

MANGANESE ORE



Indian Minerals Yearbook 2019

(Part- III : MINERAL REVIEWS)

58th 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 and also in India. 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 ($\text{Mn}_2\text{O}_3 \cdot \text{H}_2\text{O}$, Mn about 62.4%); and (iv) braunite ($3\text{Mn}_2\text{O}_3$, 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 (Archeans) of Madhya Pradesh (Balaghat, Chhindwara & Jhabua districts), Maharashtra (Bhandara & Nagpur districts), Gujarat (Panchmahal district), Odisha (Sundargarh district) and with Kodurite Series (Archeans) 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 1.04.2015 has been placed at 495.87 million tonnes as per NMI database, based on UNFC system. Out of these, 93.47 million tonnes are categorised as Reserves and the balance 402.40 million tonnes are in the Remaining Resources category. Gradewise, Ferromanganese grade accounts for 7%, Medium grade 11%, BF grade 28% and the remaining 54% are of Mixed, Low, Others, Unclassified, and Not-known grades including 0.17 million tonnes of Battery/Chemical grade.

Statewise, Odisha tops the total reserves/resources with 44% share followed by Karnataka 22%, Madhya Pradesh 12%, Maharashtra & Goa 7% each, Andhra Pradesh 4% and Jharkhand 2%. Rajasthan, Gujarat, Telangana and West Bengal together shared the remaining 2% resources (Table- 1).

EXPLORATION & DEVELOPMENT

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

PRODUCTION AND STOCKS

The production of manganese ore at 2,820 thousand tonnes during 2018-19 increased by about 8% as compared to that in the previous year.

There were 140 reporting mines during 2018-19 as against 149 in the previous year. Besides, manganese ore production was reported as associate mineral by 12 mines in 2018-19.

In 2018-19, twenty-four Public Sector mines jointly accounted for 46% of the total production. The contribution of captive mines was 10% of the total production.

As regards gradewise composition of production in 2018-19, 68% of the total production was of lower grade (below 35% Mn), 21% of medium grade (35-46% Mn) and 10% was of high grade (above 46% Mn). Production of manganese dioxide was 35,783 tonnes during the year.

Madhya Pradesh, the leading manganese ore producing State, accounted for 33% of the total production in 2018-19, which is followed by Maharashtra (27%) and Odisha (16%) (Tables- 2 to 6).

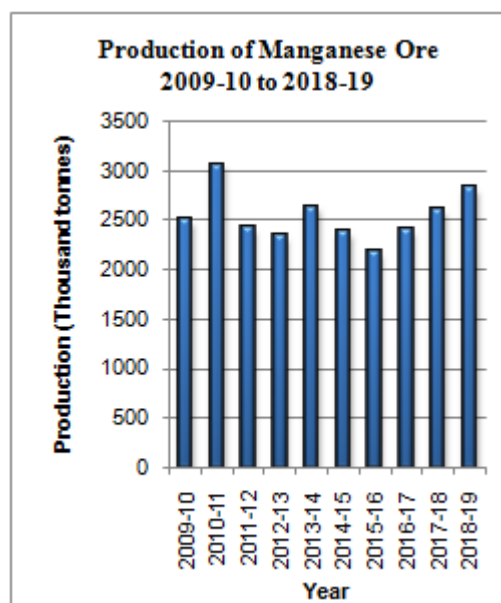


Table – 1 : Reserves/Resources of Manganese Ore as on 01.04.2015
(By Grades/States)

(In '000 tonnes)

State/Grade	Reserves				Remaining Resources							Total	
	Proved	Probable		Total	Feasibility	Pre-feasibility		Measured	Indicated	Inferred	Reconnaissance	Total	Resources
	STD111	STD121	STD122	(A)	STD211	STD221	STD222	STD331	STD332	STD333	STD334	(B)	(A+B)
All India : Total	62982	19715	10778	93475	70742	44606	73823	18189	42803	135722	16513	402399	495874
By Grades													
Battery/Chemical	-	-	-	-	4	9	12	4	26	112	-	167	167
Ferro-manganese	7069	1740	2428	11237	4241	3219	4230	1288	5236	6602	466	25282	36520
Medium	2299	-	975	3274	11545	2053	12489	448	1333	21424	116	49409	52683
BF	8195	873	2167	11235	29841	7823	21114	3011	10853	51731	5288	129662	140897
Mixed	1199	3	310	1512	224	495	3361	2262	62	11988	1126	19518	21030
Medium & BF mixed	6812	1506	1482	9800	4571	2367	4199	5215	5353	16032	221	37957	47757
Ferro-manganese, medium & BF mixed	25038	12515	291	37844	5952	4497	11255	414	9532	10195	33	41878	79723
Ferro-manganese & BF	580	1402	636	2618	137	8185	4811	1358	912	3317	4560	23280	25898
Low (-)25% Mn	1087	349	469	1905	8575	743	6483	3916	4040	3547	82	27386	29291
Beneficiable	1389	974	1423	3786	680	8401	226	-	260	1437	4560	15565	19531
Others	8456	166	176	8798	2810	1459	1390	188	87	2845	-	8780	17578
Unclassified	802	147	421	1370	2094	5353	4184	84	4953	5384	62	22115	23484
Not-Known	56	39	-	95	68	-	68	-	156	1108	-	1400	1495
By States													
Andhra Pradesh	2235	637	2086	4958	675	387	773	188	3220	6987	457	12687	17645
Goa	-	-	-	-	13954	1511	9177	48	262	9464	-	34416	34416
Gujarat	708	-	-	708	-	-	-	-	-	2180	-	2180	2888
Jharkhand	1840	-	328	2168	1710	795	1476	-	178	4177	1126	9461	11629
Karnataka	9196	-	150	9346	14003	10225	11430	1498	7306	54333	2923	101718	111064
Madhya Pradesh	20227	6760	2904	29891	5802	2779	6421	325	10481	2015	-	27823	57713
Maharashtra	10867	1787	1055	13710	1974	4966	7207	-	5350	3369	43	22910	36619
Odisha	16703	10528	3413	30643	32622	23942	37292	16130	15119	48764	11889	185760	216403
Rajasthan	1051	-	647	1697	-	-	-	-	-	4030	-	4030	5727
Telangana	156	3	196	355	2	-	46	-	886	203	76	1214	1568
West Bengal	-	-	-	-	-	-	-	-	-	200	-	200	200

Figures rounded off

MANGANESE ORE

MANGANESE ORE

The mine-head closing stock was 2,889 thousand tonnes for the year 2018-19 as against 1,951 thousand tonnes for the previous year [(Tables - 7 (A) and 7 (B)].

