

4.1 CORUNDUM

Introduction

Corundum is a natural oxide of aluminium (Al_2O_3) with 52.9% aluminium and 47.1% oxygen. It has a hardness of 9 on Moh's scale making it the hardest substance after diamond. It has two varieties; viz precious (ruby and sapphire) and abrasive (common corundum). Emery is a natural mixture of opaque, granular corundum and magnetite with minor amount of haematite and other minerals. With a melting point of 2010°C, corundum finds application in special refractory, crucibles, etc.

In nature, it occurs as a constituent of igneous rock as well as metamorphosed aluminous clay. In India, workable deposits are found in Karnataka, Andhra Pradesh and Rajasthan.

Basis of Grade Classification

The following grade classification has been adopted in National Mineral Inventory as on 1.4.2010.

- i) Semi precious
- ii) Industrial Al₂O₃ content should be minimum 70% with bright, glassy lustre, devoid of cleavage and inclusions.
- iii) Others Estimations placed under other than the above grades.
- iv) Unclassified The supporting data are such that the estimations could not be classified specifically under any one of the above grades.
- v) Not Known Estimations where grade has not been mentioned by the exploration/exploitation agencies.

Basis of Categorisation of Resources

As per United Nations Framework Classification (UNFC), resources are broadly classified into 'reserves' and 'remaining resources'.

According to norms of this system reserves of corundum have been placed under probable (121 and 122) categories. The remaining resources have been

placed under feasibility (211), pre-feasibility (221) & (222), measured (331), indicated (332), inferred (333) and reconnaissance (334) categories.

Salient Features of the Inventory

All India scenario of corundum reserves, remaining resources and total resources as on 1.4.2010 vis-a-vis 1.4.2005 have been given in Tables - 1 and 2. The tables give an idea about the significant changes in terms of increase and decrease of resources as per lease status, grade and states. In Table-3 district-wise reserves/ resources as on 1.4.2010 have been given.

The total resources of corundum in the country as on 1.4.2010 are estimated at 740,791 tonnes, of these 597 tonnes (0.08%) fall under reserves category, and the balance 740,194 tonnes (99.91%) are estimated under remaining resources.

Out of the total resources, about 82,874 tonnes (11%) are in freehold and the balance 657,917 tonnes (89%) are in leasehold (0.14% public and 99.86% private leasehold).

Out of the total resources of corundum about 710,323 tonnes (96%) constitutes industrial grade, 909 tonnes (0.12%) semi-precious, about 29,559 tonnes (4%) are in unclassified, not-known and other grades (Table -1).

Resources of corundum have been estimated in five states. Karnataka is credited with 646,860 tonnes (87%), followed by Andhra Pradesh 77,121 tonnes (10%), Rajasthan 11,925 tonnes (2%) and Tamil Nadu & Chhattisgarh 4885 tonnes (1%) (Table -2).

An analysis of district-wise resources in the states reveals that about 85% of the total resources in the country is concentrated in only Bangalore district of Karnataka and rest 15% resources is distributed in four districts comprising Khammam district, Andhra Pradesh (10%), followed by Tumkur district, Karnataka (2%), Tonk district, Rajasthan (2%) and Dharmapuri district, Tamil Nadu (1%).

An increase of about 656,996 tonnes resources has been recorded in comparison to the earlier inventory as on 1.4.2005. Of the total increase in resources, about 630,970 tonnes has been accounted alone by Karepura Corundum mine in Bangalore district, Karnataka being a new deposit. Besides, 26,026 tonnes increase is due to re-estimation in S.K.Mehboob Ali mines in Khammam district of Andhra Pradesh.

NATIONAL MINERAL INVENTORY - AN OVERVIEW

Table - 1 : Reserves/Resources of Corundum as on 1.4.2010 vis-à-vis 1.4.2005
(By Lease Status/Grade)

Lease status/Grade	(In tonne)								
	Reserves			Remaining resources			Total resources		
	1.4.2010	1.4.2005	Net change	1.4.2010	1.4.2005	Net change	1.4.2010	1.4.2005	Net change
All India : Total	597.24	604.26	(-) 7.02	740193.52	83190.47	(+) 657003.05	740790.76	83794.73	(+) 656996.03
Semi Precious	0.98	7.98	(-)7.00	907.71	900.71	(+)7	908.69	908.69	No Change
Industrial	596.26	596.28	(-)0.02	709726.42	78756.42	(+)630970.00	710322.68	79352.7	(+)630969.98
Others	-	-	-	3.95	3.95	No Change	3.95	3.95	No Change
Unclassified	-	-	-	2558.4	2558.15	(+) 0.25	2558.4	2558.15	(+) 0.25
Not Known	-	-	-	26997.04	971.24	(+) 26025.8	26997.04	971.24	(+) 26025.8
Freehold	-	-	-	82874.21	82874.21	No Change	82874.21	82874.21	No Change
Semi Precious	-	-	-	900.71	900.71	No Change	900.71	900.71	No Change
Industrial	-	-	-	78468.5	78468.5	No Change	78468.5	78468.5	No Change
Others	-	-	-	0.65	0.65	No Change	0.65	0.65	No Change
Unclassified	-	-	-	2558.15	2558.15	No Change	2558.15	2558.15	No Change
Not Known	-	-	-	946.2	946.2	No Change	946.2	946.2	No Change
Leasehold (Private)	-	7.0	(-)7.0	657031.81	28.76	(+) 657003.05	657031.81	35.43	(+) 656996.05
Semi Precious	-	7.0	(-)7.0	7.00	-	(+)7.00	7.00	7.0	No Change
Industrial	-	-	-	630970.42	0.42	(+) 630970	630970.42	0.42	(+)630970
Others	-	-	-	3.3	3.3	No Change	3.3	3.3	No Change
Unclassified	-	-	-	0.25	-	(+)0.25	0.25	-	(+) 0.25
Not Known	-	-	-	26050.84	25.04	(+) 26025.8	26050.84	25.04	(+)26025.8
Leasehold (Public)	597.24	597.26	(-)0.02	287.5	287.5	No Change	884.74	884.76	(-) 0.02
Semi Precious	0.98	0.98	No Change	-	-	-	0.98	0.98	No Change
Industrial	596.26	596.28	(-)0.02	287.5	287.5	No Change	883.76	883.78	(-) 0.02

NATIONAL MINERAL INVENTORY - AN OVERVIEW

A substantial quantity of the total resources about 618,389 tonnes (83%), have been estimated under inferred (333) and reconnaissance (334) categories. These resources are based on a limited and preliminary exploration. If these areas are examined for further detailed exploration, the confidence level of resource

position of corundum in the country may improve.

A total 62 deposits of corundum have been covered in the inventory as on 1.4.2010, of which 51 deposits are in freehold, 8 deposits in leasehold private and 3 deposits are in leasehold public leasehold.

**Table – 2 : Total Resources of Corundum as on 1.4.2010 vis-à-vis 1.4.2005
(By States)**

(In tonne)

State	Total Resources		Net Change
	As on 1.4.2010	As on 1.4.2005	
All India : Total	740791	83795	(+) 656996
Andhra Pradesh	77121	51095	(+) 26026
Chhattisgarh	885	885	No Change
Karnataka	646860	15890	(+) 630970
Rajasthan	11925	11925	No Change
Tami Nadu	4000	4000	No Change

Table - 3 : District wise Reserves/Resources of Corundum as on 1.4.2010

(In tonne)

State/District	Reserves	Remaining Resources	Total Resources
All India : Total	597	740194	740791
Andhra Pradesh	0	77121	77121
Anantapur	-	7	7
Khammam	-	77113	77113
Chhattisgarh	597	288	885
Dantewara	597	288	885
Karnataka	-	646860	646860
Bangalore	-	632339	632339
Bellary	-	632	632
Chitradurga	-	8	8
Coorg	-	Negligible	Negligible
Hassan	-	936	936
Mandya	-	1	1
Mysore	-	50	50
Tumkur	-	12894	12894
Rajasthan	-	11925	11925
Tonk	-	11925	11925
Tamil Nadu	-	4000	4000
Dharmapuri	-	4000	4000

figures rounded off.

