

Government of India  
Ministry of Mines  
Indian Bureau of Mines

# INDIAN MINERALS YEARBOOK 2013

## VOLUME I GENERAL REVIEWS



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**Controller General**  
Indian Bureau of Mines

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# PREFACE

Indian Minerals Yearbook (IMYB-2013) is the 52<sup>nd</sup> edition in its Series and comprises three volumes. Volume-I includes 11 General Reviews, Volume-II includes 19 Reviews on Metals & Alloys and Volume-III contains 50 Mineral Reviews. Volume-I contains macro level information on Indian Mineral Industry, Mineral Policy & Legislation, Status of Reconnaissance Permits, Prospecting Licences & Mining Leases, Exploration, Research & Development, etc. Besides, an extensive chapter on State Reviews on the Mineral-wealth status, Production and Industry of each of the states forms a vital part of this Volume. Topics on Prices, Production, Foreign Trade, Mineral-based Industries, Port Facilities also form part of the Reviews contained in this Volume. The data coverage of this edition i.e. IMYB-2013 pertains to the year 2012-13. It has been our continuous endeavour to improve upon the coverage of the Yearbook and to present a complete perspective of all domains that have relevance to minerals and metals to the extent possible.

This Yearbook is the outcome of the joint efforts of the Bureau's Mineral Economics Division and Mining & Mineral Statistics Division. Materials and inputs drawn from the reports of various divisions of IBM. Various survey reports/annual reports, technical journals, periodicals of various organisations, including the affirmative responses received from the Mineral Industry on statutory and non-statutory basis have also been referred, besides related websites, for compilation of this edition.

The Bureau is indebted to the Central and State Government Departments, Public Sector Undertakings, Public and Private Companies and Research Organisations, Mineral Based Industries & Associations concerned with the mines, minerals and mineral-based industries for their support & cooperation. It is firmly believed that this edition of IMYB-2013, will serve as a reference material on matters pertaining to the Mining Sector.

Nagpur  
Date: 07.05.2015

(K. THOMAS)  
Controller General (In-charge)  
Indian Bureau of Mines

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# EXPLANATORY NOTES AND SOURCES

The statistics presented in this publication are in metric units and the prices quoted are in the Indian currency unless otherwise stated.

The stage of measurement of quantity is normally the mine output which refers to the form in which the minerals are extracted. It also includes the usual processing operations done at the mine site to render the ore marketable. Exceptions to the above definition are gold and silver for which the metal output is considered, and for copper, lead and zinc, the concentrates.

The value of the mineral is reckoned in terms of the pit's mouth value which represents the sale value of the mineral at the mine site. The value of production of minerals is calculated by multiplying in each case the quantity of production and pit's mouth value per unit as furnished by the mine owners in the returns under MCDR 1988 in all cases except captive mines where the value is calculated on the basis of the cost of production. In case of fuel minerals, the production value figures in respect of coal & lignite are supplied by the Office of the Coal Controller, Kolkata, on annual basis. Regarding petroleum and natural gas (utilised), value published by the National Accounts Division, Central Statistical Office, is used. Value of sulphur produced as by-product from fertilizer plants and oil refineries is not included in the value of mineral production. The value of non-ferrous metals is furnished by the respective units. The export valuation is on the basis of free on board (f.o.b.) inclusive of export duty, wherever such duty is levied. The basis of valuation of imports is the cost, insurance and freight (c.i.f.) value.

Break-ups may not add to total in some tables due to rounding-off.

## Sources

The statistical data presented in this publication have been taken from a large number of sources as listed below:

<b>Minerals other than fuels, atomic minerals and 'minor minerals'</b>	The basic data relating to major minerals except coal, petroleum and natural gas are collected by IBM under Rule 45 of the MCDR, 1988 framed under the Mines and Minerals (Development and Regulation) Act, 1957. These Rules cover all the States and Union Territories of the Indian Union and apply to all minerals except i) petroleum and natural gas, ii) coal, lignite and sand for stowing, iii) minor minerals, and iv) any mineral declared as prescribed substance by Atomic Energy Act, 1962. Data on sulphur are collected from fertilizer plants and oil refineries.
<b>Ilmenite, rutile, monazite, rare earths and zircon</b>	Indian Rare Earths Ltd; Kerala Minerals and Metals Ltd; Department of Atomic Energy, Mumbai, and private sector producers and processors.
a) Coal and lignite	Coal Controller, Kolkata and the Coal Directory of India.
b) Crude oil and natural gas	i) Economics and Statistics Division of the Ministry of Petroleum & Natural Gas, Government of India, New Delhi, and ii) Indian Petroleum & Natural Gas Statistics, Ministry of Petroleum & Natural Gas, Government of India. iii) Basic Statistics on Petroleum & Natural Gas, Ministry of Petroleum & Natural Gas, Government of India. iv) National Accounts Division, Central Statistical Office, Ministry of Statistics and Programme Implementation, Government of India.
<b>Minor minerals</b>	Respective State Governments. 'Minor minerals' are defined in Clause (e) of the Section 3 of the Mines and Minerals (Development and Regulation) Act, 1957. The current list of 'minor minerals' is : building stones, gravel, ordinary earth, ordinary clay, ordinary sand other than sand used for prescribed purposes (i.e. used for other than refractory, ceramics, metallurgical, stowing in coal mines and optical purposes, and in manufacture of silvicate cement, sodium silicate, pottery and glass), boulder, shingle, chalcedony or impure quartz pebbles (used for ball mill purposes or filling for boreholes or for decorative purposes in buildings), limeshell, kankar, and limestone used in kilns for manufacture of lime used as building material, murrum, brick earth, fuller's earth, bentonite, road metal, rehmatti, slate and shale used for building material, stones used for household utensils, marble, quartzite and sandstone when used for purpose of building or for making road metals and household utensils and saltpetre.

**Trade statistics**

Monthly Statistics of the Foreign Trade of India, issued by the DGCI&S, Kolkata

**Prices**

## Minerals

- i) Principal producers and exporters
- ii) Coal Controller, Kolkata
- iii) Industrial Minerals (UK)
- iv) Basic Statistics on Indian Petroleum & Natural Gas, Ministry of Petroleum & Natural Gas, Government of India.
- v) DGCI&S, Kolkata (Import Value)

**World information & statistics**

- i) Mineral Commodity Summaries (USGS)
- ii) World Mineral Production (BGS)
- iii) Minerals Yearbook (USGS)
- iv) World Metal Statistics (BGS)
- v) Mineral Industry Surveys (USGS)
- vi) Canadian Minerals Yearbook

**Consumption**

## Minerals

Data obtained on statutory and non-statutory basis from industrial units consuming minerals/ores. Data have also been obtained in some cases from Central Government Ministries. The consumption indicated relates to the number of reporting units in organised sector only. Estimated consumption data is based on statistical norms in vogue.

**Reserves/Resources**

National Mineral Inventory prepared by IBM as per UNFC system has been referred to obtain reserve/resource figures of minerals so far finalised. The source of information for the remaining minerals is given against each mineral.

**Port facilities**

Annual Report of the Ministry of Shipping, Indian Ports Association, Major and Minor Port Authorities and exporters of minerals.

**Research and development**

IBM's Ore Dressing Laboratory, National Laboratories under the Council of Scientific & Industrial Research, and Ore Dressing Division of BARC and R&D laboratories in the public/private sector.

Besides, Annual Reports of various Ministries of Government of India, Annual Reports, pamphlets and websites of public sector undertakings and private companies, bulletins concerned with minerals and mineral-based industries, etc. were referred.

# ABBREVIATIONS

The following abbreviations and symbols are used:

AMD	Atomic Minerals Directorate for Exploration and Research	IMMT	Institute of Minerals & Materials Technology (Formerly RRL, Bhubaneswar)
APMDC Corp. Ltd	Andhra Pradesh Mineral Development	IREL	Indian Rare Earths Ltd
BALCO	Bharat Aluminium Company Ltd	JPC	Joint Plant Committee
BARC	Bhabha Atomic Research Centre	JV	Joint Venture
BGML	Bharat Gold Mines Limited	KCC	Khetri Copper Complex
BGS	British Geological Survey, UK	KMML	Kerala Minerals & Metals Ltd
BIS	Bureau of Indian Standards	LAPL	Large Area Prospecting Licence
BOT	Build, Operate, Transfer	LME	London Metal Exchange
BSMDC	Bihar State Mineral Development Corp. Ltd	MALCO	Madras Aluminium Company Ltd
CBM	Coal Bed Methane	MCDR	Mineral Conservation and Development Rules, 1988
CCI	Cement Corporation of India Ltd	MCR	Mineral Concession Rules, 1960
c.i.f.	cost including freight	MECL	Mineral Exploration Corporation Ltd
CMDC	Chhattisgarh Mineral Development Corporation	ML	Mining Lease
CMPDI	Central Mine Planning & Design Institute	MMDR Act	Mines & Minerals (Development & Regulation) Act, 1957
CSO	Central Statistical Office	MMTC	Minerals and Metals Trading Corp. Ltd
DES	Directorate of Economics & Statistics	MoU	Memorandum of Understanding
DGCI&S	Director-General of Commercial Intelligence and Statistics	NA	Not Available
DGH	Directorate General of Hydrocarbons	NAS	Not Available Separately
DGM	Directorate of Geology and Mining	NALCO	National Aluminium Co. Ltd
DMG	Directorate of Mining and Geology	ND	Not Determined
EEZ	Exclusive Economic Zone	NELP	New Exploration Licensing Policy
EU	European Union	NES	Not Elsewhere Stated
FDI	Foreign Direct Investment	NFL	National Fertilizers Ltd
FIMI	Federation of Indian Mineral Industries	NLC	Neyveli Lignite Corporation Ltd
f.o.b.	free on board	NMDC	National Mineral Development Corp. Ltd
f.o.b.t.	free on board trimmed	NMI	National Mineral Inventory
f.o.r.	free on rail	NML	National Metallurgical Laboratory
GMDC	Gujarat Mineral Development Corp. Ltd	NTPC	National Thermal Power Corp. Ltd
GSI	Geological Survey of India	NQ	Not Quoted
HCL	Hindustan Copper Ltd	N/v	Near Village/s
HGML	Hutti Gold Mines Co. Ltd	OIL	Oil India Ltd
Hindalco	Hindalco Industries Ltd	OMC	Orissa Mining Corporation Ltd
HZL	Hindustan Zinc Ltd	ONGC	Oil and Natural Gas Corporation Ltd
IBM	Indian Bureau of Mines	PL	Prospecting Licence

(Contd.)

**Abbreviations (contd.)**

PPP	Public Private Partnership
RP	Reconnaissance Permit
RRL	Regional Research Laboratory
RSMML	Rajasthan State Mines and Minerals Ltd
SAIL	Steel Authority of India Ltd
SCCL	Singareni Collieries Company Ltd
SEZ	Special Economic Zone
SMC	Sikkim Mining Corporation Ltd
STD	Standard (Code of UNFC)
TAMIN	Tamil Nadu Minerals Ltd
tpd	tonnes per day
tpy	tonnes per year
TSL	Tata Steel Ltd (formerly Tata Iron and Steel Co. Ltd)
TW	Territorial Waters

**Abbreviations (concl.)**

UAE	United Arab Emirates
UK	United Kingdom
UNFC	United Nations Framework Classification
USA	United States of America
USGS	United States Geological Survey
UT	Union Territory
VE	Visual estimate
VISL	Visvesvaraya Iron & Steel Ltd
w.e.f.	with effect from
(e)	Estimated
(P)	Provisional
(R)	Revised
(U)	Under reference
---	Nil
++	Negligible

**UNITS**

cm	centimetre	t	tonne
m	metre	'000 tonnes	thousand tonnes
mm	millimetre	lkm	line kilometre
cu m	cubic metre	ct	carat
'000 cu m	thousand cubic metres	g	gram
m cu m	million cubic metres	kg	kilogram
sq m	square metre	₹	Indian Rupees
km	kilometre	₹ '000	thousand Rupees
ha	hectare	kWh	kilowatt-hour
sq km	square kilometre	s	second

**Conversion Table**

Troy oz	31.1035 g	cwt	112 lb
kg	2.2046 lb	foot	0.3048 m
tonne	Metric ton or 2,204.6 lb	Crore	Ten million
ton	Long ton or 2,240 lb	Lakh	Hundred thousand

# Classification of Reserves/Resources of Various Minerals as per United Nations Framework Classification (UNFC) System

The classification of reserves/resources of various minerals based on UNFC system were first prepared by IBM as on 1.4.2000 and later, as on 1.4.2005. Reserves/resources are furnished mineralwise in State Reviews and gradewise & statewise in Mineral Reviews. Quinquennially updated resources for 68 minerals as on 1.4.2010 have been included in this edition of Indian Minerals Yearbook in State Reviews and Mineral Reviews. The amendment to Mineral Conservation & Development Rules, 1988 vide Gazette Notification No.185 dated 17.4.2003 makes it statutory for all non-coal major mineral mine-owners to report their reserves data as per UNFC and also for Mining Lease applications to submit mining plans accordingly. Detailed guidelines, definitions, etc. concerning UNFC were issued by IBM on 3 June 2003 and published in the latest edition of Mineral Conservation & Development Rules, 1988.