The average daily employment of labour in manganese ore mines was 14,096 in 2018-19 as against 12,903 in the previous year.

Table – 2 : Principal Producers of Manganese Ore, 2018-19

Name & address of Producer	Location of mine	
	State	District
MOIL Ltd, MOIL Bhavan, 1A, Katol Road, Chhaoni, Nagpur- 440 013 Maharashtra	Madhya Pradesh	Balaghat
Sandur Manganese & Iron Ores Ltd, No. 9, Bellary Road, Sadashivanagar, Bengaluru- 560 080. Karnataka	Maharashtra	Bhandara Nagpur
	Karnataka	Ballari
Tata Steel Ltd, Bombay House, 24, Homi Mody Street, Fort, Mumbai- 400 001, Maharashtra	Odisha	Keonjhar
R.B.S.S. Durga Prasad & F.N. Das, Sriram Nagar, Garividi Railway Station, Distt Vizianagaram-535 101 Andhra Pradesh	Andhra Pradesh	Vizianagaram
M/S Suryavansham Mining & Minerals (P) Ltd, 67/2, Patrakar Colony, Indore- 452 001 Madhya Pradesh.	Madhya Pradesh	Jabalpur
Mangilal Rungta, Rungta Office, Main Road, Barbil, Distt Keonjhar, Odisha-758 035.	Odisha	Keonjhar
S. R. Ferro Alloys, 9, Sidheswar Colony, Distt Jhabua- 457 661. Madhya Pradesh.	Madhya Pradesh	Jhabua
S.K. Sarawagi & Co. Pvt.Ltd, 10/1/31, Signature Towers, Level -4, Waltair Uplands, Distt - Visakhapatnam, Andhra Pradesh-530 003	Andra Pradesh	Vizianagaram
Aryan Mining & Trading Corporation (P) Ltd, P1, Hide Lane, Aryan House, 8th Floor, Kolkata - 700 073	Odisha	Sundargarh
Shobha Minerals 765, Napier Town, Distt Jabalpur - 482 001 Madhya Pradesh	Madhya Pradesh	Jabalpur

MANGANESE ORE

Table-3 : Principal Producers of Manganese Dioxide, 2018-19

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
Rungta Mines Ltd, 8A, Express Tower, 42A, Shakespeare Sarani, Kolkata-700 017, West Bengal.	Odisha	Sundargarh
Mangilal Rungta, Rungta Office, Main Road, Distt Keonjhar Barbil-758 035, Odisha.	Odisha	Keonjhar
M/s Bonai Industrial, Company Ltd, Rungta Office, Main Road, Barbil, Keonjhar-758 035, Odisha.	Odisha	Sundargarh

**Table – 4 : Production of Manganese Ore, 2016-17 to 2018-19
(By States)**

(Quantity in tonnes; Value in ₹'000)

State	2016-17		2017-18		2018-19 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	2395134	16248429	2599815	19907474	2820227	22702512
Andhra Pradesh	232257	729003	172174	706314	293279	1238252
Gujarat	43057	20605	18362	11496	-	-
Jharkhand	508	3440	4783	44527	4785	43752
Karnataka	261372	1159755	294261	1541069	332162	2090722
Madhya Pradesh	650316	4532518	837041	6760106	944207	7820952
Maharashtra	604300	6181596	731457	7243631	761424	8225757
Odisha	587517	3547363	516862	3497593	464665	3197782
Rajasthan	2545	7635	7502	22506	9410	28230
Telangana	13262	66514	17373	80232	10295	57065

MANGANESE ORE

Table – 5 (A) : Gradewise Production of Manganese Ore, 2017-18
(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	149(11)	15783	259088	595107	1276874	452963	2599815	19907474
Public Sector	24	2994	178718	363341	627210	54328	1226591	12036156
Private Sector	125(11)	12789	80370	231766	649664	398635	1373224	7871318
Andhra Pradesh	27	-	-	19380	57784	95010	172174	706314
Vizianagaram	27	-	-	19380	57784	95010	172174	706314
Goa	3*	-	-	-	-	-	-	-
South Goa	3*	-	-	-	-	-	-	-
Gujarat	1	-	-	-	-	18362	18362	11496
Panchmahal	1	-	-	-	-	18362	18362	11496
Jharkhand	3(1)	-	-	1830	2946	7	4783	44527
Singbhum (West)	3(1)	-	-	1830	2946	7	4783	44527
Karnataka	10(2)	-	-	37816	178873	77572	294261	1541069
Ballari	2(2)	-	-	27816	169230	58460	265506	1434947
Chitradurga	3	-	-	-	-	11567	11567	27457
Davanagere	4	-	-	-	9643	6245	15888	75740
Tumakuru	1	-	-	-	-	1300	1300	2925
Madhya Pradesh	42(4)	-	156652	106778	387796	185815	837041	6760106
Balaghat	31(1)	-	149419	90007	310380	30004	579811	5455270
Chhindwara	4	-	7233	16771	13991	3351	41345	495184
Jabalpur	6(3)	-	-	-	-	152460	152460	564641
Jhabua	1	-	-	-	63425	-	63425	245011
Maharashtra	24	2994	29927	309289	353346	35901	731457	7243631
Bhandara	3	2994	7386	198732	256522	19858	485492	4777772
Nagpur	21	-	22541	110557	96824	16043	245965	2465859
Odisha	33(4)	12789	72509	120014	283939	27611	516862	3497593
Keonjhar	19(2)	9993	71332	108453	160731	15346	365855	2230855
Sundargarh	14(2)	2796	1177	11561	123208	12265	151007	1266738
Rajasthan	1	-	-	-	7502	-	7502	22506
Banswara	1	-	-	-	7502	-	7502	22506
Telangana	5	-	-	-	4688	12685	17373	80232
Adilabad	5	-	-	-	4688	12685	17373	80232

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

* Only labour reported.

