of attracting the private foreign investments in the Indian mineral sector. There is an immediate need for all the exploration agencies to preserve transparency in the preparation of GRs by presenting the data in its entirety and the basis of resource estimates and categorization vis-à-vis standard definitions to inculcate confidence in the prospective investors.

To uphold reliability of the GRs, independent technical experts/ agencies shall be involved to audit the GRs before considering them for auction, much similar to that of the financial reports of the mining companies audited by independent auditors. In case of any major discrepancy noticed later in the data/ information provided in the GRs, the government should own the responsibility of imposing appropriate penalty on the erring exploration agencies and simultaneously provide respite to the disadvantaged investors.

*- Editor*

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## NEWS FROM THE MINING WORLD

### ➤ **New research to bring fibre optic technology to Australian mining sector**

A Curtin University research team will work to bring leading broadband fibre optic acoustic sensing technology to the Australian oil and gas, mining and environmental monitoring industries, aiming for a more cost-effective and safer resource extraction process.

As part of the Federal Government's Global Innovation Linkages Program, the team – led by Professor Roman Pevzner from Curtin's WA School of Mines: Minerals, Energy and Chemical Engineering – will partner with international collaborators to test the viability of the technology in the Australian landscape. The project will seek to produce a suite of passive and active geophysical data acquisition and analysis techniques based on broadband fibre optic sensing that aim to reduce the cost of geophysical characterization of the subsurface and develop a safer resource extraction process.

Curtin University Deputy Vice-Chancellor Research Professor Chris Moran said the Curtin research project sought to ensure Australia was not left behind by the latest global advances in fibre optic acoustic sensing technology. "Despite Australia's leading role in the deployment and application of fibre optic sensing for research, the current uptake of this technology in the Australian industry lags behind world leaders such as the United States of America and the United Kingdom," Professor Moran said.

"Demonstrating the benefits of fibre optic technology in Australian conditions in cooperation with our major oil and gas producers will help accelerate the uptake of this technology in the sector, as well as the wider mining and environmental monitoring industries," he said. Professor Pevzner said the project would develop technologies that use ambient seismic energy and physical phenomena, including remote earthquakes, ocean microseisms and human activity, through laboratory and field studies.

"Our Curtin team has developed, patented and commercialised a forced-oscillation stress-strain method and equipment for measuring different properties of rocks at seismic and sub-seismic frequencies," Professor Pevzner said. "As part of this new project, we will integrate fibre optic sensing technology into our apparatus with the ultimate aim of delivering cost-saving and safer resource extraction processes to Australia's critically important resources sector."

Curtin will work with CSIRO, Santos, Woodside and global leaders in seismology and fibre optic sensing in the application to geosciences such as Lawrence Berkley National Laboratory, Iowa State University, Class VI Solutions and Silixa Ltd. The Federal Government's Global Innovation Linkages Program provides funding to help Australian businesses and researchers collaborate with global partners to support strategically focused research and development in priority areas.

*MINING.com Editor | September 7, 2021*

### ➤ **Scientists working on autonomous swarms of robots to mine the Moon**



*NASA is exploring new techniques to break rocks, different of those used on Earth. (Image courtesy of NASA | JPL-Caltech.)*

Plans to start mining the Moon as early as 2025 have received a boost, with NASA granting a research team from the University of Arizona \$500,000 to develop a swarm of robots able to mine, excavate and even build simple structures on the surface of our world's natural satellite. The robots, to be constructed and trained on Earth, will at first receive instructions from operators on this planet, but the goal is to make them fully autonomous, the university said.

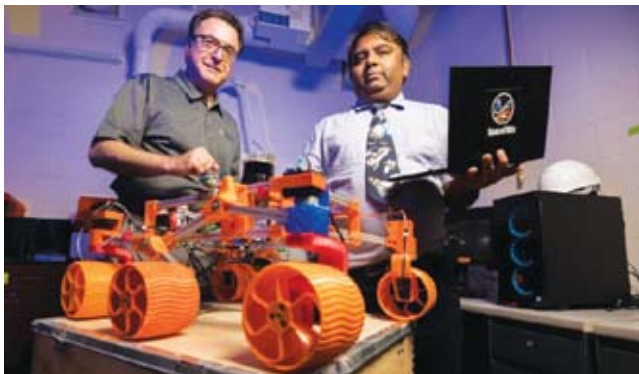
The droids will use a learning model adapted by Jekan Thanga, University of Arizona (UA) associate professor of aerospace and mechanical engineering, called the Human and Explainable Autonomous Robotic System (HEART). HEART will not only train the robots to perform mechanical tasks, but will also gradually teach them to collaborate.

"In a sense, we're like farmers. We're breeding talent out of these creatures, or a whole family of creatures, to do certain tasks," Thanga said in a media release. "The idea is to have the robots build, set things up and do all the dirty, boring, dangerous stuff, so the astronauts can do the more interesting stuff." Luxembourg, one of the first countries to set its eyes on the possibility of mining

celestial bodies, created in 2018 a Space Agency (LSA) to boost exploration and commercial utilization of resources from Near Earth Objects.

Unlike NASA, LSA does not carry out research or launches. Its purpose is to accelerate collaborations between economic project leaders of the space sector, investors and other partners. Thanks to the emerging European network, scientists announced in 2019 plans to begin extracting resources from the Moon in five years.

The mission, in charge of the European Space Agency in partnership with ArianeGroup, plans to extract waste-free nuclear energy thought to be worth trillions of dollars. Russia and China have also boarded the lunar mining train. Moscow had been pursuing plans in recent years to return to the Moon, potentially travelling further into outer space. In 2018, an official announcement came, with the country's space agency Roscosmos revealing plans to establish a long-term base on the Moon over the next two decades.



*University of Arizona engineering faculty members Jekan Thanga (right) and Moe Momayez pictured with a low-cost, rapidly designed, 3D-printed rover prototype used for testing a new generation of miniature sensors for applications in lunar mining. (Image courtesy of University of Arizona.)*

Simultaneously, President Vladimir Putin has vowed to launch a mission to Mars “very soon.”

China, which made history in 2019 by becoming the first country to land a probe on the far side of the Moon, has floated ideas about extracting helium-3 – a stable helium isotope that could fuel nuclear power plants – but is extremely rare on Earth. There are an estimated one million tonnes of helium-3 in the Moon, though only 25% of that could be brought to Earth, Gerald Kulcinski, director of the Fusion Technology Institute at the University of Wisconsin-Madison and a former member of the NASA Advisory Council has said.

But that's enough to meet the world's current energy demands for at least two, and maybe as many as five, centuries, the expert said, who estimates that helium-3 is worth almost \$5 billion a tonne. Beijing, which has already landed on the Moon twice in the 21<sup>st</sup> century, recently approached Russia to jointly build a lunar research base. President Xi Jinping has also he made sure China planted its flag on the Moon, which happened in December 2020, more than 50 years after the US reached the lunar surface.

In Canada, most initiatives have come from the private sector. One of the most touted was Northern Ontario-based Deltion Innovations partnership with Moon Express, the first American private space exploration firm to have been granted government permission to travel beyond Earth's orbit.

### Trillion-dollar market

The Giant Impact Hypothesis, sometimes called the Big Splash, suggests that the Earth and the Moon came from a common parent body. Because of this, scientists expect their chemical compositions to be relatively similar. Rare earth metals can be extracted by mining the moon's surface, and are used in technologies like smartphones and medical equipment.

The Moon is also believed to contain titanium for use in titanium alloys, and precious metals such as gold and platinum. But lunar mining presents new challenges. “Here on Earth, we have an unlimited amount of energy to throw at breaking rocks,” Moe Momayez, interim head of the Department of Mining and Geological Engineering at the University of Arizona said.

“On the Moon, you have to be a lot more conservative. For example, to break rocks, we use a lot of water, and that's something we won't have on the Moon. So, we need new processes, new techniques,” Momayez explained. “The most efficient way to break rocks on Earth is through blasting, and nobody has ever set off a blast on the moon.”

Other space ventures in the works include plans to mine asteroids, track space debris, build the first human settlement on Mars, and billionaire Elon Musk's own plan for an unmanned mission to the red planet. Geologists, as well as emerging companies, such as US-based Planetary Resources, a firm pioneering the space mining industry, are also looking at mining asteroids, believed to be packed with iron ore, nickel and precious metals at much higher concentrations than those found on Earth, making up a market valued in the trillions.

*Cecilia Jamasmie | September 13, 2021*

➤ **Mining a ‘laggard among laggards’ on female representation – report**

Amongst low labour force participation, the drop-off from entry-level to executive positions for females in mining is among the most dramatic across all industries, a new study by McKinsey & Company has found.

Women represent an estimated 8 to 17% of the global mining workforce. Breaking down the sector in terms of senior leadership roles, McKinsey found mining was a laggard among laggards: female representation within mining company C-suites sits at 13%. Among S&P 500 companies, there are only 30 female CEOs — not one of them from mining.

**Women are underrepresented in the mining sector compared with other industries.**



Notwithstanding the fundamental values of equality and equity, study after study has demonstrated the benefits of diversity on financial and operating performance. In one data set, diverse teams were reported to be more productive (11% higher adherence to production schedule) and to have safer practices (67% lower total recordable injury frequency).

**Strength in diversity**

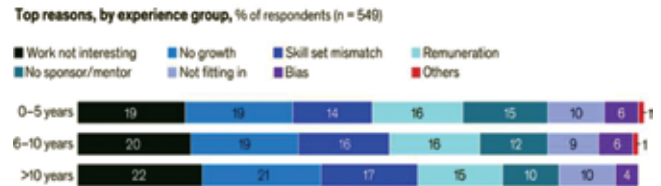
According to McKinsey, diversity promotes creativity and strategic resilience. Mining companies will need both to successfully meet the broadening challenges facing the industry today, from digital and analytics disruption to sustainability and decarbonization.

The imperative to attract and harness the capabilities of a broad and diverse labour pool is clear and should encourage mining companies to recruit more women and invest in their success. To add to the value proposition, investors tend to favour companies that help them achieve environmental, social, and governance (ESG) goals, encompassing diversity within the company and in the broader community. McKinsey launched a global survey that received more than 1,000 responses from employees in the mining sector in 52 countries and every continent to understand the trend better.

The survey looked at female representation in mining across the three dimensions critical to women’s

progression in the industry: initial recruitment, medium-term retention, and the promotion of women through the organization.

**Women are leaving the mining industry because of lack of interest and few growth opportunities, among other reasons.**



McKinsey & Company

For the most part, women are attracted to the mining sector by the type and variety of work it offers, the opportunities for professional growth and advancement, and the competitive remuneration. From a tenure perspective, women with less tenure (fewer than five years’ experience) rank growth opportunities higher than do more tenured women, McKinsey reports.

While not leaders of the pack, the mining sector (along with utilities and energy) does seem to attract women, with about 40% of entry-level roles being filled by women. So, where does mining lose them? The reported top reasons for leaving the industry are feeling that work is no longer intellectually challenging and perceiving that there are fewer advancement opportunities than there are for their male colleagues.

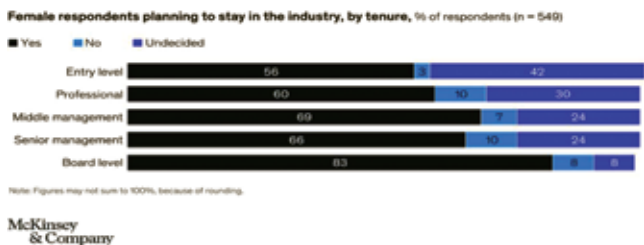
**Not part of the ‘club’**

Interviews with leading women in mining highlight that women experience being sidelined, particularly in technical roles. There is a sense that opportunities for operational experience and frontline mentorship are created proactively for men. At the same time, women are expected to have acquired frontline experience “elsewhere” to qualify for advanced technical and leadership roles.

Company culture and lack of diversity beyond the entry-level also seem to be factors pushing women out of mining. The women McKinsey surveyed commonly referred to as “not being a member of the boys’ club,” which lowered their motivation and sense of belonging. Women can find it twice as hard as men (44% versus 23%) to adapt to the culture of the mining industry.