4.2 DIAMOND

Introduction

Diamond mining in India can be traced back to the 5th Century (B.C). Mining and trading activity of diamonds took place to a large extent in 16th and 17th Century (A.D) in Andhra Pradesh. Golconda was the major trading centre. Before the 19th Century (AD), diamonds were recovered from older conglomerates and quaternary gravel. The diamond producing centres were gravel of river Krishna in Andhra Pradesh, Panna diamond belt in Madhya Pradesh, gravel of river Mahanadi in Odisha and Wairagarh Conglomerates of Maharashtra. The Majhgawan pipe in Madhya Pradesh and Wajrakarur pipe in Andhra Pradesh were also mined for diamond but the Kimberlite nature of these deposits were recognised much later in 1930. At present Majhgawan mine of M/s. National Mineral Development Corporation in Panna diamond belt of Madhya Pradesh is the only mine working on commercial scale in the country. Extensive exploration work was carried out by Geological Survey of India (GSI), National Mineral Development Corporation (NMDC), Mineral Exploration Corporation Ltd., (MECL), etc. Recently DGM, Odisha in Naupada district and GSI in Mehboobnagar district, Andhra Pradesh and Raichur district, Karnataka have carried out exploration work in search of deposits of diamond.

A number of diamond occurrences have been located in Anantapur, Kurnool, Krishna, Mehboobnagar and Guntur districts of Andhra Pradesh; Panna and Chhattarpur district of Madhya Pradesh; Raipur district of Chhattisgarh; Chittorgarh, Jhalawar and Kota districts of Rajasthan and Mirzapur district of Uttar Pradesh. Potential occurrences are being explored in the basin of river Mahanadi in Sundergarh, Bolangir and Sambalpur districts of Odisha. Diamonds as precious stones are mostly used for ornamental purpose. Industrial diamonds are used for drill bits. India has emerged as the world's single largest exporter of cut and polished diamonds. However, the domestic production of raw diamond is very nominal.

Basis of Grade Classification

In the inventory as on 1.4.2010, the resources of diamond have been classified into the following grades :

- i) Gem
- ii) Industrial
- iii) Unclassified

Basis of Categorisation of Resources

As per United Nations Framework Classification (UNFC), resources are broadly classified into 'reserves' and 'remaining resources'.

According to the norms of this system reserves of diamond have been placed under proved (111) category.

The remaining resources have been placed under measured (331), indicated (332) and inferred (333) categories.

Salient Features of the Inventory

All India scenario of diamond reserves, remaining resources and total resources as on 1.4.2010 vis-a-vis 1.4.2005 have been given in Tables - 1 and 2. The tables give an idea about the significant changes in terms of increase and decrease of resources as per lease status, grade and states. In Table-3 district-wise reserves/ resources as on 1.4.2010 have been given.

The total resources of diamond in the country as on 1.4.2010 are estimated at 31,921,750 carats with 756,765 carats gem grade, 840,823 carats industrial grade and 30,324,162 carats unclassified grade. Of these, 1,045,318 carats (3.28%) fall under reserve category and balance 30,876,432 carats (96.72%) are remaining resources. The entire quantity under reserve category is of 'unclassified grade' and has been estimated in Madhya Pradesh only. Out of the total resources, 30,876,432 carats (96.72%) are in freehold and the balance 1,045,318 carats (3.28%) are in leasehold (public) areas (Table -1).

The estimated resources of diamond are concentrated only in three states. Of these, Madhya Pradesh is credited with 28,794,795 carats (90.20%) having unclassified grade only, followed by Andhra Pradesh with 1,822,955 carats (5.71%), having 235,165 carats gem grade, 58,423 carats industrial grade and 1,529,367 carats unclassified grade and Chhattisgarh with 1,304,000 carats (4.08%) having 521,600 carats gem grade and 782,400 carats industrial grade (Table - 2).

An increase of 27,339,837 carats diamond resources has been recorded in comparison to the earlier inventory as on 1.4.2005. The entire increase is of unclassified grade and has been placed under 333 category. It is based on the prospecting report of M/s Rio Tinto Exploration Ltd. for Bunder Diamond Prospect in Chhattarpur district, Madhya Pradesh.

Diamonds are also recovered from conglomerate and gravel beds at shallow depths by small operators in Panna district on the basis of Annual Permits granted by Diamond Officer, Government of Madhya Pradesh.

Out of the 1,822,955 carats of diamond resources in Andhra Pradesh about 1,667,960 carats (91.5%) have alone been estimated in Anantpur district. The balance resources are in Krishna and Kurnool districts. The entire resource of Chhattisgarh is held by Raipur district and that of Madhya Pradesh by Panna and Chhattarpur districts.

**Table - 1 : Reserves/Resources of Diamond as on 1.4.2010 vis-à-vis 1.4.2005
(By Lease Status/Grade)**

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2010	1.4.2005	Net change	1.4.2010	1.4.2005	Net change	1.4.2010	1.4.2005	Net change
	(In carats)								
All India : Total	1045318	1205577	(-)160259	30876432	3376336	(+)27500096	31921750	4581913	(+) 27339837
Gem	-	-	-	756765	756765	No Change	756765	756765	No Change
Industrial	-	-	-	840823	840823	No Change	840823	840823	No Change
Unclassified	1045318	1205577	(-)160259	29278844	1778748	(+)27500096	30324162	2984325	(+) 27339837
Freehold	-	104118	(-)104118	30876432	3372314	(+)27504118	30876432	3476432	(+)27400000
Gem	-	-	-	756765	756765	No Change	756765	756765	No Change
Industrial	-	-	-	840823	840823	No Change	840823	840823	No Change
Unclassified	-	104118	(-)104118	29278844	1774726	(+)27504118	29278844	1878844	(+)27400000
Leasehold (Public)	1045318	1101459	(-)56141	-	4022	(-)4022	1045318	1105481	(-)60163
Unclassified	1045318	1101459	(-)56141	-	4022	(-)4022	1045318	1105481	(-)60163

figures rounded off.

NATIONAL MINERAL INVENTORY - AN OVERVIEW

Out of the total resources of diamond in the country about 29,047,514 carats (91%) resources have been estimated under inferred (333) category. These resources are based on a very limited and preliminary exploration. If these areas are examined for further detailed exploration, the confidence level of resource

position of diamond in the country may improve.

A total 20 deposits have been covered in the inventory as on 1.4.2010, for which resources have been estimated (19 freehold and 01 leasehold public).

Table - 2 : Total Resources of Diamond as on 1.4.2010 vis-à-vis 1.4.2005 (By States)

State	Total Resources		Net Change
	As on 1.4.2010	As on 1.4.2005	
All India : Total	31921750	4581913	(+) 27339837
Gem	756765	756765	No Change
Industrial	840823	840823	No Change
Unclassified	30324162	2984325	(+) 27339837
Andhra Pradesh	1822955	1822955	No Change
Gem	235165	235165	No Change
Industrial	58423	58423	No Change
Unclassified	1529367	1529367	No Change
Chhattisgarh	1304000	1304000	No Change
Gem	521600	521600	No Change
Industrial	782400	782400	No Change
Madhya Pradesh	28794795	1454958	(+) 27339837
Unclassified	28794795	1454958	(+) 27339837

figures rounded off.

