Indian Minerals Yearbook 2022

(Part- III : MINERAL REVIEWS)

61th Edition

MANGANESE ORE

(ADVANCE RELEASE)

GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES

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20 Manganese Ore

Manganese occurs as silvery grey in colour and is very hard and brittle in nature. It is always available in combination with iron, laterite and other minerals. Manganese in alloy form is an essential input in steel making and steel is one of the most important indicators of growth in the industrial economy of any country. In recent years, the trade volume of manganese ore has grown world over. Presently, India is one of the major importers of manganese ore in the world. Manganese ores of major commercial importance are: (i) pyrolusite (MnO_2, Mn about 63.2%); (ii) psilomelane (manganese oxide, containing water and varying amounts of oxides of Ba, K and Na as impurities; Mn commonly 45–60%); (iii) manganite ($Mn_2O_3.H_2O$, Mn about 62.4%); and (iv) braunite ($3Mn_2O_3$, $MnSiO_8$, Mn about 62% and SiO_2 about 10%). Indian manganese ore deposits occur mainly as metamorphosed bedded sedimentary deposits associated with Gondite Series(Archaeans) of Madhya Pradesh (Balaghat, Chhindwara & Jhabua districts), Maharashtra (Bhandara & Nagpur districts), Gujarat (Panchmahal district), Odisha (Sundargarh district) and with Kodurite Series (Archaeans) of Odisha (Ganjam & Koraput districts) and Andhra Pradesh (Srikakulam & Visakhapatnam districts).

RESERVES/RESOURCES

The total reserves/resources of manganese ore in the country as on 1.04.2020 has been placed at 503.62 million tonnes as per NMI database, based on UNFC system. Out of these, 75.04 million tonnes are categorised as Reserves and the balance 428.58 million tonnes are in the Remaining Resources category. Gradewise, Ferromanganese grade accounts for 8%, Medium grade 7 %, BF grade 29% and the remaining 56 % are of Mixed, Low, Beneficiable, Others, Unclassified, and Not-known grades including 0.16 million tonnes of Battery/Chemical grade.

Statewise, Odisha tops the total reserves/resources with 34% share followed by Karnataka (24%), Madhya Pradesh (12%), Maharashtra (12%), Goa (7%) , Andhra Pradesh (6%) and Jharkhand (3%). Rajasthan, Gujarat, Telangana and West Bengal together shared the remaining 2% resources (Table- 1).

EXPLORATION & DEVELOPMENT

The exploration and development details, if any, are covered in the Review on "Exploration & Development" under "General Reviews".

PRODUCTION AND STOCKS

The production of manganese ore at 2696 thousand tonnes during 2021-22 was almost same as compared to the previous year.

There were 127 reporting mines during the year 2021-22 as against 145 in the previous year. Besides, manganese ore production was reported as associate mineral by 14 mines in 2021-22.

In 2021-22, thirty two public sector mines jointly accounted for 46% of the total production. The contribution of captive mines was 11% of the total production.

As per the gradewise composition of production during 2021-22, 69% of the total production was of lower grade (Below 35% Mn), 23% of medium grade (35-46% Mn) and 8% was of higher grade (above 46% Mn). Production of manganese dioxide was at 11,848 tonnes (0.44%) during the year.

Madhya Pradesh is the leading producing State of manganese ore accounting for 31.50% of total production during 2021-22 followed by Maharashtra 27% and Odisha 19% (Tables- 2 to 6).

The mine-head closing stock was 2830 thousand tonnes for the year 2021-22 as against 2727 thousand tonnes in the previous year [Tables - 7 (A) and 7 (B)].

The average daily employment of labour in manganese ore mines was 11424 in 2021-22 as against 10191 in the previous year.

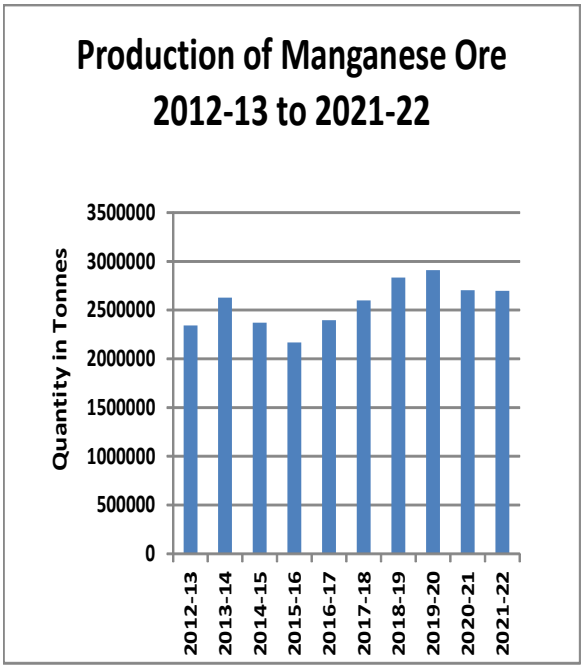


Table – 1 : Reserves/Resources of Manganese Ore as on 01.04.2020 (P)

(By Grades/States)

(In '000 tonnes)

State/Grade	Reserves				Remaining Resources								Total
	Proved	Probable		Total	Feasibility	Pre-feasibility		Measured	Indicated	Inferred	Reconnsaissance	Total	Resources
	STD111	STD121	STD122	(A)	STD211	STD221	STD222	STD331	STD332	STD333	STD334	(B)	(A+B)
All India : Total	**61510**	**6081**	**7450**	**75041**	**76106**	**51162**	**80580**	**29600**	**61205**	**117986**	**11944**	**428583**	**503624**
By Grades													
Battery/Chemical	-	-	-	-	4	9	12	4	26	112	–	167	167
Ferromanganese	15011	602	1203	16816	5040	3775	4574	1069	3771	6556	466	25251	42067
Medium	3767	28	55	3850	3871	5182	3860	448	3933	13171	116	30581	34430
BF	7995	892	1006	9892	31427	7102	19447	14391	12904	51139	2135	138545	148437
Mixed	954	75	488	1517	262	654	8259	2024	177	12472	-	23848	25365
Medium & BF mixed	5415	425	367	6207	5123	6817	6805	48	9977	14201	1907	44877	51084
Ferromangane medium & BF mixed	24030	482	-	24512	10480	16598	13844	80	16673	1987	33	59696	84208
Ferromanganese & BF	357	1583	99	2039	256	614	11775	1260	912	4380	-	19197	21236
Low (-)25% Mn	1038	522	711	2271	8474	802	7162	3916	4060	3920	152	28485	30756
Beneficiable	28	1314	1164	2506	1938	315	356	6069	8366	2708	7074	26826	29332
Others	2618	102	1447	4167	5242	5746	1699	207	120	1757	-	14772	18939
Unclassified	297	57	911	1265	3810	3508	2730	84	130	3837	62	14160	15425
Not-Known	-	-	-	-	178	39	59	-	156	1747	-	2178	2178
By States													
Andhra Pradesh	6848	1006	234	8088	1000	718	1990	465	10730	6838	15	21756	29844
Goa	31	-	34	65	14028	1479	9177	48	262	9442	-	34436	34501
Gujarat	695	-	-	695	-	-	-	-	-	2180	-	2180	2875
Jharkhand	132	433	493	1059	1394	1046	5198	-	1395	4658	-	13691	14749
Karnataka	15363	-	101	15464	14723	2373	9604	18700	7306	55471	329	108508	123972
Madhya Pradesh	13551	2230	3777	19558	3830	7037	4212	127	23351	1943	-	40499	60057
Maharashtra	16537	835	361	17733	1891	15354	16304	-	5055	2585	113	41303	59036
Odisha	7535	1511	2423	11469	39091	22916	33968	10260	12219	32657	8947	160058	171528
Rajasthan	568	-	-	568	-	100	-	-	-	1690	-	1790	2359
Telangana	250	66	26	342	150	139	126	-	886	320	2540	4162	4503
West Bengal	-	-	-	-	-	-	-	-	-	200	-	200	200

