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FEBRUARY 2021



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(A GEMCOKATI INITIATIVE)

Indian Mining & Exploration Updates

Mining sector – unburdening the legacy issues



Mining sector — unburdening the legacy issues

The government plans to bring in structural reforms in this crucial sector. But the devil lies in the detail

India has huge mineral deposits, but the country's mining sector is still suffering from legacy issues. Making a fresh attempt for a course correction, the Union Cabinet recently approved a blueprint to usher in reforms in the mining sector.

This blueprint, which will be presented in the coming Parliament session, proposes to amend the Mines and Mineral (Development and Regulation) Act, 1957, clarifying doubts on double taxation, rationalising stamp duty and developing the National Mineral Index, among others.

This is not the first attempt by a government to bring in reforms in this sector. But why did the earlier attempts not yield significant results? What were the constraints? Why has the potential of the sector not been fully realised?

According to the government's own assessment, traditionally, one percentage point growth in mining pushes up the growth rate of industrial production by 1.2-1.4 percentage points. Also, one direct job in the sector creates 10 indirect jobs. The mineral sector's contribution to the GDP is only 1.75 per cent, currently. Despite having a huge potential, the country is far from being Atmanirbhar in mineral production. India imports minerals worth over ₹2.5-lakh crore every year whereas the domestic production is only half of that, at ₹1.25-lakh crore.

With the latest move, the government aims to increase minerals production by 200 per cent in seven years. But can it achieve that? There is an urgent need to unlock the sector, everyone agrees, but still remain cautious.

According to Aruna Sharma, a Development Economist and a former Secretary to the government, "Let us say a move has

been made. Intent is there. But the devil lies in the detail. One has to see what the rules say once the amendments pass Parliament muster."

Auctions -- a mixed bag

For example, the "auction only" regime for allocation of mineral blocks was introduced by the Modi government under the MMDR (Amendment) Act, 2015. However, holders of partially or minimally explored blocks were protected and kept out of the auction regime. This relief was given under Section 10A (2)(b) of the Act. But these concessions have neither resulted in a mining lease nor have they reached closure till date.

Similarly, existing holders of Letters of Intent were given protection and kept out of the auction regime on the condition that they will obtain mining leases in a two-year period, by January 2017. This relief was given under Section 10A(2)(c) of the Act. These holders also have not been able to obtain mining leases so far.

India's huge mineral reserves (about 2.7-lakh hectares of mineral land) are locked because of legacy issues created by the provisions of Section 10A (2) (b) and 10A (2) (c). Also, public sector enterprises have for long been sitting on a large number of blocks without producing.

Hence, the government, after wide consultations with States, ministries, industry associations, public and NITI Aayog, plans to bring in major structural reforms that can help India become Atmanirbhar in the mineral sector.

A step towards this is to resolve the legacy issues by amending Section 10A (2)(b) and 10A (2)(c) of the MMDR Act and granting mineral rights only through auction for these blocks. It also proposes to reimburse exploration expenditure of those lease holders whose rights under Section 10A(2)(b) have lapsed.

If a PSU does not obtain a mining lease in the specified time, its allotted mineral block will be auctioned by the State government.

The major objective of the latest set of reforms is to generate jobs, reduce imports and increase production by bringing large mineral blocks into auction.

These amendments will bring a large number of mines for auction. The government believes this will help strengthen the "auction only" regime and boost transparency in the system.

The counterpoint

Will this lead to a maturing of the mining sector? RK Sharma, Secretary-General, Federation of Indian Mineral Industries, feels that the proposed mining reforms are not going to help in establishing a matured system.

"One of the major reforms which is being highlighted is repealing of Section 10 A (2)(b) thereby claiming to make more than 500 mineral blocks available for auction.

It is worth mentioning that while amending the MMDR Act, 1957 in 2015, the government had acknowledged the valuable contribution made by these license holders by introducing Section 10A(2)(b).

"And now removing it from the Act and offering such blocks for auction is against natural justice and will have far reaching adverse implications on the growth of the domestic mineral sector besides tarnishing the image of the country globally," he said adding "It will also show that the government has faltered on its Act and is bound to lead to irreparable loss of investors' confidence in Indian mineral sector, apart from multiple litigation in Courts resulting in such an exercise of the government being rendered completely futile."

Moreover, it will also affect adoption of state-of-the-art technology required in exploration and mining sector besides impeding much-needed FDI, he said adding that "the recent experience of auctioning of coal blocks for commercial mining is a testimony where none

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of the international mining companies evinced interest to participate despite best efforts of the government to attract FDI in coal sector.”

Implementation, the key

While Sharma may have a point, it is also important to note that the government has been

taking corrective measures. If implemented properly they will strengthen the auction regime, increase production by auctioning large number of mineral blocks as almost 500-plus non-operational blocks will be made available for auction.

But, as is the case with electricity, in mining

too, States play a critical role. It will be important for the Centre to have States on board. It needs to adopt a consultative approach for the sector. Besides, on paper, the blueprint seems attractive but it remains to be seen when it finally becomes a law, how good the rules are to implement it. Till then one will have to wait and watch.

To boost mineral exploration, GSI developing repository of all geological data of country

The project is being undertaken under the aegis of the Ministry of Mines

To collate and disseminate all the geological data of the country, the Geological Survey of India has initiated a project, National Geoscience Data Repository (NGDR) that would hold data by all agencies engaged in exploration and geoscientific pursuits.

The project, being undertaken under the aegis of the Ministry of Mines, aims at integrating the data collected by GSI, state geological departments, central public sector enterprises, academic and private sector agencies working in the domain to build a repository in the digital medium entailing multiple user access.

The ministry has also proposed that all the stakeholders from India and across the globe who are willing to participate in the current auction regime for allocation of mineral acreages will also be able to use the NGDR.

Further, the planned Baseline Geoscience Data Collection campaign would also lead to a huge database, which will be the primary inputs for future exploration programmes.

GSI is in consultation with Bhaskaracharya

Institute for Space Applications and Geoinformatics, Gandhinagar, a national institute under Ministry of Information and Technology for development of NGDR.

To expedite exploration activities in the country, GSI has also embarked upon an ambitious scheme to complete major national level surveys by 2022. These include the National Geochemical Mapping (NGCM), National Geophysical Mapping (NGPM) and National Aero Geophysical Mapping Program (NAGMP).

NGCM is an all India programme to cover the entire surface area of the country by geochemical sampling. It will generate distribution pattern of 62 elements for use in managing and developing natural resources; application in environmental, agricultural, human health and other social concerns, as well as to search for hidden mineral deposits.

NAGMP, which is the first of its kind project in the country, is meant to delineate concealed, deep seated structure/ litho-units capable of hosting mineralisation, delineate extension of the existing mineralised zone and understating of shallow crustal architecture in the context of mineral occurrence.

The collation, assimilation and integration of the data generated from the above projects and further interpretation will lead to identification of more areas for mineral exploration in the country, according to a statement issued today by the Ministry of Mines.

The increased investment in mineral exploration will build a robust pipeline of prospective mineral blocks for auction. This will ensure long-term viability and continuity of mining in the country in pursuit of self-reliance.

GSI is also going to adopt sophisticated deep penetration geophysical techniques such as Magneto-Telluric Surveys and Deep Seismic Reflection Surveys to define the crustal architecture for deep seated mineral targeting.

