

MANGANESE ORE



Indian Minerals Yearbook 2021

(Part- III : MINERAL REVIEWS)

60th 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 worldover. 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 ($Mn_2O_3 \cdot H_2O$, 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 (Archaean) of Madhya Pradesh (Balaghat, Chhindwara & Jhabua districts), Maharashtra (Bhandara & Nagpur districts), Gujarat (Panchmahal district), Odisha (Sundargarh district) and with Kodurite Series (Archaean) 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 6%, BF grade 29% and the remaining 57% are of Mixed, Low, 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

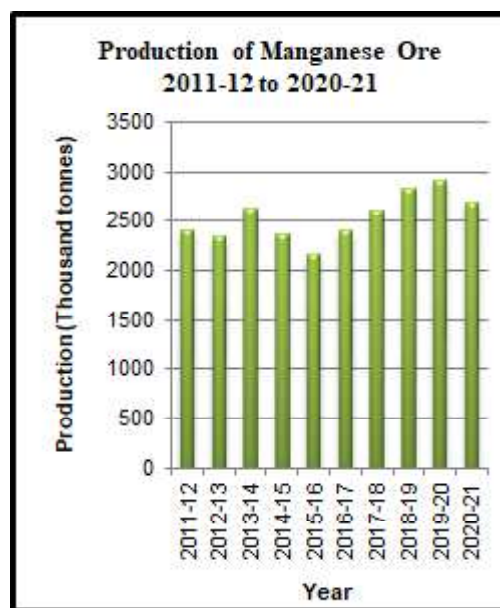
The production of manganese ore at 2688 thousand tonnes during 2020-21 decreased by about 8% as compared to that in the previous year.

There were 135 reporting mines during the year 2020-21 as against 137 in the previous year. Besides, manganese ore production was reported as associate mineral by 13 mines in 2020-21.

In 2020-21, 32 Public Sector mines jointly accounted for 43% of the total production. The contribution of captive mines was 13% of the total production.

As per the gradewise composition of production during 2020-21, 69% of the total production was of lower grade (Below 35% Mn), 21% of medium grade (35-46% Mn) and 9% was of higher grade (above 46% Mn). Production of manganese dioxide was at 14,219 tonnes (1%) during the year.

Madhya Pradesh is the leading producing State of manganese ore accounting for 34% of total production during 2020-21 followed by Maharashtra 24% and Odisha 18% (Tables- 2 to 6).



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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 Resources (A+B)								
	Proved		Probable		Total (A)		Feasibility		Pre-feasibility		Measured			Indicated		Inferred		Reconnaissance		Total (B)	
	STD111	STD121	STD122	STD121	STD122	STD121	STD221	STD222	STD331	STD332	STD333	STD334		STD335	STD336	STD337	STD338	STD339	STD340	STD341	STD342
All India : Total	61510	6081	7450	75041	80580	29600	61205	117986	11944	428583	503624										
By Grades																					
Battery/Chemical	-	-	-	-	9	4	12	12	4	26	112	-	167	167							
Ferromanganese	15011	602	1203	16816	4574	1069	3771	4574	1069	3771	6556	466	25251	42067							
Medium	3767	28	55	3850	3860	448	3933	3860	448	3933	13171	116	30581	34430							
BF	7995	892	1006	9892	19447	14391	12904	19447	14391	12904	51139	2135	138545	148437							
Mixed	954	75	488	1517	654	2024	177	8259	2024	177	12472	-	23848	25365							
Medium & BF mixed	5415	425	367	6207	6817	28	9977	6805	28	9977	14201	1907	44877	51084							
Ferromanganese medium & BF mixed	24030	482	-	24512	13844	80	16673	13844	80	16673	1987	33	59696	84208							
Ferromanganese & BF	357	1583	99	2039	614	1260	912	11775	1260	912	4380	-	19197	21236							
Low (>25% Mn)	1038	522	711	2271	802	3916	4060	7162	3916	4060	3920	152	28485	30756							
Beneficiable	28	1314	1164	2506	315	6069	8366	356	6069	8366	2708	7074	26826	29332							
Others	2618	102	1447	4167	5746	207	120	1699	207	120	1757	-	14772	18939							
Unclassified	297	57	911	1265	3508	84	130	2730	84	130	3837	62	14160	15425							
Not-Known	-	-	-	-	39	-	156	59	-	156	1747	-	2178	2178							
By States																					
Andhra Pradesh	6848	1006	234	8088	718	188465	10730	1990	188465	10730	6838	15	21756	29844							
Goa	31	-	34	65	1479	48	262	9177	48	262	9442	-	34436	34501							
Gujarat	695	-	-	695	-	-	-	-	-	-	2180	-	2180	2875							
Jharkhand	132	433	493	1059	1046	-	1395	5198	-	1395	4658	-	13691	14749							
Karnataka	15363	-	101	15464	2373	18700	7306	9604	18700	7306	55471	329	108508	123972							
Madhya Pradesh	13551	2230	3777	19558	7037	127	23351	4212	127	23351	1943	-	40499	60057							
Maharashtra	16537	835	361	17733	1891	-	5055	16304	-	5055	2585	113	41303	59036							
Odisha	7535	1511	2423	11469	22916	102600	12219	33968	102600	12219	32657	8947	160058	171528							
Rajasthan	568	-	-	568	100	-	-	-	-	-	1690	-	1790	2359							
Telangana	250	66	26	342	139	-	886	126	-	886	320	2540	4162	4503							
West Bengal	-	-	-	-	-	-	-	-	-	-	200	-	200	200							

Figures rounded off

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The mine-head closing stock was 2708 thousand tonnes for the year 2020-21 as against 6134 thousand tonnes for the previous year [(Tables - 7 (A) and 7 (B)].

The average daily employment of labour in manganese ore mines was 10947 in 2020-21 as against 11755 in the previous year.

Table – 2 : Principal Producers of Manganese Ore, 2020-21

Name & address of Producer	Location of mine	
	State	District
MOIL Ltd, MOIL Bhavan, 1A, Katol Road, Chhaoni, Nagpur- 440 013 Maharashtra	Madhya Pradesh	Balaghat
Tata Steel Ltd, Bombay House, 24, Homi Mody Street, Fort, Mumbai- 400 001, Maharashtra	Maharashtra	Bhandara Nagpur
The Sandur Manganese & Iron Ores Ltd, Satyalaya. Door No.266 ,(Old no.80), Ward No. 1, Behind Taluk office, Sandur-583119, Karnataka.	Odisha	Keonjhar
R.B.S.S. Durga Prasad & F.N. Das, Mor Bhavan, Ramdaspath, Nagpur-440010, Maharashtra.	Karnataka	Ballari
Suriyavansum Mining & Minerals (P) Ltd, 67/2, Patrakar Colony, Indore- 452 001 Madhya Pradesh.	Andhra Pradesh	Vizianagaram
Mr. Debabrata Behera,, 1234/P Govind Prasad, Bomikhal, Rasulgarh, Bhubaneswar-751010 Odisha	Madhya Pradesh	Jabalpur
S.K. Sarawagi & Co. Pvt. Ltd, Sarojini Naidu Saranisubham, 5 TH floor, Distt - Kolkata-700017, West Bengal.	Odisha	Keonjhar
S. R. Ferro Alloys, 9, Sidheswar Colony, Distt Jhabua- 457 661. Madhya Pradesh.	Andhra Pradesh	Vizianagaram
Bharat Parikh & Co. Ltd. 703/179 Sri Shanakara Keupa 4th Main 5th Cross Anjanaeaya Layout, Dawangere - 577004, Karanataka	Madhya Pradesh	Jhabua
J.K Minerals Main Road, Ward No.15, Hanuman Mandir Road, Balaghat - 481001 Madhya Pradesh.	Karnataka	Dawangere
	Madhya Pradesh	Balaghat

