

17th Convention of Indian Geological Congress and International Conference on 'New Paradigms
of Exploration and Sustainable Mineral Development:
Vision 2050 (NPESMD 2011)'

EU – Minerals Policy and Indian Minerals Policy: New Paradigm and Perspectives

Günter Tiess*

Department Mineral Resources and Petroleum Engineering, University of Leoben, Franz-Josef-Straße 18, A-8700
Leoben, Austria

Lari Shanlang Tiewsoh

Department of Mining Engineering, Indian Institute of Technology Kharagpur – 721302, West Bengal, India

Abstract

Securing mineral supply based on appropriate minerals policies is crucial for every country. Minerals policies have to be based on the analysis of the specific minerals consumption of the country ('mineral resources mix'). Particularly important is fostering the respective domestic supply possibilities, which depend on geological, technological and regulatory conditions. This paper discusses the situation of the European Union (EU) and India, including their cooperation potential.

Keywords: mineral resources, mineral economy, minerals policies, European Union (EU), India.

*Correspondence author; Tel.: +43 38424022011; fax: +43 38424022002. E-mail:

Guenter.tiess@unileoben.ac.at

1. Introduction

Mineral raw materials are the most important link in the value chain of industrial goods production and thus make a great contribution to economic prosperity. An appropriate minerals policy has to account for the specific economic situation of each country. With India, the People's Republic of China, Brazil, Russia and other fast growing emerging countries, today more than half of the world's population claims an increasing share in raw materials on the world market. China has already become the largest consumer of metals in the world and pursues an active policy to secure its mineral supply in all continents. It is assumed that by 2030 the worldwide need for raw materials will have doubled.

The present and future influence of these developments on the security of minerals supply has until a few years ago not yet induced sufficient and adequate response in Europe. Both the EU and most of its currently 27 Member States on their respective national level widely ignored the importance of minerals policies. However, rising commodity prices might have provoked a new trend: in 2008, the EU Raw Materials Initiative (RMI) was published followed by further actions (European Commission [EC], 2008). In contrast to the EU, India implemented a minerals policy even in 1993, which recently was updated (National Mineral Policy 2008). Responding to the expected developments of the next decades towards 2050 by further adaptations of the minerals policy framework will be a great challenge for India.

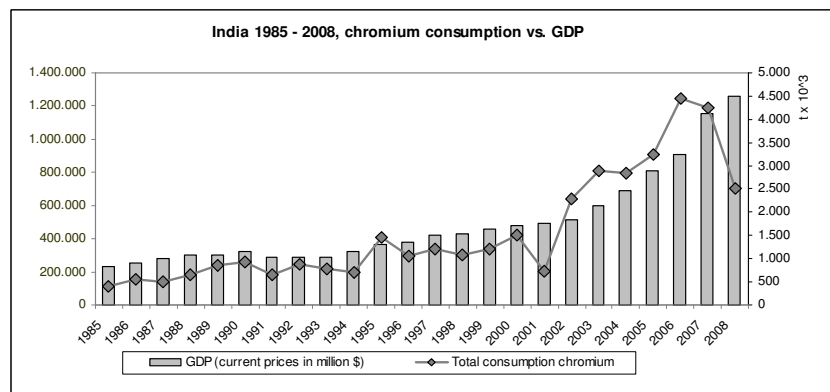
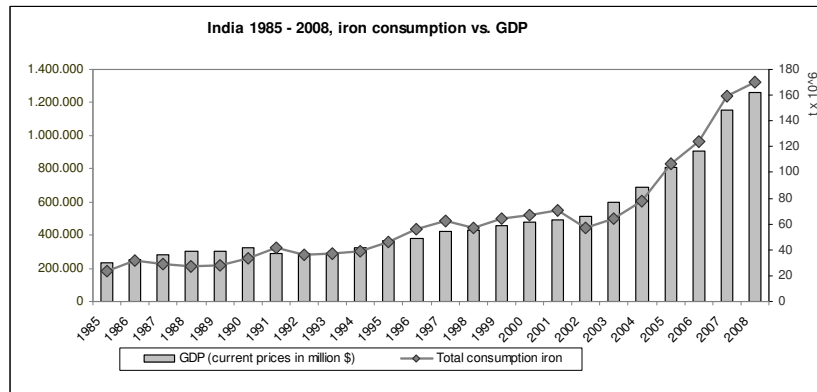
The focus of this paper is laid on the minerals development and minerals policy status quo of EU and India, emphasising non-energy minerals, particularly metallic minerals. Section 2 compares the mineral resources consumption of the European Union (EU) and India in a short overview of both countries in order to point out the line of argument pursued in this paper. In section 3, a short outline of *national* European minerals policies will be provided; recent developments at EU-level and Indian State level are discussed. Section 4 forms conclusions.

