



# Conundrums in Identifying Right Mineral Assets

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**T**he mining industry is critical for India because of its substantial contribution to the economic growth of the country.

Intending to become a \$5 trillion economy by 2027, the mining sector has a huge role to play as it's one of the most significant contributors towards the Gross Value Addition (GVA) with a total standalone contribution of INR 3,27,984 crores in 2021-22, an approximately 12% rise Y-o-Y. Keeping the growth potential of the sector in mind, since 2015, the government introduced a series of measures to ensure the liberalization of the industry by allowing the participation of private entities, both domestic as well as international players, big or small, with or without any prior experience in mining but has the capacity to perform the necessary operations and meet the financial investments that the sector needs. This opening up of the industry acted as a force multiplier and has helped in generating crores of revenues, both for the state government and the central government through the auction of 415+ mines in a short span of five years.

While the legislations framed since 2015 have provided the necessary impetus that the sector needs, there's still a lot of work that needs to be done in order to overcome the existing challenges. For example, approximately 65% of the blocks tabled for auction were either annulled or abandoned by allottees and about 70% of the successfully auctioned are yet to be operationalized. Also, in some cases, the introduction of the new amendments didn't bring about the expected respite that was anticipated instead made things more

complicated. For example, along with domestic private participation, foreign corporations were also expected to participate in the auction process, given that India is the second largest country in terms of the total deposits of minerals that it harnesses. However, FDI has been staggeringly low in the sector, with little to no participation mainly because of stringent regulatory compliances and lack of essential data for due diligence.



Similarly, there hasn't been enough incentivization for private exploration companies undertaking mineral exploration activities unless something significant is discovered, and many more. The core reason behind these less-than-expected results, to an extent, can be attributed to the mismatch between the on-ground realities and the reasoning deployed while formulating the policies. Further, policymakers need to periodically check on the effectiveness of the statutes framed and improvise them from time to time to adjust to the ever-changing business landscape for instance the government expedited the process of handing out ELs to organizations with the hope of pushing for more discovery of mineral deposits across the country, yet didn't recognize the predicaments that impede participation such as lack of

incentives, modern technology, site topography and infrastructure information and cash flow uncertainties.

At present, India has approximately 252 mines of both metallic and non-metallic minerals at G4 exploration stage and another 180 in G3/G2 level since 2022. Almost two years since then, yet progress has been at a snail's pace related to the evaluation of these different mineral blocks, thus extending the Time-to-market (TTM) for these newly found deposits.

In this article, we will delve deeper into the nuances of the encumbrances faced during the gamut of activities ranging from exploration and discovery to the pre-production stage in the mining cycle and how they pose a severe hindrance to India's vision of becoming self-reliant in the metals and minerals space.



