

INDIAN MINERAL INDUSTRY & NATIONAL ECONOMY



Indian Minerals Yearbook 2016

(Part-I : General Reviews)



55th Edition

INDIAN MINERAL INDUSTRY & NATIONAL ECONOMY

(FINAL RELEASE)

**GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES**

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NATIONAL ECONOMY

Against the backdrop of robust macro-economic stability, the year 2016-17 was marked by two major domestic policy developments, the passage of the Constitutional amendment, paving of way for the implementation of the transformational Goods and Services Tax (GST), and the action to demonetise the two highest denomination notes. The GST aimed to create a common Indian market, improve tax compliance & governance and boost investment & growth; it is also a bold new experiment in the governance of India's cooperative federalism. Demonetisation, on the other hand, has had short-term costs but holds the potential for long-term benefits. Follow-up actions that have been taken to minimise the costs and maximise the benefits include: fast demand-driven of remonetisation; further tax reforms, including bringing land & real estate into the GST framework, reducing tax rates & stamp duties; and acting to allay anxieties about over-zealous tax administration. These actions are expected to allow growth to return to expected trends in 2017-18 and absorb the shock of this temporary decline witnessed in 2016-17.

The Government introduced several conducive policy initiatives to modernise and stabilise the various facts that influence the economy, for instance, the Government enacted a package of measures to assist the Clothing Sector that by virtue of being export-oriented and labour intensive could provide a boost to employment, especially female employment; The National Payments Corporation of India (NPCI) successfully finalised the Unified Payments Interface (UPI) platform. This will facilitate inter-operability and will unleash the power of mobile phones in achieving digitalisation of payments and thereby financial inclusion, and consequently would make the "M" an integral part of the government's flagship "JAM"— Jan Dhan, Aadhaar, Mobile – initiative. In addition, FDI reform measures were implemented, allowing India to become one of the world's largest recipients of foreign direct investment.

These measures did cement India's reputation as one of the few bright spots in an otherwise grim global economy. India is not only among the world's fastest growing major economies, underpinned by a stable macro-economy with declining inflation and improving fiscal and external balances but it is also one of the few economies enacting major structural

reforms. Yet, however, there is a gap between this reality of macro-economic stability and rapid growth, on the one hand, and the perception of the ratings agencies on the other.

But much more needs to be done. Though after 1991, India progressively distanced itself from statism and made considerable strides in improving the management of the economy. On broader stock-taking India does have to traverse a considerable distance to realise its ambitious targets set, on growth, employment and social justice parameters. Broader societal shifts are required in ideas and narratives to address three major challenges: reducing "inefficient redistribution," by strengthening state capacity in delivering essential services and in regulating markets; dispelling the ambivalence about protecting property rights; and embracing the Private Sector. These structural challenges have their proximate policy counterparts. The central government alone runs about 950 central sector and centrally-sponsored schemes and sub-schemes which cost about 5 percent of GDP. Re-establishing private investment and exports as the predominant and durable sources of growth is the proximate macro-economic challenge. In sum, the steady progress on structural reforms made in the last few years needs to be rapidly built upon, and the unfinished agenda assiduously have to be completed. Especially after demonetisation and given the ever-present late-term challenges, anxieties about the vision underlying economic policy and about the forgoing of opportunities created by the sweet spot need to be decisively dispelled.

Real GDP growth in the first half of the year was 7.2 percent which was on the weaker side of the 7.0-7.75 per cent projection cited in the Economic Survey 2015-16 and somewhat lower than the 7.6 percent rate recorded in the second half of 2015-16. Nominal GDP growth recovery to respectable levels, reversing the sharp and worrisome dip that had occurred in the first half of 2015-16 was, however, encouraging. The major highlights of the sectoral growth outcome of the first half of 2016-17 were: (i) moderation in industrial and non-government service sectors; (ii) the modest pick-up in agricultural growth on the back of improved monsoon; and (iii) strong growth in public administration and defence services. Curiously, all dampeners and catalysts to growth almost balanced each other out and produced a real Gross Value Addition (GVA) growth (7.2 per cent), quite similar to the one (7.1 per cent) witnessed in the second half of 2015-16.

Gross Domestic Product (GDP) is a key indicator by which a nation's economic performance is gauged. As per the first Advance Estimates (AE) released by CSO, the GDP is estimated at 7.1% in 2016-17 as against 7.2% in 2014-15 and 7.6% in 2015-16.

Economic policies bring about pronounced changes in the industrial climate, foreign trade, domestic and international taxation policies, monetary exchange rates, etc., that have far reaching effects on the overall growth of an economy. As per the first advance estimates in India's Economic Survey 2016-17, GVA growth rate at Constant Basic Price touched 7.0% in 2016-17 as against 7.2% in 2015-16.

Economic parameters as per advance estimates published in Economic Survey 2016-17 reveal that the GDP in 2016-17 at constant market prices and GVA at Basic Price (2011-12 prices) were ₹1,21,54,797 crore and ₹1,11,53,038 crore, respectively.

Growth in the Agriculture and allied Sector has improved significantly mainly on account of normal monsoon in the year 2016-17. The growth rates in agriculture have been fluctuating from 1.5% in 2012-13, 4.2% in 2013-14 to (-) 0.2% in 2014-15 and 1.2% in 2015-16, however, in 2016-17 the growth is likely to be 4.1 percent. As per the first advance estimates of CSO, growth rate of the Services Sector is projected to grow at 8.8% in 2016-17, almost the same as in 2015-16. Growth in the Services Sector showed signs of moderation and its prospects still remain robust; on the flip side the acceleration in the growth of the Manufacturing Sector did, however, compensate for the slackness in the Sector. After achieving a real growth of 7.4% in terms of value added in 2015-16, the growth of the Industrial Sector comprising mining and quarrying, manufacturing, electricity, gas, water supply and other utility services, and construction was 5.2% during 2016-17. Within the Industrial Sector, Manufacturing is expected to register a growth of 7.4% during 2016-17.

India's Merchandise Trade Exports

In line with subdued global growth and trade, India's exports declined by 1.3 percent and 15.5 percent in 2014-15 and 2015-16, respectively. The trend of negative growth was reversed somewhat during 2016-17 (April-December), with exports registering a growth of 0.8 percent to US\$ 198.8 billion from US\$ 197.3 billion in 2015-16 (April-December). During

2016-17 (April-December) petroleum, oil and lubricants (POL) exports constituting 11.1 percent of total exports declined by 9.8 percent to US\$ 22.0 billion over corresponding previous period, while non-POL exports grew by 2.2 percent to US \$ 176.8 billion. A large number of export sectors have moved to positive growth territory in April-November 2016-17 as compared to 2015-16.

Region-wise, India's exports to Europe, Africa, America, Asia and CIS and Baltics region declined in 2015-16. However, India's exports to Europe, America and Asia increased by 2.6 percent, 2.4 percent and 1.1 percent, respectively in 2016-17 (April-November), while exports to Africa declined by 13.5 percent. USA followed by UAE and Hong Kong were the top export destinations.

Imports

Value of imports declined from US\$ 448 billion in 2014-15 to US\$ 381 billion in 2015-16, mainly on account of decline in crude oil prices resulting in lower levels of POL imports. During 2016-17 (April-December) imports declined by 7.4 percent to US \$ 275.4 billion compared to the corresponding period of previous year. POL imports declined by 10.8 percent. Gold and silver imports declined by 35.9 percent and non-POL and non-gold & silver imports by 2.0 percent. Positive growth was registered in pearls and semi-precious stones (19.0 percent) and Food and allied products (1.3 percent). Imports of capital goods declined by 8.8 percent.

India's imports from Europe, Africa, America, Asia and CIS & Baltics regions declined in 2015-16. However, in 2016-17 (April-November), imports from CIS & Baltics region increased by 10.3 percent while other four regions witnessed decline. Top three countries from where imports to India were observed include China followed by UAE and USA in 2016-17 (April-November).

Trade deficit

In 2015-16, India's trade deficit declined by 13.8 percent (vis-à-vis 2014-15) to US\$ 118.7 billion. Furthermore, it declined by 23.5 percent to US\$ 76.5 billion in 2016-17 (April-December) as compared to US\$ 100.1 billion in the corresponding period of previous year.

Gross FDI inflows to India increased significantly to US \$ 60.2 billion in 2016-17 from US \$ 55.6 billion in 2015-16. Net FDI inflows (i.e. net of outward FDI) at US \$ 35.6 billion, however, moderated marginally by 1.1% from US \$ 36.0 billion in 2015-16.

MINING INDUSTRY

The index of mineral production (base year 2011-12=100) for all minerals (excluding atomic minerals) stood at 129.3 points in 2016-17 registering an increase of 2.2% over the previous year.