Figures rounded off

Table – 2 : Principal Producers of Manganese Ore, 2021-22

Name & address of Producer	Location of mine	
	State	District
MOIL Ltd, MOIL Bhavan, 1A- Katol Road, Nagpur- 440 013 Maharashtra	Madhya Pradesh Maharashtra	Balaghat Bhandara Nagpur
The Sandur Manganese & Iron Ores Ltd, Satyalaya. Door No.266 ,(Old no.80), Ward No. 1, Behind Taluk office, Sandur-583119, Karnataka.	Karnataka	Bellary
Tata Steel Ltd, Bombay House, 24, Homi Mody Street, Fort, Mumbai- 400 001, Maharashtra	Odisha	Keonjhar
Mr. Debabrata Behera,, 1234/P Govind Prasad, Bomikhal, Rasulgarh, Bhubaneswar-751010 Odisha	Odisha	Keonjhar
R.B.S.S. Durga Prasad & F.N. Das, Mor Bhavan, Ramdaspeth, Nagpur-440010, Maharashtra.	Andhra Pradesh	Vizianagaram
S. R. Ferro Alloys, 9, Sidheswar Colony, Distt Jhabua- 457 661. Madhya Pradesh.	Madhya Pradesh	Jhabua
S.K. Sarawagi & Co. Pvt. Ltd, Sarojini Naidu Saranisubham, 5TH floor, Distt - Kolkata-700017, West Bengal.	Andhra Pradesh	Vizianagaram
M/s. Panaik Minerals Pvt Ltd., Boneikalajoda, Barbil, Keonjhar, Distt.Keonjhar-758038, Odisha.	Odisha	Sundargarh
Shobha Mineral, 765, Napier Town, Jabalpur Jabalpur-482001 Madhya Pradesh.	Madhya Pardesh	Jabalpur
M/s.S.S. Enterprises 40APR Society, Katnga, Jabalpur, Jabalpur-482001 Madhya pradesh	Madhya Pardesh	Jabalpur

Table–3 : Principal Producers of Manganese Dioxide, 2021-22

Name & address of Producer	Location of mine	
	State	District
MOIL Ltd, MOIL Bhavan, 1A-Katol Road, Nagpur-440 013, Maharashtra.	Maharashtra	Bhandara

Table – 4 : Production of Manganese Ore, 2019-20 to 2021-22
(By States)

(Quantity in tonnes; Value in ₹'000)

State	2019-20		2020-21		2021-22	
	Quantity	Value	Quantity	Value	Quantity	Value
India	**2910186**	**18849100**	**2703313**	**17415461**	**2695991**	**22240539**
Andhra Pradesh	330530	1059109	250255	848621	204002	1141924
Jharkhand	4785	36126	-	-	-	-
Karnataka	336745	2194098	371045	2359787	380004	3311881
Madhya Pradesh	962576	6220812	934548	5684482	849221	6831964
Maharashtra	720518	6096443	646513	6485961	731730	8445151
Odisha	537325	3161505	482915	1948077	512591	2421292
Rajasthan	9937	29811	6940	20820	8008	25626
Telangana	7770	51196	11097	67713	10435	62701

Table – 5 (A) : Gradewise Production of Manganese Ore, 2020-21 (By Sectors/States/Districts)

(Quantity in tonnes; Value in ` '000)

State/ District	No. of mines	MnO_2	Production By Grades: Mn Content				Total	
			46% and above	35% to below 46%	25% to below 35%	below 25%	Quantity	Value
India	**145(13)**	**14219**	**251283**	**564789**	**952900**	**920122**	**2703313**	**17415461**
Public Sector	32	13611	125571	382958	517831	112579	1152550	10667873
Private Sector	113(13)	608	125712	181831	435069	807543	1550763	6747588
Andhra Pradesh	**24**	**-**	**-**	**15140**	**52814**	**182301**	**250255**	**848621**
Vizianagaram	24	-	-	15140	52814	182301	250255	848621
Goa	**2***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
South Goa	2*	-	-	-	-	-	-	-
Karnataka	**9(3)**	**-**	**420**	**51393**	**162376**	**156856**	**371045**	**2359787**
Ballari	1(2)	-	420	51393	153446	84599	289858	2191930
Chitradurga	2	-	-	-	-	18700	18700	33660
Davanagere	4	-	-	-	8870	48740	57610	126211
Tumakuru	2(1)	-	-	-	60	4817	4877	7986
Madhya Pradesh	**47(7)**	**-**	**102651**	**99231**	**374430**	**358236**	**934548**	**5684482**
Balaghat	37	-	102301	96805	323228	129004	651338	5106994
Chhindwara	4	-	350	1954	2492	5199	9995	63153
Jabalpur	5(7)	-	-	-	-	217261	217261	286619
Jhabua	1	-	-	472	48710	6772	55954	227716
Maharashtra	**27**	**13611**	**24468**	**316677**	**247509**	**44248**	**646513**	**6485961**
Bhandara	5	13611	4907	243117	119918	13245	394798	4168317
Nagpur	22	-	19561	73560	127591	31003	251715	2317644
Odisha	**29(3)**	**608**	**123744**	**82348**	**98334**	**177881**	**482915**	**1948077**
Keonjhar	17(2)	608	123744	81982	90621	147360	444315	1778205
Raygada	1	-	-	-	544	-	544	5163
Sundargarh	11(1)	-	-	366	7169	30521	38056	164709
Rajasthan	**1**	**-**	**-**	**-**	**6940**	**-**	**6940**	**20820**
Banswara	1	-	-	-	6940	-	6940	20820
Telangana	**6**	**-**	**-**	**-**	**10497**	**600**	**11097**	**67713**
Adilabad	**6**	**-**	**-**	**-**	**10497**	**600**	**11097**	**67713**

Figures in parentheses indicate associate mines of iron ore, laterite, limestone and Clay (others)

** Only labour reported.*

Table – 5 (B) : Gradewise Production of Manganese Ore, 2021-22 (P) (By Sectors/States/Districts)

(Quantity in tonnes; Value in ₹'000)

State/ District	No. of mines	Production By Grades: Mn Content					Total	
		MnO_2	46% and above	35% to below 46%	25% to below 35%	below 25%	Quantity	Value
India	**127(14)**	**11848**	**219170**	**611189**	**1071347**	**782437**	**2695991**	**22240539**
Public Sector	32	11848	138321	405783	601448	81414	1238814	13495771
Private Sector	95(14)	-	80849	205406	469899	701023	1457177	8744768
Andhra Pradesh	**19**	**-**	**-**	**26050**	**48135**	**129817**	**204002**	**1141924**
Vizianagaram	19	-	-	26050	48135	129817	204002	1141924
Goa	**1***	**-**	**-**	**-**	**-**	**-**	**-**	**-**
South Goa	1*	-	-	-	-	-	-	-
Karnataka	**8(3)**	**-**	**-**	**62021**	**199186**	**118797**	**380004**	**3311881**
Ballari	1(2)	-	-	62021	182231	47767	292019	3027081
Chitradurga	1	-	-	-	4200	9300	13500	54286
Davanagere	4	-	-	-	12755	50430	63185	206869
Tumakuru	2(1)	-	-	-	-	11300	11300	23645
Madhya Pradesh	**44(7)**	**-**	**109234**	**107580**	**390397**	**242010**	**849221**	**6831964**
Balaghat	33	-	109234	104812	343141	95726	652913	6115860
Chhindwara	4	-	-	1266	2631	15464	19361	90076
Jabalpur	6(7)	-	-	200	-	127425	127625	362323
Jhabua	1	-	-	1302	44625	3395	49322	263705
Maharashtra	**26**	**11848**	**29465**	**326144**	**320497**	**43776**	**731730**	**8445151**
Bhandara	5	11848	2249	251088	181134	22936	469255	5403710
Nagpur	21	-	27216	75056	139363	20840	262475	3041441
Odisha	**20(4)**	**-**	**80471**	**89394**	**99115**	**243611**	**512591**	**2421292**
Keonjhar	13(3)	-	80471	87025	83980	174094	425570	2054403
Rayagada	1	-	-	-	225	-	225	1865
Sundargarh	6(1)	-	-	2369	14910	69517	86796	365024
Rajasthan	**1**	**-**	**-**	**-**	**8008**	**-**	**8008**	**25626**
Banswara	1	-	-	-	8008	-	8008	25626
Telangana	**8**	**-**	**-**	**-**	**6009**	**4426**	**10435**	**62701**
Adilabad	8	-	-	-	6009	4426	10435	62701

Figures in parentheses indicate associated mines with Clay (others), iron ore, laterite and limestone.