Table - 3 : District wise Reserves/Resources Diamond as on 1.4.2010

State/District	(In carats)		
	Reserves	Remaining Resources	Total Resources
All India : Total	1045318	30876432	31921750
Andhra Pradesh	-	1822955	1822955
Anantapur	-	1667960	1667960
Krishna	-	99395	99395
Kurnool	-	55600	55600
Chhattisgarh	-	1304000	1304000
Raipur	-	1304000	1304000
Madhya Pradesh	1045318	27749477	28794795
Chhatarpur	-	27400000	27400000
Panna	1045318	349477	1394795

figures rounded off.

4.3 GARNET

Introduction

Garnet is a collective name for a group of isomorphous minerals having a composition of $3R^{++}O$, $R_2^{+++}O_3$, $3SiO_2$ where R represents bivalent metals like magnesium, calcium, manganese, iron and trivalent metals like aluminium, iron, manganese and chromium. Many garnets are admixture of the various varieties. The hardness varies from 6.5 to 7.5 on Moh's scale and specific gravity from 3.4 to 4.3. Colour is a physical property which can broadly distinguish varieties of garnets as follows:

1. Pyrope Mg-Al garnet, deep red in colour
2. Almandite Fe-Al garnet, deep red to brownish red in colour
3. Andradite Ca-Fe garnet, brownish red, yellow green or black in colour
4. Grossularite Ca-Fe garnet. Pale green, yellow or red in colour.
5. Spessartite Mn-Al garnet, deep hyacinth or brownish red in colour
6. Uvarovite Ca-Cr garnet, emerald green in colour.

Out of these, almandite and andradite are the most common varieties. Clear flawless and richly coloured garnet are used as semi-precious stones. The most important industrial use of fresh, hard garnet is as abrasive in the form of coated paper, cloth, discs and loose grains for surfacing and polishing of soft building stones. On crushing, it breaks into angular fragments which have high capillary attraction resulting in firm adhesion to cloth, paper or wheels coated with glue.

Basis of Grade Classification

The following grade classification has been adopted in the inventory based on the reported information of the exploration/exploitation agencies.

1. Semi-Precious
2. Abrasive

3. Others
4. Unclassified
5. Not Known

Basis of Categorisation of Resources

As per United Nations Framework Classification (UNFC), resources are broadly classified into 'reserves' and 'remaining resources'.

According to the norms of this system, 'reserves' of garnet have been placed under proved (111) and probable (121) & (122) categories. The 'remaining resources' have been placed under feasibility (211), pre-feasibility (221) & (222), measured (331), indicated (332) and inferred (333) categories.

Salient Features of the Inventory

All India scenario of garnet reserves, remaining resources and total resources as on 1.4.2010 vis-a-vis 1.4.2005 have been given in Tables - 1 and 2. The tables give an idea about the significant changes in terms of increase or decrease of resources as per lease status, grade and states. In Table-3 district-wise reserves/ resources as on 1.4.2010 have been given.

The total resources of garnet in the country as on 1.4.2010 are estimated at 56,963 thousand tonnes, of these 19,325 thousand tonnes (34%) fall under 'reserve' category and 37,638 thousand tonnes (66%) are under 'remaining resource' category.

Out of the total resources, 36,179 thousand tonnes (63%) have been placed under freehold, 16,887 thousand tonnes (30%) in leasehold private and 3,897 thousand tonnes (7%) in leasehold public sectors.

Resources of garnet have been classified into abrasive, semi-precious, others, unclassified and not-known grade based on the reported end use data by the exploration/exploitation agencies. The largest share in the total resources is held by unclassified variety with 34,680 thousand tonnes (61%) followed by abrasive variety 21,561 thousand tonnes (38%). The remaining one percent is accounted by Semi-precious and others and Not-known grades (Table - 1).

NATIONAL MINERAL INVENTORY - AN OVERVIEW

Table - 1 : Reserves/Resources of Garnet as on 1.4.2010 vis-à-vis 1.4.2005
(By Lease Status/Grade)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2010	1.4.2005	Net change	1.4.2010	1.4.2005	Net change	1.4.2010	1.4.2005	Net change
	(In tonne)								
All India : Total	19324793	20975605	(-)1650812	37638032	36680028	(+)958004	56962824	57655633	(-)692808
Abrasive	18850066	20427374	(-)1577308	2710935	1838275	(+)872661	21561001	22265649	(-)704648
Semi-Precious	991	847	(+)144	4361	8618	(-)4257	5352	9465	(-)4113
Others	5534	0	(+)5534	230657	268820	(-)38163	236191	268820	(-)32629
Unclassified	468202	38336	(+)429866	34211676	12870950	(+)21340726	34679878	12909286	(+)21770591
Not Known	0	509047	(-)509047	480403	21693365	(-)21212963	480403	22202412	(-)21722010
Freehold	-	-	-	36178799	36175849	(+)2950	36178799	36175849	(+)2950
Abrasive	-	-	-	1448311	1445498	(+)2814	1448311	1445498	(+)2814
Semi-Precious	-	-	-	2922	2785	(+)137	2922	2785	(+)137
Others	-	-	-	169400	169400	No change	169400	169400	No change
Unclassified	-	-	-	34175282	12870268	(+)21305014	34175282	12870268	(+)21305014
Not Known	-	-	-	382884	21687898	(-)21305014	382884	21687898	(-)21305014
Leasehold (Private)	15663051	6627660	(+)9035391	1224112	356115	(-)867997	16887163	6983775	(+)9903388
Abrasive	15618664	6588476	(+)9030188	1119560	249713	(+)869847	16738224	6838189	(+)9900035
Semi-Precious	991	847	(+)144	1434	832	(+)602	2425	1679	(+)745
Others	5534	-	(+)5534	61257	99420	(-)38163	66791	99420	(-)32629
Unclassified	37862	38336	(-)474	36394	682	(+)35712	74256	39019	(+)35237
Not Known	-	-	No change	5468	5468	No change	5468	5468	No change
Leasehold (Public)	3661742	14347945	(-)10686203	235120	148064	(+)87056	3896862	14496009	(-)10599147
Abrasive	3231402	13838898	(-)10607496	143064	143064	No change	3374466	13981962	(-)10607496
Semi-Precious	-	-	-	5	5000	(-)4995	5	5000	(-)4995
Unclassified	430340	-	(+)430340	-	-	-	430340	-	(+)430340
Not Known	-	509047	(-)509047	92051	-	(+)92051	92051	509047	(-)416996

Figures rounded off.

NATIONAL MINERAL INVENTORY - AN OVERVIEW

The state of Tamil Nadu is endowed with the largest share of 33,828 thousand tonnes (59%) of total resources in the country followed by Andhra Pradesh 19,065 thousand tonnes (34%) and Odisha 3,534 thousand tonnes (6%) and the remaining 1% resources are accounted together by other states namely Chhattisgarh, Jharkhand, Kerala and Rajasthan (Table-2).

In the inventory as on 1.4.2010, a net decrease of resources, about 693 thousand tonnes, have been recorded as compared to earlier inventory as on 1.4.2005.

In Odisha, a substantial quantity of about 10,612 thousand tonnes resources have been decreased mainly due to reassessment of the resources in existing lease hold deposits in Ganjam and Nawapara districts. However, resources in Andhra Pradesh has

been increased by 4,294 thousand tonnes due to addition of one new leasehold (private) deposit in Srikakulam district. In Tamil Nadu an increase of resources by 5,476 thousand tonnes have also been recorded. Besides, minor increase in resources have reported from the states of Jharkhand (109 thousand tonnes) and Rajasthan (41 thousand tonnes).