## Critical Factors & their Challenges

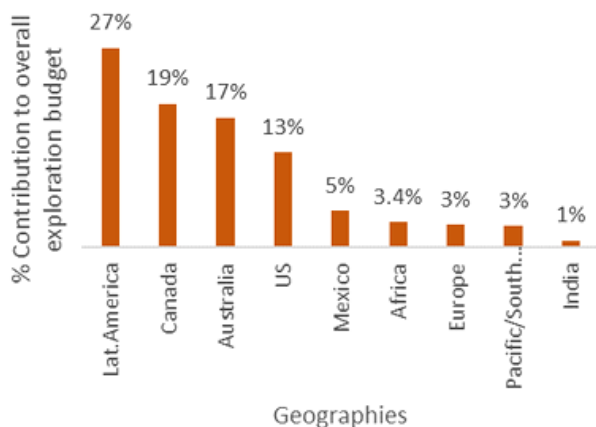
	Factors	Conundrums	Implications
TECHNICAL	<b>Geological Factors</b>	<ul style="list-style-type: none"> <li>Difficulties in conducting exploration activities at greater depths &amp; difficult terrains.</li> <li>Inadequate data about existing infrastructure on prospective site, geological anomalies and fault lines.</li> </ul>	<ul style="list-style-type: none"> <li>Less focus on exploration of indigenous deep-seated minerals &amp; more dependency on imports.</li> <li>Enhanced overhead costs and increased Time – to – market (TTM).</li> </ul>
	<b>Technology Hurdles</b>	<ul style="list-style-type: none"> <li>Selection of low-cost equipment over advanced equipment and technology due to small size of deposits with low revenue potential and profitability.</li> </ul>	<ul style="list-style-type: none"> <li>Less penetration of modern equipment and technologies in the sector affecting productivity &amp; safety.</li> <li>Pose obstacles in formulating an efficient process design.</li> <li>Unavailability of next-gen technologies impede faster decision-making process in the value chain.</li> </ul>
SOCIO-ECONOMIC	<b>Administrative Barriers</b>	<ul style="list-style-type: none"> <li>Varying land acquisition scenarios across different states.</li> <li>Long lead time for obtaining clearances such as EC, FC, WLC and Land acquisition.</li> <li>In-silo operations rather than single window procedures.</li> </ul>	<ul style="list-style-type: none"> <li>Extended time periods in obtaining clearances from regulatory bodies causing delays in mine operationalization, TTM &amp; cost escalations.</li> </ul>
	<b>Socio-Economic Hurdles</b>	<ul style="list-style-type: none"> <li>Lack of data repository on demographics, topography, land type, land holding size and other existing infrastructures.</li> </ul>	<ul style="list-style-type: none"> <li>Pose hurdles during due diligence of tabled assets resulting in error in calculations of CAPEX (R&amp;R cost, infrastructure costs, divergence costs etc.).</li> </ul>
	<b>Human Resource Constraints</b>	<ul style="list-style-type: none"> <li>Unavailability of skilled manpower in the sector due to lack of career progression, non-inclusivity, harsh working conditions and anticipation of less to no modernization.</li> </ul>	<ul style="list-style-type: none"> <li>Less interest among work-age groups to join the industry leading to operationalization delays, lower outcome, compromised quality and less innovation</li> </ul>
FINANCIAL	<b>High Project Costs</b>	<ul style="list-style-type: none"> <li>High risk of failure with little to no opportunity for recovery of investments.</li> <li>Challenging terrains, lack of advanced technology &amp; high manpower cost.</li> </ul>	<ul style="list-style-type: none"> <li>Less interest among Notified Private Exploration Agencies (NPEA) &amp; Junior mining companies to indulge in exploration activities which may result in slowing down the sector.</li> </ul>
	<b>Ever-Continuing Funding Winter</b>	<ul style="list-style-type: none"> <li>Lack of investments both in the form of equity &amp; debt from commercial banks/PE/VC because of ever increasing focus on Environmental, Social &amp; Governance (ESG)&amp; absence of sector specific funding policy.</li> </ul>	<ul style="list-style-type: none"> <li>Lower provision of CAPEX spending for augmenting capabilities in the sector.</li> </ul>
	<b>Price Volatility</b>	<ul style="list-style-type: none"> <li>Fluctuating uptrends and downtrends in the prices of commodities build fear in the minds of the mining entities across the value chain of getting caught in the wrong side of the market.</li> </ul>	<ul style="list-style-type: none"> <li>Brewing of lackadaisical attitude among entities towards participation in mining tenders may result in downswing of the sector.</li> </ul>

Let us delve deeper into the abovementioned factors and understand the nuances propagating them.

### Technological Barriers

The geological challenges faced by exploration agencies in India are worth mentioning. At the onset of the mining cycle, the prime task is to explore areas for prospective minerals by engaging Notified private exploration agencies (NPEA) or Junior Mining Companies. While a decade back or two, there was remarkably high participation from these players in the reconnaissance and prospecting activities, over the years, a gradual lack of interest has been noticed to now, with hardly a handful of players vying to participate in such tenders. Major attributable reasons for the same are challenging terrains, increased depth of deposits, lack of incentives, unavailability of infrastructural data of prospective sites, and hurdles posed by environmental regulations.

Worldwide major mining nations like Canada, USA, and Australia spend 10-14% of the share in the global exploration budget on reconnaissance and prospecting activities in comparison to India's strikingly lower than 1% expenditure, thus validating the discovery of only 10% of the Obvious Geological Potential (OGP) of the country

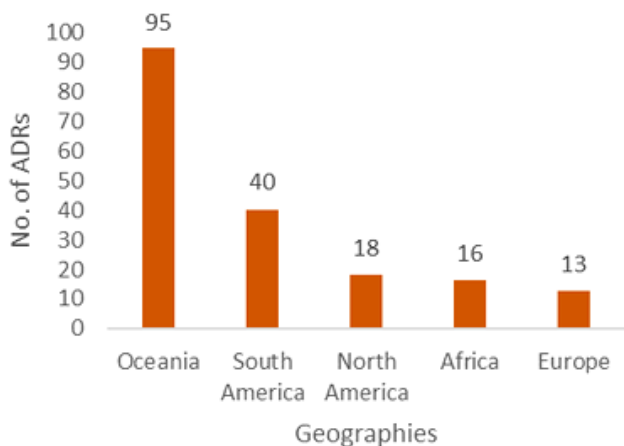


**Fig: Major mining geographies & their contribution towards the Global Exploration Budget.**

To make the mining sector one of the significant contributors to the GDP, the incumbent government needs to assess the challenges faced by the exploration agencies and formulate policies to stimulate their participation.

