

2.1 CHROMITE

Introduction

Chromite is an important commercial chromium bearing mineral. It is an oxide of chromium and iron ($\text{FeO Cr}_2\text{O}_3$ or $\text{Fe Cr}_2\text{O}_4$). It belongs to the spinel group. In its purest form the chromite ore contains 68% chromium oxide and Cr: Fe ratio is 1.8:1, but in nature such chromite is rare. It occurs as a primary mineral of ultrabasic igneous rocks and is normally associated with peridotite, pyroxenite, dunite and serpentinite. World wide, high alumina chromite, largely from podiform deposits is used in refractory applications while iron rich ores, largely from stratiform deposits are utilised in metallurgical and chemical applications.

Chromite is of critical importance because it imparts unique qualities to the products to which it is added. It is used in the production of stainless steel and high temperature alloys having numerous industrial and defence applications. It is also used in the manufacture of ferro-chrome, charge-chrome, refractories and chemicals.

India is one of the leading producers and exporters of chromite in the world. Chromite deposits of Sukinda and Nausahi ultramafic belt of Odisha constitutes 94% of the country's chromite resources. Here chromite occurs as concentration and disseminations in the ultramafic rocks, in the form of lenses, pockets, thin seams and stringers. Other states contributing to the country's resources of chromite are Manipur, Nagaland, Karnataka, Jharkhand, Maharashtra, Tamil Nadu, Telangana and Andhra Pradesh. In Manipur, chromite is associated with serpentinite. In Nagaland, nickeliferous chromite has been located in ultramafic belt. In Karnataka, the ultramafic rocks bearing chromite occur in two belts; viz. Nuggehalli, Arsikhera and Nanjangud in Mysore district. In Maharashtra, it occurs in altered ultramafic rocks. In Andhra Pradesh and Telangana, it occurs in Eastern Ghat group of rocks in Krishna and Khammam districts respectively. In Tamil Nadu, chromite associated with amphibolites bands are found in Sitampundi complex of anorthosites.

Basis of Grade Classification

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

1. Ferro-Chrome Cr_2O_3 48% (min),
Cr:Fe ratio 2.8:1 (min)
2. Charge Chrome Cr_2O_3 44% (min),
Cr:Fe ratio 1.6:1 (min)

3. Refractory Cr_2O_3 + 40%, FeO 18% (max),
 SiO_2 12% (max), MgO 15%
(max), physical - lumpy
4. Chemical Cr_2O_3 44% (min), FeO 20%
(max), Al_2O_3 14% (max), SiO_2
7% (max), CaO 3% (max),
MgO 14% (max)
5. Beneficiable Cr_2O_3 12% (min)
6. Low Chemical and physical
properties fall below the
specifications of the different
grades mentioned above.
7. Others Estimation for such grades
through usable/marketable
but can not be classified into
the above grades.
8. Unclassified The range of minimum and
maximum value of the
constituents are such that it
does not enable to classify
under any grades.
9. Not Known Such estimation about which
information/data is not
available/reported to be
classified it under any of the
grades.

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 chromite ore have been placed under proved (111) and probable categories (121) and (122).

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

The total resources of chromite in the country as on 1.4.2015 are estimated at 344.02 million tonnes, of

these 102.21 million tonnes (30%) fall under reserves category and 241.81 million tonnes (70%) are remaining resources.

All India scenarios of chromite reserves, remaining resources and total resources as on 1.4.2015 vis-a-vis 1.4.2010 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 1.4.2015 have been given.

Out of the total resources, about 65 million tonnes (19%) have been placed in freehold, 194 million tonnes (56%) in leasehold private and 85 million tonnes (25%) in leasehold public areas.

Out of the total resources, metallurgical grade constitutes 167 million tonnes (49%), {charge chrome 106 million tonnes (31%) and ferro-chrome 61 million tonnes (18%)} and beneficiable 86 million tonnes (25%). The resources of refractory grade chromite is limited which constitutes 48 million tonnes (14%) of the total resources. Besides, considerable quantity of about 38 million tonnes (11%) is held by unclassified grade, while about 4 million tonnes (1%) resources have been placed under low grade and about one million tonnes resources are placed under others and not known categories respectively.

An increase of about 141 million tonnes (69%) resources (beneficiable grade 51 million tonnes, refractory grade 38 million tonnes, charge-chrome grade 33 million tonnes, ferro-chrome grade 23 million tonnes and not known grade 0.5 million tonnes) and a decrease of 5 million tonnes of resources of unclassified grade and others grade have been recorded in the inventory as on 1.4.2015. These changes reflect the overall positive improvement in the total resources in the inventory

as on 1.4.2015 as compared to as on 1.4.2010.

The state of Odisha has been endowed with the largest share of total resources of chromite in the country at 331 million tonnes (96%). These resources have mainly been distributed in three districts, namely Jajpur (308 million tonnes), Keonjhar (20 million tonnes) and Dhenkanal (2.5 million tonnes). Manipur has 6.66 million tonnes (2%) resources estimated in Chandel and Ukhrul districts. The balance 2% resources are accounted together by other states namely Andhra Pradesh, Jharkhand, Karnataka, Maharashtra, Nagaland, Tamil Nadu and Telangana.

An increase of about 141 million tonnes resources have been recorded in the inventory as on 1.4.2015 in comparison to earlier inventory as on 1.4.2010.

In Odisha, a net decrease of 141 million tonnes resources has been registered due to upward revision in resources of existing deposits including 2 new deposits with total resources of 1.18 million tonnes.

In Nagaland, 3.2 million tonnes resources have been recorded in a freehold deposit in Tuensang district.

Of the total resources of chromite, about 65 million tonnes (19%) resources have been estimated under inferred (333) and reconnaissance (334) categories. These resources are based on a very limited and preliminary exploration. A detailed exploration in these areas may improve the confidence level of resources.

In the inventory as on 1.4.2015, a total 95 deposits have been covered. Out of these, 59 deposits are in freehold and 36 deposits in leasehold areas (17 leasehold-private and 19 leasehold-public).