2. Need of mineral resources/mineral economy

Minerals consumption¹ of a country ('mineral resources mix') is changing during the economic development process the country is undergoing. For infrastructure development, aggregates and basic metallic minerals are of primary importance. At later stages of development (shifting from industrialisation to services economy), other mineral raw materials are gaining more importance. Apart from a constant basic supply, countries fostering high-tech production like hybrid cars or electronic devices are in need of a different range of minerals. The economic importance of a sector in a country's economy is usually measured by its contribution to the gross domestic product (GDP) as well as by the job-creating effects of the respective industry. Usage of mineral resources is a function of the state of a national economy: concurrently with the growth of the economy, the demand for mineral resources increases (Gocht, 1983). In highly developed economies, the demand for mineral resources stabilizes at a high level. Obviously, the structural changes of a nation's economy are reflected in the development of the intensity of material use. In national economies running through the process from primary to secondary sector, the consumption of raw materials increases in the same or even a higher degree than the economic performance, industrialisation being a material-intensive process. Figure 1 illustrates this by the example of iron and chromium consumption in India. (When the tertiary sector increases, resource consumption decreases, also due to substitution and improved technology.)

Figure 1: Iron and chromium consumption versus GDP for India (data by BGS; metal content)

¹ Minerals consumption of a country equals production + imports – exports.



Mineral resources consumption of EU and India - short comparison

GDP development of the European Union and India has increased continuously in the last years: 1,8 % annually for EU, currently almost 9% for India. Since 1980, India's GDP has risen six-fold to the amount of US\$ 1,430,000 million in 2011. Presently, India has more than 1.2 billion inhabitants and its GDP per capita is US\$ 1,382. In 2010, the GDP was achieved by the service (55%), industry (about 28%), and agricultural sector (16%). The EU with a population of 501 millions shows a GDP of US\$ 12,268,387 million in 2010, the GDP per capita is US\$ 30,388. (International Monetary Fund, 2011; Mining Journal, 2011).

EU

The EU is self-sufficient in construction minerals, in particular aggregates. Demand for aggregates in Europe will reach 4 billion tonnes in the medium term, driven mainly by economic

growth in Central and South-Eastern Europe.² The EU is the world's largest or second largest producer of certain industrial minerals (e.g. feldspar, perlite), though it remains a net importer of most of them. 70% of the EU manufacturing production depends on mined substances, i.e. minerals; however, the EU is a mineral raw materials importer. Particularly, the EU is highly dependent on imports of metallic minerals, as its domestic production is limited to about 3 % of world production, whereas the EU share in global consumption of metallic minerals is about 30 % (EC, 2007).

The changing minerals consumption parallel to the development of GDP may be demonstrated by the example of two EU Member States - Germany and Bulgaria – and their metallic minerals use. Germany is an EU-founding Member (GDP/c in 2008: US\$ 44.181); Bulgaria, a former Soviet member country, joined the EU in 2007 (GDP/c in 2008 US\$ 6.825). Germany as a technologically far advanced country requires a lot of high tech metals like rare earths, lithium, titanium, PGM – in contrast to Bulgaria. Germany needs a highly diversified metallic mineral mix, whereas Bulgaria's raw materials mix is less diversified. Germany imports high amounts of basic metallic minerals which are mainly used for production of export goods. Germany is the seventh greatest producer of iron and steel and has considerable smelter and refinery production of copper, lead and zinc. iron, aluminium, nickel, copper, tin, and zinc scraps are imported (of those there is no domestic mining). Bulgaria has refineries for copper, lead and zinc (but unlike Germany it also produces some of these minerals). In terms of scrap, Bulgaria imports iron, copper, aluminium, zinc and PGM (Tiess 2011).