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Table-3 : Principal Producers of Manganese Dioxide, 2020-21

Name & address of Producer	Location of mine	
	State	District
MOIL Ltd, MOIL Bhavan, 1A-Katol Road, Nagpur-440 013, Maharashtra.	Maharashtra	Bhandara
Tata Steel Ltd, Bombay House 24, Homi Mody Street, Fort, Mumbai- 400 001, Maharashtra.	Odisha	Keonjhar

**Table – 4 : Production of Manganese Ore, 2018-19 to 2020-21
(By States)**

(Quantity in tonnes; Value in ₹'000)

State	2018-19		2019-20		2020-21 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	2832315	21640165	2910186	18849100	2688038	17942596
Andhra Pradesh	293679	1039486	330530	1059109	250255	987075
Jharkhand	4785	39839	4785	36126	-	-
Karnataka	332162	2276289	336745	2194098	371046	2347159
Madhya Pradesh	942738	7147719	962576	6220812	921147	5859476
Maharashtra	761985	7999939	720518	6096443	644484	6523574
Odisha	476821	3048997	537325	3161505	483069	2135372
Rajasthan	9410	28230	9937	29811	6940	20820
Telangana	10735	59666	7770	51196	11097	69120

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**Table – 5 (A) : Gradewise Production of Manganese Ore, 2019-20
(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	137(13)	22572	270184	554426	1245952	817052	2910186	18849100
Public Sector	24	20701	151401	363891	602092	157831	1295916	10741120
Private Sector	113(13)	1871	118783	190535	643860	659221	1614270	8107980
Andhra Pradesh	27	-	-	23770	76323	230437	330530	1059109
Vizianagaram	27	-	-	23770	76323	230437	330530	1059109
Goa	3*	-	-	-	-	-	-	-
South Goa	3*	-	-	-	-	-	-	-
Gujarat	1*	-	-	-	-	-	-	-
Panchmahal	1*	-	-	-	-	-	-	-
Jharkhand	2(1)	-	-	-	4785	-	4785	36126
Singhbhum (West)	2(1)	-	-	-	4785	-	4785	36126
Karnataka	9(3)	-	575	42824	209594	83752	336745	2194098
Ballari	2(2)	-	525	42799	199449	53476	296249	2059532
Chitradurga	2	-	-	-	-	11296	11296	28481
Davanagere	4	-	25	-	10085	15600	25710	94015
Tumakuru	1(1)	-	25	25	60	3380	3490	12070
Madhya Pradesh	42(5)	-	124851	106776	405373	325576	962576	6220812
Balaghat	32	-	124496	101886	345272	109583	681237	5385290
Chhindwara	4	-	355	2230	12137	4932	19654	133702
Jabalpur	5(5)	-	-	-	-	202115	202115	405090
Jhabua	1	-	-	2660	47964	8946	59570	296730
Maharashtra	20	20701	27152	294483	296138	82044	720518	6096443
Bhandara	2	20701	2303	209047	125436	63614	421101	3569413
Nagpur	18	-	24849	85436	170702	18430	299417	2527030
Odisha	27(4)	1871	117606	86573	236032	95243	537325	3161505
Keonjhar	14(2)	1504	117606	81493	158132	94444	453179	2379338
Raygada	1	-	-	-	234	-	234	1709
Sundargarh	12(2)	367	-	5080	77666	799	83912	780458
Rajasthan	1	-	-	-	9937	-	9937	29811
Banswara	1	-	-	-	9937	-	9937	29811
Telangana	5	-	-	-	7770	-	7770	51196
Adilabad	5	-	-	-	7770	-	7770	51196

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

* Only labour reported.

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Table – 5 (B) : Gradewise Production of Manganese Ore, 2020-21 (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	135(13)	14219	250520	563708	945571	914020	2688038	17942596
Public Sector	32	13611	125571	382957	517831	112579	1152549	10747111
Private Sector	103(13)	608	124949	180751	427740	801441	1535489	7195485
Andhra Pradesh	22	-	-	15140	52814	182301	250255	987075
Vizianagaram	22	-	-	15140	52814	182301	250255	987075
Goa	1*	-	-	-	-	-	-	-
South Goa	1*	-	-	-	-	-	-	-
Karnataka	9(3)	-	420	51394	162376	156856	371046	2347159
Ballari	1(2)	-	420	51394	153446	84599	289859	2187931
Chitradurga	2	-	-	-	-	18700	18700	21168
Davanagere	4	-	-	-	8870	48740	57610	130217
Tumakuru	2(1)	-	-	-	60	4817	4877	7843
Madhya Pradesh	43(7)	-	101888	97846	368476	352937	921147	5859476
Balaghat	33	-	101538	95420	317274	123610	637842	5045076
Chhindwara	4	-	350	1954	2492	5294	10090	61325
Jabalpur	5(7)	-	-	-	-	217261	217261	517675
Jhabua	1	-	-	472	48710	6772	55954	235400
Maharashtra	26	13611	24468	316676	246285	43444	644484	6523574
Bhandara	5	13611	4907	243117	119918	13245	394798	4195977
Nagpur	21	-	19561	73559	126367	30199	249686	2327597
Odisha	28(3)	608	123744	82651	98185	177881	483069	2135372
Keonjhar	17(2)	608	123744	82285	90318	147360	444315	1968297
Rayagada	1	-	-	-	544	-	544	4241
Sundargarh	10(1)	-	-	366	7323	30521	38210	162834
Rajasthan	1	-	-	-	6940	-	6940	20820
Banswara	1	-	-	-	6940	-	6940	20820
Telangana	5	-	-	-	10497	600	11097	69120
Adilabad	5	-	-	-	10497	600	11097	69120

Figures in parentheses indicate associated mines of iron ore, laterite, limestone and quartz.

* Only labour reported.