Out of the total mappable area of 3.146 million square kilometres of the country, 3.119 million square kilometres has been covered by Systematic Geological Mapping till December 2020, building up the knowledge database for National Geo-scientific information for boosting mineral exploration activities and other earth science related socio-economic activities and programmes.

Govt assures Coal India of 'full support', stresses learning 'new things'

Coal Minister Pralhad Joshi on Thursday assured Coal India of full government support

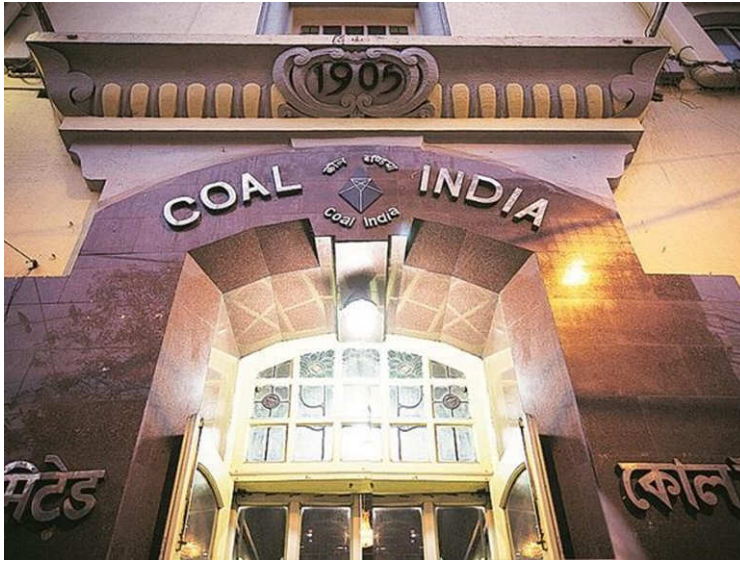
Coal Minister Pralhad Joshi on Thursday assured Coal India of full government support, even as he said the PSU needs to learn "new things" for improvement in its future prospects.

The minister, who was speaking during the launch of Enterprise Resource Planning (ERP) of Coal India Ltd (CIL), said there will be full support to the company because it is the "backbone of the country".

"But having said that the improvement is a continuous process, learning is a continuous process....let us learn new things, new ideas, new approach, and new goal. And in this, the image of coal (sector), Coal India needs to be changed. We have to change the image of Coal India," Joshi stressed.

The ERP of CIL will help improve business performance and growth of the company with enhanced data integrity.

Stating that one and two subsidiaries of CIL were doing very good work, the minister said that other arms of the PSU should also learn from them.



"Implementation of ERP will help CIL in real-time decision making, improving efficiency and reducing costs. It will empower CIL to achieve 1 billion tonne coal production by FY 2023-24 and make it one of the most efficient mining companies in today's dynamic and ever-changing energy scenario," Joshi said.

Coal India accounts for over 80 per cent of domestic coal output.

ERP in Coal India will be implemented in two phases. The first phase launched on Thursday covers operations of CIL headquarters and its two subsidiaries Western Coalfields Ltd (WCL) and Mahanadi Coalfields Ltd (MCL).

The second phase will cover rest six subsidiaries and will be made operational by August this year.

The minister also presented 'Coal Minister's Award' to three coal companies of Coal India Ltd - Northern Coalfields Ltd (NCL), Central Coalfields Ltd (CCL) and WCL in a function held here.

The award has been instituted to promote best and sustainable practices for coal mining in the country.

The minister inaugurated a new Coal Handling

Plant (CHP) at Krishnashila Coal Project of NCL via video conferencing. Having four million tonnes per annum (MTPA) coal handing capacity,

this state of the art CHP will transport coal through conveyor belts and Rapid Loading system to Anpara Thermal Power Station (ATPS) of Uttar Pradesh Rajya Vidyut Utpadan Nigam Ltd and Renusagar Power Division of Hindalco.

CHP is part of CIL's 35 First Mile Connectivity (FMC) projects with over 400 MTPA capacity that the company aims to complete by FY'24 with a whopping investment of Rs 12,500 crore.

Coal Secretary Anil Kumar Jain, CIL Chairman Pramod Agarwal, NCL CMD P K Sinha, CCL CMD P M Prasad, WCL CMD Manoj Kumar and other dignitaries were also present during the function.

Decade after scam, Odisha imposes penalty of ₹2056 cr for illegal mining

This is the biggest ever penalty on any mining company after the mining scam broke out a decade ago.

A decade after the mining scam rocked Odisha

leading to tightening of rules governing raising and transportation of minerals, the state mining department for the first time detected a major illegality, imposing penalty of ₹2,056

crore on Sarda Mines, a merchant miner for excess mining.

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The joint director of mines in Joda of mines-rich Keonjhar district last week sent the notice to Sarda Mines under Section 21 (5) of The Mines and Minerals (Development and Regulation) (MMDR) Act, 1957, for raising 4.2 million tonnes of iron ore in excess of the limits stipulated under environmental clearance, mining plan as well as the limit set by State Pollution Control Board.

The mines department in its penalty demand said the Thakurani Block-B iron mines held by Sarda Mines in Keonjhar district over an area of 947.046 hectare produced at least 7 times of the limit set up by different government agencies such as Indian Bureau of Mines, the OPCB as well as the Ministry of Environment and Forests, Climate Change for the financial year 2019-20

The demand note from the joint director of mines said the excess mining happened in the month of February and March 2020. The mines department calculated the penalty taking into account the price of lump ore decided by the Indian Bureau of Mines. In February 2020, the highest price of lump ore was ₹4,691 per tonne while in March it was ₹4,835 per tonne.

"This is the biggest ever penalty on any mining company after the mining scam broke out a decade ago," confirmed joint director of mines, Salil Behera. He, however, could not clarify how the company raised so much ore in excess of the limits set by various authorities even after many regulations were brought in after the mining scam. In 2010, the state mining department had started Integrated Mines and Minerals Management System (i3MS), a comprehensive information technology-based e-Governance initiative that provided an end-to-end tracking of minerals produced, despatched and consumed in all the 14 mining circles.

Other senior mining officials did not comment on the penalty imposed. HN Singh, vice-president of Sarda Mines, said his company would challenge the order in High Court. "We don't agree with the penalty demand. There are several flaws in it," he said.

After the mining scam was unearthed in Odisha in 2009, Justice MB Shah Commission of Enquiry had found that around ₹60,000 crore worth of ore was mined illegally from Keonjhar and Sundargarh between 2000 and 2010. However, in 2017, central empowered

committee, that was appointed by Supreme Court to probe into illegal mining in Odisha, put the amount at ₹17,576.17 crore following which the apex court ruled that the errant companies have to pay the amount. The CEC calculated the figure for illegal extraction of 215.5 million tonnes of iron and manganese ore between 2000-01 and 2010-11.

The Thakurani B iron ore mines in Joda area leased to Sarda Mines in August 1991 was a supplier of high-quality ore to the Naveen Jindal-led Jindal Steel and Power Limited plant before it was closed on March 31, 2014, due to lack of environment clearances. In January last year, the Supreme Court had allowed it to resume mining operations after directing to pay around ₹933 crore towards environmental compensation to the state government.

However, in September last year, the Ministry of Environment and Forest and Climate Change asked Sarda Mines to stop operation immediately noting that its environment clearance was invalid. Sarda Mines, however, got a stay against the order from Delhi High Court and resumed its operation. Its lease over the Thakurani B mines is scheduled to end in August this year.