Index for fuel minerals, metallic minerals and non-metallic minerals increased by 0.9%, 18.3% and 1.5%, respectively over 2015-16.

The total estimated value of mineral production (excluding atomic minerals and minor minerals) at ₹ 2,34,171 crore during 2015-16 decreased marginally as compared to the previous year due to decrease in the production of natural gas (ut.), petroleum (crude), gold, manganese ore, tin, zinc (conc.), apatite, fluorite, garnet (abrasive), kyanite, limeshell, magnesite, phosphorite, vermiculite and wollastonite. However, the production of minerals like coal, bauxite, chromite, copper ore conc., iron ore, lead conc., silver, limestone, graphite (r.o.m.), marl, moulding sand,

sillimanite, selenite, etc. increased during 2015-16.

The value of metallic minerals in 2015-16 at ₹ 33,469 crore decreased by about 12% over the previous year due to lower production reported in manganese ore and tin concentrates. Among the principal metallic minerals, iron ore contributed ₹ 22,115 crore or 66%, lead (concentrate) & zinc (concentrate) together ₹ 4,282 crore or 13%, chromite ₹ 2,304 crore or about 7%, manganese ore ₹ 886 crore or about 3%, silver ₹ 1,521 crore or 4%, bauxite ₹ 1,409 crore or 4% and the remaining value was from copper (concentrate), gold and tin concentrates.

In metallic ore, production increased in respect of chromite (34%), copper concentrates (33%), iron ore (20%) and bauxite (25%). The production of manganese ore decreased by about 9% during 2015-16. The production of zinc concentrates decreased marginally by one percent.

Table – 1 : Indian Mineral Industry : Value of Production*
2013-14 to 2015-16

(In ₹ crore)

Sector	2013-14 (R)	2014-15 (R)	2015-16 [#] (P)	% change over previous year		Sectoral contribution to the total value in %	
				2013-14 and 2014-15	2014-15 and 2015-16 [#] (P)	2014-15	2015-16 [#] (P)
				Total : All Minerals	277360	290587	282965
Fuels	186467	193372	189710	+3.70	-1.89	66.55	67.04
(a) Solid fuel	88502	97450	95881	+10.11	-1.61	33.54	33.88
(b) Liquid & gaseous fuels ^(ev)	97965	95922	93829	-2.09	-2.18	33.01	33.16
Metallic minerals	42390	37909	33469	-10.57	-11.71	13.04	11.83
Non-metallic minerals	7516	7915	6693	+5.31	-15.44	2.72	2.37
Minor minerals [@]	40987	51391	53093	+25.38	+3.31	17.69	18.76

* Excluding the minerals declared as prescribed substances under the Atomic Energy Act, 1962.

: Excludes the data of 31 minerals for February and March 2015, declared as minor minerals vide notification dated 10th February 2015.

(ev) : Value estimated.

@ : (i) Figures for earlier years have been repeated as estimates, wherever necessary, because of non-receipt of data.
(ii) Includes estimated value of 31 minerals declared as minor vide notification dated 10th February 2015 for the year 2015-16.

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The value of production of non-metallic minerals at ₹ 6,693 crore during 2015-16 decreased by 15.44% from that of the previous year. Limestone with a contribution of 90% of the total value of non-metallic minerals, retained its leading position in 2015-16 in the group. The other important non-metallic minerals in value terms, were phosphorite/rock phosphate (5%) and diamond (1%) (Table-1). Indian Mining Industry is characterised by a large number of small operational mines. As per the revised data published in Monthly Statistics of Mineral Production (MSMP)-March, 2017 Issue released by IBM, the total number of reporting mines, (excluding atomic minerals, minor minerals, petroleum (crude) and natural gas (utilised) in the country was 2,020 in 2016-17 as against 2,054 in 2015-16. Among them, 512 mines belonged to fuel minerals, 644 mines to metallic minerals and 864 mines to non-metallic minerals (Table-2). There were 637 mines in the Public Sector and the remaining 1,383 mines under Private Sector.

**Table – 2 : Number of Reporting Mines
2015-16 (R) and 2016-17 (P)**

Sector	2015-16 (R)	2016-17 (P)
All Minerals*	2054	2020
Public sector	625	637
Private sector	1429	1383
Fuel minerals(e)	512	512
Metallic minerals	667	644
Non-metallic minerals	875	864

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

Source: MSMP, March-2017.

Role of Public Sector

The value of mineral production (excluding atomic minerals) in Public Sector was at ₹ 1,69,854 crore or 60% in the overall value of mineral production in 2015-16. The share of Public Sector in the total value of fuel minerals was 82%, in metallic minerals 36% and 12% in non-metallic minerals during the year.

The entire production of copper ore & conc. among metallic minerals and diamond, fluorite, selenite and sulphur in respect of non-metallic minerals was reported from the Public Sector. By and large, the entire production of lignite, gold (ore and primary), came from Public Sector during 2015-16. Public Sector also had a sizeable contribution in production of phosphorite/rock phosphate (96%), coal (93%), natural gas (ut.) (75%), petroleum (crude) (69%), tin conc. (68%), graphite (67%), magnesite (56%) and manganese ore (50%).

Gross Value Added from Mining & Quarrying Sector

The Ministry of Statistics & Programme Implementation has released the new series of national accounts, revising the base year from 2004-05 to 2011-12 in the year 2015. The Industry-wise estimates are now presented as Gross Value Added (GVA) at basic prices. Certain changes have been made in this series including for Mining & Quarrying Industry. During 2015-16 Mining & Quarrying Industry accounted for about 2.6 % of the GVA at current prices. The GVA at current and constant prices for the period from 2013-14 to 2015-16 is furnished in Tables - 3 & 4.

Employment

The estimated average daily employment of labour engaged in Mining Sector (excluding atomic and minor minerals) was 4,88,694 in 2015-16. Of this, 3,31,544 or 68% were in Public Sector and 1,57,150 or 32% in Private Sector. Fuel minerals accounted for 78%, metallic minerals 16% and non-metallic minerals 6% of the total labour force during the year.

India's ranking in 2015 in world production was 3rd in steel (crude), barytes, talc/steatite/pyrophyllite, kyanite,andalusite & sillimanite and coal & lignite; 4th in bauxite, chromite and iron ore; 5th in aluminium and zinc (slab); 6th in manganese ore ; 7th in copper (refined) and 12th in magnesite. The statistics on indigenous and world production of principal minerals and metals are detailed in Table- 5.

**Table - 3: Gross Value Added at Basic Price, 2013-14 to 2015-16
(At Current Prices)**

Industry	2013-14 (NS)	2014-15 (NS)	2015-16 (PE)	% Change in 2015-16 over the previous year
GVA (All)	10380813	11472409	12279410	7.0
Mining & Quarrying	295978	304300	318672	4.7

Source : CSO

NS : New Series Estimates

PE : Provisional Estimates

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**Table - 4: Gross Value Added at Basic Price, 2013-14 to 2015-16
(At 2011-12 Prices)**

(in ₹ crore)

Industry	2013-14 (NS)	2014-15 (NS)	2015-16 (PE)	% Change in 2015-16 over the previous year
GVA (All)	9084369	9727490	10427191	7.2
Mining & Quarrying	267378	296328	318377	7.4

Source : CSO.

NS: New Series Estimates

PE: Provisional Estimates

**Table-5: Contribution and Rank of India in World Production of
Principal Minerals & Metals, 2015**

Quantum of production	Unit of commodity	Production quantity		Contribution (Percentage)	India's rank in World order
		World	India*		
Mineral Fuels					
Coal & lignite	million tonnes	7860	683	8.69	3 rd
Petroleum (crude)*	million tonnes	4225	37	0.88	23 rd
Metallic Minerals					
Bauxite	'000 tonnes	294074	28134	9.57	4 th
Chromite	'000 tonnes	35300	2894	8.20	4 th
Iron ore	million tonnes	3328	156	4.69	4 th
Manganese ore	'000 tonnes	53200	2148	4.04	6 th
Industrial Minerals					
Kyanite, andalusite & sillimanite	'000 tonnes	390 ^{(e)**}	73	18.72	3 rd
Magnesite	'000 tonnes	44900	265	0.59	11 th
Apatite & rock phosphate	'000 tonnes	265140	1474	0.56	16 th
Metals					
Aluminium	'000 tonnes	57670	2355	4.08	5 th
Copper (refined)	'000 tonnes	22900	790	3.45	7 th
Steel (crude/liquid)	million tonnes	1620	90 [@]	5.56	3 rd
Lead (refined)	'000 tonnes	10700	145	1.36	14 th
Zinc (slab)	'000 tonnes	13227	759	5.74	5 th

Source: World mineral production data compiled from World Mineral Production, 2011-2015; British Geological Survey.