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**Table – 6 : Production of Manganese Ore, 2019-20 and 2020-21
(By Frequency Groups)**

(Quantity in tonnes)

Production Group	No. of mines		Production		Percentage in total Production		Cumulative percentage	
	2019-20	2020-21 (P)	2019-20	2020-21 (P)	2019-20	2020-21 (P)	2019-20	2020-21 (P)
Total	137(13)	135(13)	2910186	2688038	100.00	100.00	-	-
Up to 1000	64(1)	60(3)	8744	9485	0.30	0.35	0.3	0.35
1001 — 5000	25(5)	21(2)	74908	61718	2.57	2.30	2.87	2.65
5001 — 10000	14(1)	15(2)	119246	122748	4.10	4.57	6.97	7.22
10001 — 20000	11(3)	10(2)	195775	176444	6.73	6.56	13.7	13.78
20001 — 30000	6	5(2)	146764	184198	5.04	6.85	18.74	20.63
30001 — 40000	3	4	103485	135160	3.56	5.03	22.3	25.66
40001 — 50000	2(1)	1	142813	40557	4.91	1.51	27.21	27.17
50001 and above	14(1)	14(2)	2118451	1957728	72.79	72.83	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, 2019-20 (P)
(By States/Grades)**

(In tonnes)

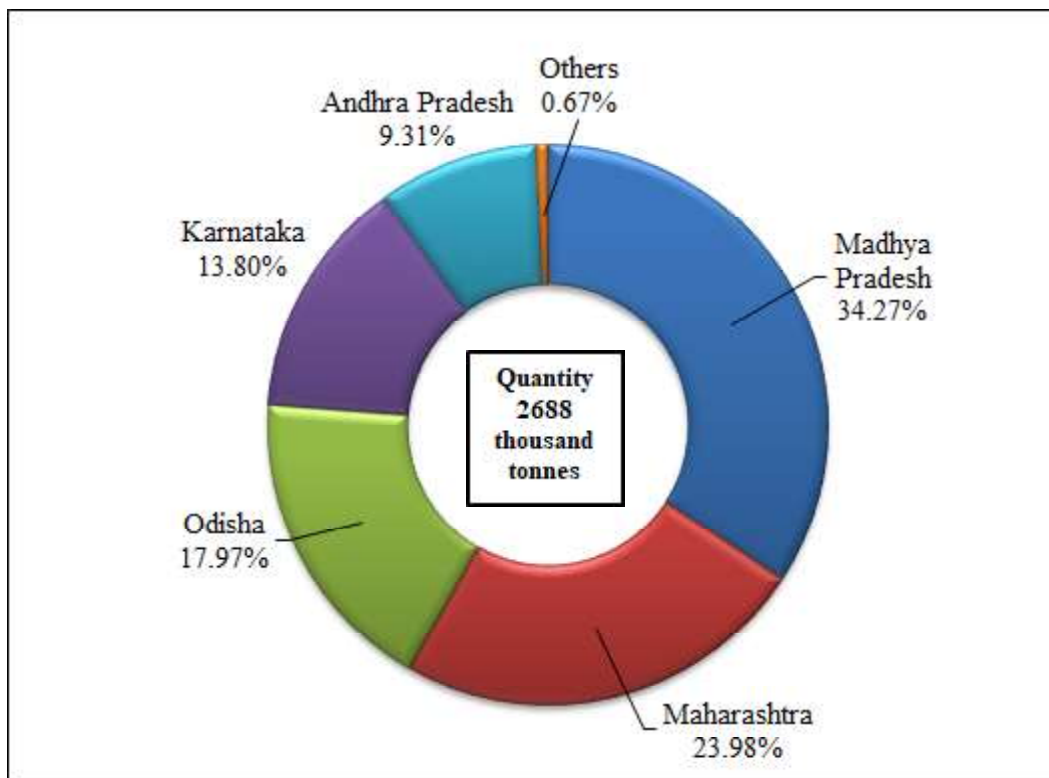
State	Grades : Mn content					Total Quantity
	MnO ₂	46% and above	35% to below 46%	25% to below 35%	below 25%	
India	22187	22446	97324	385257	5606694	6133908
Andhra Pradesh	-	-	19	35384	32464	67867
Goa	-	-	-	-	-	-
Gujarat	-	-	-	-	549066	549066
Jharkhand	1	18	1	3633	++	3653
Karnataka	-	525	8639	50152	206174	265490
Madhya Pradesh	-	13803	21637	36843	3664384	3736667
Maharashtra	19838	3542	33148	29452	56186	142166
Odisha	2348	4558	33880	227958	1097203	1365942
Rajasthan	-	-	-	1408	-	1408
Telangana	-	-	-	432	1217	1649

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

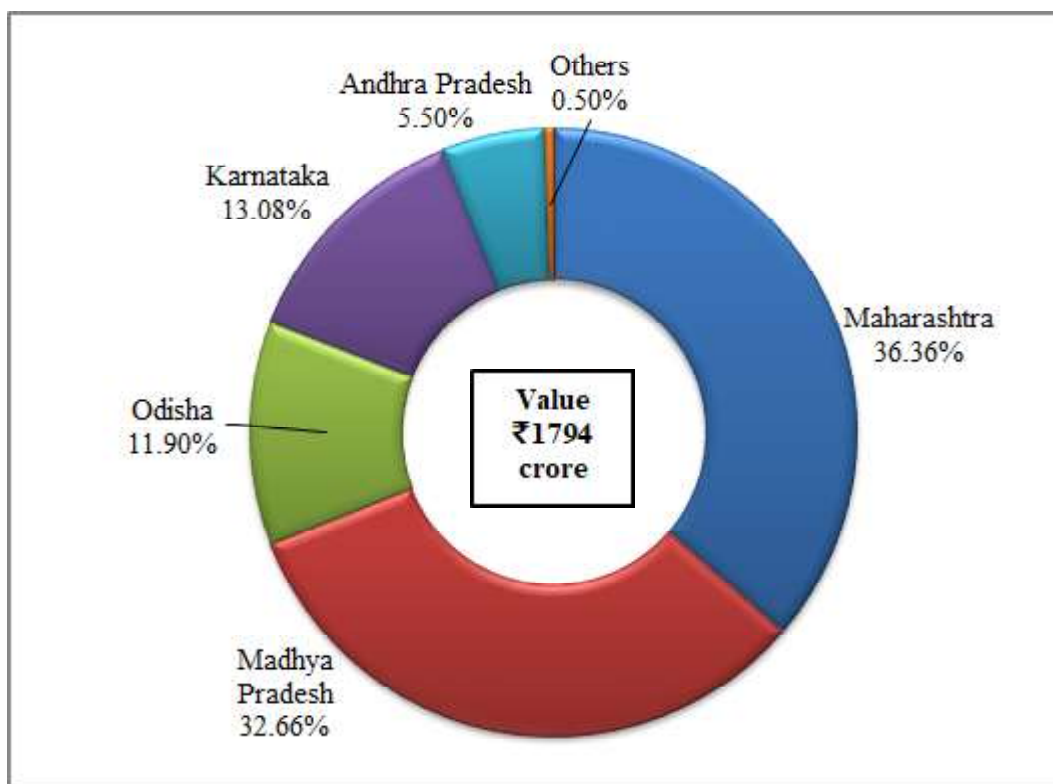
(In tonnes)

