

Unlocking the Potential of the Indian Minerals Sector

Strategy Paper for the Ministry of Mines

November 2011

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1. Preamble

With global demand for minerals consistently outpacing supply, recent years have seen an unprecedented rise in commodity prices. In response, companies worldwide have explored all possibilities to boost supply, including increased mining activity in new geographies such as Africa. As the relevance of the mining sector grows globally, the Indian mining sector¹ is lagging behind, with just 1.2 per cent contribution to GDP over the last decade (as opposed to 5 to 6 per cent in major mining economies) and very low exploration spend per square kilometre (USD 9 (₹ 400) compared to USD 124 (₹ 5,580) for Australia and USD 118 (₹ 5,310) for Canada).

India has initiated several progressive policy measures, putting itself in a good starting position to undertake the transformation of the mining sector. Unlocking the potential of the mining sector in India could add around USD 210 billion to USD 250 billion (₹ 945 to 1,125 thousand crore or 6 to 7 per cent) to the GDP and create 13 to 15 million jobs through direct and indirect contribution by 2025.

To achieve this, action is required on six key priorities, including enhancing resource and reserve base through exploration and international acquisition; reducing permit delays; putting in place core enablers (infrastructure, human capital, technology); ensuring sustainable mining and sustainable development around mining; creating an information, education and communication strategy; and undertaking measures to ensure implementation. The remainder of this report elaborates on these findings.

¹ Includes metallic and non-metallic minerals but excludes mineral oil.

2. Increasing relevance of the global minerals sector and implications for India

Global mining trends and the reactions of the various governments point to a case for India to adopt progressive policy measures for the minerals sector.

2.1 Three key trends in the minerals sector

Globally, three trends have emerged in the minerals sector in recent years:

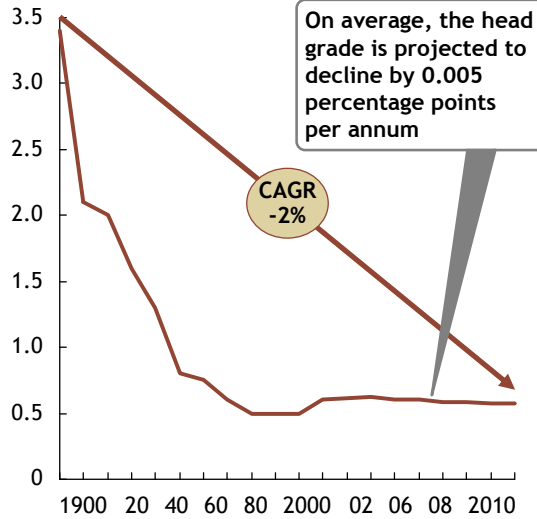
- **Rising demand relative to supply and increasing cost of mining** has led to an increase in commodity prices. The mineral demand is likely to increase at an even faster pace—the demand for iron-ore is likely to grow at 2 to 5 per cent globally over the next 10 years. At the same time, replenishing mineral reserves has only become more difficult due to declining ore grades and additional challenges such as inadequate infrastructure and human capital, critical to support the growth of the sector. Exhibit 2.1 shows the evolution of ore grades for copper and rock phosphate.
- **Consequently, we see heightened exploration activity—companies are increasingly getting into new geographies like Africa:** Exploration spend has increased four times with the share of juniors increasing from 30 per cent to nearly 50 per cent in the last decade (Exhibit 2.2). In contrast, the Indian mining sector has one of the lowest exploration spends.
- **Governments worldwide are adopting progressive policy measures to boost mining in their countries:** The Indian government, too, has initiated several measures to reform the mining sector, e.g., MMDR Act, Sustainable Development Framework. Exhibit 2.3 shows the policies and incentives used by Australia and Canada to boost their mining sector. In addition, countries like Brazil have also launched policy transformation initiatives.

Exhibit 2.1

Grade of key minerals has been declining

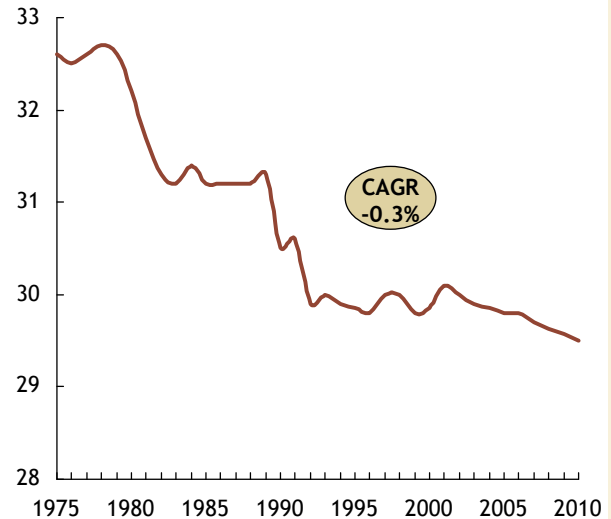
Global copper ore grade evolution 2002-2010

Average Cu grade¹
Per cent



Global Phosphate rock grade evolution 1975-2010

Average P₂O₅ grade
Per cent



¹ Milled head grade for copper producing mines

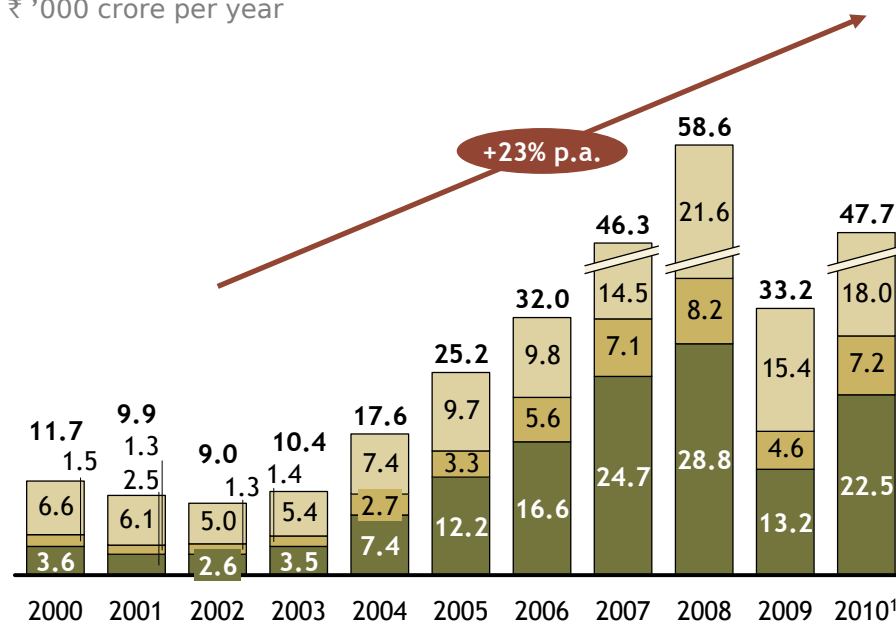
SOURCE: Brook Hunt; 2008 global copper supply model; MMSD