** Only labour reported.*

Table – 6 : Production of Manganese Ore, 2020-21 and 2021-22 (By Frequency Groups)

(Quantity in tonnes)

Production Group	No. of mines		Production		Percentage in total Production		Cumulative percentage	
	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22
Total	**145(13)**	**127(14)**	**2703313**	**2695991**	**100.00**	**-**	-	
Up to 1000	66(3)	56(2)	10697	11918	0.40	0.44	0.40	0.44
1001 — 5000	29(2)	23(4)	67522	72789	2.50	2.70	2.90	3.14
5001 — 10000	16(2)	13(2)	131006	112447	4.85	4.17	7.75	7.31
10001 — 20000	10(2)	13(1)	176444	186682	6.53	6.92	14.28	14.23
20001 — 30000	5(2)	2(1)	184198	80942	6.80	3.01	21.08	17.24
30001 — 40000	4	4(2)	135160	202876	5.00	7.53	26.08	24.77
40001 — 50000	1	3(1)	40557	184442	1.50	6.84	27.58	31.61
50001 and above	14(2)	13(1)	1957729	1843895	72.42	68.39	100.00	100.00

Figures in parentheses indicate associated mines of iron ore, laterite, limestone and clay (others).

Table – 7 (A) : Mine-head Closing Stocks of Manganese Ore, 2020-21 (By States/Grades)

(In tonnes)

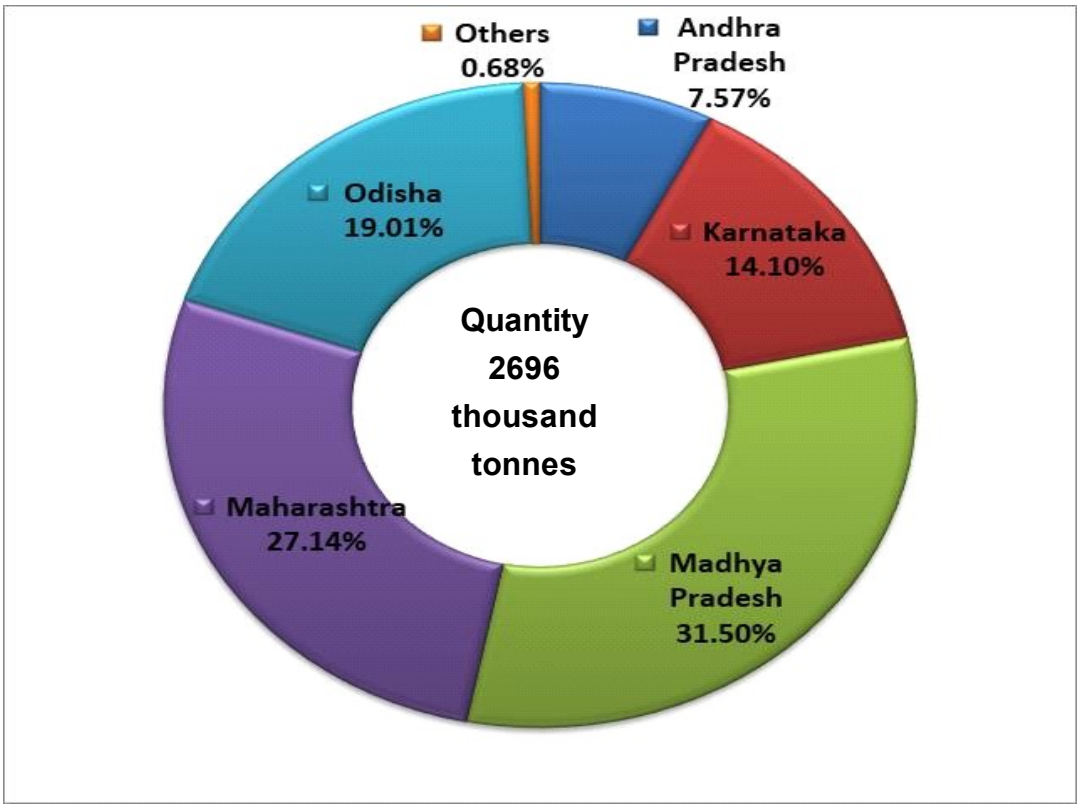
State	Grades : Mn content					
	MnO_2	46% and above	35% to below 46%	25% to below 35%	below 25%	Total Quantity
India	13311	23906	81029	359582	2249015	2726843
Andhra Pradesh	-	-	109	40561	39826	80496
Goa	-	-	-	-	-	-
Jharkhand	-	1	-	120	0	121
Karnataka	-	420	8403	67228	236418	312469
Madhya Pradesh	-	12744	27174	44673	814545	899136
Maharashtra	12062	3297	24126	20965	24522	84972
Odisha	1249	7444	21217	180580	1132827	1343317
Rajasthan	-	-	-	5165	-	5165
Telangana	-	-	-	290	877	1167

Table – 7 (B) : Mine-head Closing Stocks of Manganese Ore, 2021-22(P) (By States/Grades)

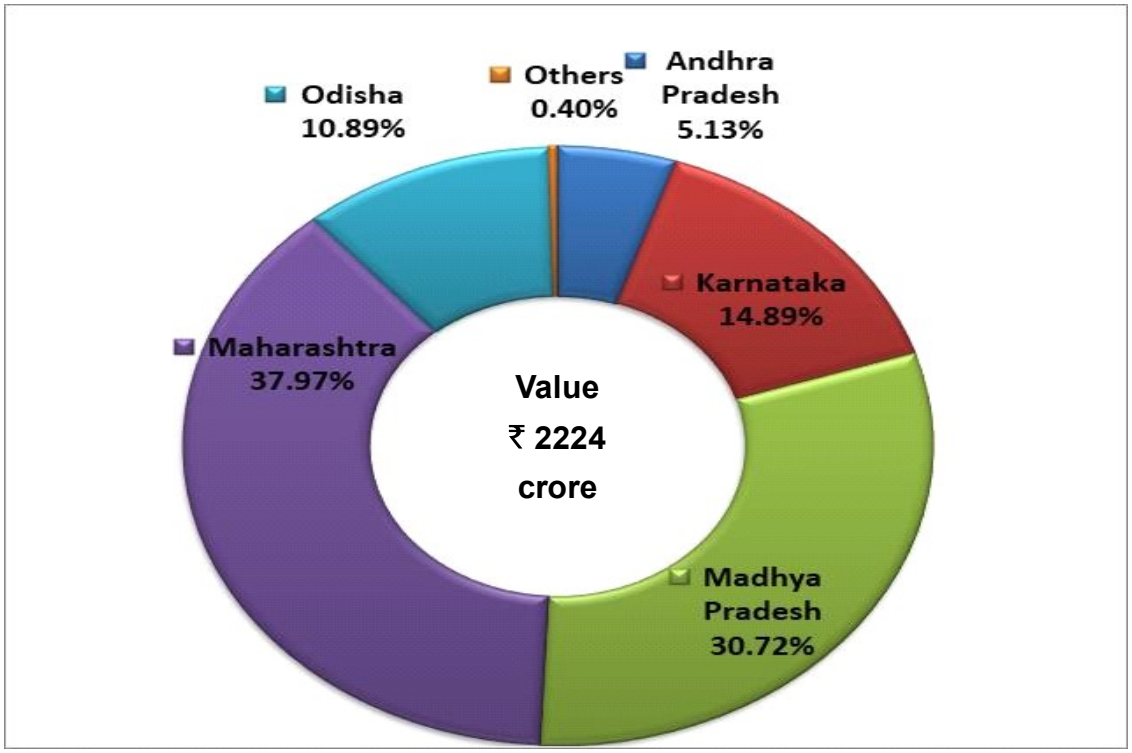
(In tonnes)

