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Indian Minerals Yearbook 2016

(Part- II : Metals & Alloys)



55th Edition

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(ADVANCE RELEASE)

**GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES**

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January, 2018

5 Copper

Copper is an important non-ferrous base metal having wide industrial applications, ranging from defence, space programme, railways, power cables, mint, telecommunication cables, etc. India is not self-sufficient in the production of copper ore. In addition to domestic production of ore and concentrates, India imports copper concentrates for its smelters. The domestic demand of copper and its alloys is met through domestic production, recycling of scrap and by imports.

Hindustan Copper Limited (HCL), a Public Sector Undertaking, is the only integrated company in the country that is involved in mining & beneficiation of ore and is engaged in smelting, refining and casting of refined copper.

Hindalco Industries Ltd, and Vedanta Limited are the major copper producers in the Private Sector that mainly rely on imported copper concentrates. These companies own copper mines in other countries.

RESERVES/ RESOURCES

The total reserves/resources of copper ore as on 1.4.2015 as per NMI data base based on UNFC system are estimated at 1.51 billion tonnes. Of these, 207.77 million tonnes (13.74%) fall under 'reserves category' while the balance 1.30 billion tonnes (86.25%) are 'remaining resources' category. Gradewise there are no reserves under 1.85% or more copper grade. However, 203.83 million tonnes reserves fall under 1% to below 1.85% Cu. Of the total 8.28 million tonnes ore resources(0.55%) comprise ore

containing 1.85% Cu or more and 657.92 million tonnes (43.53%) resources fall under 1% to below 1.85% Cu grade.

The total copper metal content in the total resources is 12.16 million tonnes of which 2.73 million tonnes constitute reserves.

Largest reserves/resources of copper ore to a tune of 813 million tonnes (53.81%) are in the state of Rajasthan followed by Jharkhand with 295 million tonnes (19.54%) and Madhya Pradesh with 283 million tonnes (18.75%). Copper reserves/resources in Andhra Pradesh, Gujarat, Haryana, Karnataka, Maharashtra, Meghalaya, Nagaland, Odisha, Sikkim, Tamil Nadu, Telangana, Uttarakhand and West Bengal accounted for remaining 7.9% of the total all India resources (Table-1).

EXPLORATION & DEVELOPMENT

Exploration were carried out by GSI for base metals during 2015-16 in the district of Prakasam in Andhra Pradesh, Mahendragarh district in Haryana, Raichur district in Karnataka, Chandrapur & Bhandara districts in Maharashtra, Alwar, Ajmer, Bhilwara, Jaipur, Jhunjhunu, Pratapgarh, Sikar & Udaipur districts in Rajasthan. DGM Rajasthan & MECL also carried out exploration in Jaipur and Jhunjhunu districts and MECL carried out exploration in Betul district in Madhya Pradesh during 2015-16. Details of exploration activities conducted for copper by different agencies during 2015-16 are furnished in Table-2.

**Table - 1 : Reserves/Resources of Copper as on 1.4.2015
(By Grades/States)**

(In '000 tonnes)

Grade/State	Reserves			Remaining Resources						Total Resources (A+B)		
	Proved STD111	Probable		Feasibility STD211	Pre-feasibility STD221	Measured STD331	Indicated STD332	Inferred STD333	Reconnaissance STD334		Total (B)	
		STD121	STD122									Total (A)
All India : Total												
Ore	162972	44796	207767	4425	31090	59209	158300	232654	772912	4640	1303730	1511498
Metal	2127.9	606.72	2734.62	382.18	324.55	585.42	1950.87	2050.98	4100.36	29.17	9423.53	12158.15
By Grades												
Ore with 1.85% & Above Cu	-	-	-	-	62	-	2520	2645	2186	870	8283	8283
Ore With 1.00 % to below 1.85 % Cu	159595	44238	203834	30883	28798	42311	130591	78410	143098	-	454091	657925
Ore with (+)0.50% to below 1.00% Cu	3376	557	3934	3124	2230	2103	25189	91989	525510	3620	653764	657698
Ore with (-)0.50% Cu	-	-	-	10919	-	14795	-	59610	102118	150	187592	187592
Metal	2127.9	606.72	2734.62	382.18	324.55	585.42	1950.87	2050.98	4100.36	29.17	9423.53	12158.15
By States												
Andhra Pradesh												
Ore	-	-	-	686	-	105	-	5791	1000	-	7582	7582
Metal	-	-	-	6.88	-	1.05	-	97.45	8.32	-	113.7	113.7
Arunachal Pradesh												
Ore	-	-	-	-	-	-	-	-	-	10	10	10
Metal	-	-	-	-	-	-	-	-	-	0.02	0.02	0.02
Gujarat												
Ore	-	-	-	2470	3010	1380	129	-	7131	-	14120	14120
Metal	-	-	-	30.13	36.72	29.04	0.69	-	113.38	-	209.96	209.96
Haryana												
Ore	-	-	-	-	2230	-	-	-	30678	-	32908	32908
Metal	-	-	-	-	11.82	-	-	-	101.8	-	113.62	113.62
Jharkhand												
Ore	5374	1940	7314	13195	24511	3990	101168	103484	41726	-	288074	295389
Metal	61.33	20.54	81.87	142.08	255.74	45.92	1183.99	1058.42	507.38	-	3193.53	3275.4
Karnataka												
Ore	314	557	872	64	-	2445	1750	6833	22701	-	33793	34665
Metal	3.52	4.19	7.71	0.49	-	16.04	22	65.77	117.49	-	221.79	229.5
Madhya Pradesh												
Ore	141950	12580	154530	17400	-	-	31560	550	79389	-	128899	283429
Metal	1887.93	148.44	2036.37	189.66	-	-	320.84	4.13	867.5	-	1382.13	3418.5

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Table - 1 : (Concld.)

Grade/State	Reserves				Remaining Resources							Total Resources (A+B)	
	Proved STD111	Probable		Total (A)	Feasibility STD211	Pre-feasibility		Measured STD331	Indicated STD332	Inferred STD333	Reconnaissance STD334		Total (B)
		STD121	STD122			STD221	STD222						
Maharashtra													
Ore	-	-	-	-	-	-	-	9399	4841	150	14390	14390	
Metal	-	-	-	-	-	-	-	89.65	47.48	0.54	137.67	137.67	
Meghalaya													
Ore	-	-	-	-	-	-	-	880	-	-	880	880	
Metal	-	-	-	-	-	-	-	9	-	-	9.00	9.00	
Nagaland													
Ore	-	-	-	-	-	-	-	-	2000	-	2000	2000	
Metal	-	-	-	-	-	-	-	-	15.00	-	15.00	15.00	
Odisha													
Ore	-	-	-	-	-	-	-	1420	2536	2095	6051	6051	
Metal	-	-	-	-	-	-	-	21.69	21.06	20.69	63.44	63.44	
Rajasthan													
Ore	15333	29718	45051	11110	228	51226	18603	102088	580541	4480	768276	813327	
Metal	175.12	433.55	608.67	12.94	3.29	492.46	338.66	699.24	2291.94	28.61	3867.14	4475.81	
Sikkim													
Ore	-	-	-	-	-	63	300	-	150	-	958	958	
Metal	-	-	-	-	-	0.91	8.47	-	4.23	-	21.47	21.47	
Tamil Nadu													
Ore	-	-	-	-	-	-	200	590	-	-	790	790	
Metal	-	-	-	-	-	-	1.08	2.73	-	-	3.81	3.81	
Telangana													
Ore	-	-	-	-	-	666	-	-	-	-	666	666	
Metal	-	-	-	-	-	9.12	-	-	-	-	9.12	9.12	
Uttarakhand													
Ore	-	-	-	-	-	-	3170	390	660	-	4220	4220	
Metal	-	-	-	-	-	-	53.45	1.44	5.15	-	60.04	60.04	
West Bengal													
Ore	-	-	-	-	-	-	-	113	-	-	113	113	
Metal	-	-	-	-	-	-	-	2.09	-	-	2.09	2.09	

Figures rounded off.