² Compare: www.sarmaproject.eu

India

India is endowed with large resources of metallic and industrial minerals. Its reserves and resources of coal, barytes, bauxite, chromite, iron ore, limestone, and manganese ore are among the 10 largest in the world. India's mining and processing industries form the backbone of industrial production. The mineral sector provides industrial minerals, aluminium, copper, iron ore and steel, and mineral fuels (coal and petroleum) for the manufacturing sector. In terms of production, the country is among the eight leading producers in the world of aluminum, barytes, bauxite, chromium, coal, iron ore, kyanite, manganese ore, mica (sheet), steel, talc, and zinc (Ministry of Mines, 2010).

The mineral industry is an important segment of the Indian economy. Mining and quarrying accounted for almost 2% of the GDP. Compared with 2008, overall mineral production in terms of tonnage increased by 7.92% in 2009. The total value of mineral production in 2009 accounted for mineral fuels 62.23% of the total value; metals, 21.55%; and industrial minerals, 16.22% (Ministry of Mines, 2010).

Presently, India is self-sufficient in many basic metallic minerals like iron, chromium, manganese, bauxite, lead, tin, zinc; also in industrial minerals like barytes, gypsum, graphite, kaolin, magnesite and talc (Indian Bureau of Mines, 2011). In 2009, production of cobalt, some ferroalloys, ilmenite, iron ore, and zircon increased by more than 10% (compared with 2008), whereas output of bauxite decreased by more than 10% (Ministry of Mines, 2010). Having good reserves of graphite, India is self-sufficient in this raw material, while only 1-2% of the productions are exported (Indian Bureau of Mines, 2011).

Trend of copper consumption in EU (Germany and Bulgaria) and India

Figure 3 illustrates exemplarily the copper consumption including demand forecasting. India and Germany are net importers of copper. Although Bulgaria is the 2nd highest producer of copper (concerning mining) of the EU-27, it requires large amounts of imported copper ores and concentrates to satisfy the domestic consumption as well as exports needs.³

The copper forecasts (30 years) were generated by the use of System Dynamics Modelling Simulations. Crucial parameter arrays in the interrelations are the economic benchmarks of GDP and population, as the consumption is in this case simulated as a function of GDP per capita. The total annual copper consumption was calculated by using trend lines which have been derived from BGS data. The (trend) starting point >0< is equivalent to year 2007.⁴