* Figures relate to 2015-16, MSMP, March, 2016

** Mineral Commodity Summary, 2017, USGS.

@ Ministry of Steel, Annual Report, 2016-17.

** As per Government of India Notification S.O. 423(E) dated 10th February, 2015, following minerals have been declared as minor minerals: i) barytes ii) dolomite iii) feldspar iv) fireclay v) quartz/silica sand and vi) talc/steatite/soapstone & pyrophyllite, hence not included in the table due to non-availability of production data for the year 2015-16.

MINERAL POLICY & LEGISLATION

The significant developments relating to National Mineral Policy and other mineral-related policies that took place in 2015-16 are highlighted below:

National Mineral Exploration Policy (NMEP)

The Ministry of Mines, Government of India has notified the National Mineral Exploration Policy (Non-Fuel and Non-Coal Minerals). The National Mineral Exploration Policy (NMEP) document spells out the strategy and outlines the action plan that the Government will adopt to ensure comprehensive exploration of country's mineral resources (non-fuel and non-coal). Successful exploration requires the bringing together of the best of knowledge and experience, the state-of-the-art technology, highly trained manpower, and also enormous financial resources, on an open, collaborative and inter-disciplinary platform.

Mines and Mineral (Development and Regulation) Amendment Act, 2015

The MMDR Act, 1957 was amended through the MMDR Amendment Act, 2015 which came into force on January 12, 2015. The amendment Act has ushered in the regime of transparent and non-discretionary grant of mineral concessions. The salient features of the Amendment Act are:

(a) Mining Plan document should be accompanied by a non-refundable fee of ₹ 25,000/-

Mining Plan document accompanied by a non-refundable fee of ₹25,000/- (Rupees Twenty-five Thousand only) per sq. km or part thereof would have to be submitted to the Indian Bureau of Mines for approval.

(b) Authorisation of Mining Plan

Regional Controller of Mines & Deputy Controller of Mines of Mineral Development and Regulation Division and who is in-charge of the Regional Offices / Sub-Regional Offices of Indian Bureau of Mines has been authorised for granting of approval to the mining plans that are submitted to the respective Offices.

(c) Role of Central Mine Planning and Design Institute Limited (CMPDI)

CMPDI shall make over the data generated by them, in respect of the prospecting operations to the State Government.

(d) Composition of the Geoscience Advisory Council (GAC)

The changes in the composition of GAC have been decided "Representatives of the following

Ministries/Departments not below the rank of Joint Secretary" shall be the Member of the Council:

- (i) Central Mine Planning & Design Institute (CMPDI)
- (ii) Bhabha Atomic Research Centre (BARC)
- (iii) National Remote Sensing Centre (NRSC).

Central Arid Zone Research Institute has been excluded from the list.

(e) Beach sand minerals include ilmenite, rutile, leucoxene, garnet, monazite, zircon and sillimanite

In the First Schedule, in Part B, after Entry 11, the following entry has been inserted, namely, " **Beach sand minerals**, that is, economic heavy minerals found in the teri or beach sands, which include ilmenite, rutile, leucoxene, garnet, monazite, zircon and sillimanite".

(f) Transfer of Mining Lease Granted Otherwise than through Auction for Captive purpose

Transfer of mining lease is possible but for those mines which are granted for captive use only otherwise not. There are a total of four Schedules (Formats) to complete the process of transfer of lease.

(g) Offshore Areas Mineral (Development and Regulation) Act, 2002 (OAMDR Act)

With effect from 30.6.2016 all subsequent actions undertaken for grant of the 62 exploration licences have been rescinded.

Mineral Conservation and Development Rules, 1988

Amendments in the Mineral Conservation and Development Rules, 1988, are as follows:

- (a) These rules are to be called the Mineral Conservation and Development Rules, 2017.
- (b) Amendment of Rule 45- Registration in electronic form would have to be done within one month from the date of registration of lease deed or storage or end use for export of minerals as the case may be.
- (c) IBM has been authorised to allot and record the registration no. in the register referred to in Sub-rule (4). In Sub-rules 5,6 &7, details regarding submission of daily returns and monthly return in the prescribed time and date in electronic form in the prescribed form along with a hard copy have been specified.

Minerals (Other than Atomic and Hydrocarbons Energy Minerals) Concession (Amendment) Rules, 2016.

In the Minerals (Other than Atomic and Hydrocarbons Energy Minerals) Concession Rules, 2016, in Rule 12, after Sub-rule (5), the Sub rule“(5A) has been inserted, which is, notwithstanding anything contained in Sub-rule (5), the State Government may grant a mining lease for area less than five hectares in respect of mining lease to be granted in pursuance of the provisions of Clause (b) or Clause (c) of the Sub-section 10A of the Act for more than one hectare of lease area.

Mines and Minerals (Development and Regulation) Removal of Difficulties Order, 2017.

It is clarified that where the condition of obtaining environmental clearance has not been complied with by the applicant on or before 11th January, 2017, but all other conditions specified in previous approval or the letter of intent have been fulfilled, the applications shall be considered under that Section and mining lease shall be granted by the concerned State Governments in accordance with the notifications issued under the Environment (Protection) Act 1986 (29 of 1986). Provided that no mining activity shall commence unless and until the applicant obtains environmental clearance as laid down under the Environment (Protection) Act, 1986 and the rules made thereunder.

EXPLORATION & DEVELOPMENT

GSI, DGMs of various States, Public Sector companies like NMDC, MECL, MOIL, GMDC, HGML, etc. continued their efforts of surveying, mapping and exploration of new deposits and reassessment of old deposits/mines during 2015-16. In the Oil and Gas Sector, ONGC, OIL and a few joint venture and private companies were engaged in exploration of onshore and offshore areas in 2015-16. Exploration conducted by various organisations during 2015-16 is highlighted below:

Geological Survey of India (GSI)

GSI is vested with the responsibility of maintaining broad-based and uniform national approach to data generation in respect of mineral resources. With the near exhaustion of resources to the proximity of surface, it has become imperative to have multidisciplinary approach to mineral exploration which comprises large-scale and detailed geological mapping aided by interpretative analysis of aerogeophysical and remotely sensed data, ground geophysical survey, geochemical prospecting and surface & subsurface exploration through pitting, trenching

& drilling. GSI’s activities in mineral exploration as well as baseline surveys have increased manifold in order to sustain the momentum of national economic development and to meet the increasing demands of various stakeholders. As per recent development towards Policy shift, GSI has been entrusted G2 level of investigations for M-IIA Items that were included in FS 2015-16. GSI also did engage in the task of upgrading the level of investigation in different important exploration items along with identification of resource potential of G3 level, for auctioning as per the recent policies of the Government. Emphasis also has been laid on the need to focus attention on the survey and exploration of those minerals in which the country has high geologic potential but poor resource-cum-reserve base. Similar priority is also has been given to minerals that have high internal demand or export potential.

GSI is executing its programmes through Mission-Region hybrid matrix mode. GSI in pursuance of its systematic geological mapping in 2015-16 had completed 5,925 sq km large-scale mapping, 106.03 sq km detailed mapping and 1,13,202 m drilling as against the preceding year’s achievement of 5,450.84 sq km large-scale mapping, 73.543 sq km detailed mapping and 87465.87 m drilling. Out of the total mappable areas of 3.14580 million sq km of the country, 3.09965 million sq km has been covered so far by systematic mapping bringing the total coverage to 98.53%. The highlights of the resources assessed are as below:

Resources augmented by GSI during 2015-16 are furnished below:

- (i) A total of 62.97 million tonnes of >55%Fe and 11.90 million tonnes of Fe(T) ~45 - 55% of iron ore resources in Sundargarh district, Odisha.
- (ii) A total of 14.66 million tonnes of 0.33% Cu and 0.2% Cu in Sikar district, Rajasthan.
- (iii) A total of 99.46 thousand tonnes of gold ore with an average grade of 2.17 g/t (cut-off grade 1.0g/t); For 0.5 g/t cut-off grade, a tentative resource of 2,13,524 tonnes of ore with an average grade of 1.45 g/t; An inferred resource of 0.21 million tonnes of gold ore (approx. 186.9 kg of Au metal) has been estimated with an average grade of 0.90 g/t (UNFC-333) in Ajjanahalli Block-C, Tumakuru district, Karnataka.
- (iv) A total of 159.45 million tonnes of limestone (CaO:38.38-47.29%) in Garhi-Upcha block; 129.5 million tonnes (CaO: 34.65%-46.03%) in Badretha block; and 20.57 million tonnes (CaO: 37.68 - 38.99%) in Hirawale block in Morena and Shivpuri districts, Madhya Pradesh.
- (v) A total of 6.25 million tonnes of graphite (average FC - 8.79%) in Betul district, Madhya Pradesh.