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Table – 2 : Details of Exploration Activities for Copper, 2015-16

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/ Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Andhra Pradesh							
Prakasam	Mallapuram block of Markapur basemetal belt	1:1000	1	12	1623	183 core samples	A G2 investigation was carried out. Mineralised zone is mainly concentrated within the dolomite band that occurs west of magnetite-quartzite(marker bed). The dolomite band shows patchy outcrop pattern with cumulative strike length of 450 m and an average width of 6-8 m. A few old workings (over dolomite) are noticed in the northern part and south-western part. Quartz veins intruding dolomite are seen oriented parallel to and across the bedding plane, which also contains galena. Gossanised calcareous phyllite bands (length 700 m x width 5 m) are noticed in the southern strike extension of the above mentioned mineralised dolomite bands, which are mainly noticed in the central and south-western part. The average thickness of the gossan zone is 5 m and has maximum thickness (33 m) along 1200 old geophysical line. The trenches namely, T-1G, 2G, 3G have been excavated on the western part mineralised zone, along 1050, 1080 and 1120 old geophysical lines, respectively. The trenches exposes grey, green and ferruginous phyllite. Borehole APMP12, shows specks of pyrite and chalcopyrite, discontinuously, both along bedding and fracture plane from a depth of 50-80 m. Borehole APMP11 also intersected this mineralised zone (discontinuously from 58-74 m along run) and shows similar features.

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Table – 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/ Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Haryana Mahendragarh	South East of Golwa area	-	-	-	-	-	A G-2 stage of exploration of copper was carried out. The rocks of the area comprised of tremolite marble with quartz bands, marble, calcareous quartz-biotite schist, and calcareous quartz-biotite schist with amphibole marble belonging to the Golwa-Gangutana Formation (Kushalgarh Formation of Rajasthan) of the Ajabgarh Group, Delhi Supergroup. Malachite stains and dissemination of sulphide minerals within the calcareous quartz-biotite schist and amphibole marble are the surface manifestation of the mineralisation. Study of drill cores suggests mineralisation in the form of specks, dissemination and fracture-filling of chalcopyrite, bornite, covellite, pyrrhotite and pyrite as sulphide minerals, mostly associated with thin veins/veinlet of calcite and rarely with quartz veins. Analytical results of core samples pertaining to borehole GEBH-9 (2 nd level) indicate 0.38% average grade of copper (Cu) within 7.5 m (175.50 m - 183.00 m) wide mineralised zone. Borehole GEBH-10 (2 nd level) indicates 0.25% average copper in 5 m (159.50 m - 164.50 m) wide mineralised zone. Borehole GEBH-11 (2 nd level) indicates 0.36% average copper in 4- (189.00 m - 193.00 m) wide mineralised zone. Borehole GEBH - 12 indicates 0.35% average copper in 3m(233.0 m - 236.0 m)wide mineralised zone. Analytical results of 15 channel samples of channel line J across the calcareous quartz-biotite schist and amphibole marble indicate 0.40% average grade of copper (Cu) in 5 m - wide mineralised zone on surface and channel line K indicates copper (Cu) with an average grade of 0.43% in the mineralised zone of 5 m on surface.

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Table – 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/ Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Mahendragarh	Northwest of Islampur	-	-	5	1038	278	A G-3 stage investigation of exploration was carried out. The field observations, core logging and thin section study suggest presence of pyrite, pyrrhotite and chalcopyrite in the calcareous quart-biotite schist. The sulphide mineralisation occurs in the form of disseminations and specks along the foliation and fracture planes of calcareous quartz-biotite schist. Based on geophysical anomalies, a total of 1038 m was drilled in five first-level boreholes (IBH-1 to IBH-5) to intersect the mineralised host rocks. The analytical results of 32 channel and pit samples showed 02 ppm to 129 ppm Cu, 10 ppm to 146 ppm Pb and 11 ppm to 159 ppm Zn. The analytical results of 246 core samples show Au values <50 ppb.
Karnataka Raichur	WNW & ENE extension in Machanur area	-	105	-	-	90 bedrock samples 65 trench samples	A G-4 preliminary investigation for delineation of copper mineralisation was carried out. The area under investigation forms a part of Hutti-maski schist belt in proximity to Gurgunta schist belt and northern part of the area is surrounded by granitoids. Three mineralised zones(Z-I, Z-II, and Z-III) have been delineated. Zone-I has been delineated 0.5 km east of Machanur with an average width of 200 m and a strike length of 5.0 km approx for copper mineralisation. In Zone-I, bedrock samples yielded Cu which varies from 405 ppm to 5.2% in sheared pink granite (maximum in BRS-29 and 3.0% in BRS-19). Average Cu content is 0.85%/2 m. In trench samples from MT-1 Cu value ranges from 520 ppm to 0.69% (maximum MT-1/16) average being 0.26%/10 m. Trench samples from MT-2 yielded Cu which varies from 485 ppm to 0.44% and average Cu content is 0.21%/6 m.

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Table – 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/ Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Raichur (Contd.)							Zone-II has been delineated 2 km west of Gaudur with an average width of 50 m and strike length of 4.2 km within schistose metabasalt. Chalcopyrite is the main ore of copper with pyrite, pyrrhotite, arsenopyrite within schistose metabasalt. The bedrock samples yielded 2.0%/2 m Cu (metabasalt), average being 2.0%/2 m. Zone-III has been delineated 4.0 km NNE of Yelagatti with an average width of 8-10 m and strike length of 3.5 km within pillowed metabasalt. Bedrock samples yielded 405 ppm to 1.52% Cu (maximum in pillowed metabasalt) and average is 1.51%/2 m. REE mineralisation along with basemetal (Cu, Pb and Zn), gold (Au) and iron (Fe) indicates polymetallic ore deposits which may be due to epigenetic/ Skarn/ remobilisation process due to secondary fracture filling and is sheared controlled.
Maharashtra Bhandara	Silejhari area	-	-	-	-	-	A G-4 investigation has been carried out. Soil samples were collected on 100 m x 200 m grid, pitting & trenching of 50 Cu m along with collection of pitting-trenching samples (PTS) and bed rock samples (BRS) for chemical analysis. The lithologies of the study area belong to Gaikhuri and Dhabetekri Formation of Sakoli Group and basement Amgaon Gneiss. Disseminations of sulphide minerals, which include mainly pyrite, chalcopyrite, covellite, sphalerite, etc. are observed in chert bands and metabasalt west of Silejhari and northeast of Jhari areas. Bedrock samples from different locations of investigated area reveal that the Zn values vary from 10 ppm to 0.12% with

