

Overview of the Mining Industry in India

Sponsored by the Virginia Economic Development Partnership (VEDP)
Report prepared by Feedback Business Consulting Services Pvt. Ltd.
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Key Deliverables

- Mining Industry – Overview
 - Stakeholders and role of each player
 - Industry structure and key players
 - Current production volumes and historic trends
 - Coal and non-coal overview
 - Key players, geographical presence, current production and trends
 - Growth drivers and barriers
- Security regulations followed in the mining industry
 - Security rules and guidelines for mining industry
 - Key products to be used for security of the personnel working in mines
 - Key regulators for security of mines
 - Details on the usage of communications products in mines

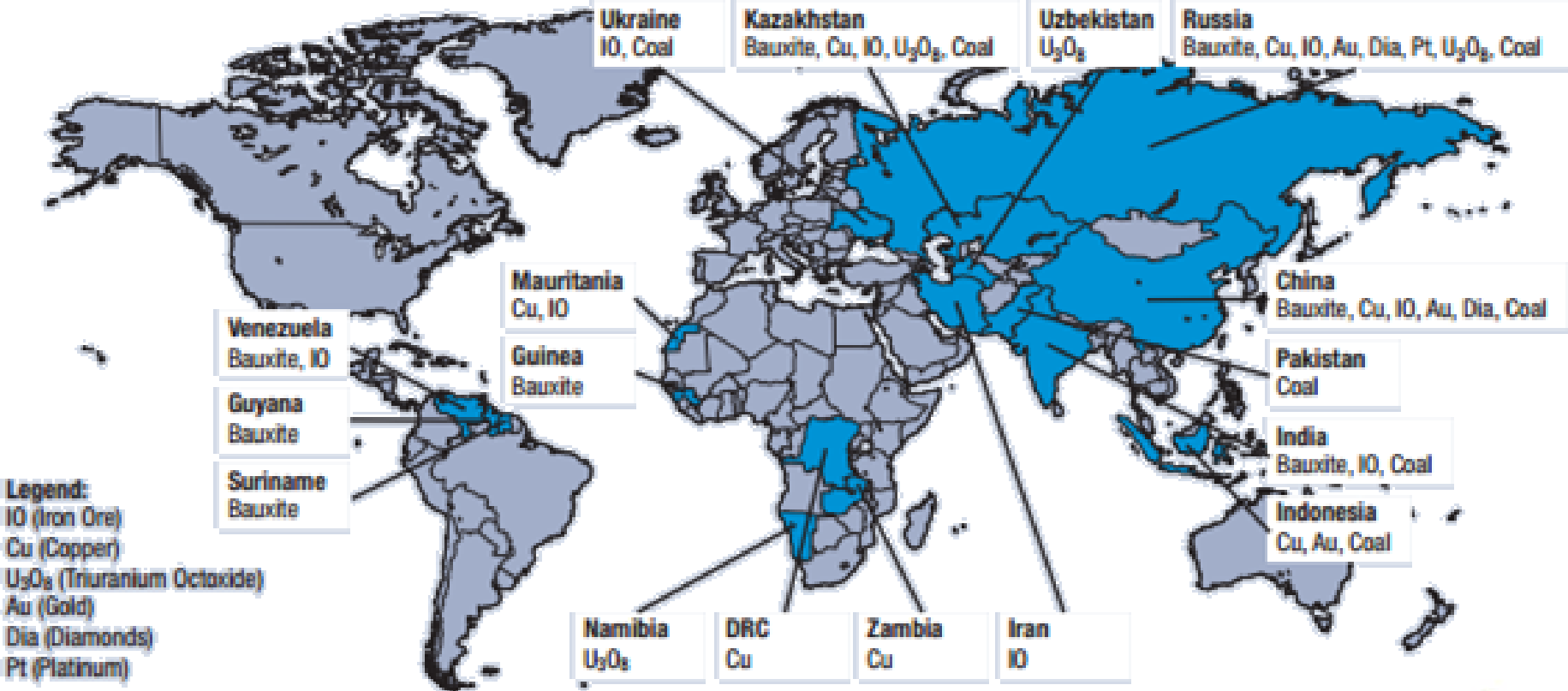


Mining Overview

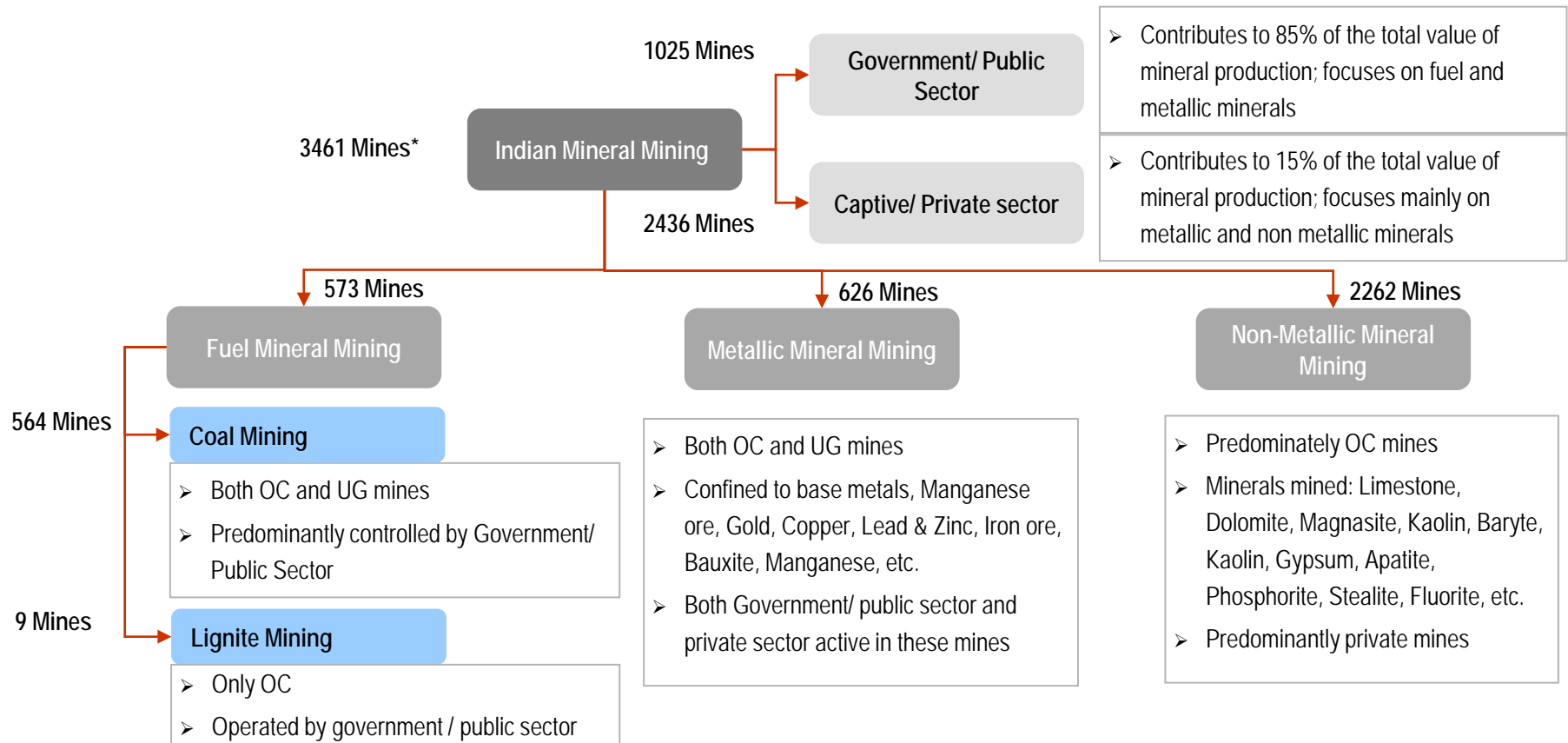


India is one of the key countries with high Iron Ore, Coal and Bauxite reserves

Commodities for which this country has top-10 reserves



Mining Industry Structure & Overview



**Excluding atomic minerals, petroleum (crude), natural gas (utilized) and minor minerals*



Mining Industry Stakeholders

Mining

Fuel Mineral Mines

- Coal: 564 mines
- Lignite: 9 mines

