

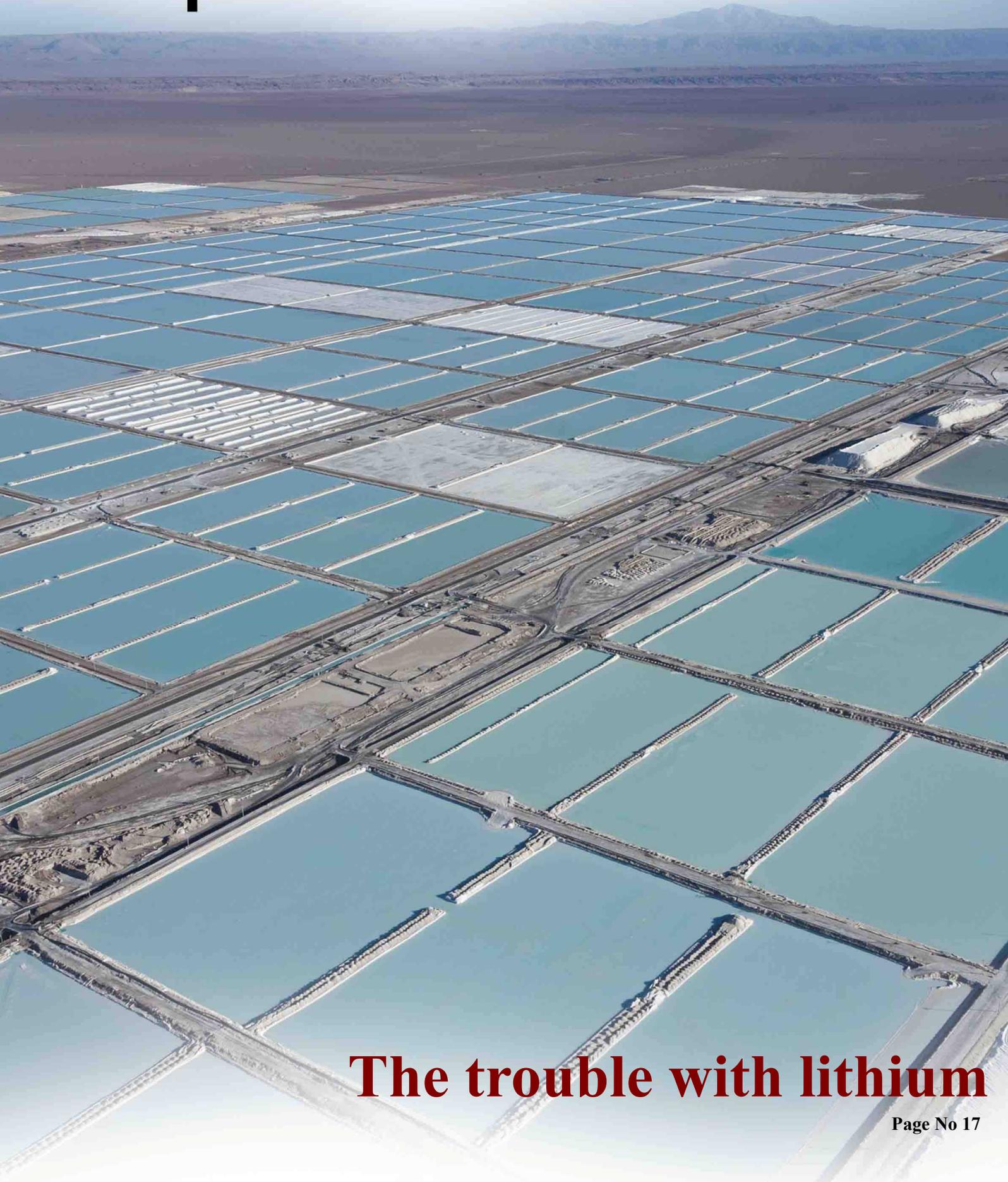
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Indian Mining & Exploration Updates



The trouble with lithium

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India must act on mining and exploration of critical minerals for green technologies

The study has been authored by Rajesh Chadha and Ganesh Sivamani, CSEP

In 2015, India announced its Nationally Determined Contributions, including reducing its Gross Domestic Product (GDP) emission intensity by 33-35% in 2030 from 2005 levels. This commitment has been revised to a 45% reduction during COP26. Critical minerals shall play an important role to achieve these goals.

The COP26 meeting held in Glasgow on climate change issues discussed accelerating action and strategies toward achieving objectives outlined in the Paris Agreement. Consequently, India has committed to increasing its non-fossil fuel energy capacity to 500 GW by 2030, reducing the economy's carbon intensity to less than 45% in 2030 compared to 2005 levels, and achieving the target of net-zero emissions by 2070. Additionally, in 2015, India announced its Nationally Determined Contributions, including reducing its Gross Domestic Product (GDP) emission intensity by 33-35% in 2030 from 2005 levels. This commitment has been revised to a 45% reduction during COP26. Critical minerals shall play an important role to achieve these goals.

Critical minerals refer to mineral resources, both primary and processed, which are essential inputs in the production process of an economy, and whose supplies are likely to be disrupted on account of non-availability or risks of unaffordable price spikes.

These minerals tend to lack substitutability and recycling processes. In addition, the global concentration of extraction and processing activities, the governance regimes, and environmental footprints in resource-abundant countries adversely impact their availability risks.

A recent study by CSEP assesses the criticality of 23 select non-fuel minerals for India's manufacturing sector and projects their needs

For manufacturing green technologies equipment required for climate change mitigation. Climate change

The study evaluated the criticality of each mineral along two dimensions: economic importance and supply risk. It projected India's mineral needs for renewable electricity generation and electric vehicle manufacturing, in line with its various climate change mitigation objectives over the next two decades.

The economic importance dimension measures the impact on the manufacturing sectors caused by a sudden non-availability of a mineral in the supply chain, and the supply risk dimension evaluates the vulnerability in global mineral supply chains due to the concentration of mineral extraction or processing in some countries and the quality of governance in these jurisdictions.

Our analysis suggests that niobium, lithium, and strontium have relatively high economic importance. Lithium, for example, is essential for the manufacture of batteries for electric vehicles, while niobium and strontium are needed for steel and aluminium alloys. Most minerals have some degree of substitutability, except for niobium and silver, for which there are no good substitutes. The supply risk is relatively high for yttrium and scandium, followed by niobium and silicon. Silicon is key for the manufacture of solar panels. The rare earth elements of yttrium and scandium have various uses, including alloys, superconductors, and battery technologies. India does not have the recycling capacity for most minerals except copper and iron. While there are limited technological options for recycling some minerals, there is scope for increased end-of-life recycling, as demonstrated by higher recycling rates globally.

One facet of India's future critical mineral needs will depend on the types of clean energy



technologies used in the green energy transition and the share of domestic manufacturing versus import reliance on each technology. Solar and wind power will play a major role in the clean energy transition in India, and electric vehicles are also being encouraged to reduce vehicular emissions and dependency on fossil fuels.

There will be an increase in the demand for several critical minerals as India transitions towards renewable power generation and electric vehicles. For example, copper, manganese, zinc, and indium will be required for renewable electricity generation equipment manufacturing. Likewise, the move to electric vehicles would require increasing quantities of various minerals, including copper, lithium, cobalt, and rare earth elements. However, India does not have any known reserves of nickel, cobalt, molybdenum, rare earth elements, neodymium and indium, and the needs for copper and silver are projected to be higher than India's current reserves.

The results of this projection exercise indicate that India is not equipped to meet its green technology manufacturing requirements through domestic mining alone. Instead, imports of minerals for domestic manufacturing, or imports of the final product (embedded in these minerals), will be needed to meet its policy agenda on climate change mitigation.



While India will need to rely on imports for these technologies over the next two decades, further work must be done to better utilise the available minerals within the country for its longer-term needs. India can be better prepared for the next stage of green technology utilisation by laying the groundwork for exploring and mining. India has significant

resources of nickel, cobalt, molybdenum, and heavy rare earth elements, but further exploration would be needed to evaluate the economically minable resources. The country must also focus on securing supply chains for critical minerals and acquiring foreign mineral assets to ensure a continuous supply.

India will also need to undertake serious

research and build a policy framework for becoming self-reliant in clean energy and high-tech equipment by acting quickly on the exploration and mining of critical minerals and setting up investments in the downstream value chains of requisite manufacturing equipment at home.

Source : Hindustan Times

Centre proposes cap on mining lease area

“Allowing acquisition of disproportionately large mineral bearing areas would defeat the present system of auctioning of mineral concessions through fair and transparent mechanism.

After giving relaxation to area limit for grant of mining lease for three states, the Centre has proposed to amend the Mines and Mineral (Development and Regulation) Act, 1957 to put a ceiling on mineral-wise lease area limits for each State.

A high-level committee constituted by the Ministry of Mines has recommended 50 square kilometre (sq km) iron ore area limit for granting prospecting license (PL) and 20 sq km for mining lease (ML) for Odisha. The area limit for other states having iron ore resources is 25 sq km for PL and 10 sq km for ML.

In September 2019, a committee of the Ministry had recommended increase in mining area limit for auction of iron ore blocks up to 58 sq km for Odisha, 75 sq km for Jharkhand and 50 sq km for Chhattisgarh by invoking Section 6 (1) and (b) of MMDR Act.

The relaxation was given by the Centre following repeated requests from several states

including Odisha, which were facing difficulties in speedier auction of mineral blocks due to restriction imposed by the Delhi High Court.

“Allowing acquisition of disproportionately large mineral bearing areas would defeat the present system of auctioning of mineral concessions through fair and transparent mechanism. There is need to fix the area limits rationally to ensure that there is a fair and equitable chance for allocation of natural resources for common good,” said a notice issued by the Mines Ministry for consultation on May 25, 2022.

In order to give stability to the proposed area limits, the Ministry proposed to amend section 6 of the MMDR Act and incorporate the recommended mineral-wise and State-wise area limits in form of a Schedule to the MMDR Act. “Where PL or ML has already been executed or letter of intent upon auction issued or reservation made for the same in accordance with the present area relaxation but would be in violation of the proposed area limits, such PL or ML shall continue till its expiry or ter-

mination with area limit initially allowed,” the notification said.