Table - 1 : Reserves/Resources of Chromite as on 1.4.2015 vis-à-vis 1.4.2010
(By Lease Status/Grade)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
All India : Total	102210	53970	(+48240)	241806	149376	(+92430)	344016	203346	(+140670)
Ferro-Chrome	13842	9346	(+4496)	47504	29061	(+18443)	61346	38407	(+22939)
Refractory	29978	5701	(+24277)	17684	4064	(+13620)	47662	9765	(+37897)
Charge-Chrome	25804	21418	(+4386)	79905	50961	(+28943)	105709	72379	(+33330)
Low	-	52	(-52)	3765	3713	(+52)	3765	3765	No Change
Beneficiable	31557	13824	(+17733)	54139	21154	(+32985)	85697	34978	(+50719)
Others	133	921	(-788)	740	183	(+557)	873	1104	(-231)
Unclassified	896	2707	(-1811)	37343	40062	(-2719)	38239	42769	(-4530)
Not Known	-	-	-	725	179	(+546)	725	179	(+546)
Freehold	-	-	-	65320	67081	(-2481)	65320	67081	(-1761)
Ferro-Chrome	-	-	-	180	180	No Change	180	180	No Change
Refractory	-	-	-	1515	1446	(+69)	1515	1446	(+69)
Charge-Chrome	-	-	-	22732	22732	No Change	22732	22732	No Change
Low	-	-	-	3473	3473	No Change	3473	3473	No Change
Beneficiable	-	-	-	2859	2295	(+564)	2859	2295	(+564)
Others	-	-	-	15	15	No Change	15	15	No Change
Unclassified	-	-	-	33822	36762	(-2940)	33822	36762	(-2940)
Not Known	-	-	-	723	18317	(-18140)	723	177	(+546)
Leasehold (Private)	82290	25474	(+56816)	111670	53939	(+57731)	193960	79413	(+114547)
Ferro-Chrome	8111	2111	(+6000)	28291	17020	(+11271)	36402	19131	(+17271)
Refractory	26263	1899	(+24364)	6024	1105	(+4919)	32287	3004	(+29283)
Charge-Chrome	23338	17375	(+5963)	45660	19059	(+26601)	68998	36434	(+32564)
Low	-	-	-	-	-	-	-	-	-
Beneficiable	23683	1394	(+22289)	28202	13455	(+14747)	51885	14849	(+37036)
Unclassified	896	2695	(-1799)	3492	3300	(+192)	4388	5995	(-1607)
Leasehold (Public)	19920	28496	(-8576)	64816	28357	(+36459)	84736	56852	(+27884)
Ferro-Chrome	5731	7235	(-1504)	19033	11861	(+7172)	24764	19096	(+5668)
Refractory	3715	3802	(-87)	10145	1512	(+8633)	13860	5314	(+8546)
Charge-Chrome	2466	4042	(-1576)	11513	9170	(+2343)	13979	13213	(+766)
Low	-	52	(-52)	292	240	(-360)	292	292	No Change
Beneficiable	7875	12431	(-4556)	23078	5403	(+17675)	30953	17834	(+13119)
Others	133	921	(-788)	725	168	(+557)	858	1089	(-231)
Unclassified	-	12	(-12)	29	-	(+29)	29	12	(+17)
Not Known	-	-	-	2	2	No Change	2	2	No Change

figures rounded off.

**Table – 2 : Total Resources of Chromite as on 1.4.2015 vis-à-vis 1.4.2010
(By States)**

(In '000 tonnes)

State	Total Resources		Net Change
	As on 1.4.2015	As on 1.4.2010	
All India : Total	344016	203346	(+) 140670
Andhra Pradesh	++	187	(-) 187
Jharkhand	736	736	No Change
Karnataka	1631	1632	(-) 1
Maharashtra	609	632	(-) 23
Manipur	6657	6657	No Change
Nagaland	3200	3200	No Change
Odisha	330714	190021	(+) 140693
Tamil Nadu	283	283	No Change
Telangana	186	-	(+)186

figures rounded off, ++: Negligible

Table - 3 : District wise Reserves/Resources of Chromite as on 1.4.2015

(In '000 tonnes)

State/District	Reserves	Remaining Resources	Total Resources
All India : Total	102210	241806	344016
Andhra Pradesh	-	++	++
Krishna	-	++	++
Jharkhand	-	736	736
Singhbhum (East)	-	736	736
Karnataka	726	905	1631
Chikmagalur	-	138	138
Hassan	726	701	1427
Mysore	-	66	66
Maharashtra	71	538	609
Bhandara	71	439	510
Chandrapur	-	11	11
Nagpur	-	56	56
Sindhudurg	-	33	33
Manipur	-	6657	6657
Chandel	-	1178	1178
Ukhrul	-	5479	5479
Nagaland	-	3200	3200
Tuensang	-	3200	3200
Odisha	101412	229301	330714
Balasore	-	3	3
Dhenkanal	-	2470	2470
Jajpur	93102	215382	308484
Keonjhar	8310	11446	19756
Tamil Nadu	-	283	283
Coimbatore	-	37	37
Salem	-	246	246
Telangana	-	186	186
Khammam	-	186	186

figures rounded off, ++: Negligible

2.2 IRON ORE (Haematite)

Introduction

Haematite is one of the most important ores for extraction of iron. In India, over 95% of iron ore is consumed in iron & steel industry. Haematite occurs in the form of oxide (Fe_2O_3) which is widely spread at various regions across the country. Haematite deposits are mainly located in Andhra Pradesh, Chhattisgarh, Goa, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra and Odisha. Bara Jamda sector in Jharkhand, Bailadila-Rowghat hill ranges in Chhattisgarh and Bellary-Hospet sector in Karnataka are considered the biggest iron ore fields in India. In India the iron ore deposits are associated with Banded-Haematite-Quartzite (BHQ)/Banded-Haematite-Jasper (BHJ) formed by sedimentation and residual concentration.

Basis of Grade Classification

In India, occurrences of iron ore are classified as high grade, medium grade and low grade deposits according to the incidence of iron in the ore. Ore is being processed by crushing, screening, washing, etc. before making ready for sintering, pelletisation, blast furnace operation, etc. It is known that even a comparatively lower grade deposit can yield high quality furnace charge after beneficiation and agglomeration. Hence, grade classification has been done according to the naturally occurring state of the ore.

The grade classification adopted in the inventory as on 01.04.2015 is based mainly on four chemical constituents namely, Fe, SiO_2 , Al_2O_3 and phosphorous which was in line with the recommendations of the Committee constituted for revision of end use grade classification (September, 2004). The Classification is given below:

- | | |
|-----------------------------------|--|
| 1. High Grade
(lump & fines) | Fe : (+) 65%
SiO_2 : 2% (max)
Al_2O_3 : 2% (max)
P : 0.1% (max) |
| 2. Medium Grade
(lump & fines) | Fe : 62 to 65%
SiO_2 : 3% (max)
Al_2O_3 : 3% (max.)
P : 0.1% (max) |

- | | |
|--------------------------------|--|
| 3. Low Grade
(lump & fines) | Fe : (-) 62%
SiO_2 : 4.5 (max)
Al_2O_3 : 4% (max)
P : 0.1% (max) |
| 4. Beneficiable | (i) Fe: 45% (min)
for ore other than Goa.
(ii) Fe: 35% (min) for
siliceous ore of Goan origin |
| 5. Black iron ore | Haematite containing 10%
manganese. |
| 6. Others | Estimation for such grade
though useable/marketable
but cannot be classified
into above grades. |
| 7. Unclassified | The range of minimum and
maximum values of
constituents are such that
it does not enable to
classify under any grades. |
| 8. Not Known | Such estimation about
which information/data is
not available/reported to be
classified it under any of the
grades. |

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 iron ore (haematite) 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

The total resources of iron ore (haematite) in the country as on 01.04.2015 are estimated at 22,487 million tonnes; of these about 5,422 million tonnes (24%) fall under 'reserves' category and the balance about 17,065 million tonnes (76%)

under 'remaining resources' category. Of the total resources, about 7,276 million tonnes (32%) have been estimated in freehold areas while about 7,420 million tonnes (33%) in leasehold private and about 7,791 million tonnes (35%) in leasehold public sector.