MANGANESE ORE

Table – 5 (B) : Gradewise Production of Manganese Ore, 2018-19 (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	140(12)	35783	291845	577628	1216233	698738	2820227	22702512
Public Sector	24	29689	167385	365573	659908	67856	1290411	13663638
Private Sector	116(12)	6094	124460	212055	556325	630882	1529816	9036874
Andhra Pradesh	27	-	-	14240	51109	227930	293279	1238252
Vizianagaram	27	-	-	14240	51109	227930	293279	1238252
Goa	2*	-	-	-	-	-	-	-
South Goa	2*	-	-	-	-	-	-	-
Gujarat	1*	-	-	-	-	-	-	-
Panchmahals	1*	-	-	-	-	-	-	-
Jharkhand	4(1)	-	-	1134	3643	8	4785	43752
Singhbhum (West)	4(1)	-	-	1134	3643	8	4785	43752
Karnataka	9(2)	-	-	65092	173704	93366	332162	2090722
Ballari	1(2)	-	-	65092	162909	61871	289872	1957597
Chitradurga	3	-	-	-	-	-	11930	23624
Davanagere	4	-	-	-	10795	18615	29410	106392
Tumakuru	1	-	-	-	-	950	950	3109
Madhya Pradesh	40(5)	-	149748	102449	439673	252337	944207	7820952
Balaghat	30(1)	-	144874	89168	366342	43953	644337	6683428
Chhindwara	4	-	4874	13281	6809	7991	32955	376309
Jabalpur	5(4)	-	-	-	10	200393	200403	429068
Jhabua	1	-	-	-	66512	-	66512	332147
Maharashtra	20	29689	22632	311469	339160	58474	761424	8225757
Bhandara	2	29689	319	182059	250342	41658	504067	5047695
Nagpur	18	-	22313	129410	88818	16816	257357	3178062
Odisha	30(4)	6094	119465	83244	194962	60900	464665	3197782
Keonjhar	17(2)	5437	119236	78030	127131	59993	389827	2499890
Sundargarh	13(2)	657	229	5214	67831	907	74838	697892
Rajasthan	1	-	-	-	9410	-	9410	28230
Banswara	1	-	-	-	9410	-	9410	28230
Telangana	6	-	-	-	4572	5723	10295	57065
Adilabad	6	-	-	-	4572	5723	10295	57065

*Figures in parentheses indicate associated mines of iron ore, laterite, limestone and quartz.*** Only labour reported.*

MANGANESE ORE

**Table – 6 : Production of Manganese Ore, 2017-18 and 2018-19
(By Frequency Groups)**

(Quantity in tonnes)

Production Group	No. of mines		Production		Percentage in total Production		Cumulative percentage	
	2017-18	2018-19 (P)	2017-18	2018-19 (P)	2017-18	2018-19 (P)	2017-18	2018-19 (P)
Total	149(11)	140(12)	2599815	2820226	100.00	100.00	-	-
Up to 1000	69	65(1)	8859	8687	0.34	0.31	0.34	0.31
1001 - 5000	37(5)	25(5)	108143	81038	4.16	2.87	4.5	3.18
5001 - 10000	13(1)	18(1)	99386	144284	3.82	5.12	8.32	8.3
10001 - 20000	8(3)	8(1)	152241	130872	5.86	4.64	14.18	12.94
20001 - 30000	3	4(1)	70222	110639	2.70	3.92	16.88	16.86
30001 - 40000	3	4(1)	103734	171972	3.99	6.10	20.87	22.96
40001 - 50000	2(1)	2(1)	132948	142865	5.11	5.07	25.98	28.03
50001 and above	14(1)	14(1)	1924282	2029869	74.02	71.97	100.00	100.00

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

**Table – 7 (A) : Mine-head Closing Stocks of Manganese Ore, 2017-18
(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	3588	26313	100487	461635	1358803	1950826
Andhra Pradesh	-	-	29	45004	21431	66464
Goa	-	-	-	-	-	-
Gujarat	-	-	-	-	646042	646042
Jharkhand	1	24	1845	5269	245	7384
Karnataka	-	-	250	51440	205631	257321
Madhya Pradesh	-	22122	17190	40643	352729	432684
Maharashtra	1167	968	33583	26267	26068	88053
Odisha	2420	3199	47590	291137	104426	448772
Rajasthan	-	-	-	1367	-	1367
Telangana	-	-	-	508	2231	2739

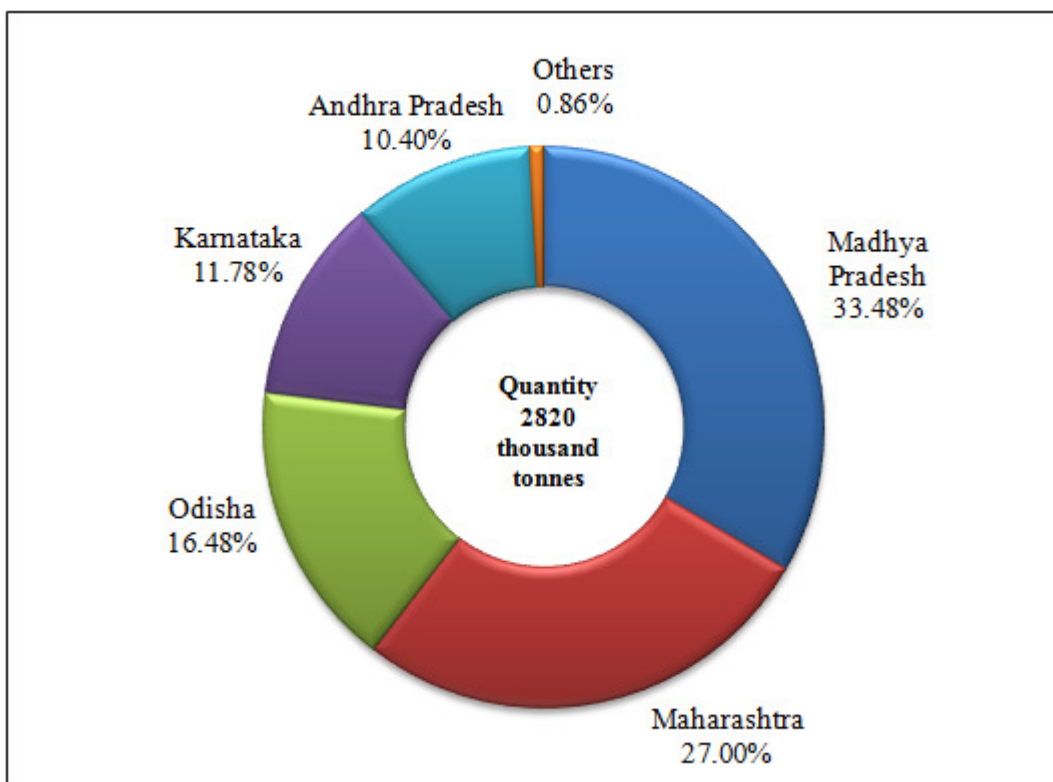
**Table – 7 (B) : Mine-head Closing Stocks of Manganese Ore, 2018-19
(By States/Grades)**