Three years on, Goa's stalled mining sector still gathers rust

As Goa's stricken iron ore mining sector completes three years in a deathly slump on February 7, a collective of private sector mines workers and other industry-dependents now appear to be banking on Prime Minister Narendra Modi's intervention to resolve the ongoing deadlock.

Three BJP chief ministers -- namely late Manohar Parrikar, Laxmikant Parsekar and the latest incumbent Pramod Sawant -- have so far failed to resolve Goa's prolonged mining imbroglio, which began first with a Supreme Court ban on mining in 2012. In 2018, another apex court order had led to complete curtailment of fresh excavation of ore in Goa.

"We now urge Prime Minister Narendra Modi for his immediate intervention for resumption of mining in Goa, before Goa loses its fourth consecutive mining year due to the mining ban imposed by the apex court of India," president of the Goa Mining People's Front Puti Gaonkar has said.

While the state's mining sector contributed between 15 to 18 per cent of Goa's Gross Domestic Product at its peak in 2012, in the same year witnessed a series of events, beginning with the revelation of a Rs. 35,000 crore illegal mining scam by a judicial commission, led to the closure of the mining sector.

The mining scam became one of the key

agendas of the 2012 state assembly elections, which resulted in the Manohar Parrikar-led Bharatiya Janata Party coming to power.

Months after taking charge, Parrikar ordered a temporary suspension of all mining activity in the state, pending verification of mining leases.

Days after Parrikar's decision, then Union Minister of State (Ind. charge) for Environment and Forests Jayanthi Natarajan cancelled all environment clearances granted to the 90-odd mining leases, before the Supreme Court in the same year imposed a ban on mining,

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while hearing a petition filed by Goa Foundation, one of the state's top green NGOs.

The mining sector resumed again in 2014 with a 20 million ton cap on extraction of ore, but came to a standstill once again in 2018, after the apex court found glaring irregularities in the lease renewal processes. This time the top court -- and later the Goa Lokayukta as well -- faulted then Chief Minister Laxmikant Parsekar for hurriedly renewing a majority of the mining leases without following due processes.

The apex court had also urged the state government to start the process for fresh allotment of leases, a step which the Goa government has still not adopted. The 2015 amendment to the Mines and Minerals (Development and Regulation) Act mandates that iron ore leases should be mandatorily auctioned.

According to Claude Alvares, director of Goa Foundation, auctioning of the mining leases would be a faster way to resume mining in Goa, instead of scouting for a "legislative cure" to restart the sector, which Chief Minister Pramod Sawant as well as Bharatiya Janata Party's central leaders have insisting on.

"Second, since the stoppage of mining on 15 March 2018, over two and a half years have passed, and there has been absolutely no movement. Is a 'legislative cure' actually the quickest way to resume mining? Had the state government adopted either the auction or the state mining route, surely operations could have begun?" Alvares said, adding that going the auctioning route would also earn more revenue to the state exchequer.

"The iron ore lease auctions over 2015-2019 across India have resulted in a six-fold

increase in the mineral sale proceeds," Alvares said. Congress spokesperson Ramakant Khalap has blamed the BJP for the current mining impasse.

"The present economic chaos is basically because of late Manohar Parrikar's haughtiness and obstinacy in abruptly closing mining in Goa and later not opposing continuation of closure of mines in the Supreme Court and aggravating the misery by illegal renewal of 88 mining leases," said Khalap, a former Union Minister of State for Law.

While little has emerged by way of a political or a legislative solution to the crisis, the Supreme Court is currently hearing a review petition filed by the Goa government which has urged the apex court to take a relook at its 2018 order.

Boost to production and pvt investment as mining reforms get green signal

Centre removes distinction between captive and merchant mines, will amend the Mines and Minerals (Development and Regulation) Act, 1957 to enforce reforms

The Union Cabinet is learnt to have approved a reform package for the mineral mining sector which would entail amendments to three existing laws, pricing formula for minerals, exploration of mines and several taxes and duties levied on mining. Officials said this is expected to boost production and private investment in the sector.

The Centre has removed the distinction between captive (self-use) and merchant (commercial sale) mines. The Centre would amend the Mines and Minerals (Development and Regulation) Act, 1957 (MMDRA) to enforce the reforms.

Senior officials said the amended MMDRA

would be placed in Parliament in the upcoming session.

Under the proposed reforms, captive mines would be allowed to sell 50 per cent of the minerals excavated in a year. The Centre has also proposed to give 50 per cent rebate in the quoted revenue share, for the quantity of mineral produced and dispatched earlier than scheduled date of production

The Centre has proposed to amend the section 10A(2)(b) & 10A(2)(c) of the MMDRA in order to unlock more mines for auctioning. This would entail Centre auctioning the pending mining leases as well. Section 10A(2)(b) pertains to the leases where reconnaissance permit (RP) or prospecting licence (PL) were granted and 10A(2)(c) relates to grant of mining leases (ML).

The Centre plans to compensate for the

mineral concessions which would get cancelled under this amendment. The compensation would come from the National Mineral Exploration Trust (NMET). NMET receives Rs 800 crore annually via the royalty paid by mineral mine owners. The Centre has also proposed to make NMET an autonomous body in order to boost exploration.

The move comes after auction of coal mines to private companies for commercial mining and sale was successful with the Centre awarding 19 mines to varied set of companies.

With this, the monopoly of state-owned Coal India Limited (CIL) ended, 42 years after coal mining was nationalised.

The Centre amended the Coal Mines (Special Provisions) Act, 2015, in May 2020 to open the coal auction for non-mining, MSMEs and foreign companies. This paper reported

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recently, the Centre would announce opening up of mineral mining sector similarly and amend the MMDRA for the same.

“We have brought reforms in the coal sector and we want to bring them in mining as well. But implementation and auction of non-coal mines is with the states. In 40-45 days, we will come out with other mineral reforms,” Union Minister of Coal, Mines and Parliamentary Affairs Pralhad Joshi had told the paper in November.

Federation of Indian Mineral Industries (FIMI) in a recent note, however, had asked the government to review the auction strategy for mineral mining. “Auction has neither served public good nor led to fair allocation of resources. The sole focus to maximize

revenues for the States has adversely affected long-term mineral development in the country and socio-economic benefits in mining areas,” R K Sharma, Secretary General, FIMI said.

As part of the mining reforms, the Centre will also amend the Indian Stamp Act, 1899, in order to bring uniformity across the States in calculation of stamp duty. “Effective tax rate (ETR) on mining in India is 64 per cent which is highest in the world where in other countries it ranges between 34-38 per cent. One such tax is stamp duty which is computed in different ways in different states. We will simplify it,” said an official. A committee would also be set up to resolve the “double taxation” issue in the mining sector.

The MEMC Rules (Minerals (Evidence of

Mineral Contents) Rules, 2015) will be amended for inclusion of the globally accepted classification standards like CRIRSCO, JORC, etc. and latest UNFC classification.

The Centre has also proposed to reallocate non-producing blocks of the public sector utilities (PSUs) so as to increase number of mines into production. There will also be charges levied on extension of mining leases of PSUs. But, there will not be any charges on transfer of mineral concessions for non-auctioned captive mines.

It is learnt that the Centre would also ask PSUs to facilitate production from those mines which were auctioned in March 2020 but have started production even after transfer of valid rights, clearances, etc.

