Exploration Scenario
Global
India

National mineral exploration policy
Policy Highlights
Critical Success Factors
Foreword

The Indian Mining Industry is undergoing significant transformation brought out by the legislations on mining like MMDR Act (2015) and Coal Mines Act (2015). The missing piece was a policy directive on exploration and the government has taken the first steps by releasing the National Mineral Exploration Policy.

India's minerals demand is only expected to grow rapidly on the back of economic growth, urbanization, thrust on infrastructure investment etc. and it is imperative that a sound exploration policy is laid out to keep a continuous flow of mining blocks which can be developed. While the government has taken auction route to ensure transparency, given that this approach is as yet the least adopted globally, we need a set of policy measures that comprehensively makes the country an attractive investment destination for entrepreneurs both global and local.

The proposed new policy framework can open up substantial new opportunities for the sector to fast track growth in India. However, only exploration permit will not lead to a successful mine. As with any transformational journey, there are aspects that need constant re-evaluation from a risk-reward perspective to make them attractive for an entrepreneur to engage and succeed. This paper has highlighted some of these issues and the need for a collaborative approach from the policymakers and the players to set the Indian exploration industry on a sustainable growth path.

EY's Mining & Metals sector professionals have developed deep insights into the metals and mining industry and provide support on a wide spectrum of issues: strategy, regulatory, tax policy, risk management, mergers and acquisitions, supply chain advisory, bid process advisory, business valuation and valuation, information technology, human capital and capital raising for the sector.

We hope this report provides you with insights to help you build your strategies. We express our deep appreciation to Federation of Indian Mineral Industries and other organizations participating in the conference for giving us an opportunity to present this report at the conference.

Anjani K Agrawal  
Partner and National Mining & Metals Leader  
Ernst & Young LLP, India
Exploration is at the source of value creation in mining. However, of late, global exploration is going through a prolonged downturn. This is due to significant discoveries declining or becoming flat, listed juniors facing funding challenges and several mineral projects being discontinued. While private enterprises had been the largest contributor to global exploration activity, their contribution to the capital pool has declined in the last few years, with some government funding stepping in but only partially.

In India, the passage of the MMDR Act 2015 and Coal Mines Act (2015) have brought in fundamental changes, primarily in the process of granting of mining concessions. Prerequisite to growth in mining is mineral exploration, which is now being addressed through the National Mineral Exploration Policy (NMEP) unveiled in July 2016. This policy reflects the directional intent of the Government and may undergo some changes. In light of global tailwinds, it needs a look in now, so that India gets a policy, which leverages its immense mineral potential.

India’s minerals demand is expected to grow rapidly on the back of economic growth, urbanization, thrust on infrastructure investment etc. The country’s geological and metallogenic history is well endowed, being similar to mineral rich regions of Antarctica, Australia, South Africa and South America. However, India is yet to be fully explored, assessed and exploited, with only around 10% of the potentially resource-bearing area having been explored, constrained by minimal exploration budgets over the years. The number of participants in the Indian exploration sector can indeed be broad based from the current 8 (compared to 400 or more for Canada and Australia each). Success in mineral exploration is a necessity to keep the flow of auctionable mining blocks into the market and meet India’s internal demand.

There is no such thing called a single best practice. We need policies, regulations and practices that are most value creative in India’s social, economic, geographic and environmental contexts. Traditionally, most of the mining countries have adopted “first come first serve” principles to grant exploration rights and have provisions for automatic transfer from prospecting to mining lease. In its quest of transparent, fair and competitive mechanism for grant of natural resources, the Indian Government has adopted a philosophy of allocating rights to mineral resources only through the auction route and has amended
the mining regulations to reflect this approach. Hence, straight adoption of the common practices followed globally is not the preferred choice here. Therefore, it is an imperative to craft a set of alternate policy measures that comprehensively makes the country an attractive investment destination for entrepreneurs both global and local.

**NMEP: a new model that can succeed**

The Indian Government has introduced some transformational regulatory changes and policy initiatives through the NMEP. The measures such as cost reimbursements and royalty sharing are in many ways bold and innovative, since the government is willing to pay the private explorers even for unsuccessful exploration and perhaps even some unsuccessfully bid mining blocks. While this framework seeks to align the principles of transparency and competitiveness, it will be tested over time for its effectiveness in achieving the desired objective of boosting the mining sector GDP. This document seeks to analyze various features of the NMEP and delineates factors critical for success in the bet, reflects upon improvements that will be necessary or challenges that may need serious attention and resolution.

Availability of risk capital for exploration, balanced scope and deliverables from explorers, risk-reward equation through the revenue-sharing mechanism, impact of economic cycles, brownfield exploration, adequacy of budget allocation within the next few years, and supportive taxation framework are some of the issues that the Government needs to address to attract the best exploration talent available globally.

**Government: the collaborative investor-partner with diverse critical roles**

In the last few months, the central and some state governments have taken initiatives to kick start the mining sector with a right earnest. The policy initiative for exploration is an attempt to progress and broaden upstream opportunities. In this journey, the Government is playing various roles including that of a legislator/regulator, planner, enabler, investor and promoter at various times. Many of these roles are relatively new and challenging, given multiple skills, competencies and behavioral attitude necessary. Unlike a private sector explorer, which is usually small and agile, the Government will function through large number of departments and representatives and hence, the impact of their action or otherwise, is a consequence of the weakest of those links. Hence, the Government also needs to accelerate capacity building of its representatives who will be performing these diverse and critical roles.

**Post discovery journey to success**

Prospecting, exploring to developing and mining is a complex journey over a long time frame, which must cross several milestones and variables. For example, the entire life cycle spans over a few rounds of economic cycles of high/low commodity prices. This may reward explorers at a good pricing period more than their contribution to discovery, and conversely we might see a period of muted interest in exploration during low prices such as now.

Even after a discovery is made, the technology available to extract, process or evacuate the output may still be at a nascent stage thereby, forcing the discovery being assessed lower than the viability threshold. Subsequent developments in technology may render the deposit move forward in viability toward a decision to grant its mining lease.