The survey indicates that women are most likely to be uncertain about leaving or planning to leave the industry before reaching middle management.

**Tenured women seem more inclined than their junior colleagues to remain in the mining industry.**



McKinsey suggests early support in women’s careers can be critical to increasing diversity within the sector. Mining companies are failing to promote women, which is evident from the sparse female representation within senior management roles. More than 44% of female respondents felt they had not received equal promotion opportunities; 20% of women across tenures said they were not given the right growth opportunities. Mining companies should attempt to address all three dimensions: attraction, retention, and promotion to make meaningful progress, McKinsey asserts.

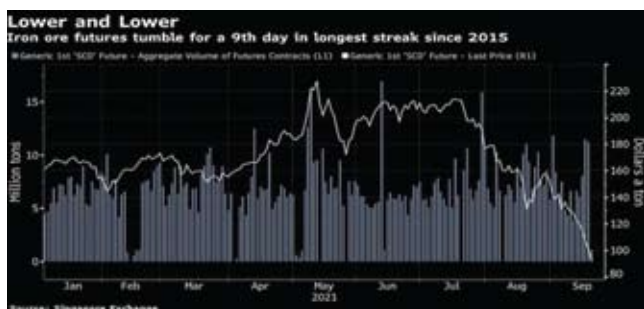
*MINING.COM Staff Writer | September 15, 2021*

➤ **Iron ore’s rout keeps rolling as China imposes more steel curbs**

Futures in Singapore tumbled as much as 12% on Monday in thin trading due to a holiday in China

Iron ore extended its slump below \$100 a ton as China stepped up restrictions on industrial activity in some provinces. Futures in Singapore tumbled as much as 12% on Monday in thin trading due to a holiday in China. Prices have collapsed about 60% since a record in May, and are below three figures for the first time in more than a year, as Chinese demand wanes.

The world’s biggest steelmaker is intensifying steel production curbs to meet a target for lower volumes this year as it pushes forward with its vow to be carbon neutral by 2060. More recently, restrictions have focused on improving air quality for the Winter Olympics next year. Measures are already showing signs of taking effect. Production declined in early September after a falling to a 17-month low in August.



“We anticipate another decline in weekly Chinese steel production numbers, which will undermine iron ore prices once again,” said Atilla Widnell, managing director at Navigate Commodities. Weekly shipments from Australia are also higher week-on-week, and Brazil’s exports have been strong, he said. The research firm has a short-term target of \$94.41 to \$98.28 a ton.

In the latest round of measures, mills in Jiangsu province have received instructions to reduce production as part of broader curbs on industrial activity aimed at lowering power usage, Mysteel reported, citing its survey of operators. The cuts are concentrated between now and Oct. 15 and focused on construction steel. Producers in Zhejiang province are also being asked to limit operations until Sept. 30. Calls to Jiangsu and Zhejiang’s provincial information departments weren’t answered on a public holiday.

China’s moves to rein in its mammoth steel industry have roiled ferrous markets this year, with iron ore spiking in the first half as mills rushed to front-load their steel volumes ahead of more production restrictions being rolled out. Prices are also being buffeted by a downturn in the property sector and concerns that tumult at developer China Evergrande Group may further weigh on a crucial source of demand for steel and metals.

Futures were 10% lower at \$91.40 a ton by 3:04 p.m. local time. Prices are down for a ninth day, heading for the longest run of losses since 2015. Miners’ shares also tumbled, with BHP Group down 4.2%, Rio Tinto Group losing 3.6% and Fortescue Metals Group Ltd. dropping 3.7%.

*Krystal Chia | Bloomberg | September 20, 2021*

➤ **CIL signs pact worth Rs 1,880 crore for commercial extraction of coal bed methane**

Coal India Ltd on Monday said its subsidiary Bharat Coking Coal Ltd (BCCL) on Monday signed a revenue sharing contract worth nearly Rs 1,880 crore for commercial extraction of coal bed methane (CBM) with Prabha Energy Pvt Ltd.

The CBM would be extracted from Jharia Block I under leasehold area of BCCL, an official statement said. While BCCL would be putting up close to Rs 370 crore towards the cost of the land, the rest will be met by the CBM developer, selected through a global bidding process. CIL has assigned CMPDI, its Ranchi-based consultancy arm, as the principal implementing agency to oversee the project, the statement said.

“This is an important development and with this CIL would be stepping into a new era of CBM extraction on

*(Continued on Page 32)*

# A NEW APPROACH TO DEVELOPMENT OF INDIA'S PRECIOUS METALS AND OTHER NON-BULK MINERAL RESOURCES: LINKING HUMAN RESOURCES TO PROMOTE RURAL ECONOMY.

D.V. Pichamuthu, R. H. Sawkar and V.N. Vasudev

## Introduction

Minerals are the basic raw materials for almost all sectors of national & global economies. Mining in India is a major economic activity but contributes only about 2% of the GDP compared to world average GDP of 6.03% in 2020.

During the years 1820-1929, under industrial and economic revolution, based on Keynesian theory, State intervention made western world prosperous and people had all good things (Sawkar and Poddar, 2017). This was broken by the oil crisis which triggered an economic down turn, unemployment and inflation. Monetarism doctrine came up to tackle unemployment and inflation with control of money supply by government but it was not sustainable. USA and Britain based their economic policies on capabilities of individuals and not government (State) at the heart of economic thinking. Such policy brought back stability, efficiency and market growth but led to the breakup of socialist policies. India's economic reforms are not driven by ideological conviction but by economic necessity. Under the British Rule, minerals became the property of the Government and people were deprived of owning the share value of minerals mined in their land which affected the rural economy. After Independence, framing of Mineral Policy, Acts and Rules became the responsibility of the Ministry of Mines, Government of India, which it executes by seeking inputs from the States, PSUs, NGOs, Private Firms and individuals. This trend is in vogue since the promulgation of the MMDR Act-1957 and Mineral Conservation and Development Rules (MCDR). In keeping with the emerging imperatives and for attracting private investments into the minerals sector three National Mineral Policies have been passed by the Parliament since the first one in 1993. The corresponding Acts and Rules were amended from time to time.

In May 1991 the UPA Govt. of India air lifted 67 tons of gold to receive an emergency loan of US\$2.2 billion from IMF. UPA Government in early 2000 did undertake some privatization in the Minerals Sector but had to pause because of political back lash. Privatization was not in the NDA agenda at the 2014 Parliament election. It was around that time controversies revolved around allocation of natural resources such as EM Spectrum allocation for mobile phone services and allocation of mining lease for coal and iron ores on FCFS basis. The controversies led to certain far

reaching judicial pronouncements which emphasized on the need for the Mineral Sector to stand the test of *Article 14 of the Constitution*, which meant that transparency and equal opportunity for all shall be ensured and unfettered discretion in allocation of natural resources shall be done away with. Post 2014, Prime Minister Modi did not consider it important to fully privatise mineral exploration hence, adopted auction system as the sole mode of granting mineral concessions, for not only ML but also Prospecting-cum-Mining Licence or the Composite Licence.

## Reasons for the failure of the National Mineral Policies and the corresponding Acts:

The MMDR Act as amended in 2015 brought in several radical changes but were not in consonance with the National Mineral Policy-2008. This was pointed out by the Hon'ble Supreme Court in its judgement dt. 2<sup>nd</sup> Aug.2017. The Ministry of Mines quickly swung into action and came out with the National Mineral Policy 2019, 4 years after effecting major amendments in the MMDR Act-2015. Normally, a policy is made first and amendments to the Act are then made to bring it in tune with the policy. Truly the cart was put before the horse. The fact that several amended provisions were unhelpful to the industry or were impractical forced the government to bring out more and more amendments to the 2015 Act, the latest amendment was promulgated in March 2021. Some of the amendments that have been in fact harmful to the mining industry are detailed below:

- (i) Mineral exploration is a high-risk, high-cost activity involving high technology. No progressive and mineral-rich country wastes tax payer's money on such ventures. However, due to the amendments like the formation of the National Mineral Exploration Trust (NMET), exploration in India has been virtually nationalized with the private sector playing only a fringe role.
- (ii) The 5-Judge Constitutional Bench of the Supreme Court had said that auction was only one of the methods of deciding the grant of mineral concessions. However, the Union Government has made it the sole mode for the grant of both ML and CL (Prospecting-cum-Mining Lease) or Composite Licence. Unless a deposit is fully explored, it cannot be valued properly hence should not be auctioned for granting a Mining Lease. The failure of the auction mode for granting ML and CL are reflected in the reduction in grants (Table1).

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**Table 1.** Licences granted before and after the auction regime

	Before the auction regime		After the auction regime
	(2006-2010)	(2010-2014)	(2015-2019)
RP granted	74	49	Nil
PL/CL granted	192	496	1(PL-cum-ML)
Execution of ML	2754	494	5
	(Mostly Greenfield)	(Mostly Greenfield)	(All Brownfield)

Source: FIMI - based on data of Indian Bureau of Mines.

- (iii) Even for granting mineral concessions for bulk minerals the auction mode has not worked satisfactorily. The estimated value of mineral resources, contribution through auction, Royalty, DMF and NMET are unreasonably high which is why the auction mode has not attracted investors in large numbers resulting the sharp reduction in the number of players which has also threatened to tip the mining sector into a fractious duopoly between merchant mining and captive minors. Auction of these key raw materials is bound to have an inflationary impact across board, be it in agriculture, mining or service sector due to successful bidder's commitment to share illogically high revenue with the State Governments which would be eventually passed on to customers resulting in high price of steel and cement.
- (iv) Former Secretaries to Govt. of India, Ministry of Mines, wrote passionately highlighting the many merits of the New Mineral Policy-1993 which emphasized on decentralization of authority, streamlining of regulations, dismantling of State monopoly and attractive private investment measures. The mining industry captains regretted that the implementation of the policy lacked zeal hence remained on paper (Jhingran, 1997; Tandon, 1988). Inordinate delays in processing of applications for grant of large area Prospecting Licences was the main reason for the failure of the liberalized National Mineral Policy (Vasudev, 1998, p.170). Today India has become one of the most unattractive destinations for investment in exploration and mining of particularly non-bulk minerals and metals. Fraser Institute, an independent think tank based in Canada, ranks countries on the basis of their attractiveness to attract investment in mining. The most attractive is ranked No.1. India was ranked 97 out of 104 countries in year

2016. It has completely dropped out of the reckoning since then.

The Ministry of Mines while promulgating the latest amendment to the MMDR Act in March 2021 has removed the pre-existing Section 10A(2)(b) terming it as a step forward. In fact, it has **put paid** to any interest that an investor might have had to invest in India. Forget FDI, such retrograde step would hasten the flight of capital of Indian investors to foreign shores. The whole intention of the government is 'Revenue Maximization' whereas it should have been 'Resource Optimization and Mining' aimed at achieving self-sufficiency.

- (v) The best arrangement for both public and private sector in India is to go in for joint venture to make a rapid progress in establishing operational climate (Radhakrishna, 1996). *Private Sector should be the Engine of Growth. State PSUs should act as catalytic agents and take the role of promoters rather than engage themselves in mining* (Pichamuthu, 2011). Globally, detailed exploration is a specialized job done by private companies, popularly known as Junior Exploration Companies (JECs). Their exploration expertise is in most cases linked to a particular mineral or group of minerals. For exploration jobs, they bank on venture capital or hedge funds. Mineral rich countries such as US, Canada, Australia, Brazil, South Africa, Chile, Mexico etc. do not spend tax payers' money on a risky venture like exploration. Those countries, therefore, encourage private companies to undertake detailed exploration by providing incentives and ensure security of tenure besides priority in grant of concessions as well as freedom to sell for premium. The minerals and metals on which India is dependent heavily on imports are gold, copper, nickel, lithium, tungsten, molybdenum, PGMs, diamond, RM-REEs etc. These have not yet been fully explored and developed or their potential realized. What is lacking is only investor-friendly laws and taxation in tune with the best global practices.
- (vi) As per NMEP 2016 the OGP area to be licensed for exploration is 570,000 sq. km of which 3,44,000 sq km remains to be surveyed under GSI's geochemical and geophysical exploration programs. The OGP area includes the currently operating mines and all known mineral resources of which there are about **300 prospects** of non-bulk minerals & metals which await conversion of Mineral Resources into mineable Mineral Reserves and into working mines. Mining is currently undertaken in only about 2% of the OGP which means there is huge scope for participation of Private entrepreneurs and PSUs in large number. State Governments should first identify Precious metals and other non-bulk Mineral Reserves of UNFC 111, 121 and 122 Categories and auction them. Throw open

other areas to private enterprises through the PPP Model being proposed utilizing the provisions in the existing Act.