Figure 2: Demand forecasting methodology

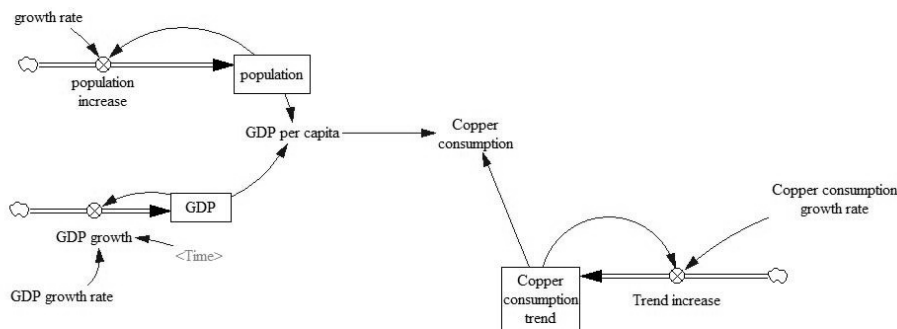
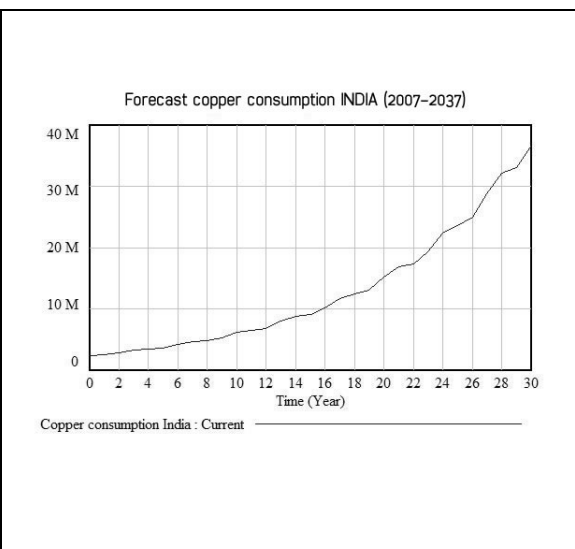
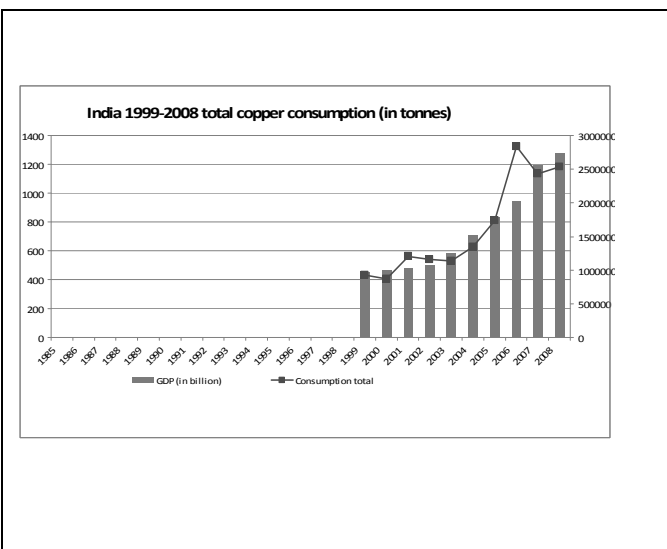