Metallic Mineral Mines

- Iron ore: 460 mines
- Bauxite: 190 mines
- Manganese ore: 180 mines
- Copper ore: 5 mines
- Lead & Zinc ore: 6 mines

Non Metallic Mineral Mines

- Limestone: 600 mines

Contractors

- Around 100 contractors exclusively engaged in mining operations
- Mostly into OB removal in large mines and all mining operations in the small mines
- Large international firms now looking at contract mining in India
- Key players: Sainik Mining, Dhansree Engineers, Nidhi Mining, Thriveni Earth Movers, NAPC, Mala Kumar, Sachdeva & Sons; Joy Mining

Influencers / Intermediaries

Regulators / Boards

- CMPDI
- IBM
- DGMS
- State and Central Government (MOE&F, Ministry of Mines, Department of Geology)

Consultants

- Around 10-15
- Key consultants: IBM, SRG Consultants, MECON, MECL, MICON, LM Group, CMPDI, CMFRI

Equipment Suppliers

Domestic

- 15+ suppliers
- Key suppliers: BEML, Caterpillar, HEC, L&T, Eimco Elecon

Imports

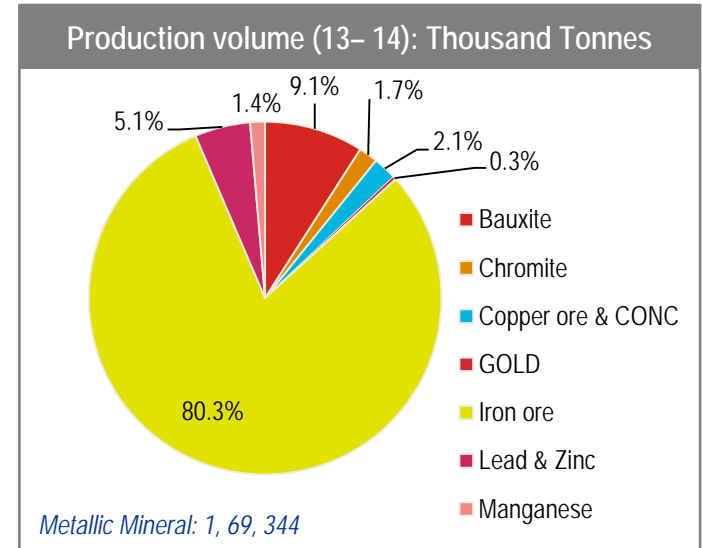
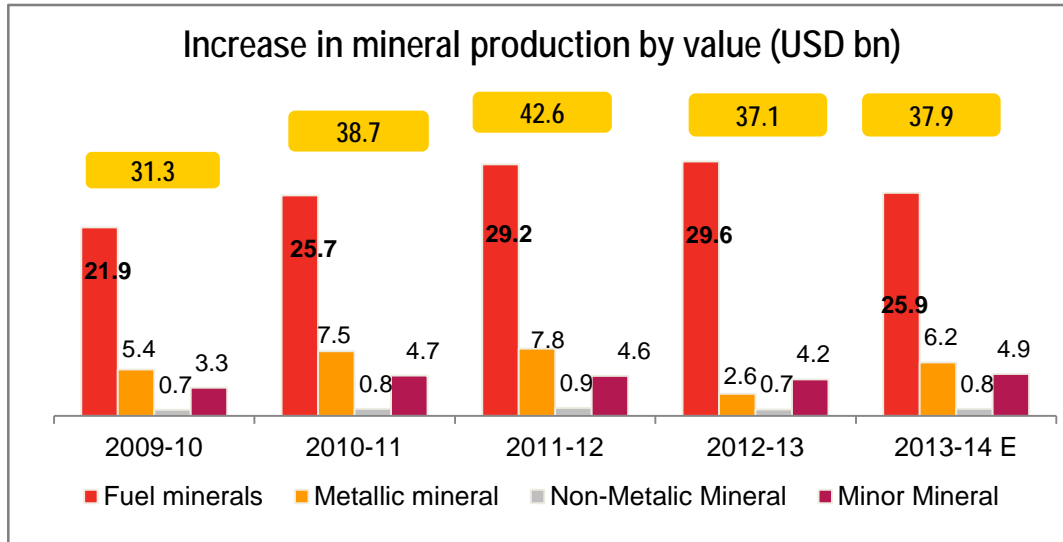
- 10+ suppliers
- Key suppliers: Bucyrus-DBT, P&H Joy Mining, Wirtgen, Liebherr

Dealers

- Around 30 players
- Negligible focus on mining



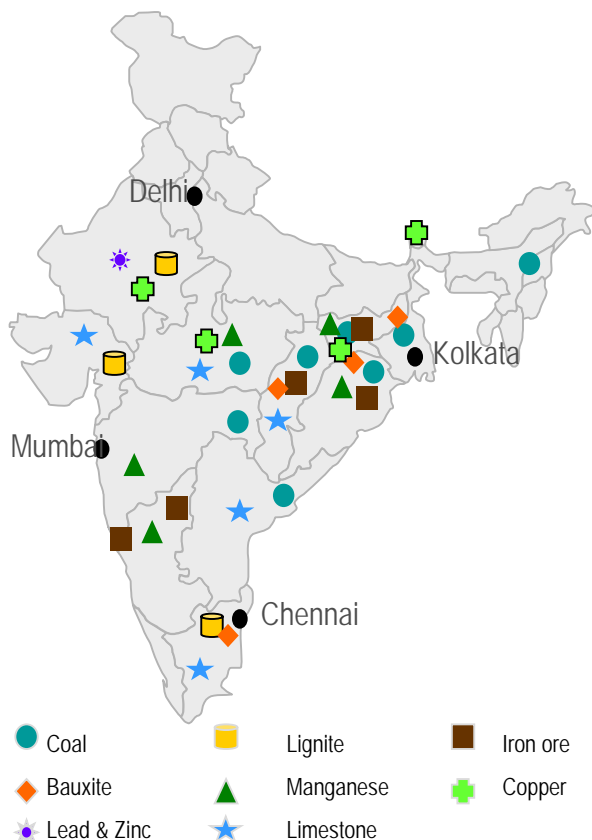
The mining sector contributed 2.1% to India's GDP (at current prices) in FY14