Exhibit 2.2

Juniors are taking the lead in greenfield exploration activity

Global exploration spend

₹ '000 crore per year



Majors
 Intermediates
 Juniors

Share of juniors in exploration activity has steadily increased from 30% to nearly 50% in last decade




¹ Break-ups for 2010 are estimated figures

² 1 USD = ₹ 45

SOURCE: MEG

Exhibit 2.3

Countries have created a favourable environment for exploration through attractive policies and additional incentives

	Chile 	Australia 	Canada 
Easy and timely process	<ul style="list-style-type: none"> Environment law requires issuance of ruling within 120 days of submission else approval is deemed to be granted 	<ul style="list-style-type: none"> Single window clearance to make overall process smoother and faster 	<ul style="list-style-type: none"> Licensing procedures and tenement registry is publicly available online; proponent can apply for an exploration license and make the payment online
Fair and transparent process	<ul style="list-style-type: none"> Courts are responsible for issuing mining licenses Independent judiciary and alternative dispute resolution mechanisms 	<ul style="list-style-type: none"> Online applications for transparent process 	<ul style="list-style-type: none"> First-come-first-served mechanism observed and no dispute over who was first since registry is updated electronically in real time Well-developed GIS¹-based cadastre that prevents most disputes Independent judiciary and alternative dispute resolution mechanism
Security of tenure	<ul style="list-style-type: none"> Mining concession treated as an inalienable property right freely transferable ML² can continue indefinitely as long as annual fee is paid 	<ul style="list-style-type: none"> Provision of “retention status” for existing PL if economically unfeasible to develop ML/PL is completely transferable at any stage 	<ul style="list-style-type: none"> Mining right is secure property right which is freely transferable Assurance of obtaining right to mine a discovery
Exploration incentives	<ul style="list-style-type: none"> No technical/financial ability or feasibility analysis required when applying Unified exploration and mining rights 	<ul style="list-style-type: none"> Hosts large number of industry associations that support exploration, e.g., Association of Mining & Exploration Companies 	<ul style="list-style-type: none"> Right to exploration open to all regardless of applicant’s means Flow through share system as a financing tool for resource companies to raise money for exploration and development. Investors can claim tax deductions for the exploration expense incurred Stock exchange for junior mining companies

1 GIS: Geographic Information System

2 ML: Mining lease

SOURCE: Press search; literature search

2.2 Implications for India

To keep pace with the growing demand, India must enhance domestic mineral production and exploration activity. It is also imperative to reform the Indian mining sector by creating a favourable policy environment and setting up core enablers such as infrastructure and human capital.

* * *

3. Performance of the Indian minerals sector

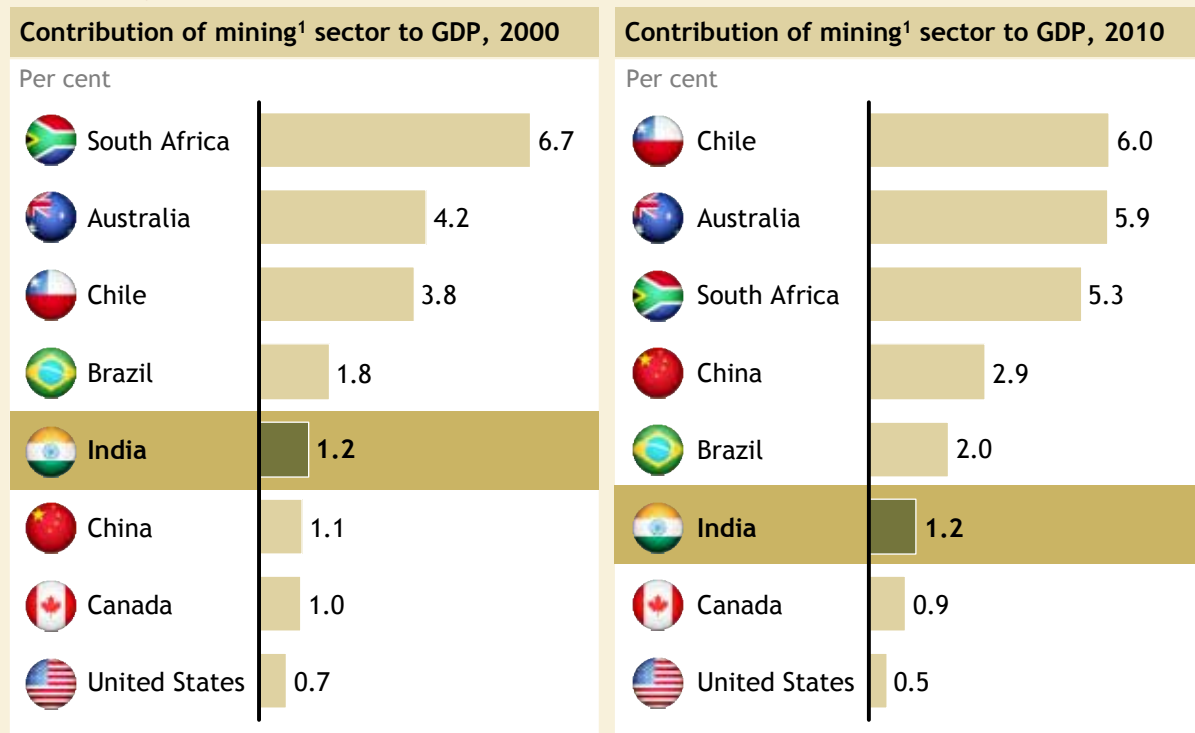
Performance of the Indian minerals sector² has been poor both on output as well as input parameters, in comparison to other best practice mining economies such as USA, Canada, Australia, China, Brazil and Chile.

3.1 Performance on output parameters

- Contribution of mining sector to India's GDP has been stagnant and low, at around 1.2 per cent over the last decade (it grew from around 4 to 6 per cent in Chile and Australia and from 1 to 3 per cent in China) (Exhibit 3.1).

Exhibit 3.1

Contribution of mining sector to India's GDP has remained stagnant and low at 1.2%



1 As defined by global insight as C10 coal mining and C13-C14 mining of metals and quarrying (excludes oil, natural gas, and atomic minerals)
SOURCE: Global insight

- The Indian mining sector grew sluggishly at a CAGR of 6.8 per cent in the last decade compared to 22 per cent in China for the same period³.

² Includes coal and minerals mining.