(In tonnes)

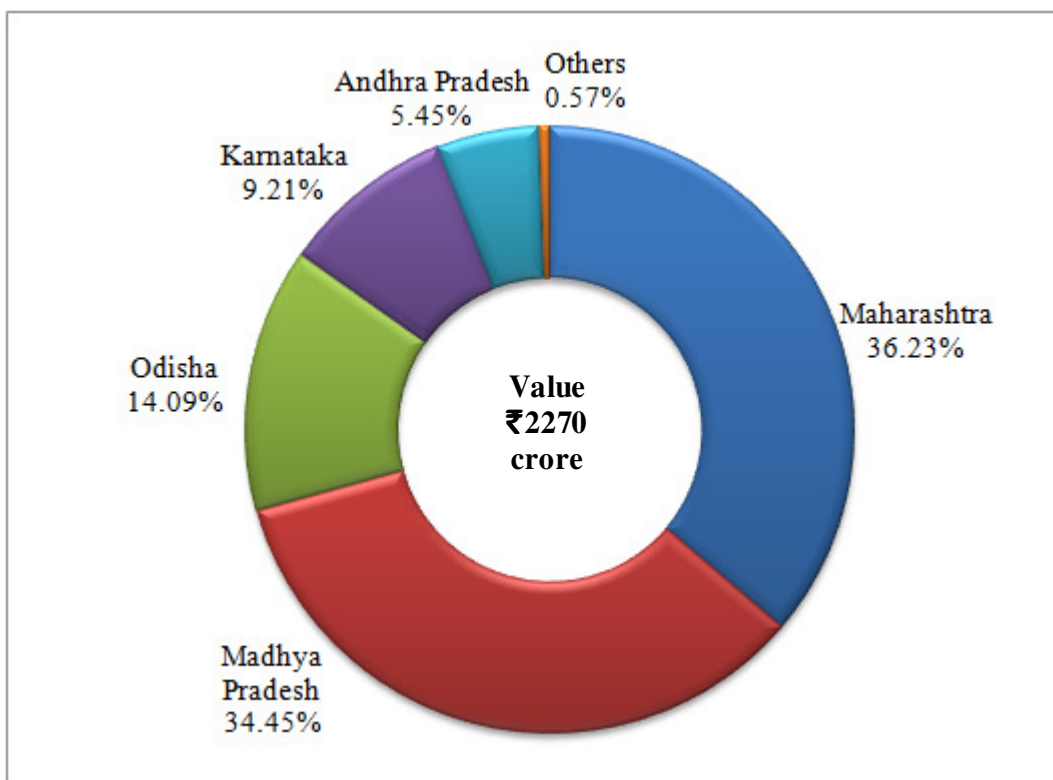
State	Grades : Mn content					Total Quantity
	MnO ₂	46% and above	35% to below 46%	25% to below 35%	below 25%	
India	17443	20732	74051	388043	2388946	2889215
Andhra Pradesh	-	-	18	33432	19278	52728
Goa	-	-	-	-	-	-
Gujarat	-	-	-	-	597329	597329
Jharkhand	1	23	779	3596	189	4588
Karnataka	-	-	98	25174	214917	240189
Madhya Pradesh	-	14663	20001	53353	476073	564090
Maharashtra	15074	733	17767	22824	25123	81521
Odisha	2368	5313	35389	247113	1054848	1345030
Rajasthan	-	-	-	1529	-	1529
Telangana	-	-	-	1022	1189	2211

MANGANESE ORE

Quantity of Manganese Production in Different States, 2018-19



Value of Manganese Production in Different States, 2018-19



MINING, PROCESSING, MARKETING & TRANSPORT

Manganese ore mining in the country is carried out by opencast as well as by underground methods. Of the 142 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 is in progress 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. 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 is planning 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 2008). 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 2008) 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 ferromanganese are prescribed by the Bureau of Indian Standards vide IS: 4763-2006, (Second Revision, Reaffirmed 2010). BIS has also laid down the specifications of manganese ore sinters for blending for ferromanganese production vide IS:12596-1989 (Reaffirmed 2009). User's specifications of manganese ore for Ferromanganese/ Silico-manganese industries are furnished in Table- 8.

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%

(Contd.)

MANGANESE ORE

Table-8 (Contd.)

Name and location of plant	Specifications of ore consumed
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.	Mn: 38-40%, Fe: 18-23%
Thermit Alloys Ltd, Shivamogga.	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
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

MANGANESE ORE

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 2010) 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 electrone-gative 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 industries as laid down

in IS : 5713-1981 (First Revision, Reaffirmed 2011) by BIS is as follows: MnO₂ 80% by mass (min.), moisture 1% (max.), matter soluble in water 0.2% (max.) and water soluble chlorides (as NaCl) 0.05% (max.). There are three types of material with above composition which show variation in their particle size: Type A, Type B and Type C. Particle size (max.) is 600 microns for Type A, 150 microns for Type B and 74 microns for Type C ore. In addition, grit content should be 1% (max.) for Type A ore. For Match Industry, the MnO₂ content shall be 50% (min.).

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 2.06 million tonnes in 2018-19 as against 2.70 million tonnes in 2017-18. Ferroalloys industries accounted for about 89% consumption followed by Iron & Steel (10%). The remaining (1%) was shared by Battery, Electrode, Chemical, Zinc Smelter and Alloy Steel industries (Table- 9).

The consumption of ferromanganese in 2018-19 decreased by 36% to 51 thousand tonnes from 79 thousand tonnes in the previous year. Iron & steel Industry was the bulk consumer of ferromanganese accounting for about 87% consumption in 2018-19. The remaining 13% was consumed in alloy steel, foundry and electrode industries. Consumption of silicomanganese which was 161 thousand tonnes in 2017-18 decreased to 123 thousand tonnes in 2018-19 (Tables- 10 & 11).