**Judicial Pronouncements:** Some of the biggest controversies and corruption scandals have revolved around allocation of natural resources such as spectrum, land, coal and iron ore. The illegalities identified by the courts in the allocation of Mineral Resources are of two kinds viz., (i) granting of mineral concessions to ineligible Governments Enterprises, Joint Ventures and private companies and (ii) malafide exercise of power to allot mines to undeserving applicants (Sawkar, 2014). The comments of the courts were set right by amendment of Sec. 17(A) authorising governments for granting Prospecting License and Mining Lease to Government companies or Corporations after obtaining prior approval of Central Government and through the auction process.

**Advantages of Section 17A(2A) & (2B):** PSUs can take advantage of Section 17A and approach the State Governments for obtaining areas reserved in their favour and also obtain PL/CL and/or ML in the reserved land. Government should amend the Act and permit PSUs to develop such areas through partnership with private companies on commercially viable terms. The magnitude of exploration carried out by Geological Survey of India, MECL or State DMG's is not sufficient for commercial mining and preparation of bankable document as per the international UNFC code or CRIRSCO-compliant Standards. The State/Central PSUs should take up selected blocks for detailed exploration to establish mineable Mineral Resources through scoping study, prefeasibility and feasibility studies with all the statutory clearances in place for starting mining operation.

**Gold in India: Initiatives of the Geological Society:** The Geological Society of India led by BPR organised the first National Seminar on gold in 1960 and published the first Memoir on Gold Mining Industry in India in the year 1963. Numerous publications highlighting the importance of gold mining have been published by the Society from time to time. In all these publications the Society has made an attempt to analyse the Indian gold mining industry in relation to the existing geological potential, resources, reserves, policies, decisions and suggested for action to be initiated by the Central and State Governments.

**Reason for dismal performance of the Auction mode for granting mineral concessions:** Mineral resources are generally mined by underground mining method or by open pit mining. Examples of open pit mining are iron ore, chromite, limestone, bauxite, manganese, coal and lignite etc. such deposits are suitable for allotment by auction route preceded by preliminary exploration. In contrast,

gold, platinum group metals, nickel, copper, zinc, lead, molybdenum, tungsten etc. are generally produced by underground mining methods because the mineral deposits of these metals are generally narrow veins or reefs and extend to hundreds and even thousands of metres depth in the earth as at Hutti and Kolar gold fields and Khetri copper field near Jaipur. Their geological continuity and grade of ore could be known and a fair value can be placed in advance if only the prospect receives sufficient exploration inputs unlike tabular and bedded mineral deposits of bulk minerals. Without detailed exploration, Mineral Resources of precious metals, base metals and RM-REEs cannot be assessed with a fair degree of confidence. Therefore, mineral concessions for these metals and minerals cannot be granted either for Prospecting cum Mining (CL) or for Mining by auction-only route.

**Economic Model for Development of Gold Mines:**

Economics of mining of mineral deposits depends on a number of parameters such as capitol cost, scale and methods of mining, grade of ore, recovery of metal and prevailing market price of metal. These parameters and the economics of mining have to be validated by a QP or CP. Breakeven cost is generally arrived at by the following formula.

$$\text{Breakeven} = \frac{\text{Fixed Cost}}{\text{Contributions (Sale value - Variable cost)}}$$

In order to prioritise areas for mining from among hundreds of known gold prospects, many of which hold drilled gold resources, a breakeven analysis was attempted to determine the minimum mineable grade which is presented in a Fig.1.

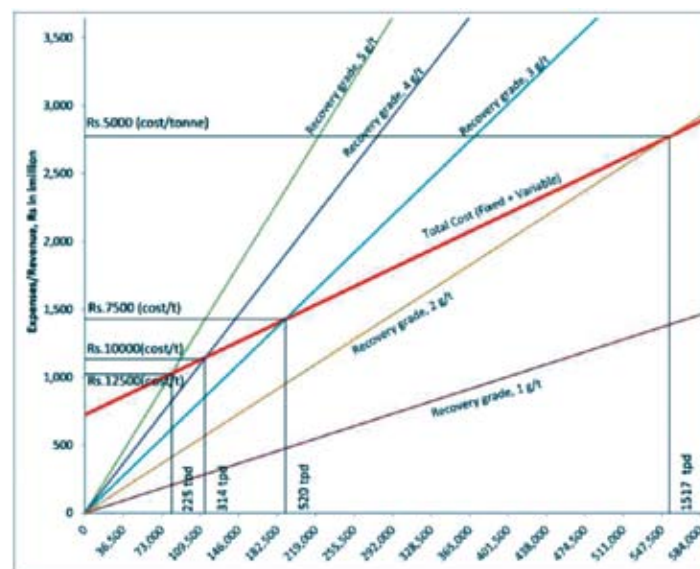


Fig. 1. Graph showing the breakeven points for different recovery grades based on 2013 gold price of Rs. 2,500 per gram. This Chart has to be modified for each deposit depending on prevailing market conditions.

The data used for generating this graph was based on the HGML's underground and open pit mining operations. The graph shows breakeven points for different recovery grades based on 2013 gold price of Rs. 2,500 per gram. The graph shows that under the Indian mining conditions and at Rs.2,500 market price, mining of resource grades of <2 g/t were not commercially viable in underground mines (Sawkar, 2014a, b) and <1.0 g/t in hard rock open pit mining. At the currently stabilized market price of Rs.4,000 per gram, recoverable grades as low as 0.5 can be profitably mined in open pits and ~2g/t in underground mines. Internationally number of open pit mines are active at 0.8 to 1 g/t recovery grades.

**Gold Resources available for mining Vs area available for Prospecting:** India is historically recognized as one of the oldest gold mining centers in the world and was

also one among the top gold mining countries during pre-independence era as indicated in Table-2. Thereafter, as stated by McKelvey (1973) combination of technology for efficient recovery of gold from ores, reduction in costs and increase in market price have favoured mining of low-grade ores. Exploration efforts in countries outside India and improvements in recovery technology have aided in new discoveries and stepping up gold production. India has not been able to catch up with the global trends in the last 3 decades due mainly to snail-paced implementation of the reforms introduced through the NMP-1993. Going by the demonstrated gold-bearing geological potential of the 5 Precambrian cratons of India, the authors believe that the gold Resource-potential could be as much as 3000 tonnes which is 4 times the existing Resources base of gold metal. Over 200 gold prospects await drilling to define gold resources.

**Table-2:** Historical Production of Gold in India.

Period	3900 BC-500 AD	500 AD-1492AD	1492AD-1998	1998-2019
Gold metal in Tonnes	990 t	145 t	832 t	63 t
World Production	10,257 t	2,472t	11,157t	60,000 t
% of World Production	10%	5.9%	7.5%	0.105%
	Source: Radhakrishna and Curtis (1999)			IBM Year Book: 1998-2019

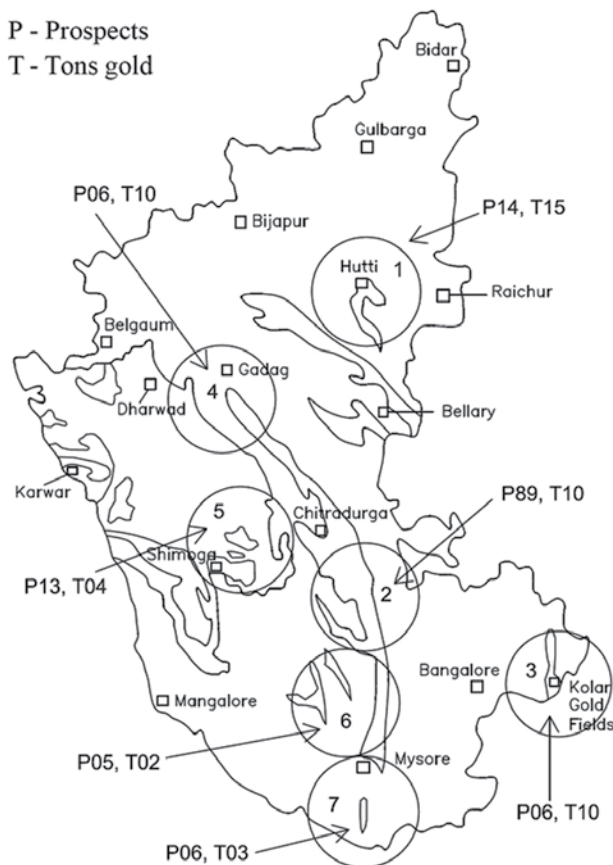


Fig.2. Gold Resources of Karnataka on which new mines could be established.

**Competent Person:** One important aspect that emerged from the deliberations at the “Conference on Sustainable Mining and UNFC: Challenges and Opportunities in India” organised by FIMI, Ministry of Mines in association with World Bank and UNFC was the absence of professional bodies recognised under the MMDR Act similar to the CRIRSCO-compliant Codes adopted by American, Canadian, Australian and South African Institutes dedicated to transparent appraisal of Mineral Resources and Reserves. These are non-profit organization that develop international Resources and Reserves Reporting Standards and also offer training to professionals and recognize them as Quantified Person (QPs) or Competent Person (CPs). Mining Projects certified by QPs/CPs are acceptable by banks in assessing loan application and funding of projects and listing on Stock Exchanges. Professional associations like the Mining Engineers Association India, Geological Society of India, Mining and Metallurgical Society of India (MEAI) can perhaps fill this gap and function as professional bodies committed to transparent certification process and ethical conduct that takes care of the environmental issues and public interests and concerns. This will also open up gainful employment opportunities for exploration geologists, mining engineers and others who could become certified appraisal experts in mineral sector (Sawkar & Raman, 2013). The proposal of MEAI on this matter is pending at the Ministry of Mines.

**Mining and its Effect on the Rural Poor:** Moddie (2002) states that British rule was a graft on the earlier culture



**Table 3**

Sl. No.	Resources, Million Tonnes	Grade g/t	Resource expressed in tonnes of gold metal.	Source	Remarks
1.	1941.67	1.08	2,097	Singer (1995) Econ. Geol., v.90, pp.88-104	2,097 t of gold refers to the total endowment (Past production and then existing Resource) quoted by Radhakrishna & Curtis in Gold in India (1999) p. 110.
2	120.52	4.58	553	Radhakrishna & Curtis (1999). p. 103, Table 13	Gold Resource in Hutti Gold Mines prognosticated to exist below the present working level up to 3,000 (meters)
3.	35.72	3.09	110	R.H. Sawkar (2010) JGSI, v.76(3), pp.210	Based on Exploration by British Mining Companies BGML, GSI, MECL & RMMPL in Karnataka.
4.	501.84	1.30	654.74	IBM Year book (2019)	All India Reserves and Resources as on 2015, Proved, Probable and Remaining resources
5.	-	-	950	Vasudev (Feb. 2019)	Based on 206 gold and basemetal-gold deposits all India. Includes Reserves and Resources estimated after 1.4.2015 up to Feb. 2019.

which tried to introduce and even force alien practices over the people of India. Minerals overnight became the property of the Government. People were deprived of the benefits of owning share in the mineral wealth in their land. Industry makes huge profits from the enterprise while the poor farmer, once owner of the land which provided the minerals, does not get anything, other than the surface value of his land. The existing MMDR Act denies the concerned Gram Panchayat and the landowner a share of the profit the industry is making. Deprived of his land and water, denied employment in the industry, the villager is forced to migrate to the cities and strive under deplorable conditions. It stands to reason that a good part of the money earned by the mining industry should be reinvested around the mines.