Even for technically assessed viable reserves, the Government may defer mining activity considering demand-supply, socio-political situation, environmental issues, lack of logistics infrastructure to evacuate or even for other strategic reasons. Timing of such events/decisions may happen after the explorer bids and wins the permit to explore. In such circumstances, while its own revenue stream may be deferred by the Government, it would be necessary to positively recognise the exploration as successful.

The proposed new policy framework potentially opens up substantial new opportunities for the sector to fast track growth in India. However, only exploration permit will not lead to a successful mine. As with any transformational journey, there are aspects that need constant re-evaluation from a risk-reward perspective to make them attractive for an entrepreneur to engage and succeed. First milestone will be to attract top explorers who have the competence, risk appetite, sustainability and leadership – and we must succeed at that.
Exploration Scenario

Global

India
India's minerals demand will continue to grow

In the next few years, India's GDP is expected to continue to grow on the back of economic development, rapid urbanization, thrust on infrastructure investment, improved private investment, strong industrial activity and increasing consumption. The Government’s focus on “Make in India” (hike manufacturing share in GDP from the current 17% to 25% by 2022), “Housing for all by 2022”, smart cities, power for all, modernization of railways and aggressive highway construction targets will drive growth at a faster pace in end-user industries including power, cement, construction and infrastructure, which will in turn boost domestic mineral consumption.¹

India's intensity of use of metals remains very low across most metals as compared to other developing and developed countries. This is indicated in the charts below. Given India's stage in the developmental cycle, consumption of minerals is expected to witness strong growth.

¹ ‘Achieving 25% of GDP from manufacturing, 100 million jobs by 2022 difficult: Survey,’ Economic Times, 27 September 2015
India’s geological potential

India has a geological and metallogenic history similar to the mineral rich shield area of Antarctica, Australia, South Africa and South America. India’s geological domains are well endowed with mineral resources; however, they are yet to be fully explored, assessed and exploited.

India produces around 88 minerals – 4 fuel-related minerals, 10 metallic minerals, 50 non-metallic minerals and 24 minor minerals. As on 31 March 2016, the country had around 1,878 reporting mines – excluding mining areas for minor minerals, crude petroleum, natural gas and atomic minerals. The table below shows mineral resources in the country and the ratio of reserves to resources. Mineral reserves, which by definition are a part of mineable resources that can be economically brought to production, form a small portion of respective resources. Exploration is the foundation for value creation in mining. Exploration broadens the pipeline of bodies for development, replenishes reserves depleted through production. It also replaces resources stranded due to uneconomic commodity prices. Currently, only around 10% of the 8 lakh sq. km potentially resource-bearing area in India has been explored, which presents a huge upside opportunity.

Exhibit 2. Significant potential to convert resources to reserves

<table>
<thead>
<tr>
<th>Manganese</th>
<th>Chromite</th>
<th>Zinc</th>
<th>Silver</th>
<th>Copper</th>
<th>Bauxite</th>
<th>Iron ore</th>
<th>Gold</th>
<th>Nickel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves</td>
<td>Remaining resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0%</td>
<td>100%</td>
<td>80%</td>
<td>60%</td>
<td>40%</td>
<td>20%</td>
<td>10%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Source: BMI

| Total ore resource (mt) | 584 | 321 | 35.8 | 29788* | 12.2 | 3739 | 31323 | 640.4* | 189 |

Source: Ministry of mines, Government of India. * Gold and Silver are in tonnes.
Indian minerals exploration – play to win

Exploration spend in India is low compared to other large mining regions

India has not been a favored mineral exploration destination for global explorers with just around 0.6% of the global exploration budget in 2015, as compared to 14% for Canada and 12% for Australia. India’s exploration expenditure estimated at around US$17 per square kilometre compares unfavourably even with its BRIC counterparts such as China and Brazil, who have exploration expenditure of around US$56 per square kilometre and US$35 per square kilometre, respectively.  

The table below shows the exploration expenditure breakdown by mineral, stage of development and the number of companies involved in exploration for various countries. With only eight companies engaged in exploration in India as compared to more than 400 each for Canada and Australia, the number of participants in the exploration sector can indeed be broad based.

Out of the exploration expenditure of US$50m during 2015, Hindustan Zinc spent around US$25m, Hindustan Copper spent around US$8.5m and Uranium Corp. spent around US$8m with the rest accounting for the balance. In India, (non-ferrous) exploration budget has primarily been spent on exploring base metals whereas, at a global level, gold accounts for a majority of exploration budget.

Exploration budget in various countries, by target and stage of development (US$m)

<table>
<thead>
<tr>
<th>Country</th>
<th># of companies</th>
<th>Country Total</th>
<th>Gold</th>
<th>Base Metals</th>
<th>Diamond</th>
<th>Uranium</th>
<th>PGM</th>
<th>Other</th>
<th>Grass roots</th>
<th>Late stage</th>
<th>Mine stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>464</td>
<td>1185.3</td>
<td>597.8</td>
<td>203.5</td>
<td>95.5</td>
<td>147.3</td>
<td>28.2</td>
<td>113</td>
<td>339.3</td>
<td>446.8</td>
<td>399.2</td>
</tr>
<tr>
<td>Australia</td>
<td>450</td>
<td>1068.4</td>
<td>509.2</td>
<td>377.5</td>
<td>7.0</td>
<td>51.6</td>
<td>1.6</td>
<td>121.5</td>
<td>381.3</td>
<td>317.2</td>
<td>369.9</td>
</tr>
<tr>
<td>United States</td>
<td>208</td>
<td>717</td>
<td>414.7</td>
<td>222.2</td>
<td>-</td>
<td>8.3</td>
<td>6.8</td>
<td>65</td>
<td>175.4</td>
<td>250.7</td>
<td>290.9</td>
</tr>
<tr>
<td>Chile</td>
<td>77</td>
<td>615</td>
<td>162.3</td>
<td>432</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>20.7</td>
<td>205.4</td>
<td>210.1</td>
<td>199.5</td>
</tr>
<tr>
<td>Peru</td>
<td>96</td>
<td>501.8</td>
<td>149.5</td>
<td>244.5</td>
<td>-</td>
<td>4.3</td>
<td>-</td>
<td>103.5</td>
<td>139.2</td>
<td>157.7</td>
<td>204.9</td>
</tr>
<tr>
<td>China</td>
<td>62</td>
<td>540.4</td>
<td>245.6</td>
<td>183.6</td>
<td>3.0</td>
<td>7.0</td>
<td>0.8</td>
<td>100.4</td>
<td>177.8</td>
<td>130.3</td>
<td>232.3</td>
</tr>
<tr>
<td>South Africa</td>
<td>34</td>
<td>117.1</td>
<td>15.8</td>
<td>10.4</td>
<td>25.0</td>
<td>0.4</td>
<td>56.3</td>
<td>9.2</td>
<td>16.5</td>
<td>78.6</td>
<td>22</td>
</tr>
<tr>
<td>Indonesia</td>
<td>40</td>
<td>106.8</td>
<td>53.7</td>
<td>51.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.9</td>
<td>26.2</td>
<td>49.4</td>
<td>31.2</td>
</tr>
<tr>
<td>India</td>
<td>8</td>
<td>50.2</td>
<td>1.7</td>
<td>36.0</td>
<td>1.9</td>
<td>8.0</td>
<td>0.3</td>
<td>2.3</td>
<td>23.0</td>
<td>7.2</td>
<td>20.0</td>
</tr>
</tbody>
</table>