GSI continued its offshore geo-scientific studies both in Exclusive Economic Zone (EEZ) and Territorial Waters (TW) along the East and West Coasts of India. During 2015-16, a total of 19 cruises were undertaken using three vessels; 6 cruises aboard R.V. Ratnakar; 7 cruises aboard R.V. Samundra Kaustubh; and 6 cruises aboard R.V. Samundra Shaudhikama.

GSI pursued its airborne geophysical surveys for generating database employing magnetic and gamma ray spectrometric techniques.

Since the acquisition and induction of TOASS, a total of 6.50 lakh line km was covered by multi-sensor survey till the field season March, 2016.

MECL

A total of 2,532 million tonnes of mineral resources was established. Mineral-wise details of resources estimated by MECL during 2015-16 are:

(i) A total of 1,849 million tonnes of coal resources was established in Mand-Raigarh, Sonhat & Bistrampur Coalfields, Chhattisgarh.

(ii) A total of 91 million tonnes of lignite resources was established in Tamil Nadu

(iii) A total of 477 million tonnes of limestone resources was established in Meghalaya.

(iv) A total of 1.061 million tonnes of lead-zinc resources was established at Maurya block in Betul district of Madhya Pradesh.

(v) A total of 2.046 million tonnes of tungsten resources was established in Kuhi-Khobna area, Nagpur, Maharashtra.

(vi) A total of 0.365 million tonnes of gold ore resources was established in Parsi West Block in Ranchi district, Jharkhand.

(vii) A total of 111 million tonnes of iron ore resources was established at Sandur Schist Belt, Ballari distt., Karnataka.

State Directorates of Geology and Mining

DGM, Chhattisgarh, established about 46.99 lakh tonnes of bauxite in Kabirdham district; about 10 lakh tonnes of bauxite in Surguja district; about 75.21 million tonnes of limestone resources in Raipur district; about 74 million tonnes of limestone resources in Janjgir-Champa district; about 75.21 million tonnes of limestone resources in Rajnandgaon district; about 10 million tonnes of limestone resources in Bastar district; and about 1 million tonne of dolomite in Bastar district.

DMG, Rajasthan, estimated about 74 million tonnes of cement-grade limestone in Jaipur & Alwar distt.;

about 2.86 million tonnes of lignite resources in Bikaner distt.; about 80 million tonnes & 0.726 million tonnes of masonry stone & limestone, respectively in Bundi distt.; about 3.55 million tonnes of sandstone (Splittable) and 2.9 million tonnes of sandstone in Karauli district; and about 170 million tonnes of dolomite resources in Rajsamand district.

DGM, Uttar Pradesh estimated about 0.01 million tonnes of tentative reserves of platinum and about 1,774.5 kg of low-grade gold ore in Lalitpur district.

DGM, Kerala established about 2.7 million tonnes tentative resources of sandy clay in Kollam district and about 30.6 million tonnes tentative resources of china clay and 14 million tonnes of laterite/aluminous laterite in Kannur district.

DGM, Maharashtra established about 258.99 million tonnes, 42.501 million tonnes and about 3.82 million tonnes of pyrophyllite/sillimanite in Chandrapur district.

Oil and Natural Gas Corporation Ltd (ONGC)

ONGC continued its operations for exploration of oil and gas and reported 17 new hydrocarbon discoveries in 2015-16. As a result of these exploratory efforts, ONGC accreted 65.58 million tonnes of ultimate reserves of oil and oil-equivalent gas (O+OEG) during the year 2015-16 in areas under its operations.

Oil India Ltd (OIL)

OIL continued its operations for exploration of crude oil and natural gas in 2015-16 and carried out 142.76 thousand metre drilling in 44 wells in onshore areas. Exploration resulted in significant discoveries of oil/gas within Upper Assam Basin and NELP-VI block MZ-ONN-2004/1, RJ-ONN-2004/2 & RJ-ONN-2005/2.

Indian Bureau of Mines (IBM)

IBM as a facilitator to the Mineral Industry (a) provided technical consultancy services in feasibility study, environmental impact assessment, environmental management plan, etc.; (b) carried out mining research on need-based aspects of mining; (c) conducted mineral beneficiation studies, including mineralogical testing and chemical analysis; and (d) prepared mineral maps. Besides, preparation of National Inventory of mineral resources is IBM's designated responsibility. The National Mineral Inventory (NMI) is brought out by IBM on a quinquennial basis. UNFC system has been adopted by IBM for resource classification. Updating of NMI of mineral resources in respect of 70 minerals based on UNFC system, as on 1.4.2015, has been completed.

During 2015-16, up to December, 2015, IBM prepared 88 multi-mineral leasehold maps with forest overlays on 1:50000 scale in respect of the States of Andhra Pradesh, Tamil Nadu and Kerala.

During 2015-16, up to December, 2015, IBM conducted 35 ore dressing investigations, chemical analysis in respect of 25,461 radicals, and 1882 mineralogical examination and one Plant Study were completed.

Other Agencies

GMDC estimated lignite resources of 37.54 million tonnes in Kachchh district, 114.72 million tonnes in Bhavnagar district, respectively.

HGML has established 9.98 million tonnes reserves of gold ore (5.30 g/t Au) in Hutti mines and Hira-Buddini areas in Raichur distt. of Karnataka.

Exploration by HZL has established (i) 6.39 million tonnes of proved reserves with 1.59% Pb & 6.11% Zn; (ii) 2.89 million tonnes ore of probable reserves with 1.48% Pb & 6.68% Zn; (iii) Feasibility - 3.20 million tonnes ore with 1.27% Pb & 7.94% Zn; (iv) pre-feasibility - 6.12 million tonnes ore with 2.28% Pb & 6.34% Zn; (v) measured - 7.17 million tonnes ore with 2% Pb & 7.5% Zn; (vi) Indicated - 6.28 million tonnes ore with 2.35 Pb & 6.86% Zn; and (vii) inferred - 26.63 million tonnes ore with 1.88% Pb & 6.74% Zn.

RSMML estimated a total of 69.585 million tonnes of lignite resources in Barmar and Nagaur districts respectively and as on 1.4.2016, estimated a total resources of 46.727 million tonnes of rock phosphate with reserves estimated to be about 26.093 million tonnes. Odisha Mining Corporation Ltd established a total of 15.505 million tonnes of iron ore resources in Keonjhar district.

NMDC estimated a total of 18.36 million tonnes proved reserves and 7.53 million tonnes of probable reserves of iron ore in Ballari district, Karnataka.

Reliance Industries Ltd (RIL)

In the year 2014-15, RIL and Myanmar Oil & Gas Enterprise (MOGE), an enterprise of the Government of Myanmar, signed a production sharing contract for two offshore blocks (M17 and M18) in the Tanintharyi basin of Myanmar. RIL will be the operator of the blocks with 96% participating interest. The United National Resources Development Services Co. Ltd (UNRD), a Myanmar company, hold the remaining interest in the block. Reliance has carried out the environment impact assessment for the blocks. Gas production from the KG-D6 field declined by 12% to 139.1 Billion Cubic Feet (BCF) in FY 2015-16. Fall in production was mainly due to natural decline in the fields coupled with sand ingress

in MA wells. This was partly offset by incremental production from side tracks in Well A1 ST and substitute Well B7 Sub and field and well management efforts in D1-D3.

During the year, RIL made significant progress towards development of two Coal-Bed Methane (CBM) blocks, namely, Sohagpur East and Sohagpur West. Detailed engineering and construction activities have been completed. RIL has commenced test production and pre-commissioning and commissioning activities from Sohagpur (West) Block.

RESEARCH & DEVELOPMENT

The Science and Technology (S&T) programmes of the Ministry of Mines, Government of India, cover the disciplines of Geology, Exploration, Mining, Beneficiation & Mineral Processing, Rock Mechanics, Ground Control and Non-ferrous Metallurgy and Environmental issues related to Mining and Metallurgy. A meeting was held on 16.07.2016 by Project Evaluation and Review Committee (PERC). Based on the Committee's scrutiny report, Standing Scientific Advisory Group (SSAG) in its 47th meeting considered and recommended Grant-in-Aid under S&T programme of the Ministry of Mines.