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Table – 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/ Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Chandrapur	Minjhari area	1:2000	1.5	04	500	33	<p>average value of 381 ppm, Pb values vary from 10 ppm to 0.23% with average value of 383 ppm and Cu values vary from 10 ppm to 345 ppm with average value of 102 ppm. Further exploration work in the area is not recommended because of very low concentration of Zn and Pb. The investigation is completed.</p> <p>A G-3 investigation has been carried out to establish copper and associated mineralisation. The basemetal mineralisation (Cu±Au) is confined to en-echelon dilational quartz veins stretching for 3.0 km strike length. The trend of the quartz reef changes from N15°W-S15°E in the northern part to N10°E-S10°W in the southern part. The width of quartz vein varies from 2 m to 30 m and maximum length of individual exposure is about 1 km. Chemical results of five core samples from borehole (MHCM-3) showed good copper concentration with a maximum value upto 0.57%. Drilling in two different surface levels indicated deeper oxidation characteristics and deep seated mineralisation. In the first bore hole (MMHCM-1) two mineralised zones were identified i.e. Zone-1 from 78.00 m to 83.75 m with 0.23% Cu and Zone-II from 92.25 m to 98.55 m with 0.20% Cu. In the borehole MHCM-2 also two mineralised zones can be demarcated i.e. Zone-1 from 63.5 m to 66.5 m with 0.23% Cu and Zone-II from 67.80 m to 69.00 m with 0.20% Cu. In the borehole MHCM-3 again two mineralised zones can be demarcated based on chemical results.i.e.Zone-I from 129.20 m to 136.20 m with 0.50% Cu and Zone-II from 142.95 m to</p>

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Table – 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/ Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							145.05 m with 0.43% Cu. The investigation will be continued in FS 2016-17.
Rajasthan							
Alwar	Agar Block Thanagazi Tehsil	1:12500	52	-	-	29 trench samples	A G-4 stage investigation was carried out. A mineralised zone with a strike length of about 1200 m has been delineated. The mineralised zone has an exposed strike length of 350 m within the quartzite hill along a fault zone with presence of old workings and numerous vertical shafts. In order to check the potential for mineralisation, four trenches were laid across the strike of the zone. The trench samples collected from trench AGTH-2 have analysed anomalous concentration of copper, Nineteen out of 29 samples have given a copper value more than 0.2% with maximum value up to 0.55%. Another grab sample collected from the mineralised zone from a well dump has given copper value of 2.53% and gold value of 300 ppb. The grab sample collected from the dumps near an old working at the quartzite hill has given a value of 0.58%. The slag samples analysed from the slag heaps have 0.26% to 0.49% of Cu. Based on the analytical data received so far, the area seems to be potential for copper mineralisation.
Alwar	Angari block Thanagazi Tehsil	1:2000	1.5	-	-	-	A G4 stage investigation was carried out. On the basis of surface indications i.e., presence of old workings, malachite stains and fresh sulphides, two mineralised zones have been delineated. The two zones are present in

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Table – 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/ Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							<p>the west-central part of the block; one in banded dolomitic marble and the other is in tremolite-bearing banded dolomitic marble with quartz and carbonate veins. Within the banded dolomitic marble pyrrhotite and arsenopyrite are present as disseminations and along foliation planes. Highly gossanised rock of tremolite-bearing dolomitic marble is observed in two dug wells further north of the Angari block.</p> <p>Stromatolitic structures are identified in dolomitic marble at two places, tasted for phosphate with Shapiro solution, which indicate presence of phosphate. Bedrock samples from west-central part of the area contain upto 0.17% Cu. Samples collected from the northern part of the block analysed 450 ppm Zn. The analytical results of samples from ferruginised brecciated zone at the eastern side of the block shows 0.24% Zn, 800 ppm Cu and 600 ppm Ni.</p>
Alwar	Mundiyawas-Khera SE Block	-	-	-	-	-	<p>A G-3 stage investigation was carried out. The borehole intersected significant sulphide mineralisation between 228.0 m - 233.0 m - 5.0 m with Cu(V.E.) = 0.2-0.4%, 233.0m-251.0m =18.0m with Cu (V.E.)=0.2-0.3%, 251.0 m-272.15 m =21.15 m with Cu (V.E.)=0.4-0.6%, 272.15 m-311.0 m with Cu(V.E.)=0.1-0.3%, 365.0 m -372.0 m=7.0 m with Cu(V.E.)=0.1-0.3% and 390.0 m-395.0 m=5.0 m with Cu (V.E.)=0.1-0.3%.</p>

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Table – 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/ Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Alwar	Mundiyawas-Khera area (Khera main block)	-	-	05	-	-	A G2 stage investigation was carried out. Out of seven boreholes planned five boreholes are completed and two are in progress. All the boreholes intersected host rock felsic metavolcanics and dolomitic marble having significant sulphide mineralisation. The sulphides are in form of occasional foliation-parallel specks, stringers, fracture and vein-filled chalcopyrite and pyrrhotite.
Alwar and Jaipur	Tehla-Khoh-Bighota area	1:10000	100	03	-	-	A G-4 stage investigation has been carried out, in Rup Bas-Talab-Losal-Ladla Ka Guwara-Katara ka Guwara-Govardhanpura-Rampura-Kundla-Ramsinghpura-Bighota area. The first boreholes PBH-1 to the west of Palpur block intersected sulphides in the form of pyrite, pyrrhotite and specks of chalcopyrite at 6 - 75 m depth. Significant dissemination of chalcopyrite along with pyrite and pyrrhotite were observed at 40 - 60 m depth. The second borehole in Bighota area WBBH-2 has intersected sulphide mineralisation at 7.50-9.00 m within bluish coloured quartzite and at 41.50-49.00 m within actinolite/tremolite-bearing dolomite marble. Besides, fracture filling of metabasic rock by pyrrhotite and chalcopyrite at 73.00-79.50m, 80.50-88.00m, and at 93.50-28.50 m has been observed. The third borehole PBH-3 to the west of Palpur block intersected sulphide mineralisation. Three major lithounits viz. amphibole marble, biotite schist and metabasic rock are intersected in the borehole. Along the borehole dissemination of chalcopyrite, pyrite, pyrrhotite besides fracture-filling were observed

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Table – 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/ Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
							at 42.30-46.00 m within amphibole marble, at 46.00-60.50 m within biotite schist at 60.50-68.50 m within amphibole marble, at 68.50-78.00 m within metabasic rock, at 80.50-95.50 m within amphibole marble, at 95.50-102.00 m within metabasic rock at 102.00-113.00 m within amphibole marble, at 120.00-123.00 m, and 136.50-143.50 m within metabasic rock.
Ajmer & Bhilwara	Sandmata complex	1:2000	50	-	-	333	Large-scale mapping, detailed mapping and pitting & trenching have been executed. The rock types exposed in the area are quartz-biotite gneisses/ migmatite, granite gneiss, calc-gneisses, conglomerate, metagreywacke, silicified dolomite, quartzite and pegmatite. Gneiss and migmatite with leucocratic patches of metasedimentary rocks are exposed from Hanutiya to Akarsada. The general strike of the area is NE-SW dipping on either side. Gritty conglomerate is the host rock of copper mineralisation. The surface indicates of mineralisation in the form of malachite staining, old mine pits and slag dump has been observed south of Hanutiya. Analytical results of 33 samples (BRS+soil) received so far have not showed any significant anomalous value of Cu.
Jhunjhunu	Bokri and Malwali prospects of the Eastern Khetri	-	-	06	1002	509	A G3 stage investigation has been carried out. On the basis of detailed mapping two sub-parallel mineralisation zones were established, one within the fault zone breccia and other in silicified quartzite. The lithologies encountered