State	Grades : Mn content					Total Quantity
	MnO ₂	46% and above	35% to below 46%	25% to below 35%	below 25%	
India	13311	23790	76970	352676	2241019	2707766
Andhra Pradesh	-	-	109	40316	37395	77820
Goa	-	-	-	-	-	-
Jharkhand	-	1	-	120	-	121
Karnataka	-	420	8403	67228	233241	309292
Madhya Pradesh	-	12628	22841	39291	812884	887644
Maharashtra	12062	3297	24097	19834	23796	83086
Odisha	1249	7444	21520	180432	1132827	1343472
Rajasthan	-	-	-	5165	-	5165
Telangana	-	-	-	290	876	1166

Quantity of Manganese Production in Different States, 2020-21



Value of Manganese Production in Different States, 2020-21



MINING, PROCESSING, MARKETING & TRANSPORT

Manganese ore mining in the country is carried out by opencast as well as by underground methods. Of the 135 mines, 8 are underground (3 in Madhya Pradesh and 5 in Maharashtra). Seven underground mines were operated by MOIL Ltd, a Public Sector company, and one by M/s J.K. Minerals, Balaghat (Madhya Pradesh), a private company. All the underground mines are mechanised or semi-mechanised and adopt cut-and-fill method of stoping. In Kandri mine, 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. MOIL has also plans to increase its production from present level of 1.2 million tonnes to 3.00 million tonnes 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 m³ 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.

MOIL has set up an integrated manganese ore beneficiation plant at Dongri Buzurg mine in Bhandara district, Maharashtra, with 4 lakh tonnes annual capacity to process r.o.m. The plant is equipped with handling, crushing, wet screening, drying and magnetic separation facilities in one complex. It has also installed a manganese ore beneficiation plant of 5,00,000 tonnes per annum capacity at Balaghat mine in order to conserve mineral and profitably utilise the low/medium-grade ore. The plant facilities include crushing, wet screening, classification and jigging operations.

The plant upgrades the low/medium-grade fines into high grade and the value addition is around 3-4 times, in case of low-grade fines. The Company has plans to set up a sintering plant for agglomeration of these fines. After agglomeration, these fines will be utilised in ferroalloys production.

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. In case of ore meant for exports, producers other than MOIL Ltd supply it

to MMTC, the canalising agency, either at rail-head or at the port.

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. The Company has also set up a wind energy farm of 20 MW capacity at Dewas, Madhya Pradesh. The Company has also plans to install 10.5 MW capacity solar power plant at all its mines in Maharashtra and Madhya Pradesh. R&D work was taken up by MOIL to improve the safety, productivity and environmental standards in the mines by introducing newer technology in consultation with reputed academic and CSIR-R&D institutions of the country.

Various energy saving projects are under process, such as, installation of solar roof top at administrative buildings at all mines; five MW solar power projects in mine areas in Maharashtra; 5.5 MW solar power projects in Madhya Pradesh as well as installation of small size compressors in underground mines for energy saving.

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%, SiO₂: 2 to 8%, Al₂O₃: 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 ORE

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).	Mn: 32-35%
ii) Jain Carbides & Chemicals Ltd, Raipur (Unit-II).	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 ₂ O 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 ₂ O 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 ₂ O ₃ : 6-7%, P: 0.10-0.12% Size: 5-25 mm Size: 10-80 mm
Natural Sugar & Allied Ind. Ltd, Sai Nagar Ranjani, Dist. Osmanabad	
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

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 MnO₂ 70% (min.), Fe 6% (max.), moisture 4% (max.), Cu 0.02% (max.) and Ni 0.02% (max.). The size requirement lays down that 90% 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 MnO₂ 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 MnO₂ 80% (min.), SiO₂ 5% (max.), Fe₂O₃ 5% (max.) and 200 to 250 mesh ore size is used. In Glass Industry, ore analysing MnO₂ 80% (preferably 86% min.), Fe₂O₃ 5% (preferably 0.75% max.), SiO₂ 2.8% (max.), Al₂O₃ 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 consumption of manganese ore in all industries was about 2.62 million tonnes in 2019-20 as against 2.89 million tonnes in 2018-19. Ferroalloys industries accounted for about 91% consumption followed by Iron & Steel (8%). The remaining (1%) was shared by Battery, Electrode, Chemical, Zinc Smelter and Alloy Steel industries (Table- 9).

Table – 9 : Estimated Consumption* of Manganese Ore, 2017-18 to 2019-20 (By Industries)

Industry	2017-18	2018-19 (R)	2019-20 (P)
All Industries	2701700	2886000	2616000
Ferroalloys	2538100	2695900	2387600
Iron & steel	128100	167700	204200
Others: (Chemical, Electrode, Pelletisation, Sponge Iron etc.)	35500	22400	24200

Figures rounded off

* Includes actual reported consumption and/or estimates made wherever required. Paucity of data, hence coverage may not be complete.

Note: The apparent consumption of manganese ore during 2019-20 has been estimated at 6.9 million tonnes.

INDUSTRY

Manganese alloys are the largest produced ferroalloys in the world with a share of about 41% of the global production of ferroalloys. 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 had set up a High Intensity Magnetic Separation Plant and 1,000 tpy Electrolytic Manganese

Dioxide (EMD) Plant at Dongri Buzurg mine. In 2020-21, about 1070 tonnes of EMD was produced as against 925 tonnes in 2019-20. Ferromanganese plant of 10,000 tonnes per annum capacity has been set up at Bharveli, Balaghat. In 2020-21, 8851 tonnes of ferro-manganese was produced as compared to 10421 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 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, 2020), production of silico-manganese was reported at 3,20,594 tonnes in 2019-20 as compared to 3,42,591 tonnes in 2018-19. It is to be noted that the data coverage is partial and does not reflect the actual production. MOIL was considering setting up of ferro-manganese and silicomanganese plants through joint venture companies with RINL and SAIL, namely, 31,000 tpy ferromanganese and 75,000 tpy silico-manganese plants at Nandini near Bhilai, Chhattisgarh and a 20,000 tpy ferromanganese and 37,000 tpy silicomanganese plants at Bobbili, Vizianagaram district, Andhra Pradesh, with RINL. These projects are not viable at present especially on account of the present power tariffs of the State Electricity Boards and consequently no further development in respect of both these joint venture companies were reported during the year.

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

Iron & Steel Industry was the second major consumer of manganese ore wherein manganese

ore is used directly as a blast furnace feed. Details on consumption, specifications and source of supply of manganese ore to major iron & steel plants in the country in 2018-19 and 2019-20 are furnished in Table-10.