The highlights of work carried out during 2015-16 by IBM and JNARDDC relating to mineral beneficiation and mining & environment are elaborated below:

1. IBM

1.1 Copper Ore

Bench-scale beneficiation studies on a borehole copper ore sample from Thanewana block, Chandrapur district, Maharashtra (for M/s Mineral Exploration Corp. Ltd): A borehole copper ore sample from Thanewana block Chandrapur district, Maharashtra was received through M/s Mineral Exploration Corp. Ltd for conducting bench scale beneficiation studies at the Modern Mineral Processing Laboratory and Pilot Plant of Indian Bureau of Mines, Nagpur. The as received sample that assayed 0.53% Cu, 4.25% Fe(T), 78.01% SiO₂, 5.43% Al₂O₃, 0.32% CaO, 2.11% MgO, 1.52% S, 0.162% P₂O₅, 0.189% TiO₂, 0.367% K₂O, 0.088% MnO₂, 0.165% BaO and 83.82% acid insoluble was subjected to the beneficiation process froth flotation. Flotation tests conducted using sodium isopropyl xanthate (SIPX) had methyl isobutyl carbinol (MIBC) as a frother and Lime as a pH modifier. Flotation test at 87.1% - 200 mesh grind at a pH of 10.5 yielded a copper concentrate assaying 20.88% Cu, 7.80% SiO₂ and 8.08% acid insoluble with copper recovery of 90.9 percent and weight percent yield of 2.3.

1.2 Iron Ore

Beneficiation on an iron ore sample from Kalane Iron Ore mines, Goa for M/s Samruddha Resources Limited, Mumbai : An iron ore sample from Kalane mines, Goa was received from M/s Samruddha Resources Limited, Mumbai for beneficiation studies at Regional Mineral Processing Laboratory, Indian Bureau of Mines, Bengaluru. The objectives of the test work were to upgrade the ore to > 57% Fe(T) with maximum Fe(T) recovery and to develop a process flow sheet.

The as received sample that assayed 55.52% Fe(T), 6.65% SiO₂, 1.36% Al₂O₃, 0.37% CaO, 0.03% MgO, 0.07% Na₂O, 0.05% K₂O, 2.98% Mn, 0.20% TiO₂, 0.01% P and 10.37% LOI after being subjected to simple processes of scrubbing and screening followed by tabling of the ground fraction to minus 6.25 mm+150 mesh yielded a final concentrate assaying 58.15% Fe(T), 3.11% SiO₂, 1.61% Al₂O₃, 2.76% Mn and 10.15% LOI with 81.30% Fe(T) recovery (wt.% yield 78.10).

The concentrate did meet the specification as stipulated by the party.

1.3 Glauconite

Beneficiation studies on a glauconite sand stone sample, Shale of Vindhyan Supergroup from Kurchha-Barwadih Area, Sonbhadra district, Uttar Pradesh for GSI. Northern Region, Lucknow: A Glauconite sand stone sample from Sonbhadra district, U.P. was received at the Modern Mineral Processing Laboratory and Pilot Plant, Indian Bureau of Mines, Nagpur for conducting beneficiation tests. The objective of the study was to enrich the glauconite mineral present in the sample so as to explore the utility of indigenous glauconitic sand as potash fertilizer. The as received sample assayed 2.85% K₂O, 3.65% Fe₂O₃, 7.88% Al₂O₃, 78.52% SiO₂, 1.20% CaO, 1.65% MgO, 0.10% Na₂O, 0.20% TiO₂, 0.20% F and 2.49% LOI. Mineralogical studies revealed that the sample consisted mainly of quartz (~60%) with subordinate amount of glauconite (~20%) and minor amounts of feldspar (~10%) along with mica (muscovite, biotite) (6-8%). Minor amounts of goethite/limonite (2-3%) and carbonate (calcite) (1-2%) along with traces of haematite and clay were also present. The sample was crushed to minus 10 mesh and stage ground in a rod mill to all passing 30 mesh after which the ground product

was screened at 100 mesh. The - 30 + 100 mesh fraction was subjected to attrition scrubbing and the scrubbed product was screened over 100 mesh. The screened +100 mesh fraction was dried and subjected to dry high force magnetic separation at 16 kilogauss to get magnetic and non-magnetic fraction. The composite concentrate of magnetic fraction and scrubbed slime assayed 4.20% K₂O, 5.19% Fe₂O₃, 13.93% Al₂O₃, 67.34% SiO₂ and 4.06% LOI with a K₂O recovery of 70.7% and weight percent yield of 48.9. The studies, therefore, confirmed that wet process involving stage grinding, screening, attrition scrubbing and dry high force magnetic separation could yield a glauconite concentrate with a reasonably good recovery. The sample is amenable for beneficiation.

1.4 Rock Phosphate

Bench-scale beneficiation studies on a low-grade rock phosphate sample from a mine in Meghnagar, district Jhabua, Madhya Pradesh for M/s Samruddha Resources Ltd, Mumbai, Maharashtra: A low-grade complex siliceous & magnesia rich rock phosphate ore sample from Madhya Pradesh was taken up for bench-scale beneficiation studies with the objective to develop a process flow sheet to produce phosphate concentrate suitable for manufacture of phosphoric acid. Mineralogical studies revealed the presence of apatite, quartz, dolomite and calcite as main minerals while the sample chemically assayed 17.26% P₂O₅, 33.15% Acid Insol., 32.65% SiO₂(T), 3.52% MgO and 30.61% CaO.

Beneficiation studies evolved included a process flow sheet that comprised ball mill wet grinding to d₈₀ size 61 microns for the purpose of liberating phosphate from gangue minerals after addition of sodium silicate in the mill as silica depressant. Single stage rougher phosphate-carbonates bulk flotation, at pH 10-11, using anionic collector sodium oleate yielded bulk rougher phosphate-carbonate float while the quartz and silicate minerals in the roughertails was discarded as reject. Three cleanings of rougher phosphate-carbonate bulk float, at pH 10, followed by reverse flotation of the III cleaner bulk float for separation of phosphate from carbonate at pH 5-6 using sulphuric acid as pH modifier, ortho-phosphoric acid as phosphate depressant and pine oil as frother yielded a phosphate concentrate

that assayed 32.66% P₂O₅, 9.77% Acid insoluble, 9.42% SiO₂(T), 0.65% MgO, 1.11% Fe₂O₃, 0.62% Al₂O₃, 1.73% R₂O₃ (Fe₂O₃+Al₂O₃), 47.34% CaO, 3.29% F and 4.32% LOI with phosphate recovery of 63.1% and weight % yield of 33.1. The study reflected the importance of beneficiation studies in producing phosphate concentrate suitable for manufacturing phosphoric acid thereby confirming the utilisation of low-grade and complex ores of rock phosphate.

1.5 Silica Sand

Bench-scale beneficiation studies on a silica sand sample from Bharatpur, Rajasthan for M/s LSC Infratech Pvt Ltd: A silica sand sample from Bharatpur, Rajasthan was received through M/s LSC Infratech Pvt. Ltd at Regional Mineral Processing Laboratory, Indian Bureau of Mines, Ajmer for conducting bench scale beneficiation studies. The objective of the beneficiation test was to investigate the amenability of the sample for removal of impurities mainly iron and alumina contents.

The as received sample assayed 98.31% SiO₂, 0.22% Fe₂O₃, 0.42% Al₂O₃, 0.21% CaO, 0.18% MgO, 0.12% Na₂O, 0.08% K₂O and 0.43% LOI.

The beneficiation test adopted attrition scrubbing followed by sieving and perm roll magnetic separation and the non-magnetic fraction produced assayed 99.13% SiO₂, 0.062% Fe₂O₃ and 0.22% Al₂O₃ with a 78.20% SiO₂ recovery (wt. yield 77.40).

The non-magnetic fraction thus produced did meet the specification of silica sand Grade-II used in the Glass Sand Industry.

2. JNARDDC

2.1 Setting up of mini-pilot plant for red mud based light weight foamed bricks for NALCO: Under the seven nations Asia Pacific Partnership on Clean Development and Climate (AP-7), JNARDDC, as the nodal agency from India successfully completed the project entitled "Management of bauxite residue/red mud" in Nov. 2009. The Centre, funded by NALCO developed a bench-scale process for development of glass ceramics and

light weight aggregates–Foam Products by utilising red mud, an industrial waste. The Centre along with NALCO has already filed joint patent for the above two innovative processes.

With a view to scale up the activity to the next level and attract prospective entrepreneurs, JNARDDC set up the Mini pilot/demo plant at NRTC, NALCO.

2.2 Upgrading & utilising laterite of east and west coast deposits: Under this project, JNARDDC undertook detailed study of various techniques for beneficiation and optimisation of different process parameters for reduction of iron, silica content as well as increase alumina in the laterite.

Among beneficiation techniques employed, hydrocyclone, magnetic separation and flotation techniques were found to be most effective. Reduction of iron content by 25-35% and silica content by almost 15% was achieved. The beneficiation studies indicated that iron content can be reduced substantially from ferruginous laterite which consequently could lead to increase in alumina percentage.

JNARDDC has suggested optimised process parameters for upgrading laterite in its report. Blending of laterite with good quality bauxite for alumina production was suggested as viable option – this would not only have a positive impact on the life of the mines but will also increase the supply position of low-grade raw material which additionally would result in optimum utilisation of laterite that lie as waste at mine site.