One formidable area where the mining landscape in India lags is the adoption of new-age technology. We are living in the era of Industrial Revolution 4.0 (4IR), which is synonymous to additive and smart manufacturing, analytics, artificial intelligence and integration of IT with heavy machineries that significantly eases operation and maintenance activities by propelling faster decision-making process through real-time data. In India, however, only 8% of the manufacturing organizations have adopted digital transformation, with automotive, chemical, and process industries at the helm. Mining stands at a far distance, with little to no adoption in this space. Given the technical challenges that are being experienced now, especially in the mining of deep-seated critical minerals, both due to depth and rugged terrains, it's a matter of urgency for the sector to embrace the latest technological elevations. Although baby steps are being taken in that direction with the introduction of drone surveys for initial prospecting, a significant role has to be played by the apex body in the form of incentivization. Top mining economies like Australia and Canada have introduced legislation promoting investment in exploration activities, rebates and concessions on mining participation, and duty waivers on advanced equipment and machinery imports. The impact of the same has been extraordinary

with the rapid deployment of high-end machinery, such as autonomous drilling equipment in mining sites.



**Fig: Number of Automated Drilling Rigs (ADRs) adopted by different geographies. These includes all the four types: remote control, tele-remote, semi-autonomous and autonomous.**

India, too, needs to act along similar lines by formulating policies that enable tech adoption, ensure adequate investment, and provide a reward system in the form of rebates and concessions for the NPEAs and Junior exploration agencies, thus making the ecosystem conducive for these players.

Other technological initiatives that need to be taken by the exploration agencies are building the required infrastructure in the vicinity of the site under consideration. Mineral beneficiation is a prerequisite in confirming the economic value and quality of the ore. Parameters such as grindability index, hardness, washability etc., need to be checked, and the data for the same to be mandatorily made available during the tender flotation for prospective participants. This helps in augmenting transparency in the bidding process and allows participants to judiciously evaluate tabled blocks. Also, India

has a long history of mining coal and iron ore, but the need of the hour is to shift from these mainstream minerals to base metals, critical and strategic minerals for self-sufficiency. However, a dearth of knowledge and practical experience in this sphere for all the entities working across the mining value chain poses serious challenges in taking up such projects of importance. Further, fewer research and technological studies in the field of advanced geophysical techniques stultifies the ongoing projects leading to long TTM. Western mining nations have adopted advanced techniques in radioactive and electromagnetic methods such as air-borne multichannel gamma-ray spectrometers with enhanced scintillating crystals, EM sounding, Nuclear magnetic resonance, and others to improve productivity in their operations and following their footsteps, both the government and the private entities co-jointly must take the initiative of making focused investments in R&D in the mining sector.

Thus, with an eye on continuous improvement from grassroots exploration to target definition, it's imperative for the organizations across the value chain to adopt tech, invest in R&D, create a repository of ongoing learnings, and embed sustainability in smart, relevant ways to deliver real and positive outcomes.

### Dwindling Investments

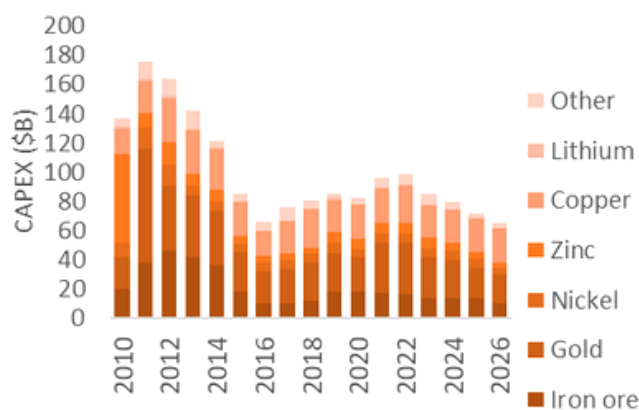
Mining has always been looked upon as a bane to the society by the Climate Change and Sustainability advocates. High GHG emissions, widespread pollution, and swathes of habitat destruction have potentially made it one of the

most unfavorable destinations for investment in recent times, even when the sector is registering a two-digit growth rate in some nations. In fact, mining forms the backbone of most economies around the world contributing in the range of 5% - 15% of the GDP. However, by 2026, it has been anticipated that portfolios of most commercial banks, private equity, and venture capitalists would turn green leaving aside particular sectors like metal and mining on the backdrop of the increased focus on SDG and corporate governance, thus leaving the companies dry and high.