State	Grades : Mn content					Total Quantity
	MnO_2	46% and above	35% to below 46%	25% to below 35%	below 25%	
India	**10489**	**15746**	**73505**	**382808**	**2347885**	**2830433**
Andhra Pradesh	-	-	2054	41408	41694	85156
Goa	-	-	-	-	-	-
Jharkhand	-	1	-	120	-	121
Karnataka	-	-	6441	85977	232954	325372
Madhya Pradesh	-	10338	18094	42643	852346	923421
Maharashtra	10108	2488	17126	22643	27350	79715
Odisha	381	2919	29790	189310	1192556	1414956
Rajasthan	-	-	-	103	-	103
Telangana	-	-	-	604	985	1589

Quantity of Manganese Production in Different States, 2021-22



Value of Manganese Production in Different States, 2021-22



MINING, PROCESSING, MARKETING & TRANSPORT

Manganese ore mining in the country is carried out by opencast as well as by underground methods. At present, India's largest manganese ore producer MOIL operates its underground and opencast mines located in the Nagpur and Bhandara districts of Maharashtra and Balaghat district of Madhya Pradesh. All these mines are about a century old. The Balaghat Mine is the largest mine of the Company. The mine has now reached a mining depth of about 435 meters from the surface. Dongri Buzurg Mine located in the Bhandara district of Maharashtra is an opencast mine that produces manganese dioxide ore used by dry battery industry. All the underground mines are mechanised or semi-mechanised and adopt cut-and-fill method of stoping. In Kandri mine of MOIL, hydraulic sand stowing has been introduced in place of manual filling system. This system is faster, cheaper and requires less manpower. Conventional timber supports are replaced by cable bolting pre-mining support to increase safety and productivity. In Balaghat underground mechanised mine, overhand flat back cut-and-fill method with rock bolting support and sand stowing is being practised to fill up the voids with a level interval of 30 m and size of stope block as 30 m x 30 m to 60 m x 30 m. Side Dump Loaders (SDL) of 0.66 cu. m bucket capacity were also deployed in underground levels for mechanised loading of run -of- mine (r.o.m.) in stopes. Tyre mounted Rocker shovel was also introduced in Balaghat mine for mechanised loading of ore from ore drive at stripping area. Deepening of high speed vertical shaft up to 750 m in Balaghat, up to 169 m in Chikla mine, up to 245 m in Kandri mine and up to 160 m in Mansar mine of MOIL is in progress. Sinking of high speed vertical shafts up to 160 m, 330 m and 324 m is in progress at Mansar, Gumgaon and Ukwa mines, respectively. The MOIL has set a target to produce 3.50 million tonnes of manganese ore by 2030.

The open-pits are usually worked manually by benching method, using portable compressors, jackhammers and dumper trucks. Tirodi mine of MOIL is worked by opencast mechanised method. Height of the benches in overburden is kept at 7.5 m and that in the ore at 6 m. Drills of 100 mm dia. with 0.9 to 1.7 m^3 capacity of shovels and 20–25 tonnes dumpers are used for production, loading and transport.

The workings vary from shallow depth in lateritoid-type deposits in Odisha, Karnataka and Goa to deep operations in deposits of a more regular nature found in Madhya Pradesh, Maharashtra and Andhra Pradesh. Bulldozers are used where the overburden is soft. In a few cases, tramways are laid up to the working face and loaded tubs are pushed manually to the dumping ground. In Odisha, Goa and Karnataka, ore is worked by loosening the ground either with crowbars or by blastings. After picking up manganese ore, the waste is removed to the dumping ground. Mining of bedded ore in Madhya Pradesh and Maharashtra is generally carried out by drilling and blasting.

Hand sorting and visual grading are adopted widely to upgrade the ore. Scrubber is also used for washing the ore at some mines. Manual as well as mechanised jigging is done in a few mines.

Most of the producers market manganese ore directly to the industrial units. In a few cases, especially in case of supplies of special type of ore or a semi-processed product, middlemen are found to be involved in marketing. Ore from mines is usually sold to the domestic consumers, either at the rail-head or ex-plant. In cases of Integrated Iron & Steel and Ferromanganese Industry, the units draw their supplies largely from captive mines. However, special ore types for specific purposes are obtained from other producers.

Transport of manganese ore from mines to rail-head is generally done by trucks from where it is transported to ports by rail wagons. From the mine of MOIL in Balaghat district, Madhya Pradesh, the ore is transported by aerial ropeways to the loading bins at the rail-heads. Battery loco was introduced for underground transport of r.o.m. tub from ore pass chute to skip bunker. In Goa, ore in bulk is carried by road-cum-river routes up to Mormugao harbour and in a few cases by rail where the mines are close to the railways. The ore loading at river-head into barges is carried out mechanically.

ENVIRONMENTAL PROTECTION

In order to embark upon low-carbon growth trajectory, MOIL has taken up some measures, such as, recycle and reuse of water for beneficiation, construction of strong parapet walls and afforestation in all its mines.

Over the past years, MOIL has set up wind farms and solar power plants, in strategic locations to maximize power generation and have entered into power purchase agreements with governmental bodies. These initiatives have resulted in the production of millions of kilowatt-hours (kWh) of electricity, leading to significant reductions in the carbon emissions.

The MOIL planted saplings across various mines to mitigate the effects of climate change and enhancing local biodiversity. This helps in carbon sequestration and improves the overall health of the surrounding ecosystems.

Manganism-a health condition attributed to manganese poisoning-has been reported to be detected in case of five persons working with BHP Billiton's Metalloys, a manganese alloy plant in South Africa. Manganism shows symptoms similar to Parkinson's disease and psychotic behaviour but conditions of development of the disease are not properly understood.

USES & SPECIFICATIONS

Classification of manganese ore, ferruginous manganese ore, siliceous manganese ore, dioxide manganese ore, and manganiferous iron ore is laid down by BIS vide specification no. IS: 11895-2006 (Reaffirmed March, 2019). Manganese ore is an important material in iron and steel metallurgy, where it is used both in the ore form and as ferromanganese. Manganese improves strength, toughness, hardness and workability of steel, acts as a deoxidiser and desulphuriser, and also helps in getting ingots free from blowholes. About 90 to 95% world production of manganese ore is used in metallurgy of iron and steel. High amount of phosphorous makes the manganese ore unsuitable for its metallurgical use, whereas, high phosphorous and high iron contents make it unsuitable for Battery Industry. Manganese has no satisfactory substitute in its major applications. The specifications of manganese ore by different industries are detailed below:

In Iron & Steel Industry, the BIS:11281-2005 (Reaffirmed March, 2021) specification is laid down for manganese ore. However, specifications based on the user industry indicate that normally manganese ore containing 28 to 35% Mn is used. Ore size generally varies from 10 to 40 mm. For other constituents general stipulations are Fe: 16 to 22%, SiO_2: 2 to 8%, Al_2O_3: 5 to 8% and P: 0.3% maximum.

For manganese ore used in Ferromanganese Industry, besides manganese content, other important considerations are high manganese to iron ratio and a very low content of deleterious phosphorous. Specifications of manganese ore for production of ferromanganese are prescribed by the Bureau of Indian Standards vide IS: 4763-2006, (Second Revision, Reaffirmed January, 2017). BIS has also laid down the specifications of manganese ore sinters for blending for ferromanganese production vide IS:12596-1989 (Reaffirmed March, 2019). User's specifications of manganese ore for Ferromanganese/Silico-manganese industries are furnished in Table-8.