As per Section 6 of the MMDR Act, the maximum area limit is 10,000 sq km for reconnaissance permit (RP), 25 sq km for PL and 10 sq km for ML. The committee has recommended area limit of 50 sq km for PL and 20 sq km for ML for bauxite for all states while for other minerals like atomic, coal, manganese and chromite is 25 sq km for pl and 10 sq km for ML.

Source : The New Indian Express





Industry Opinion

Voice of Mine & Mineral Sector

Will Indian mineral industries contribution to GDP ever increase substantially to around 10% ?

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ABSTRACT

The paper discusses the reasons for poor contribution of the Indian mineral industry (1.69%) to the GDP as compared to countries like South Africa (8.2%) and Australia(8.1%) which have similar geological prospectivity.

The paper deals briefly with the mineral prospectivity of India, its regulatory regime, the exploration expenditure being incurred as compared to the global scenario and the current exploration policy. It also looks into the practice of exploration in resource-rich countries and the First Come First Serve(FCFS) system adopted in India prior to MMDR Amendment Act-Jan.2015. After analysing the total scenario the author concludes that contribution towards India's GDP can definitely be improved if more mines are developed for high value metals and minerals, which is possible only when the Mineral Exploration is successfully enhanced and the present auction system of granting Composite License is SCRAPPED and Govt of India reverts back to FCFS system with corresponding modifications as prevailing in other advanced mineral rich countries.

KEY WORDS

Geological Prospectivity, Regulatory Regime, Exploration in Resource Rich Countries, India's waft with FCFS.

INTRODUCTION

The contribution of India's Mineral Sector (excluding Petroleum and Natural Gas) which

was around 1.93% in 2012-13 has been deteriorating and now stands at 1.69% in 2020-21. If the present system of granting mineral concessions continues the GDP is unlikely to cross even 2% in the future.

The big question to ponder over is to find the root cause of this problem since India is having similar Geological Prospectivity as South Africa and Australia and their Mineral Industry has contributed 8.2% and 8.10% respectively to the-GDP.

In my view, the problem in India is that there are not enough mines of high value minerals like Gold, Copper, Platinum group, Silver, Fertilizer group etc, which lie deep seated in the earth as compared to bulk minerals like Iron Ore, Manganese, Limestone, Bauxite etc which occur near surface. Even in these surficial minerals our mines do not have world class size and the output therefore is suboptimal.

This condition is created because we have not done enough Geological exploration for the deep seated minerals for which we have as good Geological potential as exists in South Africa and Australia both of which formed part of same super continent called Gondwana Land.

Mineral exploration is a scientific knowledge and technology-driven process involving high risk capital. It facilitates discovery of mineral deposits which may lead to development of mines, attract investment, create jobs and facilitate inclusive growth, particularly in the

hinterland and remote areas. Exploration is not always a rewarding exercise. Globally, mineral exploration is viewed as a high risk business because it involves high investment but may fail, at any stage of exploration, to show up the potential of the chosen area to deliver a viable mineral deposit. The level of exploration activity determines the level of mining in a country.

New mineral discoveries are directly linked to global demand and supply which determine the level of spending on exploration. With low spend on exploration in India compared to other mineral resource-rich countries and in absence of conducive exploration policy, even with abundant natural resources, India is not able to leverage the geological potential to its economic advantage. India's mineral wealth is yet to be fully explored, assessed and extracted for enhancing its contribution to the country's GDP as well as socio-economic development of remote and tribal areas.

1. GEOLOGICAL PROSPECTIVITY OF THE COUNTRY

Majority of the obvious geological potential (OGP) areas identified so far are accounted for deep-seated and high-value minerals. However, owing to focus on surficial minerals and lack of desired level of exploration for deep-seated minerals, the majority of the OGP area is yet to be converted to resources / reserves, leading to the poor OGP to resource as well resource to reserves ratios in respect of non-bulk minerals as brought out in the following table

Table – I

OGP to resource ratio and resource to reserves ratios for non-bulk minerals

	OGP (sq. km.)	Resources in million tonnes (except diamond)	Reserves in million tonnes (except diamond)	% of reserves to resources
Deep-seated minerals				
Gold	1,43,529	501.83	17.22	3.43
Diamond	3,00,000	31,836,091 carats	95,965,9 carats	3.01
Base metals				
Copper ore	1,92,245	1,511.49	207.76	13.75
Lead and zinc ore		749.45	106.11	14.16
Surficial minerals				
Iron ore	22,171	33,275	22,486	67.58
Coal	60,215	3,44,021	1,63,461	47.51

Source: Geological Survey of India and Indian Bureau of Mines publications

It is evident that while in case of non-bulk minerals though the delineated OGP areas are vast detailed exploration is yet to be initiated for which either the country does not have the required technology and facilitatory Acts & Rules to attract substantial private investment or lack of adequate funding for exploration by the Government for selection of potential mineral-bearing areas for auctioning under the extant Mineral Policy.

2. REGULATORY REGIME

It is evident that despite having huge mineral

potential, our country has not been able to attract investment in the mineral sector unlike the mineral rich countries. India has not only missed out on FDI, but also associated modern technologies needed for discovering high-value metals and minerals. The Act and Rules have constrained us to only produce easy-to-find bulk minerals, which are often surficial in nature. It is thus imperative that the nation becomes self-sufficient in minerals we import. To achieve this objective, conducive regulatory framework needs to be in place which would facilitate explorers to generate adequate

returns on investment (ROI) commensurate to the exploration risk for the discovery and development of high-value mineral deposits.

India is one of the countries with flourishing democracy and stable political regime. However, the mining legislation {i.e. Mines and Minerals (Development and Regulation) Act, 1957} is unstable. Not only the Act is amended frequently but even the provisions of the extant Act are not honoured.

A. 28th December, 1957: The Mines and Minerals (Development and Regulation) Act was introduced.

Prospecting licence (PL): One or more PL covering a total area of 25 sq. km. in a State. PL to be granted for initial period of two years for all minerals (other than mica) but extendable by two years.

Mineral concessions to be granted through FCFS (First-Come-First-Serve) process.

B. 30th October 1993: The mineral policy was liberalized. The first National Mineral Policy-1993 was passed by the Parliament. The concept of large area prospecting license (LAPL) was introduced: The area of grant of Prospecting Licence (PL) for the first time was increased from 25 sq. km to an area not exceeding 5000 sq. km for a single prospecting licence in a State and 10,000 sq. km for the whole country.

C. 20th December, 1999: B.B Tandon Committee was constituted and based on its recommendations, the MMDR Act, 1957 was amended in December, 1999. For the first time, the concept of Reconnaissance Permit (RP) was introduced in Feb.2000, whereby total area of 10,000 sq. km. in a State could be granted to a firm provided a single RP would not be more than 5,000 sq. kms. With introduction of RP, the concept of LAPL was dispensed with.

PL continued to be 25 sq. km. in a State. However, the initial period of grant for three years was extendable by another three years.

D. February, 2000: 100% FDI in mining allowed.

E. September, 2005: Hoda Committee was constituted to suggest steps to further encourage mineral investment akin to resource-rich countries. The recommendations were accepted and incorporated in National Mineral Policy amended in March 2008.

F. March, 2008: National Mineral Policy-2008: The salient features of the Policy NMP=2008 were;
 “Private sector to play primary role for exploration and emphasised that in order to make the regulatory environment conducive to private investment, the procedures for grant of mineral concessions of all types, such as Reconnaissance Permits, Prospecting Licenses and Mining Leases, shall be transparent and seamless and security of tenure shall be guaranteed to the concessionaires”.
 “The first-in-time principle in the case of sole applicants and the selection criteria in the case of multiple applicants to be appropriately elaborated”.
 “Prospecting and mining shall be recognized as independent activities with transferability of concessions playing a key role in mineral sector development”.
 The Policy remained only on paper and never saw the light of the day.

G. 12th January, 2015: The MMDR (Amendment) Act, 2015 effective from 12th January, 2015 made transformational changes. All mineral concessions are to be granted through auction process.
 Grant of non-exclusive permit (NERP) introduced, but without any right / claim of concessionaire for grant of prospecting license or mining lease.
 Grant of CL (Composite Licence) which is Prospecting License cum Mining Lease (PL-cum-ML) through auction was introduced.
 With a view to take up regional and detailed exploration by the Government agencies National Mineral Exploration Trust (NMET) was constituted for which a lessee has to contribute at the rate 2% of the royalty.

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H. 13th July, 2016: National Mineral Exploration Policy (NMEP) was introduced to outline the strategy and action plan which the Government has to adopt for ensuring comprehensive exploration of mineral resources.

I. 12th March, 2019: National Mineral Policy (NMP) 2019
 Special attention for exploration of strategic and deep-seated minerals which are otherwise difficult to access and for which the country is mainly dependent on imports.
 Introduces Right of First Refusal for RP/PL holders.
 Auctioning in virgin areas for grant of CL (Composite Licence) on revenue share basis was continued.

J. 28th March, 2021: MMDR Amendment Act, 2021

- NERP was removed as there were no takers ever since it was introduced in Jan.2015. NERP failed to attract any investor.
- Redefined Composite Licence (diluting the norms of exploration level) with seamless transition to ML:
 - ◇ Mineral blocks for Composite Licence can be auctioned at G4 level of exploration instead of G3 level as per earlier standard.
 - ◇ Private entities can be notified under Section 4(1) of the MMDR Act for conducting exploration.
- Dispensed with the rights of existing concession holders of RP and PL for grant of PL &/or ML – Section 10A(2)(b) & (c)

K. 18th June, 2021: Amendments to Mineral (Auction) Rules, 2015.

EXPLORATION EXPENDITURE : GLOBAL VS INDIA

Mineral Exploration is dependent on the country's specific needs, global market conditions and swings in demand, supply and price of minerals and metals.

From the data available from S & P Global Market Intelligence for 2012-19 it is understood that worldwide, more than 85% of the expenditure is on the exploration of deep-seated minerals and less than 15% on other minerals. However, in our country the major expenditure has only been on surficial minerals like iron ore, coal, limestone, bauxite etc.