The exploration agencies are the first in line of the value chain in mining, and their survival is extremely important to sustain the mining operations in the country. While nations like Australia, Canada and US have seen huge investments post-pandemic even in the midst of tightening fiscal and monetary policy, interest rate hikes, intensifying geo-political tensions and supply chain shocks due to trade sanctions in US and Europe, in India the scenario appears gloomy. To put things into perspective, Australia alone has investments worth \$50 billion in the sector, a rise of 5.6% Y-o-Y, thus promoting CAPEX spending among its major players across the value chain to further exploration, pre-feasibility and feasibility studies and subsequent mining and production activities. In India, however the picture is contradictory. Here, most of the exploration agencies are small-sized firms falling under the category of MSMEs. With stretched balance sheets due to extended payment cycles, these entities more than ever need funds to participate and execute tasks, mobilize resources at sites, adopt the latest

technologies, embrace sustainable practices, and make their valuations strong. Also, worldwide banks are skeptical about investing in the mining sector due to its intensive pre-investment nature during exploration and metallurgical activities with looming uncertainties of no discovery. The World Bank, known for supporting economies globally by helping nations realize their potential across various industries, has a total exposure of 2.5 percent in its portfolio, a significantly low figure. However, with declining reserves across geographies, a regulatory policy has been framed to ensure more flow of funds in the mining sector in the coming decade, and commercial banks across nations, too, must align their objectives with the same.

It's a prerogative at this juncture, both for the government and the investment fraternity, to have a relook at the sector and provide it with the necessary financial impetus to boost the morale of these organizations and help them in preparing for the future by turning their assets green



Other includes Platinum metals, Silver, Uranium, Lead, Cobalt, and Molybdenum...

**Fig: Declining global CAPEX trends across different minerals over the years in the mining sector owing to decreased investments.**



## Macro Sentiments

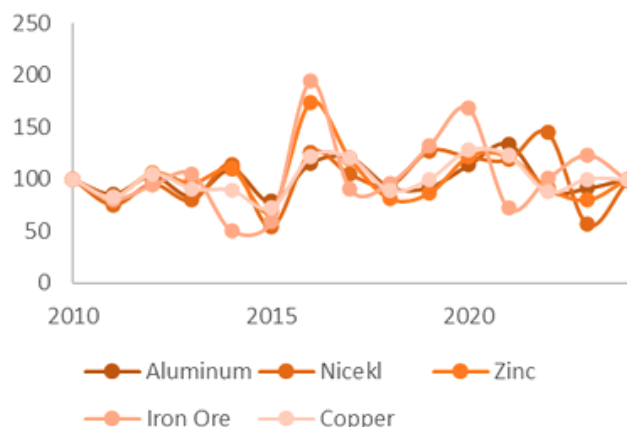
Worldwide commodity prices are affected by several factors, such as climate change, demand-supply dynamics, economic environment, geopolitical relations, government policies, and speculative trading, to mention a few. The repercussions of the same are of great magnitude affecting economic and industrial growth by distorting the trade scenario and devaluation of currencies.

If a comparison is drawn of the price volatility of metal and mineral commodities globally across the last decade and a half, then it may be noticed that in the period from 2010 to 2015, the fluctuations have been less in comparison to the last 7-8 years, i.e., from 2016 – 2023. What's enticing is that the mineral index over the timeline mentioned above has more or less remained constant.

Investor sentiments are mostly driven by the possibility of future cash flows and investment risks, which is directly proportional to the market behavior. A period characterized by severe turbulence definitely is not favorable for investments, and hence, since the last decade, a notable decrease in the same has been observed, thus depriving the financial cushion that the players in the sector need.

Further, the lack of forecasts and credible macro-economic data pose a major concern for the mining organizations in India across the value chain of getting caught in a whirlwind between the unanticipated periodic uptrend and the downtrend cycles, thus risking the financial health of the organization.