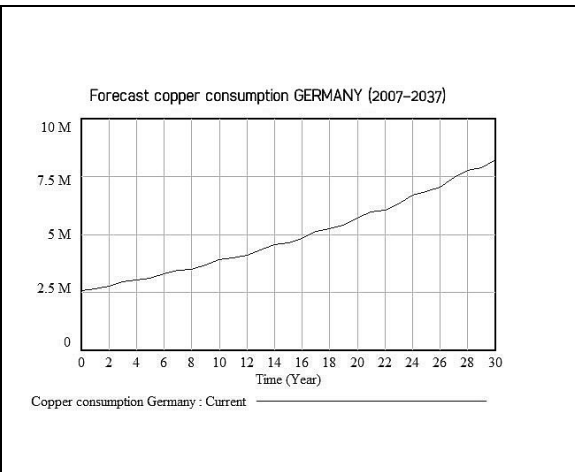
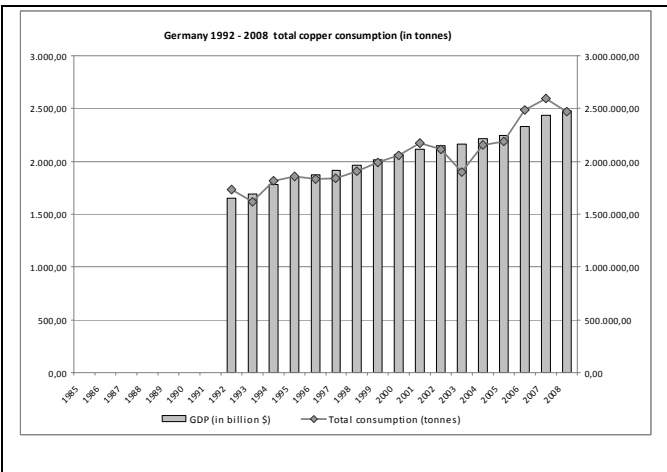
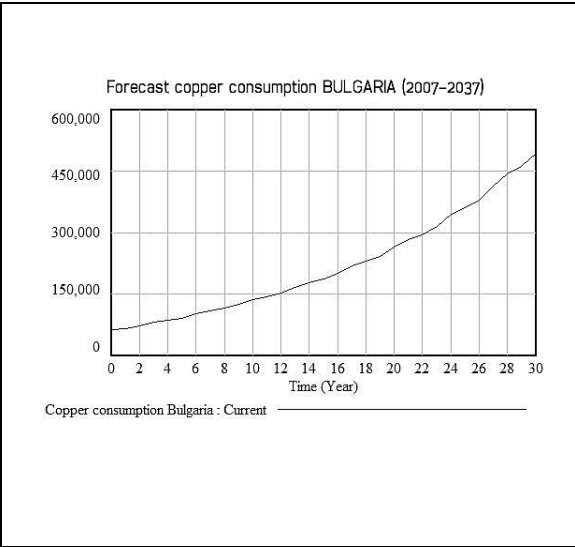
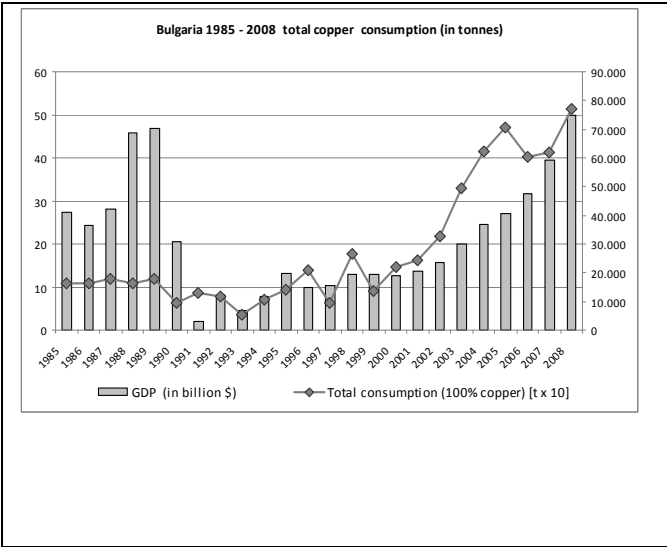


