

INDIAN MINERALS YEARBOOK 2008



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Ministry of Mines
INDIAN BUREAU OF MINES
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PREFACE

Indian Minerals Yearbook 2008 is the 47th edition in its series. This is the flagship publication of Indian Bureau of Mines published every year for the benefit of the Mineral Industry. In tune with the established standards, this edition too embarks in to present the latest information on mineral developments, production and foreign trade data up to March, 2008. Concerted efforts have been made this time to update data/information for two consecutive years, 2006-07 and 2007-08, leaving aside 2005-06 which was already published in last Yearbook 2007. Except for the information on world scenario, all statistical data presented in this Yearbook are on financial-year basis.

The content of this Yearbook is based mostly on in-house information including that from the unpublished reports of Mines Control & Conservation of Minerals Division and Ore Dressing Division and on information drawn freely from various annual reports, technical journals and periodicals of other related organisations. This edition by convention constitutes two parts — Part I contains 11 General Reviews that delve into the macro-level scenario of the country's mineral position, citing all indicators relevant to the Mineral Sector while Part II comprises 69 Reviews of minerals placed in alphabetical order and attempts to holistically cover the various facets and developments of the minerals and mineral-based commodities that are relevant to the period.

It has been our constant endeavour to make the publication user-friendly and to improve the coverage and content of the Yearbook so that a fuller perspective of the developments in the field of mines and minerals of the year under reference is duly presented. The information on exploration and mineral consumption has been further updated to 2007-08 while that on world mineral production has been updated to 2007 in the present edition of the Yearbook. Accordingly, data on exploration during 2006-07 and 2007-08 is presented separately. Relevant insights on the major developments in exploration, resources, production, stocks, prices, mining, consumption, specifications, industrial activities, foreign trade, world scenario along with statewise analysis of various minerals are also discussed in these Reviews with comprehensive consolidation of data and facts.

The Yearbook, needless to say, is an outcome of concerted efforts of officers and staff of the Mineral Economics Division, Mining & Mineral Statistics Division and editorial and production wing of IBM's Publication Section. The Mineral Economics Division played a pivotal role in organising the requisite technical and statistical inputs available with various institutions related to Mineral Sector including the affirmative responses received from the Mineral Industry on non-statutory basis.

IBM is indebted to the various Central and State Government Departments, Public Sector Undertakings, a large number of Industrial Units and Research Organisations connected with the Mineral Sector for their active cooperation and support. We specially acknowledge with thanks the Director General of Commercial Intelligence and Statistics, Government of India, Kolkata, for the statistical data received on foreign trade in minerals and metals. We further extend our thanks to Department of Atomic Energy, Government of India, Mumbai, for according their concurrence to the reviews on Ilmenite & Rutile, Rare Earths and Zircon. We hope that this cooperation from all mineral-related sectors will continue in the future as well.

Last but not the least, we are thankful to the readers of the Yearbook who are eagerly awaiting every year and I hope that it will satisfy to their requirement.

Nagpur
Date : 31/12/2009

(C.S. GUNDEWAR)
Controller General
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 excepting 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), administered prices notified from time to time by the Government of India are taken into account by adding royalty, taxes and duties as applicable. 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. Similar figures for ferrous metals and ferro-alloys are not available and hence not published. The value of metal production is based on the ex-plant value. The value of production of gold and silver recovered from imported ores/concentrates is not included in the total value of metal production. 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 due to rounding-off.

Sources

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

Minerals other than fuels, atomic minerals and 'minor minerals'

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.

Ilmenite, rutile, monazite, rare earths and zircon

Indian Rare Earths Ltd, Kollam (Kerala); Kerala Minerals and Metals Ltd, Chavara (Kerala), Department of Atomic Energy, Mumbai, and private sector producers and processors.

Fuels

a) Coal and lignite

b) Crude oil and natural gas

Coal Controller, Kolkata.

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.

Minor minerals

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 silvicrete 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.

Metals

- a) Ferrous
- b) Non-ferrous

Joint Plant Committee, Kolkata as well as individual producers
Individual producers

Trade statistics

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

Prices

- a) Minerals

- i) Principal producers and exporters
- ii) Coal Controller, Kolkata
- iii) Publications such as :
 - a) Indian Trade Journal
 - b) The Indian Mining & Engineering Journal
 - c) Engineering and Mining Journal (USA)
 - d) Minerals Market Reporter (Weekly)
 - e) Mining Journal (UK)
 - f) Industrial Minerals (UK)
 - g) Basic Statistics on Indian Petroleum & Natural Gas, Ministry of Petroleum & Natural Gas, Government of India.