Source: SNL Financial

Overall FDI in the mining sector remains weak despite recent pick up

During most of the last decade, FDI inflow into the Indian mining industry was subdued as compared to other sectors such as telecommunications, power, machinery and transport equipment. This despite the Government allowing 100% FDI in the mining sector under the automatic FDI route.

FDI in mining increased sharply in the last couple of years, from a very low base, on the back of reinvigorated mining sector regulations and activities. Despite this significant rise, it is still only around 0.8% of the total FDI. Furthermore, the recent news of Rio Tinto exiting the Bunder diamond project, since it did not reportedly get timely permits for concessions and environment approvals, may again hurt sentiments of foreign investors.


Exhibit 5. FDI flow in Indian mining industry

Source: Government of India

Mining can be GDP booster for India

The contribution of mining in India’s GDP has continuously declined with mining’s share in GDP declining from 3% in 1999–2000 to around 2.3% currently. The mining industry, by its very nature, impacts a wide variety of stakeholders, triggers various downstream economic activity and therefore, has a multiplier effect on the economy. With the right policy support, the mining sector can boost national GDP, increase state level and national taxes and royalties and provide employment especially to the population in remote areas.

The new minister for mines, Shri Piyush Goel, aims to increase the volume of mined minerals by 30%-35% annually and increase the share of mining in GDP by 1% in the next two to three years.4


“New mines minister Piyush Goyal seeks to raise mineral output,” Mint, 7 July 2016.
Global mining is undergoing a downturn

The chart below shows a sharp decline in the capital market performance of the listed junior exploration companies compared to the broader index in the last few years with a marginal recovery in the last quarter or so. The constant decline, since 2012 reflects the market sentiment toward junior mining companies and the funding constraints they are facing. The recent uptick is due to mild recovery in sentiments and mineral commodity prices. Most of these mining companies are junior explorers or developers with little or no revenues from mining operations.

Exhibit 6. Performance of Mining Eye and FTSE AIM All share (rebased to 100)

Source: EY; EY’s Mining eye is a weekly share index tracking the combined performance of the top twenty mining companies on AIM by market weight.
Similar challenges are being faced by mining companies listed on TSX and TSX-V, the world's largest exchange for financing mineral projects across the globe. The table below shows the geographical reach of TSX/TSX-V listed companies. The number of funded projects dropped by 31% y-o-y on an average with sharp declines observed across all regions, which highlight the universal nature of the challenge in accessing capital for this business.

**Geographic distribution of projects by TSX/TSX-V listed companies, January 2015**

<table>
<thead>
<tr>
<th>Location of mineral projects</th>
<th>Number</th>
<th>YOY change (absolute)</th>
<th>YOY change (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>3,152</td>
<td>-1,159</td>
<td>-26%</td>
</tr>
<tr>
<td>Latin America</td>
<td>1,046</td>
<td>-425</td>
<td>-28%</td>
</tr>
<tr>
<td>United States</td>
<td>659</td>
<td>-399</td>
<td>-37%</td>
</tr>
<tr>
<td>Africa</td>
<td>418</td>
<td>-157</td>
<td>-27%</td>
</tr>
<tr>
<td>Asia</td>
<td>190</td>
<td>-91</td>
<td>-32%</td>
</tr>
<tr>
<td>United Kingdom and Europe</td>
<td>153</td>
<td>-146</td>
<td>-52%</td>
</tr>
<tr>
<td>Australia</td>
<td>135</td>
<td>-158</td>
<td>-54%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>5,618</td>
<td>-2,535</td>
<td>-31%</td>
</tr>
</tbody>
</table>

Source: Facts and Figures of the Canadian mining Industry - 2015

**Private enterprise is the largest contributor to global exploration activity**

Globally, exploration is largely funded by private enterprises as they have the technology and the expertise to carry out such a risky and capex-intensive activity. In 2015, private enterprise accounted for more than 90% of the global exploration budget (split between major mining companies (48.8%), juniors (29.3%) and intermediates (13.1%)) whereas Government and other institutions accounted for only around 8.8% of the budget.

**Global capital pool available for exploration has significantly shrunk**

The chart below shows the contribution to exploration budgets by various types of companies during 2006-2015 and clearly highlights the role played by junior miners and major miners toward global exploration activity. Reflecting global macroeconomic uncertainty and weak commodity markets, corporate exploration spends fell significantly in the last few years, down 30%, 26% and 18% in 2013, 2014 and 2015, respectively. Exploration budget is expected to be low this year too, since commodity markets continue to be depressed resulting in majors remaining cautious about their expenditures and volatile commodity prices keeping external funding challenged for all types of mining companies.
The majors, still prime spenders of late, have cut their exploration budgets by more than half from US$9.1b in 2012 to US$4.3b in 2015. The juniors segment, which was at the forefront of exploration activity before financial crisis, have now significantly cut back their spends by almost one-third — from US$8.0b in 2012 to US$2.6b in 2015. Such divergence in exploration spend cutback is also due to the way the two segments source their exploration funds. Majors largely fund it from internal accruals but juniors are mostly dependent on secondary sources such as capital markets or venture capital, where raising funds becomes difficult during weak global macro-economic environment. Because juniors are largely dependent on external funding and mine discovery can be a long-drawn process, juniors often partner with one or more large mining company for funding continuity.