All India scenario of iron ore (haematite) reserves, remaining resources and total resources as on 01.04.2015 vis-a-vis 01.04.2010 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, grades and state. In Table-3, district-wise reserves/resources as on 01.04.2015 have been given.

In terms of grade, the medium grade lumps & fines resources constitute for 10,662 million tonnes (47%), followed by low-grade 4,573 million tonnes (20%), high grade 3,786 million tonnes (17%), unclassified lumps, fines, blue dust & black iron grade 1,244 million tonnes (6%), beneficiable grade 422 million tonnes (2%) and black iron, others & not known grades constitute about 1,799 million tonnes (8%).

About 91% of the country's resources have been reported from four states namely Odisha (34%), Jharkhand (24%), Chhattisgarh (22%) and Karnataka (11%). The balance 9% resources are distributed in Goa (5%), Maharashtra, Andhra Pradesh & Madhya Pradesh (1% each) and Assam, Bihar, Meghalaya, Rajasthan, Uttar Pradesh & Telangana together contribute 1% .

An increase of about 4,605 million tonnes resources of iron ore (haematite) have been

recorded in comparison to the earlier inventory as on 01.04.2010.

A total of 90 new deposits possessing about 811 million tonnes of resources for freehold, leasehold private & leasehold public areas in Andhra Pradesh, Chhattisgarh, Goa, Jharkhand, Karnataka, Madhya Pradesh, Odisha, Rajasthan, Telangana & Uttar Pradesh states were added during updation as on 1.4.2015.

Out of the total increase in resources, Odisha reported 1628 million tonnes, Chhattisgarh 1566 million tonnes, Jharkhand 690 million tonnes, Karnataka 308 million tonnes increase in resources. Besides, an increase of about 453 million tonnes was reported together from Goa, Madhya Pradesh, Maharashtra, Rajasthan, Telangana & Uttar Pradesh states. However, Assam, Bihar, & Meghalaya states reported no change in resources. Further, depletion of about 40 million tonnes resources was reported from Andhra Pradesh.

A sizeable quantity of about 6,989 million tonnes (31%) of iron ore (haematite) have been estimated under inferred and reconnaissance categories. If these areas are examined for further detailed exploration, the confidence level of resource position of iron ore (haematite) in the country may improve further.

A total of 1078 deposits of iron ore (haematite) have been covered in NMI as on 01.04.2015. Out of which, 393 deposits are in freehold areas, 628 deposits are in leasehold private areas and 57 deposits are in leasehold public areas.

Table - 1 : Reserves/Resources of Iron Ore (Haematite) as on 1.4.2015 vis-à-vis 1.4.2010
(By Lease Status/Grade)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
	(In '000 tonnes)								
All India : Total	5421751	8093546	(-) 2671795	17065214	9788551	(+) 7276663	22486965	17882098	(+) 4604867
Lump, high grade	1424375	1023938	(+) 400437	1150092	474803	(+) 675289	2574466	1498741	(+) 1075725
Lump, medium grade	1441151	4327691	(-) 2886540	6167154	2093623	(+) 4073531	7608306	6421314	(+) 1186992
Lump, low grade	262679	245847	(+) 16832	1725796	1380139	(+) 345657	1988474	1625986	(+) 362488
Lump, unclassified grade	248	69233	(-) 68985	291951	323420	(-) 31469	292200	392653	(-) 100453
Fines, high grade	350628	228492	(+)122136	214334	130293	(+) 84041	564962	358785	(+) 206177
Fines, medium grade	188862	711153	(-) 522291	1485105	1395805	(+) 89300	1673967	2106958	(-) 432991
Fines, low grade	310263	428296	(-) 118033	950157	764624	(+) 185533	1260420	1192919	(+) 67501
Fines, unclassified grade	982	1055	(-) 73	156851	155297	(+) 1554	157833	156352	(+) 1481
Lumps & Fines, high grade	208286	344241	(-) 135955	438791	280271	(+) 158520	647077	624512	(+) 22565
Lumps & Fines, medium gr	598568	305700	(+) 292868	752136	355287	(+) 396849	1350705	660987	(+) 689718
Lumps & Fines, low grade	210012	235520	(-) 25508	1114567	504191	(+) 610376	1324579	739711	(+) 584868
Lumps & Fines,									
unclassified grade	244809	148443	(+) 96366	354485	223511	(+) 130974	599293	371955	(+) 227338
Black Iron Ore	-	4520	(-) 4520	19106	18469	(+) 637	19106	22989	(-) 3883
Lumps, low & medium grade	14788	-	(+) 14788	13865	-	(+) 13865	28653	-	(+) 28653
Others	30934	16924	(+) 14010	38715	38769	(-) 54	69649	55693	(+) 13956
Unclassified	72331	-	(+)72331	102905	2093	(+) 100812	175236	2093	(+) 173143
Not known	4434	2494	(+) 1940	1705721	1647957	(+) 57764	1710155	1650451	(+) 59704
Lumps, Fines & Blue Dust	15197	-	(+)15197	4810	-	(+) 4810	20007	-	(+) 20007
unclassified grade									
Beneficiable grade	43204	-	(+) 43204	378673	-	(+) 378673	421877	-	(+) 421877
Freehold	-	400	(-) 400	7275626	6461842	(+) 813784	7275626	6462242	(+) 813384
Lump, high grade	-	-	No Change	419966	121947	(+) 298019	419966	121947	(+) 298019
Lump, medium grade	-	-	No Change	1399818	1224010	(+) 175808	1399818	1224010	(+) 175808
Lump, low grade	-	-	No Change	1115183	1040282	(+) 74901	1115183	1040282	(+) 74901
Lump, unclassified grade	-	-	No Change	241426	241146	(+) 280	241426	241146	(+) 280
Fines, high grade	-	-	-	65139	62302	(+) 2837	65139	62302	(+) 2837
Fines, medium grade	-	-	No Change	859985	840676	(+) 19309	859985	840676	(+) 19309
Fines, low grade	-	400	(-) 400	383020	439081	(-) 56061	383020	439481	(-) 56461
Fines, unclassified grade	-	-	No Change	115217	115217	No Change	115217	115217	No Change
Lumps & Fines, high grade	-	-	No Change	160234	113935	(+) 46299	160234	113935	(+) 46299
Lumps & Fines, medium grade	-	-	No Change	315626	264406	(+) 51220	315626	264406	(+) 51220
Lumps & Fines, low grade	-	-	No Change	378914	322302	(+) 56612	378914	322302	(+) 56612
Lumps & Fines, unclassified grade	-	-	No Change	31429	32855	(-) 1426	31429	32855	(-) 1426
Black Iron Ore	-	-	No Change	698	1932	(-) 1234	698	1932	(-) 1234
Others	-	-	No Change	18	18	No Change	18	18	No Change
Unclassified	-	-	No Change	27312	-	(+) 27312	27312	-	(+) 27312
Not known	-	-	No Change	1702416	1641731	(+) 60685	1702416	1641731	(+) 60685
Beneficiable grade	-	-	No Change	59225	-	(+) 59225	59225	-	(+) 59225