Mineral-rich countries like Canada, Australia are spending more than US\$ 1 billion, whereas the exploration expenditure in India is in the range of US\$ 0.13 to 0.17 billion (about Rs 1275 crores) :

Table – II Country-wise expenditure on exploration (in billion USD)

Country	2012	2013	2014	2015	2016	2017	2018	2019	2020
Canada	3.29	1.88	1.51	1.28	0.97	1.11	NA	NA	NA
Australia	2.46	1.88	1.3	1.09	0.9	1.08			
US	1.64	1.01	0.75	0.74	0.49	0.64			
Russia	0.62	0.72	0.54	0.46	0.35	0.32			
Mexico	1.23	0.87	0.75	0.54	0.42	0.48			
Peru	1.03	0.72	0.54	0.54	0.42	0.56			
Chile	1.03	0.87	0.75	0.69	0.42	0.64			
South Africa	0	0.43	0.3	0.35	0.28	0.16			
China	0.81	0.57	0.7	0.54	0.42	0.40			
Brazil	0.62	0.04	0.3	0.27	0.28	0.24			
Argentina	0.62	-	-	-	-	0.16			
DRC	-	-	0.3	0.13	0.14	-			
Other countries	7.18	5.44	3	2.57	1.88	2.16			
Total	20.53	14.43	10.74	9.2	6.97	7.95	9.62	9.30	8.33

Source: (1) S&P Global Market Intelligence, 2018 (2) **For India:** Ministry of Mines; **Note:** India's exploration expenditure for the financial years 2016, 2017 and 2018 was USD 0.13, 0.15 and 0.17 billion respectively. This comprises of expenditures incurred by GSI, MECL and NMET only. In addition, State DMGs also incur expenditure on exploration. NOTE: CMPDIL spends on Coal/Lignite not on the so called deep-seated, high value minerals and metals or non-fuel bulk minerals. DAE spends only on atomic minerals and related minerals REEs etc.

With a view to expedite mineral exploration in the country, NMET was introduced in MMDR Amendment Act-2015 and 2% of

royalty was made payable by lessees towards contribution for NMET funds. Till December 2020, out of the total amount of Rs. 2604.91 crore accrued, only Rs. 299.02 crore have been spent. Further, during the last three years (2018-19 to 2020-21), the actual expenditure on exploration from NMET account has been less than Rs 75 crores per annum on an average.

4. CURRENT EXPLORATION POLICY

(a) Engagement of private sector for carrying out exploration

As per the recent amendment effective from 28th March, 2021 made in the first proviso of Section 4(1) of MMDR Act, 1957, the private entities are allowed to undertake prospecting operations. The relevant proviso to Section 4 (1) reads:

“Provided further that nothing in this subsection shall apply to any prospecting operations undertaken by the Geological Survey of

rights to *mineral concessions in their favour*. Such a provision will attract only drilling or survey contractors rather than explorers for funding through NMET. This will not result in discovery of deep-seated resources. *Only drilling / survey contractors / companies will make money out of it as they do not have the expertise and technology to locate deep-seated resources.*

(b) Dilution of norms of exploration for Composite License

Following the amendments to the MMDR Act in March 2021, changes have been carried out in Mineral (Auction) Rules, 2015 on 18th June, 2021. The amended sub-rule 1(m) of Rule 2 reads as under:

(m) “value of estimated resources” means an amount equal to the product of, -

(i) the estimated quantity of mineral resources for which the mineral block is being auctioned, expressed in metric tonne; and

(ii) the average price per metric tonne of such mineral as published by Indian Bureau of Mines for the relevant State for a period of twelve months immediately preceding the month of computation of the Value of Estimated Resources:

“Provided that if for any mineral or mineral grade, the average sale price in respect of the relevant State for any month is not published by the Indian Bureau of Mines, the average sale price for the latest month published for such mineral or mineral grade shall be deemed to be the average sale price for the said month for which average sale price is not published:

“Provided further that if for any mineral or mineral grade, the average sale price in respect of the relevant State is not published for the entire period of the preceding twelve months, then the all India average sale price published for such mineral or mineral grade for the said twelve months shall be used:

Provided also that in case of auction of mineral block for Composite Licence for minerals and corresponding deposits as specified in Schedule II of the Minerals (Evidence of Mineral Contents) Rules, 2015, the ‘estimated

India, the Indian Bureau of Mines, the Atomic Minerals Directorate for Exploration and Research][of the Department of Atomic Energy of the Central Government], the Directorates of Mining and Geology of any State Government (by whatever name called), and the Mineral Exploration Corporation Limited, a Government company within the meaning of [clause (45) of section 2 of the Companies Act, 2013, and any **other entities including private entities that may be notified for this purpose, subject to such conditions as may be specified by the Central Government.**”

As per the above amendment, though private entities have been allowed to undertake exploration activities they would do so without any

quantity of mineral resources' shall be arrived in the following manner, namely:—

(a) the estimated quantity of mineral resources as assessed under G4 level of exploration for the mineralised area in the block shall be considered the 'estimated quantity of mineral resources' of the block;

(b) in case the estimated quantity of mineral resources is not possible to be assessed under clause (a), then the same shall be arrived at

by multiplying—

(i) the average of the estimated quantity of mineral resource per hectare for the same mineral available in the mineralised area of nearby mining leases or mineral blocks having similar geological features and explored upto G3 level in accordance with the said rules; and
(ii) the mineralised area of the mineral block, which is to be auctioned for Composite Licence.

Explanation. — For the purposes of this clause 'nearby mining leases or mineral blocks' shall mean mining leases or mineral blocks located in the same district or in any adjacent district" Amendments in the MMDR Act 2021 and Rules allow mineral blocks with G4 level Reconnaissance survey to be offered for auction as Composite License. It is worth mentioning that G4 level is just a reconnaissance survey with very limited preliminary exploration data where it is not possible even to assess the estimated quantity of mineral resources with any level of confidence.

The confidence level of mineral resource of the block to be auctioned for Composite License would be too low to make any informed decision. Mineral deposits, especially gold, diamond, copper, lead, zinc, tin, tungsten, nickel, PGMs etc. occur as lenses, veins, pockets, stockworks and irregularly shaped bodies or small pipes, such as kimberlite pipes for diamonds. As they vary greatly in shape, size and grade, in all dimensions, exploration at the least up to G3 level is essential for the blocks to be offered for auction of Composite License.

Further, *to estimate quantity of resources and work out the value thereof as per Indian Bureau of Mines sale price for G4 level as stipu-*

lated in the proviso and ask an explorer to bid for it is too much to expect.

It is obvious that no serious resource exploration company will participate in auction for such an area.

(c) Restrictions on exploration and mining in adjoining areas

* Rule 69 of MCR 2016, defines the boundaries below the surface as under:

"The boundaries of the area covered by a Mining Lease shall run vertically downwards below the surface towards the centre of the earth."

* Accordingly, Mining Lease is granted and demarcated at the surface area.

* This stipulation of definition of boundaries below the surface is limiting the mining of the lateral expansion of minerals beyond the earmarked lease area particularly in case of deep-seated minerals.

* A vein is a continuous body of minerals or mineralized rocks, filling a seam of fissure in the earth's crust which may extend beyond the surficial boundaries of a mineral concession. Since the ore body belongs to the vein or mineralized rock, a mineral concession holder particularly in respect of deep-seated and concealed minerals like gold, copper, zinc, lead, silver etc. which have poor surface manifestation or altogether blind with cap should have the right to explore and this should be followed by exploiting the ore body / vein extending up to the entire course of such single ore body / vein even when it extends beyond the leased area, irrespective of any faults / separation attributable to geological causes in between, as long as a mineralizing event and the apex of such vein can be established within the existing leased area.

* The lack of such a dispensation in the existing regulatory framework / law through enabling rules for such contiguous mining opportunities particularly in case of underground mines under operations has adversely impacted the optimum extraction of high-value mineral resources which are established after

incurring huge costs of development and using state-of-the-art exploration technology.

* The right to exploit the ore body/ vein extending up to the entire course of such single ore body/ vein even when it extends beyond the demised area is recognised in many developed countries like the USA and United Kingdom.

(i) In the USA, the same is codified under a statute and is known as 'extra-lateral rights' whereby

"every vein, the top or apex of which lies inside of such surface lines extended downward vertically become his by virtue of his location, and he may pursue it any depth beyond his vertical side lines, although in doing so he enters beneath the surface of some other proprietor."

(ii) Section 30 read with Section 326 of the Halsbury Laws of England provides a logical way of interpretation of a mining lease.

"Acts of taking or dealing with minerals under certain land are evidence of ownership of the minerals under other land within the same boundaries, and if possession is taken under a document constructive possession will be inferred of so many seams, or such areas as are intended to be comprised in the document."

Where the superficial limits of demised mines are ascertained it is sometimes a question of construction what seams or veins are included in the demise, or as to the extent of the demise where the description contains technical expressions which have a definite meaning according to local usage."

To remove the restrictions placed by Rule 69 of MCR 2016 which defines the boundaries of a Mining Lease, the author suggests the following amendments:

* The term 'Continuous Ore Vein(s)' may be defined as a set of mineral vein(s) which:

- Extend(s) from the Mineral Block/Leased Area up to 20% beyond the boundaries of such Mineral Block/Leased Area; and;



- Is/are necessary to exploit beyond such boundaries for the purpose of economic and profitable mining operations and in the interest of mineral conservation and development.

* The determination / ascertainment of the continuity of the ore-body beyond the depth known at the time of granting the ML shall be undertaken by the mineral concession holder subsequent to the award of the mineral concession and commencement of mining activities in accordance with the terms of the concession.

The results of the ascertainment of the ore body will be submitted to State Government by the concession holder. The State Government, after verifying the documents submitted by the Lessee may extend the boundaries of the ML by way of rider agreement incorporated into the ML Deed.

* The extension of mineral blocks can be subject to a payment of certain premium by the mineral concession holder to the State Government.