Dry Battery

Dry battery Industry also consumes EMD along with natural manganese dioxide ore. The only one plant of 1,000 tpy capacity producing EMD is owned by MOIL and is located in Bhandara district of Maharashtra. Sale quantity of EMD has decreased slightly from 930 tonnes in the year 2019-20 to 918 tonnes in the year 2020-21.

RESEARCH & DEVELOPMENT

The CSRI-Institute of Scientific and Industrial Research, Bhubaneswar, in its Annual Report has reported that during 2019-20, a project was carried out for manganese ore beneficiation with an objective to meet the increased demand for manganese alloys and compounds for various industries and to offset the shortage of manganese ore to serve this demand. World manganese resources are classified into 3 major categories, i.e., oxide, siliceous and carbonate ores considering the beneficiation characteristics. Selection of the appropriate beneficiation process depends on the gangue minerals and their association. Gravity separation methods are applied on the siliceous ores and these are in industrial practice. Iron ore minerals are always found as an impurity in all kind of manganese ores, however, these are successfully removed using variety of magnetic separation processes or reduction roasting followed by magnetic separation. The Mn value could be enhanced from 28% to 40%.

With the high-grade non-renewable Mn ore depleting at a faster rate, the attention shifts to alternative routes, such as, lean-grade Mn ore to produce ferro-manganese. CSIR-IMMT, Bhubaneswar, made efforts to perform smelting reduction studies of lean-grade manganese ore supplied. The obtained lean-grade Mn ore was subjected to crushing and grinding operation followed by scrubbing, reduction roasting

studies and wet magnetic separation to separate out the magnetic and non-magnetic fractions. Finally, smelting reduction studies in a plasma arc furnace were conducted to produce ferro-manganese from the non-magnetic fraction of the sinter and pig iron from the magnetic fraction of the sinter. The attempts taken to produce ferro-manganese by enriching the lean-grade Mn ore was successfully achieved by this novel pyrometallurgical technique.

Manganese Ore India Ltd. (MOIL), in its Annual Report during 2019-20, efforts taken under its R&D in the area of Mine Environment, Mining Technology-Subsidence and Patent, Mineral Conservation, Sustainable Development Framework, Underground Mechanisation, Mineral Beneficiation, Metallurgical Studies, Exploration & Petrography, Remote Sensing Study, R & D in cement Concrete and XRF analyzer. Some of the R & D activities are given below:

(A) In area of mine environment, Ventilation reorganisation studies for deeper levels have been conducted at Balaghat Mine and sinking has been commenced for 5m diameter ventilation drifts.

(B) For the mine safety, MOIL conducted (i) In-house 3-D analysis of subsidence parameters has been carried out by MOIL and found no noticeable movements in any orthogonal direction above the ground at Munsar Mine. (ii) CSIR-CIMFR, Nagpur and Dhanbad centre have been engaged to design support system for better safety and productivity of ROM at Balaghat and Ukwa underground mines. (iii) Designed in-house rock mechanics software 'MOIL-RMR' for rock mass characterisation and support design. (iv) Modern rock mechanics instruments like MPBX, Strain Bars, Load Cells for indicating displacement/load on travelling/haulage road, stopes have been installed in all the underground mines of the company for immediate information of failure in transport and travelling roadways for safety.

(C) Mine Planning and Design Department has conducted the in-house R&D study of overburden material and bottom ash to use as a fill material in underground by hydraulic transportation at Munsar Mine.

(D) For mechanical handling of ROM in drills and stopes SDL along with modern electro-hydrostatic drill machine-Universal Drilling Machine (UDM) has been introduced on experimental basis at Chikla and Gumgaon Mine.

(E) For Mineral Beneficiation, R&D studies on "Bench scale beneficiation study on a manganese ore sample from Balaghat mine" have been carried out by Modern Mineral Processing Laboratory and Pilot Plant, Indian Bureau of Mines, Nagpur for recovery of sand and manganese separately.

(F) In the area of exploration and remote sensing study, Hydrostatic high penetration core drilling machine has been introduced in the Company for exploration. Further, MOIL has signed MoU with National Remote Sensing Centre (NRSC), Hyderabad for remote sensing studies of four districts of Madhya Pradesh, namely Balaghat, Chindwada, Jabalpur & Jhabua for identification of manganese bearing area. NRSC has submitted the report. On the basis of report, MOIL has carried out field survey and applied for permission core drilling from Govt. of Madhya Pradesh in potential zone. This will help generate new mining leases in the said area.

(G) In the field of Cement concrete, pre-cast concrete columns and beams have been prepared for concreting work in underground drifts. This has improved the safety standard and reduced time for erecting of concrete supports in underground drifts. Installation is in progress at Gumgaon Mine.

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.

MANGANESE ORE

Table – 10 : Consumption, Specifications and Source of Supply of Manganese Ore in different Iron and Steel Plants, 2018-19 and 2019-20

Plant	Production of pig iron/hot metal (tonnes)		Consumption of Mn-ore (tonnes)		Specifications of ore consumed	Source
	2018-19	2019-20 (P)	2018-19	2019-20 (P)		
Bhilai Steel Plant, Bhilai Nagar, Durg Chhattisgarh.	Hot metal 4751515	Hot metal NA	6186	NA	Size: 25 to 85 mm Mn: 30% min. SiO ₂ : 30% max. Al ₂ O ₃ : 5% max. P: 0.3% max.	MOIL/ Tirodi Balaghat
Bokaro Steel Plant, Bokaro, Jharkhand.	Hot metal 4209268	Hot metal 4086135	NA	NA	NA	-
Durgapur Steel Plant, Durgapur, West Bengal.	Hot metal 2515068	Hot metal 2403284	NA	NA	NA	-
Rourkela Steel Plant, Rourkela, Odisha.	Hot metal 3836421	Hot metal 3624686	NA	NA	-	-
IISCO Steel Plant, Burnpur, Dist. Burdwan, West Bengal- 713 325.	Hot metal 2200348	Hot metal 2505193	NA	NA	NA	-
Visvesvaraya Iron and Steel Ltd, Bhadravati, Shivamogga, Karnataka.	Hot metal NA	Hot metal NA	NA	NA	-	-
KIOCL Ltd, Pellet Plant, Mangaluru, Dakshina Kannada, Karnataka.	Hot metal NA	Hot metal NA	NA	NA	NA	-
Visakhapatnam Steel Plant, Visakhapatnam, Andhra Pradesh.	NA	NA	NA	3205	25% to below 35% Mn Below 25% Mn	-
IDCOL, Kalinga Iron Works Ltd, Barbil, Kendujhar, Odisha.	Hot metal NA	Hot metal NA	NA NA	NA NA	Size: 10-40 mm	From own/ local mines
Gordan Steel India Ltd, Jaonbulapadu, Anantapur, Andhra Pradesh.	Hot metal NA	Hot metal NA	NA	NA	Mn 28-35% Mn	-