**Table – 9 : Estimated Consumption* of Manganese Ore, 2016-17 to 2018-19
(By Industries)**

Industry	(In tonnes)		
	2016-17	2017-18 (R)	2018-19 (P)
All Industries	2868300	2701700	2061700
Ferroalloys	2707500	2538100	1845400
Iron & steel	131600	128100	198300
Others: (Alloy steel, chemical, zinc smelter, Battery & electrode)	29200	35500	18000

Figures rounded off

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

MANGANESE ORE

**Table – 10 : Consumption* of Ferromanganese,
2015-16 to 2017-18
(By Industries)**

(In tonnes)			
Industry	2015-16	2016-17 (R)	2017-18 (P)
All Industries	130700	79300	50800
Alloy steel	11900	6600	6600
Iron & steel	117100	72200	44100
Other	1700	500	100

Figures rounded off

* Includes actual reported consumption and/or estimates made wherever required; Paucity of data has posed restriction to the data coverage on consumption.

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 ferro manganese, 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. The capacity of the EMD Plant was increased from 1000 tpy to 1,500 tpy capacity during 2018-19. In 2018-19, about 992 tonnes of EMD was produced as against 875 tonnes in 2017-18. Ferromanganese plant of 10,000 tonnes per annum capacity has been set up at Bharveli, Balaghat. In 2018-19, 11,003 tonnes of ferro-manganese was produced as compared to 10,573 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 which was the same in the year 2017-18 as per Monthly Statistics of Mineral Production (March, 2019- Final Release). 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,

**Table – 11 : Consumption* of Silicomanganese,
2015-16 to 2017-18
(By Industries)**

(In tonnes)			
Industry	2015-16	2016-17 (R)	2017-18 (P)
All Industries	256400	161400	122600
Alloy steel	12600	9900	9900
Iron & steel	243500	151400	112700
Others (Electrode, Foundry)	300	100	++

Figures rounded off

* Includes actual reported consumption and/or estimates made wherever required; Paucity of data has posed restriction to the data coverage on consumption.

2019- Final Release), production of silico-manganese was reported at 3,45,291 tonnes in 2018-19 as compared to 3,11,326 tonnes in 2017-18. 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. Activities in respect of both these joint venture companies have been put on hold.

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 2017-18 and 2018-19 are furnished in Table-12.

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.

MANGANESE ORE

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.

Table – 12 : Consumption, Specifications and Source of Supply of Manganese Ore in different Iron and Steel Plants, 2017-18 and 2018-19

Plant	Production of pig iron/hot metal (tonnes)		Consumption of Mn-ore (tonnes)		Specifications of ore consumed	Source
	2017-18	2018-19 (P)	2017-18	2018-19 (P)		
Bhilai Steel Plant, Bhilai Nagar, Durg Chhattisgarh.	Hot metal 4280056	Hot metal 4751515	5845	6186	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 4045681	Hot metal 4209268	NA	NA	NA	-
Durgapur Steel Plant, Durgapur, West Bengal.	Hot metal 2282182	Hot metal 2515068	NA	NA	NA	-
Rourkela Steel Plant, Rourkela, Odisha.	Hot metal 3319398	Hot metal 3836421	NA	NA	-	-
IISCO Steel Plant, Burnpur, Dist. Burdwan, West Bengal- 713 325.	Hot metal NA	Hot metal NA	NA	NA	Mn (dry) 30% (min.) -10 mm - 10.0% max. +40 mm - 15% max.	-
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	Fe: 25-50% min. MnO ₂ : 44% min. SiO ₂ +Al ₂ O ₃ : 12% max.	Milan Minerals, Karnataka
Visakhapatnam Steel Plant, Visakhapatnam, Andhra Pradesh.	NA	NA	NA	NA	Mn: 28%, (min.) Fe: 16% SiO ₂ : 25% max. Size: 10-60 mm (BF) (-) 10 mm (SP)	Garividi, Andhra Pradesh
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	-
Tata Steel Ltd, Jamshedpur, Jharkhand.	Hot metal 10948835	Hot metal 10839210	167	296	Mn 25% to below 35%	Bichakundi Mine, Keonjhar

(Contd.)

MANGANESE ORE

Table - 12 (Contd)

Plant	Production of pig iron/hot metal (tonnes)		Consumption of Mn-ore (tonnes)		Specifications of ore consumed	Source
	2017-18	2018-19 (P)	2017-18	2018-19 (P)		
Kirloskar Ferrous Industries Ltd, Bevinahalli, 583 234, Koppal, Karnataka.	Pig iron 588000	Pig iron 588000	NA	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 NA	Hot metal NA	NA	NA	below 35% Mn Mines	Siljoda
Sunflag Iron & Steel Co. Ltd, Warrthy, Bhandara, Maharashtra.	Hot metal 319598	Hot metal 311821	NA	NA	25% to below 35% Mn	-
Jaiswal Neco Industries Ltd, Siltara, Raipur, Chhattisgarh.	Hot metal NA	Hot metal NA	NA	NA	Mn:26-28% Size:10-60 mm	-
Jaiswal Neco Industries Ltd, Ballari, Karnataka.	Hot metal NA	Hot metal NA	-	-	NA	NA
Tata Metalliks Ltd, Kharagpur, Medinipur, West Bengal.	Hot metal NA	Hot metal NA	NA	NA	NA	NA
JSW Steel Ltd, Salem, Tamil Nadu- 636 453.	Hot metal NA	Hot metal NA	-	-	NA	NA
JSW Steel Ltd, Vidyanagari, Ballari, Karnataka.	Hot metal NA	Hot metal NA	-	-	NA	NA
Rashmi Metaliks Ltd, Gokulpur, West Midnapore, West Bengal.	Hot metal 169910	Hot metal 172612	NA	450	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 Metaliks Ltd, Bhugaon- 442 001, Wardha, Maharashtra.	Hot metal 533036	Hot metal 476535	NA	NA	NA	NA
Tata Metalliks Ltd, Gokulpur, Maheshpur West Bengal.	Hot metal 499540	Hot metal 518170	9679	9576	NA	NA

(Contd.)