5. EXPLORATION IN RESOURCE-RICH COUNTRIES

(a) Principle of First-Come-First-Served (FCFS)

Most of the resource-rich countries have followed the principle of first-come-first-served (FCFS) to develop their mineral resources. The system is non-discretionary and transparent. However, some of the countries which predominantly follow FCFS for exploration and mining have also adopted auction in a limited manner. The table below summarises the ground situation:

All over the world, prospecting and mining are recognised as independent activities with transferability of the concessions. By and large, almost all the resource-rich countries have adopted the system of first-come-first-served (FCFS) for the resource development. Under the FCFS system, an agreement is entered with the Government with full checks and balances whereby there is annual financial / expenditure commitment (which differs from country to country) by the concessionaire to undertake minimum committed level of work, which normally goes on increasing every year (FIMI, 2018).

Table – III: Auction regime in other countries

Grant method	Type of blocks	Countries
Auction and FCFS (hybrid system)	Mostly, unexplored blocks are granted under FCFS. Auction is done for: ◆ Mined-out / exhausted areas ◆ Already explored areas ◆ Rock and non-metallic minerals	1. China 2. Indonesia 3. Mozambique 4. Queensland (Australia) 5. Russia
FCFS mainly (Auction in a limited manner)	All concessions are granted under FCFS, except the following which are auctioned: ◆ Cancelled / expired licences ◆ Overlapping areas ◆ Reserved areas ◆ Areas explored by Government	1. Brazil 2. Mexico 3. Mongolia 4. Peru 5. USA

Source: FIMI study on “*Auction of Mineral Resources – an anatomy*”

All over the world, prospecting and mining are recognised as independent activities with transferability of the concessions. By and large, almost all the resource-rich countries have adopted the system of first-come-first-served (FCFS) for the resource development. Under the FCFS system, an agreement is entered with the Government with full checks and balances whereby there is annual financial / expenditure commitment (which differs from country to country) by the concessionaire to undertake minimum committed level of work, which normally goes on increasing every year (FIMI, 2018).

Normally the success rate of finding Mineral Resource in exploration is 1:100. As such, *no resource rich country spends tax payers’ money on such a risky venture* instead entrusts the same to private companies, popularly known as *junior exploration companies. Junior exploration company is formed by a group of geologists/Mining Experts whose domain expertise is in a particular mineral or a group of minerals which again depends on the global demand and price of any mineral or metal and effective tax rate in the host country.* For exploration expenditure, they bank on venture capital or hedge funds. Around 80% of the global exploration expenditure is financed by Toronto Stock Exchange (TSX-Ventures) and the balance by other stock exchanges e.g. New York (NYSE-OTC), London (Alternative Investment Market - AIM) and Perth (Australian Stock Exchange - ASX).

The ratio between the attempts made by companies and the discoveries that have led to development of mines varies among the 3 precious metals / minerals. In case of diamond and platinum, it is 1:1500 to 1:1000; and gold 1:800 to 1:400.

De Beers India has carried out reconnaissance for diamonds over an area of 80,160 sq.km. in 53 RPs, discovering 58 kimberlites. De Beers also carried out prospecting over 343 sq.km on PLs granted on RPs in AP. However, none of the kimberlites were either diamondiferous or of any economic significance. Since 2000, De Beers and Rio Tinto have discovered almost 100 kimberlites in India. In the last 60 years, GSI has also discovered about 100 kimberlite pipes of which about 40 are diamondiferous. (Total kimberlites discovered in India is around 220).

A junior exploration company, when it succeeds in locating a discovery, sells it to a major mining company at a price which may recover its past losses, if any, and may possibly cover future losses. A mining company can also undertake exploration since it has finance and expertise built in its organisational structure. Both the Junior exploration companies as well as mining companies have freedom to sell / transfer the concessions which come statutorily with tenurial guarantee and seamless transition to mining, all of which are key to success of FCFS system (FIMI, 2018).



(b) Exploration & Mining friendly Regulatory Regimes

The FCFS operates and is regulated in both advanced and developing mineral economies. Whilst the regulations do vary between and within these regions, the spirit of the FCFS for mineral exploration remains similar and entrenched. The following points provide broad contours of understanding of the operating exploration environment:

Most of the regions are divided into exploration blocks in a grid pattern measuring 1km X 1km or lesser by local Geological Survey. Explorer can select and stake claims on multiple blocks.

An explorer has to commit an expenditure (in some regions as prescribed by Law and in some voluntarily). The regulator requires periodic reporting on committed minimum-exploration expenditure. If the commitments are not met, the regulator can query the explorer and, in case expenditure commitments are not met, terminate the concession.

On termination, the area is open to other explorers. Some regions require a cooling off period (in weeks) and some make the ground available the next day. Some jurisdiction enable, online application, some physical pegging and some a paper application to the regulator.

In some countries like Canada, if the expenditure is exceeded then the explorer can immediately access the neighbouring blocks (if available) in preference to offset minimum commitments.

Whilst there is a defined timeline for exploration (3 to 5 years), the concessions can continue for significantly longer duration if the expenditure commitments continue to be met.

These concessions and mineral rights are freely transferable. The explorer has full freedom to;

- out rightly sell their whole or partial mineral rights for premium
- partially or fully finance the project from third party / financiers
- syndicate or list the exploration companies on a stock exchange

The above operating principles have yielded results, brought billions of exploration dollars

and provided a fair and competitive market environment leading to large discoveries and development of mines of high value metals and minerals.

6. INDIA'S SHORT WAFT WITH FCFS

Following the promulgation of the first liberalized National Mineral policy in 1993 and amendment to the Act in 1994 and December-1999, a large number of multinational as well as Indian mining and junior exploration companies evinced interests in undertaking exploration activities and applied for Reconnaissance Permit (Table IV). Subsequently these companies carried out reconnaissance / prospecting works particularly for high-value minerals like gold and diamond using latest technologies and met their committed exploration commitments. However, owing to years of delay due to non-adherence of the States as well as the Ministry of Mines to the time-lines mandated in the Act and non-conducive business environment besides red tapism, these companies were discouraged and many of them had to leave the country.

Table – IV: Status of the Reconnaissance Permits (RPs) applied

1	Total number of RPs issued	401
2	Number of RPs actually implemented	341
3	Area covered by RPs	5.18 lakh sq km
	(a) No of RPs on Diamond	156 (Area-2,31,551 sq km)
	(b) No of RPs on Gold	83 (Area- 95,295 sq km)
	(c) No of RPs on Base Metals	76 (Area- 80, 380 sq km)
4	Number of RPs where final reconnaissance reports were submitted to IBM and State Governments	191
	Number of RPs on relatively easily discoverable surficial mineral (leading to automatic transition)	17
	Number of RPs where no work has been done	55
5	Amount of committed expenditure	Rs. 43,522 lakh
6	Actual expenditure reported	Rs. 34,569 lakh
7	RPs graduated to PLs and MLs	About 15

Source: Base Paper for Discussion – National Mineral Exploration Policy 2016

As per information available with FIMI, the experience of those has not been very pleasant and, by almost all foreign companies with the exception of a few have left India. Some of those companies who have shared their experience with FIMI are:

Andhra Pradesh: Ramgad Minerals and Mining Ltd., applied PL for diamond after RP in 2008 and was under process.

Chhattisgarh: While issuing a LOI for copper in favour of Mira Exploration Pvt. Ltd. the Chhattisgarh Govt. stated that the Govt. cannot assure ML in case of adverse decision of the Committee set up for this purpose. Chhattisgarh has a policy of reservation in favour of CSMDC who then give contract to private parties.

Gujarat: Reserved the entire bauxite and limestone areas in favour of GMDC (a State PSU).

Jharkhand: GSI getting priority over prior applications for exploration by private entrepreneurs.

Karnataka: Delayed 14 PL applications of Deccan Exploration Services (P) Ltd. and Geomysore Services (India) Pvt. Ltd. for gold and, after expiry of their RPs, reserved them in favour of Hutti Gold Mines Ltd. (a State PSU). After long Court battle the Apex Court nullified the State's decision and restored the rights of the RP holders.

PL applied by HZL for gold in 1999 and approved by Govt. of India in 2010 was yet to be executed by Govt. of Karnataka. Similarly, a ML approved by Govt. of India in 2015 was not executed by the State Government of Karnataka.



Ramgad Minerals and Mining Limited, (Baldota Group), applied for 7 PLs for Gold in Gadag area and are still under process. One other PL granted in 2010 is still pending for execution. Six MLs derived from other PLs and applied in 2012 were under process at the DMG. One ML granted in 2008 with approved Mining Plan and EC, was pending for execution. In another area (Bellary) 7 PLs progressed from RPs for gold and associated minerals, applied in 2014 were under process. In Hassan district 2 PLs and one ML for dunite were pending since 2007.

All the above cases were saved under Section 10A(2)(b) of the amended MMDR Act, 2015 which has since been rescinded.

Madhya Pradesh: Rio Tinto discovered the world class diamond deposit in Bunder area in Madhya Pradesh in 2011. However, the company had to wind up, after having spent almost Rs 500/- crores because it was denied permission under Forest (Conservation) Act, 1980.

Odisha : Reserved all areas for iron, manganese, chromite and bauxite in favour of Orissa Mining Corporation despite the PSU is working only in few areas reserved to it and that too in joint venture with private partners.

Rajasthan : Rejected 10 PLs and one ML applications for gold of Metal Mining India Pvt. Ltd. (MMI) after expiry of their RPs/PLs in 2008. Reserved the areas in favour of RSMML (a State PSU) in 2010.

Similarly, for Potash-a strategic mineral the State Govt., reserved the PL area, applied for by two Indian companies, in favour of RSMML. The applicant companies had technology tie-up with foreign companies for solution mining deep below the earth surface, involving an initial investment of about US\$ 2 billion.

Rajasthan has also reserved manganese ore and rock phosphate for RSMML.

Ramgad Minerals and Mining Limited a Baldota Group Company, discovered a Rare Earth deposit in Barmer district, during RP stage exploration which is an excellent example of high tech mineral exploration by an Indian private company.

Tamil Nadu : No RP / PL for nickel and platinum to Premier Nickel Mines Ltd. as the area was reserved for exploration through

MoU between TAMIN (a State PSU) and GSI.