(contd)

MANGANESE ORE

Table - 10 (contd)

Plant	Production of pig iron/hot metal (tonnes)		Consumption of Mn-ore (tonnes)		Specifications of ore consumed	Source
	2018-19	2019-20 (P)	2018-19	2019-20 (P)		
Tata Steel Ltd, Jamshedpur, Jharkhand.	Hot metal 10839210	Hot metal 10774978	296	-	Mn 25% to below 35%	Bichakundi Mine, Keonjhar
Kirloskar Ferrous Industries Ltd, Bevinahalli, 583 234, Koppal, Karnataka.	Pig iron 397046	Pig iron 385510	8159	NA	NA	NA
LANCO Industries Ltd, Chittoor, Andhra Pradesh.	Pig iron+ (molten metal) NA	Pig iron+ (molten metal) NA	NA	NA	NA	NA
Visa Steel Ltd, Kalinganagar, Jajpur, Odisha.	Hot metal 11920	Hot metal -	-	-	25% to below 35% Mn	-
Sunflag Iron & Steel Co. Ltd, Warrthy, Bhandara, Maharashtra.	Hot metal 311821	Hot metal 304265	659	-	25% to below 35% Mn	-
Jaiswal Neco Industries Ltd, Siltara, Raipur, Chhattisgarh.	Hot metal 607856	Hot metal 622867	NA	NA	NA	-
Jaiswal Neco Industries Ltd, Ballari, Karnataka.	Hot metal NA	Hot metal NA	-	-	NA	NA
JSW Steel Ltd, Salem, Tamil Nadu- 636 453.	Hot metal 950800	Hot metal 959212	NA	NA	NA	NA
JSW Steel Ltd, Vidyanagari, Ballari, Karnataka.	Hot metal 11598167	Hot metal 11195349	NA	NA	NA	NA
Rashmi Metaliks Ltd, Gokulpur, West Midnapore, West Bengal.	Hot metal 172612	Hot metal 179987	450	662	NA	NA
Sona Alloys P. Ltd, Lonad, Pune, Maharashtra.	Hot metal NA	Hot metal NA	NA -	NA -	NA -	NA -
Aparant Iron & Steel Pvt. Ltd, Goa.	Pig Iron NA	Pig Iron NA	NA	NA	NA	NA
Uttam Galva Metallics Ltd, Bhugaon- 442 001, Wardha, Maharashtra.	Hot metal 476535	Hot metal 487214	NA	NA	NA	NA
Tata Metaliks Ltd, Gokulpur, Maheshpur West Bengal.	Hot metal 518170	Hot metal 543932	9576	8976	25% to below 35% Mn Below 25% Mn	NA

(contd)

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Table - 10 (concl'd)

Plant	Production of pig iron/hot metal (tonnes)		Consumption of Mn-ore (tonnes)		Specifications of ore consumed	Source
	2018-19	2019-20 (P)	2018-19	2019-20 (P)		
Vedanta Ltd, Navelim Amona, Marcela, Goa.	683025	682726	-	642	Below 25% Mn	-
Neelachal Ispat Nigam Ltd, Kalinga Nagar,	NA	NA	NA	NA	-	-
Duburi, Jajpur, Odisha. Suraj Products Ltd, Barpali, Rajgangpur, Sundargarh, Odisha.	NA	NA	NA	NA	-	-
Jindal Saw Ltd, Mundra, Gujarat.	478861	491626	3801	3164	Mn 25% to below 35%	-
SLR Metaliks Ltd, Narayan Devara Kere, Hagari Bommana Halli, Karnataka	246651	229646	NA	61.44	-	-

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 Foreign Trade Policy, 2015-20 and the policy on export as per ITC (HS), 2018 schedule 2 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

Import Policy

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 1500 million tonnes of metal content which is unevenly distributed (Table-11). Reserves are located in South Africa (43%), Brazil (18%), Australia (18%), Gabon (4%), China (4%) and India (2%). Only a small fraction of global manganese reserves is economical. This fact continues to prompt and support interests in deep-sea manganese nodules, which constitute an enormous untapped resource. Most nodules are found in areas of deep-sea floor at water depths of 5 to 7 km. The Pacific Ocean alone is estimated to contain about 2.5 billion tonnes nodules containing about 25% Mn, making them similar in abundance to low-grade land-based deposits. Most major steel-making nations lack manganese resources. North America reportedly has less than 1% world reserves and the United States is said to have lean-grade reserves which would

potentially entail high extraction cost. This situation has created an active global trade in manganese ore and manganese alloys.

World production of manganese ore in 2020 was estimated to be around 49 million tonnes as compared to 57 million tonnes in 2019. South Africa was the leading producer contributing about 32% followed by Gabon (16%), Australia (10%), China (13%), Brazil (5%), India (5%) and Ghana (5%) (Table-12). The production of manganese ore is linked with the production of steel. The Steel Industry consumes it in the form of ore and manganese alloys.

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

(In '000 tonnes of metal content)

Country	Reserves
World: Total (rounded off)	1500000
Australia ^(a)	11270000
Brazil	270000
Myanmar	NA
China	54000
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, 2022.

(a): Joint Ore Reserve Committee compliant reserves were about 76 million tonnes gross weight.

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.*

FOREIGN TRADE

Exports

Exports of manganese ore (total) increased by 40% to 82363 tonnes in 2020-21 from 58198 tonnes in 2019-20. Out of the total exports in 2020-21, only 10 tonnes of manganese ore having +46% Mn of value ₹3,30,000 was exported. Exports of manganese

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

(In '000 tonnes)

Country (Rounded off)	2018	2019	2020
World: Total	54825	57408	49583
South Africa	14919	17008	16020
Gabon	6542	7186	8147
China	7977	6650	6500
Australia	7212	6649	4752
India*	2820	2956	2457
Brazil	3189	3726	2385
Ghana	4551	5383	2357
Ukraine	1845	1854	1850
Ivory Coast	930	1175	1280
Other countries	4837	4820	3834

Source: BGS, World Mineral Production, 2016-2020.

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

** India's production of manganese ore in 2018-19, 2019-20 and 2020-21 was 3832 thousand tonnes, 2,910 thousand tonnes and 2,688 thousand tonnes, respectively.*

ore (others) were at 22045 tonnes as compared to 49206 tonnes in the preceding year. About 58% of exports of Manganese ore total were to China followed by Indonesia with 24% and UAE with 12%. Exports of manganese oxide (total) increased by 2% to 29116 tonnes in 2020-21 as against 28485 tonnes in 2019-20. Manganese dioxide exports in 2020-21 decreased by 60% to 4476 tonnes from 11412 tonnes in 2019-20. Exports were mainly to UAE (53%), Poland (5%), & UK (3%). In 2020-21, exports of manganese & alloys (including waste & scrap) increased marginally by 469 tonnes as compared to 418 tonnes in the previous year. Exports of manganese & alloys (wrought & unwrought) in 2020-21 increased by 38% to 188 tonnes as compared to 136 tonnes in the previous year. (Tables- 13 to 26).