A sizeable quantity, about 26,995 thousand tonnes (47%) of total resources of garnet have been estimated under inferred (333) category. These resources are based on a limited and preliminary exploration. A detailed exploration in these areas may improve the confidence level of the resources.

A total 140 deposits have been covered in the inventory as on 01.04.2010. Out of this, 48 deposits are in freehold areas and 92 deposits are in leasehold areas (85 deposits in leasehold private sector and 7 deposits in leasehold public sector).

**Table – 2 : Total Resources of Garnet as on 1.4.2010 vis-à-vis 1.4.2005
(By States)**

State	Total Resources		Net Change
	As on 1.4.2010	As on 1.4.2005	
All India : Total	56962824	57655633	(-) 692809
Andhra Pradesh	19064747	14771023	(+) 4293724
Chhattisgarh	28800	28800	No change
Jharkhand	110,071	975	(+) 109096
Kerala	198861	198861	No change
Odisha	3533610	14146101	(-) 10612491
Rajasthan	198416	157104	(+) 41312
Tamil Nadu	33828319	28352769	(+) 5475550

figures rounded off.

NATIONAL MINERAL INVENTORY - AN OVERVIEW

Table - 3 : District wise Reserves/Resources Garnet as on 1.4.2010

(In tonne)

State/District	Reserves	Remaining Resources	Total Resources
All India : Total	19324793	37638032	56962824
Andhra Pradesh	3625887	15438860	19064747
Godavari East	-	12811200	12811200
Khammam	-	1907060	1907060
Nellore	11900	10600	22500
Srikakulam	3613987	710000	4323987
Chhattisgarh	-	28800	28800
Bastar	-	28800	28800
Jharkhand	-	110071	110071
Hazaribagh	-	110071	110071
Kerala	45797	153064	198861
Kollam	45797	143064	188861
Thiruvananthapuram	-	10000	10000
Odisha	3185605	348005	3533610
Ganjam	3185605	-	3185605
Nawapara	-	5	5
Sambalpur	-	348000	348000
Rajasthan	26250	172167	198416
Ajmer	2849	17346	20195
Bhilwara	-	128019	128019
Jhunjhunu	-	2570	2570
Sikar	-	3972	3972
Tonk	23400	20260	43660
Tamil Nadu	12441254	21387065	33828319
Kanyakumari	553418	8872870	9426288
Ramnathapuram	-	1625	1625
Thanjavur	-	4900	4900
Tiruchirapalli	56684	-	56684
Tirunelveli	11831152	12361300	24192452
Tiruvarur	-	146370	146370

figures rounded off.

4.4 GOLD

Introduction

Gold is a noble and scarce metal highly valued by mankind since antiquity as an adornment for cultural, status and decorative reasons and as a source of wealth and for coinage. It is also owned as an investment. Properties of gold which makes it useful in industry are malleability, ductility, colour, resistance to corrosion, high electrical conductivity, reflecting power and therapeutic effect of some of its salts. India is a minor producer of gold but has tremendous demand in the country. The domestic demand is mainly met through imports of gold. The primary ore deposits are found in Andhra Pradesh, Bihar, Chhattisgarh, Jharkhand, Karnataka, Madhya Pradesh and Rajasthan. The placer deposits have been identified in Kerala. Production of gold is reported from Manmohan Industries, Jharkhand and Hutti Gold Mines, Karnataka.

Basis of Grade Classification

Gold ore is not used directly in the industry, it is first converted into metal and then marketed for end-use. Therefore the resources of gold as on 1.4.2010 have been classified based on their type of occurrences as primary and placer (ore and metal).

Basis of Categorisation of Resources

As per United Nations Framework Classification (UNFC), the resources have broadly been classified into 'reserves' and 'remaining resources'. According to the norms of this system, reserves of gold ore have been placed under proved (111) and probable (121) & (122) categories. The remaining resources have been placed under feasibility (211), pre-feasibility (221) & (222), measured (331), indicated (332), inferred (333) and reconnaissance (334) categories.

Salient Features of the Inventory

All India scenario of gold ore and metal reserves, remaining resources and total resources as on 1.4.2010 vis-a-vis 1.4.2005 have been given in Tables - 1 and 2. The tables give an idea about the significant changes in terms of increase or decrease of resources as per lease status, grade and state. In Table -3 district wise reserves/resources as on 1.4.2010 have been given.

The total resources of primary gold ore in the country as on 1.4.2010 are estimated at 493.69 million tonnes with 659.84 tonnes of gold metal. Of these, 24.12 million tonnes (4.88%) fall under reserve category containing 110.54 tonnes of primary gold metal and

balance 469.57 million tonnes (95.11%) are remaining resources containing 549.30 tonnes of primary gold metal. The total resources of placer gold ore (which occur only in Kerala state) as on 1.4.2010 are estimated at 26.12 million tonnes with 5.86 tonnes gold metal. The entire placer gold resources have been placed under remaining resources.

Of the total resources, 407.98 million tonnes primary gold ore (82.63%) containing 389.41 tonnes metal and 26.12 million tonnes of placer gold ore (100%) containing 5.86 tonnes metal are in freehold. About 85.56 million tonnes of primary gold ore (17.33%) containing 270 tonnes metal are in leasehold public and 0.14 million tonnes of primary gold ore (0.02%) containing 0.43 tonnes metal are in leasehold private. The entire 0.20 million tonnes primary gold ore containing 0.51 tonnes metal, reported in partly leasehold in inventory as on 1.4.2005 has been merged with leasehold (Public) in the inventory as on 1.4.2010. (Table - 1).

Of the total primary gold ore resources (494 million tonnes), Bihar holds the lion share at 223 million tonnes (45%) ore containing a meager 38 tonnes metal. It is followed by Rajasthan 114 million tonnes (23%) containing 217 tonnes metal and in Karnataka having about 109 million tonnes (22%) ore resources, containing 337 tonnes metal. The remaining 48 million tonnes ore (about 10%) containing 68 tonnes metal resources are confined in eight states namely Andhra Pradesh, Chhattisgarh, Jharkhand, Kerala, Madhya Pradesh, Maharashtra, Tamil Nadu and West Bengal. Besides, about 26 million tonnes placer gold ore resources containing 5.86 tonnes metal have been estimated in the state of Kerala.

An overall increase of 103.41 million tonnes of gold ore containing 169.03 tonnes metal has been recorded in the inventory as on 1.4.2010. The increase is attributed to re-estimation of resources in existing deposits and inclusion of 23 new freehold deposits mainly in Rajasthan (12 deposits), Karnataka (5 deposits), Jharkhand (3 deposits), Chhattisgarh (2 deposits) and Madhya Pradesh (1 deposit) as compared to inventory as on 1.4.2005.

In Karnataka an increase of 43 million tonnes ore containing 183.59 tonnes metal recorded in inventory as on 1.4.2010 as compared to earlier inventory as on 1.4.2005. It is mainly due to re-assessment of resources in one leasehold (Public) deposit of M/s. HGML and eight freehold deposits including five new deposits.