MANGANESE ORE

Table - 12 (Contd)

Plant	Production of pig iron/hot metal (tonnes)		Consumption of Mn-ore (tonnes)		Specifications of ore consumed	Source
	2017-18	2018-19 (P)	2017-18	2018-19 (P)		
Vedanta Ltd, Navelim Amona, Marcela, Goa.	NA	NA	NA	NA	-	-
Neelachal Ispat Nigam Ltd, Kalinga Nagar, Duburi, Jajpur, Odisha.	NA	NA	NA	NA	-	-
Suraj Products Ltd, Barpali, Rajgangpur, Sundargarh, Odisha.	NA	NA	NA	NA	-	-
SLR Metaliks Ltd, A-2/452, Sector-8 Rihini, Delhi, 110 085.	NA	NA	NA	NA	-	-
Jindal Saw Ltd, Mundra, Gujarat.	455205	478861	7082	3801	Mn 25% to below 35%	-
SLR Metaliks Ltd, Narayan Devara Kere, Hagari Bommana Halli, Karnataka	NA	NA	NA	NA	-	-

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 reserve of manganese ore is approximately 810 million tonnes of metal content which is unevenly distributed (Table-13). Reserves are located in South Africa (32%), Brazil (17%), Australia (12%), Gabon (8%), China (7%) and India (4%). Only a small fraction of global manganese reserves is economical. It is fact that 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

MANGANESE ORE

1% world reserves and the United States is said 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 2018 was estimated to be around 53 million tonnes as compared to 48.20 million tonnes in 2017. South Africa was the leading producer contributing about 28% followed by China (17%), Australia (14%), Ghana (9%), Gabon (8%), Brazil (6%), India (5%) and Ukraine (3%) (Table-14). 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 – 13 : World Reserves of Manganese Ore (By Principal Countries)

(In '000 tonnes of metal content)	
Country	Reserves
World: Total (rounded off)	810000
Australia ^(a)	100000
Brazil	140000
Burma	NA
China	54000
Cote d'Ivoire	NA
Gabon	61000
Georgia	NA
Ghana	13000
India*	34000
Kazakhstan, (concentrate)	5000
Malaysia	NA
Mexico	5000
South Africa	260000
Ukraine, (concentrate)	140000
USA	-
Other countries	Small

Source: USGS Mineral Commodity Summaries, 2020.

(a): Joint Ore Reserve Committee compliant reserves were about 45 million tonnes of manganese content. _ : Zero

*: India's total reserves/resources of manganese ore as per NMI database based on UNFC system have been estimated at 495.87 million tonnes as on 1.4.2015. _ : Zero

Table – 14 : World Production of Manganese Ore (By Principal Countries)

(In '000 tonnes)			
Country	2016	2017	2018
World: Total	50800	48200	53000
Australia	5328	6172	7211
Brazil	2881	3273	3200
China ^e	15528	8500	9000
Gabon	3413	4163	4330
Ghana	2018	3004	4552
India*	2395	2589	2759
Kazakhstan	1601	1460	1427
Malaysia	701	1226	1263
South Africa ^e	13745	13889	14918
Ukraine	1328	1758	1845
Other countries	1872	2166	2462

Source: World Mineral Production, 2014-2018.

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

* India's production of manganese ore in 2016-17, 2017-18 and 2018-19 was 2,395 thousand tonnes, 2,600 thousand tonnes and 2,820 thousand tonnes, respectively.

FOREIGN TRADE

Exports

Exports of Manganese Ore increased substantially by 26% to 55,845 tonnes in 2018-19 from 44,167 tonnes in 2017-18. Out of the total exports in 2018-19, only 2 tonnes of manganese ore having +46% Mn of value ₹55,000 was exported. Exports of Manganese Ore (Others) were at 55,843 tonnes as compared to 19,367 tonnes in the preceding year. More than 59% of exports was to China and 40% exports to Indonesia. Exports of Manganese oxide (total) decreased by 13% to 18,035 tonnes in 2018-19 as against 20,771 tonnes in 2017-18. Manganese dioxide exports in 2018-19 decreased slightly by less than a per cent to 2,529 tonnes from 2,545 tonnes in 2017-18. Exports were mainly to UAE (19%), Poland (13%), Bangladesh (11%) and Kenya (10%). In 2018-19, exports of Manganese & Alloys (including waste & scrap) increased by 50% to 456 tonnes as compared to 305 tonnes in the previous year. Exports of Manganese & Alloys (wrought & unwrought) in 2018-19 increased drastically by 54% to 414 tonnes as compared to 269 tonnes in the previous year (Tables- 15 to 28).

MANGANESE ORE

Imports

Imports of Manganese Ore decreased by 23% to 2.78 million tonnes in 2018-19 from 3.63 million tonnes in the previous year. South Africa with 45% and Australia, Brazil, Gabon, & Cote d'Ivoire with 8% each were the main suppliers of manganese ore in 2018-19. Out of the total Manganese Ore imported, the contribution of Manganese Ore having +46% Mn was 2,19,963 tonnes (8%), Manganese Ore having 35-46% Mn was 16,41,885 tonnes (59%), Manganese Ore having 30 to 35% Mn was 3,95,736 tonnes (14%) and Manganese Ore (Others) was 4,28,446 tonnes (15%). In 2018-19, imports of Manganese dioxide were 9,164 tonnes. Imports were mainly from China (68%), Belgium (15%) and Peru (14%). In 2018-19 imports of Manganese oxide (total) were 23,978 tonnes. During 2018-19, imports of Manganese & Alloys (including waste and scrap) were 45,868 tonnes, out of which Manganese & Alloys (wrought/unwrought) comprised 45,838 tonnes. Imports of Manganese & Alloys NES were negligible. Imports of Manganese Waste & Scrap were at 28 tonnes in 2018-19 (Tables- 29 to 43).

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

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	44167	508784	55845	138120
Indonesia	-	-	22535	75396
China	43800	490447	33000	49003
Netherlands	167	9342	100	6559
Turkey	72	4092	50	3382
Sri Lanka	27	523	50	1023
Taiwan	-	-	14	978
Uganda	32	418	64	864
Nepal	20	1083	8	438
Kenya	-	-	11	255
Djibouti	-	-	10	184
Other countries	49	2878	3	37

Figures rounded off.

Table – 16 : Exports of Manganese Ore (46% or more Mn) (By Countries)

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	++	29	2	55
Turkey	-	-	2	55
Bangladesh	++	29	-	-
China	++	++	-	-

Figures rounded off.

Table – 17 : Exports of Manganese Ore (Others) (By Countries)

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	19367	177006	55843	138063
Indonesia	-	-	22535	75396
China	19000	158698	33000	49003
Netherlands	167	9342	100	6559
Turkey	72	4092	48	3328
Sri Lanka	27	523	50	1023
Taiwan	-	-	14	978
Uganda	32	418	64	864
Nepal	20	1083	8	438
Kenya	-	-	11	255
Djibouti	-	-	10	184
Other countries	49	2850	3	35

Figures rounded off.