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Table – 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/ Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Pratapgarh	Mahuri Khera Block	-	-	04	516.80	-	<p>are quartzofeldspathic mica schist + garnet and albitite, chlorite-biotite schist+ garnet and epidote, graphite schist and calc-silicate rock. Graphite schist and the calc-silicate rock host sulphide mineralisation. All the boreholes have intersected the sulphide mineralisation in the form of dissemination and streaks with two copper zones (3.5 m x 0.32% Cu, 6m x 0.4% Cu) in the first borehole.</p> <p>A G3 stage investigation has been carried out. Surface evidences of mineralisation are in the form of gossan, ferruginisation, silicification, wall-rock alteration, old workings and malachite/azurite staining. Indication of mineralisation is also seen in the form of intense silicification and hydrothermal alteration. Fresh sulphides in the form of pyrite and chalcopyrite are recorded in dolomitic marble and tourmalinite bands. Based on these surface indications, seven mineralised zones have been identified. Four boreholes (MKH-1 to 4) were planned at 100 m intervals to intersect the mineralisation zone MZ-1. Drilling in these boreholes proved sub-surface continuity of the surface mineralisation zones. The sulphide zones (1.10 m to 9.00 m thick) are recorded mainly in the altered dolomitic marble and massive dolomitic marble with sparsely spaced alteration veins. The main sulphide minerals are pyrite, pyrrhotite, chalcopyrite and arsenopyrite in decreasing order of abundance. The sulphide minerals are, in general, medium to fine grained and occur as fine dissemination, veins, veinlets, stringers and smears. Analytical results of core samples received so far have revealed the presence of 4.25-m-thick zone with 0.26% average copper content.</p>

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Table – 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/ Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Sikar	West of Nanagwas block	-	-	22	4171	-	A G-2 stage investigation has been carried out in this block which is one of the most significant explored blocks in Neem Ka Thana copper belt. The block having 2 km strike length which has contributed 14.66 MT x 0.33% Cu by cross-section method at 0.2% cut off. Drilling includes first-, second-, third-, and fourth-level boreholes. Copper mineralisation is in the form of vein-filling, stringers and dissemination of bornite (dominantly) and chalcopyrite.
Sikar	Kishanpura Loharwas	1:12500	56	-	-	-	A G4 stage investigation has been carried out. The surface evidence of basemetal mineralisation is marked by the presence of malachite stains, fresh sulphides i.e. chalcopyrite, pyrite, bornite and specularite occurring along the quartz/carbonate veins. The above mineralisation is hosted by calc-silicate rock and amphibole bearing marble. Based on the above evidences a mineralised zone, about 1 km long and 25-50 m wide, has been delineated on surface and 71 bedrock samples on grid pattern (100 x 25 m) have been collected and analysed. Three channels have been put across a mineralised zone at spacing of 200 m. From channel RCH-1, 13 samples have been collected which analysed copper varying from 10 ppm to 4400 ppm. Eight samples from channel RCH-2 have been analysed for copper which varies between 90 ppm and 240 ppm and copper content in 5 samples collected from channel RCH-3 varies between 60 ppm and 170 ppm. As most of the study area is occupied by pegmatite body, a total of 135 samples have been collected from different pegmatite bodies for REE & RM mineralisation. Out of 135 samples analysed, results of 5 samples have been received which do not show any encouraging results for REE & RM mineralisation.

(Contd.)

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Table – 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/ Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Sikar	South-east of Kharagbijpur	1:2000	0.75	-	-	90 BRS 100 channel samples	A G-4 stage investigation has been carried out. The area exposes dolomitic marble and biotite rich dolomite bands. Mineralisation is in the form of chalcopyrite and bornite specks which is observed along thin veins of quartz and calcite. Several thin (few centimetres to 0.5 m wide), pink-coloured pegmatite veins are observed along foliation planes and have been mapped. The thicker quartz veins are mostly emplaced along S3 foliation plane but do not show any evidence of copper mineralisation. Bedrock samples collected along the baseline for a distance of 600 m were analysed for copper which varies from 0.58% to 0.14%. On the basis of chemical analysis of BRS, about 600m long surface mineralised zone has been demarcated in the biotite dolomitic marble unit and four channels have been cut across it at an interval of 200 m and 100 channel samples have been collected. The exact thickness of the mineralised zone will be ascertained after the results of chemical analysis of channel samples are received.
-do-	Pachlagi- Narsinghpuri & surrounding area	1:12500	82	-	-	75 BRS	A G-4 stage investigation has been carried out. On the basis of surface indications and the presence of old workings (for fluorite, Salwari area, where intense malachite/azurite stains occur), the area holds good promise for basemetal mineralisation. Also east of Guhala the magnetite-bearing brecciated albitite which contains sulphides has been marked as a mineralised zone extending for approximately 600 m with 5 to 10 m width. Salwari and Guhala areas hold good potentiality. So far analytical results of only 17 BRS have been received. Cu content varies from 10 ppm to 2.1%. Three disposed core samples of AMD have been analysed and one sample reveals the presence of 201 ppm of molybdenite. The analytical results of 55 BRS are awaited.

(Contd.)

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Table – 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/ Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Sikar	Southern extension of Nanagwas block	1:2000	0.55	08	1050	-	<p>A G-3 stage investigation has been carried out to delineate southern extension of the mineralised zone. The current mapping and detailed surface geochemical evaluation not only helped in tracing the southern extension of the main mineralised zone exposed in Nanagwas main block but also helped in delineating an additional mineralised zone in the eastern part of the block for a strike length of about 1550 m. The drilling in the western zone established strike continuation up to 800 m. Similarly four boreholes drilled in the newly delineated eastern zone established subsurface continuation of mineralisation at least for 800 m, though surface extension has been established for a strike length of 1550 m. The remaining portion of the zone will be established subsequently in relation to the subsurface continuation of mineralisation.</p> <p>Core sampling and detailed logging suggests a bornite-dominated copper mineralisation in association with chalcopyrite, covellite, specularite, pyrrhotite and pyrite. Mineralisation is mostly present in the form of stringers, vein-fillings, streaks, specks of above sulphides/oxides, predominantly hosted within biotite-bearing dolomitic and calc-quartz-biotite schist. The mineralised zone intersected in various boreholes at a vertical depth of 50-60 m and has a thickness varying between 12 m and 18 m along the borehole. Visual estimate of the sulphides and copper content indicates copper values ranging from 0.1% to 0.3% Cu.</p>

(Contd.)

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Table – 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/ Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
Udaipur	Devimata- Pipaldaran area	1:12500	100	-	-	256 BRS 52 pit samples	A G-4 stage investigation has been carried out. The major lithounits identified and mapped are phyllite, dolomite, quartzite, metagreywacke, calcite marble, polymictic conglomerate, intrusive granite and mafic rocks belonging to Paleoproterozoic Aravalli Supergroup. Surface indication of copper mineralisation is recorded in the form of old working pits, slag heaps, profuse malachite encrustation associated with azurite, zone of oxidation and gossanisation. Fresh sulphides viz. pyrite and chalcopryrite are hosted in dolomite, sheared phyllite and interface of granite and cover sequences. Several old workings hitherto unknown in the north of Chandni, south of Kala Magra and Kevda Kalan area were also mapped. These old workings are at the interface of intrusive granite and cover sequences. Bedrock samples and mine dump samples collected from the old workings have shown Cu values varying from 350 ppm to 1.53%, Pb values between 90 ppm and 510 ppm and Zn values between 150 ppm and 0.20%.
SIKKIM East district	Dikling-Pirik- Martam area	-	60	-	-	-	A G-4 stage investigation has been carried out. Malachite stains were observed at few places along with specks of pyrite and chalcopryrite within the mica schist and phyllites of Daling Group. Prominent mineralization in the form of dissemination of pyrite, chalcopryrite, etc. was observed at two places namely Lingdum near to Rey Khola and Raigaon. Mineralisation appears to be localised and sporadic and seen associated with quartz veins within the host rocks. Sulphide mineralisation in the form of pyrite, chalcopryrite, etc was observed in the rolled boulders at Chhuba Khola though in-situ unit could not be traced. At Lingdum, the mineralisation occurs along the foliation plane in the chlorite-sericite-mica schist tra-

(Contd.)