NATIONAL MINERAL INVENTORY - AN OVERVIEW

Table - 1 : Reserves/Resources of Gold as on 1.4.2010 vis-à-vis 1.4.2005
(By Lease Status/Grade)

(In tonne)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2010	1.4.2005	Net change	1.4.2010	1.4.2005	Net change	1.4.2010	1.4.2005	Net change
All India : Total									
Ore (Primary)	24124537	19253951	(+)4870586	469570375	371035286	(+)98535089	493694912	390289237	(+)103405675
Metal (Primary)	110.54	85.12	(+)25.42	549.30	405.61	(+)143.61	659.84	490.81	(+)169.03
Ore (Placer)	-	-	-	26121000	26121000	No Change	26121000	26121000	No Change
Metal (Placer)	-	-	-	5.86	5.86	No Change	5.86	5.86	No Change
Freehold									
Ore (Primary)	-	500282	(-)500282	407989423	332892892	(+)75096531	407989423	333393174	(-)74596249
Metal (Primary)	-	1.30	(-)1.3	389.41	356.40	(+)33.01	389.41	357.70	(+)31.71
Ore (Placer)	-	-	-	26121000	26121000	No Change	26121000	26121000	No Change
Metal (Placer)	-	-	-	5.86	5.86	No Change	5.86	5.86	No Change
Leasehold (Public)									
Ore (Primary)	24086478	18454819	(+)5631659	61475517	37888394	(+)23587123	85561995	56343213	(+)29218782
Metal (Primary)	110.41	82.48	(+)27.93	159.59	47.00	(+)112.59	270.00	129.48	(+)140.52
Leasehold (Private)									
Ore (Primary)	38059	92850	(-)54791	105435	254000	(-)148565	143494	346850	(-)203356
Metal (Primary)	0.13	0.83	(-)0.70	0.30	2.29	(-)1.99	0.43	3.12	(-)2.69
Leasehold (Partly)									
Ore (Primary)	-	206000	(-)206000	-	-	-	-	206000	(-)206000
Metal (Primary)	-	0.51	(-)0.51	-	-	-	-	0.51	(-)0.51

figures rounded off.

NATIONAL MINERAL INVENTORY - AN OVERVIEW

In Andhra Pradesh, an increase of gold ore of 0.17 million tonnes containing 4.14 tonnes metal has been recorded due to upward revision in resources of one deposit each in Chhitoor & Kurnool districts. In Rajasthan, 12 new deposits have been included, one each in Dungarpur and Sirohi districts and 10 deposits in Banswara district. As a result, gold ore resources in Rajasthan have increased by 48 million tonnes containing 91.64 tonnes metal as compared to inventory as on 1.4.2005.

In Jharkhand, an increase of 8 million tonnes ore containing 9.61 tonnes metal has been recorded due to inclusion of 3 new deposits, two deposits in Ranchi district and one deposit in Singhbhum (West) district as compared to inventory as on 1.4.2005.

In Chhattisgarh, an increase of 4 million tonnes gold ore containing 2.81 tonnes metal is attributed to the inclusion of 2 new deposits one each in Kanker and Raipur district.

In Purulia district of West Bengal, metal resources in one deposit has decreased by 123.35 tonnes due to re-calculation of metal content in the ore.

In Madhya Pradesh, there is an increase of ore by 0.46 million tonnes and metal 0.59 tonnes due to inclusion of one new deposit in Katni district.

Of the total resources of gold ore, about 357.59 million tonnes (72.43%) have been placed under inferred (333) and reconnaissance (334) categories. These resources are based on a limited and preliminary exploration. If these areas are examined for further detailed exploration, the confidence level of resource position of gold ore in the country may improve.

A total of 84 deposits have been covered in the inventory as on 1.4.2010, of which 71 deposits are in freehold, 13 deposits are in leasehold (12 public and 1 private).

NATIONAL MINERAL INVENTORY - AN OVERVIEW

**Table – 2 : Total Resources of Gold as on 1.4.2010 vis-à-vis 1.4.2005
(By States)**

State	Total Resources		Net Change
	As on 1.4.2010	As on 1.4.2005	
(In tonne)			
All India : Total			
Ore (Primary)	493694912	390289237	(+)103405675
Metal (Primary)	659.84	490.81	(+) 169.03
Ore (Placer)	26121000	26121000	No Change
Metal (Placer)	5.86	5.86	No Change
Andhra Pradesh			
Ore (Primary)	12275347	12098347	(+) 177000
Metal (Primary)	35.72	31.58	(+)4.14
Bihar			
Ore (Primary)	222884860	222884860	No Change
Metal (Primary)	37.6	37.6	No Change
Chhattisgarh			
Ore (Primary)	4841033	900000	(+)3941033
Metal (Primary)	5.51	2.7	(+)2.81
Jharkhand			
Ore (Primary)	8151348	346850	(+)7804498
Metal (Primary)	12.73	3.12	(+) 9.61
Karnataka			
Ore (Primary)	108802811	66172387	(+)42630424
Metal (Primary)	337	153.41	(+)183.59
Kerala			
Ore (Primary)	558460	558460	No Change
Metal (Primary)	0.2	0.2	No Change
Ore (Placer)	26121000	26121000	No Change
Metal (Placer)	5.86	5.86	No Change
Madhya Pradesh			
Ore (Primary)	7788000	7322000	(+) 466000
Metal (Primary)	8.4	7.81	(+) 0.59
Maharashtra			
Ore (Primary)	1517000	1517000	No Change
Metal (Primary)	3.55	3.55	No Change
Rajasthan			
Ore (Primary)	113975720	65589000	(+) 48386720
Metal (Primary)	217.48	125.84	(+)91.64
Tamil Nadu			
Ore (Primary)	67000	67000	No Change
Metal (Primary)	1	1	No Change
West Bengal			
Ore (Primary)	12833333	12833333	No Change
Metal (Primary)	0.65	124	(-) 123.35

figures rounded off.

NATIONAL MINERAL INVENTORY - AN OVERVIEW

Table - 3 : District wise Reserves/Resources Gold as on 1.4.2010

(In tonne)			
State/District	Reserves	Remaining Resources	Total Resources
All India : Total			
Ore (Primary)	24124537	469570375	493694912
Ore (Placer)	-	26121000	26121000
Metal (Primary)	111	549	660
Metal (Placer)	-	6	6
Andhra Pradesh			
Ore (Primary)	-	12275347	12275347
Metal (Primary)	-	36	36
Anantapur			
Ore (Primary)	-	795815	795815
Metal (Primary)	-	3	3
Chittoor			
Ore (Primary)	-	3011532	3011532
Metal (Primary)	-	14	14
Kurnool			
Ore (Primary)	-	8468000	8468000
Metal (Primary)	-	19	19
Bihar			
Ore (Primary)	-	222884860	222884860
Metal (Primary)	-	38	38
Jamui			
Ore (Primary)	-	222884860	222884860
Metal (Primary)	-	38	38
Chhattisgarh			
Ore (Primary)	-	4841033	4841033
Metal (Primary)	-	6	6
Kanker			
Ore (Primary)	-	2403608	2403608
Metal (Primary)	-	2	2
Raipur			
Ore (Primary)	-	2437425	2437425
Metal (Primary)	-	4	4
Jharkhand			
Ore (Primary)	38059	8113289	8151348
Metal (Primary)	++	13	13
Ranchi			
Ore (Primary)	-	7520000	7520000
Metal (Primary)	-	11	11
Singhbhum(East)			
Ore (Primary)	38059	105435	143494
Metal (Primary)	++	++	++
Singhbhum(West)			
Ore (Primary)	-	487854	487854
Metal (Primary)	-	2	2
Karnataka			
Ore (Primary)	24086478	84716333	108802811
Metal (Primary)	110	227	337

(Contd.)

NATIONAL MINERAL INVENTORY - AN OVERVIEW

Table-3 (Contd.)