- Total value of mineral production (excluding atomic minerals) during 2012-13 is estimated at USD 37.9 bn, which is an increase of about 2% over the previous year
 - Of the total value, fuel minerals accounted for USD 25.9 bn (68.51%), metallic minerals for USD 6.2bn (16.39%) and non-metallic minerals (including minor minerals) for USD 5.7 bn (15.10%)
- The bulk of volume of mineral production is from:
 - Iron ore (80.3%)
 - Lead & Zinc (5.1%)
 - Manganese (1.4%)
 - Bauxite (9.1%)
 - Chromite (1.7%)
 - Copper & CONC (2.1%), AND
 - Gold (0.3%)



India is bestowed with a fair geographical distribution of various minerals of interest



Minerals	Key states of occurrence	Reserves (bn. tons)			India's reserves as a % of global resource	China's reserves as a % of global resource
		Current	Proven	Future		
Coal	➤ Jharkhand, Chhattisgarh, Orissa, West Bengal, Maharashtra, MP	287	115	172	10	77.94
Lignite	➤ TN, Rajasthan, Gujarat	36	11	25	< 1	12
Iron ore	➤ Karnataka, Goa, Orissa, Chhattisgarh, Jharkhand	25	7	18	7	14
Bauxite	➤ Orissa, Chhattisgarh, Jharkhand, TN	3.3	0.9	2.4	6.76	2.59
Manganese	➤ Maharashtra, Karnataka, MP, Jharkhand, Orissa	0.38	0.14	0.24	7	8
Copper	➤ Rajasthan, MP, Jharkhand	1.4	0.4	1	2	5.45
Lead & Zinc	➤ Rajasthan	0.52	0.12	0.40	5	13.92
Limestone	➤ Gujarat, MP, AP, TN, Chhattisgarh	175	13	162	2	NA

Source: IBM, Ministry of Mines, GSI

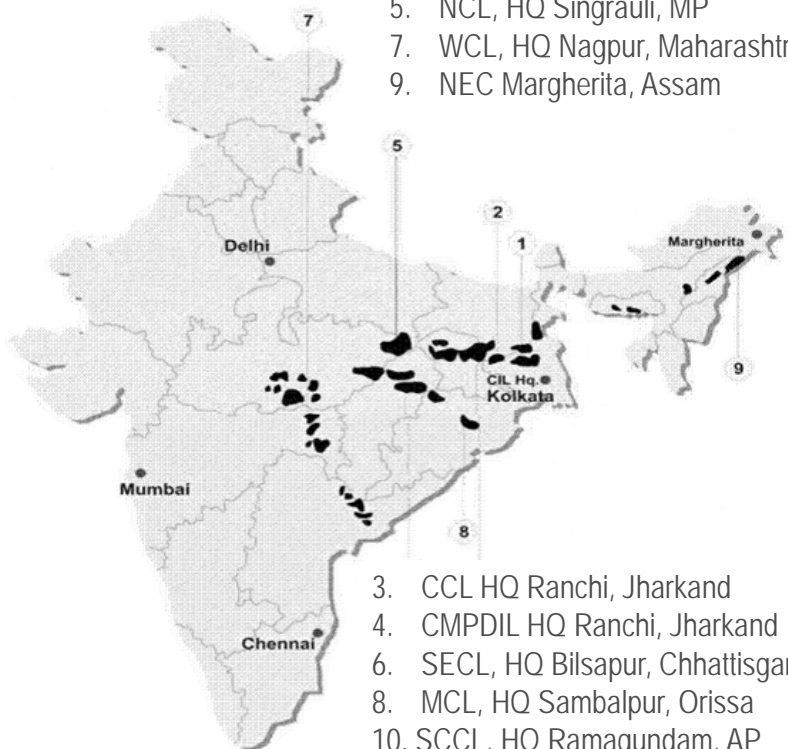


Coal and Iron Ore



Coal Production

1. ECL, HQ Sacntoria, West Bengal
2. BCCL, HQ Dhanbad, Jharkand
5. NCL, HQ Singrauli, MP
7. WCL, HQ Nagpur, Maharashtra
9. NEC Margherita, Assam



3. CCL HQ Ranchi, Jharkand
4. CMPDIL HQ Ranchi, Jharkand
6. SECL, HQ Bilsapur, Chhattisgarh
8. MCL, HQ Sambalpur, Orissa
10. SCCL, HQ Ramagundam, AP
11. Other captive mines

- India ranks 4th in terms of size of reserves
 - 186,600 mn tons are available within 300 mtr. depth and 100,400 mn tons at 300 - 1200 mtr. depth
- Mine Ownership Pattern:
 - Public Sector: 546
 - Others: 19
- Coal mining done mainly by CIL & its subsidiaries, accounting for 84% of the total coal production in India
- Outside of CIL, the only other major producer is SCCL, contributing to about 8.8% of India's overall coal production
- Captive mines account for 7.5% of the total production
 - Expected to reach 120 MTPA (16%) by 2013-14

Depth (mtr)	Proven (bn T)	Current (bn T)	Future (bn T)	Total reserves (bn T)	Reserves as a % of total mineral reserves
0 - 300	86.08	72.52	15.56	174.16	60.68
300 - 600	7.71	49.06	19.64	76.42	26.63
0 - 600	14.88	0.54	0.00	15.42	5.37
600 - 1200	1.81	12.64	6.56	21.02	7.32
Grand Total (0 - 1200)	110.49	134.77	41.76	287.02	100

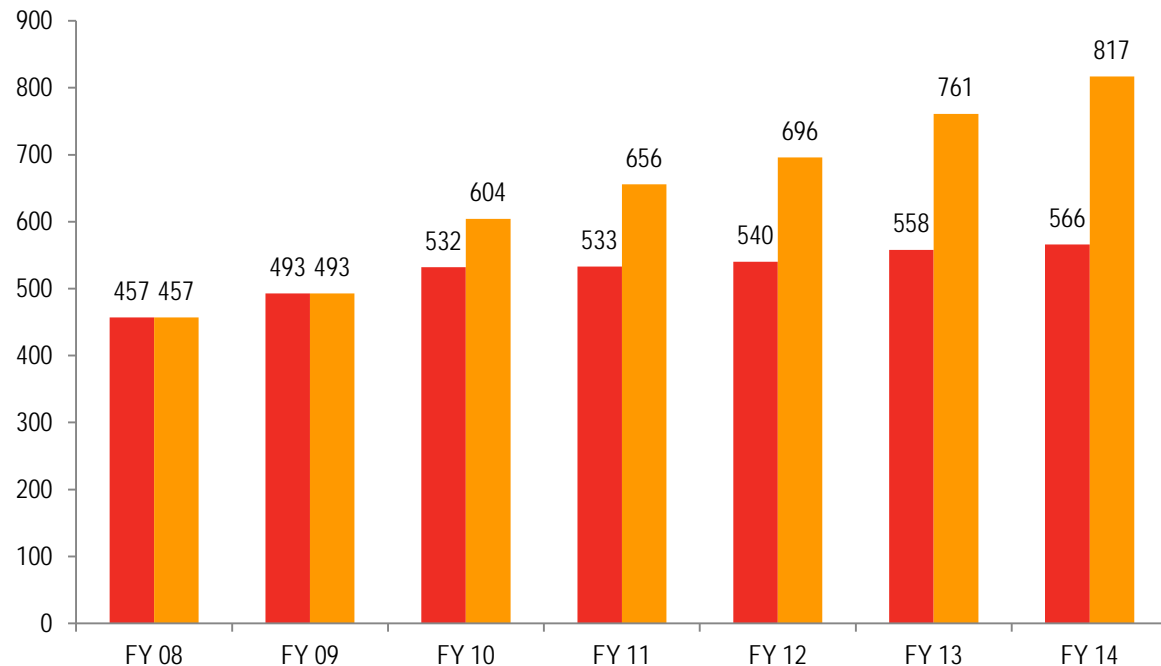
Source: IBM, CIL, Ministry of Coal, GSI



Coal Production vs Demand

- As of FY14, 82% of total coal production in the country came from Coal India Limited