Uttarakhand : Ascot Multi Metal Project was a world-class multi metal deposit of copper lead zinc with significant gold and silver content, drilled and resource defined by Adi Gold Mining Pvt. Ltd. (Indian arm of a Canadian Junior exploration company named Pebble Creek Mining Limited, listed on TSX. The project finally did not take shape despite the company having made significant investment in the project as well as in CSR activities because the forest and environmental clearances were not forthcoming even after years of waiting.

Considering uncertainties of regulations and legislations not in line with the best international practices besides business unfriendly environmental regulations and high taxation structure, the Fraser Institute in its Survey of Mining Companies has put India among the 10 least attractive jurisdictions globally (97 out of 104) in 2016, in terms of investment Attractiveness Index for mining and exploration. In subsequent years, India *has not even been in the reckoning.*

7. CONCLUSION

With the development of high tech industries, where India has to play important role, the requirement of Strategic Minerals and metals like Rare Earth Elements, Lithium, Cobalt, Nickel, and high value metals such as Gold, Silver and Platinum Group Metals etc becomes critical. The country has to explore for these minerals & metals and strive to become self sufficient or arrange for safe and secure supply chains from other countries which, in the present geopolitical situation seems extremely difficult. Hence, exploration of high value minerals is extremely critical for the overall development.

The question raised by this paper about the role of Indian Mineral Industry for achieving the higher contribution to GDP can be answered in POSITIVE if the Govt of India scraps the present auctioning system for grant of CL (composite license) and reverts to FCFS system with modifications as appropriate in tune with the exploration business-friendly laws as prevalent in other Advanced Mineral

Rich countries. It may also be kept in mind that suitable processes be introduced after FCFS system to avoid the pitfalls which caused failure in earlier years.

It takes around 5 to 8 years for developing a mine after locating and delineating the Mineral Resource(s). Therefore, the Ministry of Mines has to take the necessary steps to improve the mineral exploration regime in the country on a very urgent basis.

ACKNOWLEDGEMENT

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Mapped: The 10 Largest Gold Mines in the World, by Production



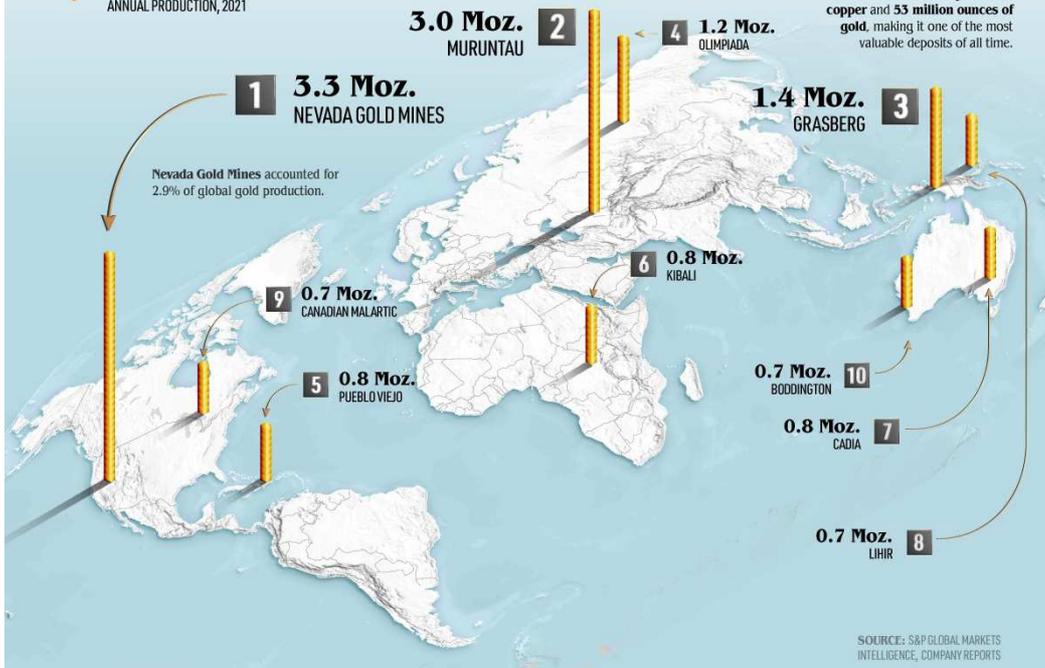
Mapping the World's Top 10 GOLD MINES

The world produced an estimated 3,561 tonnes of gold in 2021.

Which gold mines were at the forefront of production?

100,000 OZ. OF GOLD ANNUAL PRODUCTION, 2021

Since 1990, **Grasberg** has produced more than **33 billion pounds of copper** and **53 billion ounces of gold**, making it one of the most valuable deposits of all time.



SOURCE: S&P GLOBAL MARKETS INTELLIGENCE, COMPANY REPORTS

Top Gold Mines by 2021 Production



Newmont was the top producing gold miner in 2021 with more than 5.9 Moz across all their projects.



Barrick was the second-largest global gold producer in 2021, mining 4.4 Moz.

<p>1 U.S. </p> <p>NEVADA GOLD MINES</p> <p>3.3 Million Oz.</p> <p>OWNERS: BARRICK, Newmont</p> <p>OPERATOR: BARRICK</p>	<p>2 UZBEKISTAN </p> <p>MURUNTAU</p> <p>3.0 Million Oz.</p> <p>OWNERS: NAVOI MINING & METALLURGY COMBINAT</p> <p>OPERATOR: NAVOI MINING & METALLURGY COMBINAT</p>	<p>3 INDONESIA </p> <p>GRASBERG</p> <p>1.4 Million Oz.</p> <p>OWNERS: FREEPORT-McMoRAN</p> <p>OPERATOR: PT FREEPORT INDONESIA</p>	<p>4 RUSSIA </p> <p>OLIMPIADA</p> <p>1.2 Million Oz.</p> <p>OWNERS: POLYUS</p> <p>OPERATOR: POLYUS</p>	<p>5 DOMINICAN REP. </p> <p>PUEBLO VIEJO</p> <p>0.8 Million Oz.</p> <p>OWNERS: BARRICK, Newmont</p> <p>OPERATOR: BARRICK</p>
<p>6 D.R.C. </p> <p>KIBALI</p> <p>0.8 Million Oz.</p> <p>OWNERS: BARRICK, ANGLOGOLD ASHANTI</p> <p>OPERATOR: BARRICK</p>	<p>7 AUSTRALIA </p> <p>CADIA</p> <p>0.8 Million Oz.</p> <p>OWNERS: NEWCREST MINING LTD</p> <p>OPERATOR: NEWCREST MINING LTD</p>	<p>8 PAPUA NEW GUINEA </p> <p>LIHIR</p> <p>0.7 Million Oz.</p> <p>OWNERS: NEWCREST MINING LTD</p> <p>OPERATOR: NEWCREST MINING LTD</p>	<p>9 CANADA </p> <p>CANADIAN MALARTIC</p> <p>0.7 Million Oz.</p> <p>OWNERS: YAMANA GOLD, AGNICO EAGLE</p> <p>OPERATOR: MINE CANADIAN MALARTIC</p>	<p>10 AUSTRALIA </p> <p>BODDINGTON</p> <p>0.7 Million Oz.</p> <p>OWNERS: Newmont</p> <p>OPERATOR: Newmont</p>

The 10 Largest Gold Mines in the World, by Production

This was originally posted on Elements. Sign up to the free mailing list to get beautiful visualizations on natural resource megatrends in your email every week.

Gold mining is a global business, with hundreds of mining companies digging for the precious metal in dozens of countries.

But where exactly are the largest gold mines in the world?

The above infographic uses data compiled from S&P Global Market Intelligence and company reports to map the top 10 gold-producing mines in 2021.

Editor's Note: The article uses publicly available global production data from the World Gold Council to calculate the production share of each mine. The percentages slightly differ from those calculated by S&P.

The Top Gold Mines in 2021

The 10 largest gold mines are located across nine different countries in North America, Oceania, Africa, and Asia.

Together, they accounted for around 13 million ounces or 12% of global gold production in 2021.

In 2019, the world's two largest gold miners—Barrick Gold and Newmont Corporation—announced a historic joint venture combining their operations in Nevada. The resulting joint corporation, Nevada Gold Mines, is now the world's largest gold mining complex with six mines churning out over 3.3 million ounces annually.



Rank	Mine	Location	Production (ounces)	% of global production
#1	Nevada Gold Mines	U.S.	3,311,000	2.9%
#2	Muruntau	Uzbekistan	2,990,020	2.6%
#3	Grasberg	Indonesia	1,370,000	1.2%
#4	Olimpiada	Russia	1,184,068	1.0%
#5	Pueblo Viejo	Dominican Republic	814,000	0.7%
#6	Kibali	Democratic Republic of the Congo	812,000	0.7%
#7	Cadia	Australia	764,895	0.7%
#8	Lihir	Papua New Guinea	737,082	0.6%
#9	Canadian Malartic	Canada	714,784	0.6%
#10	Boddington	Australia	696,000	0.6%
N/A	Total	N/A	13,393,849	11.7%

Share of global gold production is based on 3,561 tonnes (114.5 million troy ounces) of 2021 production as per the World Gold Council.

Uzbekistan's state-owned Muruntau mine, one of the world's deepest open-pit operations, produced just under 3 million ounces, making it the second-largest gold mine. Muruntau represents over 80% of Uzbekistan's overall gold production.

Only two other mines—Grasberg and Olimpiada—produced more than 1 million ounces of gold in 2021. Grasberg is not only the third-largest gold mine but also one of the largest copper mines in the world. Olimpiada, owned

by Russian gold mining giant Polyus, holds around 26 million ounces of gold reserves.

Polyus was also recently crowned the biggest miner in terms of gold reserves globally, holding over 104 million ounces of proven and probable gold between all deposits.

How Profitable is Gold Mining?

The price of gold is up by around 50% since 2016, and it's hovering near the all-time high of \$2,000/oz.

That's good news for gold miners, who achieved record-high profit margins in 2020. For every ounce of gold produced in 2020, gold miners pocketed \$828 on average, significantly higher than the previous high of \$666/oz set in 2011.

With inflation rates hitting decade-highs in several countries, gold mining could be a sector to watch, especially given gold's status as a traditional inflation hedge.