State/District	Reserves	Remaining Resources	Total Resources
Chitradurga			
Ore (Primary)	-	1230000	1230000
Metal (Primary)	-	5	5
Dharwar			
Ore (Primary)	-	9789500	9789500
Metal (Primary)	-	33	33
Gulbarga			
Ore (Primary)	100065	64132	164197
Metal (Primary)	++	++	1
Hassan			
Ore (Primary)	-	4040000	4040000
Metal (Primary)	-	6	6
Haveri			
Ore (Primary)	-	5957000	5957000
Metal (Primary)	-	18	18
Kolar			
Ore (Primary)	-	35602563	35602563
Metal (Primary)	-	36	36
Raichur			
Ore (Primary)	23986413	24200475	48186888
Metal (Primary)	110	118	228
Tumkur			
Ore (Primary)	-	3832663	3832663
Metal (Primary)	-	11	11
Kerala			
Ore (Primary)	-	558460	558460
Ore (Placer)	-	26121000	26121000
Metal (Primary)	-	++	++
Metal (Placer)	-	6	6
Malappuram			
Ore (Primary)	-	558460	558460
Ore (Placer)	-	24815000	24815000
Metal (Primary)	-	++	++
Metal (Placer)	-	5	5
Palakkad			
Ore (Placer)	-	1306000	1306000
Metal (Placer)	-	1	1
Madhya Pradesh			
Ore (Primary)	-	7788000	7788000
Metal (Primary)	-	8	8
Jabalpur			
Ore (Primary)	-	200000	200000
Metal (Primary)	-	++	++
Katni			
Ore (Primary)	-	466000	466000
Metal (Primary)	-	1	1
Sidhi			
Ore (Primary)	-	7122000	7122000
Metal (Primary)	-	7	7

(Contd.)

NATIONAL MINERAL INVENTORY - AN OVERVIEW

Table-3 (Concl.d.)

State/District	Reserves	Remaining Resources	Total Resources
Maharashtra			
Ore (Primary)	-	1517000	1517000
Metal (Primary)	-	4	4
Bhandara			
Ore (Primary)	-	57000	57000
Metal (Primary)	-	++	++
Nagpur			
Ore (Primary)	-	1460000	1460000
Metal (Primary)	-	3	3
Rajasthan			
Ore (Primary)	-	113975720	113975720
Metal (Primary)	-	217	217
Banswara			
Ore (Primary)	-	100695000	100695000
Metal (Primary)	-	207	207
Bhilwara			
Ore (Primary)	-	1270000	1270000
Metal (Primary)	-	1	1
Dausa			
Ore (Primary)	-	4600000	4600000
Metal (Primary)	-	7	7
Dungarpur			
Ore (Primary)	-	4500000	4500000
Metal (Primary)	-	1	1
Sirohi			
Ore (Primary)	-	2430720	2430720
Metal (Primary)	-	1	1
Udaipur			
Ore (Primary)	-	480000	480000
Metal (Primary)	-	1	1
Tamil Nadu			
Ore (Primary)	-	67000	67000
Metal (Primary)	-	1	1
Dharmapuri			
Ore (Primary)	-	67000	67000
Metal (Primary)	-	1	1
West Bengal			
Ore (Primary)	-	12833333	12833333
Metal (Primary)	-	1	1
Purulia			
Ore (Primary)	-	12833333	12833333
Metal (Primary)	-	1	1

figures rounded off. (++) negligible quantity.

4.5 RUBY

Introduction

Ruby is a transparent, lustrous, red gem variety of corundum. It frequently shows variation in colour from deep to pigeon's blood red, in parallel or irregular bands. The colour is supposed to be due to traces of chromium. The minute, hexagonal or irregular, often elongated or angular cavities and irregularly occurring inclusions are distinguishing characters of natural ruby. It also has low dispersion and hence exhibit no 'fire'. There is an abnormal amount of fire, when parallel. Fibrous inclusions occur along the lines of crystallisation. Ruby, when cut in en-cabochon fashion (dome shaped, the base coinciding with the basal plane of the crystal) shows a white, six-rayed star on the surface when examined in light. The phenomenon is called as 'asterism'. Such star ruby is a valuable gem stone. Ruby occurs as disseminated crystals formed by:

1. Magmatic segregation of basic igneous rocks.
2. Desilication of pegmatite dykes intruded into basic igneous rocks.
3. Metamorphism of highly aluminous rocks.

It also occurs as alluvial placers. Though the resources of ruby have only been estimated in Orissa, its occurrences are also reported from Tumkur and Chikmagalur districts, Karnataka, and Tiruchirapalli district, Tamil Nadu.

Basis of Grade Classification

Ruby is the prime gem variety of corundum. This is the most fascinating gem stones after diamond. Resources of ruby in the inventory as on 1.4.2005 have been placed under unclassified grade.

Basis of Categorisation of Resources

As per United Nations Framework Classification (UNFC), resources are broadly classified into 'reserves' and 'remaining resources'.

According to the norms of this system, reserves of ruby have been placed under proved (111) and probable (122) categories. The remaining resources have been placed under pre-feasibility (222), and inferred (333) categories.

Salient Features of the Inventory

All India scenarios of ruby reserves, remaining resources and total resources as on 1.4.2010 vis-a-vis 1.4.2005 have been given in Tables - 1 and 2. These tables give an idea about changes in terms of increase or decrease of resources as per lease status, grade and state. In Table-3 district wise reserves/resources have been given.

Total resources as on 1.4.2010 of ruby in the country are estimated at 5,349 kg. These resources include 236 kg (4%) of reserve and 5,113 kg (96%) of remaining resources. Out of the total resources about 4,537 kg (85%) are in freehold and remaining 812 kg (15%) in leasehold areas (Table - 1).

The entire resources of ruby have been estimated in the state of Odisha (Table - 2).

An increase of about 78 kg. resources of ruby has been recorded in the inventory as on 1.4.2010 as compared to earlier inventory as on 1.4.2005. This increase is attributed to the addition of two lease hold (Public) areas and two free hold areas in Kalahandi district of Odisha.

A total 5 deposits of ruby have been covered in the NMI as on 1.4.2010, of which 2 deposits are in freehold areas and 3 deposits in leasehold (public) areas.

**Table - 1 : Reserves/Resources of Ruby as on 1.4.2010 vis-à-vis 1.4.2005
(By Lease Status/Grade)**

Lease status/Grade	(In kilogram)								
	Reserves		Remaining resources		Total resources				
	1.4.2010	1.4.2005	Net change	1.4.2010	1.4.2005	Net change			
All India : Total	236	1925	(-)1689	5113	3345	(+)1768	5349	5271	(+)78
Unclassified	236	1925	(-)1689	5113	3345	(+)1768	5349	5271	(+)78
Freehold									
Unclassified	-	1482	(+)1482	4537	3005	(+)1532	4537	4537	No Change
Leasehold (Public)									
Unclassified	236	443	(-)207	576	290	(+)286	812	734	(+)78

figures rounded off.

NATIONAL MINERAL INVENTORY - AN OVERVIEW

**Table – 2 : Total Resources of Ruby as on 1.4.2010 vis-à-vis 1.4.2005
(By States)**

State	Total Resources		Net Change
	As on 1.4.2010	As on 1.4.2005	
All India : Total	5349	5271	(+)78
Odisha	5349	5271	(+)78

figures rounded off.

Table - 3 : District wise Reserves/Resources Ruby as on 1.4.2010

State/District	Reserves	Remaining Resources	Total Resources
			(In kilogram)
All India : Total	236	5113	5349
Odisha	236	5113	5349
Kalahandi	236	5113	5349

figures rounded off.