- b) Metals

- i) Producers and exporters
- ii) Reserve Bank of India Bulletin
- iii) World Metal Statistics (BGS)
- iv) Engineering and Mining Journal (USA)
- v) Mining Journal (UK)

World information & statistics

- i) Mining Annual Review (UK)
- ii) Mineral Commodity Summaries (USGS)
- iii) World Mineral Production (BGS)
- iv) World Metal Statistics (BGS)
- v) Engineering and Mining Journal (USA)
- vi) Minerals Yearbook (USGS)
- vii) Mineral Industry Surveys (USGS)
- viii) Canadian Minerals Yearbook

Consumption

- a) Minerals

Data obtained on 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.

- b) Metals

Consumption of non-ferrous metals (copper, lead & zinc) is compiled from data obtained by IBM on non-statutory basis from end-use consumers.

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 Surface Transport, Ministry of Shipping, 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:		IMMT	Institute of Minerals & Materials Technology (Formerly RRL, Bhubaneswar)
ACC	Associated Cement Cos. Ltd	IRE	Indian Rare Earths Ltd
AMD	Atomic Minerals Directorate for Exploration and Research	JPC	Joint Plant Committee
APMDC	Andhra Pradesh Mineral Development Corp. Ltd	JV	Joint Venture
BALCO	Bharat Aluminium Company Ltd	KCC	Khetri Copper Complex
BARC	Bhabha Atomic Research Centre	KIOCL	Kudremukh Iron Ore Co. Ltd
BGML	Bharat Gold Mines Limited	KMML	Kerala Minerals & Metals Ltd
BGS	British Geological Survey, UK	LAPL	Large Area Prospecting Licence
BIS	Bureau of Indian Standards	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
CC	Coal Controller	MCR	Mineral Concession Rules, 1960
CCI	Cement Corporation of India Ltd	MECL	Mineral Exploration Corporation Ltd
c.i.f.	cost including freight	ML	Mining Lease
CMPDI	Central Mine Planning & Design Institute	MMDR Act	Mines & Minerals (Development & Regulation) Act, 1957
CSO	Central Statistical Organisation	MMTC	Minerals and Metals Trading Corp. Ltd
DES	Directorate of Economics & Statistics	MOIL	Manganese Ore (India) Ltd
DGCI&S	Director-General of Commercial Intelligence and Statistics	MoU	Memorandum of Understanding
DGH	Directorate General of Hydrocarbons	NA	Not available
DGM	Directorate of Geology and Mining	NAS	Not available separately
DMG	Directorate of Mining and Geology	NALCO	National Aluminium Co. Ltd
EEZ	Exclusive Economic Zone	ND	Not determined
ESD	Economics and Statistics Division	NES	Not elsewhere stated
EU	European Union	NFL	National Fertilizers Ltd
FDI	Foreign Direct Investment	NLC	Neyveli Lignite Corporation Ltd
FIMI	Federation of Indian Mineral Industries	NMDC	National Mineral Development Corp. Ltd
f.o.b.	free on board	NMI	National Mineral Inventory
f.o.b.t.	free on board trimmed	NML	National Metallurgical Laboratory
f.o.r.	free on rail	NQ	Not quoted
GMDC	Gujarat Mineral Development Corp. Ltd	N/v	Near Village/s
GSI	Geological Survey of India	OIL	Oil India Ltd
HCL	Hindustan Copper Ltd	OMC	Orissa Mining Corporation Ltd
HGML	Hutti Gold Mines Co. Ltd	ONGC	Oil and Natural Gas Corporation Ltd
Hindalco	Hindalco Industries Ltd	PL	Prospecting Licence
HZL	Hindustan Zinc Ltd	RP	Reconnaissance Permit
IBM	Indian Bureau of Mines	RRL	Regional Research Laboratory
IISCO	Indian Iron and Steel Company Ltd	RSMML	Rajasthan State Mines and Minerals Ltd

(Contd.)

abbreviations (contd.)

SAIL	Steel Authority of India 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
UAE	United Arab Emirates
UK	United Kingdom

abbreviations (concl.)

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
(e)	Estimated
(p)	Provisional
(R)	Revised
(U)	Under reference
---	Nil
++	Negligible

UNITS

cm	centimetre	t	metric tonne
m	metre	'000 tonnes	thousand metric tonnes
mm	millimetre	lkm	line kilometre
cu m	cubic metre	crt	carat
'000 cu m	thousand cubic metres	g	gram
m cu m	million cubic metres	kg	kilogram
sq m	square metre	Rs.	Indian Rupees
km	kilometre	Rs.'000	thousand Rupees
ha	hectare	kWh	kilo-watt-hour
sq km	square kilometre		

Conversion Table

Troy oz	31.1035 g	cwt	112 lb
kg	2.2046 lb	foot	0.3048 m
tonne	Metric tonne of 2,204.6 lb	Crone	Ten million
ton	Long ton of 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 and statewise in 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 also published by IBM 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.

The Graphical Representation has been deleted

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.