Index metal price 100 = Year 2010



**Fig: Price Fluctuation trends across years of the mentioned minerals.**

## Socio-Economic Factors: Human Capital Constraints

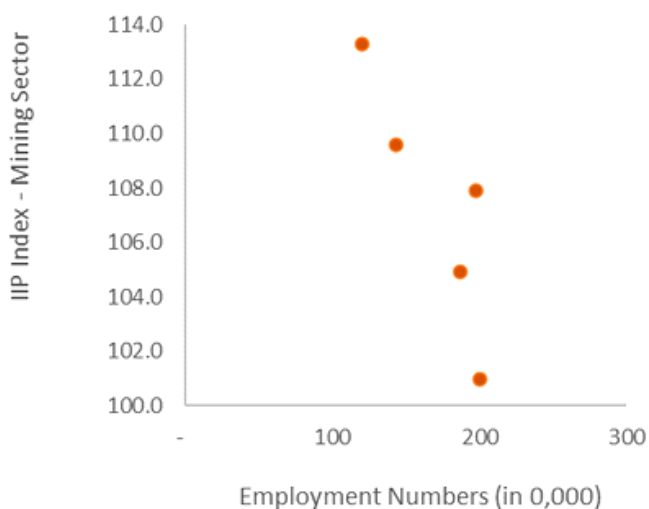
Mining has lost its luster over the years and hasn't been a sought-after domain for the talent pool. Harsh working conditions, less inclusivity, cultural barriers and anticipation of less technological advancements in the coming years are some of the key reasons why talents are shying away from joining this sector. Further, there has been an ever-increasing drop in the student pool willing to take up mining and its allied disciplines in higher education across nations thus signaling the sector to be not an aspirational one for young talent pool. In US, a significant drop of 39% has been registered in mining enrolment since 2016. Australia too witnessed a staggering decline of 69% in mining graduates since 2014 onwards and in India, where the working ecosystem is further plagued by challenges, the numbers are glaringly low.

This shortage of skilled, semi-skilled and unskilled manpower in mining coupled with lack of training and upskilling of existing employees has led to a serious downfall in the productivity and safety. Further as India is on a trajectory to unlock its mining potential, a dearth of manpower can reverse the trends of growth that the sector has witnessed in the past few years. In between 2018-22, the country has witnessed a reduction of 35.8% in its mining workforce all across the value chain due to inadequate career advancement and development, low compensation, lack of working flexibility, workplace safety and uninspiring leadership. As India plans to augment its production of different classes of minerals, the above drivers of attrition and shortage needs to be checked otherwise lack of adequate manpower will severely hinder its progress in that direction.

Another major factor for people not taking interest in joining the mining workforce is because of the lack of addressal of the social impact on the host communities. Apart from the environmental impact, the existing workforce and the host communities are worried about their livelihood resultant of the technological interventions taking place in the sector. Worldwide, by 2030, it is anticipated that up to 30% of the predictable manual tasks in the sector would be mechanized resulting in loss of livelihoods for the semi-skilled and unskilled labor because of lack of formal training in the adoption of the new-age tech. This fear itself has forced the workforce to seek a different profession affecting the overall spectrum of mining activities. Thus, in order to retain talent and keep the cogs of the sector moving, a full-proof strategy needs to be built such that the mining sector doesn't fall prey to workforce shortage.

### Regulatory Factors

India's complex regulatory landscape poses significant challenges for the players in the mining industry. One major concerning area is with regards to the long lead times in obtaining various clearances such as Environmental Clearance (EC), Forest Clearance (FC), Wildlife Clearance (WLC), and Land acquisition, thereby hampering the mining operations. A recent study by a reputed international agency highlights that in India, it takes 4+ years to obtain all the clearances and leases in comparison to other leading mining nations such as Brazil, Chile, the US, and Canada.



**Fig: Employment Numbers in mining sector Vs. the Indian Industrial Production (IIP) Index of the sector over the years, from 2018-22.**



Similarly, accurate data related to ownership of prospective sites, census, and demography also has a crucial role to play in evaluating the mineral blocks. As of today, there's sparse data available to substantiate figures on household dwellings, land holdings, and their sizes, thereby posing significant hurdles in estimations of capital outlay in land acquisition, resettlement, and rehabilitation (R&R) activities during computations of investments by prospective bidders. Further, to make matters worse, oftentimes after obtaining PL-cum-ML, unknown disputes related to land prop-up posing serious financial and reputational threats for the licensees. Recently, a number of cases regarding such incidents have created apprehension in the minds of the exploration agencies and the prospective allottees, thus making them tread cautiously while participating in mining tenders.