Rigid adherence to rules by bureaucrats results in rejection of innovative ideas. Bureaucracy prefers generalist over specialist. Bureaucracy prefers leadership based on position but technocracy prefers technological inputs based on the leadership in science. Radhakrishna and Curtis (1999) have pointed out that mining is a highly technical operation, in which man puts in his mental and physical abilities and knowledge. Major decisions regarding development of mineral resources require technical support of persons with adequate qualification and experience in geology, mining, metallurgy, environment and finance at the Board level and training of local people at production level. Appointments to Board of Directors for brief periods without direct knowledge in

mining operations does considerable harm to the company's long-term interest. The suggestion of B.P. Radhakrishna that an IAS officer functioning as CEO, when transferred, should continue on Board to defend the project proposals initiated by him, is invariably opposed by political bosses who change the CEO or a new CEO himself opposes it. This trend should be discontinued in the interest of smooth progress of mining projects. The suggestion of Radhakrishna and Curtis to disburse 10% of pay to employees of HGML in the form of gold or allot the Company's share at par as ESOP (employee stock option) was not implemented. These two gentlemen wondered as to why Labour Unions or social activists did not insist on implementation of their suggestion.

There is a definite need to reform the Act and Rules to promote the mining industry, particularly of precious metals, as an effective tool to serve the local community and general public with the eventual aim of eradicating social inequality and regional variations and also to reduce the rural and urban divide. The Rules for development of precious metals should involve the public sector, private sector and civil society. They should work together for effective production, on the lines of Swaminathan's formula for green revolution, white revolution for dairy development and development of National Highways.

**Role of Panchayat in the development of Natural Resources:** Mining activity always happens in rural areas

where acquisition of private lands, forest lands and other government lands are involved. The Panchayat Raj institutions have been accorded constitutional powers through the 73<sup>rd</sup> Amendment to the Constitution. Radhakrishna (2003) stated that both nationally and internationally community-based natural resource management systems alone will lead the nations of the world towards a durable peace and development. Panchayats should be involved in the management of natural resources viz., minerals, water, wind, solar and forestry. The initiation of mining projects under the control of local Panchayats is an experiment worth trying. In mining, village Panchayat should have a specified and well defined right not only over the land surface but also on the resource lying below the land acquired or to be acquired for mining. The Panchayat will act as a facilitator in establishing contacts with the people, in securing environmental clearances from government agencies and in promoting the development of the rural mining industry by facilitating supply of water, power, land and other infrastructure. Such activities can be better controlled by the local self-government under Panchayat Raj rather than from any centralized system of management headquartered at the District, State or National level.

**Public Private Partnership (PPP) Model:** A new trend in development of precious metal resources with the active participation of the local people should be ushered in. Local people and Panchayats should be made to feel they are partners in the endeavour and that decisions are not imposed from above. The National Policy's aim should be for production by masses and not mass production. Any new authority we create should include independent technical and financial experts and local skills besides politicians and bureaucrats. The National Mineral Policy-2019 has all the necessary ingredients to usher in a vibrant mineral sector. The existing MMDR Act-2002 is good for facilitating and promoting the growth of captive mining of bulk minerals like coal, iron ore, limestone, manganese, bauxite, chromite etc. The need of the hour is partial amendments to the Act to attract private investors to join hands as JV partners with PSUs and carry on stand-alone commercial exploration and mining of non-bulk minerals and metals such as gold, silver, lead, zinc, copper, molybdenum, tungsten, cobalt, nickel, PGEs and REEs. Going by the disappointing experience of the past 6 years auction route would not be feasible to explore and develop resources of these metals specifically precious metals. Hence, a combination of procedures of granting mineral concessions has to be enacted to deal with different types of mineral deposits occurring in the Earth's crust. Allocation either entirely on first-come-first-serve (FCFS) basis or only through auction, would not satisfy a variety of factors involved in allocation of mineral concessions. Hence, a new mode namely Public Private Partnership (PPP) Model with PSUs as Promoters and Rural Panchayats as Facilitator is being proposed. This model is

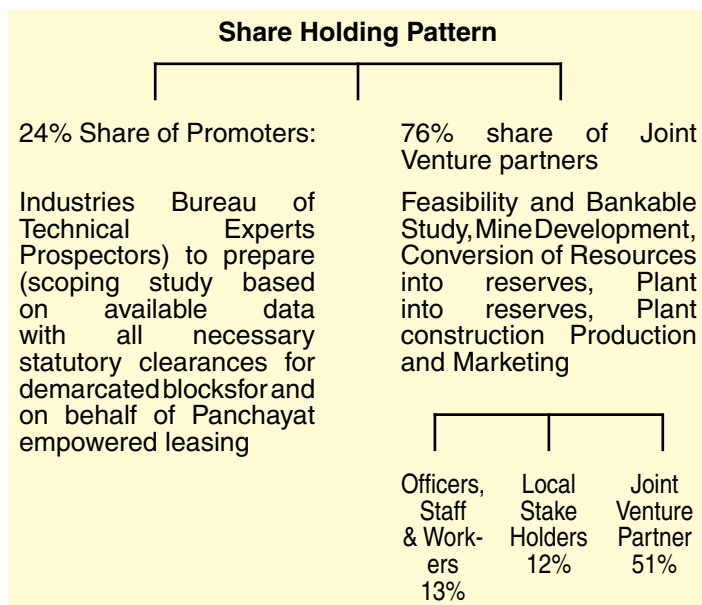
not an alternative to FCFS and Auction mode but has the potential to fast-track exploration and mining of non-bulk minerals especially gold and base-metals

A Committee on development of non-bulk mineral blocks should be constituted under the Chairmanship of the Minister in-charge of Mines and Geology in each State with the objective to prepare a Model Mineral Concession Agreement (MCA) for PPP model to function. The MCA should incorporate international best practices in mineral exploration and mining and clearly state the benefits to be accrued to both public and private sectors as well as to rural community in whose lands the Mineral Resource to be mined is found. The Committee should refer to the PPP Model in State Highways ([www.infrastructure.gov.in](http://www.infrastructure.gov.in)), State Agricultural sector and the Model Concession Agreement published by the Secretariat for the Committee on Infrastructure by NITI Aayog.

Section 17A(2A) 7(2B) of the MMRD Act-2015 read with recent amendments in March 2021, provides for grant of mineral concession to PSUs such as HGML, KSMCL, BGML and MECL. On obtaining either a CL or ML as the case may be, the PSUs shall carry out detailed exploration including mineral processing on pilot plant scale and delineate Mineral Resources through detailed Scoping and Prefeasibility studies following which PSUs shall begin to function as Project Promoter. The Promoter will acquire private land in which mining operations will be carried out by paying the prevailing market rate of land plus allot free equity on par with the value of the land acquired. The Gram Panchayat will act as a facilitator in these matters. All the costs incurred by Promoter (PSU) will entitle him to hold a maximum of 24% of equity in a project.

The Promoter will select a Mine Developer & Operator (MDO) through a transparent process of selection. The MDO will undertake Bankable Feasibility Studies to convert the existing Resources into Reserves and undertake construction of mineral processing plant. The total shareholding of the MDO shall be 76% of the share capital which shall include 13% share of officers, staff & workers which shall be deducted out of their monthly salary. The developer shall offer 12% of the share capital on par to Gram Panchayat in case they come forward to buy shares at par.

At any stage in the development or operation of a mining project, if MDO is not interested in the J.V. with the promoter, the MDO should reimburse all the expenditure (24% share capital) incurred by the Promoter towards infrastructure development, establishment of Resources and Reserves etc. The shareholding of the proposed PPP Model is illustrated in the chart given below. The MDO will also be free to sell his shares, in part or full, at the prevailing value and exit at any stage during the tenure of the Mining Lease.



**Water:** Since water is a highly mobile and hence an elusive resource capable of moving across property line and even international boundaries, its management is difficult and its ownership is hard to define (Narasimhan, 2003). Agriculture has to be organised as an industry. For such a thing to happen in case of Agri-Food production, the primary requisite should be consolidation of land holdings which at present is in a too fragmented condition. If better production is to be achieved in farming, landowners in the villages have to come together and form a single co-operative (Corporate) body. By so doing, they will not lose rights over their land but become equal partners of a larger corporate unit (Radhakrishna, 2003).

The proposals of Smeeth (1928) and Radhakrishna (1966) are the role model for development of groundwater in Hard rock areas. With proper management of surface and groundwater, all the states of peninsular India can be converted to water blessed region. Air, water, soil, land and forest are critically interwoven with life on earth and agriculture is an important resilience tool for climate adaptation and mitigation. Based on local community wisdom, traditional knowledge and bottom-up solution, decentralised water uses for cropping and sanitation, agriculture policies and MSP must be based on Swaminath's formula C2+50% with procurement, storage and distribution of crops linked to efficient water use through adaptation of low water demanding crop production in different agro-climatic regions and reward states that use less water yet maximise the productivity. How to put water science in the minds of decision makers is the main problem facing the densely populated developing countries of the world. J.F. Kennedy, former President of USA, had said: "Anybody who can solve the problems of water will be worthy of two Noble prizes, one for peace and another for science of water."

There is a need for a common act applicable to States covering (i) Himalayan Belt (ii) Indo-Gangetic Plain (iii) Peninsular India (iv) Coastal belt for equitable distribution of Surface and Groundwater. It is a time bond necessary for all state legislature to respond positively and fulfil the constitutional requirements (Sawkar and Guruswami, 2020).

**Summary:** UPA Government in its long tenure of time missed the chance of boldly reforming the system. NDA Government, to overcome the court orders suggested to auction all mineral blocks even though the Apex Court had ruled that Auction mode of permitting utilization of natural resources is "not the panacea for all ills" and the choice of a method of granting mineral concessions is left to the wisdom of the Govt. The Auction mode suited well in granting Mining Lease for bulk minerals such as iron ore, limestone, coal, bauxite, chromite and manganese even where such deposits are least explored or prospected. In case of non-bulk and deep-seated metals and minerals because of their complex distribution in nature and low metal content do not attract bidders for PL cum ML or ML in case such blocks are least explored or where Mineral Resources estimates are not certified by QPs or CPs. All those countries which have abundantly succeeded in discovering and developing their country's geological potential have done so by adopting FCFS mode of granting licences with security of tenure from Reconnaissance to Prospecting and Mining.

In 1991 the economic reforms unleashed the spirit of free enterprises. Several policy changes from 1991 to 2019 and amendments to MMRD act and the recent introduction of auctioning for all minerals, irrespective of the complexity of their occurrences in the earth crust. India has been dropped out of ranking of Fraser's institute of Canada, on the basis of ease of doing business and confidence to relinquish control of economy by the Government in power. After 30 years' time it is necessary to take economic reforms based on either Keynesian theory or monetarism doctrine. The Government promises to achieve GDP growth to world average of 6.03% as compared to the present GDP of about 2%.

Added to the restrictive and complex laws of granting mineral concessions, Legislators and Administrators are interfering in the implementation of Acts and Rules at the Government and Department levels. Officers recruited under Indian Administrative Services are posted as Heads of Technical Departments which is beyond the scope for which they are originally appointed. Unlike Atomic Energy, Science & Technology, Ministry of Earth Sciences (MoES) and a few such ministries that are headed by specialists, the Ministry of Mines and the State Departments of Mines & Geology are headed by people who have no domain expertise. Frequent transfer of such non-professional HoDs have further aggravated the situation which is yet another

cause for delays in the progress of mineral development in the country.