R&D FOR RECOVERY AND UTILISATION OF WASTES

1. IBM

1.1 Iron Ore

Beneficiation studies on an Iron ore dump sample from Subbarayanahalli mines, Sandur taluka, Ballari district, Karnataka for M/s Mysore Minerals Ltd, Bengaluru: An Iron ore dump sample from Subbarayanahalli mines, Sandur taluka, Ballari district, Karnataka was received from M/s Mysore Minerals Ltd for beneficiation studies at Regional Mineral Processing

Laboratory, Indian Bureau of Mines, Bengaluru. The objectives of the test work was to develop a process flow sheet to produce pellet-grade concentrate.

The as received sample assayed 52.92% Fe(T), 7.43% SiO₂, 8.72% Al₂O₃, 0.09% CaO, 0.02% MgO, 0.07% Na₂O, 0.05% K₂O, 0.20% Mn, 0.81 TiO₂, 0.02% P, 0.19% S and 6.45% LOI.

The sample that was subjected to gravity concentration by tabling yielded the combined concentrate (Table conc. I+II+III) assaying 64.30% Fe(T), 2.72% SiO₂, 2.69% Al₂O₃ and 3.49% LOI with 50.90% Fe(T) recovery (wt.% yield 41.90).

The concentrate thus produced did meet the specification as stipulated by the party.

1.2 Manganese Ore

Bench-scale beneficiation studies on manganese ore sample from black dump rejects of Ukwa manganese mines for MOIL: A manganese ore sample from black dump rejects of Ukwa mines, district Balaghat was received at the Modern Mineral Processing Laboratory and Pilot Plant, Indian Bureau of Mines, Nagpur with a purpose to assess the possibility of upgrading the ore for end industrial use. The as received sample assayed 8.02 % Mn, 2.61% Fe (T), 75.41% SiO₂, 2.63% Al₂O₃, 0.68% CaO, 0.23% MgO, 0.13% P, 0.02% TiO₂ and 1.26% LOI. Mineralogical studies revealed that the sample consisted predominantly of quartz with subordinate amount of braunite, pyrolusite, bixbyte, jacobsite, hollandite, hausmanite and psilomelane in minor to trace amounts as manganese minerals, similarly, other minerals that were also found to be present included mica, pyroxene, haematite, goethite/ilmenite in minor to trace amounts. The beneficiation process adopted was gravity separation. Tabling the as received sample ground to all – 65 mesh yielded a table concentrate (Concentrate-I) assaying 38.12% Mn, 8.55% Fe(T), 16.53% SiO₂, 1.97% Al₂O₃, 0.23% P and 2.97% LOI with Mn recovery of 43.7% and weight percent yield of 9.2. Magnetic separation test on (table middling and table tailings) yielded magnetic concentrate (concentrate-II) assaying 20.70% Mn, 5.95% Fe(T), 48.57% SiO₂, 3.25% Al₂O₃, 0.13% P and 2.91% LOI with Mn recovery of 42.1% and weight percent yield of 16.3. The composite concentrate obtained by combining table concentrate (concentrate-I) and magnetic fractions of table middling and table tails (Concentrate-II) assayed

26.99% Mn, 6.89% Fe(T), 37.01% SiO₂, 2.79% Al₂O₃, 0.16% P and 2.93% LOI with Mn recovery of 85.8% and weight percent yield of 25.5.

The studies, therefore, showed that the dump reject sample that assayed 8.02% Mn which is less than the threshold value could be beneficiated by gravity separation at -65 mesh size to obtain +35% Mn concentrate with ~44% Mn recovery. Alternatively, a combination of gravity-cum-wet magnetic separation at -65 mesh size could yield a +25% Mn concentrate with ~86% Mn recovery. The concentrates thus produced could find industrial application after agglomeration.

2. JNARDDC

Analysis of impurities (Fe, Si, Ca, etc.) in alumina and aluminate liquor using hand-held spectrometer: The Centre developed an in situ quantitative analytical tool consisting of hand- held spectrometer which is capable of spot determination of decisive inorganic impurity elements, such as, Fe, Si and Ca in alumina and aluminate liquor.

During the course of R&D endeavour, a selective dissolution procedure was developed for rapid determination of Fe in alumina hydrate, at room temperature (18-30°C). Also, alkali digestion of alumina hydrate was developed for determination of Si. A typical composition of sample and flux ratio has been identified for preparation of calcined alumina for pH specific calorimetric determination of Ca.

RECOVERY OF SILICA SAND FROM OVERBURDEN

Recovery of silica sand from overburden of Katanghari Manganese ore mine, Balaghat, Madhya Pradesh: Mineral Processing Division of IBM has developed a process to recover silica sand as a value-added product on the overburden of Katanghari Manganese ore mine which could be used as stowing material in the same mine of M/s J.K. Minerals, Balaghat, Madhya Pradesh. Thus, the process developed by Mineral Processing Division of IBM enabling the conversion of overburden into value-added product could have viable potentialities.

FOREIGN TRADE

The year 2016-17 witnessed a turnaround in India's external sector with export growth becoming positive after two years of continuous negative growth, the import growth, however, remained negative, though marginally, for the fourth year in succession. The year also witnessed major policy changes like rationalisation of export promotion schemes; a new push towards building export infrastructure and trade facilitation measures; further opening up of foreign investment; and above all finalising the blue print of the Goods and Services Tax (GST) that got implemented from 1st July 2017.

India's ranking amongst the leading exporters and importers improved from 30 and 23 in 2004 to 19 and 13 in 2015 as per the WTO International Trade Statistics 2016.

India's exports turned positive at 5.2% in 2016-17 after an interlude of two years. This along with a marginal decline in imports by 1% resulted in narrowing down of trade deficit to US \$ 112.4 billion (5% of GDP) in 2016-17 as compared to US \$ 130.1 billion (6.2% GDP) in 2015-16.

After two years of negative growth, merchandise exports (Balance of Payments basis) grew by 5.2% in 2016-17 with positive growth in both Petroleum Oil and Lubricants (POL) and non-POL exports. India's merchandise exports (on customs basis) reached the highest level of US \$ 314.4 billion in 2013-14. In tandem with the global trend of decline in export growth, India's export growth also declined during 2014-15 and 2015-16, by 1.3% and 15.5%, respectively. However, it registered positive growth of 5.3% during 2016-17, resulting in exports reaching US \$ 276.3 billion. It was due to the positive growth of both POL and non-POL exports at 3.7% and 5.6% respectively. With increase in crude oil prices, POL exports growth at 25.8% was more than double from that of non-POL exports growth of 10% reported in the second half of 2016-17.

India's merchandise imports (on customs basis) also fell from a high level of US \$ 490.7 billion in 2012-13 to US \$ 381.0 billion in 2015-16 and registered a marginal increase of 0.9% to US \$ 384.3 billion in 2016-17 due to rise in POL imports and also marginal increase in non-POL and non-gold and silver imports.

Exports

According to the data available, the total exports (including re-exports) of all merchandise in 2014-15 and 2015-16 were ₹18,96,348 crore and ₹17,16,378 crore, respectively. The ores and minerals group (including diamond, precious and semi-precious stones) earned foreign exchange

worth ₹1,70,946 crore in 2015-16 which is a decrease of about 3.97% as compared to that in the previous year. Contribution of cut diamonds in 2014-15 & 2015-16 was ₹1,48,055 crore and ₹1,42,664 crore while that of iron ore was ₹3,143 crore and ₹1,263 crore, respectively.

Diamond (total) continued to be the largest constituent item with a share of 83.50% in the total value of mineral exports in 2015-16. Next in order was granite with a share of 5.42% followed by alumina with 1.51%, bauxite with 1.14% and emerald (cut & uncut) with 1.05 percent. The individual share of remaining minerals in the total value of exports of ores and minerals from India during the year under review was less than one percent.

The export of selected mineral-based products during 2014-15 and 2015-16 was valued at ₹2,93,842 crore and ₹1,81,826 crore, respectively. The exports of petroleum products, e.g., light distillates (naphtha and others), middle distillates and heavy ends, earned foreign exchange of ₹2,88,579 crore and ₹1,76,772 crore in 2014-15 and 2015-16, respectively, with more than 97% share in both the years in the export of selected mineral-based products.

India also exported metals and alloys valued at ₹1,67,296 crore and ₹1,52,913 crore during 2014-15 and 2015-16, respectively. Iron & steel, with a share of 44.30%, continued to hold the top position in the total value of metals exported from India in 2015-16. Copper & alloys (including brass & bronze) accounted for 10.58 percent. Aluminium and alloys including scrap and gold (non-monetary & monetary) contributed 11.20% and 21.30%, respectively. The contribution of ferroalloys was 4.72%, nickel & alloys including scrap was 2.10%, zinc & alloys including scrap was 2.25% and precious metals/metals clad with precious metals 1.92 percent. The individual share of other remaining metals and alloys was less than one percent.