Coal Production Vs Demand in India (in Mt)



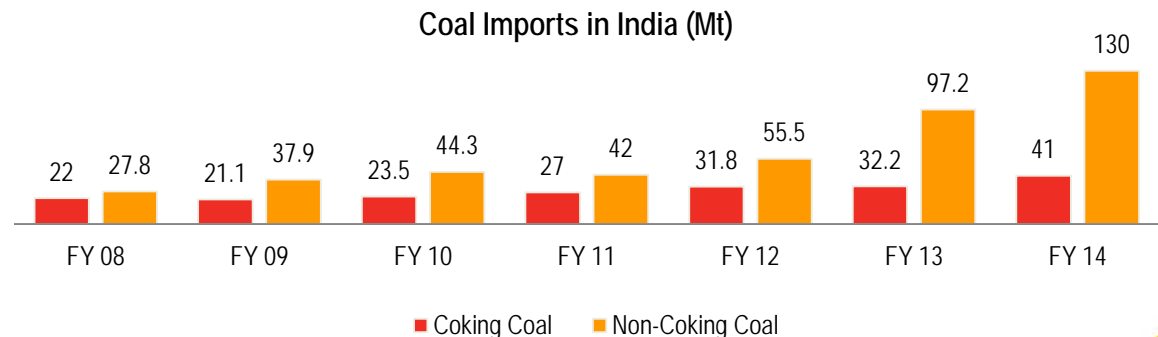
Source: Ministry of Coal



Coal – Demand Supply Gap

- Coal meets around 40% of the primary commercial energy needs of the country
- Approximately 70% of India's power generation is based on coal

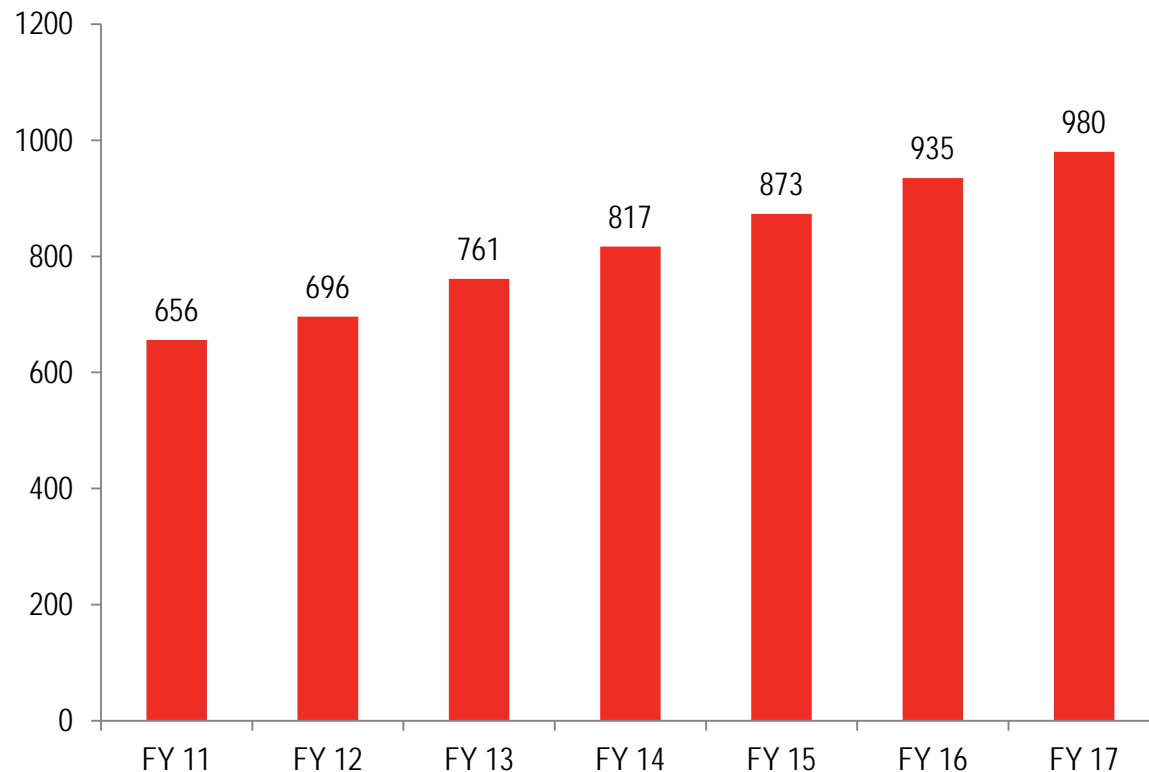
Type	Gap – FY 13 (Mt)	Gap – FY 17 (Mt)
Coking Coal (C)	32.01	31.81
Non-Coking Coal (NC)	160.52	153.69
Power (Utilities)	107.27	161.83
Power (Captive)	-1.70	-17.46
Cement	15.51	24.29
Sponge Iron	10.84	-7.15
Others	29.27	-7.16
Total (C+NC)	192.53	185.50



Forecast for Coal Demand in India

(In MT)

- Reforms in the coal sector, if implemented, have the potential to increase the annual production of coal in India.
- *However, the production still would be insufficient to meet the coal demand in India in the near term.*