³ Indian mining sector (excluding coal) grew at 7.3 per cent in the last decade compared to 22 per cent in China.

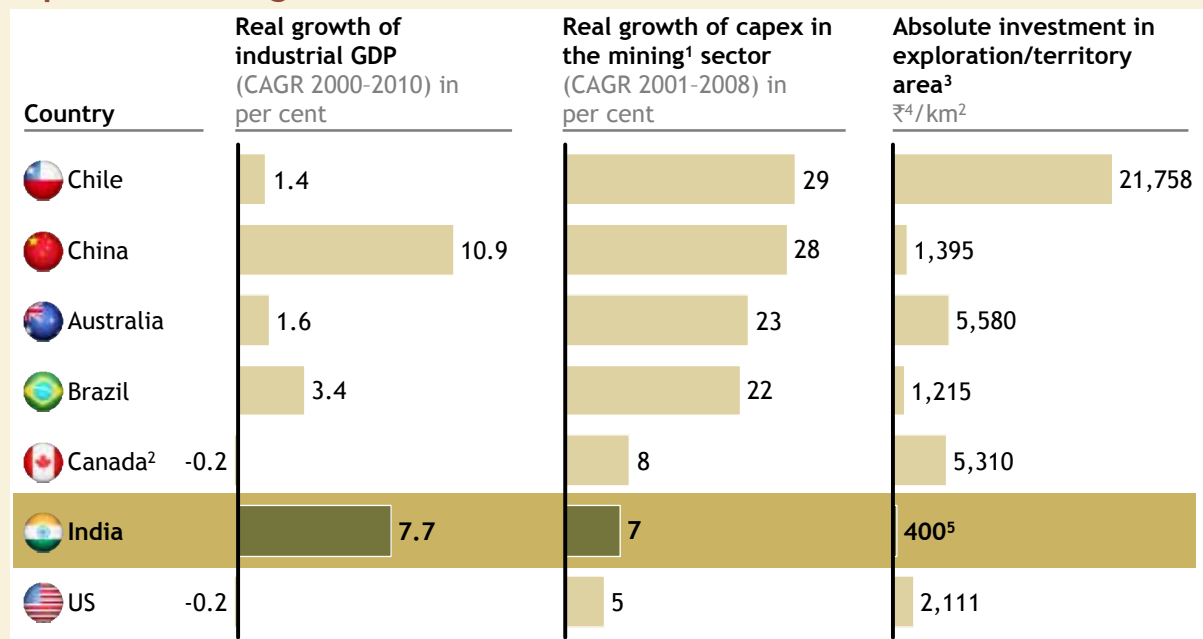
- The mining sector employs a smaller percentage of India's population (0.3 per cent as compared to 3.8 per cent in South Africa, 1.4 per cent in Chile, and 0.7 per cent for China). In addition, employment in the Indian mining sector has grown at a slow rate of just about 3 per cent per annum over the last 10 years.
- Per capita GDP of the majority of mineral rich states in India is lower than the national average. In contrast, the mineral rich states in other countries such as Australia have leveraged their mineral wealth to propel their state GDP higher than the national average.

3.2 Performance on input parameters

- India's spend on exploration projects is low, at 0.3 per cent of the global spend (compared to 19 per cent for Canada and 12 per cent for Australia) leading to a stagnant reserve base for all mineral categories. Exploration spend per square kilometre in India is one of the lowest among the major mining economies (Exhibit 3.2). Exploration in India is mostly restricted to a depth of 50 to 100 metre vs. as deep as 300 metre in countries such as Australia. This is a huge driver for low exploration spend in India.

Exhibit 3.2

The exploration spend and capex in India is low, particularly given the rapid industrial growth



¹ As defined by global insight as C10 coal mining and C13-C14 mining of metals and quarrying (excludes oil, natural gas and atomic minerals)

² For Canada, capex growth rate is for entire mining industry including oil and gas

³ Total exploration spend/area includes metallic and non-metallic minerals but excludes mineral oil

⁴ 1 USD = ₹ 45

⁵ Assuming 50% of the exploration spend in India is contributed by private sector, state governments, state departments of mining and geology

SOURCE: Global Insight; Brazil Mining Institute, Metal Economics Group, PDAC, GSA, GSI, expert interviews

- It takes 5 to 8 years (or more) to get a mining lease in India (it takes about a year in Australia)—India ranks very low in the Fraser Survey 2011 on both policy and mineral potential.
- Logistical inefficiencies lead to mining sector losses of about USD 2 billion (9,000 crores) each year, nearly double the losses in other sectors.
- Applying best practice technology in exploration, mining and mineral processing is a challenge in India—for instance it can take up to 6 months to get permission for airborne surveys in India, whereas in Australia and Canada it takes less than a month.

Despite this scenario, India is in a good starting position to transform its mining sector. This is due to India's large reserve base of coal, iron ore, bauxite manganese, etc., and also the push towards progressive policy measures initiated by the Ministry, such as the MMDR Act, and IBM/GSI reforms. Exhibit 3.3 enlists some of the policy reforms underway.

Exhibit 3.3

Various progressive reforms are already underway

NMP	<ul style="list-style-type: none"> ■ 1993 policy updated with new policy in 2008 which clearly incentivises private sector investment in exploration, for example: <ul style="list-style-type: none"> — Increased transparency in allocation of concessions — Thrust on building infrastructure for mining — Promote R&D in minerals and establish education facilities for human resource development
MMDRA draft, 2011	<ul style="list-style-type: none"> ■ 'Open sky policy' with non-exclusive RPs¹ to be allowed ■ PL/ML² will be auctioned for known mineralisation areas, first in time for others ■ Time limit for disposal of applications reduced by 50% ■ Assured transition of licences; transfer of RP/PL allowed ■ Dedicated mining tribunal for grievance redressal ■ Mining activity to adhere to sustainable development framework ■ National state and district mineral fund set up through additional cess/fees levied on mining companies ■ A new composite license for high technology based reconnaissance and prospecting to explore for deeper deposit in order to incentivise investment and technology flows
GSI/IBM reform	<ul style="list-style-type: none"> ■ Revamping the vision and redefining the roles and responsibilities ■ Re-organisation of functional divisions and structure with special focus on modernisation of equipment, hardware and software ■ Greater coordination with state government agencies through a 'Regional Co-ordination Committee' ■ Allow GSI to function commercially where required through MoU with MECL ■ Disseminate information through internet and other information-sharing mechanisms
International tie-ups	<ul style="list-style-type: none"> ■ MoUs with countries like Australia, Canada, etc. for bilateral research cooperation, knowledge sharing and promotion of trade and investments
Sustainable development framework	<ul style="list-style-type: none"> ■ Develop a Regional Mineral Development Plan to address the health, safety and social aspects ■ Formulation of mine level framework and systems that are periodically reviewed ■ Guidelines for community engagement, benefit sharing and socio-economic development ■ Stringent auditing of mine closure plan addressing post-closure issues such as water treatment or catastrophic events