Manganese dioxide is used for manufacturing dry cell batteries in which it functions as a depolariser of hydrogen. For use in dry cell battery, BIS has prescribed Specification No. IS:11153-1996 (First Revision, Reaffirmed Sept. 2015) for manganese dioxide. Suitability of ore depends not only on manganese dioxide content but also on its crystallographic structure. Ore having predominant gamma structure is required. The ore must have high manganese dioxide and low iron content, a certain degree of porosity and moderate hardness. It should be free from metallic compounds, such as, copper, nickel, cobalt, arsenic, lead and antimony, which are electronegative to zinc (container). User industry specifications are MnO_2 70% (min.), Fe 6% (max.), moisture 4% (max.), Cu 0.02% (max.) and Ni 0.02% (max.). The size requirement lays down that 90%

Table – 8 : User's Specifications of Manganese Ore in different Ferromanganese/Silico-manganese Units

Name and location of plant	Specifications of ore consumed
Andhra Pradesh	
Ferro-Alloys Corp. Ltd, Shreeram Nagar, Dist. Vizianagram.	Mn: 70-75% C: 6-8%
Nav Bharat Ferro-Alloys Ltd, Paloncha, Khammam.	Mn: 28-50%, P: 0.1-0.3%, SiO_2: 8-30% Fe :5-8%
Chhattisgarh	
Sarda Energy & Minerals Ltd Raipur.	Mn: 28-30% (Low P) Mn: 37-40%, 42-44%, 46% (High P)
Monnet Ispat & Energy Ltd, Raipur	Mn: 28-46% Fe : 5-16% SiO_2: 6-34% S & P: 0.05-0.28% Size: 0-100% (lumps & fines)
Hira Power & Steel Ltd, Raipur	
i) Jain Carbides & Chemicals Ltd, Raipur (Unit-I). ii) Jain Carbides & Chemicals Ltd, Raipur (Unit-II).	Mn: 32-35% Mn: 32-35%
Karnataka	
S. R. Chemicals & Ferro Alloys, Belagavi. Thermit Alloys Ltd, Shivamogga.	Mn: 38-40%, Fe: 18-23% Mn: 48-54%
Kerala	
INDSIL Hydro Power and Manganese Ltd, Pallatheri, Palakkad.	Fe-Mn ratio 1:3 to 5% (50%) 1:5 to 8% (50%) P: 0.05% max. Al_2O_3: 3 to 5% max.
Madhya Pradesh	
MOIL, Ferro-manganese Plant, Bharveli, Dist. Balaghat.	Mn: 46-48%
Maharashtra	
Chandrapur Ferro Alloys Ltd, (Formerly Maharashtra Electro-Smelt Ltd) Chandrapur.	Mn: 38-46%, Fe: 6-17% SiO_2+Al_2O_3: 10-16% P: 0.5-0.25% max. +100 mm, 10% max. +10-100 mm, 80-85% min. +5-10 mm, 10% max.
Nagpur Power & Industries Ltd, Nagpur.	Mn: 42-46%, Fe: 7-8%, SiO_2: 3.6%, Al_2O_3: 6-7%, P: 0.10-0.12% Size: 5-25 mm
Natural Sugar & Allied Ind. Ltd, Sai Nagar Ranjani, Dist. Osmanabad	Size: 10-80 mm
Odisha	
Tata Steel Ltd, Joda, Kendujhar.	Mn: 43%, min. (for FeMn) 36% min. (for SiMn), Size: 10-75 mm (for FeMn & SiMn) **Captive Mn Ore** **Size (mm)** Below 35% (10-75) + 5% 35% to 46% (10-75) + 5% 46% to 49% (10-75) + 5% Dioxide + 49% (10-75) + 5% **MOIL, Mn Ore** Below 35% (10-75) + 5% Imported Mn 46 to 49% (10-75) + 5%
Tamil Nadu	
Silcal Metallurgical Ltd, Ramanuja Nagar, Coimbatore.	Mn: 35-40% & above Size: 35 mm
West Bengal	
Cosmic Ferro Alloys Ltd, Bankura.	Size: 75 mm

material should pass through 300 mesh and 100% through 100 mesh. User industry specifications for electrolytic manganese dioxide (EMD) used in dry cell battery are MnO_2 90% (min.), Fe (as oxide) 0.05% (max.), moisture 4% (max.), Pb 0.15% (max.) and pH 4.5 to 5.6. The size requirements are same as those for manganese dioxide ore. Manganese ore is also used in the manufacture of various chemicals, such as, potassium permanganate, hydroquinone, manganese sulphate, manganese chloride, manganese phosphate, etc. In Chemical Industry, generally high-grade material is used for potassium permanganate. Ore containing MnO_2 80% (min.), SiO_2 5% (max.), Fe_2O_3 5% (max.) and 200 to 250 mesh ore size is used. In Glass Industry, ore analysing MnO_2 80% (preferably 86% min.), Fe_2O_3 5% (preferably 0.75% max.), SiO_2 2.8% (max.), Al_2O_3 1.1% (max.), BaO 1.3% (max.), CaO 0.4% (max.) and MgO 0.4% (max.) is consumed.

Requirement of manganese dioxide for Explosive and Pyrotechnic compositions as laid down in IS : 5713-1981 (First Revision, Reaffirmed April 2021) by BIS.

Pyrolusite is used generally to impart glaze to the pottery and to make coloured bricks. It also finds use as driers for oils, varnishes and paints. Manganese sulphide is used in the manufacture of salts and in calico printing. Manganese chloride is used in cotton textile as a bronze dye. Manganese salts are used in photography and in leather and matchbox industries.

CONSUMPTION

The apparent consumption of manganese ore in 2021-22 was about 9 million tonnes as against the 10 million tonnes during preceding year, i.e., decreased by about 11 % in 2021-22.

INDUSTRY

Manganese alloys are the largest produced ferroalloys in the world. For production of one tonne of ferromanganese, about 2.6 tonnes of manganese ore, 0.5 tonne of reductant and 3 MWh of electricity inputs are required. As per Indian Ferro Alloys Producers' Association (IFAPA), the total installed capacity of manganese alloys including ferromanganese/silicomanganese in the country was estimated to be around 3.16 million tonnes per annum. MOIL has 1,500 tpy Electrolytic Manganese Dioxide (EMD) Plant at Dongri Buzurg mine and . In 2021-22, about 1,202 tonnes of EMD was produced as against 1,070 tonnes in 2020-21. The MOIL has 12,000 tpy Ferromanganese plant in Balaghat. In 2021-22 about 10,245 tonnes of ferro-manganese was produced as compared to 8,851 tonnes in the previous year.

Ferromanganese

The total production of various types of manganese alloys (high-carbon ferromanganese, medium-carbon ferromanganese and low-carbon ferromanganese) was about 5.18 lakh tonnes in 2018-19 as per Monthly Statistics of Mineral Production (March, 2020). Further, production of ferromanganese during 2019-20 to 2021-22 is not available in the source. It is to be noted that the data coverage is partial and does not reflect the actual production.

Silicomanganese

Silicomanganese is a combination of 60-70% Mn, 10-20% silica and about 20% carbon. As per Monthly Statistics of Mineral Production (March, 2022), production of silico-manganese was reported at 3,49,414 tonnes in 2021-22 as compared to 3,29,295 tonnes in 2020-21. It is to be noted that the data coverage is partial and does not reflect the actual production.

The major factor driving the production of manganese alloys is high production growth of low nickel austenitic stainless steel. India is emerging as the largest producer of this steel where manganese is added substituting the expensive nickel.

Iron & Steel

Manganese ore is an important and indispensable input raw material for steel making and steel production and its consumption is among the key indicators of industrial development in any country. Manganese ore in the form of ferro and silicomanganese alloys are the most essential ingredients in the production of steel, both crude and stainless. Iron & Steel Industry was the second major consumer of manganese ore wherein manganese ore is used directly as a blast furnace feed.

Dry Battery

Satisfactory performance of battery is usually the determining factor for use of battery grade manganese ore. Several factors control the suitability of manganese ore for dry-cell manufacture. Dry battery Industry consumes EMD along with natural manganese dioxide ore.