Deep mining: Over 500 non-coal mineral blocks up for grabs

Sources said the Cabinet also gave the go-ahead for reallocation of several non-producing blocks of the state-run companies, a move that could also enthuse the private players as many of these blocks have abundant proven resources.

Over 500 non-coal mineral blocks, partially or minimally explored under current leases, but are entangled in legacy issues and litigation, will be up for grabs as the Cabinet is learnt to have approved a proposal to amend the relevant law for their re-allocations through competitive bidding. Also, the employment-intensive, but highly under-invested sector, will get a fillip from a Cabinet decision to do away with end-use restrictions for miners. Those with captive leases will be allowed to sell the minerals in the open market.

Sources said the Cabinet also gave the go-ahead for reallocation of several non-producing blocks of the state-run companies, a move that could also enthuse the private

players as many of these blocks have abundant proven resources.

The moves are in sync with the National Mineral Policy, which aims to increase the domestic production of non-coal, non-fuel minerals by 200% in seven years with a greater private sector participation.

The leases stuck in disputes and legacy issues have failed to start production even after a 5-year window provided under the Mines and Minerals (Development and Regulation) Act in 2015. The rescinding of the relevant sections of the Act will bring these leases back in the hands of state for prompt reallocation, the sources said. The current holders of these leases will be compensated for exploration expenditure incurred by them, by dipping into the funds under the National Mineral Exploration Trust (NMET).

Mineral-potential areas will be put to auction offering seamless prospecting licence-cum-mining-leases and this will add to certainty of tenure and will come in handy for potential

investors with deep pockets and appetite for long-gestation projects.

“These amendments will make a large number of mines available for auctions. It will help us strengthen the ‘auction-only’ regime and boost transparency in the system,” an official source said.

The investor-friendly measures are taken as part of the Atmanirbhar Bharat scheme for the mining sector announced by finance minister Nirmala Sitharaman in May last year.

While the distinction between captive and non-captive mines will be removed, captive miners will likely augment production for sale in the open market, boosting supplies in the country. This also means that the preference to ‘captive’ users will go and, instead, all mines will be available for anyone including commercial miners. Captive mines will be allowed to sell up to 50% of the minerals excavated.

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The sources added that as in the coal sector, it is proposed to provide 50% rebate in the quoted revenue share for non-coal mineral lease holders, for the quantity of mineral produced and dispatched earlier than scheduled date of production. Further, the cabinet has also cleared the long-pending demand of the industry for waiver of charges for transferring mineral concessions for non-auctioned captive mines.

Given that hefty levies are making India's

mineral sector globally uncompetitive – the effective tax rate (ETR) on mining in India is about 64% which is highest in the world where in other mineral-rich countries it ranges between 34-38 % – , the government has also proposed to bring in necessary amendments to the Indian Stamp Act, 1989, to bring in uniformity across states in calculation of stamp duty. However, it remains to be seen if these will be duly complied with by states, as royalty from minerals and stamp duties on these items are large revenue sources for mineral-

rich states.

The cabinet has also approved introduction of an index-based mechanism by developing a National Mineral Index (NMI) for various statutory payments and others for future auctions. At present, the average sale price (ASP) is the basis for calculation of various statutory payments, which is subject to distortions due to absence of sale price data for some minerals, differences in prices across states, etc. A committee will be constituted to examine the issue, the sources added.

Prospects of Phosphorite in Jurassic Sequence of Jaisalmer Basin, Western Rajasthan

During the course of systematic Geological mapping (1974-1982) author recorded phosphatic nodules in upper most unit-D of Jaisalmer Formation (Middle Jurassic) and basal unit -A of Baisakhi Formation (upper Jurassic) of author's classification. The nodules were recorded at places like Nibh Dungar, Kuldhar, Manpiya, Rupsi, north of Khara Rann and Kaladungar. Keeping in view better concentration of phosphatic nodules Kaladungar section was studied in detail.

Geology and distribution of Phosphorite in Jaisalmer

Kaladungar occurrence : Phosphorite as phosphatic nodules occur in the Jaisalmer-Baisakhi contact zone of Middle to upper Jurassic age. Phosphatic nodules are sporadically distributed in marls and marly calcarenite in unit-D of Jaisalmer Formation and is exposed over potential area of 0.4 Sqkm with average thickness of 0.35 m while Basal Baisakhi unit-A is mainly made up of shales which contains five phosphatic nodules bearing ferruginous bands in thickness of 0.35 m covering an area of 0.65 sq km. Preliminary estimates shows the Kaladungar prospect may have total geological resource of 2.6 million tonnes. Baisakhi nodules solubility

tests of two samples show solubility of phosphate in 2% formic acid (FA) 39.19% and 34.5% and in neutral ammonium citrate (NAC) 16.71 and 9.76%. The Kaladungar phosphorite is suitable for direct application in acidic soils. Basal Baisakhi shale has five phosphatic nodules bearing ferruginous bands and nodules have analysed phosphate content varying from 5.85-22.42% P₂O₅, ferruginous cortex 0.5-9.95% and host rock shale 0.5-1% (Laul and Kumar, 1994). Average grade is 9.5% P₂O₅. Jaisalmer Formation phosphatic nodules have average grade of 22.47% P₂O₅. The average grade of Jaisalmer-Baisakhi contact Zone is 12.75% P₂O₅ in potential area. The other economic minerals in vicinity of area are cement to high grade limestone of Pohar area and locally produced salt of Kanod rann. Pohar area contains drinkable groundwater under artesian conditions unlike other areas of marine Jurassic sequence having saline groundwater.

Kanod rann area may be prospective to explore the thin phosphate bearing zone but rich in grade of 22% or more of P₂O₅ in unit-D of Jaisalmer Formation by geochemical sampling followed by pitting and trenching.

Nibh Dungar area: Nibh Dungar is mainly

represented by units-C and D of Jaisalmer Formation. The unit-C in general is represented by calcarenite, calcareous sandstone and at places associated with fragile sandstone whereas unit-D in general is represented by sequence of calcarenite-oolitic calcarenite-calcareous sandstone-calcilutite. At places limestone is marly to shaly. Localised occurrences of small phosphatic nodules (4-5 cms) have recorded in shaly to marly limestone in south-eastern part of Nibh Dungar. In surrounding area Basal Baisakhi unit-A is mainly concealed and sometimes exposed in Nala sections. It is mainly made up of shales/clays with intercalated sandstone. It is 4m thick west of Nibh Dungar in nala section and contains phosphatic nodules (4-5 cms) as core of ferruginous nodules in ferruginous partings. Baisakhi unit-A is 6m thick north and west of Bhuj Kharin/ khadin overlain by arenaceous bed of unit-B of Baisakhi Formation.

Manpiya area: East of Manpiya NNW trending fault (Manpiya Fault) is perhaps continuation of Ramgarh Fault along which Jaisalmer-Baisakhi contact zone has been faulted down and Basal Baisakhi shales form depression.

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Fault controlled ephemeral stream Kankani flows through this depression. The phosphatic nodules bearing zone is exposed in lower part of fault scrap section. The Baisakhi shales have been eroded away by river. However phosphatic nodules bearing zone of Jaisalmer Formation with limited average thickness of around 0.35m and rich grade of 22 to 27% P₂O₅ is expected at shallow depth.

Rupsi hill section : This Baisakhi section is mainly represented by 4m thick dark grayish shale at basal part followed upward by 3m thick greenish shale with nodules (8-9 cms) bearing layer. The nodules have phosphatic core at places. The eastern part of Mitha rann may be prospected by geochemical sampling initially followed by pitting and trenching if required. The limestone of Jaisalmer Formation near rann may also be examined.