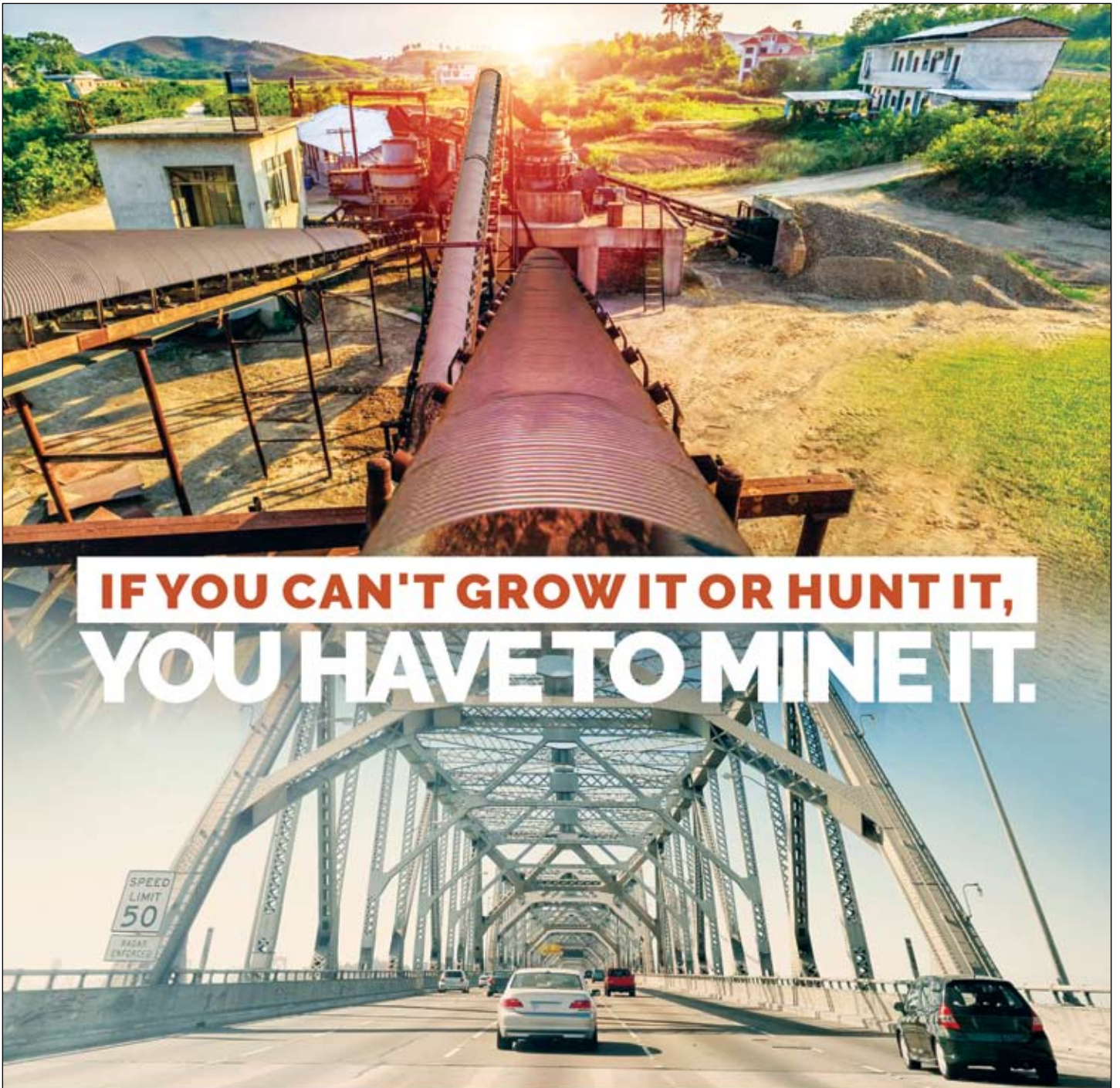
Gram Panchayats should be fully empowered to have a say in the management of natural resources. Panchayats should get financial returns based on revenue generated and not on profit earned. Management of natural resources should be based on political ideological conviction and economic necessity. In May 1991, 67 tons of gold was air lifted to get an emergency loan of \$2.2 Billion from IMF. Today we are in the same juncture and passed the MMRD bill by voice vote in parliament to increase the contribution of the Mineral Sector to the GDP from the present 1.75% to 2.25% by auctioning large number of mines by resolving legacy issues. The problem of revitalising the Mineral industry with its rich unexplored potential cannot be solved through miner tinkering and creation of autonomous bodies like NMET. This will be possible if the government removes all the restrictions and control and give a free hand to the State Governments to reform and promote privatisation through Panchayat Raj System of Governance. Therefore, an attempt should be made to involve Panchayats in mining activities. A committee should be set up at State level to prepare a PPP Model concession agreement to develop resources of precious metals and other metals on which India has been perpetually dependent on imports.

### Recommendations

1. The Auction mode of granting mineral concessions be restricted to fully explored blocks of any mineral (drilled by Govt agencies), holding Mineral Resources of UNFC 111, 121 and 211 categories.
2. Any area, be it reserved or granted for Prospecting cum Mining (=CL) or Mining (ML) in favour of PSUs be available for development under the PPP model proposed in this article.
3. Private Sector, be it Indian or overseas (the so-called Junior Exploration Companies), be granted Reconnaissance Permits (RPs) on FCFS basis in a strictly time bound manner with provision for seamless transition to PL and ML. RPs be granted over areas not exceeding 500 sq km, per Company per State. The RP shall have unambiguous security of tenure and provision for transfer, trading and listing on stock exchanges at any stage during the tenure of RP/PL/CL/ML.
4. Tax policy needs to be reformed as suggested by NITI Aayog in 2018 to bring the total tax on par with the global average of ~40%.
5. The Import-Export policy should be tweaked to remove the present bias against merchant mining. Presently high import tariffs favour producers of metals.
6. Suitable incentives and tax holidays be incorporated into the Act or Rules to encourage small and marginal grade deposits of precious metals and base metals on MSME System.
7. Statutory Clearances for mineral concessions be put on the fast track.

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# ASSESSMENT OF WHOLE-BODY VIBRATIONS OF MACHINERY OPERATORS IN A MECHANIZED OPENCAST COAL MINE

Fayiz Muhammed<sup>1</sup>, Dr. Debi Prasad Tripathy<sup>2</sup>

## Abstract

*In the mining industry, there is an increasing demand for heavy machinery due to mechanization of mines. Whole-body vibrations are transferred from heavy machinery to the operators through vibrations and contact. These vibrations have harmful effects on the operators' body that they are unaware of. This study aims to determine the operators under high risk from vibration exposure and to understand ways to resolve the harm it can cause to an operator in two mechanized opencast coal mines. The vibration study was conducted using a Human Vibration Monitor (HVM100) and a triaxial accelerometer pad and the procedure for the data collection is as specified in ISO 2631- 1:1997. Vibrations experienced by the operators along the three orthogonal axes were measured by the accelerometer and recorded as accelerations by the HVM100. Data collected from the study defined the daily vibration exposure values and vibration dose values. Their limits are defined in the ISO guidelines. The results of the study categorized mainly dozer operators to fall in the high-risk category; whereas shovel, and drill operators fall in the lower to medium risks. It was also found that the difference in movement method that is, wheels and tracks caused difference of vibration levels among dozers. The conditions of the road and the amount of movement one does during its operation were also key factors in the increase of vibration levels.*

**Keywords:** Whole-body Vibrations; Coal mine, Operators, Vibration Dose Value, HVM 100

## Introduction

The mining industry works using a wide variety of highly mechanized machinery that helps to reduce the workload on labourers. These types of machinery such as haul trucks, dozers, drillers and even shovels are operated by one or two operators that continuously work for at least an 8-hours duration. During this period, these operators are continuously exposed to various factors that affect their health ranging from the vibrations produced by the machinery to the heat and pollution emanating from them. All these can cause various health impacts in the operator, which tend not to be noticed easily until it reaches a point wherein there can be no easy way to cure it.

Every machinery operator be it a drill machine or a shovel machine is exposed to continuous vibrations during their operation time. These vibrations are conveyed to the body of the operator due to contact the operators share while being seated or while their hands control the various levers and control sticks (Genser et al., 2019). Such vibrations are termed as whole-body vibrations (WBV). It is better defined as the mechanical oscillations that are transferred to a human body, which is in contact with vibrating surfaces. These exposures, which are faced in the workplaces such as mines, could lead to musculoskeletal disorders (MSD) due

to the long duration for which they are exposed. Common ailments that arise out of this are the neck pain and back pain that is predominantly seen in all operators of machinery that exceeds the vibration limits. To study these whole-body vibrations in detail, certain guidelines have been proposed by various organisations. In this study, the authors followed the ISO 2631-1:1997 guidelines. They define the various methods of measurement as well as the limits within which such vibrations should be limited to. The health and safety of those subjected to or exposed to whole-body vibrations under the bare minimum are also defined under the European vibration directive (ISO, 2014).

## Harmful Effects of Whole Body Vibration

Vibrations cause health effects in the humans at a very slow rate, which usually starts as mild pain. However, due to the continuous exposure, these people are subjected to, the pain slowly progresses into an injury that requires lot of attention. These whole-body vibrations can cause several health conditions such as muscular-skeletal disorders, fatigue, headache, shakiness and even blood pressure variations. The studies on various operators of machinery as well as drivers of different types of vehicles such as buses and boats have provided evidence to the kind of health disorders people are facing from vibration exposure.

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Under the muscular-skeletal disorders, the prominent back pain and neck pain are prevalent for seated operators. When operators are continuously operating the machine using sticks or levers to control the movements they face vibrations that end up causing muscular-skeletal disorders that affect the fingers and elbow.

### Methodology

Whole-body vibrations faced by each operator of machinery needs to be measured and compared with the limits specified to estimate the extent to which disorders are caused to the workers. The methods of measurement are mentioned in the ISO 2631-1:1997 and are the prescribed standards in our study. The detailed methods of data collection and analysis are mentioned below:

The phases of the project work are:

- Data collection
- Data analysis
- Interpretation of data into useful results

The data collection phase involved travelling to the various mines after obtaining the necessary permission and collection of vibration data as needed from the various machines. The data was collected using Human Vibration Monitor(HVM) 100. By connecting it to a triaxial accelerometer pad and collecting the data from movements of the operator in the various axes, one can understand the directions of movement and the acceleration values based on it. The data collected by the HVM 100 was as accelerations along the three axes or vibration dose values (VDV).

### Human Vibration Monitor

The Human Vibration Monitor 100 is a hand-held instrument that is utilized for estimating human presentation to vibration, performing applicable calculations and giving outcomes or generally measurements on its LCD. The point by point vibration levels is effectively put away in its inherent information logger, which can accumulate 100 diverse time-history test documents including every single required outcome or measurements. This data would then be downloaded to a PC for examination and chronicling (Larson Davis, 2006). Estimating each of the three orientation axes of vibration simultaneously incredibly simplifies the arrangement of the test and improves the repeatability and relationship of vibration information. From the 3 channels of estimated information, the HVM 100 consequently computes the different significant vector sum data as well as presents it as fourth arrangement of information esteems. For consistency with the most recent models in the estimation, the HVM 100 uses digital channels, each channel can be empowered as required (Hav Control Ltd. Noise and Vibration Consultants, n.d.).



Figure 1. Human Vibration Monitor 100

### Triaxial Accelerometer Pad

Triaxial accelerometers can help us in analysing the entire vibrations experienced by a structure by measuring the accelerations along with all three different orthogonal directions simultaneously. In each accelerometer, there exist three separate sensing elements, which are directed at right angles concerning each other. Each of these axes or directions are considered as an independent and individual channel by the data system. Multi-pin electrical connectors, multiple coaxial connectors or individual cable leads provide the signal outputs for axes acceleration (NDT International, 1980).



Figure 2. Triaxial Seat Pad Accelerometer



### Blaze Software

It is well known that the HVM 100 is one of the smallest and most powerful tools available in the industry for measuring vibrations. Even though it is just a handheld instrument, it can record and analyse vibrations under a wide variety such as whole-body vibrations, hand-arm vibrations and even general vibration analysis. A few of its features would be the 3 input channels, a sum channel and the sheer variety of frequency weighting and band-limiting settings including both single and double integrations. They can also display various data in a variety of units. What blaze software does for us is enhancing the capabilities of using the HVM 100. The flexibility and ease of use of operating the instrument are made better by providing us with various setup utilities, instrument calibration and even computer-based control of the instrument. It even allows for the downloading of the data and merging the required data and even displays the data in a wide variety of graphical representations. (Larson Davis, 2016).

### Assessment of Whole Body Vibration Exposure of Mining Operators in a Mechanized Opencast Coal Mine-A

Mine A was started in 1985 and has one of the largest coalfield spread over an area of 2202 sq. km. It currently has a depth of 180m and has achieved a production level of 15.50 MT. The mine is certified under ISO: 14001:2015, ISO: 9001:2015, and OHSAS: 18001:2007.