Table-1 (Concd.)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
Leasehold (Private)	2717062	3476122	(-) 759060	4703102	2503449	(+) 2199653	7420163	5979571	(+) 1440592
Lump, high grade	502652	460192	(+) 42460	272374	222887	(+) 49487	775026	683079	(+) 91947
Lump, medium grade	748226	1518933	(-) 770707	1793020	656547	(+) 1136473	2541246	2175481	(+) 365765
Lump, low grade	129268	192032	(-) 62764	360937	265103	(+) 95834	490205	457134	(+) 33071
Lump, unclassified grade	248	233	(+) 15	6045	6274	(-) 229	6294	6506	(-) 212
Fines, high grade	2357	20226	(-) 17869	2498	29320	(-) 26822	4855	49547	(-) 44692
Fines, medium grade	62994	136887	(-) 73893	132454	423999	(-) 291545	195448	560887	(-) 365439
Fines, low grade	200570	386460	(-) 185890	478315	273593	(+) 204722	678885	660053	(+) 18832
Fines, unclassified grade	982	1055	(-) 73	1634	80	(+) 1554	2616	1135	(+) 1481
Lumps & Fines, high grade	177986	277872	(-) 99886	250880	164621	(+) 86259	428866	442493	(-) 13627
Lumps & Fines, medium gr	309771	160830	(+) 148941	371099	81232	(+) 289867	680870	242063	(+) 438807
Lumps & Fines, low grade	202892	149020	(+) 53872	527852	128229	(+) 399623	730744	277249	(+) 453495
Lumps & Fines, unclassified grade	200750	148443	(+) 52307	180515	187957	(-) 7442	381265	336400	(+) 44865
Black Iron Ore	-	4520	(-) 4520	18407	16536	(+) 1871	18407	21056	(-) 2649
Lumps low & medium grade	14788	-	(+) 14788	13865	-	(+) 13865	28653	-	(+) 28653
Others	30934	16924	(+) 14010	38697	38751	(-) 54	69631	55675	(+) 13956
Unclassified	72331	-	(+) 72331	75593	2093	(+) 73500	147925	2093	(+) 145832
Not known	4434	2494	(+) 1940	3305	6226	(-) 2921	7739	8719	(-) 980
Lumps, Fines & Blue Dust	15197	-	(+) 15197	4810	-	(+) 4810	20007	-	(+) 20007
Unclassified grade	-	-	-	-	-	-	-	-	-
Beneficial grade	40681	-	(+) 40681	170801	-	(+) 170801	211482	-	(+) 211482
Leasehold (Public)	2704689	4617025	(-) 1912336	5086487	823261	(+) 4263226	7791176	5440285	(+) 2350891
Lump, high grade	921723	563746	(+) 357977	457752	129968	(+) 327784	1379475	693714	(+) 685761
Lump, medium grade	692925	2808757	(-) 2115832	2974316	213066	(+) 2761250	3667241	3021824	(+) 645417
Lump, low grade	133411	53815	(+) 79596	249675	74754	(+) 174921	383086	128569	(+) 254517
Lump, unclassified grade	-	69000	(-) 69000	44480	76000	(-) 31520	44480	145000	(-) 100520
Fines, high grade	348271	208266	(+) 140005	146697	38670	(+) 108027	494968	246936	(+) 248032
Fines, medium grade	125868	574266	(-) 448398	492666	131129	(+) 361537	618534	705395	(-) 86861
Fines, low grade	109693	41435	(+) 68258	88822	51950	(+) 36872	198515	93385	(+) 105130
Fines, unclassified grade	-	-	-	40000	40000	No Change	40000	40000	No Change
Lumps & Fines, high grade	30300	66369	(-) 36069	27677	1715	(+) 25962	57977	68084	(-) 10107
Lumps & Fines, medium grade	288797	144870	(+) 143927	65412	9648	(+) 55764	354209	154518	(+) 199691
Lumps & Fines, low grade	7120	86500	(-) 79380	207801	53660	(+) 154141	214921	140160	(+) 74761
Lumps & Fines, unclassified	44059	-	(+) 44059	142541	2700	(+) 139841	186600	2700	(+) 183900
Beneficial grade	2522	-	(+) 2522	148647	-	(+) 148647	151169	-	(+) 151169

figures rounded off

**Table – 2 : Total Resources of Iron Ore (Haematite) as on 01.04.2015 vis-a-vis 01.04.2010
(By States)**

(In '000 tonnes)

State	Total Resources		Net Change
	As on 1.4.2015	As on 1.4.2010	
All India : Total	22486965	17882098	(+) 4604867
Andhra Pradesh	341062	381478	(-) 40416
Assam	12600	12600	No Change
Bihar	55	55	No Change
Chhattisgarh	4858124	3291824	(+) 1566300
Goa	1189313	927172	(+) 262141
Jharkhand	5286417	4596620	(+) 689797
Karnataka	2466854	2158678	(+) 308176
Madhya Pradesh	329963	231446	(+) 98517
Maharashtra	294103	283209	(+) 10894
Meghalaya	225	225	No Change
Odisha	7558664	5930232	(+) 1628432
Rajasthan	38404	30560	(+) 7844
Telangana	53181	-	(+) 53181
Uttar Pradesh	58000	38000	(+) 20000

*figures rounded off.***Table - 3 : District wise Reserves/Resources of Iron Ore (Haematite) as on 1.4.2015**

(In '000 tonnes)

State/District	Reserves	Remaining Resources	Total Resources
All India : Total	5421751	17065214	22486965
Andhra Pradesh	29768	311294	341062
Anantapur	298	202237	202535
Cuddapah	13544	19874	33418
Guntur	-	80000	80000
Krishna	26	317	343
Kurnool	14642	7499	22141
Nellore	1258	1256	2513
Prakasam(Ongole H.Q.)	-	112	112
Assam	-	12600	12600
Kokrajhar	-	12600	12600
Bihar	-	55	55
Bhagalpur	-	55	55
Chhattisgarh	1387437	3470687	4858124
Balod	89120	1520	90640
Bastar	-	1439027	1439027
Dantewara	1269721	1759632	3029353
Durg	-	6000	6000
Kabirdham	-	200787	200787
Kanker	9444	61973	71418
Rajnandgaon	19152	1748	20900

(Contd.)

National Mineral Inventory - An Overview

Table-3 (Concl.d.)