The UNFC consists of a three-dimensional system with the following three axes : Geological Assessment, Feasibility Assessment and Economic Viability. The process of geological assessment is generally conducted in stages of increasing details. The typical successive stages of geological investigation, i.e., reconnaissance, prospecting, general exploration and detailed exploration, generate resource data with a clearly defined degree of geological assurance. These four stages are, therefore, used as geological assessment categories in the classification. Feasibility assessment studies form an essential part of the process of assessing a mining project. The typical successive stages of feasibility assessment, i.e., geological study as initial stage followed by prefeasibility study and feasibility study/mining report are well-defined. The degree of economic viability (economic or sub-economic) is assessed in the course of prefeasibility and feasibility studies. A prefeasibility study provides a preliminary assessment with a lower level of accuracy as compared to that of a feasibility study which assess the economic viability in detail.

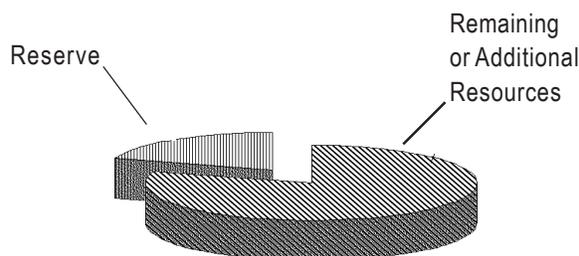
It is a three-digit-code-based system, the economic viability axis representing the first digit, the feasibility axis, the second digit and the geologic axis, the third digit. The three categories of economic viability have codes 1, 2 and 3 in decreasing order. Similarly, the three categories of feasibility study have also codes 1, 2 and 3 while the four stages of geological assessment are represented by 4 codes, i.e., 1 (detailed exploration),

2 (general exploration), 3 (prospecting) and 4 (reconnaissance). Thus, the highest category of resources under UNFC system will have the code (111) and lowest category, the code (334). The various terms used in this classification and their definitions in brief are as follows:

## Total Mineral Resources

Reserve plus Additional or Remaining Resource comprise the Total Resource, or Total Resource minus Reserve gives the Remaining Resource.

## Total Resources



Diagrammatic Representation of Reserve and Resource

## A. Mineral Reserve

Economically mineable part of measured and/or indicated mineral resource.

### (i) Proved Mineral Reserves (111)

Economically mineable part of Measured Mineral Resource.

### (ii) Probable Mineral Reserves (121 & 122)

Economically mineable part of indicated or in some cases, a measured mineral resource.

## **B. Mineral Resource**

A Mineral Resource (Remaining or Additional Resource) is the balance of the Total Mineral Resources that have not been identified as Mineral Reserve.

### **(i) Measured Mineral Resource (331)**

That part of mineral resource for which tonnage, density, shape, physical characteristics, grade and mineral content can be estimated with a high level of confidence, i.e., based on detailed exploration.

### **(ii) Indicated Mineral Resource (332)**

Tonnage, density, shape, physical characteristics grade and mineral content can be estimated with reasonable level of confidence based on exploration, sampling and testing information, location of borehole, pits etc.

### **(iii) Inferred Mineral Resource (333)**

Tonnage, grade and mineral content can be estimated with low level of confidence inferred from geological evidence.

### **(iv) Reconnaissance Mineral Resource (334)**

Estimates based on regional geological studies and mapping, airborne and indirect methods, preliminary field inspections as well as geological inference and extrapolation.

### **(v) Prefeasibility Mineral Resource (221 and 222)**

That part of an indicated and in some circumstances measured mineral resource that has been shown by prefeasibility study as not economically mineable or can become economically viable subject to changes in technological, economic, environmental and/or other relevant conditions.

### **(vi) Feasibility Mineral Resource (211)**

That part of measured mineral resource, which after feasibility study has been found to be economically not mineable.

## **Definition of Uneconomic Occurrence**

Materials of estimated quantity, that are too low in grade or for other reasons are not considered potentially economic. Thus, Uneconomic Occurrence is not part of a mineral resource. If quantity and quality are considered worthy of reporting, it should be recognised that an Uneconomic Occurrence cannot be exploited without major technological and/or economic changes, which are not currently available.

## **Mineral Occurrence**

A mineral occurrence is an indication of mineralisation that is worthy of further investigation. The term mineral occurrence does not imply any measure of volume /tonnage or grade/ quality and is thus not part of a mineral resource.

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