### Methodology

The method of work adopted at Mine A is dragline-cum-shovel-dumper combination mining. The exposure of various machinery operators was measured using a Human Vibration Monitor 100 and triaxial accelerometer pad. Each of the operators was made to be seated on top of the accelerometer pad placed on their seats and these are connected to HVM 100. During their usual work in operating the machinery, the HVM 100 was used to collect the vibration data over some

time, usually between 10 – 30 minutes. The procedure is as per ISO 2371:1997. The acceleration data collected in this period was transferred to Blaze software for preliminary analysis and data storage. From the software, it is possible to view the data such as root mean square acceleration, vibration dose value and these were used to compute the daily vibration exposure the operators were subjected to.

### Results of Daily Vibration Exposure, A (8)

The daily vibration exposure values obtained were for 8 hours that the operators were subjected to vibrations produced by the machines is presented in Table 1. The values less than 0.9 m/s<sup>2</sup> were within the acceptable limit as per ISO guidelines on health risk. Only the values above 0.45 m/s<sup>2</sup> need to even be monitored as part of the vibration study. The rest fall within safe limits.

### Results of Vibration Dose Value, VDV

Whenever there are too many shocks during machinery operation, the daily vibration measured in terms of just the root means square will not be enough and hence another measure called vibration dose value is used. As per the ISO standards, for operations where the Crest Factor is higher than nine, vibration is measured in terms of VDV. The exposure limit value for VDV is 17 m/s<sup>1.75</sup> and the exposure action value is 8.5 m/s<sup>1.75</sup>. Thus, any value that lies within this range is acceptable as an allowed range of vibration exposure and machines exceeding the VDV value pose high threats to life. Below mentioned are the crest factors and Vibration dose values tabulated in Table 1.

### Results and Discussions

As per the ISO guidelines specified in ISO 2631-1:1997, the various vibration levels an operator is exposed to were categorised. As there is an RMS Daily exposure vibration value-based categorization and categorization based on VDV due to higher than nine crest factors, the results are tabulated as below (Table 1):

**Table 1.** Vibration levels at Mine-A

No:	Type of Machine	Machine Make	Daily Vibration Exposure A(8), m/s <sup>2</sup>	Crest Factor	Vibration Dose Value VDV m/s <sup>1.75</sup>	Final Vibration Level
Operator 1	Dozer	CAT D9	1.27	9.2	16.1	Medium
Operator 2	Dozer	Komatsu D475A	1.47	7.4	16.6	High
Operator 3	Dozer	CAT D9	1.46	8.2	17.8	High
Operator 4	Dozer	Komatsu D475A	1.52	7	15.81	High
Operator 5	Drilling	Atlas Copco IDM 70E	0.56	11.1	11.05	Medium
Operator 6	Drilling	Revathi Equipment C750 E	0.31	12	8.63	Medium
Operator 7	Drilling	Atlas Copco IDM70E	0.52	8.3	10	Medium
Operator 8	Drilling	Atlas Copco IDM 70E	0.48	10.7	10.71	Medium

Operator 9	Drilling	Revathi Equipment C750 E	0.28	10.6	8.41	Low
Operator 10	Drilling	Atlas Copco IDM70E	0.54	10.7	11.76	Medium
Operator 11	Shovel	BEML 295 HD	0.24	11.2	8.18	Low
Operator 12	Shovel	BEML 182 M	0.68	14.9	11.94	Medium
Operator 13	Shovel	P & H 8	0.59	13.7	11.31	Medium
Operator 14	Shovel	BEML BD 355	0.45	11.1	9.2	Medium
Operator 15	Shovel	BEML 295 HD	0.21	8.7	8.51	Low
Operator 16	Shovel	BEML 182 M	0.61	11.1	11.9	Medium
Operator 17	Shovel	P & H 8	0.45	9.3	9.57	Medium
Operator 18	Shovel	BEML BD 355	0.42	17.3	9.82	Medium
Operator 19	Wheel Loader	Komatsu WA800	0.92	10.9	12.49	Medium
Operator 20	Wheel Loader	Komatsu WA800	0.83	7.7	11.96	Medium

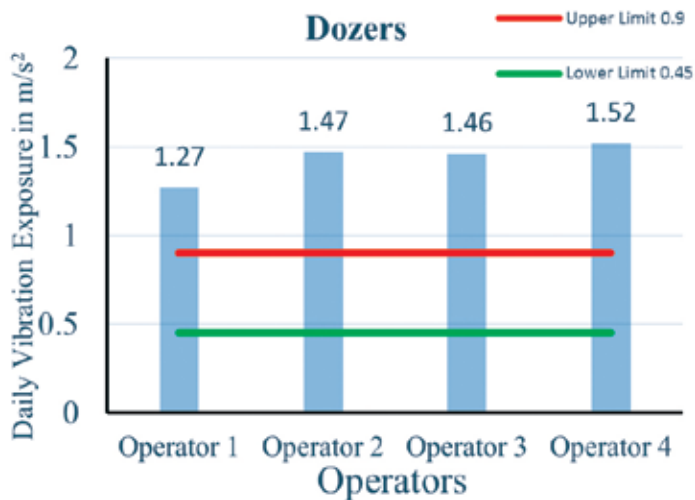


Figure 3. Daily Vibration Exposure of Dozers at Mine A

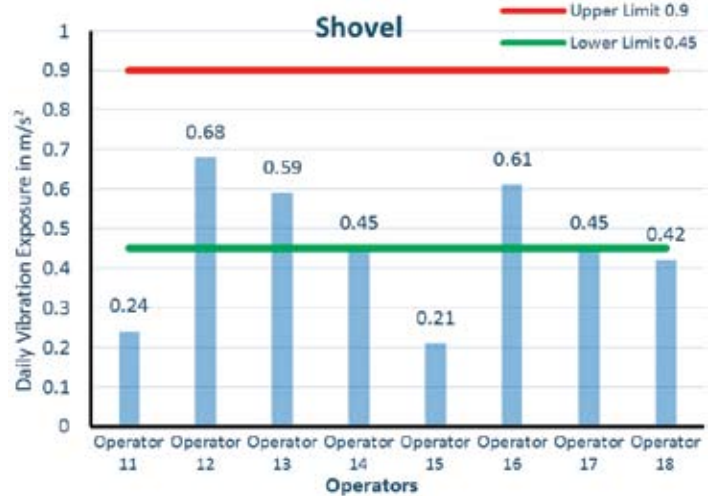


Figure 5. Vibration exposure of Shovel operators at Mine A

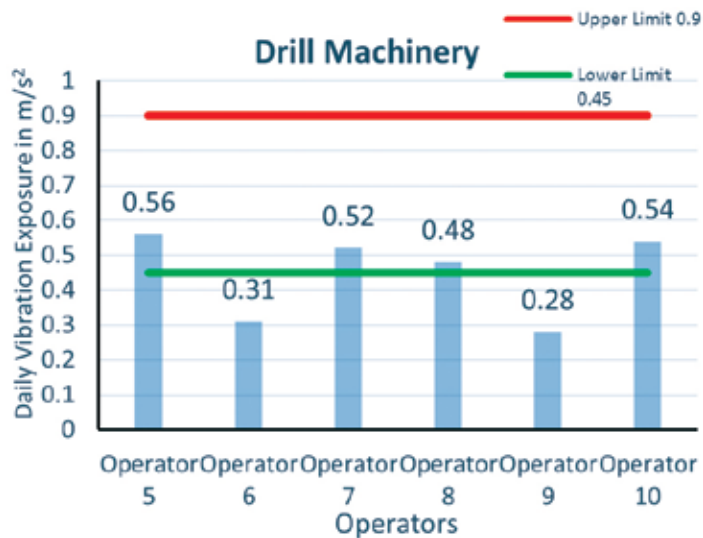


Figure 4. Vibration exposure of Drill operators at Mine A

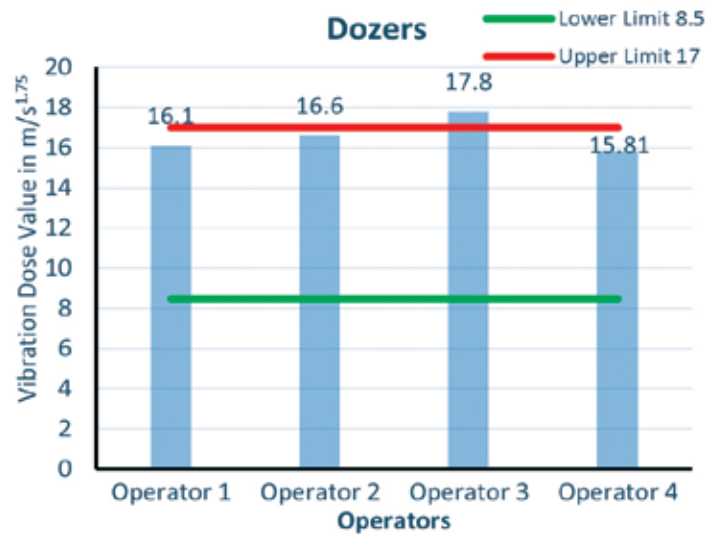


Figure 6. Vibration Dose Value of Dozer operators at Mine A

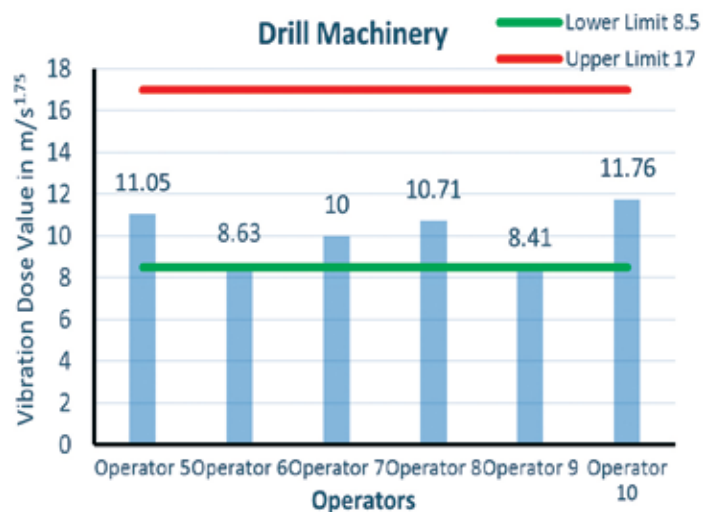


Figure 7. Vibration Dose Value in Drill operators at Mine A

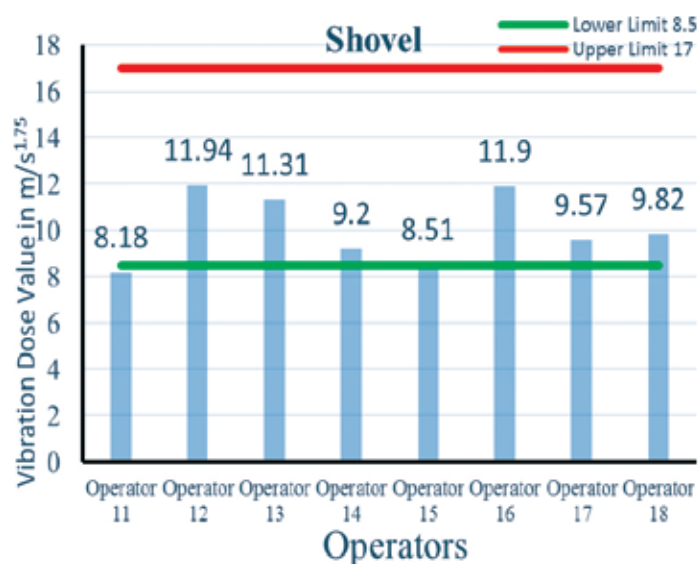


Figure 8. Vibration Dose Value in Shovel operators at Mine A

From the above data, only three operators were at high risk due to vibration exposure. All these three operators under high risk were found to operate dozers. Most of the shovel and drill operators belong in the medium level of risk with a few in the low tier. However, none of them was found to be exposed to high-risk levels at all. This could be due to the difference in movement methods, and the type of impact force they apply on the material being excavated. In addition, the direction in which they apply their machine expertise matters.