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Table – 2 (Contd.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/ Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
SIKKIM							
East district (contd.)							
DEPARTMENT OF MINES & GEOLGY							
RAJASTHAN							
Jaipur	Near village Chenpura, Tehsil Bassi	1:4000	2.5	-	-	150 (25 channel samples + 125 spot samples)	versed by quartz veins. It covers approximately 5m. It is massive, light yellow in colour. At Raigaon, mineralisation was observed within the quartz veins present in the phyllite of Daling Group. These quartz veins traverse mainly along the foliation plane though one or two cut across it also. They are lensoidal in shape but not continuous. These occurrences are about 10 m long. Due to thick forest and soil cover, its continuity could not be traced. At both locations, mineralisation appears to be of hydrothermal origin.
Jhunjhunu	Near village Bankoti, Rasulpur, Modki, Tal Ki Dhani, Madhogarh tehsil Khetri	1:50000 1:10000 (RGM) 1:4000 (detailed geological mapping)	100 16	- -	- -	- 85 (spot samples)	Geologically the area comprises of Quartzite, Phyllite, Mica-Schist, etc. belonging to Ajabgarh Group of Delhi Supergroup intruded by Amphibolites and Quartz veins of Post-Delhi age. Surface indications of Copper in the form of Malachite, Azurite staining was observed in Madhogarh-Padeva block (associated with schist and quartzite). The two other such zones were observed around Madhogarh-Guninicha block and Kalota-Mandana block.

(Contd.)

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Table – 2 (Concl.d.)

Agency/ State/ District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks Reserves/ Resources estimated
		Scale	Area (sq km)	No. of boreholes	Meterage		
MECL Madhya Pradesh Betul	Muariya block	1:2000	1	07	1659.7 m	211	<p>Results of Chemical analysis are awaited. Further work will be proposed subject to chemical analysis results.</p> <p>The Sulphide Mineralisation in the Muariya block occurs in the form of sphalerite, chalcopyrite and galena in the form of vein and vein-lets and disseminations. Fracture filling is also observed, it is dominantly a Zinc deposit with Pb & Cu as associated metals Cd and Ag concentration to significant amount of 129.79 g/t and 43.63g/t respectively makes the deposit economically important. Out of seven lensoidal lodes identified in the block, the main lode and its splits are found to have most significant strike & depth continuity.</p> <p>The total ore resources at 1.061 million tonnes with 6% Zn, 1.43% Pb and 0.62% Cu has been estimated at 1% Zn cut-off grade and 2.0 m minimum stoping width. The resources are placed under 332 category of UNFC. The resources include resources estimated by GSI. (1.51 million tonnes with 7.88% Zn, 1.83% Pb and 0.78% Cu.) Resource estimated by MECL is considerably less than that of estimated by GSI.</p>

There are 14 mining leases of copper ore in the country. Out of 14 leases, 7 leases are held by Hindustan Copper Ltd, in which 3 leases are located in Rajasthan, 3 leases in Jharkhand and one lease in Madhya Pradesh. For remaining 7 leases; one lease is held by GMDCL at Banaskantha

district, Gujarat; 2 leases are held by Hutti Gold Mines Co. Ltd at Chitradurg district, Karnataka; one lease is held by RBG Minerals at Sirohi district, Rajasthan and 3 leases are held by Sikkim Mining Coporation at East district, Sikkim.

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PRODUCTION & PRICES

Copper Ore and Concentrates

The production of copper ore at 3.91 million tonnes in 2015-16 increased by 11% as compared to that in the previous year.

The metal content in the ore produced in 2015-16 is reported as 35,492 tonnes as against 27,915 tonnes in 2014-15. During the year under review 3.9 million tonnes of ore was treated for obtaining copper concentrates as against 3.51 million tonnes in 2014-15 (Tables - 3 & 4).

Production of copper concentrates at 1,42,649 tonnes in 2015-16 increased by about 33% as compared to that in the previous year. Madhya Pradesh was the leading producer state of copper concentrates, accounted for about 49% of the production during 2015-16, followed by Rajasthan with 45% and Jharkhand with 6% production. The number of reporting mines in 2015-16 were five same as in the previous year (Tables- 5 to 7).

Grade Analysis

During the year, copper content in the ore produced was 0.91% Cu against 0.80% in the year 2014-15. All India average metal content of ore treated during 2015-16 works out to 0.89% Cu and 0.79% Cu for 2014-15. The average copper content

in the ore treated varies from State to State. It was 0.88% Cu in Jharkhand, 0.82% Cu in Madhya Pradesh, and 1.06% Cu in Rajasthan. The average metal content in the concentrate produced works out to 22.54% Cu in 2015-16 as against 23.12% Cu in the previous year. The copper concentrate produced in Madhya Pradesh with 27.79% Cu in 2015-16 was of the highest grade in the country followed by Jharkhand 25.26% Cu and Rajasthan 16.43% Cu.

The average daily employment of labour in copper mines in 2015-16 was 3,231 as against 3,473 in the preceding year.

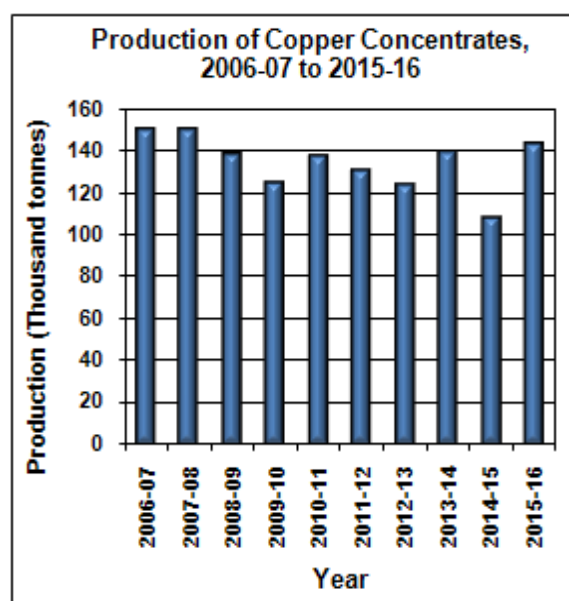
Copper Metal

Hindustan Copper Ltd produces copper metal from the ore produced at their captive mines. Sterlite Industries (India) Ltd and Hindalco Industries Ltd produce copper metal from imported copper concentrates (Table-8).

The production of copper blister increased by 1% and copper continuous cast wire rods registered a increase of 15% in 2015-16 as compared to the previous year. The production of copper cathodes also increased by 3%. Production of copper electrolytic wire bars was not reported for more than six years (Tables-9 to 12). Prices of copper are furnished in the general review on 'Prices'.