RESEARCH & DEVELOPMENT

The CSIR-Institute of Minerals and Materials Technology, Bhubaneswar, in its Annual Report - 2021-22 has reported about a project for recovery of Mn as EMD from low grade ores and secondaries for energy applications. It is mentioned therein that India's manganese ore deposits are predominantly low grade which constitues > 60% of total reserves and remains under-utilized due to very high iron content.SO_2 is well known reductant for its favourable kinetics in leaching manganese. However, commercial SO_2 (99.9%) are either imported or produced through a concentrator plant,making it energy and cost intensive to implement for the production of Electrolytic Manganese Dioxide (EMD).In the current project, low concentration SO_2 produced from typical sulphur burners,was successfully utilized in reductive acid leaching to recover Mn from low grade ores and ferroalloy slags, instead of concentrated 99% SO_2 gas in a novel approach.

This approach makes concentrated 99% SO_2 redundant in the leaching of Mn. The electrolytic manganese dioxide (EMD) produced subsequent to purification from the leach liquors from ferroalloy slag and low grade ores containing 10-20% Mn was found to satisfy and surpass quality criteria for battary applications as per BIS (IS11153:1996).

As mentioned in the Annual Report 2022-23 of Manganese Ore India Ltd. (MOIL) the significance of R&D projects of the MOIL are as under :

(A) Mine Ventilation

Studies for ventilation at stope and concreted drive at Beldongri Mine are being carried out by Visvesvaraya National Institute of Technology (VNIT) Nagpur. This will provide a detailed report of pressure, quantity and hygrometric survey of Beldongri Mine and will also include study of the main fans running in the mine. Further, VNIT will also advice MOIL for suitable measures for improvement of ventilation in the existing condition.

(B) Mines Safety - Mining subsidence and patents

1. The work of evaluation of support requirement in stope and stability assessment of drivages at Beldongri Mine has been awarded to Central Institute of Mining and Fuel Research (CIMFR) for working towards enhanced safety parameter and innovation in the field by virtue of scientific studies and their implementation.

2. MOIL has installed rock mechanics instruments in seven underground mine for safety of men and machines in the stopes as per the guideline of DGMS. For the use and implementation of the procured Rock mechanic instruments for mines safety, experts at CSIR-CIMFR have been approached and they have been given the work of instrumentation, installation and interpretation of the strata conditions for a period of one year for the seven underground mines.

(C) R&D labs

A Rock Mechanics lab has been established at head office to conduct Geo technical studies of various lithology available at all Mines. This will help to know various parameters of rocks which will be useful in preparation of mining plans and method of working for better safety and higher productivity. It helps to generate technical reports for onward submission to regulatory authorities like DGMS, IBM, DGM etc. for safer mining operations with higher productivity.

(D) R&D Studies

1. In accordance with proposal of the Strategic Management Group to have a trial stoping method by sub level stoping to increase the rate of production and safety standards, CSIR-CIMFR has been engaged for “Evaluation of stoping parameters, stope design, and implementation of planned sublevel stoping at Chikla-B section of Chikla Mine” This trial stoping method, if successful and economic, may open new possibilities for MOIL to modify recent stoping methods for better productivity and safety.

2. Modification, mechanization and evaluation of Modified Stoping parameters of Cut and Fill Stoping at Ukwa Mine is being carried out by Indian Institute of Technology, Banaras Hindu

University (IIT-BHU) to bring about positive changes and transform the age old system of stoping at MOIL Mines.

(E) Exploration

Government of Madhya Pradesh has granted reservation in two districts i.e. in Balaghat and Chhindwara under the tripartite MoU of MOIL with the Government of Madhya Pradesh and MP State Mining Corporation Limited to explore the manganese bearing areas within four districts of Madhya Pradesh viz. Jabalpur, Balaghat, Chhindwara & Jhabua.

SUBSTITUTES

Cost and technology militate against substitution in major applications. However, for economic reasons, there is only limited substitution in minor applications in Chemical and Battery industries. The Steel Industry has, however, made great strides in economising the use of manganese, largely through changes in steel-making techniques.

TECHNICAL POSSIBILITIES

The deep-sea nodules can be a potential resource of manganese in the next decades to come. There is a trend towards using lower grades of ores in ferromanganese production. New steel-making practices and techniques are reducing the amount of manganese consumed in the process. However, counter balancing this to some extent is a trend towards higher manganese specifications for modern steels.

TRADE POLICY

Export Policy

The policy on export as per ITC (HS), 2018 schedule 2 is as follows:

HS Code	Item description	Policy
2602 00	Manganese ores and concentrates including ferruginous Manganese ores and concentrates with Manganese content of 20% or more calculated on the dry wet.	Free

ITC(HS) based Import Policy

As per ITC(HS), 2022 Schedule 1 Import Policy Section V, MINERAL PRODUCTS , Chapter 26 Ores, Slag and Ash, imports of manganese ore and concentrates including ferruginous manganese ores and concentrates containing 20% or more manganese (calculated on dry weight basis), agglomerated manganese ore sinters, etc. are freely allowed.

WORLD REVIEW

The total world reserves of manganese ore is approximately 1700 million tonnes of metal content which is unevenly distributed (Table-11). Reserves are located in South Africa (38%), China, Australia & Brazil (16% each), Ukraine (8 %), Gabon (3%) and India (2%).

World production of manganese ore in 2021 was estimated to be around 56 million tonnes as compared to 50 million tonnes in 2020. South Africa was the leading producer contributing about 34% followed by Gabon (16%), China (12%), Australia (11%), Ghana (6%), India (4%), Ukraine and Brazil (3% each) and Ivory Coast (2%) (Table-12).

FOREIGN TRADE

Exports

Exports of manganese ore (total) increased by 38% to 113606 tonnes in 2021-22 from 82363 tonnes in 2020-21. Out of the total exports in 2021-22, only 21 tonnes of manganese ore having +46% or more Mn of value ₹10,59,000 was exported. Exports of manganese ore (others) were at 70636 tonnes in 2021-22 as compared to 22045 tonnes in the preceding year. About 62 % of exports of Manganese ore total were to China followed by Indonesia with 22% and UAE with 16%. Exports of manganese oxide decreased by 27% to 21148 tonnes in 2021-22 as against 29116 tonnes in 2020-21. Manganese dioxide exports in 2021-22 increased by 18 % to 5297 tonnes from 4476 tonnes in 2020-21. In 2021-22, exports of manganese & alloys (including waste & scrap) increased by 31 % to 616 tonnes as compared to 469 tonnes in the previous year. Exports of manganese & alloys (wrought & unwrought) in 2021-22 increased by 53 % to 288 tonnes as compared to 188 tonnes in the previous year. (Tables- 13 to 26).

Imports

Imports of manganese ore (total) increased rapidly by 60% to 6.50 million tonnes in 2021-22 from 4.05 million tonnes in the previous year. In 2021-22 about 44 % of imports of Manganese ore total were to South Africa followed by Gabon (21%), UAE (10%), Australia (8%) and Singapore (6%). Out of the total manganese ore imported, the contribution of manganese ore having +46% Mn was 185816 tonnes (3%), manganese ore having 35-46% Mn was 4464163 tonnes (69%), manganese ore having 30 to 35% Mn was 929453 tonnes (14%) and manganese ore (others) was 613709 tonnes (10%). In 2021-22, imports of manganese dioxide were 11268 tonnes. In 2021-22, imports of manganese oxide (Other than Manganese Dioxide) were 17956 tonnes. During 2021-22, imports of manganese & alloys (including waste and scrap) were 40463 tonnes, out of which manganese & alloys (wrought & unwrought) comprised 39842 tonnes. Imports of manganese & alloys NES were 621 tonnes during 2021-22. (Tables- 27 to 40).