Source : Visual Capitalist

Coal India aims at green mining, to increase production from underground mines: CIL Chairman

Agrawal's comments come at a time when there have been concerns about global climate change on account of the burning of fossil fuels including coal, resulting into greenhouse gas emission

To tackle global warming, state-owned Coal India (CIL) is aiming at green mining options and increase production from its underground mines, which are favourable for cleaner ecosystem, through installation of technologies.

"The company is also aiming at green mining

options and planning to increase its underground output," CIL's Chairman Pramod Agrawal said.

Agrawal's comments come at a time when there have been concerns about global climate change on account of the burning of fossil fuels including coal, resulting into greenhouse gas emission.

Coal India, which accounts for more than 80% of the domestic coal output, is setting up coal handling plant/silos in 35 projects under the

first phase of the first-mile connectivity, and will continue in the second phase as well for environmentally cleaner transportation of coal.

Stating that CIL is committed to preservation of environment and creating a green canopy around its mining areas, the chairman said that the public sector unit planted over 30.4 lakh saplings during FY22, expanding its green cover to 1,468.5 hectares.

Agrawal said that 27 eco parks and mine

tourism projects have been developed as on date.

Satellite surveillance indicates that 76 major open-cast projects have reclaimed 62.5% of excavated area limiting active mining area to 37.5%.

For every hectare of land degraded due to mining, CIL created green cover of around 2

hectares of land.

Meanwhile, the coal dispatch by CIL to captive power plants and sectors like cement registered a decline in May as compared to the year-ago month.

While the fuel supply by CIL to captive power plants dropped 39.74% in May 2022 over the year-ago period, dispatch to the cement sector

declined 16.74%, as per the latest government data.

India has recently eased the environment approvals for coal mine expansions to boost output amid fuel shortages that have triggered hours-long blackouts.

Source : The Mint

Snapshot: environmental regulations for mining activities in India

Principal applicable environmental laws

What are the principal environmental laws applicable to the mining industry? What are the principal regulatory bodies that administer those laws?

The principal environmental laws applicable to the mining industry include:

- the Environment (Protection) Act 1986 (EPA);
- the Forest (Conservation) Act 1980;
- the Water (Prevention and Control of Pollution) Act 1974; and
- the Air (Prevention and Control of Pollution) Act 1981.

Further, the Mines and Mineral (Development and Regulation) Act 1957 (MMDRA) empowers the central government to frame rules for the conservation and sustainable development of minerals and the protection of the environment by preventing or controlling pollution that may be caused by prospecting or mining operations. The Mineral Conservation and Development Rules 2017 (MCDR) regulate environmental aspects of mining and provide for sustainable mining.

The principal regulatory bodies are the Ministry of Environment Forest and Climate Change (MoEF) and the Central and State Pollution Control Board. Specifically, in relation to mining, the Indian Bureau of Mines and the state government also regulate mining.

Environmental review and permitting process

What is the environmental review and permitting process for a mining project? How long does it normally take to obtain the necessary permits?

The Environment Impact Assessment (EIA) Notification 2006 notified by the MoEF under the EPA provisions regulates the grant of environment clearances. The impact on the environment resulting from a mining project is assessed by an EIA study. Consequently, an environmental management plan is prepared and the environment clearance is granted stipulating conditions to minimise the impact on the environment from the project.

Further, in the case of mining projects on forest land, the central government may stipulate mitigative measures for the diversion of forest land, such as the creation and maintenance of compensatory afforestation.

The EIA process for mining takes a year, if not longer, as the EIA study has to be conducted over three seasons along with public consultations, followed by a review by the appraisal committee. If forest land is involved, then the clearance for diverting the forest land also needs to be obtained in parallel. While previously the process of getting environmental clearance was known to stretch for two years or more, under the present policy to encourage industry and development, clearances are granted in less time. The government has launched a single-window integrated environmental management system called Pro-Active and Responsive facilitation by Interactive, Virtuous and Environmental Single-window

Hub (PARIVESH), where a project developer can apply for environmental clearances.

Following the Mines and Mineral (Development and Regulation) Amendment Act 2021, the environment and forest clearance, along with other statutory clearances, will continue to be valid even after the expiry or termination of the earlier lease and will be transferred to and vested, subject to applicable law, in the new lessee. A corresponding amendment in the EIA Notification 2006 was also made in July 2021, which provides that the prior environmental clearance vested with the previous lessee will be deemed to have been transferred to the successful bidder from the date of commencement of the new lease for the remaining validity period (calculated from the date from which said environment clearance was initially granted) subject to the successful bidder registering with the PARIVESH portal with an undertaking to comply with the conditions pursuant to which the environmental clearance had been granted to the previous lessee.

Sustainability

Do government agencies or other institutions in your jurisdiction provide incentives or publish environmental and social governance (ESG) guidelines for green projects?

The Ministry of Corporate Affairs has issued the National Guidelines on Responsible Business Conduct, which have as a core principle that businesses should make efforts to protect and restore the environment. There are several

mechanisms to promote environmentally sustainable mining in India, which include a mandatory EIA, forest clearance provisions, air and water pollution prevention acts and adherence to the sustainable development framework under the Mines and Mineral (Development and Regulation) Act 1957 (MMDRA). In addition, the MMDRA and associated rules prescribe detailed mining standards (specifically with regard to carrying out scientific and environmentally friendly mining) by mining companies. Accordingly, the Ministry has launched a star rating system through the Indian Bureau of Mines, which awards a star rating to mining companies for their efforts and the initiatives taken for the implementation of the sustainable development framework in mining.

Closure and remediation process

What is the closure and remediation process for a mining project? What performance bonds, guarantees and other financial assurances are required?

A mining rights holder has to prepare two mine closure plans: a progressive mine closure plan and a final mine closure plan. The progressive mine closure plan is submitted with the mining plan while the final closure plan is submitted for approval two years prior to the proposed closure. The rights holder has to ensure that the protective measures including reclamation and rehabilitation works are carried out according to the approved mine clo-

sure plan. The government authority must certify that all protective works in accordance with the final mine closure plan have been carried out.

Further, for concessions granted other than by auction, a financial assurance in the form of a bank guarantee has to be furnished for proper implementation of the mine closure plan, failing which the state government may realise this bank guarantee. For concessions granted by auction, if proper closure and remediation according to the mine closure plan are not followed, the performance security can be realised as per the provisions of the mine development and production agreement signed between the parties.

Restrictions on building tailings or waste dams

What are the restrictions for building tailings or waste dams?

Under the MCDR, the rights holder must ensure that:

- overburden, waste rock, tailings and slimes are stored in separate dumps;
- the waste dams are properly secured to prevent floods and escape of material in quantities that may cause degradation of the environment;
- the site for waste dams, tailings or slimes is as far as possible on impervious ground to ensure minimum leaching; and

- the waste dumps are to be suitably terraced and stabilised through vegetation or otherwise.

Inspection of mines is carried out by the Indian Bureau of Mines in an order of priority based on the following criteria:

- all mechanised mines;
- all underground mines;
- other A-category mines; and

all mines whose leases are expiring within two years.

While no specific qualifications are detailed for persons in charge of operation and management of dam waste, qualified and experienced mining engineers and geologists need to be employed by mining companies for conducting prospecting and mining works. There are no requirements for mandatory alarm systems or emergency drills with local communities. The government has the primary responsibility for the rescue of people in event of a dam failure; however, under the doctrine of absolute liability in India, the mining companies would be liable for the dam failure or loss of life or injury caused by the dam failure.

Trilegal - Karthy Nair and Neeraj Menon

Source : Lexology

Supreme Court pulls up mining company for operating without environment clearance

The Supreme Court has pulled up a mining company for going ahead with mining without getting environmental clearance.

The Supreme Court came down heavily on a mining company for continuing with the mining activities without getting the required environmental clearance. The Supreme Court also directed the Orissa High Court to decide and dispose of all the matters wherein status quo was ordered within six months.

On Monday, the vacation bench of Justices MR Shah and Aniruddha Ghose pulled up the counsel appearing for the mining company for going ahead with the extraction of ore when it doesn't have required environment clearances.

The court was hearing the special leave petition by M/S Balasore Alloys Ltd assailing Orissa High Court's order of refusing to extend the interim order of status quo.

The counsel responded, "My application for forest clearance is pending. We've challenged the timelines. We have excavated the ore and have not been allowed to pick it up."

The bench replied, "You cannot be permitted. By way of order of status quo, you cannot get mining clearance. It cannot be done. Even if the



timelines were extended. We'll set aside the HC's order. Anything which is excavated without forest clearance is illegal. You cannot be permitted to continue excavation."

The court further said, "We are in fact going to pass a general order where status quo order has been passed. We'll direct the HC to decide it within 6 months. Without forest clearance, how can you undertake mining?"

The bench then ordered the high court to dispose of the cases in six months and said, "It's not in dispute that the petitioner is not having forest clearance at this stage. Merely because the application for forest clearance is pending cannot be treated as having obtained forest clearance permitting the petitioner to carry excavation activity of mining. Under the guise of order of Status quo, the petitioner who does not have clearance cannot be allowed to carry

the mining activity. The high court has rightly not extended the order of status quo."

"We request the high court to decide and dispose of all the matters where the order of status quo is continuing in mining activity within the period of 6 months from today," the orders stated.

Source : India Today

Auction of mineral blocks stabilising

The government on Wednesday said the auction of mineral blocks has stabilised in the country as 186 mines have been put on sale so far. Of the 186 mineral blocks, 28 were auctioned in the last two months and 46 were successfully sold in FY22, Mines Joint Secretary Veena Kumari Dermal said. "...186 to be precise blocks are allocated through auction. I am very happy to say that out of this, 46 (mineral blocks) were (auctioned) last year and this financial year in the first two months we have completed auction of 28 blocks. So, auction is stabilised in the country," she said during 'India Sweden Mining Day' here.

The state governments, she said, are getting a very good share of revenue from the auctions and stressed that those states which were early birds in the whole race were really happy. The Indian mining sector is vibrant, dynamic and

has very good players, she said, and expressed hope that "the Swedish companies will also take part." Swedish companies, she said, are providing technological and automation support to the Indian mining industry. "Hope today's meeting will help us to kick-start the cooperation and take it forward," she added. Private participation in exploration is being encouraged and a very good legislative provision is made to encourage private participation in exploration also, the joint secretary said.