Over the years, the Governments had to step in with some increased budgets but that uptick has been insufficient to replace the private expenditure.

**Declining discovery rates**

Discovery rates, which tracked exploration expenditure until last decade, have started declining since and giant discoveries have trickled to only one or two per year globally while there has been a sharp drop in major discoveries. This is reflection of the trend that shows most of the easy discoveries of shallow bodies have been done — thereby needing more expensive exploration effort in future. Therefore, despite a softness in the cost of a standard exploration activity (due to downturn) the aggregate cost of discovery is likely to continue to rise.
National mineral exploration policy

- Policy Highlights
- Critical Success Factors
Government launched NMEP to intensify mineral exploration

Although India has a vast mineral potential and is a major producer of some minerals, yet, the size of its mining sector is not commensurate with its potential. It is worth emphasizing that investment decisions are based on both the mineral potential of the jurisdiction and the policy perception of the jurisdiction. Fraser’s annual policy perception index, a composition of survey responses to policy factors that affect investment decisions, ranks India at 81 out of 109 mining provinces surveyed in 2015. However, that is certainly going to change.

Like many other legislations, minerals exploration policy in various regions of the world has evolved over a period of time. Each region may have its own “best practice” based on the local social, cultural, economic and political context and also on global macro-economic environment.

Traditionally, most of the mining countries have adopted a principle of “first come first serve” to grant exploration rights and have provisions for automatic transfer from prospecting to mining lease. We do understand that in the quest for transparent impartial and competitive mechanism for grant of natural resources, the Indian Government has adopted a philosophy of allocating rights to mineral resources only through the auction route and has accordingly amended the mining regulations to reflect this approach. Therefore, some globally followed common practices are not the preferred choice here. Hence, it is suggested that the Government implements a set of alternate policy measures that can comprehensively make the country an attractive investment destination for large entrepreneurs both global and local. Robust mineral exploration activity is a necessity to keep the flow of auctionable blocks into the market.

With the launch of the new mineral exploration policy (NMEP) in July 2016, the Indian Government has continued to take steps to transform the Indian mining sector. A well-crafted NMEP with robust execution can improve India’s ranking in the policy perception index and become an attractive destination for mineral exploration.

NMEP recognizes the need to incentivize private sector participation and has various provisions for that. For example, revenue sharing with private explorers in case exploration efforts lead to auctionable resources and cost reimbursement to explorers if the exploration agency is unsuccessful in discovering any economic reserves.

The Ministry of Mines has identified around 100 non-coal, non-fuel blocks (70 of them deep-seated minerals such as diamonds and gold) to be auctioned off to private explorers in the next nine months. As per the provisions of the NMEP, model templates are being drafted on how to engage private exploration agencies.

In India, exploration activity so far has been carried out largely by the state-run Geological Survey of India (GSI) and Mineral Exploration Corp. Ltd. (MECL). NMEP envisages increased involvement of GSI, MECL together with an enhanced role for the states, who will refer exploration projects, which can be taken up through National Mineral Exploration Trust (NMET). State-run companies can form joint ventures with private companies to undertake exploration projects.
Policy highlights

Below are the highlights of the NMEP:

- Creation of baseline geoscientific data for open dissemination free of cost
- Ministry of Mines to auction exploration blocks on revenue sharing basis
  - Payment to the exploration agency will be dependent on the complexity of the project
  - For simple projects exploration agency will be paid on successful completion of each milestone of the exploration project
  - For moderately complex projects, exploration agency will be paid actual project cost incurred or normative project cost, whichever is lower, and a fixed percentage return on the project cost quoted by the exploration agency
  - For complex projects, exploration agency will be paid actual project cost incurred or normative project cost, whichever is lower, and annual returns, which will be a product of a) royalty paid by mining lease holder and b) percentage share of royalty as quoted by the successful bidder
- If explorer agency does not discover auctionable resources, exploration expenditure to be reimbursed on normative cost basis
  - The exploration agency will be paid actual project cost incurred or normative project cost, whichever is lower.
- National Aero-geophysical program to acquire state-of the-art baseline data for targeting concealed mineral deposits
- National Geoscientific Data Repository to collate all baseline and mineral exploration information
- To establish a National Centre for Mineral Targeting (NCMT)
- To probe deep seated/concealed mineral deposit in collaboration of NGRI and proposed NCMT

**Categorizing exploration projects based on complexity**

- Simple projects for stratiform, stratabound and tabular deposits type of mineralization, e.g., bulk minerals
- Moderately complex projects for surface and shallow subsurface deposits of vein type structurally controlled mineral deposits, e.g., base metals, porphyry deposits of copper
- Complex projects for geological formations such as deep-seated and concealed deposits, e.g., gold, diamond

The Indian Government has introduced several transformational changes to the mining sector environment with several regulatory changes and policy initiatives including the NMEP to provide a thrust to the mining and exploration activities. The policy measures such as above are in many ways bold, innovative and move away from the traditional path adopted by most other countries. While this framework seeks to align the philosophy of the Government for transparency and competitiveness, it will be tested over time for its effectiveness in achieving the objectives of boosting the mining sector GDP. We analyze below some key features of the NMEP and attempt to delineate critical factors for success and reflect upon what further improvements may be necessary or what challenges that need further attention and resolution.

Free accessibility of geological information:

Making geological database accessible free of cost is an important step to attract exploration, since geological potential of an area is one of the main considerations for a mineral explorer to engage.