Table – 11 : World Reserves of Manganese Ore (By Principal Countries)

(In '000 tonnes of metal content)

Country	Reserves
World: Total (rounded off)	**1700000**
Australia[a]	270000
Brazil	270000
Myanmar	NA
China	280000
Cote d'Ivoire	NA
Gabon	61000
Georgia	NA
Ghana	13000
India*	34000
Kazakhstan, (concentrate)	5000
Malaysia	NA
Mexico	5000
South Africa	640000
Ukraine, (concentrate)	140000
Vietnam	NA
USA	–
Other countries	Small

Source: *USGS Mineral Commodity Summaries, 2023.*

(a): Joint Ore Reserve Committee compliant reserves were about 135 million tonnes.

NA: Not Available; - : Zero

**: India's total reserves/resources of manganese ore as per NMI database based on UNFC system have been estimated at 503.62 million tonnes as on 1.4.2020.*

Table – 12 : World Production of Manganese Ore (By Principal Countries)

(In '000 tonnes)

Country (Rounded off)	2019	2020	2021
World:Total	**57400**	**50400**	**56200**
South Africa	17009	16198	19156
Gabon	7186	8147	9241
China[e]	6650	6700	6500
Australia	6649	4752	6285
Ghana	5383	2357	3336
India*(a)	2910	2688	2457[e]
Ukraine	1854	1850[e]	1850[e]
Brazil	3726	2385	1775
Ivory Coast	1182	1325	1400[e]
Other countries	4807	4002	4201

Source: *BGS, World Mineral Production, 2017-2021.*

(a): Years ended 31st March following that stated.

(e) : Estimated

** India's production of manganese ore in 2019-20, 2020-21and 2021-22, was 2,910 thousand tonnes, 2,703 thousand tonnes and 2,696 thousand tonnes respectively.*

Table – 13 : Exports of Manganese Ore : Total (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**82363**	**974940**	**113606**	**588189**
UAE	10050	113362	18363	320917
China	47714	755315	70569	203405
Indonesia	22000	60852	24620	61977
Nepal	3	39	15	906
Bangladesh	23	590	22	667
Germany	-	-	13	257
Tanzania	-	-	4	41
Djibouti	-	-	++	19
Bhutan	2544	44283	-	-
Ethiopia	10	235	-	-
Other countries	19	264	-	-

Figures rounded off

Table – 14 : Exports of Manganese Ore (46% or more Mn)
(By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**10**	**330**	**21**	**1059**
Nepal	-	-	15	880
Bangladesh	-	-	6	160
Djibouti	-	-	++	19
Ethiopia	10	235	-	-
Kenya	++	87	-	-
Bhutan	++	8	-	-

Figures rounded off

Table – 15 : Exports of Manganese Ore (Others)
(By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**22045**	**61658**	**70636**	**206256**
China	-	-	70569	203405
Indonesia	22000	60852	50	2527
Germany	-	-	13	257
Tanzania	-	-	4	41
Nepal	3	39	++	26
Bangladesh	23	590	-	-
Sri Lanka	17	150	-	-
Burundi	2	27	-	-

Figures rounded off

Table – 16: Exports of Manganese Oxide
(By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**29116**	**1357914**	**21148**	**986863**
France	2540	77879	2981	112403
UAE	2548	129789	2266	110738
Indonesia	850	44317	2007	96612
South Africa	27	1505	1613	70554
Vietnam	1785	91663	1408	67281
Russia	944	44763	1269	61125
Turkey	944	49469	1137	54639
Canada	1198	62730	922	49244
Thailand	1152	59102	970	48018
U S A	8580	368161	864	41132
Other Countries	8548	428536	5711	275117

Figures rounded off

Table – 17: Exports of Manganese Dioxide (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**4476**	**227849**	**5297**	**258822**
UAE	2343	118891	2041	99555
Indonesia	29	3574	1208	57569
Netherlands	121	9223	175	13013
Poland	222	14003	198	11608
Turkey	75	5541	143	9996
Ireland	100	7431	125	9587
Bangladesh	168	6503	200	7137
Kenya	267	5122	314	6891
Philippines	45	2482	80	4499
Lithuania	75	4790	75	4167
Other Countries	1031	50289	738	34800

Figures rounded off

Table – 18: Exports of Manganese Oxide (Other than Manganese Dioxide) (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**24640**	**1130065**	**15851**	**728041**
France	2540	77879	2981	112355
South Africa	--	--	1573	68236
Vietnam	1709	88671	1322	64411
Russia	944	44664	1223	59172
Canada	1175	60835	903	47509
Thailand	1152	59062	960	46352
Turkey	869	43928	994	44643
U S A	8521	363677	863	40163
Indonesia	821	40743	799	39043
Australia	780	38520	634	31416
Other Countries	6129	312086	3599	174741

Figures rounded off

Table – 19: Exports of Manganese & Alloys (Incl. Waste & Scrap) (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**469**	**375616**	**616**	**631089**
France	283	270014	435	444943
Korea	12	19625	40	69463
Slovenia	4	7050	10	17225
Italy	3	5590	6	13749
Indonesia	13	4887	17	9159
Brazil	2	1690	14	8155
U S A	++	142	4	7207
Malaysia	14	6433	11	6561
Armania	++	820	4	6435
Romania	3	6233	3	5555
Other countries	135	53132	72	42637

Figures rounded off

Table – 20: Exports of Manganese & Alloys (Wrought/Unwrought) (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**188**	**106409**	**288**	**307908**
France	2	997	108	122952
Korea	12	19580	40	69463
Slovenia	4	7050	10	17225
Italy	3	5590	6	13749
Indonesia	13	4887	17	9159
Brazil	2	1690	14	8155
U S A	++	142	4	7150
Malaysia	14	6433	11	6561
Armenia	++	820	4	6435
Romania	3	6233	3	5555
Other countries	135	52987	71	41504

Figures rounded off

Table - 21 : Exports of Manganese :Wrought (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**2**	**688**	**15**	**6909**
UAE	++	54	4	2335
Brazil	1	288	7	2333
Turkey	-	-	2	1338
Malaysia	1	197	1	459
UK	++	89	1	239
Kenya	++	60	++	177
Bangladesh	-	-	++	19
Colombia	-	-	++	9

Figures rounded off

Table - 22: Exports of Manganese & Alloys Unwrought (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**186**	**105721**	**273**	**300999**
France	2	997	108	122952
Korea	12	19580	40	69463
Slovenia	4	7050	10	17225
Italy	3	5590	6	13749
Indonesia	13	4887	17	9159
U S A	++	142	4	7150
Armenia	++	820	4	6435
Malaysia	13	6236	10	6102
Brazil	1	1402	7	5822
Romania	3	6233	3	5555
Other countries	135	52784	64	37387

Figures rounded off

Table - 23 : Exports of Manganese & Alloys : NES (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**249**	**260113**	**280**	**298469**
France	249	260039	279	297383
Iran	-	-	++	489
Burundi	-	-	1	422
UAE	-	-	++	78
Serbia	++	32	++	58
Nepal	-	-	++	35
Bhutan	++	9	++	4
South Africa	++	33	-	-

Figures rounded off

Table - 24 : Exports of Manganese Ore (35% Or More but Below 46% Mn) (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**40108**	**698245**	**18379**	**321424**
UAE	2950	42986	18363	320917
Bangladesh	-	-	16	507
China	34614	610984	-	-
Bhutan	2544	44275	-	-

Figures rounded off

Table – 25 : Exports of Manganese Ore (Ferruginous, 10% or More but Below 30% Mn) (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**-**	**-**	**24570**	**59450**
Indonesia	-	-	24570	59450

Figures rounded off

Table – 26 : Exports of Manganese Waste & Scrap (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**32**	**9094**	**48**	**24712**
France	32	8978	48	24608
USA	-	-	++	57
Finland	-	-	++	47
China	++	71	-	-
Korea	++	45	-	-

Figures rounded off

Table – 27: Imports of Manganese Ore : Total (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**4058590**	**55242138**	**6500149**	**96424799**
South Africa	1754857	19894390	2851947	39684590
Gabon	680154	14231857	1371423	22766318
Australia	594049	8301688	525185	9318282
UAE	271579	2768760	670246	8982902
Singapore	274626	3848144	361419	6085643
France	54122	740638	169445	2949149
Brazil	175622	2410870	116332	1981983
Cote d'Ivoire	88229	930035	130809	1843644
China	6961	91530	180050	929402
Hong Kong	67871	816612	56643	764844
Other countries	90520	1207614	66650	1118042