From the data, it can be concluded that dozers were having a higher risk of transferring vibrations to the operators at an unsafe level as compared to drillers and shovels. A quarter of the dozer operators showed very high levels of vibration

exposure. As per the RMS study, all dozers were at high risk, but on a further study using VDV data, it was found that Operator 1 operating the CAT D9 machine was less prone to transferring the harmful levels of vibration to an operator. As the value was quite close to the VDV threshold of 17, there is a high probability of it being just as harmful to the operator. In retrospect, the data obtained about the operators of drills and shovels showed that all of them were in the safe category with less than a quarter of them were not even need to be considered for the vibration exposure effects as their vibration data classified them in the low category. Dozers with their track wheels and continuous motion of lifting materials off the hard surfaces could be the attributes that caused high levels of vibration exposure. By controlling, the amount of time these machines were allowed to be operated one can control the level of vibration to an extent. Dozers operate by moving around a lot, unlike drillers, which are fixed in one location unless it is transferred to a new drill site. The shovels operate mainly by being stationary concerning its location and focus on the movement of its excavating arm and buckets, the upper part of the machine and hence is found to be transferring fewer vibrations compared to the vibrations transferred while relocating from one point to the other.

ISO 2631-1:1997 defined the limits, which categorise the vibration exposure that a machine operator is facing into low, medium and high, which signifies the severity of harmfulness that he would face. From the above data, 12 operators were at high risk due to vibration exposure. The maximum number of operators at high risk were the dozer operators. However, among them, the wheel dozer operators were facing fewer risks. This could be due to the difference in movement methods; one uses a set of tracks, which is in contact at a larger surface area than the other is which uses a set of wheels.

It is quite visible that among the dozer operators more than half the operators were under high risk for vibration exposure and health issues such as muscular-skeletal disorders. They operate mainly by clearing the site and removing overburden. They have a lifting motion by digging into the surface, which could be the impact for vibration. Shovel operators on the hand operate by having and top to bottom motion for breaking down material from wall sides and then using a scoop-like motion to lift it onto the dumpers. They mostly operate in the medium levels of exposure except for a few in the high risk. However, compared to their operation and the power with which each movement is controlled, this level of vibration could be the best possible result. Among drill operators, the levels vary with only less than a quarter of them falling

into the high-risk zone. They face intense shocks instead of continuous shocks and most of the vibration acceleration spikes were during their movement from one location to another. The operators of these machines operating in high-risk zones can be controlled mostly by regular maintenance of machines. Better vibration controlling measures need to be implemented along with better protection from such vibration transfers. This can be achieved by implementing thicker seat cushioning as the primary modes for vibration absorption. In addition, the amount of time such operators are made to work in such machines can be reduced from an 8-hour duration to protect their health. In retrospect, the operators coming under the low vibration levels can be provided with overtime work without having to worry about any vibration-related health effects.

### Conclusions

The mining industry, as big as it maybe does not run solely on the power of human labour. It requires the constant participation of various machinery ranging from the low powered jackhammer to the high-powered shovels and dozers. Each of these machines is found to have played an important role in the industry and they make the life of the operator that much easier. They help them by reducing their workload and the amount of time the work would take but what most people do not realize are the ill effects involved.

The operators are unaware of these whole-body vibrations not only because of their educational backgrounds but also because there is no awareness of such ill effects being conveyed to them at all. Neither the owners nor the machine manufacturers are interested for vibration an operator will be facing during their operation. As long as it does not hinder the work that they have to do, the issue is not considered. However, unlike the owner or manufacturer, the operators that spend most of their work-life glued to such machines need to be aware of the various musculoskeletal disorders that could accompany such unsafe machines. After studying the whole-body vibrations, which these machines produce and transfer onto an operator through the contact of the operator's body and the seats or levers of the machine, it was inferred from the study which of the operators were under the high-risk category and which of them were safe. It has been found that most of the machines are operated by three different operators daily and in three different shifts of 8 hours. During these periods, the total vibrations transferred was studied using the human vibration monitor and normalised and compared with safe acceptable limits as specified in ISO 2631-1:1997.

The findings of the present study can be summarised as follows:

- A total of 20 operators were studied for the whole body vibrations transferred to them from the various machines.
- Four of them were dozer operators and out of these three were in the high-risk category and only operator 1 had a crest factor greater than 9 and was found to have vibration dose value in the medium level.
- Out of six drill machine operators only operator, nine showed low vibration levels and the rest fell into the medium vibration level category. Except for Atlas Copco operated by Operator 7, the rest all had high crest factor resulting from the impulsive shocks they face.
- At the mine, 6 out of 8 shovel operators were found to exhibit vibration levels corresponding to medium level whereas the rest 2 by operators 11 and 15 operating the BEML 295 HD machine seemed to have only low levels of vibration hence at less risk. It is also to be noted that operator 15 was the only one with a crest factor below nine. Both the loaders found at mine A have medium levels of vibration only.

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## CORRIGENDUM

In page 18 of September 2021 issue of MEJ, the caption of figures of 4(a) and 4(b) have been interchanged while editing, inadvertently. Sincerely regret the error.

Editor

## MEAI NEWS

### BANGALORE CHAPTER

The Bangalore Chapter has organised its Annual General Meeting on 11-9-2021. Sri. K. Madhusudhana, President MEAI graced the AGM. In the AGM, new Executive Committee was elected for the term 2021-2023.

Following are the office bearers:

Sri. Dhananjay Reddy	Chairman
Dr. H.S. Venkatesh	Vice Chairman
Sri. Rajendran	Secretary
Dr. C.V. Raman	Joint secretary
Sri. K. Ramani	Treasurer

The other members of the Executive Committee are Sri. Bhaskar Reddy, Sri. Srinivasan, Sri. Mallikarjun, Sri. D.B. Yuvaraj and Sri. Maheswar Reddy.



### BELGAUM CHAPTER

The Belgaum Chapter of MEAI has organised Installation Programme of new Executive Committee on 29-8-2021 at Hotel HariPriya, Belgaum. The program was graced by Sri. K. Madhusudhana, President MEAI as Chief Guest. The following are the members of new Executive Committee for Belgaum Chapter.

Dr. B.K. Purandara	Chairman
Sri. G.S.N. Murthy	Vice Chairman
Sri. Amit Ghooly	Secretary
Sri. Sagar Wagnmare	Treasurer
Sri. Siraj Mense	Joint Secretary and

The program was attended by Sri. D.A. Hiremath, Sri. Rachappa and several members of the Chapter.



### BELLARY -HOSPET CHAPTER

#### ANNUAL GENERAL MEETING HELD ON 15<sup>TH</sup> SEPTEMBER 2021 AT MGVTC, SANDUR

The Meeting commenced at 5.30 pm. All the Executive Committee Members and over 140 Life members attended the Meeting. Sri. K. Madhusudhana, MEAI President graced the occasion.



Sri. Chandrashekar Halli, DGM MGVTC-Sandur welcomed all the members present for the meeting.



Member present for the AGB Meeting

Secretary Sri. S. H. M. Mallikarjuna has presented annual report of the Chapter on the events that took place during the previous year.

- BH Chapter donated Rs. 2.5 Lakhs to “Chief Minister COVID-19 Relief Fund” by Individual Life Members of the Chapter.
- BH Chapter celebrated World Environment Day on 5.6.2020 at MGVTS, Hosapete and SUMS office premises.
- The Nature Walk was organized near Tungabhadra Dam, Hosapete and about 20 Life Members of the Chapters participated in the event on Sunday, 29.9.2020.
- BH Chapter celebrated 72<sup>nd</sup> Republic Day of India on 26.1.2021 at SUMS premises.
- Refresher coaching classes for the Aspirants of Mine managers’ competency examination conducted by DGMS, Dhanbad in 3 phases during January, February and March 2021 on virtual platform.
- BH Chapter organised a National Seminar and the National council meeting at Hosapete in hybrid mode on 20<sup>th</sup> & 21<sup>st</sup> August 2021 at Hotel Hampi International, Hosapete.



Secretary report by Sri. Mallikarjuna S.H.M.

Sir. S.M. Jagadeesh, Treasurer of the Chapter has presented the report of audited accounts in the Meeting. General body approved the audited report unanimously.

The General Body approved continuation of M/s Boriah & Co. Chartered Accountants as auditors for the financial year 2021-22.

Sri. K. Madhusudhana has expressed his gratitude for receiving support from the seniors and Life members of the Chapter in elevating him for the position of the Vice President of the Association. He also recollected and shared his views on the development of the Chapter.

Sri. K. Madhusudhana installed the following new Office bearers & Executive Committee along with Development committee for the term 2021-23

### Office Bearers

- Chairman : Sri. K. Prabhakara Reddy, SUMS  
 Vice-Chairman : Sri. Jagadeeswhwar S.M., M/s NMDC Ltd.  
 Secretary : Sri. S.H.M. Mallikarjuna, M/s JSW Ltd.  
 Jt. Secretary : Sri. Bharth Kumar, M/s SMIORÉ  
 Treasurer : Sri. A. Sreekantha Reddy, M/s HRG.

### Executive Committee Members

1. Sri. Nanda Kumar H.M., M/s VESCO
2. Sri. Gopal Joshi, M/s RBSSN Pvt. Ltd.
3. Sri. Y.V.R. Krishna Reddy, M/s P.B.S. & Son
4. Sri. K. Krishnudu, M/s MGVTS, HPT
5. Sri. Mallikarjun Sarapur, M/s KSM Corp, Ltd.
6. Sri. Satyanarayana, M/s SKME Pvt Ltd, Sandur
7. Sri. M.T. Jagadeesha, M/s Chowgule & Co Pvt Ltd
8. Sri. M.M. Rakesh, M/s JSW LTD., Sandur



New Office Bearers, Executive Committed and Development Committee

After the installation of new Executive Committee of the BH Chapter for the term of 2021-23, Sri. K. Madhusudhana has introduced the council members nominated from the BH Chapter. He appreciated the various initiatives taken by the Chapter in developing the chapter in a remarkable manner.



Address by Sri. K. Madhusudhana, President MEAI

Sri. K. Prabhakara Reddy the newly elected Chairman of the Chapter has shared his thoughts for development of the Chapter in the next term. He expressed his gratitude for re-electing him as Chairman for the next term.



*Installation of the Chairman Sri. K. Prabhakara Reddy*

Sri. S.M. Jagadeeswhwar, the newly elected Vice-Chairman expressed his gratitude for giving him the new role in the Chapter.

Sri. S.H.M. Mallikarjuna, newly elected Secretary has expressed his gratitude for re-electing him as the Secretary of Chapter and he assured of increased efforts to improve the Chapter.

Former Chairman of the Chapter Sri. H. Yellappa shared his experience and appreciated the progress made by the Chapter during the Chairmanship of Sri. K. Prabhakara Reddy.



*Speech by Sri. H. Yellappa, Former Chairman of Chapter*

Former Council Member Sri. P. Sreenivasa Rao also appreciated the events and achievement of the Chapter during the previous term.

Sri. Sanjeev Sahi, Chief General Manger (Production), NMDC Limited, Donimalai and National Council Member of MEAI from the BH Chapter assured that NMDC Limited will extend all the required support for the development of the BH Chapter and organising first aid training.



*Speech by Sri Sanjeev Sahi, New National Council Member*

National Council Member Sri. V. Jaya Prakash has also shared his experience and appreciated the efforts of the President, Chairman, Secretary and other office bearers.

Senior Members Sri. H. Yellappa, M/s SMIORE, former Chairman of the Chapter, Sri. Gnana Pragasan, M/s SMIORE and Sir. Sheshagiri Rao, General Manger, M/s GG & Bros. were felicitated during the Annual General Meeting.



*Felicitatation Programme*

Sri. M.M. Rakesh, Newly elected Executive member of the Chapter, proposed vote of Thanks to the members present in the meeting.

## HYDERABAD CHAPTER

The Hyderabad Chapter has held Executive Committee meeting on 7-9-2021 at Hotel Golconda to discuss the issue of setting up First Aid Training Centre at Head Quarters of MEAI to help the freshly passed out Graduates, Diploma holders and other competent persons. Acquiring First Aid Certificate is one of the requisites of obtaining First class/ Second class Mine Manger Certificate and for Overman, Forman, Mate Sirdar Certificates.