Imports

Imports of manganese ore (total) decreased drastically by 6% to 4.05 million tonnes in 2020-21 from 4.31 million tonnes in the previous year. South Africa (43%), Gabon (17%), Australia (15%) and Singapore (7%) were the main suppliers of manganese ore in 2020-21. Out of the total manganese ore imported, the contribution of manganese ore having +46% Mn was 182048 tonnes (4%), manganese ore having 35-46% Mn was 2942210 tonnes (72%), manganese ore having 30 to 35% Mn

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was 449497 tonnes (11%) and manganese ore (others) was 316464 tonnes (8%). In 2020-21, imports of manganese dioxide were 12996 tonnes. Imports were mainly from China (58%), Belgium (22%) and Peru (12%). In 2020-21, imports of manganese oxide (total) were 25687 tonnes. During 2020-21, imports of manganese & alloys (including waste and scrap) were 37247 tonnes, out of which manganese & alloys (wrought/unwrought) comprised 36890 tonnes. Imports of manganese & alloys NES were 357 tonnes during 2020-21. (Tables- 27 to 41).

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	58198	254643	82363	974940
China	27500	55197	47714	755315
UAE	5887	88687	10050	113362
Indonesia	21600	59179	22000	60852
Bhutan	-	-	2544	44283
Bangladesh	40	991	23	590
Ethiopia	-	-	10	235
Sri Lanka	25	548	17	150
Kenya	16	417	++	87
Nepal	++	12	3	39
Burundi	++	17	2	27
Other countries	3130	49595	-	-

Figures rounded off

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	5	299	10	330
Ethiopia	-	-	10	235
Kenya	-	-	++	87
Bhutan	-	-	++	8
Lebanon	5	298	-	-
Nepal	++	1	-	-

Figures rounded off

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	49206	116935	22045	61658
Indonesia	21600	59179	22000	60852
Bangladesh	40	991	23	590
Sri Lanka	25	548	17	150
Nepal	++	11	3	39
Burundi	++	17	2	27
China	27500	55197	-	-
Uganda	21	527	-	-
Kenya	16	417	-	-
Tanzania	4	48	-	-

Figures rounded off

MANGANESE ORE

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	28485	1382052	29116	1357914
USA	1373	68893	8580	368161
UAE	6143	307406	2548	129789
Vietnam	1457	79180	1785	91663
France	2805	78860	2540	77879
Canada	1070	58998	1198	62730
Thailand	882	50420	1152	59102
Turkey	1105	60290	944	49469
Russia	867	43280	944	44763
Indonesia	1876	99850	850	44317
Australia	867	42872	857	411116
Other countries	10040	492003	7718	388925

Figures rounded off

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	11412	549640	4476	227849
UAE	6063	303005	2343	118891
Poland	195	11409	222	14003
UK	250	16495	155	11428
Netherlands	175	11535	121	9223
Ireland	50	3525	100	7431
Bangladesh	161	5595	168	6503
Turkey	48	3258	75	5541
Kenya	254	5133	267	5122
Lithuania	50	3113	75	4790
Italy	13	1934	87	4701
Other countries	4153	184638	863	40216

Figures rounded off

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

Country	2018-19 (R)		2019-20 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	15506	810243	17073	832412
Indonesia	1282	73387	1850	98570
France	3153	138637	2805	78860
Vietnam	1339	78499	1356	76325
Spain	775	39278	1375	68411
Canada	1151	68182	1050	57356
Turkey	521	28108	1057	57032
Thailand	438	24165	862	47558
Australia	1232	54774	867	42872
Russia	533	29400	842	42312
UK	575	30994	725	36754
Other countries	4507	244818	4284	226361

Figures rounded off

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	418	343896	469	375616
France	299	242113	283	270014
Korea	++	586	12	19625
Philippines	22	5655	44	11337
Burundi	-	-	4	9390
UAE	5	734	62	8950
Slovenia	++	789	4	7050
Malaysia	3	3332	14	6433
Romania	3	4709	3	6233
Georgia	-	-	3	5928
Italy	3	6977	3	5590
Other countries	83	79001	37	25066

Figures rounded off

MANGANESE ORE

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	136	119131	188	106409
Korea	++	586	12	19580
Philippines	22	5655	44	11337
Burundi	-	-	4	9390
UAE	5	704	62	8950
Slovenia	++	789	4	7050
Malaysia	3	3332	14	6433
Romania	3	4709	3	6233
Georgia	-	-	3	5928
Italy	3	6790	3	5590
Indonesia	9	4143	13	4887
Other countries	91	92423	26	21031

*Figures rounded off***Table - 22: Exports of Manganese & Alloys
Unwrought
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	134	118826	186	105721
Korea	++	586	12	19580
Philippines	22	5629	44	11337
Burundi	-	-	4	9390
UAE	5	704	62	8896
Slovenia	++	789	4	7050
Malaysia	2	3223	13	6236
Romania	3	4709	3	6233
Georgia	-	-	3	5928
Italy	3	6790	3	5590
Indonesia	9	4143	13	4887
Other countries	90	92253	25	20594

*Figures rounded off***Table - 21 : Exports of Manganese :Wrought
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	2	305	2	688
Brazil	-	-	1	288
Malaysia	1	109	1	197
UK	1	110	++	89
Kenya	++	11	++	60
UAE	-	-	++	54
Phillipines	++	26	-	-
Egypt	++	19	-	-
Pakistan	++	19	-	-
Bulgaria	++	11	-	-

*Figures rounded off***Table - 23 : Exports of Manganese & Alloys :
NES
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	258	218849	249	260113
France	258	218534	249	260039
South Africa	-	-	++	33
Serbia	++	++	++	32
Bhutan	++	3	++	9
Italy	++	187	-	-
Switzerland	++	92	-	-
UAE	++	30	-	-
Congo	++	3	-	-
UK	++	++	-	-

Figures rounded off

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	8987	137409	40108	698245
China	-	-	34614	610984
Bhutan	-	-	2544	44275
UAE	5887	88687	2950	42986
Oman	3098	48698	-	-
Australia	2	24	-	-

Figures rounded off

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

Country	2018-19 (R)		2019-20 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	++	2	-	-
Maldives	++	2	-	-

Figures rounded off

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	24	5916	32	9094
France	20	5184	32	8978
China	-	-	++	71
Korea	-	-	++	45
Saudi Arabia	4	732	-	-

Figures rounded off

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	4316572	41282100	4058590	55242138
South Africa	2901445	20518427	1754857	19894390
Gabon	219280	3284695	680154	14231857
Australia	461946	6947206	594049	8301688
Singapore	133117	2306103	274626	3848144
UAE	185788	1847279	271579	2768760
Brazil	17863	2923247	175622	2410870
Cote d'Ivoire	97623	1203533	88229	930035
Hong Kong	56692	748618	67871	816612
France	21850	434181	54122	740638
Uruguay	-	-	41261	460361
Other countries	60468	1068811	56220	838783