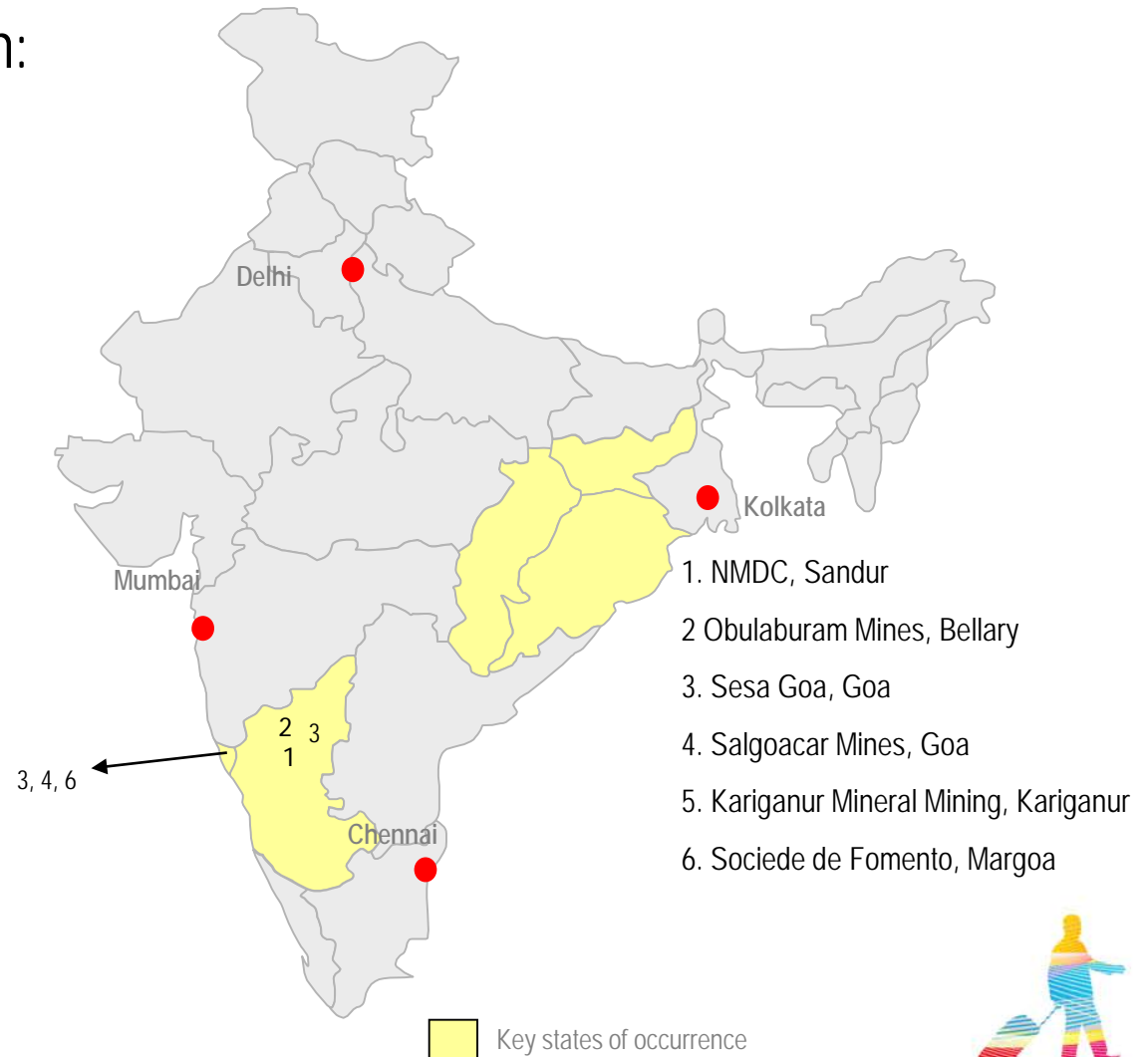
Source: Planning Commission



Iron Ore Mines

➤ Mine Ownership Pattern:

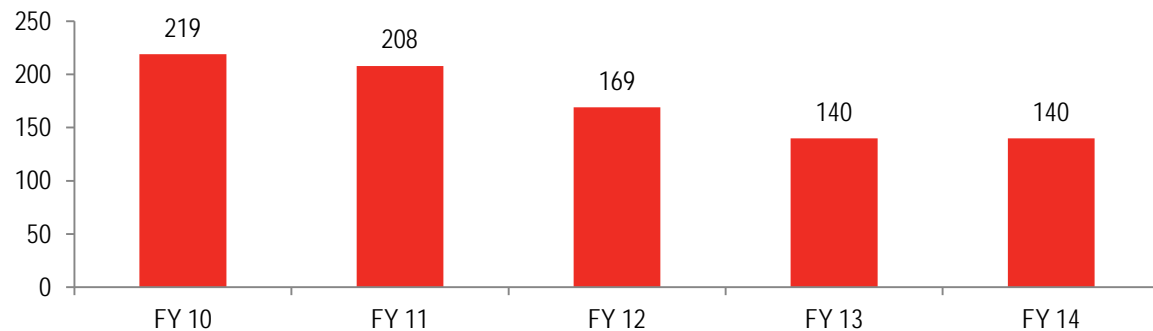
- Public sector: 240
- Others: 220



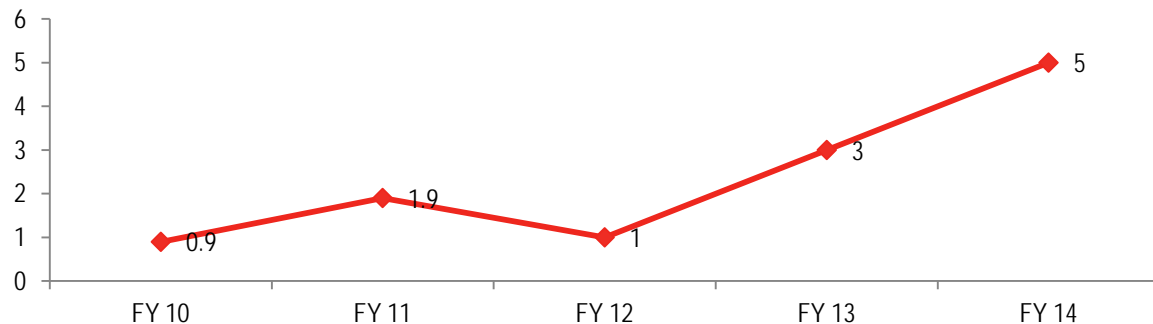
Iron Ore Production

- The domestic steel industry, which is facing an acute shortage of iron ore, is likely to increase its dependence on imported iron ore for this year as well.

Iron ore production (Mn Tonnes)



Iron ore imports (Mn Tonnes)



Source: News Articles



Opportunities in the Iron Ore Sector

Exploration in proposed exploration zones	Opportunities for value-add projects and agglomeration plants for fines utilization
<ul style="list-style-type: none"> ➤ Odisha: Bonai (Keonjhar belt) and Tomka (Daitari and Umerkoke belts) ➤ Jharkhand: All major high-grade ore deposits contain low-grade lateritic ores ➤ Karnataka: Bagalkot, Tumkur, and Chitradurga districts ➤ Maharashtra: Sindhudurg, Gadchiroli, and Gondia ➤ Chhattisgarh: All 14 deposits of Bailadila range, Dantewada district ➤ Andhra Pradesh: Kadapa, Kurnool, Karimnagar, Adilabad, and Guntur districts 	<p>Scope for domestic and foreign firms in upcoming PPP opportunities</p> <ul style="list-style-type: none"> ➤ Joint venture or technical participation with midcap players with lease/license and seeking capital, expertise and technology ➤ In coal mines with auctions, and iron ore mines with larger scale