Table – 3 : Principal Producer of Copper Concentrates, 2015-16

Name and address of the producer	Location of mine	
	State	District
Hindustan Copper Ltd, Tamra Bhavan, 1, Ashutosh Choudhury Avenue Post Box No. 10224, Kolkata – 700 019. West Bengal,	Jharkhand	Singbhum (East)
	Madhya Pradesh	Balaghat
	Rajasthan	Jhunjhunu



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**Table – 4 : Production of Copper Ore, 2014-15 and 2015-16
(By States)**

(In tonnes)

State	2014-15			2015-16 (P)		
	Ore produced	Cu%	Metal content	Ore produced	Cu%	Metal content
India	3505348	0.80	27915	3907823	0.91	35492
Jharkhand	179036	0.84	1504	267251	0.88	2350
Madhya Pradesh	2378912	0.76	17984	2536580	0.81	20540
Rajasthan	947400	0.89	8427	1103992	1.14	12602

**Table – 5 : Copper Ore Treated, 2014-15 and 2015-16
(By States)**

(In tonnes)

State	2014-15			2015-16 (P)		
	Ore treated	Cu%	Metal content	Ore treated	Cu%	Metal content
India	3508623	0.79	27888	3891715	0.89	34603
Jharkhand	193708	0.84	1627	267145	0.88	2343
Madhya Pradesh	2380370	0.76	17972	2507415	0.82	20468
Rajasthan	934545	0.89	8289	1117155	1.06	11792

**Table – 6 : Production of Copper Concentrates, 2013-14 to 2015-16
(By States)**

(Quantity in tonnes; Value in ₹'000)

State	2013-14		2014-15		2015-16 (P)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	139307	6681011	107604	5289409	142649	6259863
Jharkhand	13742	475046	5903	198641	8576	287299
Madhya Pradesh	79909	3355313	57551	2480829	70089	2966017
Rajasthan	45656	2850652	44150	2609939	63984	3006547

**Table – 7 : Production of Copper Concentrates, 2014-15 and 2015-16
(By Sector/States/Districts)**

(Quantity in tonnes; Value in ₹'000)

State/District	No. of mines	2014-15		No. of mines	2015-16 (P)	
		Quantity	Value		Quantity	Value
India	5	107604	5289409	5	142649	6259863
Public Sector	5	107604	5289409	5	142649	6259863
Jharkhand	2	5903	198641	2	8576	287299
Singhbhum (East)	2	5903	198641	2	8576	287299
Madhya Pradesh	1	57551	2480829	1	70089	2966017
Balaghat	1	57551	2480829	1	70089	2966017
Rajasthan	2	44150	2609939	2	63984	3006547
Jhunjhunu	2	44150	2609939	2	63984	3006547

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Table – 8 : Producers of Copper Metal, 2015-16

Name and address of the producer	Location	
	State	District
Hindustan Copper Ltd, Tamra Bhavan, 1, Ashutosh Chowdhury Avenue, Post Box No.10224, Kolkata-700 019.	Jharkhand	Singhbhum (East)
West Bengal.	Maharashtra	Raigad
Hindalco Industries Ltd, Century Bhawan, Dr. Annie Besant Road, Mumbai -400 030, Maharashtra.	Gujarat	Bharuch
Vedanta Ltd., Sesa Ghor, 20 EDC Complex, Patto, Panaji - 403001, Goa.	Tamil Nadu	Thoothukudi
	Dadra & Nagar Haveli	Chinchpada (Silvassa)

Table – 9 : Production of Copper Metal, 2013-14 to 2015-16

(In tonnes)

Year	Copper blister	Copper cathodes	Copper Electrolytic Wirebars	Copper CCWR*
2013-14	17245	644193	-	282969
2014-15	16471	765568	-	337713
2015-16 (P)	16692	790372	-	389587

**Table – 10 : Production of Copper (Blister), 2014-15 and 2015-16
(By State/Plant)**

(Quantity in tonnes)

State	Plant	2014-15		2015-16 (P)	
		Quantity	Value	Quantity	Value
India		16471	-	16692	-
Jharkhand	Surda ICC	16471	-	16692	-

**Table – 11 : Production of Copper (CCWR), 2014-15 and 2015-16
(By States/Plants)**

(Quantity in tonnes; Value in ₹'000)

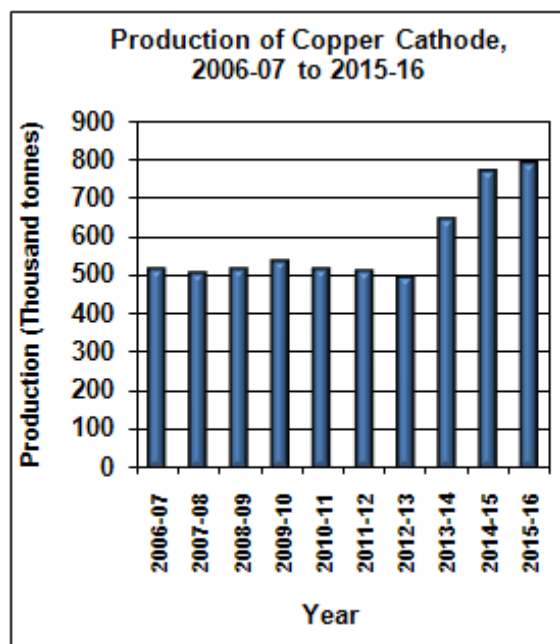
State	Plant	2014-15		2015-16 (P)	
		Quantity	Value	Quantity	Value
India		337713	140373262	389587	135417380
Gujarat	Hindalco	150562	66077672	157514	59164704
Maharashtra	HCL Taloja	16815	7480890	21274	8087176
Tamil Nadu	Vedanta Ltd	53397	20918300	68684	22297900
Dadra Nagar Haveli	Vedanta Ltd	116939	45896400	142115	45867600

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**Table – 12 : Production of Copper (Cathodes), 2014-15 and 2015-16
(By States/Plants)**

(Quantity in tonnes; Value in ₹'000)

State	Plant	2014-15		2015-16 (P)	
		Quantity	Value	Quantity	Value
India		765568	305302465	790372	265282521
Gujarat	Hindalco	387952	157983898	389301	135830439
Jharkhand	Surda ICC	15243	6706067	17026	6351282
Tamil Nadu	Vedanta Ltd.	194019	75158300	201865	64792400
Dadra Nagar Haveli	Vedanta Ltd.	168354	65454200	182180	58308400



MINING & MILLING

HCL's mines and plants are spread across four operating units, the Indian Copper Complex (ICC) at Ghatsila in Jharkhand, the Khetri Copper Complex (KCC) at Khetrinagar in Rajasthan, Malanjkhand Copper Project (MCP) at Malanjkhand in Madhya Pradesh and Taloja Copper Project (TCP) at Taloja in Maharashtra. HCL operates three underground mines and one opencast mine, with a combined ore production capacity of about 3.5 million tonnes per year.

Malanjkhand Copper Project is the largest copper ore producing mine with 2.0 million tonnes production capacity per year. Khetri Copper Complex and Indian Copper Complex have production capacities 1.1 and 0.4 million tonnes per annum, respectively.

Hindustan Copper Ltd

Khetri Copper Complex (KCC), Khetrinagar, Jhunjhunu District, Rajasthan

The operation unit at Khetri Copper Complex (KCC) comprises two underground mines, namely, Khetri mine & Kolihan mine and one beneficiation plant. Earlier, KCC also had smelting and refining facility. But owing to economic consideration the Company had to suspend this operation w.e.f. December 2008. Mining methods adopted in Khetri and Kolihan underground mines of HCL are sub-level open stoping and blasthole stoping. In sub-level open stoping, sub-levels are developed at vertical intervals of 20 to 25 m and a crown level is developed 15 m below upper main level. Sub-level open stoping method has two variations, namely, longitudinal stoping and transverse stoping. Longitudinal stoping is adopted where the thickness of the orebody is small to moderate. In this method, an extraction drive is developed from the main footwall drive at extraction level and a trough drive is developed in the orebody along the strike. Draw points at 9 m interval are also developed from extraction drive connecting the trough drive. A slot raise is made from the main level to top of the ore block to be extracted. Slot crosscuts are made in the sub-levels and extraction level. The slot crosscut exposes the orebody from hangwall to the footwall. Parallel holes are drilled (115 mm or 57 mm diameter depending on the orebody width) in the slot crosscut and are blasted against the pre-face of the slot raise. This provides an opening throughout the height of ore covering the entire width of the orebody. Rings of holes, drilled in the trough drive and sub-levels, are blasted against pre-face of the slot. The broken ore falls into the trough where it is loaded into the track

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mounted Gran-By cars by loading equipment such as LHD and Loaders.