Figures rounded off

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	191766	399776	182048	3156903
South Africa	46805	869014	86851	1261006
Gabon	-	-	44376	868826
Brazil	34477	727823	19112	323322
Cote d'Ivoire	12607	305908	7498	182123
Tanzania	7069	137129	6699	142804
Zambia	6932	128117	8074	126450
Togo	-	-	2988	104634
China	1515	49088	1675	57809
UAE	2111	50035	1674	30651
Senegal	2147	45490	1045	22233
Other countries	78103	1685172	2056	37045

Figures rounded off

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	1871739	26995931	2942210	39070738
South Africa	943644	13567432	1110682	13627236
Gabon	183230	2852359	591454	8582003
Australia	362861	4961059	564638	7842159
Singapore	40806	638022	209991	3021710
Brazil	118233	1924127	138475	1937166
UAE	49769	626849	119220	1523011
France	21850	434181	54122	740638
Hong Kong	44749	621055	58600	726597
Uruguay	-	-	41261	460361
Cote d' Ivoire	72676	793526	43080	430075
Other countries	33921	577321	10687	179782

Figures rounded off

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	1773356	5844006	316464	8006608
Gabon	19235	242987	30597	4615697
South Africa	1606830	3207625	154548	1718613
Singapore	72414	1253884	57397	770684
Australia	37811	692451	29411	459529
UAE	10984	137245	19838	192360
Brazil	22558	239765	7233	104655
Mozambique	-	-	12075	82220
Hong Kong	-	-	2999	38020
Cote d' Ivoire	4	26	2061	17352
China	25	2317	85	3582
Other countries	3495	67706	220	3896

Figures rounded off

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	432072	4049808	449497	3789163
South Africa	280837	2676028	316047	2636360
UAE	102281	869313	63170	523655
Cote d' Ivoire	12336	104073	35590	300485
Gabon	16815	189349	13727	165331
Hong Kong	10945	113897	6272	51995
Switzerland	-	-	5415	48189
China	-	-	5201	30139
Singapore	1980	19681	3669	28946
Brazil	3095	31532	406	4063
Turkey	1367	16486	-	-
Other countries	2416	29449	-	-

Figures rounded off

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	10607	963139	12996	1016479
China	6961	841248	7569	851348
Belgium	2041	68780	2906	96802
Peru	1453	40095	1530	38100
UAE	64	5999	370	9841
Australia	-	-	437	8731
Netherlands	70	3409	132	7198
Hong Kong	-	-	25	2469
Morocco	-	-	25	795
UK	++	153	1	501
Germany	3	115	++	293
Other countries	15	3340	1	401

Figures rounded off

MANGANESE ORE

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	17073	832412	24640	1130065
USA	251	18914	8521	363677
Vietnam	1356	76325	1709	88671
France	2805	78860	2540	77879
Canada	1050	57356	1175	60835
Thailand	862	47558	1152	59062
Russia	842	42312	944	44664
Turkey	1057	57032	869	43928
Indonesia	1850	98570	821	40743
Australia	867	42872	780	38520
Spain	1375	68411	674	32968
Other countries	4758	244202	5455	279118

Figures rounded off

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	45195	6188389	37247	4933243
China	43709	5629033	35674	4602138
France	426	310078	125	111625
Hong Kong	654	82810	554	72961
Singapore	25	3016	625	72940
Sweden	130	127018	40	38775
Taiwan	-	-	100	11964
Korea, Rep. of	115	14899	69	10730
South Africa	20	4541	35	8288
Br. Virgin Is	50	6831	25	3155
USA	++	107	++	279
Other countries	66	10056	++	388

Figures rounded off

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	44580	5882186	36890	4838565
China	43485	5599584	35391	4566206
Hong Kong	654	82810	554	72961
Singapore	25	3016	625	72940
France	39	35019	51	53506
Sweden	130	126941	40	38775
Taiwan	-	-	100	11964
Korea, Rep. of	115	14899	69	10730
South Africa	20	4541	35	8288
Br. Virgin Is	50	6831	25	3155
UK	++	2	++	40
Other countries	62	8543	++	++

Figures rounded off

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	1834	250991	758	96754
China	1834	250991	660	83883
Hong Kong	-	-	98	12871

Figures rounded off

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

Country	2019-20 (R)		2019-20 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	598	303087	357	94678
France	370	271963	74	58119
China	224	29449	283	35932
USA	++	87	++	279
UK	1	461	++	204
Germany	++	247	++	137
UAE	3	467	++	7
Italy	++	336	-	-
Sweden	++	77	-	-

Figures rounded off

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	47639	394579	168371	1218726
South Africa	23329	198328	86729	651175
UAE	20643	163837	67677	499083
Brazil	-	-	10396	41664
Singapore	2952	28148	3569	26804
Kenya	665	3758	-	-
Nigeria	50	508	-	-

Figures rounded off

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	18239	1325712	25687	1565080
China	7185	873949	8267	947140
South Africa	6226	164107	10704	275017
Belgium	2661	161633	3537	204656
UAE	80	12385	759	49779
Peru	1453	40095	1530	38100
Germany	38	13423	39	15401
Australia	-	-	437	8731
USA	85	11073	62	7997
Netherlands	70	3409	137	7602
Hong Kong	-	-	25	2469
Other countries	441	45638	196	8188

Figures rounded off

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

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	42746	5631195	36132	4741811
China	41651	5348593	34731	4482323
Singapore	25	3016	625	72940
Hong Kong	654	82810	456	60090
France	39	35019	51	53506
Sweden	130	126941	40	38775
Taiwan	-	-	100	11964
Korea, Rep. of	115	14899	69	10730
Br Virgin Is	20	4541	35	8288
South Africa	50	6831	25	3155
UK	++	2	++	40
Other countries	62	8543	++	++

Figures rounded off

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**Table – 41 : Imports of Manganese Waste and Scrap
(By Countries)**

Country	2019-20 (R)		2020-21 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	17	3116	-	-
France	17	3096	-	-
USA	++	20	-	-

Figures rounded off

FUTURE OUTLOOK

As per World Steel Association, India's per capita steel consumption is about 74.7 kg as against the world's per capita consumption of 230.3 kg. 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 103.044 million tonnes in 2020-21. This indicates

strong growth of Steel Industry in the country as steel is the principal market accounting for 65 to 70% manganese consumption.

India has set a production capacity target of 300 million tonnes of steel by 2030-31. The demand for manganese ore is expected to raise commensurately to about 10 million tonnes per year in the coming years.

India's largest manganese ore producing company "MOIL Ltd" has targets to increase its production to 3 million tonnes by 2030, the gap in the demand will continue to be filled by imports in years to come.