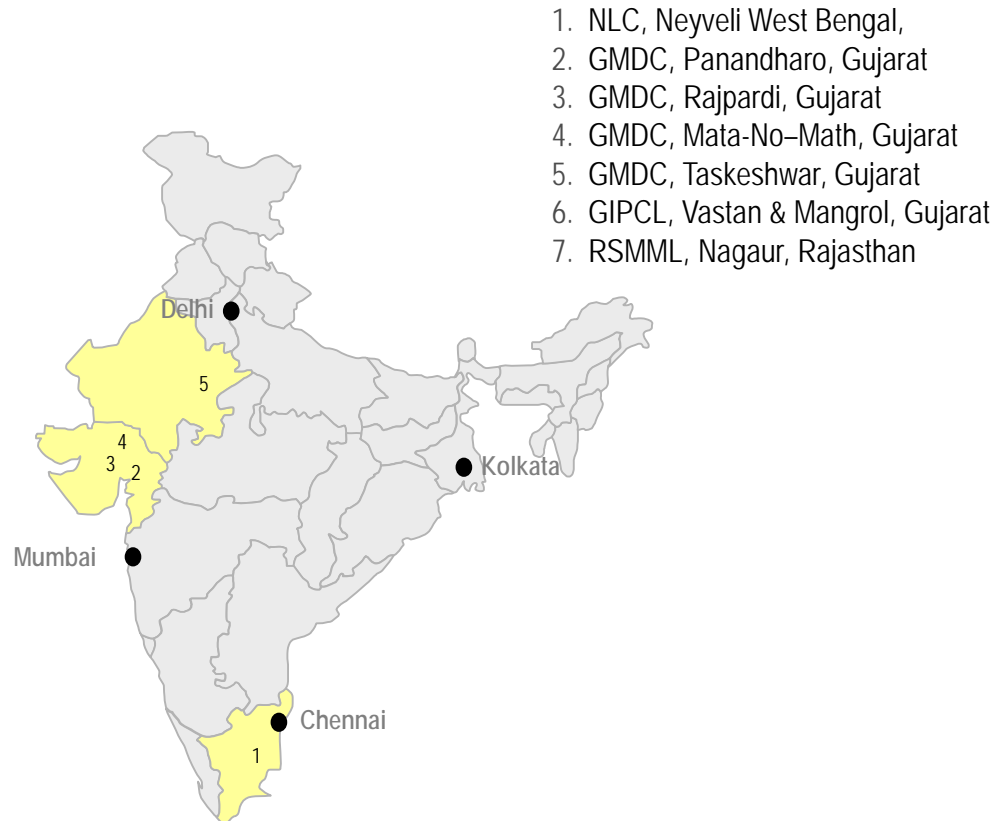


Other Non-Metal Mines



Lignite Mining

- India ranks 3rd in terms of size of reserves
- NLC accounts for 70% of total production
- Mine ownership pattern:
 - Public sector: 3
 - State government: 4



Source: IBM, NLC, GMDC, GIPCL, Ministry of Mines



Bauxite

- India ranks 5th largest in the world in terms of reserve base
- Ranks 6th in the production of bauxite ore
 - Backed by a huge demand for aluminum, bauxite production to increase at 15% CAGR, from 13.5MTPA to ~24 MTPA by 2014
- Mine Ownership Pattern:
 - Public sector: 11
 - Private sector: 180
(Captive: 65, Non-captive: 115)
- Key companies:
 - NALCO,
 - HINDALCO Industries,
 - MALCO,
 - INDALCO Industries



1. Koraput, Orissa
2. Mainpat, Chhattisgarh
3. Kolli Hills, Yercaud – Salem
4. Lohar Daga Jharkhand

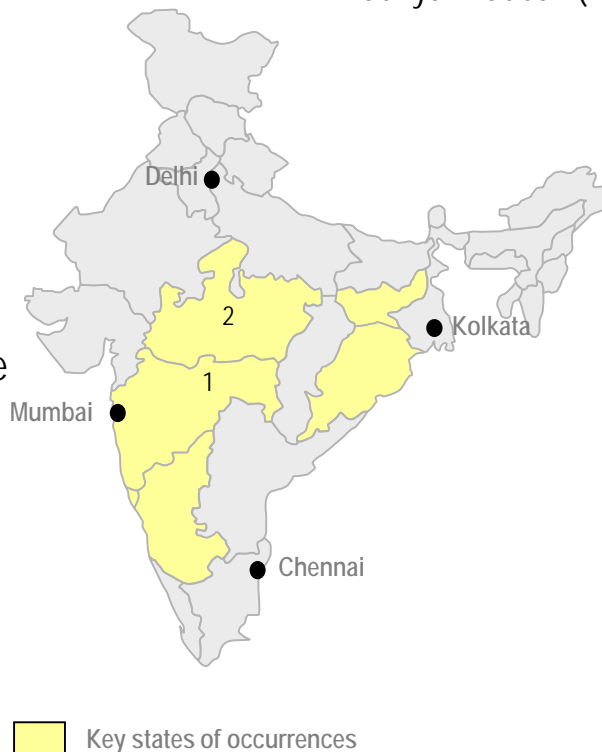
Source: IBM, Ministry of Mines



Manganese

- India ranks 7th in terms of size of reserves
- Mining operations carried out predominantly by private companies
- Ranks 6th in the production of manganese ore
 - Marginal growth in manganese production to over 3 MTPA by 2011-12, at a CAGR of 4.33%, driven by the steel sector and exports
- Mine Ownership Pattern:
 - Public sector: 21
 - Private sector: 86
- Key Companies:
 - Manganese Ore India Ltd,
 - TISCO,
 - Sandur Manganese and Iron Ore Ltd,
 - Rungta Mines

1. Nagpur (Chikla, Satuk, Gurgaon, Ramongri, Kandsi)
2. Madhya Pradesh (Balaghat, Tirodi, Mansar, Miragpur)



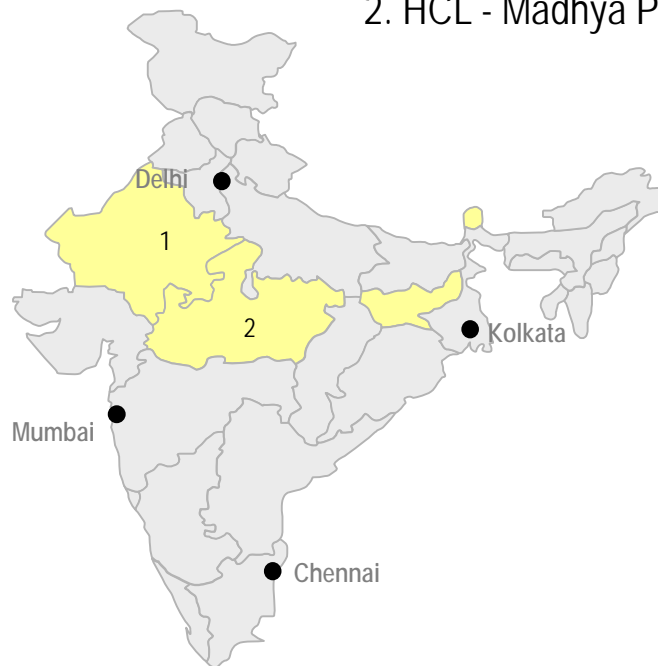
Source: IBM, Ministry of Mines



Copper

- Mine Ownership Pattern:
Public sector: 5 mines
- Key Companies:
Hindustan Copper Ltd is the sole company involved in mining operations