State/District	Reserves	Remaining Resources	Total Resources
Goa	358239	831075	1189313
North Goa	225496	390813	616310
South Goa	132742	440261	573004
Jharkhand	439372	4847045	5286417
Singhbhum (West)	439372	4847045	5286417
Karnataka	550247	1916607	2466854
Bagalkot	-	45359	45359
Bellary	464627	1271398	1736025
Chikmagalur	-	42665	42665
Chitradurga	85620	148791	234411
Dawangere	-	62400	62400
Dharwar	-	12485	12485
Gadag	-	10202	10202
Haveri	-	78810	78810
North Kanara	-	108323	108323
Shimoga	-	20450	20450
Tumkur	-	115723	115723
Madhya Pradesh	62063	267900	329963
Betul	-	10	10
Chhatarpur	-	3513	3513
Gwalior	9802	15817	25620
Jabalpur	51334	141391	192724
Katni	-	105520	105520
Sagar	897	1646	2544
Satna	30	2	32
Maharashtra	17241	276862	294103
Chandrapur	1200	2278	3478
Gadchiroli	17	200124	200140
Sindhudurg	16024	74461	90485
Meghalaya	-	225	225
Khasi Hills East	-	225	225
Odisha	2572217	4986447	7558664
Dhenkanal	-	1120	1120
Jajpur	-	3510	3510
Keonjhar	1794825	2661058	4455883
Mayurbhanj	53296	39661	92957
Nawrangpur*	-	2650	2650
Sambalpur	-	50000	50000
Sundargarh	724097	2228448	2952545
Rajasthan	4658	33745	38404
Alwar	-	1415	1415
Dausa	-	3388	3388
Jaipur	930	14033	14963
Jhunjhunu	3726	3348	7074
Sikar	2	161	163
Udaipur	-	11400	11400
Telangana	509	52673	53181
Khammam	509	25433	25941
Karimnagar	-	27240	27240
Uttar Pradesh	-	58000	58000
Jhansi	-	20000	20000
Lalitpur	-	38000	38000

figures rounded off

* Nawrangpur is a new district carved out from Koraput district. Earlier resources as on 1.4.2010 were in Koraput district.

2.3 IRON ORE (Magnetite)

Introduction

Iron ore is the basic raw material in iron & steel industry. Magnetite is one of the principal minerals of iron ore occurring in the form of oxides (Fe_3O_4). The important magnetite deposits are mainly reported from Prakasam (Ongole) district of Andhra Pradesh, South Goa district of Goa, Bababudan, Gargarikal, Kudremukh deposits in Chikmangalur, Hassan, North Kanara, Shimoga districts of Karnataka, Bhilwara district of Rajasthan, Dharmapuri, Salem, Thiruvannamalai districts of Tamil Nadu.

Basis of Grade Classification

The grade classification adopted in the inventory as on 1.4.2015 is in line with the recommendations of the Committee constituted for revision of End use Grade Classification with regard to the Possible Optimum Industrial Use (September, 2004). The classification is as follows:

- | | |
|------------------|--|
| 1. Metallurgical | Average (+) 38% Fe |
| 2. Coal Washery | 64% Fe (min) |
| 3. Foundry | Actual use reported by exploitation agencies. |
| 4. Unclassified | Minimum & maximum range of values of chemical constituents are too wide to be fitted into any of the above grades. |
| 5. Not Known | The information on chemical constituents is not available or potential/actual use is not reported. |
| 6. Others | Those grades which could not be classified into above grades. |

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 iron ore (magnetite) 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

The total resources of iron ore (magnetite) in the country as on 1.4.2015 are estimated at 10,789 million tonnes, of these about 53 million tonnes (0.5%) fall under 'reserve' category and the balance about 10,736 million tonnes (99.5%) under 'remaining resources' category. About 94% resources are in freehold areas and 6 % resources are in leasehold areas.

All India scenario of iron ore (magnetite) reserves, remaining resources and total resources as on 1.4.2015 vis-a-vis 1.4.2010 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, grades and states. In Table-3 district wise reserves/resources as on 1.4.2015 have been given.

Resources placed under metallurgical grade is about 2,197 million tonnes (20%), coal washery grade 98 million tonnes (0.9%), unclassified 8,204 million tonnes (76%), not-known 281 million tonnes (2.6%), others 8 million tonnes (0.07%) and foundry 0.8 million tonnes. Of the total metallurgical grade, about 90% of magnetite has been estimated in 2 states namely Karnataka (66%), Rajasthan (24%). The balance 10% has been reported from Andhra Pradesh, Assam, Chhattisgarh, Goa, Jharkhand, Kerala, Maharashtra & Tamil Nadu. The coal washery grade magnetite are very limited and have been reported from Bihar, Jharkhand & Rajasthan. Further, about 99% resources of not known grade has been reported from Karnataka state alone, and more than 90% resources of unclassified grade are shared by two states viz Andhra Pradesh & Karnataka.

Country's 96% resources are located in four states namely Karnataka credited with 7,802 million tonnes (72%) followed by Andhra Pradesh 1,392 million tonnes (13%), Rajasthan 617 million tonnes (6%) and Tamil Nadu 507 million tonnes (5%). Besides, minor resources have been estimated in Assam, Bihar, Chhattisgarh, Goa, Jharkhand, Kerala, Maharashtra, Meghalaya, Nagaland, Odisha & Telangana.

Table - 1 : Reserves/Resources of Iron Ore (Magnetite) as on 1.4.2015 vis-à-vis 1.4.2010
(By Lease Status/Grade)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
	(In '000 tonnes)								
All India : Total	52699	21755	(+) 30944	10736455	10622305	(+) 114150	10789155	10644060	(+) 145095
Metallurgical	11663	5565	(+) 6098	2185521	2182111	(+) 3410	2197183	2187676	(+) 9507
Coal Washery	32629	856	(+) 31773	65636	7719	(+) 57917	98265	8575	(+) 89690
Foundry	-	455	(-) 455	836	303	(+) 533	836	758	(+) 78
Others	1192	2213	(-) 1021	6633	293	(+) 6340	7826	2506	(+) 5320
Unclassified	6606	12041	(-) 5435	8197449	8151582	(+) 45867	8204056	8163622	(+) 40434
Not Known	609	626	(-) 17	280379	280297	(+) 82	280989	280923	(+) 66
Freehold	-	-	No Change	10142047	10141969	(+) 78	10142047	10141969	(+) 78
Metallurgical	-	-	No Change	1877893	1877893	No Change	1877893	1877893	No Change
Coal Washery	-	-	No Change	7427	7427	No Change	7427	7427	No Change
Foundry	-	-	No Change	381	303	(+) 78	381	303	(+) 78
Others	-	-	No Change	43	43	No Change	43	43	No Change
Unclassified	-	-	No Change	7976208	7976208	No Change	7976208	7976208	No Change
Not Known	-	-	No Change	280095	280095	No Change	280095	280095	No Change
Leasehold (Private)	51878	21350	(+) 30528	178311	64238	(+) 114073	230189	85588	(+) 144601
Metallurgical	11287	5159	(+) 6128	6530	3121	(+) 3409	17817	8280	(+) 9537
Coal Washery	32629	856	(+) 31773	58210	292	(+) 57918	90838	1148	(+) 89690
Foundry	-	455	(-) 455	455	-	(+) 455	455	455	No Change
Others	1192	2213	(-) 1021	6590	250	(+) 6340	7783	2463	(+) 5320
Unclassified	6160	12041	(-) 5881	106241	60374	(+) 45867	112402	72414	(+) 39988
Not Known	609	626	(-) 17	284	202	(+) 82	894	828	(+) 66
Leasehold (Public)	822	405	(+) 417	416097	416097	No Change	416919	416502	(+) 417
Metallurgical	376	405	(-) 29	301097	301097	No Change	301473	301502	(-) 29
Unclassified	446	-	(+) 446	115000	115000	No Change	115446	115000	(+) 446

figures rounded off.

