

Fostering Resource Efficiency in India: A key for sustainable growth

Executive summary

Global consumption of materials, including minerals and metals, has increased over the past 2–3 decades. The main factors underpinning the growing demand for minerals and metals are rising population growth rates, increasing affluence, rapid industrialization and urbanization in emerging economies like China, and new technological developments leading to increased metal use intensity in products. Although India's per capita metals consumption is one of the lowest in the world, the absolute consumption has increased over the last two decades. The demand for metals will continue to increase given the high anticipated future growth in GDP, higher expected rates of population growth, rapid urbanization and industrialization, emergence of advanced and sophisticated technologies, and growth of the new middle class with distinctive lifestyles and consumption patterns. These factors raise questions about the availability of minerals and metals to meet the growing demand in future, issues and challenges that could impinge on minerals and metals security in India, policies and strategies that have been adopted by the government to address supply security concerns, relevance of promoting resource efficiency, and the Indian government's approach towards it. Guided by the above research questions, TERI has undertaken a scoping study on "Fostering Resource Efficiency in India: A key for sustainable growth" in collaboration with partners which include the Institut für Energie- und Umweltforschung Heidelberg, the Sustainable Europe Research Institute, and the Wuppertal Institute. The project is supported by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) on behalf of the German Ministry of Economic Cooperation and Development (BMZ).

The project involves analysis of metals trends in India, viz., the extraction, production, consumption, imports and exports; issues and challenges associated with metals security; their likely impact on the Indian economy; and the policies initiated by the government to address these concerns. To understand which of the factors constrain the availability of minerals and metals in India, six materials have been taken as case studies. These are chromium, molybdenum, copper, limestone, rock phosphate, and cobalt. These materials have been shortlisted for detailed analysis due to their inputs into high technology and/or strategic sectors, and no or inadequate substitution opportunity.

The analysis of key trends and supply security challenges for the six materials indicate that while India is blessed with immense geological potential, this potential is not realized due to inadequate exploration activities. The flow into exploration efforts is paltry in India, and requires urgent attention. With the exception of phosphorous where the government has been laying emphasis on exploration since 1992, almost all other materials have had either a stagnant resource base for the last 10 years, or have witnessed only a meagre increase.

Lack of appropriate technologies for improving the feasibility of converting resources into economically mineable reserves has hindered production of almost all materials under consideration. For various materials like copper, chromium,

limestone, and phosphorous, indigenous reserves are low grade, which could be utilized through beneficiation, dressing, and other activities. However, no major attempts to develop appropriate technologies for this have been undertaken yet. In some cases like chromium, policy constraints hinder appropriate beneficiation, which need to be corrected. Technical constraints with regard to production of by-products are also a major deterrent for production of metals like molybdenum and cobalt. Sub-optimal extraction of resources due to the absence of appropriate mining technologies or industry structure is also a challenge.

Thus, rather than the absence of geological potential, it is the techno-economic constraints and lack of exploration that hinders availability from domestic sources and leads to high import dependence, and in turn high exposure to geopolitical risks. Not only do these techno-economic constraints hinder supply, they also lead to various environmental problems, as has been seen in the case of chromium and copper.

The government needs to lay strong emphasis on addressing techno-economic constraints while also considering the negative environmental and social consequences, which are becoming increasingly prominent and are leading to opposition. Environmental pollution has resulted in the shutting down of mining and processing operations, as has been seen in the case of copper and limestone. Many such instances are prominent in the case of other minerals and metals too. These socio-environmental constraints, if not addressed in a holistic manner, have the potential to interfere with mining and metals production in India. In addition, resources for various metals and minerals (which include chromium and limestone) are found in thick forest areas, bio-zones, and other environmentally sensitive regions. Thus, supply may be affected due to lack of access to these resources. Practices of efficient use in metals and minerals mining have the potential to bring down these impacts to a large extent by taking the pressure off the demand for higher extraction to fulfil India's future needs. This is especially important due to the realization that India would have to compete with China in mining assets, raw material supply and refined imports to feed its growing demand. The government has been adopting several ad-hoc measures to address the environmental and social costs of mineral development; however, their adequacy and implementation are questionable. Therefore, there is a need to develop a roadmap for resource efficiency in India, integrating it into a comprehensive policy on resource strategy. This vision of developing an integrated resource-efficient path will be a multi-stakeholder and cross-sector exercise. However, it will need to be backed by political willingness to effectively enforce and implement the same. Otherwise, as prior experience proves, the lack of a transparent policy framework and effective governance will result in diffusion of the efforts made to attain the said objective.