1 RP - Reconnaissance Permit

2 PL - Prospecting License, ML - Mining Lease

4. Value in unlocking the potential of the Indian minerals sector

The Indian minerals sector holds a huge potential for all stakeholders, including the central government, state government, community and the entire economy. With the right kind of support, the mining sector⁴ has the potential to:

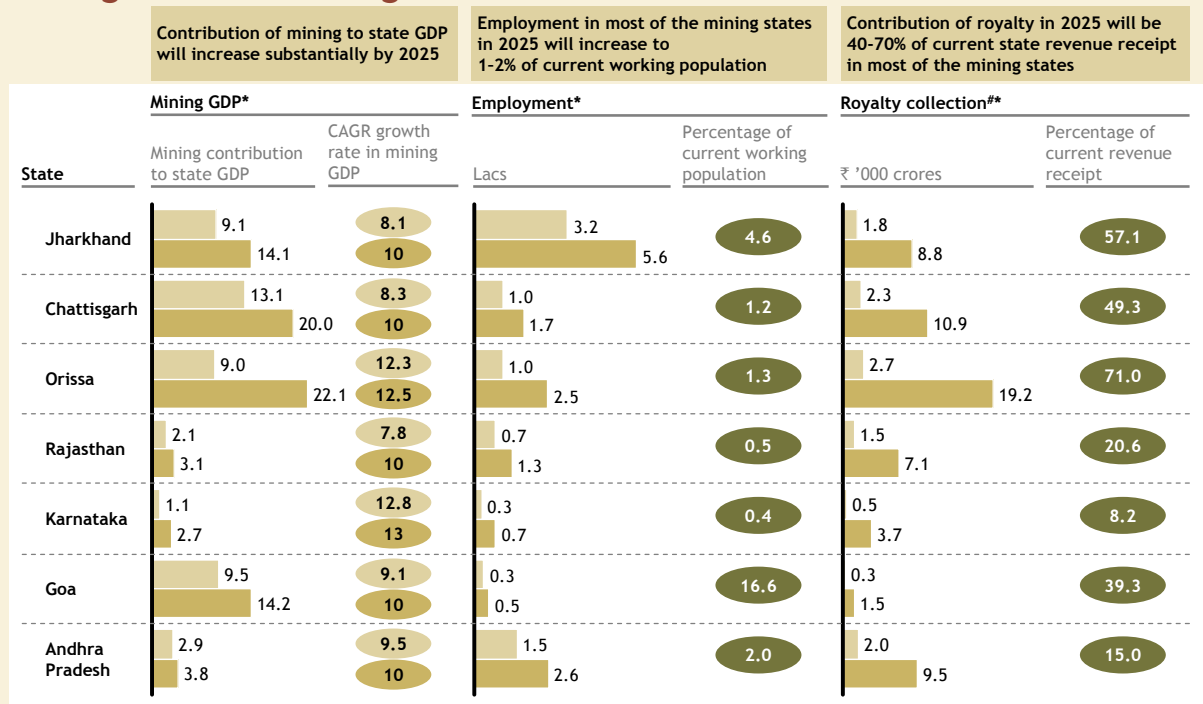
- Add USD 210 billion to USD 250 billion (₹ 945 thousand crore to 1,125 thousand crore) to GDP by 2025, a growth of 10 to 12 per cent per annum. This includes USD 60 billion to USD 80 billion (₹ 270 thousand crore to 360 thousand crore) direct and USD 150 billion to USD 170 billion (₹ 675 thousand crore to 765 thousand crore) indirect contribution.
- Create 2 million to 2.5 million direct jobs by 2025, and an additional 11 million to 13 million jobs through indirect employment opportunities created in other sectors, thereby contributing 3 per cent to total employment.
- Contribute USD 55 billion to USD 70 billion (₹ 275 thousand crore to 315 thousand crore) of revenue to the central and state governments through corporate taxes, royalty and export duty collections by 2025—around 50 per cent of the current combined fiscal deficit of the central and the state governments.
- Make a substantial impact on the mineral-rich states—for instance, the contribution of mining to state GDP in Chhattisgarh could grow from the current 13 per cent to 20 per cent in 2025, with a five-fold increase in royalty collection and twice as many people employed in the sector (Exhibit 4.1).

⁴ Includes metallic and non-metallic minerals but excludes mineral oil.

Exhibit 4.1

Contribution of mining sector in the growth of seven major mining states will be significant

2009 2000-09
2025 2009-25



1 Royalty as a percentage of mining sector value is assumed to be same in 2025 as in 2008

2 2008-09 is the latest data available for state wise break-up of mining sector value add

3 All state mining sectors are projected to grow at 10% except Orissa (12.5%) and Karnataka (13%)

SOURCE: India Urbanisation Econometric Model; Central Statistical Organisation, NSSO employment report

Royalty collection is for the year 2009-10

* Includes metallic and non metallic minerals but excludes mineral oil

* * *

5. ‘Transforming’ the Indian minerals sector — Six priorities

The vision of the Ministry of Mines is to promote optimal utilisation of India’s mineral resources for its industrial growth and create economic surplus using scientific exploration and sustainable mining practices.

The key objectives of the Ministry are to:

- Define a legislative and non legislative framework to
 - Promote scientific exploration for expanding the mineral reserves in India to its full potential (onshore and offshore)
 - Ensure globally best, fair, transparent, and efficient process for the mineral concession system
 - Enable sustainable mining
 - Address the needs of key stakeholders (states, industry, concerned ministries and departments, local communities)
 - Define the mandate for the key agencies under the Ministry viz, Indian Bureau of Mines (IBM), Geological Survey of India (GSI), PSUs.
- Develop geo-scientific partnerships with the state government, industry and other stakeholders for the management of mineral resources and development of mineral based industries.
- Support the Indian industry in accessing the mineral resources internationally to ensure raw material security.
- Position the Ministry as a techno-economic policy formulator and promoter of sectoral scientific activities.

Given the starting position of the Indian mining sector, global trends in the industry, as well as the overall vision and objectives of the Ministry of Mines, targeted action is required on six key initiative areas while working closely with the stakeholders.