All India resources of iron ore (magnetite) have been increased by about 145 million tonnes as compared to previous inventory as on 1.4.2010. The overall increase in resources was mainly due to addition of 7 new deposits with 113 million tonnes resources and re-assessment of resources in existing deposits.

Of the total resources of iron ore (magnetite), about 6,351 million tonnes (59%) have been estimated under inferred category and 584 million tonnes (5%)

under reconnaissance category. These resources are based on a very limited and preliminary exploration and require further exploration, to enhance the confidence level of resource position of iron ore (magnetite) in the country.

A total of 150 deposits of Iron ore (magnetite) have been covered in the NMI as on 1.4.2015. Out of which, 104 deposits in freehold, 43 deposits in leasehold private and 03 deposits are in leasehold public areas.

Table – 2 : Total Resources of Iron Ore (Magnetite) as on 1.4.2015 vis-à-vis 1.4.2010 (By States)

(In '000 tonnes)			
State	Total Resources		Net Change
	As on 1.4.2015	As on 1.4.2010	
All India : Total	10789155	10644060	(+) 145095
Andhra Pradesh	1392098	1463541	(-) 71443
Assam	15380	15380	No Change
Bihar	2659	2659	No Change
Chhattisgarh	11225	-	(+) 11225
Goa	266336	222673	(+) 43663
Jharkhand	10667	10541	(+) 126
Karnataka	7802190	7801744	(+) 446
Kerala	83435	83435	No Change
Maharashtra	885	1361	(-) 476
Meghalaya	3380	3380	No Change
Nagaland	5280	5280	No Change
Odisha	152	199	(-) 47
Rajasthan	616916	526831	(+) 90085
Tamil Nadu	507037	507037	No Change
Telangana	71514	-	(+) 71514

figures rounded off.

Table - 3 : District wise Reserves/Resources of Iron Ore (Magnetite) as on 1.4.2015

State/District	(In '000 tonnes)		
	Reserves	Remaining Resources	Total Resources
All India : Total	52699	10736455	10789155
Andhra Pradesh	-	1392098	1392098
Prakasam (Ongole H.Q)	-	1392098	1392098
Assam	-	15380	15380
Dhubri	-	4240	4240
Goalpara	-	8900	8900
Kokrajhar	-	2240	2240

(Contd.)

National Mineral Inventory - An Overview

Table - 3 (Concl.d.)

State/District	Reserves	Remaining Resources	Total Resources
Bihar	-	2659	2659
Gaya	-	589	589
Jamui	-	2070	2070
Chhattisgarh	11183	42	11225
Kanker	11183	42	11225
Goa	4990	261345	266336
North Goa	3251	2330	5581
South Goa	1739	259015	260755
Jharkhand	-	10667	10667
Gumla	-	147	147
Hazaribagh	-	32	32
Latehar	-	672	672
Palamau	-	6185	6185
Singhbhum (East)	-	3630	3630
Karnataka	446	7801744	7802190
Chikmagalur	-	6055299	6055299
Hassan	446	574080	574526
North Kanara	-	152064	152064
Shimoga	-	1012951	1012951
South Kanara	-	7350	7350
Kerala	-	83435	83435
Kozhikode	-	79225	79225
Malappuram	-	4210	4210
Maharashtra	583	302	885
Gondia	583	302	885
Meghalaya	-	3380	3380
Garo Hills (East)	-	3380	3380
Nagaland	-	5280	5280
Kiphire	-	5280	5280
Odisha	74	79	152
Keonjhar	-	43	43
Mayurbhanj	74	36	109
Rajasthan	35423	581493	616916
Bhilwara	32629	578511	611139
Jhunjhunu	2559	1759	4317
Sikar	236	1223	1459
Tamil Nadu	-	507037	507037
Dharmapuri	-	109700	109700
Erode	-	6055	6055
Namakkal	-	25161	25161
Nilgiris	-	7517	7517
Salem	-	231804	231804
Thiruvannamala	-	126000	126000
Tiruchirapalli	-	50	50
Villupuram	-	750	750
Telangana	-	71514	71514
Adilabad	-	31500	31500
Warangal	-	40014	40014

figures rounded off

2.4 MANGANESE ORE

Introduction

Manganese ore is an indispensable raw material in the manufacture of steel where it is used in the form of ferro-manganese and also as a direct feed to the blast furnace. The important non-metallurgical uses of manganese ore are in the manufacture of dry battery and chemicals. In agriculture, it is used as a micro-nutrient for the plants. Manganese is also used in the manufacture of drier for paints and varnishes. It has important application in ceramic and glass industry as colouring agent. Manganese is also known for its decolorising properties. Chief manganese ore of commercial importance are (i) Pyrolusite (MnO_2 , Mn 63.2%); (ii) Psilomalane (manganese oxide, containing water and varying amount of oxides of Ba, K and Na as impurities; Mn commonly 45-60%) (iii) Manganite ($\text{Mn}_2\text{O}_3 \cdot \text{H}_2\text{O}$, Mn 62.4%); and (iv) Braunite ($3\text{Mn}_2\text{O}_3$, Mn SiO_3 , Mn about 62% and SiO_2 about 10%).

The important manganese ore deposits in India mainly occur as bedded sedimentary (metamorphosed) deposits associated with Gondite series (Archean) in Madhya Pradesh (Balaghat, Chhindwara, Jabalpur Jhabua and Katni districts), Maharashtra (Bhandara and Nagpur districts), Gujarat (Panchmahal and Chhota Udaipur districts), Odisha (Sundergarh district) and with Kodurite series (Archean) in Odisha (Koraput district), Andhra Pradesh (Srikakulam and Vizianagaram districts) and Telangana (Adilabad district). Manganese ore also occurs in the form of lateritoid deposits. These ores contain appreciable quantities of iron and vary from manganese ore to iron ores through every gradation. Such deposits occur in Jharkhand (Singbhum West district), Karnataka (Belgaon, Bellary, Dawangere, Gadag, North Kanara, Tumkur, Chitradurga and Shimoga districts), Odisha (Keonjhar district), Rajasthan (Banswara and Jaipur districts) and West Bengal (Midnapur district). Goa also has important deposits of manganese ore.

Basis of Grade Classification

In the inventory as on 1.4.2015 resources of manganese ore have been classified into the following grades:

- | | |
|-------------------------------|--|
| 1. Battery/
Chemical grade | MnO_2 : 72 % (min)
Cu, Pb, Cr & Ni : in traces |
| 2. Blast Furnace (BF) | Mn : 25 to below 35%
P : 0.2% (max) |

Al_2O_3 : 7.5% (max)
 SiO_2 : 13% (max)

- | | |
|--|--|
| 3. Ferro Manganese | Mn : 38% (min)
P : 0.2% (max)
Mn : Fe ratio 2.5 : 1 (min),
7:1 (max) |
| 4. Medium Grade | Mn : 35 to 37% |
| 5. Mixed Grade | |
| 6. Ferro-Manganese &
Medium Mixed Grade | |
| 7. Medium & B.F.
Mixed grade | |
| 8. Ferro -Manganese,
Medium & B.F. Mixed grade. | |
| 9. Ferro-manganese &
B.F Mixed Grade | |
| 10. Low | Mn (+) 18% to (-) 25% |
| 11. Beneficiable | Mn : 10% (min.) |
| 12. Others | Estimation for marketable grades which could not be classified into above grades. |
| 13. Unclassified | The range of maximum and minimum value of chemical constituents is too wide to fit into any of the above grades. |
| 14. Not known | The information on chemical constituents are not available or potential/ actual use is not reported. |

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 manganese 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

The total resources of manganese ore in the country as on 1.4.2015 are estimated at about 496 million tonnes, of these 94 million tonnes (19%) falls under 'reserve' category and 402 million tonnes (81%) are under 'remaining resource' category.

