

## Strengthening geological prospecting capabilities in India to meet the aims of the new National Mineral Policy

Mining and mineral development in independent India have been under both private and public sectors. For a long time, mining industry has functioned under a mineral licensing policy that promoted reconnaissance mineral exploration, prospecting including exploratory mining and mining, for which the licenses were issued. Private companies which carried out exploration and prospecting, and proved the feasibility of undertaking mining in a certain area were assured of the mining lease if they had the required technical expertise and financial capacity, and if mining activity in that area did not have a negative effect on the environment. Government organizations such as the Geological Survey of India (GSI) and the State Departments of Mining and Geology, parallelly conducted regional exploration and prospecting. The extended arm of GSI in a few cases carried out more detailed prospecting to mature the same towards mining stage. Deposits successfully proven by the Government organizations generally passed on for mining by the Government or quasi-Government mining companies/corporations. Private and public sector companies, thus, functioned parallelly. Overall, the licensing policy was considered fair by the mining and mineral industry.

The Government of India (GoI) invited foreign direct investment (FDI) in mining and mineral industry in 1993 because, for a certain length of time, except for a few (lead and zinc deposits in Rajasthan, copper in Central India), no new large-scale metallic mineral deposits were discovered in spite of efforts within the country. Several foreign companies came forward to explore for mineral resources with previous experience, different exploration strategies and technologies. Regional exploration by these companies drew attention to possible new targets other than the ones which had been discovered or proved by the Government organizations such as GSI, MECL, State Departments of Mines and Geology, etc. Copies of exploration reports provided by these companies had to be submitted to the State Departments of Mines and Geology, GSI and the Indian Bureau of Mines. The survey and analytical data generated at enormous costs by the companies contained in these reports were available to the Government agencies for free. However, reports of the State Departments, GSI or MECL, were kept either as classified or had to be purchased at enormous costs by the

private companies which were keen to prospect the areas further using new tools and strategies. Over and above these, the private companies which wanted to go for advanced prospecting following regional exploration, or those which opted for mining following exploration and prospecting stages, did not succeed in getting exploratory mining licenses. Corruption in the licensing departments of geology and mining was one of the reasons for this. The mineral industry did not witness fast tracking in spite of bringing in FDI since 1993.

The National Mineral Policy 2019 and MMDR Act of 2021 are two major steps taken by GoI at fast tracking the growth of mining and mineral industry in the country to achieve 200% increase in mineral production and reduce trade deficit in the mineral sector by 50% in less than ten years. The target is tied to the 'Make in India' initiative of the present Government and to boost the country's economic growth. The Government plans to accomplish this goal by attracting investment from private sector by providing incentives like financial packages, right of first refusal at the time of auction of the mining lease and others on the lines of accepted international practices. The new Bill allows seamless transition from exploration stage to the mining and mineral production stage. For granting mining lease without delays, it plans to create mining zones. These zones, in principle, will have all statutory clearances such as from the forest and environment departments. The Policy lays emphasis on simplifying the clearance process, making it time-bound for mineral development and commencement of mining operations. If there are critically fragile ecosystems in the proposed area for mining lease, then that area will be out of bounds for mining. The Policy also lays emphasis on ensuring the welfare of the people or communities likely to be affected by mining, ensuring rehabilitation and resettlement in conformity with the Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (RFCTLARR) Act, 2013. The Policy also encourages merger and acquisition of mining entities, transfer of mining leases which have been granted in a transparent manner to ensure seamless supply of ores and scaling up of business with focus on long-term export-import. Also, there is a move towards harmonizing royalty and all other taxes similar to those in other countries. It also lays

emphasis on providing stability for investing in large-scale mining activity. Overall, the new Policy and the Bill have together tried to address many of the issues that have been affecting the growth of the mineral industry for decades. However, under the new Policy even the organizations which discovered, explored and prospected the deposits will have to participate in the bidding license along with organizations which did not invest money, time and effort in the proving of the deposits for mining. The companies which put in decades of effort in exploration and prospecting at enormous costs and identified deposits for mining can make a more realistic bid, but they have a chance to lose the bid against a new bidder who has not put in much effort. This is seen as one of the weaknesses by the industry in the new initiatives taken by the Government. Some major mining companies from overseas withdrew from continuing their efforts in India and closed their operations considering this as an unfair development which departed from the policy that brought them to the country under FDI in 1993. Clearly, there is a need for continuation of policies from one political regime to another.

Fast tracking of mining and mineral industry requires quick generation of world-class mineral exploration reports. In this context it must be mentioned that most of the earlier reports of GSI do not meet the requirement of providing information on proved and recoverable reserves, the grade of a mineral deposit and its mineability at the 65% to 95% confidence level, as required by the United Nations Framework Classification (UNFC). If the auctioning route must be pursued by the Government, the Government Departments and private companies must henceforth carry out prospecting at such a level so as to produce reports right up to exploratory mining stage conforming to the UNFC standards. It becomes necessary that GSI and its extended arm, viz. MECL reorient their activities to accomplish this task. GSI and State Departments of Mines and Geology together have so far contributed to the completion of the regional geological mapping and preliminary prospecting reports. They must now reorient themselves strengthening their mineral prospecting wing for producing reports which provide reserves proven at the confidence level required for the mining industry. Probable and possible reserves which form the present exploration and prospecting reports are not adequate for mining. The Ministry of Mines, GoI, must strengthen these Departments with adequate manpower, facilities and funding to make them capable of producing reports with proven deposits.

The reports produced by the Government organizations could be sold to the bidders before they can bid for mining lease. Any trading (bidding) in the absence of such dependable data made available would amount to gambling, which no Government would like to promote. If these reports have utilized the results of exploration and prospecting generated by private companies earlier, the latter should be compensated commensurately from

the bid amount if the successful bidder is not that company.

India has been a mineral producer for centuries. It has not only supported mining and mineral industry, but has been an exporter to many countries. Geological and tectonic settings in which the mineral deposits occur in the country are varied. The demand for minerals which were not much in use or required earlier, e.g. rare earth elements, precious metals, etc. is increasing as the infrastructure and motor industries are driving the mineral industry today much more than ever before. Most of the surface and near-surface deposits have been exploited. Hidden ore bodies are becoming more important, and their discovery and proving is a challenging task. The discovery and proving of deposits at depth require contribution from not run-of-the-mill geologists and routine drilling engineers. The exploration geologists must have expert knowledge on ore genesis and distribution of deposits in different geological and tectonic settings. The exploration department must not only be able to generate new targets, but also must be conversant with the state-of-the-art field mapping and analysis. Expertise in remote sensing, hyperspectral mapping, generating advanced exploration databases and working with them using data management and machine learning techniques are all required. Proficiency in three-dimensional visualization of ore bodies using modern softwares such as such as GOCAD, GeoModeller, Leapfrog, etc. is a necessity. Drilling engineers must be conversant with drilling that brings out oriented cores and must be able to improve drilling for maximum core recovery. The reports produced as pointed out earlier should conform to UNFC standards or other best practices of reporting. The reports should also give details on the recovery percentage of the desired element and mineral for which flow sheets of mineral processing and metallurgy must have been tested. Advice regarding the possible effects of mining and mineral processing on the environment should be a part of any detailed report. The reports should also satisfactorily answer the questions posed by private investors, banks, stock exchanges, etc.

The geology teaching institutions should train students for this challenging task at the required level. The shortcomings in fresh graduates from educational institutions is to an extent being addressed by in-house training at GSI. However, it still falls far short of producing talent at the level that is required in internationally competitive exploration departments. Change in mineral policies would be helpful for the country's mineral industry only when it considers this subject holistically.

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