The Government will make available pre-competitive baseline geoscience data for open dissemination free of charge, since it has now also obtained relaxation in restrictions from the Ministry of Defence (MoD) on sharing of data. This data will be continuously updated and benchmarked with those of other leading countries such as Australia. The Government will implement a National Aero-geophysical program to acquire state-of-the-art baseline data for targeting concealed mineral deposits. NMEP has proposed to set up a National Geoscientific Data Repository (NGDR) to collate all baseline and mineral exploration information generated by various central and state government agencies as well as mineral concession holders and to maintain these on geospatial database.

What NMEP envisages with respect to making the country’s geological information is in line with the global best practices. The table below shows the availability of geological information across various countries.

### Availability of geological information in various regions

<table>
<thead>
<tr>
<th>Name of agency</th>
<th>Are there restrictions on who can use the data</th>
<th>Whether data is available online</th>
<th>Is data available free of charge</th>
<th>Smallest scale at which data is available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>1: 100 000 Geoscience Australia, other state agencies</td>
</tr>
<tr>
<td>Canada</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>1: 50 000 Geological Survey of Canada, Various provincial agencies</td>
</tr>
<tr>
<td>United States</td>
<td>No</td>
<td>Yes (yes)</td>
<td>Yes</td>
<td>1: 24 000 Unites States Geological Survey</td>
</tr>
<tr>
<td>Peru</td>
<td>No</td>
<td>Yes</td>
<td>NA</td>
<td>1: 100 000 INGEMMEt</td>
</tr>
<tr>
<td>China</td>
<td>Yes</td>
<td>No</td>
<td>NA</td>
<td>1: 50 000 China geological survey</td>
</tr>
<tr>
<td>Chile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Africa</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>1: 50 000 Rural development and land reforms</td>
</tr>
<tr>
<td>Indonesia</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>1: 200 000 Bedan Informasi Geospasial</td>
</tr>
<tr>
<td>India*</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>1: 50 000 Geological Survey of India</td>
</tr>
</tbody>
</table>

Source: “Mineral exploration in APEC economies – ABARE”, Agency websites

* As proposed in the NMEP 2016

NA - Information not available

According to the chart below, the quality of geological database currently in India does not stand up well when compared to other competing mining regions.
The Fraser survey indicates that India ranks low in the quality of its geological database (which includes quality and scale of maps, ease of access to information). One of the reasons could be that the information so far was non-digitized and was not available freely in the public domain. Moreover, most of the exploration in the country has so far been near the surface (50–100m) with little or no information on deep-seated minerals.

Recent policy considerations and its implementation should lead to more quality data being available. GSI has a repository of more than 8,500 geological reports of mineral investigations carried out since 1941. However, geological mapping needs to be updated on a continuous basis, since technology advancement in geophysical surveys are likely to make older reports look insufficient or sub-standard.

The real test of these reports will come once exploration companies bid for permits on the basis of these reports. The Government has plans to intensify geochemical mapping (target to cover entire OGP by 2018-19) and geophysical mapping (target to cover entire OGP by 2020-21), which are important milestones for exploration of metallic minerals.
National Centre for Mineral Targeting (NCMT) and exploration of deep-seated deposits

Exploration of deep-seated deposits would require modern and sophisticated exploration methods/techniques, which in turn would require additional investments in talent and technology. The Government has proposed to establish a not-for-profit autonomous institution, NCMT, as a public-private partnership and will contribute a part of the seed funding for this venture. The GSI will initiate a project on pilot basis for probing deep seated/concealed mineral deposits (300m–1000m).

In addition to collaboration on an autonomous institution, the industry can also be incentivized to spend on R&D in new technologies. The Government can relax import norms and duties on latest high tech equipment critical for sub surface exploration of primarily strategic minerals. Through “Make in India”, the Government can also encourage technology transfer and manufacturing of such equipment in the country.

Availability of risk capital for exploration

Mineral exploration activities (across scoping to feasibility stages) require significant capital outlay not only for initial equipment investment, but also for labour and administrative activities. As explorers lack certainty of revenue streams to finance debt, they are usually constrained to raise funds through equity, despite its increased costs in comparison to cost of debt. Furthermore, debt financing for exploration is also difficult to obtain because of lack of an asset as a collateral to the lender during times of distress. On the other hand, internal funds are more often than not unavailable due to absence of operating mines.

Junior miner exit strategy

For junior exploration companies, as has been observed in mature mining regions such as Canada and Australia, one of the major incentives to undertake such a high risk activity is that the exploration company can then sell the mining license at a premium to larger better capitalized company.

An analysis of the M&A activity across minerals provides insights into the risk-return trade-off for explorers. Most of the junior’s sell part stake of their project to large miners/explorers to safeguard their investment or tap working capital requirement for preliminary mining of the deposit, during the initial three to five years following exploration. Furthermore, once initial production from these assets commenced, majority/full stakes in these projects were then sold to major miners/financial investors/metal smelters. Barring the Chinese state-owned enterprises, almost all transactions globally were between private enterprises with little or no government involvement in any deal.

Most of the available data points to sale of assets after some level of development of the mine, indicating that junior explorers cum miners would sell the asset at a significant premium. This is the global trend across regions and we think India is not likely to be any different if the right to mine the explored area was also granted to the explorer. However, since data obtained during NERP will need to be shared with the government and made public, the Indian framework needs to embed an alternative model to incentivize participants in exploration.
Equity financing for mineral exploration can be raised either through an organized stock exchange or off exchange.

- Shares issued through organized stock exchanges are more liquid, allowing the owners to sell the equity through the exchange with ease. However, stock exchange transactions are subject to significant reporting standards and regulatory procedures and costs. Furthermore, valuations as well as investor appetite for risk are highly dependent on the prevailing macroeconomic scenario. If the country, where the company intends to undertake exploration, does not have a well-developed risk capital market, the company can raise capital in other exchanges such as TSX-V, AIM London or ASX, which have well developed capital markets to finance junior mining companies. A capital market on the lines of AIM or TSX-V may be of immense support if developed within the country.
Majority of the equity raised by junior miners is “off exchange” such as joint ventures with similar sized or larger mining company, private placements to a financial/strategic investor, venture capital and royalty-based financing, where procedures are not subject to as many regulations and are less standardized and structured. Such transactions have the possibility of getting a like-minded partner, closing the deal at a premium with a strategic partner and higher likelihood of continued funding. However, it may take time to find the right partner through this method, equity tends to be less liquid and there may also be issues of control between partners.