Figures rounded off

Table – 28 : Imports of Manganese Ore (46% or more Mn) (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**182048**	**3156903**	**185816**	**3797474**
South Africa	86851	1261006	79968	1372767
Cote d'Ivoire	7498	182123	15361	578038
Gabon	44376	868826	18260	371803
Togo	2988	104634	10635	308569
UAE	1674	30651	18776	299148
Tanzania	6699	142804	12882	245260
Brazil	19112	323322	11807	215841
Zambia	8074	126450	8838	164417
China	1675	57809	3935	154284
Singapore	-	-	2611	44872
Other countries	3101	59278	2743	42475

Figures rounded off

Table – 29 : Imports of Manganese Ore (35% or more but below 46% Mn) (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**2942210**	**39070738**	**4464163**	**69812534**
South Africa	1110682	13627236	1586523	23294128
Gabon	591454	8582003	1066980	18872085
Australia	564638	7842159	525185	9318244
UAE	119220	1523011	347876	5461931
Singapore	209991	3021710	319536	5336575
France	54122	740638	169445	2949149
Brazil	138475	1937166	101505	1739842
Cote d' Ivoire	43080	430075	115448	1265606
China	-	-	176115	775118
Hong Kong	58600	726597	40055	578472
Other countries	51948	640143	15495	221384

Figures rounded off

Table – 30 : Imports of Manganese Ore (30% or more but below 35% Mn) (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**449497**	**3789163**	**929453**	**9970098**
South Africa	316047	2636360	500060	4878179
Gabon	13727	165331	244564	3024339
UAE	63170	523655	151239	1736259
Hong Kong	6272	51995	15969	175569
Switzerland	5415	48189	9511	77333
Brazil	406	4063	2852	24645
Seychelles	-	-	1644	17667
Kenya	-	-	1905	16654
Tanzania	-	-	691	8744
Oman	-	-	910	8723
Other countries	44460	359570	108	1986

Figures rounded off

Table – 31 : Imports of Manganese Ore (Others) (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**316464**	**8006608**	**613709**	**9915315**
South Africa	154548	1718613	504069	8449594
Singapore	57397	770684	39272	704196
Gabon	30597	4615697	41619	498091
UAE	19838	192360	27214	248967
Switzerland	-	-	1314	11979
Brazil	7233	104655	168	1655
Tanzania	-	-	53	645
Zambia	192	2973	++	68
USA	++	143	++	64
Australia	29411	459529	++	38
Other countries	17248	141954	++	18

Figures rounded off

Table – 32 : Imports of Manganese Dioxide (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**12996**	**1016479**	**11268**	**1267664**
China	7569	851348	6935	1071153
Belgium	2906	96802	2948	156270
Peru	1530	38100	995	30035
Australia	437	8731	389	8877
Germany	++	293	1	1121
UK	1	501	++	148
Netherlands	132	7198	++	28
USA	++	151	++	22
Japan	++	43	++	10
UAE	370	9841	--	--
Other Countries	51	3471	--	--

Figures rounded off

Table – 33 : Imports of Manganese Oxide (Other than Manganese Dioxide) (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**12691**	**548601**	**17956**	**835748**
South Africa	10704	275017	15955	408863
China	692	95792	875	242837
Belgium	631	107854	712	116864
Germany	39	15108	56	21778
UAE	389	39938	43	14922
USA	62	7846	67	10356
Spain	--	--	150	10218
Australia	--	--	47	4535
Italy	25	1763	50	3339
Japan	++	247	1	2014
Other Countries	149	5036	++	22

Figures rounded off

Table – 34 : Imports of Manganese & Alloys (Incl. Waste & Scrap) (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**37247**	**4933243**	**40463**	12752665
China	35674	4602138	38617	12027868
Belgium	-	-	235	184760
Hong Kong	554	72961	893	184245
Indonesia	-	-	297	143740
France	125	111625	137	109310
Taiwan	100	11964	96	41921
Korea	69	10730	95	28398
Sweden	40	38775	12	12770
UK	++	244	49	10527
UAE	++	7	27	5313
Other countries	685	84799	5	3813

Figures rounded off

Table – 35 : Imports of Manganese & Alloys (Wrought/Unwrought) (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**36890**	**4838565**	**39842**	**12402477**
China	35391	4566206	38445	11987299
Hong Kong	554	72961	893	184245
Indonesia	-	-	297	143740
Taiwan	100	11964	96	41921
Korea	69	10730	67	23429
Sweden	40	38775	12	12770
UAE	-	-	27	5312
South Africa	35	8288	5	3661
UK	++	40	++	12
Singapore	625	72940	-	-
Other countries	76	56661	++	88

Figures rounded off

Table – 36 : Imports of Manganese (Wrought) (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**758**	**96754**	**1915**	**681347**
China	660	83883	1890	676540
Hong Kong	98	12871	25	4807

Figures rounded off

Table – 37 : Imports of Manganese & Alloys NES (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**357**	**94678**	**621**	**350188**
Belgium	-	-	235	184760
France	74	58119	137	109310
China	283	35932	172	40569
UK	++	204	49	10515
Korea	-	-	28	4969
USA	++	279	++	48
Germany	++	137	++	16
UAE	++	7	++	1

Figures rounded off

Table – 38 : Imports of Manganese Ore (Ferruginous, 10% or more but Below 30% Mn) (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**168371**	**1218726**	**307008**	**2929378**
South Africa	86729	651175	181327	1689922
UAE	67677	499083	125141	1236597
Kenya	-	-	540	2859
Brazil	10396	41664	-	-
Singapore	3569	26804	-	-

Figures rounded off

Table –39 : Imports of Manganese Oxide (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**25687**	**1565080**	**29224**	**2103412**
China	8261	947140	7810	1313990
South Africa	10704	275017	15955	408863
Belgium	3537	204656	3660	273134
Peru	1530	38100	995	30035
Germany	39	15401	57	22899
UAE	759	49779	43	14922
Australia	437	8731	436	13412
USA	62	7997	67	10378
Spain	++	6	150	10218
Italy	26	1964	50	3339
Other Countries	332	16289	1	2222

Figures rounded off

Table - 40 : Imports of Manganese & Alloys: Unwrought (By Countries)

Country	2020-21 (R)		2021-22 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	**36132**	**4741811**	**37927**	**11721130**
China	34731	4482323	36555	11310759
Hong Kong	456	60090	868	179438
Indonesia	-	-	297	143740
Taiwan	100	11964	96	41921
Korea	69	10730	67	23429
Sweden	40	38775	12	12770
UAE	-	-	27	5312
South Africa	35	8288	5	3661
UK	++	40	++	12
Singapore	625	72940	-	-
Other countries	76	56661	++	88

Figures rounded off

FUTURE OUTLOOK

As per World Steel Association, per capita finished steel consumption in 2022 was 221.8 kg for world while the same for India was 86.7 kg in 2022-23. This difference in the per capita consumption of steel in itself reflects opportunities that are bound to occur for Steel Industry which in turn would positively impact the demand for manganese ore. Production of crude steel is the single most important factor that influences the demand for manganese ore. Steel Industry accounts for approximately 90% of the world demand for manganese. India's crude steel production grew from 89.79 million tonnes in 2015-16 to 120.293 million tonnes in 2021-22.This indicates strong growth of Steel Industry in the country as steel is the principal market accounting for 65 to 70% manganese consumption. The National Steel Policy, which aims to achieve a steel capacity of 300 million tonnes by 2030,with a corresponding demand for approximately 11 million tonnes of manganese ore, offers a promising future. MOIL being India's largest manganese ore producer, accounts for ~ 45% of the country's production has set a target to produce 3.50 million tonnes of manganese ore by 2030 and the gap in the demand will continue to be filled by imports in years to come.