Figure 3: Copper consumption (GDP left scale) and forecasting of Bulgaria / Germany (EU) and India (data by BGS) Note: data availability for Germany since 1982, for India since 1999.

³ In Bulgaria a major drop in the GDP development illustrates the transition from a state owned, centrally planned economy to a free market economy.

⁴ Economic growth has been very limited in European countries recently due to several problems with regard to national debt by some member states. This factor has not been taken into account.



3. Securing minerals supply based on appropriate minerals policies

Any national minerals policy/strategy must be based on the existing respectively intended minerals economy. Mineral economy comprises production, import and export (see Section 2), which have to be analysed similarly (interrelated), not one part isolated from the others. A national raw materials strategy has to determine different priorities and different actions, for instance to increase exploration and production by an appropriate investment policy and to reduce import needs. Raw material demand forecast including different scenarios is crucial to determine the strategic objectives and actions of a country (Tiess, 2011). The figures in Section 2 show that the increasing mineral resources consumption trend can be expected to continue, so appropriate mineral policies will be indispensable.

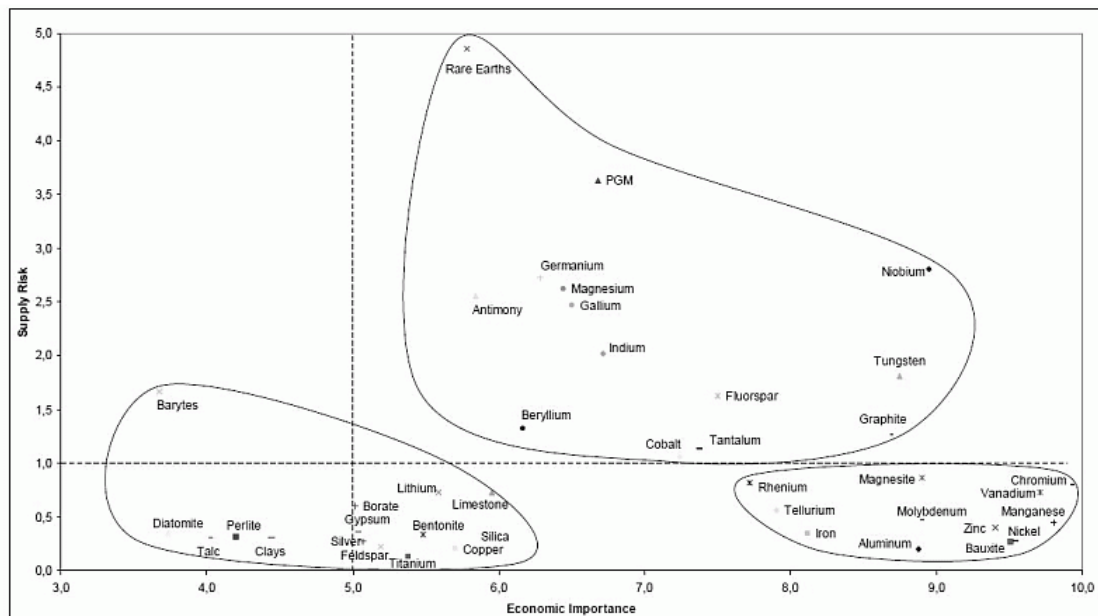
EU-Mineral Policy perspective

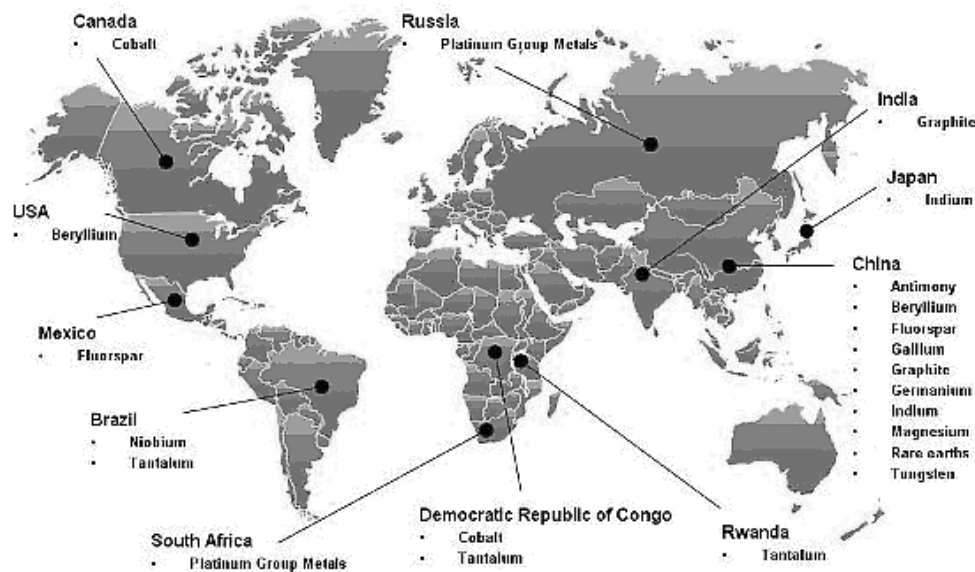
The European Union (EU) is a federation of countries, an economic and political union, which reached its current number of 27 member states only in 2007. Whereas the present European Union had one of its roots in the European Coal and Steel Community of the 1950s, securing the supply of raw materials for the European economy has not been a primary aim of common policy in the past decades. Price development at international commodity markets and supply limitations and shortages in the last years induced a re-thinking of this field. The European Commission published its Raw Materials Initiative (RMI) in 2008, determining a raw materials strategy including a list of actions (EC, 2008). The three pillars of the RMI claim (1) access to raw materials from international markets under the same conditions as other industrial competitors; (2) sustainable supply of raw materials from European sources; (3) resource efficiency and recycling to reduce consumption of primary raw materials and import dependence.