Given the above challenges in financing exploration activities, governments have also stepped in to supplement and support. The Indian Government’s stated philosophy now is to fund the exploration activity as a customer of exploration as a service. This is the most fundamental departure from most models that operate globally, but may alleviate the problem of uncertainty of revenue stream for a pure exploration activity.

Framework for concessions and tenure

Under the current regulations, a private sector participant can obtain two types of mineral concessions, both on auction basis.

- **Composite License (Prospecting License-cum-Mining Lease):** Composite license gives the company security of tenure of the mining lease.

- **Non-Exclusive Reconnaissance Permit (NERP):** NERP holder can either retain the reconnaissance data with them (in contrast to earlier provision of mandatorily sharing the data within 60 days) or submit it to the state government in case it is of an auctionable nature.

As we noted in our report on Mineral concessions framework, the policy framework wherein the RP holder cannot stake claim for an ML and risks termination in case of auction notification, does not balance risk reward in the prospecting business. One approach to address this could be that the NERP operators be granted a right to bid (among themselves) at the end of the exploration activity by all RP holders. Alternatively, the successful area may be notified for CL and put to competitive bidding including all these RP holders being eligible. Some form of first right of refusal may be allowed to the most successful RP explorer (success having been evaluated with a pre-decided set of parameters)

Selection of private explorers

Private explorers will be selected through a transparent process of competitive bidding through e-auction. The Government has categorized various exploration projects based on their complexity level (simple projects, moderately complex and complex projects) and has separate contractual framework for each type of project. There will be qualifying criteria on the basis of technical and financial eligibility for each category of exploration project to attract the right exploration agency suited for each category.

In the current environment of constrained finances for exploration and low commodity price cycle, this opportunity may appear to be a viable business model to a private explorer in the business of of exploration only as a service. It is to be tested if this will attract successful explorers who excel in high risk-high reward exploration as a business. With lowering risk of uncertainty of revenue streams from exploration activity (reimbursement of even cost of failed exploration) the proposed Indian model may be sufficiently attractive for a segment of explorers who are risk averse and are relatively under-utilized in the current economic environment of low exploration budgets/activity.

The challenge is: what can be done to attract the top-end of global explorer’s community who
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have the talent, competence, leadership, sustainability and risk appetite – as perhaps they are the ones that generate most value through successful exploration. Private players who want to explore areas that are not part of the 100 identified blocks are encouraged to apply for requisite licences. However, in our view, given industry concerns, the government may want to come up with clearer guidelines. For example, the 100 identified blocks may have already been categorized into three complexity levels but for newer blocks, will there be criteria on how these blocks will be categorized?

For each category of exploration project, the relevant committee constituted by NMET/ State DGMs will prescribe technical and financial eligibility criteria to attract the right exploration agency suited for each category. However, it may be difficult to make watertight definitions of three types of exploration projects. For example, simple projects, which are primarily surficial deposits and include bulk minerals such as iron ore, bauxite, limestone can also be mined shallow sub surface (underground). If a company, while exploring the surface, also wants to conduct sub surface exploration for the same minerals and in the same area, what will be the process? Will it be eligible to conduct the exploration given it had only met the qualification criteria for exploring surface deposit. If it meets the qualifying criteria, will it be required to wait for the next round of auctions or can there be some guidelines for smoother transition of such cases?

Balanced scope and deliverables

The primary reason for inviting private sector explorers/mining companies to bid for exploration blocks is to leverage their global knowledge, skills, learnings, technology and tools etc. After evaluating them technically by experts in their field, they should be left to lead their work without micro management. In this context, it will be prudent to maintain a good balance between the broader objectives and the details of the mandated scope, approach, activities etc. Hopefully the program draws interest and attention of successful exploration community – and then the deliverables may rather be goal oriented than activity driven. A collaborative, knowledge-sharing partnership model is likely to yield better success as compared to a contractor-owner model.

Revenue sharing with private explorers:

Private exploration agencies will get a share of revenue accruing to state governments from auction of successful blocks, with transferable rights. In case the exploration efforts lead to auction-able resources, the exploration firms will be paid, depending upon the complexity category, either a fixed return percentage on the costs or a part of the royalty by the miners during the lease period of 50 years. The revenue share can be in the form of an annuity (percentage of royalty) paid throughout the mining lease or as a lump sum amount based on the net present value of the accruing royalty. This amount will be paid by the successful bidder to the concerned exploration agency and will be determined at the time of e-auction of those mineral blocks. The discounting rates applied to arrive at the NPV are also planned to vary depending upon the time of exit by the explorer over the life cycle of the mine, after the completion of exploration. Conceptually this appears to be aligned to the risks and time factors over the life cycle.

For a successful explorer, returns in the form of revenue sharing for the entire mine life may not be the most attractive proposition. If an explorer is able to establish reserves, it would ideally prefer to have a seamless transition to mining rights of those minerals or at least a right of first refusal. The explorer may then want to either mine it or transfer the concession to another mining company. A global major miner may not make investments in exploration only to then again bid for what it discovered. Indeed, Deccan mines said that it has no incentive to explore for gold after laws passed last year forced miners to bid for the right to mine the deposits they find.6

6. “India could be sitting on a gold mine and not know it,” Mint, 7 April 2016.
Economic cycles

Another factor that needs consideration is the impact of economic cycles. At the high point of the cycle, as we had in the previous decade, at least in the global mining business, even a sub-grade resource or a high cost mine was developed primarily driven by high commodity prices. However, the aim of an exploration programme is to discover a world class resource that is not only technically feasible to extract, but also has an economic viability across the entire life of the mine, which will generally experience a few economic cycles. Hence, the economic feasibility decision is a function of, among others, the then prevailing commodity prices. This is a challenge that needs to be addressed by the explorer who wishes to be deemed successful – and hence, the Government has to lay out a longer term policy and definitions. Moreover, the timing and success rate of mining lease auctions will also be affected, thereby impacting the planned “revenue stream” – something a bidding explorer has to additionally factor in – particularly in an environment, where we have struggled to achieve speed of execution in the past.