Baisakhi section north of Khara Rann:

This section is mainly represented by 9m thick shales (unit- A) of Baisakhi Formation containing phosphatic nodules bearing ferruginous bands at 5.50-9m level (about 3.50 thick zone). Kaladungar near kanod rann is extension of Khara rann section. Khara rann Baisakhi section (unit- A& B) along with Jaisalmer unit-D exposed on other side of rann and rann area deserves attention for more studies and prospecting. Baisakhi section north of Khara can be easily prospected by pitting, trenching, section measurement and sampling as arenaceous beds over phosphorite bearing shales are only 1.50 m thick.

Kuldhar area : This area is well known to Geologists as type section of Kuldhar member- topmost member of Jaisalmer Formation. This has been mapped as unit- D of Jaisalmer Formation. This unit and overlying unit A (Baisakhi Formation) may be examined for phosphorite.

Prospective Areas: Most of occurrences of phosphorite as phosphatic nodules were recorded during mapping and not studied as mineral prospects excepting Kaladungar occurrence. All the occurrences deserve attention as mineral prospects.

Following are suggestions for systematic approach for studying and prospecting of recorded occurrences.

History of Kankani river and its bearing on phosphorite prospects:

During wet Holocene period Kankani now ephemeral stream was perhaps flowing along NNW trending fault in upper reaches followed by flowing in ENE direction (general strike direction of formations) through valley now ranns and eroded away Basal Baisakhi shales along with phosphatic bands as results only thin layer of rich phosphatic nodules (22-23 % P₂O₅) of Jaisalmer Formation may be expected below Manpiya depression of Kankani and eastern part of Mitha rann of Rupsi, Khara rann and Kanod ranns. The Jaisalmer limestone sections near Mitha rann, Jaisalmer limestone with high grade phosphatic nodules in thin layer together with Baisakhi shales and its phosphorite bearing ferruginous bands, overlain by ferruginous sandstone/ ironstone exposed on either side of Khara rann and Kanod rann may be studied in detail and prospected by pitting and trenching for sampling along with host rocks- limestone , marls (unit -D) of Jaisalmer Formation and shales (unit -A)) of Baisakhi Formation The area around Nibh Dungar deserves attention for prospecting of phosphorite zone by geochemical sampling followed by pitting and trenching for sampling. In Kuldhar

area Jaisalmer- Baisakhi contact is gradational and appears to less disturbed so this area may be examined for phosphatic nodules in contact zone. Outcrops and depressions of Baisakhi unit-A around Kuldhar may be carefully examined.

The occurrences of phosphorite between

Rupsi and Kanod areas along Jaisalmer - Baisakhi contact are shown on District Resource map of Jaisalmer district of Geological Survey of India (Figure 1).

Conclusion: Jaisalmer-Baisakhi gradational contact zone is rich in phosphorite and deserves attention. It may be mentioned that depressions along Kankani river only exposed sections on either side of ranns like Khara & Kanod ranns are more prospective and in rann areas only thin but rich in phosphate layer is expected. Similarly Nibh Dungar area is prospective so Nibh Dungar and surrounding depressions may be prospected. Kuldhar area may also be carefully examined for prospecting.

Acknowledgment: Author is thankful to Dr

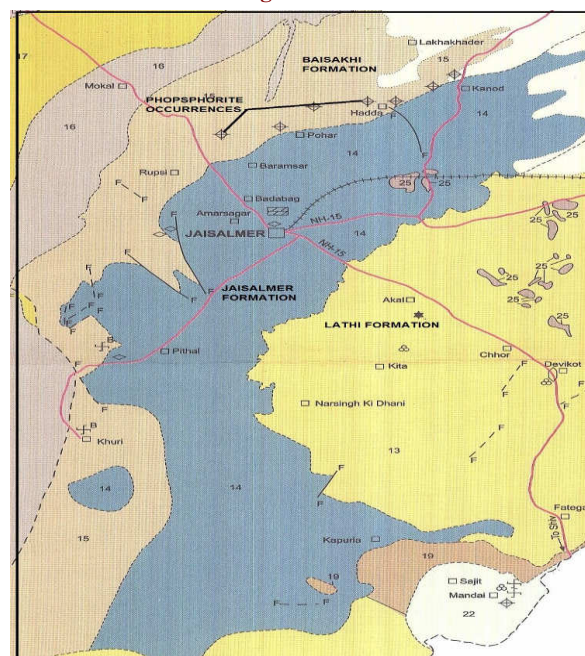


Figure 1: Geological map showing distribution of phosphorite occurrences between Rupsi and Kanod (part of District Resource Map of Jaisalmer district, Geological Survey of India)

Vivek Laul , Vivek Geoservices Jaipur for keeping author updated about Geological, exploration of minerals and mining activities in India and world and for going through MS of article for corrections and formatting of article for Geonesis.

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How Long Will Coal Remain King in India?

India isn't ditching coal. But its use could plateau and even decline with the right blend of policies and technologies.

Despite market turbulence brought by the coronavirus pandemic, 2020 proved to be a formative year for India's clean energy transition.

Solar prices hit record lows, definitively ousting coal as the cheapest source of electricity. The government held creative auctions designed to facilitate adding greater amounts of intermittent renewables on the grid. And Prime Minister Narendra Modi reaffirmed India's commitment to reaching its bold renewable energy targets, claiming the country will ultimately exceed its Paris climate goals.

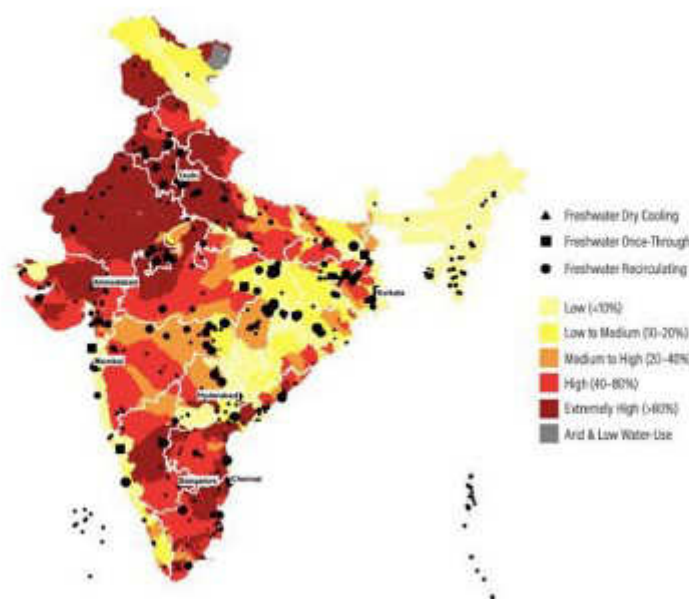
But the growing adoption of solar, wind and other clean energy technologies doesn't tell the full story of India's energy shift. It is impossible to ignore the role of coal.

State-owned enterprise Coal India is the largest coal mining company in the world. The coal sector is a major source of revenue for states and the central government. Also, while renewable energy capacity is dramatically increasing, coal still provides around 70 percent of the country's electricity.

Last year, the Modi government sought to boost the domestic coal mining sector with a series of commercial auctions. The government has also repeatedly delayed the implementation of pollution regulations for coal plants, effectively throwing the dirtiest coal plants a lifeline.