5.1 Expanding resource and reserve base by stepping up exploration and aiding international acquisition of strategic minerals

The sector needs to systematically invest towards:

■ **5.1.1 Exploring and expanding the resource and reserve base for minerals having adequate potential in India** (iron ore, bauxite, lead, zinc, etc.). The following initiatives are necessary to enhance mineral exploration in India:

- The current geological survey efforts of the government should be complemented further with GSI setting aside ₹ 360 crore to ₹ 400 crore per year. GSI should coordinate with hydrocarbons and coal sector through Geological Programming Board for these surveys. GSI should drive majority of these surveys by hiring private geo-survey organisations to increase geo physical and geochemical baseline data from the current 3 to 4 per cent of the landmass to 20 to 30 per cent over the next 5 years (Exhibit 5.1).

Exhibit 5.1

India lags behind Australia in geophysical and geochemical data generation

NOT EXHAUSTIVE

	India		Australia		
	Area	Scale	Area	Scale	
Geo-logical	Base	98%	1:50,000	100%	1:500,000
	Topographic	-	-	100% N. Australia ¹	1:250,000, 1:50,000
	Mineral	Almost all states	1:250,000 - 1:5,000,000	100%	1:5,000,000
	Tectonic	100%	1:7,500,000	100%	1:5,000,000
Geo-physical	Magnetic/ Aeromagnetic	2% 30-40%	1:50,000 1:250,000	100%	1:5,000,000
	Gravity	2%	1:50,000	100%	1:5,000,000
Geo-chemical	Soil sampling/ stream sediment data	4%	1:50,000	91%	N.A.

“Geochemical mapping is very useful for rare minerals, gold, diamond and base metals exploration”
- Interview with geologists

“A geologist in India is at a significant disadvantage due to lack of data availability as compared to developed countries”
- Interview with geologists

“Seismic data is needed to establish continuing of reserves and is not sufficiently available. We need to hire service companies to do seismic surveys for us”
- Interview with geologists

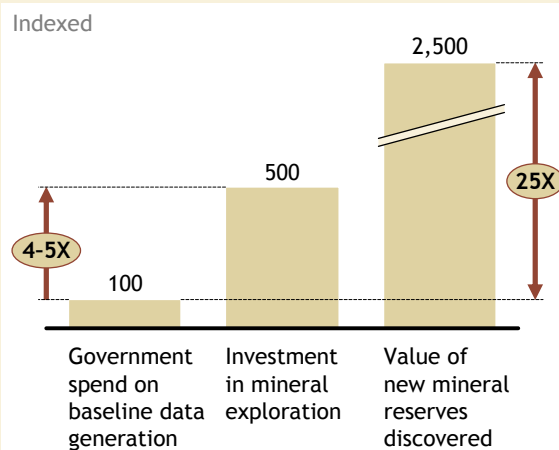
¹ Partial coverage at 1:50,000 scale predominantly in northern Australia – mainly spanning across Northern Territory, Queensland and western Australia
SOURCE: Literature search; interviews

Baseline data thus generated will continue to be owned by GSI and not the agencies hired. Countries like Australia, which have around 100 per cent coverage for baseline data, have witnessed 5 dollars of private investment in exploration activity for every dollar spent by government in acquiring pre-competitive geo-scientific data (Exhibit 5.2). For successful implementation, it is important to ensure that adequate support mechanisms are in place, e.g., proper quality checks, measures to coordinate among multiple sub-contractors (through GSI).

Exhibit 5.2

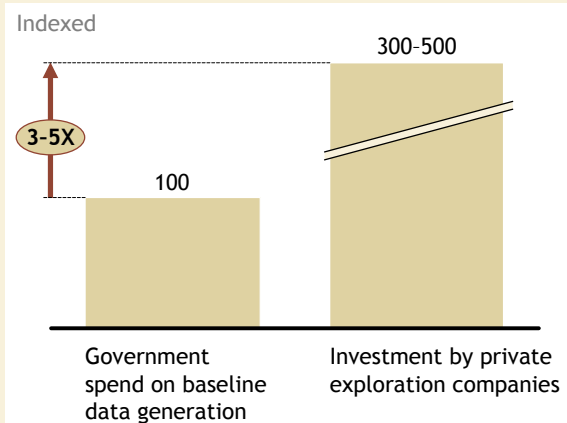
Investment in baseline data is critical as it stimulates the exploration spend and leads to discovery of new minerals

Case example - British Columbia, Canada



“Geosciences data is the foundation that leads to the discovery of new mines!”
— *Geosciences British Columbia*

Case example - Southern Australia



“Since 1992-93, all Australian states have established initiatives which have accelerated data collection. The states have expended and committed over US\$270 million of additional funding to major data acquisition programs over 1992-2005”
— *Committee document on resource exploration, Parliament of Australia*

SOURCE: Geosciences BC, Geological Survey of Australia - Strategic Review

- GSI should digitise and make the baseline data (existing data and additional data generated by GSI and private sector reconnaissance) publicly available on its internet portal to enable juniors and exploration companies in their exploration effort, in line with the best practices in major mining economies such as Australia and Canada.

- GSI should complete four major programmes in the next 5 to 10 years including online GIS⁵, national geomorphological mapping, national geochemical mapping and national aeromagnetic mapping.
- GSI and progressively, the State Directorates, should step up regional resource assessment activities to identify known mineralisation areas for auctioning at PL level. Therefore, the states should build capacity for conducting these activities. This should be complementary to the exploration activity conducted by private companies through the RP route. It is critical to ensure that the geoscience data generated by companies is submitted and integrated with GSI's datasets and published online as per best international practices.
- In addition, GSI should coordinate with the Ministry of Earth Sciences to assess mineral potential in offshore areas (including exclusive economic zone, territorial waters, international waters) and create a plan to enable exploration and development of resources.
- It is imperative to reduce permit delays (discussed separately in section 5.2), provide security of tenement and transferability to create a favourable policy environment to attract juniors and private mining companies for exploration, similar to mining economies such as Australia, Canada and Chile. In addition, provide fiscal incentives for exploration through tax deductions/tax credits for investing in mining exploration, such as the flow through share program in Canada.
- As advocated in the NMP 2008 and proposed in the new MMDRA act; a composite High Technology Reconnaissance cum Exploration Licence (HTREL) is planned to boost exploration of deeper/concealed mineral deposits e.g. base metals (copper, lead, zinc), noble metals (gold, silver, platinum), gemstones etc. Given transferability and eight year time frame for the licence, introduction of HTREL will potentially lead to higher exploration investments and technology flows for sub-surface minerals. This will require systems and capabilities for administration and monitoring of HTREL e.g., identifying technologies eligible for the licence, management of pre/post HTREL data, etc., to be developed.

⁵ Geographic Information System.

- **5.1.2 Internationally acquiring strategic minerals with low availability.** These include cobalt, nickel, fertiliser minerals, etc., that have low reserve base, lower likelihood of future finds in India and scarce supply/consolidated market structure globally (Exhibit 5.3).