Out of the total resources, about 121.70 million tonnes (25%) have been placed in freehold, 260.20 million tonnes (52%) in leasehold private and 113.97 million tonnes (23%) in leasehold public areas.

All India scenario of manganese ore reserves, remaining resources and total resources as on 1.4.2015 vis-a-vis 1.4.2010 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 1.4.2015 have been given.

In the total resources, BF grade constitutes 140.90 million tonnes (28%); Ferro manganese, medium and BF mixed grade 79.72 million tonnes (16%); Medium grade 52.68 million tonnes (11%); Medium and BF mixed grade 47.76 million tonnes (10%); Ferro-manganese 36.52 million tonnes (7%); Low grade (-25% Mn) 29.29 million tonnes (6%); Ferro-manganese and BF mixed 25.90 million tonnes (5%) and Mixed grade 21.03 million tonnes (4%). About 42.6 million tonnes (8.6%) resources are placed under unclassified, not known and others grade, due to paucity of data for classifying these resources into any specific end use grade. A new grade namely Beneficiable was introduced in 2015 inventory and 19.4 million tonnes (4%) of resources are placed in this category. A meagre quantity of 0.2 million tonnes is placed under Battery/chemical grade.

A comparison of grade wise resources as on 1.4.2015 vis-a-vis 1.4.2010 shows that there is an increase in resources in almost all grades except BF and Battery/chemical grades (4% decrease) and unclassified and not known combined (32% decrease). Remarkable increase in resources is recorded in Low grade (220%) and Ferro manganese, medium & BF mixed (21%).

The state of Odisha has been endowed with the

largest share of total resources of manganese ore in the country at 216 million tonnes (44%). These resources have mainly been distributed in 3 districts, namely Keonjhar (141 million tonnes), Sundergarh (72 million tonnes) and Bolangir (2 million tonnes).

Karnataka has 111 million tonnes (22%) resources estimated in nine districts, major being Chitradurga and North Kanara (29 million tonnes each), Bellary (25 million tonnes), Tumkur (19 million tonnes), Shimoga (4 million tonnes) and Belgaum district (3 million tonnes).

Madhya Pradesh has 57.7 million tonnes (12%) resources mainly in Balaghat (41 million tonnes) and Jabalpur district (7.4 million tonnes).

Maharashtra has 36.6 million tonnes (7%) resources estimated in Nagpur (20.5 million tonnes) and Bhandara (16 million tonnes) districts. Goa has 34.4 million tonnes (7%) of resources mostly found in South Goa (26.7 million tonnes).

The balance 8% resources are accounted together by other states namely Andhra Pradesh, Gujarat, Jharkhand, Rajasthan, Telangana and West Bengal.

An increase of about 65.89 million tonnes resources has been recorded in the inventory as on 1.4.2015 as compared to earlier inventory as on 1.4.2010.

Of the total net increase of 26 million tonnes resources in Odisha, about 13.6 million tonnes have been accounted in Sundergarh district mainly due to addition of 6 new deposits (3 deposits each in leasehold private and freehold areas). In Keonjhar district, about 12.5 million tonnes resources increased due to addition of 1 leasehold (private) and 3 freehold deposits.

In the state of Goa, an increase of 20.8 million tonnes of resources is reported from South Goa, due to addition of 5 new private leasehold deposits and re-estimation of resources in one private leasehold deposit.

In Karnataka, an addition of 14.9 million tonnes of resources is recorded. The increase is mainly due to re-assessment of resources in one of the leasehold private deposit in Bellary district and addition of new leasehold private deposits, 4 in Chitradurga and one in Dawangere districts.

In Maharashtra, a net increase of 2.5 million tonnes resources have been recorded mostly due to addition of one leasehold private and one freehold deposit in Nagpur district.

Table - 1 : Reserves/Resources of Manganese Ore as on 1.4.2015 vis-à-vis 1.4.2010
(By Lease Status/Grade)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2015		Net change	1.4.2015		Net change	1.4.2015		Net change
	1.4.2015	1.4.2010		1.4.2015	1.4.2010		1.4.2015	1.4.2010	
All India : Total	93475	141977	(-)48502	403399	288003	(+)114396	495874	429980	(+)65894
Battery/Chemical	-	112	(-)112	167	240	(-)73	167	352	(-)185
Ferro-Manganese	11237	12869	(-)1632	25282	22585	(+)2697	36520	35455	(+)1065
Medium	3274	8694	(-)5420	49409	40034	(+)9375	52683	48728	(+)3955
BF	11235	49894	(-)38659	129662	95961	(+)33701	140897	145855	(-)4958
Mixed	1512	1763	(-)251	19518	11617	(+)7901	21030	13380	(+)7650
Medium & BF Mixed	9800	12263	(-)2463	37957	32024	(+)5933	47757	44287	(+)3470
Ferro Manganese,									
Medium & BF mixed	37844	34541	(+)3303	41878	31162	(+)10716	79723	65703	(+)14020
Ferro Manganese & BF	2618	2425	(+)193	23280	13902	(+)9378	25898	16327	(+)9571
Low (-) 25 % Mn	1905	1647	(+)258	27386	7505	(+)19881	29291	9152	(+)20139
Others	8798	7870	(+)928	8780	6053	(+)2727	17578	13923	(+)3655
Unclassified	1370	7167	(-)5797	22115	20216	(+)1899	23484	27383	(-)3899
Not Known	95	2731	(-)2636	1400	6702	(-)5302	1495	9433	(-)7938
Beneficiable	3786	-	(+)3786	15565	-	(+)15565	19351	-	(+)19351
Freehold : Total	-	602	(-)602	121697	110099	(+)11598	121697	110701	(+)10996
Battery/Chemical	-	-	-	142	142	No change	142	142	No change
Ferro-Manganese	-	-	-	9654	11358	(-)1704	9654	11358	(-)1704
Medium	-	533	(-)533	12735	12086	(+)649	12735	12619	(+)116
BF	-	69	(-)69	57848	45955	(+)11893	57848	46024	(+)11824
Mixed	-	-	-	9285	9285	No change	9285	9285	No change
Medium & BF Mixed	-	-	-	13277	13255	(+)22	13277	13255	(+)22
Ferro Manganese,									
Medium & BF mixed	-	-	-	3408	3375	(+)33	3408	3375	(+)33
Ferro Manganese & BF	-	-	-	3614	3614	No change	3614	3614	No change
Low (-) 25 % Mn	-	-	-	5280	5087	(+)193	5280	5087	(+)193
Others	-	-	-	560	216	(+)344	560	216	(+)344

(Contd.)