In 2010, the economic importance and supply risk of mineral resources for the European raw materials economy was analysed for 41 minerals, based on the EU Report on Critical Minerals (EC, 2010). The supply risk (SR_i) was accentuated by the low political-economic stability (HHI_{WGI} – Combination of Herfindahl – Hirschmann and World Governance index) of the main supplier(s), as well as by the low substitutability (s_i) and low recycling rates (r_i) of raw materials:

$$SR_i = \sigma_i (1 - \rho_i) HHI_{WGI}.$$

Figure 4: EU critical minerals and production concentration of the ‘critical’ raw materials by source country (EC, 2010)





Due to environmental, societal or economic reasons there are still many unexplored and unexploited resources within Europe. Europe’s non-energy extractive industry is hindered by a heavy regulatory framework and competition with other land uses. In the new Communication “Tackling the challenges in commodity markets and on raw materials” published in February 2011, the Commission considers the improvement of framework conditions: defining national minerals policies/strategies; setting up land use planning policies for minerals; authorising minerals exploration and extraction providing certainty and streamlining the administrative process (EC, 2011). Presently, only three countries of the EU-27 - Finland, Germany and France - provide a national minerals strategy (see table 1).

The *Europe 2020 Strategy* (published in 2010) underlines the need of promoting technologies to increase investment in the EU’s mineral resources.⁵ The Council Conclusions of 10th of March 2011 invite the Commission to further promote innovation, research and development efforts in the raw materials value chain and to assess launching a European Innovation Partnership (EIP)

⁵ http://ec.europa.eu/europe2020/index_en.htm

on raw materials. This partnership shall contribute to the future security of supply with and access to raw materials essential for the competitiveness of the EU industries, to increase resource efficiency in the EU and to the development of new European based recycling activities. While the metallic minerals potential is well known at the surface in EU countries, the challenge will be to explore and extract deposits in depths of 1,000 meters and more. Deep mineral resource extraction (> 1500 m) has not only a European, but also a global dimension, requiring new technologies for such extreme conditions. There is still world class mining potential in Europe, for example in the Fennoscandian Shield with its geological conditions similar to the shield areas of Australia and Canada. The region is attracting international exploration and mining interests, as it has not yet been thoroughly explored for many minerals, and new discoveries are expected.

Table 1: Comparison of the raw materials strategies of Finland, Germany and France (Tiess, 2011).

National Mineral Strategy			
	Finland	Germany	France
Publication	Minister of Employment and Economy (2010)	Minister of Economy and Technology (2010)	Minister of State, Minister for Ecology, Energy, Sustainable Development and Sea
Minerals	Metallic, industrial and construction minerals	Metallic, industrial and construction minerals	Metallic minerals (additionally substrategies for the other minerals)
Objectives	Three strategic objectives: Promoting domestic growth and prosperity, solutions for global mineral chain challenges and	Nine objectives: e.g. Support of economy in the development of synergies through sustainable management and increased material efficiency	Access to strategic metallic minerals in good conditions is needed to ensure French industry conditions of development and to enable the development of

	mitigating environmental impact.	Development of bilateral commodity partnerships with selected countries	products more virtuous and more competitive
Actions	Strengthening R&D capacities and expertise. *Analysis of the minerals deposits potential /discovery potential *Demand/production forecasting *Analysis of minerals industry *Improve regulatory framework	Actions are contained in the context of the objectives	Action plan focuses following issues: Improving knowledge of strategic metals Extension of geological knowledge by exploration campaigns Development of new exploration tools Recycling policy

Indian Mineral Policy perspective

The Republic of India with its 1.2 billion multilingual and multiethnic inhabitants is a democracy consisting of 28 states and 7 union territories. It is the seventh largest country and the world's tenth largest economy by nominal GDP. India's fast economic growth has been dominated by the development of the services sector (presently 55% of the GDP), e.g. in the field of information technology. India intends to spend US\$ 1,000 billion over the next five years on road, railway and power networks. As a result of this infrastructure development and additionally, of rising car production, base-metals demand might jump 15% this year (Mining journal, 2011). Under these conditions, the required 'mineral resources mix' covers all kinds of minerals - besides construction materials, also base metals (e.g. copper, iron, zinc, aluminium) for industrial goods production, lithium and rare earth metals for high-tech industries, and fuels (coal, petroleum, gas, uranium). The heterogenous geologic situation of India with its manifold mineral deposits

yields a large mineral potential and presently a high grade of self-sufficiency and allows mineral exports. Nevertheless, also imports (e.g. of high-grade copper) are needed for the growing manufacturing and service sector.