Exhibit 5.3

Key minerals/resources for international acquisition

	Resource	Rationale
Metallic Minerals	▪ Cobalt	<ul style="list-style-type: none"> ▪ No primary cobalt resources in India ▪ 36% of world's reserves are in DRC ▪ Strategic applications in super alloys and aviation
	▪ Nickel	<ul style="list-style-type: none"> ▪ No commercially exploitable reserve in India, entire requirement imported for use in stainless steel, etc. ▪ Highly consolidated global supply - top 5 companies account for 86% of production
Non-metallic Minerals	▪ Rock phosphate	<ul style="list-style-type: none"> ▪ Very low reserve base; entire requirement currently serviced through imports (5 mt in 2009) ▪ 45% of world's reserves in Morocco
	▪ Metallurgical coal ¹	<ul style="list-style-type: none"> ▪ Low reserve base, existing reserves not developed, 40 mt demand and 24 mt imported in 2009, imports expected to go up to ~120 mt by 2020 ▪ Global market highly concentrated, top 3 companies account for 66% of seaborne trade
	▪ Potash	<ul style="list-style-type: none"> ▪ No commercially exploitable reserve, entire requirement of potash fertilisers currently imported (5 million tons) ▪ Canada and Belarus account for ~46% of the world's production

¹ Under the ambit of the Ministry of Coal

SOURCE: India Mineral Year book 2009; analysis

This acquisition of key minerals has to be centrally coordinated and will require:

- Designating a 'central resource planning cell' under the Ministry of Mines to support PSUs (and private sector) in international resource acquisition of strategic minerals. This cell should:
 - Conduct a 25-year demand—supply analysis for India and prioritise the resources to be acquired.
 - Prioritise the geographies to be targeted for resource acquisition/supply.

- Providing well-defined government support to target focus geographies and support projects.
 - Support PSUs in facilitation process and clearances, providing expertise, gathering deal intelligence, and resolving conflicts and priority order when multiple companies are bidding for the same resource. Support should also be given to the private sector in acquiring resources through government relations, facilitating cross-ministry approvals, and post-acquisition infrastructure development.
 - Develop a comprehensive India offering to the partner state (infrastructure development, trade benefits, support in other causes).
 - Support Indian projects through embassies, and facilitate interaction between regulators in resource-rich countries and Indian companies.
- Provide funding at attractive terms for infrastructure setup in under-developed countries and to gain an operating stake in high-ticket deals.

5.2 Reducing permit delays to create a more favourable policy environment

India needs to address permit delays by reducing permit timelines for mining leases from 5 to 8 years to below 2 years. Also, it is equally important to reduce uncertainty in time and outcomes while awarding permits for mining. Towards this, the following initiatives are required:

- Facilitate the passing of new MMDR Act in the next 6 to 12 months to put in place the structural mechanisms for reducing permit delays, e.g., mining appellate for faster dispute resolution.
- Undertake a joint exercise with the MoEF to jointly rationalise process and speed up forest and environment clearances such as replacing sequential approval of documents for forest clearance by committee approvals at state level. Consider embedding a small environment desk

within Ministry of Mines for processing environment clearance for mining projects.

- Besides CEC meetings, conduct bilateral forums every quarter with MoEF and National Land Records Modernisation Programme to jointly take stock of priority projects—such as status database for all pending applications for environment and forest clearance, and land reclassification for priority districts. Create a national database for forest and environmental clearance rather than a partitioned database for centre/state and forest/environment.
- Set an example by cutting in half the time taken to approve mining lease grants in the priority areas (it currently takes 24 to 30 months) and setting up defined timelines for each intermediate step: technical opinion—5 months; opinion on forest land—5 months; revenue opinion—5 months; recommendation by state—4 months; approval by Ministry of Mines – 3 months; mining plan approval—3 months (Exhibit 5.4).

Exhibit 5.4

Recommendations for the mining lease grant process

Area	Key issues	Recommendations
Timelines for intermediate steps	<ul style="list-style-type: none"> ■ No clear timelines defined for the intermediate steps 	<ul style="list-style-type: none"> ■ Define clear timelines for each step of the process <ul style="list-style-type: none"> — Technical opinion: 5 months — Opinion on forest land: 5 months — Revenue opinion: 5 months — Recommendation by state: 4 months — Approval by ministry of mines: 3 months — Approval by IBM: 3 months
Land identification	<ul style="list-style-type: none"> ■ Land identification for revenue opinion takes time as the land records are not updated 	<ul style="list-style-type: none"> ■ Complete and regularly update all land records at state level ■ Make them available online to increase transparency

SOURCE: Expert interviews

5.3 Setting up core enablers for mining—infrastructure, human capital and technology

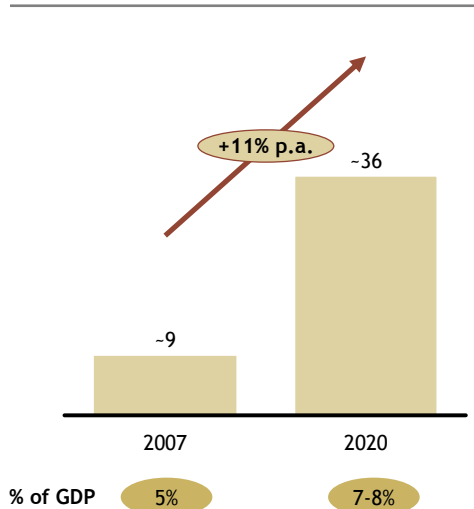
A set of core enablers across infrastructure, human capital and technology are necessary to support the growth of the mining sector.

- 5.3.1 India needs to develop infrastructure capacity to support the mining sector.** Exhibit 5.5 shows losses borne by mining sector due to inefficiencies in logistics.