As the third-largest producer of carbon dioxide emissions in the world today with an economy that's poised to see massive growth in the future, what happens to India's energy mix will have a significant impact on the entire planet and its inhabitants.

Figure 2.3: India's Freshwater-Cooled Thermal Utilities Mapped Against Baseline Water Stress



Source: Adapted from WRI Report.

Experts say that these factors have already killed prospects for new coal-fired power plants in India. In 2019, the states of Gujarat and Chhattisgarh, the latter of which is home to India's third-largest coal reserves, announced that they will not build any new coal generating facilities. Last fall, Indian power minister R.K. Singh said that the generating capacity from 29 coal plants scheduled to retire in the coming years would be replaced entirely by renewables.

Still, coal isn't going away. Even as the Indian government strives to meet bold renewable energy targets, coal use is expected to increase as India's overall energy demand grows. With a robust domestic supply chain and ample capacity available to ramp up coal use at existing power plants, India could burn through a lot more of the polluting resource without having to build any new generating stations.

"We have an abundance of coal, so the reality is that we will have more coal as we go forward," said Sumant Sinha, chairman and managing director of ReNew Power,

India's largest clean energy company, and author of the book *Fossil Free*.

As a percentage of India's total power production, coal is expected to decline from 70 percent to 50 percent over the next decade, according to India's Central Electricity Authority. But in absolute terms, coal use will increase as India's overall energy demand grows.

"Now, the question is what happens after that? What happens after 2030 and 2035?" said Sinha. "Because in reality, nobody's going to want to invest in new coal capacities."

All eyes on solar and storage

What India's energy mix will look like in the medium term relies in large part on how the next phase of India's clean energy transition unfolds. Solar and wind have proven to be reliable and affordable energy resources. But the market for energy storage and other advanced technologies needed to balance the use of intermittent renewables on the grid is still emerging.

Until clean energy is flexible enough to

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provide power whenever it's needed, experts say there will be a role for coal in India — even if it's not as dominant in the mix of energy resources as it once was.

“Today, solar electricity is the cheapest electricity that is produced in India, but only when the sun is shining. At night, coal is the cheapest electricity. So we are living in these times where both coal and solar are growing,” said Ajay Mathur, director general of The Energy & Resources Institute (TERI), in an interview in Delhi early last year.

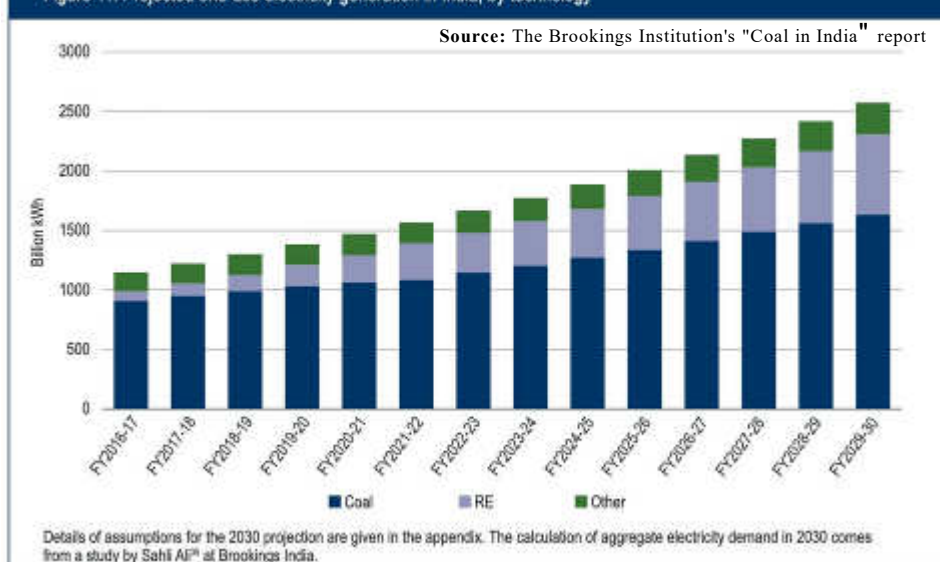
“This will continue until we get batteries that are inexpensive enough that...the cost of solar-plus-storage is less than the cost of coal electricity,” he continued. “Once that happens, nobody, not a developer or a financier, will have any interest in financing a coal plant.”

Before the pandemic hit, TERI projected that the tipping point for low-cost battery storage would come before 2030. In a year-end memo, TERI researchers affirmed their belief that India may not need any new coal-fired power plants beyond what's in the current pipeline. But the memo also underscored that India does need a comprehensive set of solutions to increase the flexibility of its power system and integrate a larger share of variable renewable energy.

According to a 2019 Brookings Institution report, coal will still produce the majority of electricity used in India at the end of the decade. Coal use in the power sector could plateau, according to the authors. But that will require deploying renewables at an even faster pace than the current trajectory and increasing the utilization or load factor for those renewable energy projects, as well as converting coal-fired power plants to natural gas and growing hydro and nuclear power generation.

Sivaram noted that accelerated investments in energy efficiency, and air conditioning in particular, will be critical.

Figure 11: Projected end-use electricity generation in India, by technology



India's cooling demand could drive demand for an additional 800 gigawatts of power generation by midcentury, which is more than twice the capacity of India's entire electricity capacity today.

Sinha of ReNew Power believes that coal will eventually reach negligible levels in India, but that the transition will take time and require building new competencies and promoting an equitable transition.

“It's going to be a gradual process,” he said. “But that gives sufficient time for people to get trained away from coal and into newer areas [and] for those companies that are coal-based...to wind down and find new business models and invest their money into new activities. It could be solar manufacturing, for example. I think that's the way the transition is going to work out.”

An all-of-the-above approach

There are signs that India's transition could move more rapidly than expected. Continued cost declines in solar and wind, coupled with pervasive health and environmental issues, have started to trigger discussions in India around closing existing coal facilities, in addition to avoiding the construction of new ones. Notably, Power Minister R.K. Singh and Finance Minister Nirmala Sitharaman have both stated that India's oldest and dirtiest coal-fired power plants need to shut down.

Aarti Khosla, founder and director of Climate Trends, a Delhi-based strategic communications initiative, said these are no longer isolated remarks.

“The fact is that there are a lot of open doors now to have these conversations because there is growing evidence of coal power's role in aggravating air pollution,” she said. “It is about a range of issues from societal impacts, the impact on health, and also economic indicators, which are looking worse due to air pollution impacts. Today, it's far more possible for states to be discussing the phase-down of existing coal and not just stopping the new build.”

However, India's Ministry of Power appeared to backtrack last month on commitments to shutter existing coal facilities by proposing to allow relinquished plants to continue selling power, which could help old coal plants earn additional revenue. The situation today remains murky as policymakers seek to mitigate poor air quality while keeping coal plants open.

“It's interesting because the government does have a really strong commitment to clean energy, but that is not the same as a really strong commitment to decarbonization,” said Kanika Chawla, senior

Continued on Page 11

program lead at the Council on Energy, Environment and Water, a Delhi-based think tank.

“They want clean energy to thrive. They want it to be a new business and industry that develops in India. They want the world to come and participate in the Indian energy transition given how much private money is required. But that doesn’t mean they’re willing to shut down power plants,” she said. “So it’s a bit of an all-of-the-above kind of approach.”