In transverse stoping, the basic design remains the same. But, the development is done across the orebody and stoping advances from hangwall to the footwall. Slot drive is developed along strike.

Another mining method used is blasthole stoping method, wherein, a drill level is prepared between two main levels leaving a crown pillar of 9 to 15 m. Slot raise, slot, stope and rib pillar are drilled by Cubex 165 mm dia. machine. Trough, sill and crown pillar drilling are done by BBC120F drifter machine. Sequence of blasting remains the same as in the sub-level open stoping method.

The proposed expansion of Khetri & Kolihan mine and development of Banwas deposit will increase the ore production from existing one million tonnes to 3.1 million tonnes per annum. The Engineering Procurement & Construction (EPC) agency for executing the Khetri mine expansion project had been appointed on 15.07.2011 and the work at site started from 16.9.2011. Development of Banwas deposit started in May, 2010 and the work was expected to be completed by 2016. In Kolihan mine, environment clearance for shaft sinking and creation of ore handling facilities below 0 mRL has been obtained on 02.02.2015. Action for floating tender is under process.

Indian Copper Complex (ICC), Ghatsila, East Singhbhum District, Jharkhand

The Indian Copper Complex (ICC) comprises mines, beneficiation plant and smelting & refining facility. India Resources Limited (IRL) of Monarch Gold Company Ltd, Australia, through its alliance with Hindustan Copper Ltd (HCL) operates the Surda Copper Mine and Mosabani Concentrator Plant. At present, IRL has a term contract with HCL which began in 2007 and is expected to be extended up to May 2017, as recommended by a committee of HCL and IRL executives for operating and maintaining Surda Copper Mine. Surda is one of the several copper deposits which has been mined since ancient time and it lies along the shear zone. The orebody of the mine has a strike length of 2.2 km and is currently at a

maximum depth of 450 m. The width of the orebody varies from a few metres up to 60 m in thickness as the copper mineralisation occur in pinches and swells. Most of the mining is done by using horizontal cut-and-fill method. The extraction of ore, i.e., cut takes place by drilling and blasting which leaves void that needs to be filled with tailings to provide for platform so that mining activity could be taken up further to the next cut up. The mine operations of Surda mine has been stopped on 08.09.2014 due to state government orders pursuant to Hon'ble Supreme Court judgment on operation of mines on deemed renewal basis. Terms of References received from Ministry of Environment & Forests(MoEF). Public hearing for Environment clearance was held on 15.12.2015. Final EIA report prepared and being uploaded to MoEF website. The Plan envisages increase in the depth of the mine and enhancement of production capacity from 0.4 million tonnes per annum to 0.9 million tonne per annum.

Environment Clearance (EC) of Kendadih mine and Rakha mine for reopening of mines by MOEF & Climate change has been obtained on 20.01.2015 01.08.2014 respectively, stage-I forest clearance obtained and stage-II is awaited. Company initiated action to re-open closed mines at Singhbhum Copper Belt of ICC namely, Kendadih and Rakha mines to produce 0.21 million tonne and 1.5 million tonnes of ore per annum respectively.

Malanjkhand Copper Project (MCP), Malanjkhand, Balaghat District, Madhya Pradesh

MCP has the largest copper ore producing open-pit mechanised mine in the country with an annual capacity to produce 2 million tonnes ore along with a matching concentrator plant. Prominent deposits in MCP are Malanjkhand, Shitalpani, Gidhri Dhorli, Jatta and Garhi Dongri. Currently, this mine contributes to around 70% of HCL's copper production. The deposit is estimated at average grade of 1.31% Cu with 0.45% cut-off grade. The strike length of the deposit is 2.6 km in North-South direction with a dip of 65⁰ to 75⁰ degree towards the East and the average width is 70-75 m. Mining is carried out by deployment of large capacity electric rope shovels having 10 m³

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bucket capacity and hydraulic excavators having 5-10 m³ bucket capacity in combination with 60, 85 and 100 tonnes capacity dumpers. The bench height and diameter of blastholes is 12 m and 165 mm respectively. Site Mixed Slurry explosives are used for primary blasting and Cartridge explosives are used for secondary/ pre-split blasting.

The Cabinet Committee on Economic Affairs (CCEA) had approved the investment of ₹1856.74 crore for the expansion of MCP from 2 million tonnes per annum to 5 million tonnes per annum by developing an underground mine below the existing opencast mine. To improve the physical condition, the company has redesigned the Malanjhand open pit mine in consultation with IIT Kharagpur. All the approval are in place, Environment Clearance (EC) and clearance from National Board for Wild Life (NBWL) have been obtained in 2014-15. The foundation stone laying of the project was held on 12.04.2015. Sinking of north ventilation shaft and south ventilation shaft has commenced during the year.

SMELTING

HCL has two smelting & refining plants at KCC and ICC with installed capacity of cathode 31,000 tonnes and 19,000 tonnes per annum, respectively. However, due to economic considerations the Company suspended KCC's smelting and refinery operation from December 2008. HCL also has one continuous casting plant of copper wire rod, namely, Taloja Copper Project (TCP) with 60,000 tonnes per annum capacity at Taloja, Maharashtra.

Apart from HCL, two other major players dominate the Indian Copper Industry, namely, M/s Hindalco and M/s Sterlite Industries which are under the Private Sector. M/s Hindalco at Dahej in Gujarat and M/s Sterlite Industries in Thoothukudi in Tamil Nadu have set up port-based smelting and refining plants which depend on imported copper concentrates either from their own mines at abroad or other overseas sources with annual production capacity of 500 thousand tonnes and 400 thousand tonnes, respectively. Besides, there are few small companies which produces Electrowon copper but their capacities are very low and production is inconsistent.

Jhagadia Copper Ltd (formerly SWIL Ltd) has operating plant with a capacity of 50,000 tonnes

per annum copper cathodes. The total installed capacity of copper smelter in the country is one million tonnes per annum. Details regarding capacity of copper smelter are given in Table-13.

Table – 13 : Capacity of Copper Smelters

Smelter/Location	Annual Capacity (Quantity in '000 tonnes)
TOTAL	1000
1. Hindustan Copper Ltd	50
i) Khetri Copper Complex, Distt. Jhunjhunu, Rajasthan.	31
ii) Indian Copper Complex Distt. East Singhbhum, Jharkhand.	19
2. M/s. Sterlite Industries (India) Ltd, Thoothukudi, Tamil Nadu.	400
3. M/s. Hindalco Industries Ltd, Dahej, Distt. Bharuch, Gujarat.	500
4. M/s Hindustan copper Ltd., (Formerly Jhagadia Copper Ltd), Distt. Bharuch, Gujarat.	50

Besides, continuous cast wire rod plants are operated by HCL, sterlite and Hindalco. In addition, M/s TDT formerly Alchemist Metals Ltd, Rewari, Haryana and M/s Finolex also have continuous cast wire rod plants that are based on imported copper cathodes.