Imports

The total imports of all merchandise in 2014-15 and 2015-16 were ₹27,37,086 crore and ₹24,90,298 crore, respectively. The value of imports of ores and minerals in 2015-16 decreased by 31.07% to ₹7,38,789 crore from ₹10,71,733 crore in 2014-15. Petroleum (crude) continued to be the largest constituent item with a share of 58.12% in the total value of mineral imports in 2015-16. Next in order of importance was diamond with a share of 14.97% followed by coal (excluding lignite) with the contribution of 11.66%, natural gas 5.93% and copper ores & concentrates 3.56 percent. The combined share of these five minerals was 94.24% in 2015-16 as against 95.54% in the previous year.

INDIAN MINERAL INDUSTRY & NATIONAL ECONOMY

The import of selected mineral-based products during 2014-15 and 2015-16 was valued at ₹99,546 crore and ₹91,536 crore, respectively. The imports of petroleum products in 2015-16 declined by 3.10% in value over the preceding year to ₹65,805 crore and had a share of 71.89% in the value of import of selected mineral-based products during 2015-16.

The value of imports of metals and alloys at ₹3,90,825 crore showed a decrease of 2.60% in 2015-16 from ₹4,01,259 crore in 2014-15. Gold, non-monetary & monetary (total) with a share of 53.09% continued to occupy the top position in the total import value of metals & alloys in 2015-16 followed by iron & steel with a share of 23.81%, silver 6.25%, aluminium & alloys including scrap 5.74%, copper & alloys (including brass & bronze) 5.51%, nickel & alloys including scrap 1.50% and ferroalloys 1.13 percent. The individual share of remaining metals & alloys imports.

VALUE-ADDED EXPORT TRADE

India's foreign trade includes exports of minerals, both in the raw form and semi-processed & processed forms like mineral-based primary manufactured products.

Minerals contributed significantly to India's exports trade in 2015-16 with a share of about 10% (i.e., ₹1,70,946 crore) in the total value of all merchandise. The contribution of minerals in exports in raw/unprocessed forms was about ₹12,734 crore and in semi-processed/processed forms was about ₹1,58,212 crore. The manufactured mineral-based products contributed about ₹33,44,933 crore in 2015-16 to the total value of exports of all merchandise. The value-added semi-processed/processed minerals figuring in India's foreign trade included cut & polished diamond/emerald, pulverised barytes, steatite, feldspar (cut), garnet, calcined magnesite, magnesia (fused), magnesite (dead-burnt), magnesium oxide, slate (worked), processed mica & manufactured mica products, coke, cut & polished dimension stones, alumina, etc. The manufactured mineral-based commodities included metals & alloys and products thereof, cement, firebricks & other refractory materials, clay-bonded graphite crucibles & silicon carbide crucibles, manganese dioxide, asbestos-cement products, inorganic chemicals like lime & fluorine chemicals, refined borax & borates, elemental phosphorus & phosphoric acid, titanium dioxide, petroleum products, phosphatic & potash fertilizers, etc. Table-6 provides data on contribution of various value-added minerals and mineral-based products to India's exports during 2013-14 to 2015-16.

Table – 6 : Contribution of Value-added (Processed) Minerals & Mineral-based Products in India's Export* Trade, 2013-14 to 2015-16 (P)

Sl. No.	Commodity group	Value of exports (₹ million) (P)			Contribution (percentage) (P)		
		2013-14	2014-15	2015-16 (P)	2013-14	2014-15	2015-16 (P)
1.	All Merchandise	19050110	18963480	17163780	100.00	100.00	100.00
2.	Minerals	1947835	1780194	1709463	10.22	9.39	9.96
	2.1 Raw/Unprocessed form	188904	138504	127341	0.99	0.73	0.74
	2.2 Semi-processed/processed forms (preliminary and intermediate stages of processing)	1758931	1641690	1582122	9.23	8.66	9.22
3.	Manufactured Mineral-based Commodities (final stage of transformation)	5259154	4606399	3344933	27.61	24.29	19.49
	3.1 Metals/Alloys	1531564	1672957	1529126	8.04	8.82	8.91
	3.2 Others	3727590	2933442	1815807	19.57	15.47	10.58

Figures rounded off.

** Including re-exports.*

INFRASTRUCTURE

Infrastructure development is critical to delivering growth, reducing poverty and addressing broader development goals. In a developing country like ours, it is imperative to increase investment in infrastructure to sustain high economic growth momentum. A safe, inter connected and qualitative infrastructure is the key driver of growth and per capita income.

To maintain the momentum of higher economic growth and to satisfy the expectations of all the diversified stakeholders of an emerging economy of the country, it is but indispensable that the Infrastructure Sector gets the necessary attention of investment. As per global ranking of the World Bank's 2016 Logistics Performance, India rose to 36th rank in 2016 from 58th position in 2014, which in terms of qualitative physical infrastructure is quite remarkable. However, this Sector is still facing multiple issues, the Government in order to address them has devised a decisive road map which includes a multi-pronged strategy & multifarious schematic interventions like UDAN and Bharatmala.

Coal

Coal production at around 639.2 million tonnes in 2015-16 was higher by 4.9% from that of 609.18 million tonnes in 2014-15. In 2015-16, out of the total production of coal, 9.5% (60.72 million tonnes) was of coking coal and the remaining 90.5% (578.48 million tonnes) was of non-coking coal. Of the 632.44 million tonnes despatches of raw coal in 2015-16, about 79.4% despatches were to Electricity Sector, 1.9% to the Steel Industry, 1.23% to Sponge Iron Industry, 1.42% to Cement Industry, 0.36 % to the Fertilizer and 0.19% to the Paper & Pulp Industry. The remaining 15.39 was made for other priority sectors including Textiles & Rayons, cokeries, chemicals and other Basic metals.

Electricity

The Government has unveiled an ambitious plan to provide electricity supply for all by 2019. The total installed power generation capacity as on December 2016 was 3,10,005.28 MW comprising 2,15,168.90 MW Thermal; 43,139.43 MW Hydro; 5,780 MW Nuclear; and 45,916.95 MW Renewable Energy Sources (RES). The electricity generation target for the year 2016-17 was 1,178 Billion Unit (BU), however, the actual generation during April-December 2016 was 872.74 BU which as against the

generation target of 882.74 BU is close to 98.86% in its achievement reach. The growth registered during April-December, 2016 as compared to the same period in the preceeding year was 5.15 percent.

For the year 2015-16, a capacity addition target of 20,037.1 MW including 1,000 MW of Nuclear power was fixed. Against this, a capacity addition of 23,976.6 MW was achieved. This is the highest capacity addition ever achieved in a single year and has exceeded 22,566.3 MW that was achieved during 2014-15 in Thermal.

The capacity addition target of 88,537 MW excluding 30,000 MW of RES was fixed for 12th Plan period. The 12th Plan cumulative capacity addition has reached 92,423 MW (as on 31/12/2016) and this include Thermal power generation of 87,283 MW, Hydro power of 4,140 MW and Nuclear power of 1,000 MW.

The Government has adopted a robust monitoring system for the capacity addition programme with a purpose to ensure timely execution of projects.

Transport

Railways

Indian Railways consist of an extensive network spread over 66,687 Route kilometers (RKM). The Indian Railways (IR) focussed on implementation of Safety Action Plans to reduce accidents caused by human errors; computerised Passenger Reservation System (PRS); the unserved Ticketing System (UTS) through Smart card based Automatic Ticket Vending Machines (ATVM); fitment of Bio-toilets in order to improve cleanliness/sanitation in Indian Rail; and electrification of the railway tracks with a view to make the Railway System more ecofriendly. As on 01/04/2017, 30,012 route kilometers (RKM) have been electrified which is 45% RKM of the total network length. During 2016-17, all time record of 2,013 RKM have been electrified as against the target of 2,000 RKM.

During 2016-17, Indian Railways carried 1106.6 million tonnes of revenue-earning freight traffic (P), as against 1101.5 million tonnes during 2015-16, transcribing, therefore, an increase of 0.5%.

For generating revenue, Indian Railways is planning to tap into other non-fare based sources which include station redevelopment and commercially exploiting vacant buildings at the station; monetising land along tracks by leasing out to promote horticulture and plantation, and through advertisement as well as parcel earnings. In the recent past, Indian Railways has also introduced dynamic pricing model with an aim to enhance revenue collection from passenger without compromising on the passenger volume.