1. HCL - Rajasthan (Khetri, Kolihan)
2. HCL - Madhya Pradesh (Malanjkhand)



 Key states of occurrences

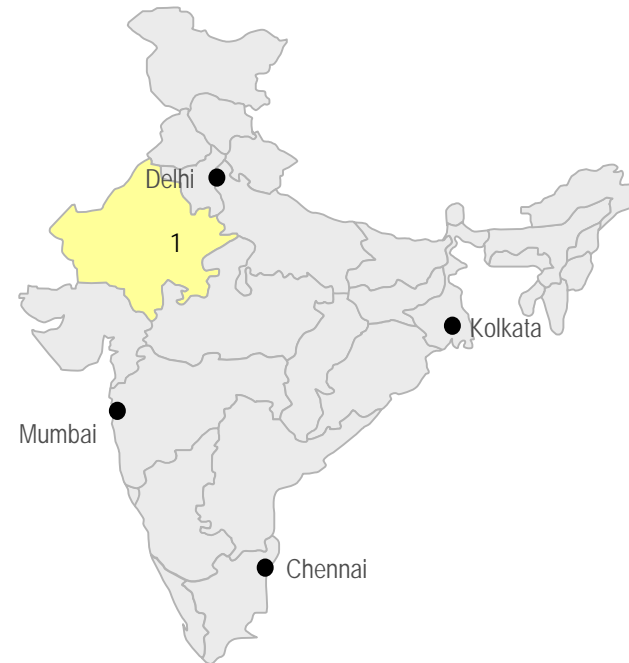
Source: IBM, Ministry of Mines



Lead & Zinc

- Ranks 7th in the production of Lead-Zinc ore
 - Marginal growth in Lead-Zinc production to over 7MTPA by 2011-12, at a CAGR of 5%, driven by the steel sector and exports
- Hindustan Zinc Ltd (part of Vedanta Group, U.K) is the only company involved in mining operations

1. HZL - Rajasthan (Dariba, Zawar mala, Ramagurcha)



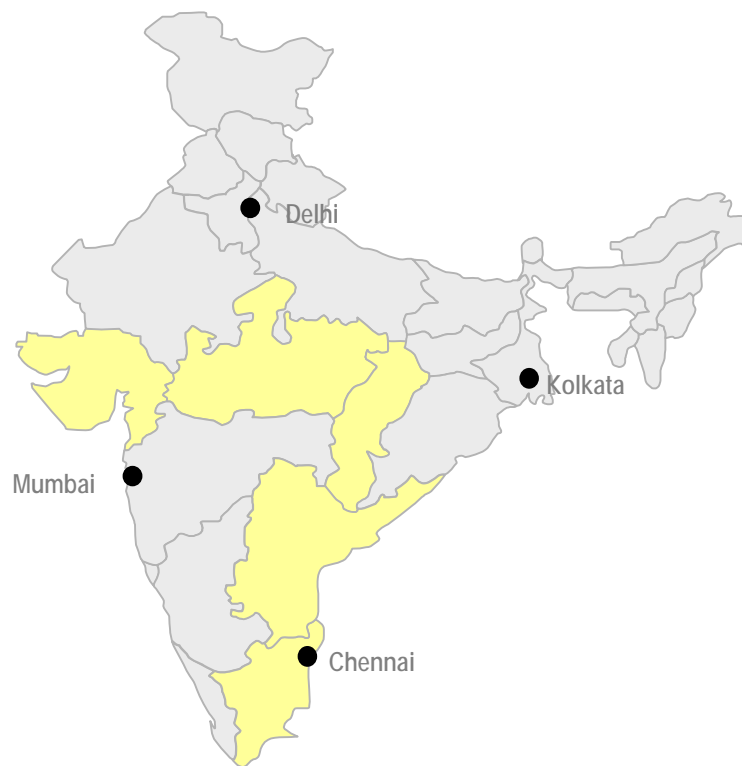
 Key states of occurrences

Source: IBM, Ministry of Mines



Limestone

- Mining operations are carried out predominantly by private cement companies:
 - Public sector: 32
 - Private sector: 568
- Key Companies:
 - India Cements,
 - Madras Cements,
 - ACC,
 - Gujarat Ambuja,
 - Lafarge,
 - Birla

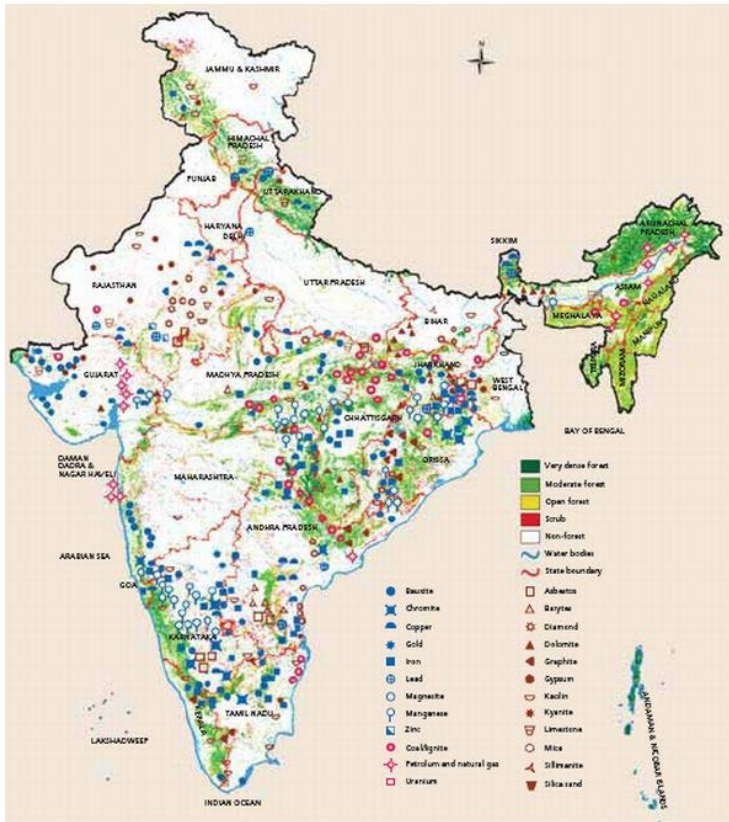


 Key states of occurrences

Source: IBM, Ministry of Mines



Other Non-Metal Ore Production



Mineral	(Million Tonnes or otherwise specified)*			Estimated Demand	
	World Reserves	Indian Resources	Production FY14	FY14	FY17
Rock Phosphate	65,000	296	1.65	8.43	12.3
Potash	9500	21819			
Sulphur and Pyrites	Large	1674	0.26	1.89	2.78
Asbestos ('000 tonnes)	200000	21740	0.23	386	567
Dolomite	Large	8000	5.2	6.03	8.87
Fluospar	23	18	0.014	0.18	0.26
Gypsum	Large	1286	3.42	5.55	8.16
Quartz and Silica Sand	Large	3499	3.54	3.09	4.54
Fireclay	Large	714	0.57	0.47	0.69
Kaolin	Large	2705	2.52	2.93	4.31
Ball Clay	Large	79.29	0.89	1.16	1.7
Magnesite	2400	335	0.23	0.39	0.58
Graphite	2271	175	0.11	0.13	0.19
Pyrophyllite	Large	269	0.23	0.28	0.41
Kyanite ('000 tonnes)	Large	103000	5	6	9
Sillimanite ('000 tonnes)	Large	67,000	47	37	54
Vermiculite ('000 tonnes)		2500	22	14	21
Barytes	240	73	2.33	1.33	1.96