4.6 SAPPHIRE

Introduction

Sapphire in true sense is the blue, transparent, gem variety of corundum but in trade parlance all gem varieties other than red are called as sapphire. Natural sapphire has low dispersion and hence no fire. Some of them are characterised by the presence of fine parallel fibres as inclusions exhibiting the phenomenon of 'Silk'. With an abnormal amount of silk developed along the lines of crystallisation and when the crystal is cut in en-cabochon fashion, it shows 'asterism' i.e. a white, six-rayed star seen on the surface when examined in light. The blue colour of sapphire is considered to be due to the presence of titanium.

Sapphire occurs as disseminated crystals formed by the following :

1. Magmatic segregation in basic/ultrabasic igneous rocks.
2. Desilication of pegmatite dykes intruded into basic igneous rocks.
3. Metamorphism of highly aluminous rocks.

It also occurs in alluvial placers. Though the resources of sapphire are confined only in Jammu & Kashmir, its occurrences are reported from Andhra Pradesh, Karnataka, Kerala and Tamil Nadu also.

Basis of Grade Classification

Sapphire is the prime gem varieties of corundum. This is the most fascinating gem stone after diamond. The blue variety is called 'Sapphire'. In the inventory as on 1.4.2010 the resources have been placed under 'unclassified grade'.

Basis of Categorisation of Resources

As per United Nations Framework Classification (UNFC), resources are broadly classified into 'reserves' and 'remaining resources'.

According to the norms of this system the entire estimation of sapphire has been placed under inferred (333) category of remaining resources.

Salient Features of the Inventory

All India scenario of sapphire reserves, remaining resources and total resources as on 1.4.2010 vis-a-vis 1.4.2005 have been given in Tables - 1 and 2. The tables give an idea about the changes in terms of increase or decrease of resources as per lease status, grade and state. In Table-3 district wise reserves/resources have been given.

The total quantity of sapphire estimated in the country as on 1.4.2010 at 450 kg, is placed under remaining resource category. The entire resource is in a single lease hold (Public) deposit and has been estimated in Doda district of Jammu and Kashmir. Since the information of exploitation of this deposit is not available, the resource position remains unchanged as compared to 1.4.2005 (Tables - 1 and 2).

Out of the total 5 deposits of sapphire covered in the updation of NMI as on 1.4.2010, 4 deposits are in free hold and 1 deposit is in lease hold (Public) area. Only occurrences have been reported in all the free hold deposits.

Table – 2 : Total Resources of Sapphire as on 1.4.2010 vis-à-vis 1.4.2005 (By States)

State	Total resources		Net Change
	As on 1.4.2010	As on 1.4.2005	
	All India : Total	450	
Jammu & Kashmir	450	450	No change

figures rounded off.

Table -3 : District wise Reserves/Resources of Sapphire as on 1.4.2010

State/District	Reserves	Remaining resources	Total resources
All India : Total	-	450	450
Jammu & Kashmir	-	450	450
Doda	-	450	450

figures rounded off.

**Table - 1 : Reserves/Resources of Sapphire as on 1.4.2010 vis-à-vis 1.4.2005
(By Lease Status/Grade)**

(In kilogram)

Lease status/Grade	Reserves		Remaining resources		Total resources	
	1.4.2010	1.4.2005	1.4.2010	1.4.2005	1.4.2010	1.4.2005
		Net change		Net change		Net change
All India : Total	-	-	450	450	450	450
Unclassified	-	-	450	450	450	450
Leasehold (Public)	-	-	450	450	450	450
Unclassified	-	-	450	450	450	450

figures rounded off.

4.7 SILVER

Introduction

Silver is a noble and scarce metal. It is white in colour, malleable and resistance to atmospheric oxidation. Hence it is in use since last thousands of years. Apart from its monetary and decorative uses, its highest known electrical conductivity amongst all metals has found application in modern age, viz for printed electric circuits, coating for electronic conductors and in alloys of gold and copper for electric contacts. Its chloride and iodide are light sensitive and hence used in photographic material. These two modern uses are also responsible for contributing its supply as scrap.

It occurs generally with lead, zinc, copper and gold ores and its extraction is as a by-product from electrolysis or chemical methods.

Silver is recovered as a co-product as well as a by-product in the country. Economically viable native silver deposits are not reported. Silver was recovered in the past as a co-product in gold refining, at KGF complex and Hutti Gold Mines in Karnataka, as a by-product in smelting and refining of lead, zinc and copper concentrates at Chanderiya and Debari smelters in Rajasthan, at Tundoo and Moubandar smelters (Ghatsila) in Jharkhand and at Visakhapatnam in Andhra Pradesh. The present production of silver comes from Ghatsila copper smelter of HCL, Chanderiya Lead-Zinc smelters of HZL and from gold refinery of HGML. In addition, Hindalco Industries Ltd., recovers silver from imported copper concentrates.

Basis of Grade Classification

As silver is associated with copper, lead, zinc and gold mineralisation and recovered as a by-product, hence a specific basis could not be adopted for grade classification. Therefore, the resource classification has been adopted in the inventory in terms of ore and metal.

Basis of Categorisation of Resources

As per United Nations Framework Classification (UNFC), resources are broadly classified into 'reserves' and 'remaining resources'.

According to norms of this system reserves of silver ore and corresponding metal have been placed under proved (111) and probable (121) & (122) categories.

The remaining resources have been placed under feasibility (211), pre-feasibility (221) and (222), measured (331), indicated (332) and inferred (333) categories.

Salient Features of the Inventory

All India scenario of silver ore and metal reserves, remaining resources and total resources as on 1.4.2010 vis-a-vis 1.4.2005 have been appended in Tables - 1 and 2. The tables give an idea about the significant changes in terms of increase of resources as per lease status, grade and state. In Table - 3 district wise reserves/resources as on 1.4.2010 have been given.

The total resources of silver ore in the country as on 1.4.2010 are estimated at 466.98 million tonnes with 27628.25 tonnes of silver metal, of these 187.55 million tonnes ore (40.16%) fall under reserve category containing 8039.57 tonnes silver metal and the balance 279.42 million tonnes of silver ore (59.83%) are remaining resources containing 19588.68 tonnes of silver metal.

Of the total resources 56.81 million tonnes ore (12.16%) containing 1098.97 tonnes metal are in freehold, 112.13 million tonnes ore (24.01%) containing 361.8 tonnes metal are in leasehold public and 298.04 million tonnes ore (63.82%) containing 26167.48 tonnes metal are in leasehold private (Table - 1).

Rajasthan is credited with the largest share of the resources at 405.92 million tonnes ore (86.92%) containing 27006.2 tonnes silver metal followed by Jharkhand 23.84 million tonnes ore (5.10%) containing 5.22 tonnes metal, Andhra Pradesh 16.95 million tonnes ore (3.62%) containing 128.13 tonnes metal, Karnataka 9.06 million tonnes ore (1.94%) containing 6.07 tonnes metal, Uttarakhand 3.39 million tonnes ore (0.72%) containing 138.59 tonnes metal, Madhya Pradesh 3.21 million tonnes of ore (0.68%) containing 159.86 tonnes metal and the rest 4.60% million tonnes ore (0.98%) containing 119.27 tonnes metal are shared by other states namely Maharashtra, Meghalaya, Odisha, Sikkim and Tamil Nadu (Table - 2).