Exhibit 5.5

Indian mining sector loses ~USD2 billion (₹ 9,000 crores) each year due to inefficiencies in logistics

Extra costs spent on logistics in mining sector
₹ '000 crore



Industry wise¹ breakdown of extra costs on logistics, 2007

Industry	Extra costs on logistics ₹ '000 crore	Per cent of gross output
Agriculture, forestry & fishing	49-54	5-6
Mining & quarrying	9	5-6
Manufacturing	76-81	3-3
Electricity, gas & water	4	2-3
Construction	31	2-3
Other wholesale & retail trade	22	2-3
Total logistics-intensive industries	201	3

¹ Based on ISIC code classification. Each ISIC code is estimated as a hybrid of coal, agriculture and auto components, based on closed analogue

² Estimated for 2007

³ 1 USD = ₹ 45

SOURCE: Global Insight; industry reports; expert interviews; analysis

Developing infrastructure capacity to support the mining sector will require:

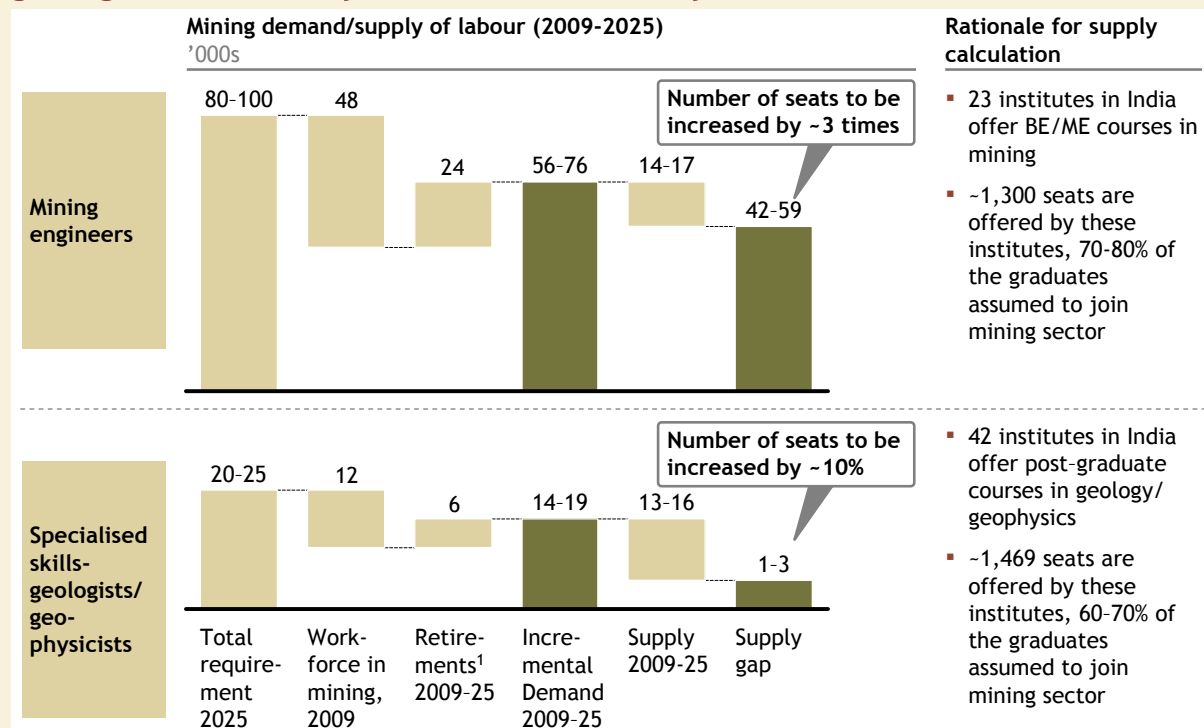
- Collaboration with railways, ports and surface transport ministry to pursue the top 50 infrastructure projects (railway sidings, trunk lines, doubling of track, use of better equipment) for the mining sector.
- Use of local development funds (including District Mineral Fund) for local socio-economic infrastructure creation, management and maintenance.

— Liaison with department of shipping to develop key coastal corridors and expand capacity of major ports.

- **5.3.2 India must take multiple steps to bridge the impending shortage of human capital in mining**, especially for mining engineers, diploma holders and skilled/semi-skilled labour (Exhibits 5.6 and 5.7).

Exhibit 5.6

Supply of mining engineers needs to increase by 300% while supply of geologists will closely meet the demand by 2025

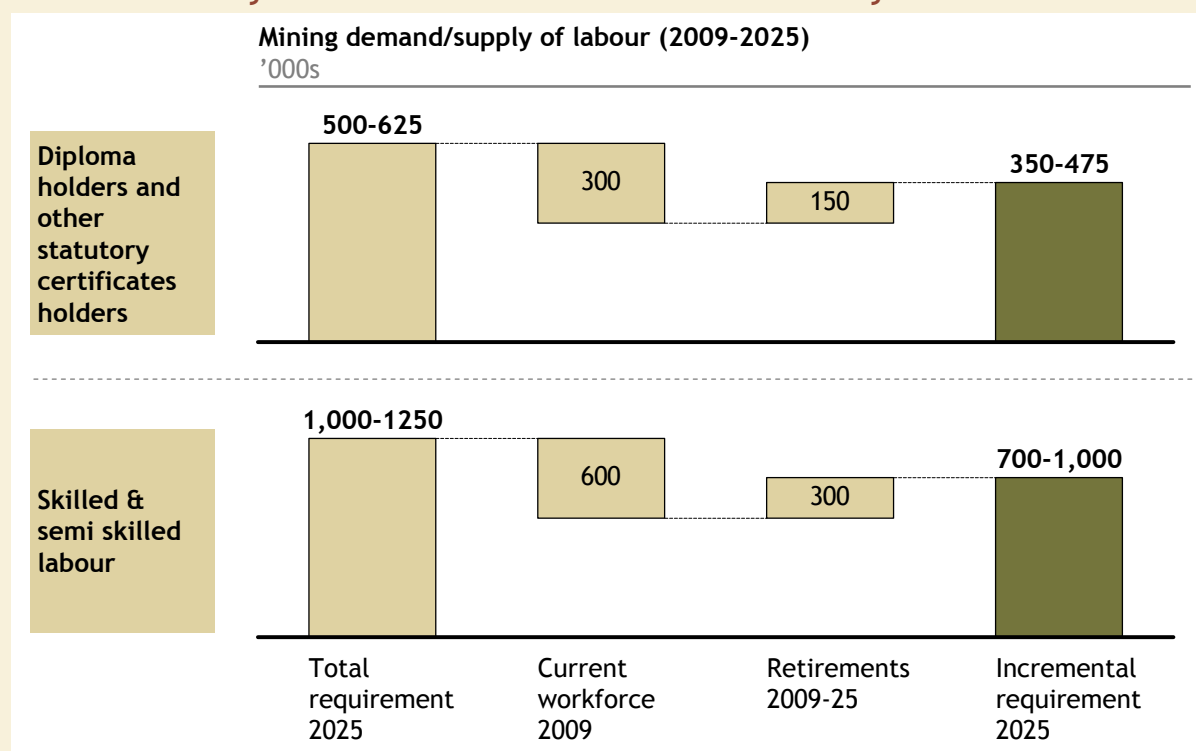


¹ Assuming that total working life of an employee is 32 years, 50% of the workforce will retire after 16 years

SOURCE: Report on Mapping of Human Resources and skills for the Mining Industry in India by CII; literature search; interviews, analysis

Exhibit 5.7

Incremental demand for diploma holders and skilled/semi skilled labour will increase by 1-1.5 times the current workforce by 2025



SOURCE: Report on Mapping of Human Resources and skills for the Mining Industry in India by CII; literature search; interviews; analysis

This will require:

- Working with the HRD ministry to increase the mining engineering seats by around 4,000 over 10 years (three times the current number) in relevant institutes such as IITs and state technological institutes.
 - Liaising with DG employment and training, and Ministry of Labour to include mining-specific courses at ITIs in the six major mining states.
 - Liaising with Ministry of Finance (MoF) to include mining as a priority sector in the National Skill Development Corporation (NSDC) charter to facilitate private sector participation in skill development for the mining sector.
- **5.3.3 India must ensure best practice technology application across the mining value chain**, most prominently in high-tech exploration instruments and underground mining equipments. The government should help bridge the technology gap in the short-term by

de-bottlenecking clearances for import and use of technology (such as collaborating with Ministry of Defence to reduce time for permissions for airborne survey) (Exhibit 5.8).