Aviation

Civil Aviation is a potential sector in the country which can be a sunrise sector of growth. In India the conditions are quite favourable for growth to be achieved in the sector, i.e. favourable demography, high disposable incomes, a rising middle class population and faster economic growth plan are stimulators that could proper growth. Since 2001, domestic air passengers showed a six-fold increase while there was four-fold increase in international passengers. Keeping in view the above statistics, Government of India introduced UDAN (Ude Desh Ka Aam Nagrik), a key element of National Civil Aviation Policy 2016. It is an innovative regional connectivity scheme to supplement air traffic growth in regional aviation through a market-based mechanism. It also provides a few seats at affordable passenger fares of ₹ 2,500 for an hour-long flight. Under this scheme, about 70 airports and 128 routes are connected and about 100 more routes are to be connected in the future. UDAN ensures profitability to airlines to sustain operations through reducing operating costs by eliminating airport charges on UDAN route, subsidising ATF, providing market-based subsidy for half of the seats and guaranteeing three years exclusivity on route.

Ports and Shipping

India's coastline of 7,517 km, spread on the western and eastern shelves of the mainland and also along the islands is studded with 12 major ports and about 200 non-major ports. Approximately, 95% of the India's trade by volume and 68% by value are moved through Maritime Transport. As on 30/04/2017, India had a fleet strength of 1,323 ships with dead weight tonnage (DWT) of 17.50 million (1,170 million Gross Tonnage) including Indian controlled tonnage, with Shipping Corporation of India (SCI), having the largest share of 34%. Of these, 90% cater to India's overseas trade and the rest to coastal trade. The cargo traffic of Indian ports increased by about 6% to about 1,136 million tonnes in 2016-17, of which the traffic at major ports was about 648 million tonnes and approximately 448 million tonnes at non-major ports. Share of non-major ports is increasing gradually from 29% in 2007 to 43% in 2016. The connectivity of these

ports with the hinterland would further the prospects of coastal trade.

Further, several measures have been initiated by Government of India to encourage the growth of this sector by way of making fuel tax free for all Indian flag coastal vessels engaged in container trade; offering of income tax benefits to Indian seafarers working on Indian ships, etc. Apart from this, several steps have also been taken to promote inland waterways by way of launching 'Jal Marg Vikas Project' between Varanasi and Haldia covering a distance of 1,380 km and also The National Waterways Act, 2016 has been enacted and enforced to provide for the declaration of 106 additional inland waterways to be National Waterways in addition to the already existing five National Waterways.

Cargo handling capacity at major ports was 965.36 million tpy in 2015-16 as compared to 871.52 million tpy in 2014-15. Traffic handled by major ports was 606.48 million tonnes in 2015-16 as compared to 581.34 million tonnes in 2014-15. Traffic handled at major ports relating to minerals/mineral products during 2015-16 was: POL 195.94 million tonnes, iron ore 15.35 million tonnes, thermal coal 125.96 million tonnes and fertilizer 15.90 million tonnes.

Roads

With about 54.8 lakh km of road network comprising National Highways, State Highways and other roads, India has the second largest road network in the world. As on 31/03/2017, out of the total road network, the length of National Highways (NH) is 1,14,158 km State Highways (SH) is 1,61,487 km and of other roads is 52,07,044 km. The Government has proposed "Bharatmala Programme" with a view to develop road connectivity to border areas; develop coastal roads including road connecting non-major ports; improve efficiency of National Corridors; develop of economic corridors/feeder routes; remove choke and congestion points; construct ring roads; etc. The Government has also initiated separate 'Setu Bharatam' in 2016 for construction, rehabilitation and widening of 1,500 major bridges and 208 railway overbridges/railway underbridges on National Highways.

PERFORMANCE OF SELECTED MINERAL-BASED INDUSTRIES

Steel

India from its 8th position in 2003 has climbed up the rank and is currently the world's 3rd largest producer of crude steel and is expected to become the 2nd largest producer of crude steel in the world soon. India is the largest producer of direct reduced iron (DRI) or sponge iron in the world. Production of finished steel (including C.R. sheets) in 2015-16 at 90.98 million tonnes decreased by about 1.26% from 92.15 million tonnes achieved in 2014-15. The total production of pig iron was 9.2 million tonnes and about 9.7 million tonnes in 2015-16 and 2014-15, respectively. Exports of finished steel (including C.R sheet) were 4.08 million tonnes in 2015-16 as compared to 5.20 million tonnes reported in 2014-15. Also exports of semi-finished steel, including steel ingot were 2.67 million tonnes while pig & cast iron, including spiegeleisen were 0.33 million tonnes in the corresponding period.

Cement

As per DIPP Annual Report, 2016-17, production of cement in 2015-16 at 283.45 million tonnes registered an increase of about 2.35% over the previous year's production of 276.93 million tonnes. Cement Industry has been undergoing a transition with modernisation and upgradation of technology particularly with a view to conserve energy. India exports cement including white cement and clinker. The exports in 2015-16 and 2014-15, including clinker were about 6.22 million tonnes and 6.28 million tonnes, respectively.

Petroleum Oil and Refineries

Crude oil production in 2015-16 at 36.95 million tonnes registered a decrease of 1.36 % as compared to that in the previous year. The production of natural gas

(utilised) was at 32,249 million cubic metres in 2015-16, 4.2% lower than 33,657 million cubic metres achieved in 2014-15. The refinery crude throughput of 232.86 million tonnes in 2015-16 was 4.31% higher than 223.2 million tonnes processed in 2014-15. The total refining capacity in the country was about 230.066 MMTPA as on 1.4.2016. Production of petroleum products (including LPG production from natural gas) was 231.92 million tonnes in 2015-16 as compared to 221.14 million tonnes in 2014-15.

SELF-RELIANCE IN MINERALS & MINERAL-BASED PRODUCTS

India continued to be wholly or largely self-sufficient in minerals which constitute primary mineral raw materials that are supplied to Industries, such as, Iron & Steel, Aluminium, Cement, various types of refractories, China Clay-based Ceramics, Glass, Chemicals like caustic soda, soda ash, calcium carbide, titania white pigment, etc. India is self-sufficient in bauxite, chromite, iron ore and ilmenite among metallic minerals and almost all the industrial minerals with the exception of chrysotile asbestos, borax, fluorite, potash, rock phosphate and elemental sulphur. Despite high degree of self-sufficiency, some quantities of flaky and amorphous graphite of high fixed carbon, very low silica limestone, dead-burnt magnesite & sea water magnesia, battery-grade manganese dioxide, manganese ore, etc. were imported to meet the demand for either blending with locally available mineral raw materials and/or for manufacturing special qualities of mineral-based products. To meet the increasing demand of uncut diamonds, emerald and other precious & semi-precious stones by the domestic Cutting and Polishing Industry, India is dependent on imports of raw uncut stones for their value-added re-exports. The degree of self-sufficiency in respect of various principal minerals and metals/ferroalloys in 2015-16 is furnished in Table-7.

INDIAN MINERAL INDUSTRY & NATIONAL ECONOMY

Table-7: Degree of Self-sufficiency in Principal Minerals & Metals, 2015-16 (P)

Sl. No.	Commodity	Demand/Domestic consumption (‘000 tonnes)	Supply/Domestic supply (‘000 tonnes) (R)	Order of self-sufficiency (%)
Minerals				
1.	Bauxite	14028	28133	100
2.	Chromite	2191	2894	100
3.	Fluorite	64	2	3
4.	Iron ore	122619	155910	100
5.	Kyanite	3	3	100
6.	Limestone & other calcareous minerals	307355	303815 ^{1/}	99
7.	Magnesite	263	265	100
8.	Manganese ore	3544	2148	61
9.	Rock phosphate (including apatite)	4363	1474	34
10.	Sillimanite	34	70	100
Metals^{2/}				
11.	Aluminium	2872	2355	82
12.	Copper (refined)	820 ^{3/}	790	96
13.	Lead (primary)	266 ^{4/}	145	55
14.	Zinc	669 ^{5/}	759	100

Source: Consumption: Data based on statutory & non-statutory information; **Production:** MCDR Returns & MSMP, March, 2016 for production data.

Note: As per Government of India Notification S.O. 423(E) dated 10th February, 2015, following minerals have been declared as minor minerals: i) barytes ii) dolomite iii) feldspar iv) fireclay v) quartz/silica sand and vi) talc/steatite/soapstone & pyrophyllite, hence not included in the table due to non-availability of production data for the year 2015-16.

Even in cases where almost entire domestic demand is satisfied by domestic supplies, some quantities of certain special quality/types of minerals and metals/ferroalloys are imported to meet the requirement in certain specific end-uses.

^{1/} Excludes production of limestone as a minor mineral, calcite and chalk and includes limeshell, limekankar and marl.

^{2/} Apparent demand (production+ import-export).

^{3/} Based on production of copper cathode and imports & exports of copper & alloys.

^{4/} Based on production of lead (primary), and imports & exports of lead & alloys.

^{5/} Based on production of zinc (ingots) and imports & exports of zinc & alloys.