MANGANESE ORE

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

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	20771	1016498	18035	928690
France	1931	72303	3153	138637
Vietnam	1465	75166	1441	81604
Indonesia	1161	60265	1282	73447
Canada	989	53997	1151	68183
Australia	999	49605	1232	54774
UK	680	37781	815	51023
Spain	1361	66683	786	40177
USA	216	11612	429	29893
Russia	1622	75464	533	29401
Turkey	1475	76431	548	29244
Other countries	8872	437190	6665	332306

*Figures rounded off.***Table – 19: Exports of Manganese Dioxide
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	2545	123550	2529	118447
UAE	37	2019	480	23665
UK	55	4602	240	20029
Poland	197	10586	319	19509
Italy	50	2524	235	10837
Bangladesh	233	6834	269	7576
Malaysia	60	3600	105	6543
Kenya	201	3309	253	4494
Saudi Arabia	76	4654	88	4180
Japan	21	561	168	4030
Vietnam	50	1317	102	3105
Other countries	1565	83545	269	14478

Figures rounded off.

MANGANESE ORE

**Table – 20: Exports of Manganese Oxide
(Other than Manganese Dioxide)
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	18226	892948	15506	810243
France	1931	72303	3153	138637
Vietnam	1415	73850	1339	78499
Indonesia	1141	59366	1282	73387
Canada	989	53997	1151	68182
Australia	999	49605	1232	54774
Spain	1324	64972	775	39278
UK	625	33179	575	30994
Russia	1622	75464	533	29400
USA	216	11265	424	28718
Turkey	1475	76431	521	28108
Other countries	6489	322516	4521	240265

Figures rounded off.

**Table – 21: Exports of Manganese & Alloys
(Incl. Waste & Scrap)
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	305	207272	456	312178
France	165	107544	282	197735
China	58	45633	51	46336
Croatia	9	12318	9	12804
Germany	1	1786	52	11795
Brazil	1	1634	6	8270
Italy	3	5192	3	5406
Poland	1	1382	3	4488
Romania	3	5100	2	4424
Philippines	10	1877	22	4409
Malaysia	3	3769	3	3577
Other countries	52	21038	24	12933

Figures rounded off.

**Table – 22: Exports of Manganese & Alloys :
(Wrought/Unwrought)
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	269	199909	414	300771
France	144	102595	241	186443
China	58	45623	51	46323
Croatia	9	12318	9	12804
Germany	1	1786	52	11795
Brazil	1	1634	6	8270
Italy	3	5192	3	5406
Poland	1	1382	3	4488
Romania	3	5100	2	4424
Philippines	10	1877	22	4409
Malaysia	3	3769	3	3577
Other countries	37	18634	23	12831

Figures rounded off.

MANGANESE ORE

Table - 23 : Exports of Manganese :Wrought**(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	11	2063	12	2636
Nigeria	-	-	5	1178
Saudi Arabia	-	-	2	433
Taiwan	-	-	2	389
Pakistan	++	46	2	319
Malaysia	1	104	1	146
Brazil	-	-	++	77
Kenya	-	-	++	52
UK	++	37	++	41
Philippines	10	1877	-	-

*Figures rounded off.***Table - 24: Exports of Manganese & Alloys
Unwrought
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	258	197846	402	298135
France	144	102595	241	186443
China	58	45623	51	46323
Croatia	9	12318	9	12804
Germany	1	1786	52	11795
Brazil	1	1634	5	8193
Italy	3	5192	3	5406
Poland	1	1382	3	4488
Romania	3	5100	2	4424
Philippines	-	-	22	4409
Malaysia	2	3665	2	3431
Other countries	36	18551	12	10418

*Figures rounded off.***Table - 25 : Exports of Manganese & Alloys :
NES
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	6	1742	++	82
Uganda	-	-	++	35
Serbia	-	-	++	30
Indonesia	-	-	++	6
UAE	++	118	++	6
Bhutan	-	-	++	5
Guinea	-	-	++	++
France	1	658	-	-
Bangladesh	3	552	-	-
Taiwan	2	357	-	-
Pakistan	++	56	-	-
Other countries	++	1	-	-

Figures rounded off.

MANGANESE ORE

**Table - 26 : Exports of Manganese Ore
(35% Or More but Below 46% Mn)
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	24800	331750	-	-
China	24800	331750	-	-

Figures rounded off

**Table – 27 : Exports of Manganese Ore
(Ferruginous, 10% or More but Below 30% Mn)
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	-	-	++	2
Maldives	-	-	++	2

Figures rounded off

**Table – 28 : Exports of Manganese
Waste & Scrap
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	30	5620	41	11325
France	20	4290	41	11292
Spain	-	-	++	21
China	++	10	++	13
Oman	10	1306	-	-
USA	++	14	-	-

Figures rounded off.

**Table – 29: Imports of Manganese Ore : Total
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	3627742	50633966	2784473	48484514
South Africa	2118574	25889561	1254315	20953738
Australia	482439	9254873	224161	5129502
Brazil	209888	3134341	210423	4169187
Gabon	476301	6802381	227873	3529302
Singapore	4897	172930	159424	3401667
Cote d'Ivoire	248064	4089651	218262	2931916
UAE	-	-	160487	2451109
Uruguay	-	-	85207	1520168
Tanzania	8585	151455	58094	1105758
France	-	-	41630	916413
Other countries	78994	1138774	144597	2375754

Figures rounded off.

**Table – 30 : Imports of Manganese Ore
(46% or more Mn)
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	327431	5971223	219963	5275364
Australia	225430	4437683	100095	2401033
Brazil	6326	115947	38306	953476
UAE	-	-	18640	452561
Cote d'Ivoire	3422	65019	12396	326806
South Africa	58521	658103	15863	307341
Tanzania	3509	58416	11145	243190
Singapore	4872	172068	5211	203253
Zambia	21392	378006	9317	171483
Senegal	2351	49999	5066	114773
Congo, Dem. Rep. of	-	-	2682	70947
Other countries	1608	35082	1242	30501

Figures rounded off.

MANGANESE ORE

**Table – 31 : Imports of Manganese Ore
(35% or more but below 46% Mn)
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	2095807	30130889	1641885	29972597
South Africa	1274430	17105173	749657	13966672
Gabon	384281	5732586	185054	3002040
Singapore	25	862	126289	2592572
Australia	148282	2943513	92253	1972141
Brazil	113767	1714590	90203	1671243
Uruguay	-	-	85207	1520168
UAE	-	-	85534	1345064
Cote d'Ivoire	150531	2250716	92464	1329363
France	-	-	41630	916413
Tanzania	1452	24386	35579	639261
Other countries	23102	359063	58015	1017660

Figures rounded off.