Swedish Ambassador to India Klas Molin said, "India Sweden Mining Day is precisely to look at opportunities for cooperation. We have all major companies who have long experiences of working in mining in Sweden...and in India here today. "And as we speak there's a panel going on collaboration, opportunities etc. So the day is really meant to look at those opportunities and I am sure lots of tie up and poten-

tial collaboration will follow."

The mines ministry had earlier said that the amendment in mineral auction rules will encourage competition that will ensure more participation in sale of blocks. The Ministry of Mines had earlier notified the Minerals (Evidence of Mineral Contents) Second Amendment Rules, 2021, and the Mineral (Auction) Fourth Amendment Rules, 2021 to amend the Minerals (Evidence of Mineral Contents) Rules, 2015 (MEMC Rules) and the Mineral (Auction) Rules, 2015 (Auction Rules), respectively. The amendment rules have been framed after extensive consultations with the states, industry associations, miners, other stakeholders and general public.

Source : Economic Times

The Ins and Outs: Mines and Minerals Development and Regulation

India is well endowed with natural resources, particularly minerals, which serve as raw materials for many industries, paving the way for rapid industrialisation and infrastructural development. This, in turn, is set to facilitate the economy's ascent along the road of sustained growth and a five trillion-dollar economy. In order to realise the mineral wealth of the country, extensive amendments have been made to the Mines and Minerals (Development and Amendment) Act, 1957 ('MMDR Act') by the

MMDR Amendment Act, 2021 and the corresponding Rules with the objectives of generating employment and investment in the mining sector, increasing revenue to the States, improving the production and time-bound operationalisation of mines, etc.

Further, to facilitate State Governments in identifying more blocks for auction and increase the availability of minerals across the country, the Ministry of Mines had introduced a series of amendments to ramp up the auction

of mineral blocks for composite licencing. To this effect, recently, the Government notified the Mineral (Auction) Amendment Rules, 2022 that allowed global positioning system for the identification and demarcation of the area where a composite licence is proposed to be granted. The Union Cabinet had also approved the amendment to the Second Schedule of the MMDR Act in March, 2022 to specify the



royalty rates of certain minerals, including potash, emerald and platinum group of metals to ensure better participation in the auction of Mines.

This Article studies the series of amendments made to the MMDR Act and related Rules while analysing their impact on the developmental activities of the sector.

Analysis of the Amendments

Removal of the Distinction Between Captive and Non-captive Mines

Earlier, the Act empowered the central government to reserve any mine (other than coal, lignite, and atomic minerals) as a captive mine which would be used for a specific purpose only. The present Amendment removes this distinction between captive and non-captive mines. Now, the mines will not be limited to just a specific purpose/industry/sector. Thus, no mine will be reserved for a particular end-use. All future auctions will be without any end-use restrictions. The amendment would “*facilitate an increase in production and supply of minerals, ensure economies of scale in mineral production, stabilise prices of ore in the market and bring additional revenue to the States...*”

Present amendments in the Mines and Minerals (Development and Amendment) Act, 1957 and the corresponding Rules do nullify several restrictive and covert provisions that existed in the erstwhile Act of 1957. The new regime shall be instrumental in boosting mineral production, improving the ease of doing business in the country and increasing contribution of mineral production to Gross Domestic Product (GDP).

Sale of Minerals by Captive Mines

Earlier, as per the Act, the ores extracted from captive mines were only used by captive industries. The present Amendment provides that captive mines (other than atomic minerals) may sell up to 50% of their annual mineral production in the open market after meeting their own needs. The central government may increase this threshold through a notification. The lessee will have to pay additional charges for minerals sold in the open market. The sale of minerals by captive plants will aid and expedite growth in mineral production and supply, leading to commercial viability in mineral production and, as a result, additional revenue

for the states.

Transfer of Statutory Clearances

Earlier, the Act provided that upon expiry of a mining lease (other than coal, lignite, and atomic minerals), mines are leased to new parties through auction. The statutory clearances issued to the previous lessee are transferred to the new lessee for a period of two years. The new lessee is required to obtain fresh clearances within two years. The present Amendment replaces this provision and instead provides that transferred statutory clearances will be valid throughout the lease period of the new lessee. This amendment ensures continuity of mining operations, even with the change of the lessee and helps to avoid the repetitive process of obtaining clearances again for the same mine, which would facilitate the early commencement of the mining operations.

Auction by the Central Government in Certain Cases

Under the Act, states conduct the auction of mineral concessions (other than coal, lignite, and atomic minerals). Mineral concessions include mining leases and prospecting license-cum-mining leases. The present Amendment empowers the central government to specify a time period for completion of the auction process in consultation with the state government. If the state government is unable to complete the auction process within this period, the auctions may be conducted by the central government. This amendment ensures that no mine is left idle and increases mining in the country.

Allocation of Mines with Expired Leases

The Amendment adds that mines (other than coal, lignite, and atomic minerals) whose lease has expired may be allocated to a government company in certain cases. This will be applicable if the auction process for granting a new lease has not been completed, or the new lease has been terminated within a year of the auction. The state government may grant a lease for such a mine to a government company for a period of up to 10 years or until the selection of a new lessee, whichever is earlier. This Amendment increases revenue for the states.

Lapse and Extension of Mining Lease

The erstwhile Act provided that where the mining operation is not commenced by the

lessee within 2 years of the grant of a lease or the mining operation has been discontinued for two years, the mining lease shall be deemed to have expired for such period. The new amendment substituted the earlier provisions of Section 4A with a new provision stating that the mining lease will not lapse at the end of the said period if a concession is granted by the State Government upon an application by the lessee. It also provides for the extension of the mining lease by declaring that the State Government can extend the threshold period of lapse of the lease only once and up to one year. This ensures continuity in mining operations.

In the earlier act, companies had a non-exclusive licence for the reconnaissance of the area to find out mineral potential. The amendment removes the non-exclusive licence permit.

Simplification of Exploration Regime

As per the new amendment:

- Mineral Blocks for Composite Licences can be auctioned at the G4 level of exploration instead of the G3 level as per the earlier standard.
- Mineral Blocks for surficial minerals can be auctioned for the grant of a mining lease at G3 level instead of G2 level.
- Private entities may be notified under Section 4(1) of the Act to conduct exploration.

Transfer of Mineral Concessions

Restrictions on the transfer of mineral concessions have been removed and now mineral concessions can be transferred without any transfer charge.

District Mineral Foundation (DMF)

It is a non-profit body established to work for the interest and benefit of people and areas affected by mining or mining-related operations. State governments were tasked with establishing DMFs in each mining district of their respective states, as well as prescribing the composition and operation of DMFs, including the use of funds. The new Amendment Act, 2021, empowers the Central Government to direct the composition and utilisation of the funds from the District Mineral Foundation. This ensures the optimization of funds for the development of mining areas.



Conclusion

Present amendments in the Mines and Minerals (Development and Amendment) Act, 1957 ('MMDR Act') and the corresponding Rules do nullify several restrictive and covert provisions that existed in the erstwhile Act of 1957. The new regime will be instrumental in increasing mineral production, improving the ease of doing business in the country, and

increasing mineral production's contribution to GDP.

The amendments have also successfully capacitated the State governments to notify 40 mineral blocks of G4 level of exploration for grant of composite license, out of which 6 mineral blocks have been successfully auctioned, as of April 2022.

However, like any other public policy and

legislation, implementation of the Act and Rules with proper coordination among central and state governments is the key to achieving reforms in the mining sector and sustainable development.

Fox Mandal - Satish N D and Shruthi Ande

Source : Lexology

The trouble with lithium

Lithium, the wonder metal at the heart of the global shift to electric cars, is in a full-blown crisis. Demand has outstripped supply, pushing prices up almost 500% in a year and hindering the world's most successful effort yet to halt global warming.

Elon Musk wants to mine it, China is scouring Tibet for it, battery makers are crying out for it. Lithium, the wonder metal at the heart of the global shift to electric cars, is in a full-blown crisis. Demand has outstripped supply, pushing prices up almost 500% in a year and hindering the world's most successful effort yet to halt global warming.

The shortage of lithium is so acute that in China, which makes about 80% of the world's lithium-ion batteries, the government corralled suppliers and manufacturers to demand "a rational return" to lower prices. Analysts at Macquarie Group Ltd. warned of a "perpetual deficit," while Citigroup Inc. nearly doubled its price forecast for 2022, saying an "extreme" rally could be coming.

The consequences of failure to produce enough lithium are potentially devastating. Global investment in EVs has grown faster than any other new-energy sector over the past few years, outstripping even wind and solar power. Current lithium spot prices could add up to US\$1,000 to the cost of a new vehicle, Benchmark Mineral Intelligence said. Along with higher prices of other raw materials, that is reversing years of falling prices as EVs race to become cost-competitive with gasoline-powered cars. If battery makers can't get enough lithium, it would curb the expansion of clean-energy vehicles, making it harder to meet global emissions targets.

"It looks like the expansion ramp up is not going to be fast enough to hit demand" over the next three years, said Cameron Perks, an analyst at Benchmark. EV makers "have been asleep at the wheel."

The crunch prompted a characteristically blunt tweet from Musk in April. "Price of lithium has gone to insane levels!" he posted on Twitter. "Tesla might actually have to get into the mining & refining directly at scale, unless costs improve."

Musk's Tesla Inc. and Chinese automakers BYD Co., XPeng Inc. and Li Auto Inc. have all already raised sticker prices, as has Contemporary Amperex Technology Co. Ltd., the world's biggest EV battery maker. "The industry is facing very strong headwinds in terms of cost escalation," XPeng President Brian Gu told Bloomberg TV in late March.

The silvery-white metal, the third-lightest element after hydrogen and helium, is in the throes of an unprecedented boom because a slump in 2018-2020 that halved its value caused chronic underinvestment in new sources of supply just as EV demand was taking off. For battery makers, those woes have been compounded by the pandemic and Russia's war in Ukraine, which have snarled supplies of other ingredients they need, including nickel, graphite and cobalt.