National Mineral Inventory - An Overview

Table-1 (Concld.)

Lease status/Grade	Reserves			Remaining resources			Total resources		
	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change	1.4.2015	1.4.2010	Net change
Unclassified	-	-	-	4607	4607	No change	4607	4607	No change
Not Known	-	-	-	1288	1118	(+)170	1288	1118	(+)170
Leasehold (Private)	59760	78675	(-)18915	200443	126106	(+)74337	260203	204781	(+)55422
Battery/Chemical	-	63	(-)63	8	98	(-)90	8	161	(-)153
Ferro-Manganese	10478	12274	(-)1796	14928	10994	(+)3934	25405	23268	(+)2137
Medium	3274	7773	(-)4499	36139	27537	(+)8602	39414	35310	(+)4104
BF	10187	23463	(-)13276	53275	38698	(+)14577	63461	62161	(+)1300
Mixed	1512	1531	(-)19	9958	192	(+)9766	11470	1723	(+)9747
Medium & BF Mixed	2986	3057	(-)71	15582	4564	(+)11018	18568	7621	(+)10947
Ferro Manganese,									
Medium & BF mixed	15641	11721	(+)3920	10442	4391	(+)6051	26083	16113	(+)9970
Ferro Manganese & BF	2618	2425	(+)193	19666	10288	(+)9378	22284	12713	(+)9571
Low (-) 25 % Mn	1154	441	(+)713	8100	2353	(+)5747	9254	2794	(+)6460
Others	8798	7871	(+)927	8206	5822	(+)2384	17005	13693	(+)3312
Unclassified	1370	5323	(-)3953	15682	15592	(+)90	17052	20915	(-)3863
Not Known	95	2731	(-)2636	102	5574	(-)5472	198	8305	(-)8107
Beneficial	1648	-	(+)1648	8354	-	(+)8354	10002	-	(+)10002
Leasehold (Public)	33715	62699	(-)28984	80259	51798	(+)28461	113974	114497	(-)523
Battery/Chemical	-	49	(-)49	17	-	(+)17	17	49	(-)32
Ferro-Manganese	760	595	(+)165	701	233	(+)468	1461	828	(+)633
Medium	-	388	(-)388	535	411	(+)124	535	799	(-)264
BF	1049	26361	(-)25312	18539	11307	(+)7232	19588	37668	(-)18080
Mixed	-	231	(-)231	275	2140	(-)1865	275	2371	(-)2096
Medium & BF Mixed	6814	9205	(-)2391	9098	14205	(-)5107	15912	23411	(-)7499
Ferro Manganese,									
Medium & BF mixed	22203	22819	(-)616	28028	23396	(+)4632	50232	46215	(+)4017
Low (-) 25 % Mn	751	1206	(-)455	14006	65	(+)13941	14757	1271	(+)13486
Others	-	-	-	14	14	No change	14	14	No change
Unclassified	-	1844	(-)1844	1825	17	(+)1808	1825	1861	(-)36
Not Known	-	-	-	10	10	No change	10	10	No change
Beneficial	2138	-	(+)2138	7211	-	(+)7211	9349	-	(+)9349

figures rounded off.

In Madhya Pradesh, a net increase of 2 million tonnes resources have been recorded mostly due to addition of one leasehold public deposit in Balaghat district.

The state of Telangana was carved out from Andhra Pradesh on 2nd June 2014, therefore when compared to 2010 resources, they are all additional resources for this state. Adilabad is the only district of Telangana reported manganese ore resources.

The state of Jharkhand is the only state reported decrease of about 2 million tonnes of resources mainly due to reassessment of two leasehold public deposits and one leasehold private deposit in Singhbhum(W) district.

Manganese resources are also reported from the states of Gujarat, Rajasthan and W. Bengal, where it shows no significant change in resources as compared to 2010 inventory.

Total 25 new deposits were added during the five year span of National Mineral Inventory i.e. from 1-04-2010 to 1-04-2015, which include 17 leasehold private, 7 freehold and 1 leasehold public deposits. This has resulted in cumulative addition of about 21 million tonnes of resources.

A sizeable quantity of the total resources of manganese ore constituting about 153 million tonnes (31%), has been estimated under inferred and reconnaissance categories. These resources are based on a very limited and preliminary exploration. A detailed exploration in these areas may improve the confidence level of resources.

A total of 696 deposits have been covered in the inventory as on 1.4.2015. Out of this, 302 deposits are in freehold and 394 deposits in leasehold (361 leasehold - private and 33 leasehold - public).

**Table – 2 : Total Resources of Manganese Ore as on 1.4.2015 vis-à-vis 1.4.2010
(By States)**

			(In '000 tonnes)
State	Total Resources		Net Change
	As on 1.4.2015	As on 1.4.2010	
All India : Total	495874	429980	(+) 65894
Andhra Pradesh	17645	17598	(+) 47
Goa	34416	13596	(+) 20820
Gujarat	2888	2954	(-) 66
Jharkhand	11629	13709	(-) 2080
Karnataka	111064	96188	(+) 14876
Madhya Pradesh	57713	55725	(+) 1988
Maharashtra	36619	34153	(+) 2466
Odisha	216403	190047	(+) 26356
Rajasthan	5727	5810	(-) 83
Telangana	1568	-	(+) 1568
West Bengal	200	200	No Change

figures rounded off.

Table -3 : District-wise Reserves/Resources of Manganese Ore as on 1.4.2015

(In '000 tonnes)

State/District	Reserves	Remaining Resources	Total Resources
All India : Total	93475	402399	495874
Andhra Pradesh	4958	12687	17645
Srikakulam	-	100	100
Vizianagaram	4958	12587	17545
Goa	-	34416	34416
North Goa	-	7695	7695
South Goa	-	26722	26722
Gujarat	708	2180	2888
Panchmahals	-	2180	2180
Chhota Udaipur	708	-	708
Jharkhand	2168	9461	11629
Singhbhum (West)	2168	9461	11629
Karnataka	9346	101718	111064
Belgaum	-	3433	3433
Bellary	5325	19482	24807
Chikmagalur	-	130	130
Chitradurga	1129	28235	29363
Dawangere	211	1123	1334
Gadag	-	25	25
North Kanara	-	29307	29307
Shimoga	-	3893	3893
Tumkur	2682	16089	18771
Madhya Pradesh	29891	27823	57713
Balaghat	19927	21484	41411
Chhindwara	1799	848	2647
Jabalpur	5074	2398	7472
Jhabua	1206	120	1326
Katni	1884	2972	4857
Maharashtra	13710	22910	36619
Bhandara	6791	9320	16111
Nagpur	6919	13590	20508
Odisha	30643	185760	216403
Bolangir	-	1649	1649
Keonjhar	10041	131157	141198
Koraput	-	1248	1248
Mayurbhanj	-	57	57
Rayagada	-	345	345
Sambalpur	-	120	120
Sundergarh	20603	51183	71786
Rajasthan	1697	4030	5727
Banswara	1697	3520	5217
Udaipur	-	510	510
Telangana	355	1214	1568
Adilabad	355	1214	1568
West Bengal	-	200	200
Midnapur	-	200	200

figures rounded off.