An increase of 222.35 million tonnes resources with 17415.72 tonnes metal has been recorded in the inventory as on 1.4.2010 in comparison to the earlier inventory as on 1.4.2005. About 90.6% of the total increase in resources, amounting to 201.59 million

NATIONAL MINERAL INVENTORY - AN OVERVIEW

**Table - 1 : Reserves/Resources of Silver as on 1.4.2010 vis-à-vis 1.4.2005
(By Lease Status/Grade)**

Lease status/Grade	Reserves		Remaining resources			Total resources			
	1.4.2010	1.4.2005	1.4.2010	1.4.2005	Net change	1.4.2010	1.4.2005	Net change	
	Net change								
All India : Total									
Ore	187558668	115912738	(+) 71645930	279426291	128720729	(+) 150705562	466984959	244633467	(+) 222351492
Metal	8039.57	6058.33	(+) 1981.24	19588.68	4154.29	(+) 15434.48	27628.25	10212.53	(+)17415.72
Freehold									
Ore	-	3864000	(-)3864000	56817079	31037579	(+)25779500	56817079	34901579	(+)21915500
Metal	-	46.37	(-) 46.37	1098.97	699.61	(+)399.36	1098.97	745.98	(+)352.99
Leasehold (Public)									
Ore	85468668	18167988	(+)67300680	26664212	50314150	(-) 23649938	112132880	68482138	(+)43650742
Metal	345.87	50.94	(+) 294.93	15.93	90.39	(-)74.46	361.8	141.33	(+)220.47
Leasehold (Private)									
Ore	102090000	93880750	(+)8209250	195945000	47369000	(+)148576000	298035000	141249750	(+)156785250
Metal	7693.7	5961.02	(+)1732	18473.78	3364.2	(+)15109.58	26167.48	9325.22	(+)16842.26

figures rounded off.

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tonnes ore with 17134.79 tonnes metal, have been accounted alone by Rajasthan. The remaining 9.4% increase has been accounted for by other states namely Andhra Pradesh 7.2% (16.06 million tonnes ore containing 121.07 tonnes silver metal), Madhya Pradesh 1.44% (3.21 million tonnes ore containing 159.86 tonnes silver metal) and Karnataka 0.66% (1.47 million tonnes ore having no change in silver metal).

In Rajasthan, a net increase of resources (ore 201.59 million tonnes with metal 17134.79 tonnes) has been recorded due to addition of one new deposit namely Kolihan Copper Mine of M/S Hindustan Copper Ltd., (19.04 million tonnes ore with 156 tonnes metal) in Jhunjhunu district and upward revision in resources of Rampura-Aghucha deposit (45.26 million tonnes). Rajpura Dariba (19.86 million tonnes), Sindeswar Khurd deposit (46.69 million tonnes), Zawar group of mines (46.66 million tonnes), Kayar deposit (1.39 million tonnes) and Khetri & Banawas (23.12 million tonnes).

In Madhya Pradesh, silver resources has been estimated for first time in Betul and Katni districts. In Andhra Pradesh, a net increase of resources (ore 16.06 million tonnes with 121.07 tonnes metal) due to upward revision of Bandalmottu deposit of Guntur district.

Of the total resources of silver ore, about 172.17 million tonnes (36.86%) resources have been estimated under inferred (333) category. These resources are based on very limited and preliminary exploration. If these areas are examined for further detailed exploration, the confidence level of resource position of silver ore in the country may improve.

A total 30 deposits have been recorded in the inventory as on 1.4.2010, of which 16 deposits are in freehold and 14 in leasehold, comprising 7 deposits each in leasehold (Public) & leasehold (Private).

Table – 2 : Total Resources of Silver as on 1.4.2010 vis-à-vis 1.4.2005 (By States)

State	Total Resources		Net Change
	As on 1.4.2010	As on 1.4.2005	
All India : Total			
Ore	466984959	244633467	(+)222351492
Metal	27628.25	10212.62	(+)17415.72
Andhra Pradesh			
Ore	16950000	881250	(+)16068750
Metal	128.13	7.06	(+)121.07
Jharkhand			
Ore	23840000	23840000	No change
Metal	5.22	5.22	No change
Karnataka			
Ore	9064677	7591915	(+)1472762
Metal	6.07	6.07	No change
Madhya Pradesh			
Ore	3216000	-	(+)3216000
Metal	159.86	-	(+)159.86
Maharashtra			
Ore	235000	235000	No change
Metal	0.23	0.23	No change
Meghalaya			
Ore	880000	880000	No change
Metal	19.8	19.8	No change
Odisha			
Ore	1749500	1749500	No change
Metal	64.91	64.91	No change
Rajasthan			
Ore	405920159	204326179	(+)201593980
Metal	27006.20	9871.41	(+)17134.79
Sikkim			
Ore	949623	949623	No change
Metal	56.69	56.69	No change
Tamil Nadu			
Ore	790000	790000	No change
Metal	42.55	42.55	No change
Uttarakhand			
Ore	3390000	3390000	No change
Metal	138.59	138.59	No change

figures rounded off.

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Table - 3 : District wise Reserves/Resources Silver as on 1.4.2010

(In tonne)			
State/District	Reserves	Remaining Resources	Total Resources
All India : Total			
Ore	187558668	279426291	466984959
Metal	8040	19589	27628
Andhra Pradesh			
Ore	-	16950000	16950000
Metal	-	128	128
Guntur			
Ore	-	16950000	16950000
Metal	-	128	128
Jharkhand			
Ore	-	23840000	23840000
Metal	-	5	5
Singhbhum (East)			
Ore	-	23840000	23840000
Metal	-	5	5
Karnataka			
Ore	8681065	383612	9064677
Metal	3	3	6
Chitradurga			
Ore	-	383612	383612
Metal	-	3	3
Raichur			
Ore	8681065	-	8681065
Metal	3	-	3
Madhya Pradesh			
Ore	-	3216000	3216000
Metal	-	160	160
Betul			
Ore	-	2630000	2630000
Metal	-	126	126
Katni			
Ore	-	586000	586000
Metal	-	34	34
Maharashtra			
Ore	-	235000	235000
Metal	-	0.23	0.23
Bhandara			
Ore	-	235000	235000
Metal	-	0.23	0.23
Meghalaya			
Ore	-	880000	880000
Metal	-	20	20
Khasi Hills (East)			
Ore	-	880000	880000
Metal	-	20	20

(Contd.)

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Table-3 (Concl.d.)

State/District	Reserves	Remaining Resources	Total Resources
Odisha			
Ore	-	1749500	1749500
Metal	-	65	65
Sundergarh			
Ore	-	1749500	1749500
Metal	-	65	65
Rajasthan			
Ore	178377980	227542179	405920159
Metal	8022	18985	27006
Ajmer			
Ore	-	10574000	10574000
Metal	-	301	301
Bhilwara			
Ore	75710000	44672579	120382579
Metal	5041	2611	7651
Jhunjhunu			
Ore	76287980	2440600	78728580
Metal	328	7	335
Rajsamand			
Ore	18530000	111505000	130035000
Metal	2371	13320	15691
Sikar			
Ore	-	5000000	5000000
Metal	-	125	125
Udaipur			
Ore	7850000	53350000	61200000
Metal	282	2620	2902
Sikkim			
Ore	499623	450000	949623
Metal	15	41	57
Sikkim East			
Ore	499623	450000	949623
Metal	15	41	57
Tamil Nadu			
Ore	-	790000	790000
Metal	-	43	43
Villupuram			
Ore	-	790000	790000
Metal	-	43	43
Uttarakhand			
Ore	-	3390000	3390000
Metal	-	139	139
Dehradun			
Ore	-	1790000	1790000
Metal	-	5	5
Pithoragarh			
Ore	-	1600000	1600000
Metal	-	134	134

figures rounded off.