Deferment of auction

Volatility of minerals is here to stay. It is probable and indeed logical at times, that the government may decide, in view of the low price environment of minerals, to defer the mining lease auctions post a successful exploration. In such a situation, will this exploration be deemed successful, will the government authorities come under increased scrutiny of having accepted exploration success but “failing” to auction the mine? How does this impact the explorer and how will disputes be resolved? Response to such potential issues is something that will need to be clearly laid out in advance to remove any ambiguity and potential risks in the value chain.
Indian minerals exploration – play to win

The Central Government and some state governments have taken initiatives to kick-start mining sector activities in the country with a right earnest and have taken several steps starting with amending the regulations relating to mining activities. The policy initiative for exploration is an attempt to progress and broaden upstream opportunities. The Government is moving toward active governance of the sector with a mind to drive growth agenda. In this journey, it may well be necessary to take a look at various roles and responsibilities the Government is taking upon itself and the attributes that are necessary to be successful in those roles:

- **Legislator and regulator:** As the prime law-making body both at the Centre and states, to design, socialize, consult and frame regulations that drive achievement of goals and govern the sector.

- **Strategic planner:** In addition to long-range visioning, mid-term and near term goal setting are imperatives to drive growth and keep performance on track. For this, clarity of goals, key performance indicators and objective measurement tools for monitoring progress are a must – something that may need to be crafted for the minerals exploration sector. Synergy between economic development goals and models, industrialization, minerals strategy, public and private sector roles and socio-economic development aspirations will also need prime attention. Goal congruence between Central and state governments is also vital.

- **Growth enabler:** While it may not be so obvious, leadership to drive and enable growth in the mining sector has been assumed by the Government (at least partly due to a belief in some quarters that the private mining sector has fallen short of credibility – which perhaps is due to some specific past actions by a very small section of industry participants). As the key change agent in the mining sector, the duty to create the enabling environment and infrastructure falls on governments and all its agents.

- **Governance:** In this role, all governments must govern with the zeal to monitor and regulate related activities, maintain transparency, integrity and balance, while enabling growth.

- **Anchor investor and promoter:** This is a new role that the Government is assuming in the new policy framework in the exploration sector. Recognizing lack of interest (primarily due to lack of widespread involvement /success hitherto by the private sector) in the exploration activity, the Government is proposing to be the anchor investor and principal promoter to kick start the major investment cycle in exploration. While the PSUs were hitherto the prime agencies conducting exploration, the Government has now proposed to be the owner and investor who will mandate exploration contracts to the private sector. Fully aware of the low success rate in exploration, it is willing to fund the activity. This is a fundamental shift in role and responsibility and therefore, necessitates similar transformational change in the mind set also – akin to that of a private equity investor nurturing start-up entrepreneurs. Furthermore, will current governance and vigilance environment in the country encourage or inhibit this behaviour?

- **Collaborating partner – able and willing:** Exploration is a significant value creation economic activity that gets fully realized through mining over a long-term period. Typically the explorer/mining entrepreneur is a long-term partner in this journey. For successful partnership, certain attributes that are critical success factors include competency, entrepreneurship, integrity, collaboration, commitment, engagement, sustained hard work, co-ownership of decisions, a sense of purpose and drive for success. While the governments and its agencies must strive to select its exploration partner with above qualities, on its own part, the Government must also evaluate and assess if it leads by example on all the above attributes.

Many of the above roles are relatively new and challenging given the multiple competencies and behavioural aptitude necessary. Unlike a private sector organisation (particularly in the exploration domain) which is small and agile, the functions of the Government are performed by large number of departments and representatives. However, the impact of their action or otherwise, is a consequence of the weakest of those links. Hence, the most significant investment government must simultaneously initiate is in capacity building amongst its departments/agents/representatives that will perform its role. We are starting to see quite good signs of positive results for example in the coal sector, but this is a long transformational journey that must be undertaken and completed to achieve success in the much more diversified and difficult exploration value chain of other minerals.
Project timelines

The combined duration from initial reconnaissance to commissioning of a mining project can be from five to eight years or more unless there are unforeseen hurdles and delays, which can be quite common going by past experience. Such time frame needs to be built into the overall planning, goal setting, performance measures and the activity cycle. There is immense scope for rationalizing the usual timeline and if that is achieved, the country can witness accelerated value creation from this sector. The Government can comprehensively develop a project case before auctioning, pre-bundling it with all pre-requisite enabling approvals (for example, land, access rights and environment issues) to eliminate uncertainty in execution and hence, enhance the probability of success in exploration. Some of the broad activities in exploration are:

- **Reconnaissance**: This encompasses air borne geo physical, chemical surveys and field inspections. The final reconnaissance report should help identify mineralized areas worthy of further investigation. The timeline for this phase for an individual project can be between 1 and 2 years depending upon, inter alia, the size of the geographic area, depth of minerals from the surface, type of minerals under investigation. National Geochemical mapping has been completed for 42% of OGP area. The National Mineral Policy has suggested that National Geochemical mapping for the entire country will require another eight years.

- **Prospecting**: The activities undertaken in this phase are mineral outcrop identification and geological mapping. Limited trenching and sampling is also conducted. The timeline for this phase can be 1-1.5 years. The geological report will be the outcome.

- **General exploration**: The activities conducted include surface mapping, widely spaced sampling, trenching and drilling. The results from this phase will indicate whether pre-feasibility study and detailed exploration is warranted. The timelines for undertaking these activities can be 1-1.5 years.

- **Detailed exploration**: The detailed exploration provides detailed three dimensional delineation of a mineral deposit. Close paced drilling and bulk sampling are conducted to establish the presence of size, shape, structure and grade of the deposit. The results of this study will determine whether the project moves into feasibility stage. This again takes around 1.5-2 years.

Seamless transition from exploration to mining

Seamless transition from exploration to mining is important from the following perspectives too:

- **Community engagement**: In recent years many large mining projects were significantly delayed or stalled, since the ML holders were not able to get the affected communities fully on board. Social licence is a critical enabler in a successful mining venture. If the exploration company is confident of transition, it can appropriately engage with the project impacted communities from an early stage.