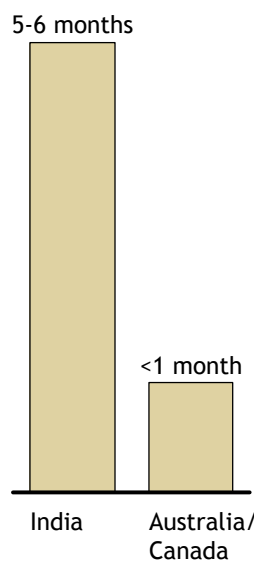
In the long-term, create an ecosystem to support joint research programs by GSI, IBM with participation from academic institutions, industry players and foreign research agencies.

Exhibit 5.8

Faster clearance for technology import and usage needs to be ensured

AIRBORNE SURVEY EXAMPLE

Time taken for approval



Key reasons for delay

- Need for approval from 6-7 agencies routed through DGCA¹ (e.g., Ministry of Defence, NRSA, Department of Atomic Energy) leading to 3-4 months delay due to lack of coordination
- Any query by a single agency leads to repetition of entire clearance process leading to 1-2 months additional delay
- Separate application to states for permission to use helipads which starts only after DGCA approval
- Initial permit to fly only at >150 metre height; need for separate application to DGCA to fly at lower height
- Custom clearance for aircraft and equipments subject to DGCA approval
- Multiple applications to Bureau of Civil Aviation (state) for more than 3 days of flying permit

Potential solutions

- Well-defined timelines for approval at each stage; deemed approval in case of delay
- Single window clearance policy where DGCA (including state) can be only interfacing agency with the applicant
- Active role by Ministry of Mines in reviewing the pending applications during Coordination-cum-Empowered Committee (CEC) meeting and expediting the process by co-ordinating with other agencies/departments

¹ DGCA - Directorate General of Civil Aviation
SOURCE: Expert interviews

5.4 Ensuring sustainable mining and development

India's draft sustainability development framework (SDF) is progressive and is tailored to the unique national context. To enforce the overall framework, the following additional measures are required:

- In conformance with the draft MMDR Act, improve regulatory system in IBM for approval and monitoring of mining plan.
- Enforce critical components of sustainability through regulatory changes e.g., increase financial commitment for mine closure and link it to post-

closure rehabilitation cost (e.g., financial guarantee in Quebec is 70 per cent of the post-closure cost).

- Promote large-scale mining through creation of SPVs similar to UMPP for large-scale power projects.
- Incentivise private sector R&D in mineral beneficiation and processing so as to utilise lower grades and extract important by-product metals like Mo, Co, Ni, platinum group elements, rare earth elements, etc.
- Award companies which outperform on sustainability, similar to the Golden Gecko Award in Western Australia.
- Once SDF is accepted, clearly define the activities required to implement SDF principles, provide best-practice case studies and flesh out concepts for implementation.

5.5 Creating an information, education and communication plan

The Indian mining sector has seven key stakeholders: local community, public representatives (NGOs, MLA, panchayats), central government bodies (Planning Commission, PMO, etc.), related ministries (MOEF, railways, etc.), state governments, mining sector ecosystem (mining and associated legal/financial companies) and the international community. The sector should effectively communicate four key themes to its stakeholders, in line with the proposed transformation agenda:

- The mining sector is critical for the country in terms of GDP growth, tax, employment, and as an enabler of industrialisation.
- Mining activity can be stepped up in a responsible and sustainable manner while generating benefits for and addressing concerns of all stakeholders.
- The transformation agenda for the Indian mining sector needs to be developed keeping in mind the unique challenges and context.
- The Ministry of Mines is committed to transforming the mining sector. This will require active participation of all concerned stakeholders.

The above themes should be delivered through an Information, Education and Communication (IEC) plan based on four design principles:

- **Prioritising themes by stakeholders:** For instance, central government bodies and other ministries need to understand the significance of mining in India, and the international community needs to be informed about the unique realities of India and the progressive measures adopted by the Ministry of Mines.
- **Choosing the right medium of communication:** This is important to reach various stakeholders. For example, meetings with NGOs and local panchayats can address the concerns of local community; setting up mining parks will educate the broader community on the benefits of mining, etc.
- **Multiple stakeholders must drive communication efforts:** These include the Ministry of Mines, state governments, as well as mining companies.
- **Bring about tangible, visible change through relevant stakeholders:** This would be the most credible element of the IEC.

IBM or the new National Mining Regulator (or both jointly) must take ownership for detailed action plan based on the above four design principles.

5.6 Establishing the right governance structure for effective implementation

Several key initiatives need to be driven by the ministry and related central organisations like GSI and IBM, while many others require coordination with other ministries or states for implementation. Therefore, structural and process mechanisms are required to ensure effective implementation.

Set up an implementation office to drive priority initiatives by providing problem-solving support in addition to tracking/reviewing progress. The implementation office should include the Secretary, one Joint Secretary/Additional Secretary and one full-time Director reporting to the Secretary. It should review the status of all initiatives and discuss with the

stakeholders every 1 to 3 months, e.g., land reconciliation under National Land Records Modernisation Programme in priority mineral belt areas.

Implementation office needs to work very closely with the states to drive the transformation agenda. Pilot implementation of key initiatives with select mineral-rich states. Conduct workshops to build upfront alignment on initiatives and periodically review progress. Implementation office must also ensure that the state mineral policies are aligned with the NMP on key topics such as enhancing exploration, mineral allocation, infrastructure development, human capital for mining. In addition, it is critical to develop and implement an action plan for creating capacity in state governments and state departments of mining and geology for managing information databases on mineral resources, managing the system of mineral concession grants and ensuring proper regulation of the exploration and mining sectors. GSI's and IBM's training infrastructure can be leveraged to build this capacity in the states.

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