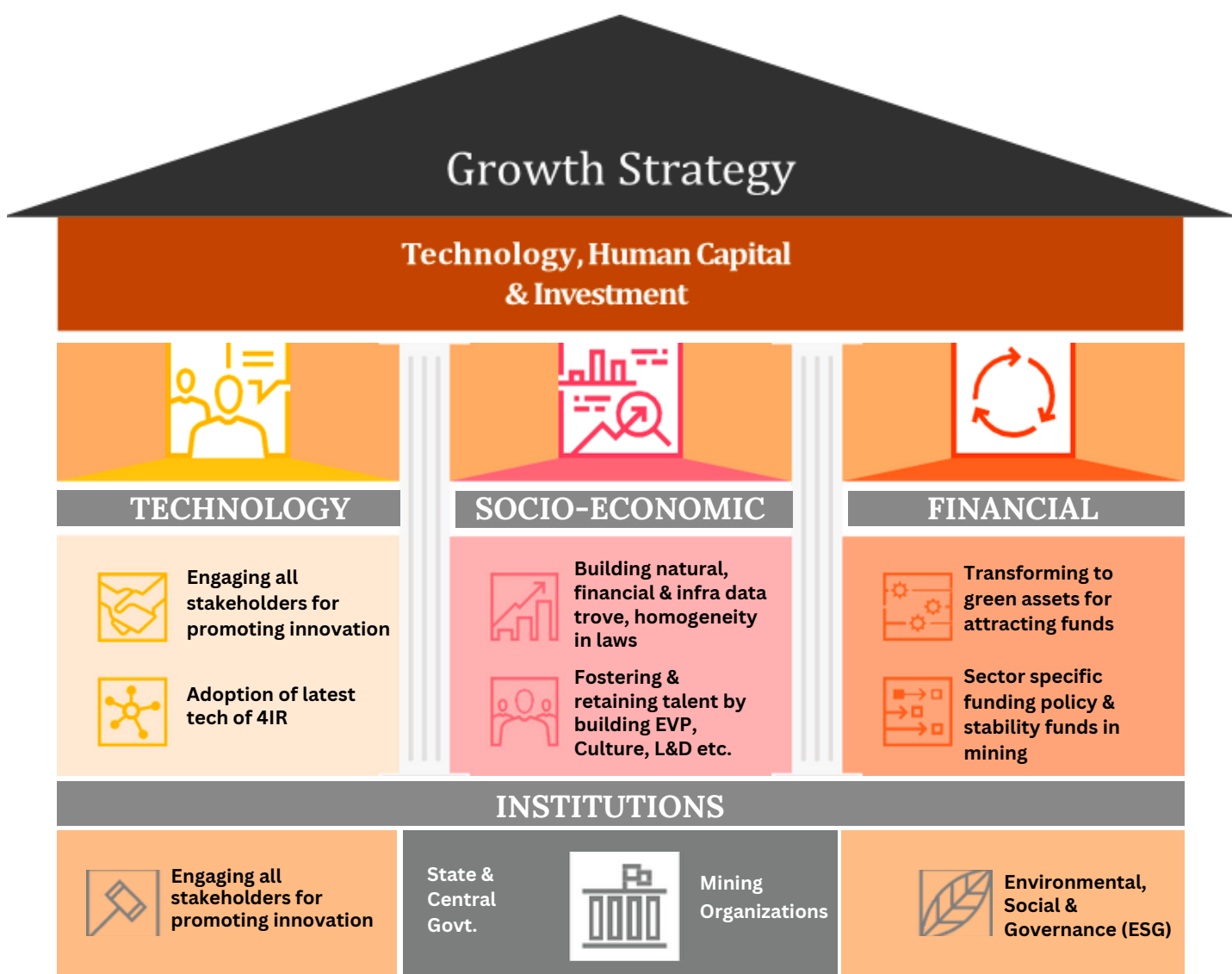
**Fig: Statutory mining rights processing time in India Vs Other mining nations.**



## Way Forward

Over the last decade, the mining sector has transformed due to the introduction of several reforms. Yet some challenges need to be addressed; otherwise, downstream sectors like automotive, renewable energy, power, and steel production would be directly impacted by the shortfall in the production of essential minerals. Also, India's aim of becoming self-reliant will be superimposed by imports thereby distorting the nation's trade balance and devaluation of currency. Thus, it's paramount for policymakers to review the current scenario and formulate ways to overcome these existing barriers.

We have highlighted the course of actions that the mining industry may take under the broader headings of the criticalities that may lead to the sector's growth, make it more inclusive, and open up ways for further investments



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