Tightening supply and higher prices have prompted a flurry of acquisitions and joint ventures as battery makers and automakers try to secure supplies, and unleashed a wave of resource nationalism among governments. As early as last June, Fitch Solutions said lithium had become a "strategic mineral," and warned of "rising government intervention."

EVs and batteries drew US\$271 billion and US\$7.9 billion of investment respectively in 2021, according to Kwasi Ampofo, head of metals and mining at BloombergNEF. "The upstream part of the value chain has, on the other hand, attracted relatively low investment over the last five years," he said.

Lithium has taken a long time to hit the mainstream. Discovered in 1817 by Swedish chemist Johan August Arfwedson, it wasn't produced in quantity until the US government began stockpiling it to make hydrogen bombs in the late 1950s. After the Cold War, production declined until the metal began to be adopted for use in light alloys, coin cells and then mobile phone batteries in the 1990s.

More than half of the global resources are located in the so-called lithium triangle between Argentina, Bolivia and Chile, where producers pump lithium-rich brine from underground lakes and allow the liquid to evaporate for 12-28 months to yield a slurry that can be profitably processed. Current technology recovers only about 50% of the lithium in the brine.

Much of the remaining supply comes from deposits of an igneous rock called spodumene, with Australia the biggest miner. The ore is roasted and leached with sulfuric acid and the silvery-grey residue typically shipped to China to be made into lithium hydroxide and lithium carbonate – compounds that can be combined with nickel or cobalt to make battery electrodes, or with solvents to make electrolytes.

The quickest way to increase supply is to ramp up output from these existing sources. Ganfeng Lithium Co., one of the world's largest producers, said it'll use record profits to boost output.



Australia's Pilbara Minerals Ltd. aims to raise production capacity more than 50% by the September quarter by expanding its Pilgangoora mine in Western Australia, a project that includes Chinese partners Great Wall Motor Co. and CATL.

For many brine-lithium producers, increasing output quickly is constrained by their permits and the time taken to let the liquid evaporate. One longer-term solution is to find new deposits.

Mining superpowers Australia and Canada have both promised to help develop critical mineral resources, including lithium. China recently announced that its geologists had discovered a spodumene deposit on the Qinghai-Tibet plateau in the region of Mount Everest that could hold more than 1 million tons of lithium oxide. But it takes years to develop a new mine and, in some countries, the process is becoming more difficult due to resistance from local communities.

"There is plenty of lithium in the ground, but timely investment is the issue," said Joe Lowry, founder of advisory firm Global Lithium. "Tesla can build a gigafactory in about two years, cathode plants can be built in less time, but it can take up to 10 years to build a green-field lithium brine project."

Rio Tinto Group's proposed US\$2.4 billion Jadar mine on farmland in western Serbia, which would be Europe's biggest, stalled as thousands of protesters marched in the streets. Rio says the mine, originally scheduled to open in 2026, would create more than 2,000 jobs and meet the highest environmental standards, including using recycled water and electric trucks. Savannah Resources' Barroso project in Portugal and Lithium Americas Corp.'s proposed mine in Nevada are others that have to negotiate local opposition.

Chile's Constitutional Convention this month approved an expansion of environmental governance that includes reshaping water rules and other environmental protections that could affect lithium producers if the charter is ratified in a September referendum. "If you're a multinational company going in to Chile right now, you have to think twice, because you don't know what the rules are," Lowry said. But lithium producers face an even bigger

problem. Part of the reason consumers are prepared to pay a premium for an electric vehicle is that it's better for the environment. But the lithium supply chain is far from green.

"Lithium mineral producers have the greatest need to reduce their emissions profiles," said Dominic Wells, senior sustainability and cost analyst at Wood Mackenzie Ltd.

The Atacama desert of northern Chile is one of the driest places on Earth, but extracting the mineral from salt flats 10 times the size of New York's Central Park and processing it requires a lot of water. According to BloombergNEF, it can take about 70,000 litres of water to make one ton of lithium. Mining spodumene is energy intensive and together with shipping the concentrate to China for refining can emit 3.5 times more carbon dioxide than lithium extracted from brine, according to Wood Mackenzie.

"There's a lot of dirty things happening in producing these materials," said Steven Vassiloudis, chief executive officer of Novalith, which is working on a system that would streamline processing of spodumene and absorb carbon. "Hard-rock lithium has such a high carbon footprint because of the energy requirement" and the many steps needed in conventional processing.

Automakers are wading in to protect the "green" image of their electric cars. BMW and a group backed by German automobile giants including Daimler AG and Volkswagen AG and have begun separate investigations into water use and production methods in the South American salt flats.

Companies are pursuing new technologies to lower expenses, cut water use and green their operations. Charlotte, North Carolina-based Albemarle Corp., the world's biggest lithium producer, is seeking responsible mining certification for its operations in Chile and said it will reduce the intensity of freshwater use by 25% by 2030 in areas of high water risk.

"Producing lithium to use as little electricity and water is a critical goal," said Ken Hoffman, senior expert at McKinsey & Co. "Coming up with one or several of these novel ways to produce 'green lithium' will be vital to the long term success of this industry. Whomever is able to deliver this technology, they should see very strong returns."

That prize has spawned a raft of startups. Many are pursuing direct lithium extraction, a term used to describe ways to chemically capture lithium compounds that would speed up production.

"DLE can massively increase supply," said Hoffman at McKinsey who estimates the technology could come online as soon as late next year. "You don't need two years of drying lithium out from brine. And instead of getting about 40% of lithium out of the brine, you can get more than double the amount."

If they succeed, it will still take time to catch up with demand.

"Even if DLE happens, we are still far behind the car companies' EV plans for at least a decade," Lowry said. "DLE has to be customised. It's not a one-size-fits-all technology."

Albemarle, which carries out its own research, said DLE so far has shown to be "typically less economic and less sustainable than conventional brine resources." The company said it continues to investigate DLE and other processes to meet sustainability goals.

Alternative batteries

The environmental and supply issues have prompted companies to look for alternatives to the lithium-ion battery, including hydrogen. But none have come close to supplanting lithium in the all-important passenger car market, and most are years away from commercial viability.

"Lithium-ion will remain the dominant battery technology, at least up to 2035," said BloombergNEF's Ampofo. "Automakers will potentially have to become miners to help develop and scale up some of these next generation lithium extraction technologies."

Lithium-ion batteries fall into a sweet spot that balances high energy density and safety. The mineral is the least-dense solid element with the greatest electro-chemical potential and a very low melting point, producing an excellent energy-to-weight performance.

Ulderico Ulissi, battery research lead at London-based Rho Motion Ltd., an energy transition researcher, predicts that solid-state and sodium-ion batteries could eventually challenge lithium-ion packs in some applications in the second half of the decade. "EV qualific-



ation, however, is a lengthy process and scaling up manufacturing of new technologies can bring several challenges.”

Recycled cells

Another potential source of lithium is from recycling old batteries, a practice that could meet 16% of annual demand by 2035, according to BloombergNEF. But battery retirements are only set to surge after 2030. “Basically, there's just not enough batteries to be recycled right now,” said McKinsey’s Hoffman, adding

that recycling presents its own environmental problems. “There is no great way to recycle a battery today.”

One roadblock to investing in output is that not everyone is convinced that the market will remain undersupplied and miners don’t want to be burned again by the kind of glut that caused prices to slump in 2018.

The upshot is that the lithium crunch isn’t likely to go away soon, leaving an industry that exists because of the need to protect the

environment with little option but to ramp up output as fast as possible, even with a supply chain that spews emissions and guzzles scarce resources.

“Yes, it helps to be green,” said Perks at Benchmark. “But right now, we need all the lithium we can get.”

— *With assistance from Yvonne Yue Li, Allan Ray Restauero and Elaine To.*

SWASTHA

A GEMCOKATI EMPLOYEES INITIATIVE

Impermanence of health –a bitter reality, no matter what you do

Understanding that our health is temporary could allow us to live fuller lives. In a society where displaying a toned physique has become a benchmark or trend, unfortunately has forced every individual to believe and overestimate about one's health status. Irrespective of what we do, our health is just a temporary state of being. If we realize this the earlier, and start seeing health which requires constant maintenance, we will be able to live a more fulfilling lives.

The World Health Organization (WHO) defines health as a “state of complete physical, mental, and social well-being and not merely the absence of any disease or infirmity.” Thinking deeply, this definition sets the bar pretty high, as it would immediately disqualify most of the human population living.

In the 21st century, the percentage of obese people have risen multifold, where actually obesity is just one medical condition. If individuals with high blood pressure, diabetes, cancer, or psychiatric disorders, the list will be unending, are excluded, then the pool of so called “healthy” people becomes even smaller.

No matter how much you go to the gym every

day, no matter how fantastic your nutrition is, no matter how much perfect your sleep pattern is, no matter how many nutritional supplements/pills for longer life you take, no matter how much zero stress activities you undertake on daily basis, which is all fine and good, but of course our body and mind will eventually break down, and a time comes when the body can be perceived as a burden, and cease to function and as the older you get it is more likely to happen. Yet we all have a tendency to think of health and youth as the standardized state of being throughout our lifetime.

Being in this delusion state can be partly blamed on the excess consumption of social media information by every individual. So when people are bombarded with commercials depicting young people enjoying their best lives, it's no wonder we are told to look at these beautiful people, and forced to see ourselves reflected in these glorified images. This faulty belief makes us overestimate our own health and people wrongly believe that they are healthier than they actually are.

It can be a great paradigm shift if we start thinking of health as a temporary state that requires constant effort to maintain, under



standing that the goal is to prolong this period as long as possible and a shift in this perspective would allow more and more people to live longer and enjoy a higher quality of life. By realizing that one day, we all will suffer a decline in our health, (unless someone leaves the world at a relatively young age), we would be more motivated to create kinder, more humane and more effective care options for our elderly citizens and others who cannot take care of themselves, thus allowing everyone to live more fully.

By acknowledging the impermanence of our health, we would be more encouraged to maintain a healthy lifestyle, valuing the present gifts bestowed on us in whichever form, preparing gracefully for a purposeful end, allowing us to live healthier, thus a journey lived with passion.

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