A workshop was also organised on "Industry Academia Interaction with the mining Industry". In the workshop, Sri. V.S. Rao, Sri. Sumit Deb, CMD NMDC and Chairman Hyderabad Chapter, Prof Limbadri, Chairman for Technical and higher Education of Telangana State and Vice Chancellor of Osmania university and others addressed the members. Many senior member of Hyderabad Chapter attended the workshop.





**NEW DELHI CHAPTER**

New Delhi Chapter has organised an interactive session with Sri. Sanay Lohiya, Addl. Secretary of Mines ministry on 9-9-2021. The members of Delhi Chapter attended the interactive session. Sri. Lohiya has answered all the questions raised by members.



*(Continued from Page 12)*

its own in its leasehold area”, said a senior official of CIL. Spread over an area of approximately 27 Sq Kms, Jharia CBM Block-I has a resource of around 25 Billion Cubic Metres (BCM). Average production capacity is pegged at 1.3 million metric standard cubic metres per day once the commercial operation kick starts.

The project is scheduled in three phases. The first phase of exploration is of two year duration from the signing of the contract followed by the pilot phase of three years. Thereafter the production phase is for thirty years. CIL is hopeful that the first two phases would be completed earlier than scheduled and production commences sooner than planned. CBM extraction is a part of CIL’s diversification portfolio under clean coal initiatives.

The statement said harnessing CBM has dual advantages. Methane has energy potential, and the captured gas can be put into use for many commercial uses. The commissioning of a gas pipeline in eastern India under URJA Ganga project is in the works by GAIL. CBM produced may be used for city gas distribution or through pipeline for potential users.

Also, methane is a potent greenhouse gas with global warming potential greater than 25-28 times compared to Co2 and is a cause of concern for the safety of mines and environment. Removing fugitive methane gas from UG coal mines and using it in profitable and practical ways can enhance safety, mine productivity, increase revenues and reduce GHG emissions, it said.

*PTI | September 20, 2021*

➤ **316 District Mineral Foundation Trusts exempted from income tax: Coal and Mines Minister Pralhad Joshi**

Coal and Mines Minister Pralhad Joshi on Saturday said the increase in number of District Mineral Foundation Trusts exempted from income tax payment will result in more fund availability with them, thus ensuring better implementation and outcome-oriented activities for welfare of mining affected people.

District Mineral Foundation (DMF) is a non-profit statutory ‘Trust’ for every district affected by mining-related operations. It is an initiative of the government to ensure that funds are collected under DMF and utilised for welfare of those affected by mining-related operations. “Thank you PM @narendramodiji & FM @nsitharaman ji for exempting 165 DMF trusts from Income Tax payment. This will result in more fund availability with the Trust, thus ensuring better implementation and outcome-oriented activities for welfare of mining affected people,” Joshi said in a tweet.

Collections under DMF as well as interest accrued will be exempted from IT. A Gazette notification has been issued to this effect. “I thank @FinMinIndia for exempting 165 Trusts. Adding to earlier exemption of 151, now a total of 316 Trusts stand exempted from IT,” the minister tweeted. DMF has been created in each district under the provisions of Mines and Minerals (Development and Regulation) Amendment Act, 2015 and falls under the purview of Ministry of Mines.

*PTI | September 11, 2021*





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# CONFERENCES, SEMINARS, WORKSHOPS ETC.

## INDIA

**2-4 Mar 2022: International Mineral Development Conference and Exhibition (Mbd-2022).** Nagpur, India. For details contact: Website: <http://www.mineralinfo.net>; E-mail: [mineralinfoindia@gmail.com](mailto:mineralinfoindia@gmail.com); [mbd.info2021@gmail.com](mailto:mbd.info2021@gmail.com); Cell No./ WhatsApp +91 9823015772

## ABROAD

**6-7 Oct 2021: ICEGGE 2021 - International Conference on Engineering Geology and Geomorphology Engineering** in Beijing, China. For more details, please visit: <https://waset.org/engineering-geology-and-geomorphology-engineering-conference-in-october-2021-in-beijing>

**13-16 Oct 2021: Bauma Conexpo Africa.** Gallagher Convention Centre, 19 Richards Dr, Halfway House, Midrand, South Africa

**18-19 Oct 2021: ICEG 2021 - International Conference on Earthquake Geology** in Rome, Italy. For more details, please visit: <https://waset.org/earthquake-geology-conference-in-october-2021-in-rome>

**18-22 Oct 2021: International Mineral Processing Congress. CTICC** (Cape Town International Convention Centre), Convention Square, 1 Lower Long Street, Cape Town, South Africa.

**21-22 Oct 2021: ICRSSGA 2021- International Conference on Remote Sensing Sensors for Geoscience Applications** in Athens, Greece. For more details, please visit: <https://waset.org/remote-sensing-sensors-for-geoscience-applications-conference-in-october-2021-in-athens>

**25-27 Oct 2021: International Mining and Resources Conference (IMARC)** where Global mining leaders connect with technology, finance & the future. Melbourne showgrounds, Australia. For details contact [connect@imarcglobal.com](mailto:connect@imarcglobal.com); Australia: +61 (0) 3 9008 5946

**Oct 2021: Southern African Rare Earths International Conference.** The Canvas Riversands Conferencing, 8 Incubation Drive Riverside View Ext 15, Fourways, Midrand, South Africa.

**3-4 Nov 2021: International Conference on Mineral and Mining Engineering ICMME 2021.** Cape Town, Cape Town, South Africa

**8-10 Nov 2021: Iron Ore Conference 2021.** Online conference organized by AusIMM Perth, Australia

**8-9 Nov 2021: ICEGGP 2021 - International Conference on Environmental Geology and Geological Problems** in Istanbul, Turkey. For more details, please visit: <https://waset.org/>

environmental-geology-and-geological-problems-conference-in-november-2021-in-istanbul

**17-18 Nov 2021: Cement Business & Industry Africa (CBI Africa).** Leading cement conference & exhibition. Johannesburg, South Africa. Venue to be announced.

**18-19 Nov 2021: International Conference on Mining Geology, Exploration and Mining ICMGEM** in Singapore, Singapore. Website URL: <https://waset.org/mining-geology-exploration-and-mining-conference-in-november-2021-in-singapore>; Contact URL: <https://waset.org>

**2-3 Dec 2021: ICRMGEA 2021 - International Conference on Rock Mechanics for Geotechnical Engineering Applications** in Tokyo, Japan. For more details, please visit: <https://waset.org/rock-mechanics-for-geotechnical-engineering-applications-conference-in-december-2021-in-tokyo>

**6-7 Dec 2021: ICCGM 2021 - International Conference on Computational Geosciences and Mathematical Modelling** in Kuala Lumpur, Malaysia. For more details, please visit: <https://waset.org/computational-geosciences-and-mathematical-modelling-conference-in-december-2021-in-kuala-lumpur>

**6-8 Dec 2021: International Future Mining Conference 2021.** Online conference organized by AusIMM Perth, Australia

**13-14 Dec 2021: ICRGGACS 2021 - International Conference on Regional Geology, Geologic Analysis and Computer Simulations** in Cairo, Egypt. For more details, please visit: <https://waset.org/regional-geology-geologic-analysis-and-computer-simulations-conference-in-december-2021-in-cairo>

**20-21 Dec 2021: International Conference On Geotechnical Challenges In Mining, Tunneling & Underground Structures Icgmtu – 2021.** Venue: Geotropik, Universiti Teknologi Malaysia, Johor Bahru, Malaysia. Contact <https://icgmtu.icresearch-geotropik.com/>

**21-22 Jan 2022: International Conference on Economic Geology, Mineralogy and Mining ICEGMM** in Amsterdam, Netherlands. Website URL: <https://waset.org/economic-geology-mineralogy-and-mining-conference-in-january-2022-in-amsterdam>; Contact URL: <https://waset.org>

**11-12 Feb 2022: International Conference on Geology and Mining ICGM** in Kuala Lumpur, Malaysia; Website URL: <https://waset.org/geology-and-mining-conference-in-february-2022-in-kuala-lumpur>; Contact URL: <https://waset.org>

**25-26 Mar 2022: International Conference on Mining Geology and Ore Treatment ICMGOT** in Madrid, Spain. Website URL: <https://waset.org/mining-geology-and-ore-treatment-conference-in-march-2022-in-madrid>; Contact URL: <https://waset.org>

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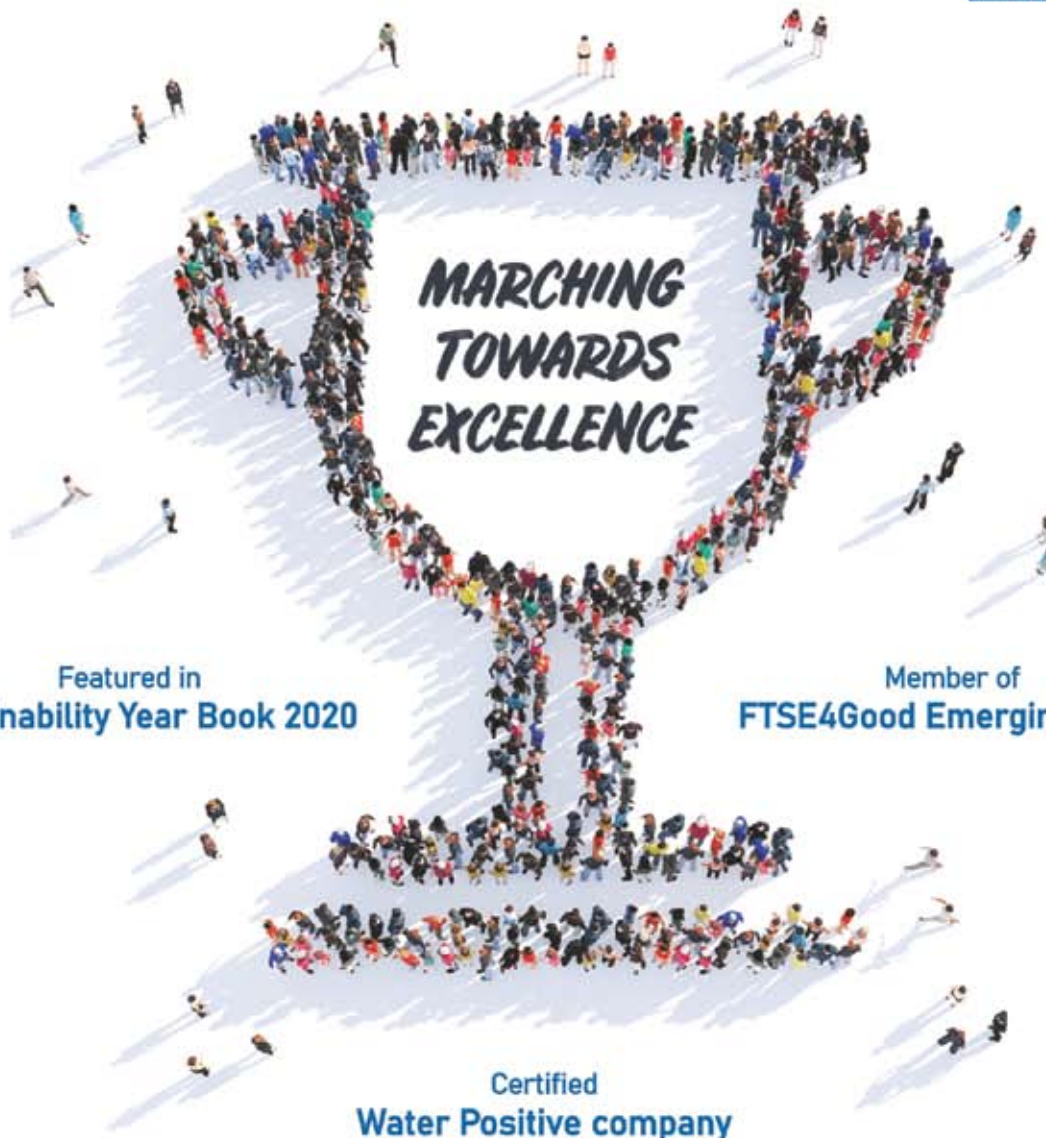
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