To meet all these challenges, India had already defined its National Mineral Policy in 1993. A new version was released in 2008, taking account of the significance of sustainability ("zero waste mining"), use of modern exploration and mining technology, considering environmental issues and establishing the necessary political framework to ensure transparency and support of private and state-run mining activities. It also proposes to substantially increase the scale of privatisation. A futuristic policy is based on a strategy of cooperation with other nations for sustaining India's growing needs. The National Mineral Policy 2008 states that the import of machinery and technology would be freely allowed, use of foreign state of the art technology and "participation for this purpose" is to be encouraged, in order to increase productivity, safety and minimise ore waste. Resource efficiency is to be achieved by the development of a recycling industry by 2050 and beyond.

4. Conclusions

Mineral raw materials are a key issue to move forward the economy. Therefore, sustainable supply of mineral raw materials is needed and appropriate mineral policies are essential for the development of a country. India has taken a considerable step with the establishment (and amendment) of its "National Minerals Policy"; however, improvements and adaptations will be necessary in an ongoing process in the future. The EU and its Member States have ignored this issue for a long time, but presently they are also acting on it. Pillar I of the EU Raw Materials Initiative includes foreign policy: the EU should actively pursue raw materials diplomacy with regard to securing access to minerals. This includes coordination on EU level in the management

of EU strategic partnerships. An EU-India Strategic Partnership based on shared values and mutual respect was launched in 2004 and fully acknowledges the importance of India not only as EU's largest trading partner, but as a country "committed to democracy, pluralism, the rule of law and multilateralism in international relations, which contribute stability and peace in the world" (EC, 2004).

Against the background of dwindling global mineral resources, Indian cooperation with EU could be a realistic option, helping secure Indian mining development as well as European minerals supply: EU nations could assist in the development of modern mining technology and recycling industry in India. In return, the EU nations could come to agreement with the various mineral producing companies operating in India to secure mineral supply for their economies. Furthermore, training of manpower could be provided in collaboration of Indian and European universities. For this scenario to come into being, strong mutual efforts at all levels would be crucial.

Future cooperation on minerals policies between EU and India is to strengthen mutual relationships to the benefit of both partners.

5. References

BGS (British Geological Survey) (1985-2010): European and World mineral statistics

EC, DG Enterprise and Industry (2007): Analysis of the Competitiveness of the non-energy Extractive Industry in EU, SEC 771

EC, DG Enterprise and Industry (2008): The Raw Materials initiative – Meeting our critical Needs for Growth and Jobs in Europe, COM (2008) 699

EC, DG Enterprise and Industry (2010): Report of the Ad-hoc Working Group on defining Critical Raw Materials

EC (2011): Communication tackling the Challenges in Commodity Markets and on Raw Materials

European Commission (EC) (2004): An EU-India Strategic Partnership, COM 430

Gocht, W. (1983): Economic geology and minerals policy), Berlin, published by Springer.

Government of India, Ministry of Mines (2008): National Mineral Policy 2008

Indian Bureau of Mines (2011): <http://ibm.nic.in/>

International Monetary Fund, India (2011): Report for selected countries and subjects

Ministry of Mines (2010): Annual report 2009-2010, New Delhi, India, p. 147-148, p. 152-155.

Mining Journal (2011), February 18, p. 2

Tiess, G. (2011): General and International Mineral Policy, Focus: Europe, published by SpringerWienNewYork.

Acknowledgement

The authors appreciate the valuable comments received from Prakrit Silal, Alex Kriz, Anna Werner and Irene Leischner.