That approach is reflected in the government’s treatment of air pollution regulations, which would require coal plants to adopt new pollution control technologies. The rules have already been delayed several times. And yet 70 percent of India’s coal plants may still fail to comply with the current 2022 deadline, according to the Centre for Science and Environment, a Delhi-based think-tank.

In addition to propping up coal-fired power plants, the central government has taken concerted steps to support coal mining. Because existing coal plants are operating at extremely low plant load factors (PLFs), there is plenty of room for India to use more coal without having to build additional plants.

“Currently, there’s not enough demand, so a lot of these plants are not operating at their full capacity or at very low PLFs. There are some plants where they are struggling with the availability of coal,” said Vibhuti Garg, energy economist with IEEFA, in an interview last year. “But as economic growth picks up and demand for electricity picks up, while we are adding more and more renewables, there is a highly likely chance that this existing coal capacity will be ramped up and that will contribute to more emissions.”

New auctions for coal mines

In June 2020, Prime Minister Modi launched an auction process to open 41 coal mines to commercial mining for the first time. The move was designed to create competition for government-owned Coal India, reduce India’s reliance on imported energy products, and attract investment to help the country recover from the economic fallout of the COVID-19 pandemic.

“The market for coal is now open. It will help all sectors,” Modi said in a video address.

The auction brought new domestic players into the Indian coal sector. However, two-

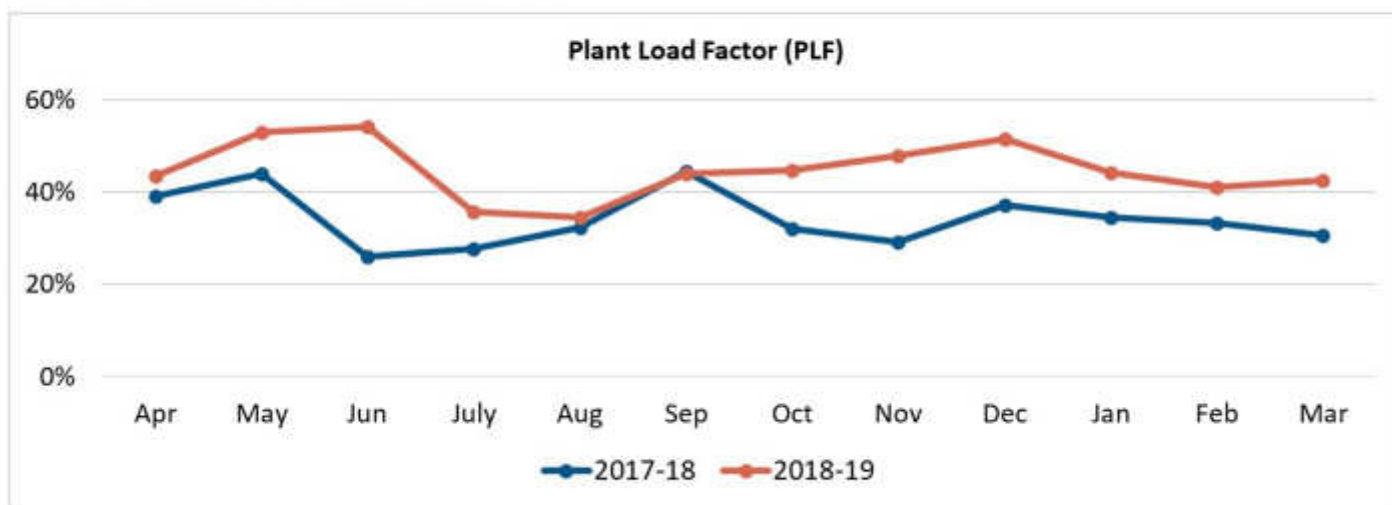
fifths of the mines opened up to private investment received no bids, and zero foreign firms participated.

“They got none of them because foreign capital is not interested in investing in coal, full stop,” said Tim Buckley, director of energy finance studies for Australia and South Asia for IEEFA. “That’s how far we’ve moved.”

But the Indian government hasn’t given up on expanding the domestic coal mining sector, claiming that recently auctioned mines will create tens of thousands of jobs. In December, the government reinvited bids for four coal blocks that initially saw little interest. Indian officials are also looking at ways to expedite the operationalization of coal blocks that have already been allocated or auctioned. In addition, the central government plans to come up with the second round of auction of blocks for commercial mining in January.

India is home to vast coal reserves, but it still imports large quantities. The push to expand domestic mining stems from a desire to mitigate energy security risk. Some government officials also believe that coal will be the largest contributor to India’s ambition of becoming a \$5 trillion

Figure 3.1.1: Prayagraj Power Generation Company Limited Plant Load Factor FY2017-18 and FY2018-19



Source: CEA Monthly Generation Reports.

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economy.

Balancing development and "breathable air"

While energy demand took a dive in 2020 amid the pandemic, the International Energy Agency's December market report forecasts global electricity demand to increase in 2021, driven predominantly by China and India.

Looking at the longer term, India is expected to lead the world in energy demand growth between now and 2030. To meet the needs of a growing population seeking upward mobility, India's per capita energy consumption will have to quadruple, according to an economic survey presented in Parliament last year.

Meeting all of India's growing energy needs will take more than reaching the country's target of 450 gigawatts of renewables by 2030. Even if the energy transition continues to accelerate in the

electricity sector, coal use in India's growing industrial sector must still be addressed.

"Even if India meets the ambitious 450-gigawatt target, its overall coal use is still slated to rise because of its industrial sector, which the IEA projects will be the economy's largest source of growing emissions and coal use," said Columbia's Sivaram. "So it's just as important this decade to demonstrate clean industrial technologies — in steel, fertilizer, cement, petrochemicals and other industrial sectors — that can avoid the need for coal use so that in subsequent decades, India can rapidly wean its industrial sector off coal."

"India should not have to sacrifice development for breathable air," he added.

Air pollution killed more Indians in 2019 than any other risk factor — and that was before the pandemic. Doctors are concerned that poor air quality makes COVID-19 even more deadly. Recognition of these

threats could fuel the political will to put India's clean energy transition on an even faster path.

Cities have already seen air pollution levels spike as winter sets in and business activity resumes. The mountains that were briefly visible from Delhi at the height of the coronavirus lockdown are once again shrouded in smog. While it's a mixed picture, market-watchers are optimistic that coal will meet its demise sooner rather than later.

"It is a period of flux, but it will shake out very soon in favor of a transition toward renewables," said Khosla of Climate Trends.

"I think among the policymakers in the country, one thing is pretty clear: With the rapid expansion that will happen in the consumption of energy, not all of it can be met by fossil-fuel sources," she said. "Coal will no longer be the king."

India's mining reforms ignore the livelihood and rehabilitation of those affected by the industry

The reforms focus on increasing mineral production while remaining silent on the damaging effects of mining over the last few decades.

As the debate around the new farm laws rages on, the Indian government has gone ahead and cleared changes in the country's mining laws, to push mineral extraction and production. Like farming, mining is another sector where the mining reforms, meant to boost the economy, are going to have large-scale consequences.

The changes, according to the government, will have a positive impact on the sector and economy, but experts working with the mining-affected communities note that they could have a domino effect,

with a negative impact on communities, human health, water bodies, environment or wildlife.

The experts point out that the government, in fact, needs to look at displacement and rehabilitation issues and give attention to the transition of communities and their livelihoods in areas where mines will exhaust in another two or three decades.