- **Accountability**: The company, which gets the mining lease may inherit issues, created by the exploration company, which may become apparent only at a later stage. This can increase the cost of the project due to unforeseen liabilities and legal proceedings regarding ownership thereof. Therefore, the Government will have to create safeguards for such eventualities.

Additionally, it will be a long period before a successful explorer starts getting revenue because the gestation period for opening of mines is very long in India. Indeed, to start with, it is uncertain what kind of interest will mineral auctions receive.
Brownfield exploration

Quite often brownfield exploration has yielded substantial reserves accretion. Experience suggests that as a mine approaches the end of its original life, substantial improvement in reserves can happen. Apart from fresh discovery, other factors that lend success include the knowledge acquired by the adjacent miner, access, technology, expanded project economics etc. The value that can be created is therefore dependent upon an integrated approach by or involving the current mining operator. The exploration policy ambit needs to be expanded to cover brownfield exploration of mineral deposits. Since the current mining lessee has the best contextual expertise in mining such a deposit, continuity even beyond lease expiry period, may be an option that should be favorably explored.

Discovery to success

A particular area may be explored by multiple explorers before a viable mineral deposit is found. Explorers at later stage will benefit from the work carried out by previous explorers. There is currently no provision for a revenue sharing model among the explorers and it appears the entire benefit will accrue to the last explorer.

Mining business operates over cycles of high and low commodity prices. A technically extractable deposit, which is assessed not economically viable for mining during suppressed commodity prices, may turn viable with increase in prices, without any further physical activity related to discovery or technical assessment. This may reward explorers based on timing of the price cycle rather than the effort in discovery and hence, we might see a period of muted interest in exploration during the trough.

Even after a discovery is made, the technology available to extract, evacuate or process the output may still be at a nascent stage thereby, getting the discovery assessed lower than the viability threshold at the time of deciding of success/otherwise. Subsequent developments in technology may render the deposit move forward in viability towards a decision to grant its mining lease.

Even for technically assessed viable reserves, the Government may defer mining activity considering demand-supply, socio-political situation, security or environmental issues, judicial intervention, lack of logistics infrastructure to evacuate or even strategic reasons (e.g., need to build strategic reserves). Timing of such events or decisions may happen after the explorer bids and wins. In such circumstances, while revenue stream may be deferred by the owner of minerals (government), it will be necessary to positively evaluate the exploration as successful.

Globally there are ample examples of above varieties of situations and hence, necessary considerations must be provided for in the policy framework.
**Cost reimbursement to explorers**

If the exploration agency is unsuccessful in discovering any mineral reserves, the Government will still compensate the agency by working out a normative cost of exploration for various types of minerals. NMET/State DGM will pay the company actual project cost incurred or normative project cost, whichever is lower. Necessary guidelines for computation of normative costs need to be socialized, which will provide unambiguous method that minimizes subsequent disputes.

**Budget allocation**

Given the risky nature of the exploration business, there are many failed pursuits for a successful discovery. Some relevant questions in this regard will be – has the government allocated sufficient funds for such pursuits? Assuming the ratio of successes is low and the budget is exhausted in unsuccessful pursuits, will there be a moratorium on issuance of further exploration permits? Given the need to expand the resource pipeline and hence, undertake an accelerated exploration program, is there a significantly high budget support planned?

**Taxation framework**

Many of the mining companies specialize only in exploration and do not proceed to mining activities. For these companies there is little incentive of tax deduction of exploration expenses. Moreover, quite often, each project is housed in a separate SPV and hence the SPVs may end up having losses, which cannot be set off against profit from a successful venture. Unless the same taxable entity has won and is executing large portfolio of exploration projects thereby having the opportunity to such set off, the effective tax rate on net income will be relatively high.

Exploration requires high end equipment, which is subject to technological obsolescence. Therefore, it is recommended that high rates of depreciation be provided to mining companies. Furthermore, equipment involved is complex and expensive. At times, mining companies obtain such equipment of finance lease. Position of law in terms of depreciation is not clear and it is recommended that law be clarified to the effect that depreciation should be granted to lessee.

Some of the countries also provide attractive and innovative tax incentives as a way to attract exploration companies, for whom such incentives might make or break their decision to engage. Canada provides tax incentive known as flow-through shares to these companies. Under this scheme exploration expenses “flow through” to individual investors in that company, who can then adjust it against their personal incomes. Below are few recent examples of how various regions are incentivizing their mineral exploration sectors as a whole or encouraging activity in specific mineral exploration:

- The Government of Uganda abolished taxes on mineral exploration as a means to encourage investment in the country. Taxes would only be incurred upon production.
- As part of its 2015 budget, the Canadian Government extended its 15% Mineral Exploration Tax Credit through 31 March 2016. The tax credit has been in effect since 2000.
- The Australian senate passed the Exploration Development Incentive (EDI), which will allocate A$100m (US$75m) over the next three years to provide tax breaks to junior miners and investors in early-stage mineral exploration projects.
- Under the Exploration Incentive Scheme (EIS), the Western Australia Government refunds up to 50% of drilling costs for greenfield projects and provides funding for additional geophysical and geochemical surveys in Western Australia.

A comprehensive taxation policy should be drawn up to align India’s taxation framework with the strategic needs of the mining sector. That should comprise both direct and indirect taxes and should also find appropriate reflection in the ongoing GST structure.
## Critical success factors

- Availability of risk capital
- Viable exit strategy for explorer
- Private sector participation
- Pre-bundled approvals
- Government as a collaborative partner
- Quality and availability of digital data
- Accelerated Budget support from Government
- Viability across economic cycles
- Technical knowledge and competence
- Policy enablement for brownfield exploration
- Goal-oriented scope and deliverables
- Engaging global leaders in exploration
- Supportive taxation policy
- Visibility and control over revenue stream
- Sustained journey from discovery to mining

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**Indian minerals exploration – play to win**
For further reading

Business risks facing mining and metals 2016-17 - August 2016
M&A and capital raising in mining & metals: 2Q 2016 August 2016
Navigating Volatility June 2016
Mineral Concessions Framework - Imperatives for Success September 2015
Debt in the mining sector August 2015

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