Industry Challenges & Drivers



Key Industry Challenges

- Educating and training the labor force
 - The labor force is easily available but highly unskilled and inexperienced. This situation leads to a poor productivity and a high rate of accidents
- Increasing productivity
 - Mining in India is associated with poor employee productivity. The output per miner per annum in India varies from 150 to 2,650 tones compared to an average of 12,000 tones in the U.S. and Australia
- Turning to sustainable mining
 - Indian mining companies give little importance to environmental concerns. Historically, opencast mining has been favored over underground mining which has led to land degradation, reduced quality and massive environmental pollution
- Integrating updated mining technology
 - Public incentives for updated mining technology integration might contribute to fill the huge operational gap that separates the Indian mining industry from the average international exploitation standards
- Increasing foreign direct investment flows
 - Considering the geologic potential of India, FDI flows in exploration and mining activities might be rapidly improved through certain quantity of measures:
 - Conducting a complete minerals taxation reform
 - Eliminating corruption
 - Reducing the long lead times / bureaucracy associated with permits, concession, investment projects and company registration
 - Promoting the extractive industries



Key Growth Drivers

- FDI encouraged in the sector
 - 100 percent FDI allowed in the mining sector under the Automatic Route
 - Mining lease granted for a long duration (minimum of 20 years and up to 30 years)
 - Untapped metal reserves in India are approximately 82 billion tonnes
- High growth in the dependent sectors driving demand
 - The power sector accounts for a large share of the consumption of aluminium and coal in the country
 - Power supply in India has increased at a CAGR of 5.6 percent during FY06-14
 - Infrastructure industry has grown at a CAGR of 12.3 percent from FY08 to FY14
 - Residential and non-residential building industry has grown at a CAGR of 5.3 percent from FY08 to FY14 and estimated to reach USD \$150 bn by 2016
 - Iron and steel being a core component of the real estate sector, rise in demand in the residential and commercial building industry will lead to increase in the demand for these metals
- High demand for mining products and has high potential mining dependent industries
 - India is the world's second-largest producer of cement and a major consumer of coal
 - The production of cement increased at a CAGR of 6.2% between FY08-14
 - FDI up to 100 per cent is permitted under the Automatic Route to explore and exploit all non-fuel and non-atomic minerals and process all metals as well as for metallurgy
 - FDI caps for coal and lignite have been increased to 100 per cent under the automatic route



Mine Security



Key Regulators for Security of Mines

Organization	Role
Directorate General of Mines Safety (DGMS), Dhanbad	<ul style="list-style-type: none"> ➤ Indian Government Regulatory agency for safety in mines and oil-fields ➤ The mission of the DGMS is to continually improve safety and health standards, practices and performance in the mining industry and upstream petroleum industry by implementing: <ul style="list-style-type: none"> - Pro-active safety and health strategies - Continuous improvement of processes - Effective use of resources - Commitment and professional behaviour in its personnel
Indian Bureau of Mines (IBM), Nagpur	<ul style="list-style-type: none"> ➤ To promote systematic and scientific development of the country's mineral resources ➤ To approve mining plans, schemes and mine closure plans, with regard to conservation of minerals and protection of environment ➤ To collect, collate and maintain database on exploration, prospecting, mines and minerals; to play a proactive role in minimizing adverse impact of mining on environment ➤ To conduct techno-economic field studies in mining, geology, mineral processing and environmental aspects ➤ To provide technical consultancy services in the fields of mining, geology, mineral processing and environment
Ministry of Mines, New Delhi	<ul style="list-style-type: none"> ➤ Ministry of Mines is responsible for survey and exploration of all minerals, for mining and metallurgy of non-ferrous metals like aluminium, copper, zinc, lead, gold, nickel, etc. ➤ Administration of the Mines and Minerals (Regulation and Development) Act, 1957 in respect of all mines and minerals other than coal, natural gas and petroleum
Ministry of Coal, New Delhi	<ul style="list-style-type: none"> ➤ The Ministry of Coal is responsible for development and exploitation of coal and lignite reserves in India ➤ The subjects allocated to the Ministry which include attached and sub-ordinate or other organizations including PSUs concerned with their subjects under the Government of India (Allocation of Business) Rules, 1961



Security Rules & Guidelines for the Mining Industry

The following acts and rules are followed in the Indian Mining Industry, framed by the Ministry of Mines, and controlled by the Director General of Mine Safety.

Acts and Rules	Brief Description
Mines Act '52	<ul style="list-style-type: none"> ➤ An Act to amend and consolidate the law relating to the Regulation of labour and safety in mines, has 10 Chapters and 90 Acts ➤ Chapter 5 in talks and Rule 18-22 about PROVISION AS TO HEALTH AND SAFETY
Coal Mines Regulations (CMR 1957)	<ul style="list-style-type: none"> ➤ Rule framed by Central Government in exercise of the powers conferred by section 57 of the Mines Act, 1952 (35 of 1952) and in supersession of the Indian Coal Mines Regulations, 1926 ➤ Has 16 chapters and 191 Regulation with 8 -12 sub regulations
Metal Mines Regulations (MMR 1966)	<ul style="list-style-type: none"> ➤ Rule framed by Central Government in exercise of the powers conferred by section 57 of the Mines Act, 1952 (35 of 1952) ➤ Shall apply to every mine of whatever description other than a coal or an oil mine ➤ Has 17 chapters and 196 Regulation with 8 -12 sub regulations
Rescue Rules	<ul style="list-style-type: none"> ➤ Rule framed by Central Government in exercise of the powers conferred by section sub-section (4) of section 59 of the Mines Act, 1952 ➤ Has 6 chapter with 44 rules and 4-5 sub rule for each rule ➤ Shall apply to Both Coal and Metal Underground mines for rescue operation in event emergency
Mines Rules 1955	<ul style="list-style-type: none"> ➤ Rule framed by Central Government (Ministry of Labour) in exercise of the powers conferred by section 58 of the Mines Act, 1952 ➤ Shall apply to every mine of whatever description to which the Act applies



Key products used for safety of the personnel working in mines

- Miners work in a small groups in underground mines, and some of the security products are given to the group and some to the individual miner
- Safety products for the group
 - Breathing apparatus
 - Reviving apparatus
 - Flame safety lamps
 - Gas detector
 - Self rescuers
- Safety products for a miner
 - Smoke helmets
 - Ear plug
 - Safety shoes
 - Safety glasses
 - Electric safety lamps
- All the above products are not provided to all miners



Details on the usage of communications products in mines

- Communication systems required for an underground mine can be divided into the following four categories based on purposes and locations:
 1. Shaft communication: Bell signaling system is being used today in most of the underground mines in India
 2. Straight gallery communication: Radio system covers voice communications within the underground mine. Some mines use telephonic line to certain depth (200 ft.)
 3. Mine-wide communication: Underground coal mines generally employ a hard-wired system or a special cable called a "Leaky Feeder"
 4. Trapped miner communication
- Instrumentation Division of Central Mining Research Institute, Dhanbad is actively engaged in development of various wireless communication systems for different locations in underground mines
- CMRI has developed some wireless communication systems and they plan to conduct pilot tests in the Indian mines
 - The carrier current system working on induction theory was used for shaft communication and also experimented in galleries for line-of-sight communication working on the same principle
 - VHF and UHF transceivers of 160 MHz and 450 MHz with 1 W output power have been used in a straight gallery for line-of-sight communication as well as for the cage communication
 - Medium frequency transceivers of 457 KHz and 50 MW transmitting power have been used to establish voice communication link between trapped miner and rescue team



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