The mining reforms proposed in August 2020 aimed at increasing participation of the private sector in mineral exploration, clearly defining illegal mining, removing the distinction between captive and non-captive mines, resolving legal issues, moving towards an auction-only regime, developing a national mineral index and creating

tangible assets using the district mineral fund.

In May 2020, while the central government was announcing a Rs 20-lakh crore package to kickstart the stalling economy, mining reforms was a big item on the agenda. It was also emphasised during the budget of 2020.

The move, however, was criticised by the mining-affected communities with experts stating that it comes in the middle of the Covid-19 pandemic while people are battling for survival. They had also noted that such far-reaching changes – propagated only in English language and only

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online – need to be widely accessed and debated instead of just giving a few weeks to people to send suggestions. The government had received a large number of comments and suggestions on the proposed reforms in response to the public consultation notice.

Earlier this month, sources confirmed that the Union Cabinet, chaired by Prime Minister Narendra Modi, cleared changes in the mining norms to give a push to the sluggish economy. The view that the uptick in mining activities and mining reforms will give a significant push to the slowing economy, including providing jobs, has been highlighted by many in the central government and industry, stating that it will help in taking the Indian economy to the “five trillion-dollar mark” within the next few years.

What changes will mining reforms bring?

According to sources, the changes made by the Union Cabinet will “resolve legacy issues through amending the Mines and Minerals (Development and Regulation) Act which will make a large number of mines available for auctions and strengthen the government’s idea of an auction only regime and boost transparency in the system”.

The mining reforms cleared by the cabinet, including amendments of certain acts, will now go to parliament for clearance during the budget session in February 2021.

The reforms will also have provisions for “compensating those whose mineral concessions would be cancelled under this amendment, through the National Mineral Exploration Trust funds”.

According to sources, the government believes that the move will “operationalise a large number of mines and will bring a large number of mines into production while making the public sector units efficient and competitive”.

In other words, this would mean a lot of new chances for the private sector into mining as well as taking big strides towards an auction-only regime for minerals – a move that is not entirely appreciated by some players in the mining sector.

This would mean that soon about 500 mineral blocks across the country would be up for auction even as the final decision of it will depend on the states where those mines are situated.

The reforms also talk about charges on the extension of mining leases for government companies to create a “level playing field” and bring uniformity in the sector. The changes further focus on the removal of the distinction between captive and merchant mines following which the captive mines will be allowed to sell up to 50% of the minerals excavated during the current year.

Kanchi Kohli, a senior researcher with Delhi-based Centre for Policy Research, emphasised that these reforms “present a myopic view of the mining sector.”

“The legacy issues do not identify the serious infirmities that have been identified by high-level committees, including that of the Supreme Court,” Kohli told Mongabay-India. “These include decades of illegal mining resulting in land grab, high levels of pollution, unemployment and loss of the biodiverse farm, forest or grasslands, over and above the huge loss of revenue for both central and state governments. All these continue to prevail and cannot be wished away simply by ownership and management to the private sector.”

District mineral fund to focus on visible outcomes

As part of the approved amendments, the cabinet has reportedly okayed amendments to the guidelines related to the district mineral fund which “intend to utilise these funds better with more visible outcomes” and make the local member of Parliament a member of the body governing those funds.

But this is one area of concern that mining-

affected communities have repeatedly voiced. They often complain that there is no transparency on how this fund is used and that bodies tasked with use of district mineral fund do not properly involve the mining-affected communities resulting in funds being used for issues that don’t matter to them.

Rajesh Tripathi of Chhattisgarh-based Jan Chetna Manch, who works with mining-affected communities in Raigarh, states that even though their district has hundreds of millions under the district mineral fund mechanism the people are devoid of basic facilities which should have been provided for them anyways.

He also said the government failed in reaching out to the mining-affected communities – an important stakeholder – and consider their concerns while deciding about the mining reforms.

Kohli said that the “design and viability of the district mineral fund as a concept has faced serious criticisms from the time it was proposed and envisaged”.

“One of the fundamental criticisms was that the district mineral fund is a distraction and justifies mining at all cost,” Kohli said. “In fact, it is viable only if mining operations continue to grow. The experience with the district mineral fund has thrown open even more challenges where fund collections are increasingly being channelised away from the needs and welfare of people most affected by mining operations. In such a context, the intention to better utilise the district mineral funds appears to be mere lip service to address serious hardships being faced in most heavily mined areas.”

Reforms aim to simplify the mineral exploration

In order to give the impetus to the mining sector, the government also proposes to simplify the mineral exploration process.

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According to the government, despite the huge mineral potential, the exploration activities are abysmally low in India and that of the total Obvious Geological Potential area of 0.571 million square kilometres only 10% of the area has been explored so far while mining is carried out in only 1.5% of the Obvious Geological Potential area.

The government sources point out that while countries like Canada and Australia spend almost 14% of global exploration expenditure, India's exploration expenditure is approximately 0.2% and that too mainly on surficial deposits and not on minerals which we import.

Under the changes that were cleared by the cabinet, the focus is also on facilitating a seamless transition from exploration to production and rationalising stamp duty. The government sources claim that the effective tax rate on mining in India is about 64% which is highest in the world wherein other countries it ranges between 34%-38%. They note that one such tax is stamp duty which is computed differently in different states. Thus the government proposes to amend the Indian Stamp Act, 1899 to bring uniformity across the states in the calculation of the stamp duty.

The reforms cleared by the cabinet also propose to introduce an index-based mechanism by developing a National Mineral Index for various statutory pay-

ments and others for future auctions.

They propose steps to review the functioning of National Mineral Exploration Trust, which was formed to promote exploration of minerals in the country, as the pace of exploration, the government often says is abysmally low and expenditure is negligible.

“Due to various reasons, expenditure under the National Mineral Exploration Trust is not satisfactory and thus exploration,” said government sources. “Therefore in order to boost exploration, it is proposed to make the National Mineral Exploration Trust an autonomous body.”

Sreedhar Ramamurthi, an earth scientist of the Environics Trust, which is involved in research and development on environmental issues, called for rationalising of mining activities.

“Whether it is the cement industry, iron ore or many other minerals, there is this problem of excess capacity and ultimately this ends up cartels where prices of the commodities such as cement and steel are not coming down,” Ramamurthi told Mongabay-India. “There is very poor demand in the market. But still, there is this rush for increasing the mining activities. This is going to end up digging more of our land across the country – in destroying the forests, water bodies and lives of communities who, as per the experience so far, are rarely rehabilitated properly.”

“If we continue with this rush, it is only going to add to the woes of the communities and the environment,” he added. “Instead, the idea should be to look at rationalising mining activities and utilising already opened areas rather than opening new ones.”

Kohli stressed that the “government is increasingly missing the opportunity to bring in reforms which look at the rehabilitation of areas where mines capacity will be exhausted in the next two-three decades”.

“This can lead to a serious crisis for local contractors and ancillary operations which will have no relevance,” said Kohli. “Most people have already lost their farms and access to forests for livelihoods, and few daily wage or petty jobs available will be lost too. Single-minded reforms focusing only on mineral extraction and production are blind to all the other lived realities of mining geography, be it wildlife, forests, food, water or human cultures.”

She emphasised that India needs a “reform in the way mineral policy is designed”.

“Legacy issues include displacement, contamination and human health or ecological fragmentation,” she added. “It also needs an upfront evaluation not only on fiscal parameters but also on grounds of human rights and environmental justice.”

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