**Table – 33 : Imports of Manganese Ore (Others)
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	658891	9452943	428446	7545578
South Africa	346855	4111376	248937	3949261
Brazil	89795	1303804	80862	1530670
Australia	108727	1873677	31813	756329
Singapore	-	-	27924	605842
Tanzania	3624	68652	10533	212027
Angola	-	-	4894	132859
Zambia	790	20299	5182	94885
Gabon	23894	395355	6968	81305
Congo, P. Rep.	-	-	2023	50232
Cote d' Ivoire	82007	1619785	4625	43920
Other countries	3199	39995	4685	88248

Figures rounded off.

**Table – 32 : Imports of Manganese Ore
(30% or more but below 35% Mn)
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	494928	4658514	395736	4809679
South Africa	412809	3810428	205999	2440126
Cote d' Ivoire	12104	151131	71331	838567
UAE	-	-	44818	554253
Gabon	68189	621440	35851	445957
Hong Kong	-	-	29678	436257
Myanmar	-	-	2890	32403
Turkey	952	11553	1708	19260
Brazil	-	-	1052	13798
Tanzania	-	-	836	11280
Egypt	-	-	755	10719
Other countries	873	7962	818	7059

Figures rounded off.

**Table – 34 : Imports of Manganese Dioxide
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	7760	771226	9164	892944
China	7610	739269	6199	743044
Belgium	140	27851	1417	68718
Peru	-	-	1257	41528
Hong Kong	-	-	270	31821
UAE	-	-	12	5261
USA	6	1834	9	2287
UK	++	243	++	153
Germany	4	1989	++	132
Australia	++	20	-	-
Korea, Rep. of	++	20	-	-

Figures rounded off.

MANGANESE ORE

**Table – 35 : Imports of Manganese Oxide
(Other than Manganese Dioxide)
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	6902	302587	14814	552990
South Africa	4768	96115	12960	313552
Belgium	945	134510	816	126879
China	102	13133	370	60939
UAE	++	39	27	11253
Peru	800	24218	317	9507
USA	68	7731	63	7875
Germany	26	9442	17	6828
Singapore	-	-	145	4956
Brazil	75	4291	50	3836
Netherlands	-	-	24	2348
Other countries	118	13108	25	5017

Figures rounded off.

**Table –36 : Imports of Manganese & Alloys
(Incl. Waste & Scrap)
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	55819	6878790	45868	7676643
China	54207	6462674	43752	7031795
France	306	199341	379	281390
Hong Kong	25	2474	895	132905
Sweden	58	45798	136	125498
Indonesia	-	-	150	21141
Singapore	-	-	125	20015
Thailand	-	-	98	16027
Korea, Rep. of	120	15749	83	13143
Br. Virgin Is	-	-	74	10241
South Africa	286	36223	65	9133
Other countries	817	116531	111	15355

Figures rounded off.

**Table –37 : Imports of Manganese & Alloys
(Wrought/Unwrought)
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	55766	6871294	45838	7674481
China	54156	6457154	43751	7031668
France	306	199341	375	280812
Hong Kong	25	2474	895	132905
Sweden	57	45791	136	125498
Indonesia	-	-	150	21141
Singapore	-	-	125	20015
Thailand	-	-	98	16027
Korea, Rep. of	120	15749	83	13143
Br. Virgin Is	-	-	74	10241
South Africa	286	36223	40	8542
Other countries	816	114562	111	14489

Figures rounded off.

**Table –38 : Imports of Manganese (Wrought)
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	9903	1191910	10223	1757913
China	9819	1182125	10223	1757913
Gabon	84	9783	-	-
UK	++	2	-	-

Figures rounded off.

**Table –39 : Imports of Manganese & Alloys NES
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	9903	1191910	10223	1757913
All Countries	52	7496	++	993
UK	++	224	++	284
UAE	-	-	++	271
Germany	1	1417	++	143
China	51	5520	++	127
USA	++	234	++	124
Austria	++	94	++	42
Belgium	-	-	-	-
Sweden	++	7	-	-

Figures rounded off.

MANGANESE ORE

**Table – 40 : Imports of Manganese Ore
(Ferruginous, 10% or more but Below 30% Mn)
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	50684	420398	98443	881294
Cote d'Ivoire	-	-	37446	393260
South Africa	25959	204482	33860	290337
Korea, Rep. of	-	-	14714	93020
UAE	-	-	10499	90617
Kenya	-	-	650	5548
Albania	-	-	735	4800
Turkey	-	-	539	3712
Malaysia	24725	215916	-	-

Figures rounded off.

**Table –41 : Import of Manganese Oxide
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	14662	1073812	23977	1445933
China	7712	752402	6569	803983
South Africa	4768	96115	12960	313552
Belgium	1085	162361	2233	195597
Peru	800	24218	1574	51035
Hong Kong	-	-	270	31821
UAE	++	39	39	16514
USA	74	9565	71	10161
Germany	30	11431	17	6960
Singapore	-	-	145	4956
Brazil	75	4291	50	3836
Other countries	118	13390	49	7518

Figures rounded off.

**Table – 42 : Import of Manganese
Waste and Scrap
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	-	-	28	1169
South Africa	-	-	25	591
France	-	-	3	578

Figures rounded off.

MANGANESE ORE

**Table - 43 : Import of Manganese & Alloys: Unwrought
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	45863	5679384	35616	5916567
China	44337	5275029	33529	5273754
France	306	199341	375	280812
Honk Kong	25	2474	895	132905
Sweden	57	45791	136	125498
Indonesia	-	-	150	21141
Singapore	-	-	125	20015
Thailand	-	-	98	16027
Korea, Rep. of	120	15749	83	13143
Br Virgin Is	-	-	74	10241
South Africa	286	36223	40	8542
Other countries	732	104777	111	14489

Figures rounded off.

FUTURE OUTLOOK

As per World Steel Association, in 2017 India's per capita steel consumption is about 65.2 kg as against the world's per capita consumption of 214.5 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 97.94 million tonnes in 2017-18 to 102.34 million

tonnes in 2018-19 registering a growth of 4.49 per cent. 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.