1. Hindustan Copper Ltd

i) Khetri Copper Complex (KCC)

The KCC smelter is located at Khetri in Jhunjhunu district, Rajasthan having a capacity of 31,000 tpy . In addition, KCC has sulphuric acid and phosphatic fertilizer plant facilities. At present, KCC's smelter has been closed owing to economic considerations since December, 2008.

ii) Indian Copper Complex (ICC)

ICC has the smelting & refining facility of 19,000 tonnes per annum capacity. Smelter is located at Ghatsila, East Singhbhum district, Jharkhand. In addition, the Complex consists of 8,400 tpy wire bar casting plant, 54,000 tpy sulphuric acid plant and a brass rolling mill. There is also a precious metal recovery plant for recovery of gold, silver, selenium, tellurium, nickel

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sulphate, copper sulphate, etc. A pilot plant with a capacity to produce one tonne nickel cathodes per month was also set up at ICC. The plant is currently being scaled up to a production capacity of 5 tonnes per month of nickel cathodes. Copper cathode production at ICC is less in 2014-15 as compared to previous year due to planned shutdown of Ghatsila Smelter & Refinery Plant for 75 days.

iii) Gujarat Copper Project (GCP)/ Jhagadia Copper Ltd (formerly SWIL Ltd)

HCL has acquired the assets of Jhagadia Copper Ltd (renamed as GCP) situated at 747, Jhagadia Industrial Estate, Bharuch, Gujarat through Asset Reconstruction Company (India) Ltd (ARCIL) during April 2015. The plant is designed to produce 50,000 tonnes LME A-grade cathode through secondary route based on Outokumpu Technology AB (formerly Bolidewn Contech AB), Sweden.

iv) Taloja Copper Project (TCP)

The plant with a capacity of 60,000 tonnes per annum continuous cast wire rods (CCWR) is located at Taloja in Maharashtra. It uses the SCR 2000 system of the world renowned South Wire Co., USA. It produces rods of 8 mm, 11 mm, 12.5 mm and 16 mm diameters and meet most precise standards conforming to ASTM B 49/98 &/ or IS 12444/1988. The Plant commenced commercial production in April 1991. The installed capacity could further be increased to 80,000 tpy in the future. The unit also undertakes tolling of cathodes.

The status of Private Sector smelter plants is as follows:

2. Sterlite Industries (India) Ltd

The Sterlite Industries (India) Ltd having an installed smelter capacity of 4,00,000 tonnes per annum copper anodes is located at Thoothukudi in coastal Tamil Nadu. It is based on 'Isasmelt' technology using imported concentrates. The Company is investing ₹ 3,300 crore for expansion to double its copper production capacity at the

plant. After expansion the plant will be Asia's largest copper manufacturing facility in a single location. Sterlite copper has two units in Silvassa in the Union Territory of Dadra & Nagar Haveli where it operates two copper Rods plants (one in Chincpada and another in Piparia). Anodes from Thoothukudi are refined at Silvassa for domestic market. Besides copper, the Company also manufactures sulphuric acid, phosphoric acid, gold and silver as by-products.

3. Hindalco Industries Ltd (Birla Copper)

The Company's smelter located at Dahej, Bharuch district, Gujarat, has a capacity of 5,00,000 tpy. The smelter is based on Outokumpu technology. The cathodes produced are mostly used for production of continuous cast wire rods. In the process of extraction of copper metal, sulphuric acid, phosphoric acid, gold and silver are also recovered as by-products. The entire requirement of copper concentrates was met through imports from many countries, namely, Chile, Australia, Indonesia, Papua New Guinea, Brazil, Peru and Canada.

RECYCLING OF COPPER

Copper scrap is traded in the form of new scrap generated from copper smelters, copper workings as well as old scrap recovered from electrical motors, electronic equipment, cables, wires, utensils, etc.

Copper is one of the most recycled metal of all the metals. The recycling of copper scrap is gaining importance worldwide simply because of the fact that recovery of copper metal from scrap requires much less energy than its recovery made from primary source. Besides, it enables conservation of natural resources.

In Indian condition, however, collection of scrap is in the unorganised sector and there is paucity of factual data in this regard. Still, as per the licences granted by Central Pollution Control Board as on 13.5.2010, there were 35 Units operating in different States with a combined capacity of 2.42 lakh tpy for handling different types of scrap.

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In addition there are 132 Units with combined capacity of 5.17 lakh tpy which recover copper along with other metals. As per the estimates made in the recently published Market Survey on Copper by IBM, production of 1.07 lakh tpy of secondary copper was reported and all of which have been in Organised Sector, in the country.

USES

The per capita consumption of copper in India is currently at 0.6 kg in the year 2016 which is very low in comparison to Russia 3.3 kg, China 5.4 kg, USA 5.5 kg, Italy 8.9 kg, Germany 13.6 kg and to that of 10 kg of developed nations. India's per capita consumption is likely to be moderate and has many strides to cover so as to match that of China. Electrical/Electronic Industry is by far the largest consumer of copper, where it is used in the form of cables, winding wires as it is the best non-precious metal conductor of electricity as it encounters much less resistance and is safe for electrical distribution system from high voltage transmission cables to micro-circuits. Copper also has relatively high creep strength as compared to other commonly used materials. In Electronic Industry, semi-conductor manufacturers have launched a revolutionary 'copper chip'. By using copper for circuitry in silicon chips, microprocessors are able to operate at higher speeds, using less energy. Copper heatsinks help remove heat from transistors and enable computer processors operate at peak efficiency. Copper is used in Construction Industry as plumbing, taps, valves and fittings components. In Transportation Industry, copper is used in various components. According to an estimate by ICSG, most cars contain an average of 20 kg copper and luxury & hybrid vehicles contain about 45 kg copper. Copper is extensively used in industrial machinery and equipment. It is used in a number of consumer products, such as, coinage, utensils, fixtures, etc. Large quantities of copper are consumed in making copper-based alloys, such as, brass and bronze.

CONSUMPTION

As per the estimate of ICSG, the share of Electrical and Telecommunication Industry in total consumption is 56%, followed by Transport (8%), Consumer Durables (7%), Building & Construction (7%), General Engineering goods (6%) and other industries including Process Industries (16%). The apparent availability of copper for internal consumption in various industries have been computed on the basis of production of refined copper (cathodes) and from the imports and exports data of copper (refined). Copper is also traded in the form of alloys but have not been considered for arriving at apparent availability of copper. During 2015-16, the exports of refined copper was more than the imports, and the availability of refined copper increased from 4,35,153 tonnes in 2014-15 to 5,03,263 tonnes in 2015-16 (Table-14).

Table – 14 : Apparent Availability of Copper for Domestic Consumption (Based on Production of Refined Copper, Imports and Exports)

(Quantity in tonnes)			
Item	2014-15	2015-16 (P)	
I) Total Production* (Cathodes)	765568	790372	
II) Total Imports (copper refined)	37610	32492	
III) Total Exports (copper refined)	368025	319601	
IV) Apparent Availability	435153	503263	

* Primary.

SUBSTITUTES

Copper is vulnerable for substitution on grounds of price, technical superiority or weight. Aluminium is used as substitute for copper in various products, such as, electrical power cables, electrical equipment, automobile radiators and cooling/refrigeration tubing. Optical fiber has substituted copper in some telecommunication applications and plastics too is used as substitute for copper in water pipe, plumbing, fixtures and many structural applications.

WORLD REVIEW

The world reserves of copper metal is assessed at 720 million tonnes of copper content. Chile has the largest share, accounting for about 29.2% of world reserves, followed by Australia (12.4%), Peru (11.2%), Mexico (6.4%), USA (4.9%), Russia (4.2%) and China (3.9%) (Table-15).

The world mine production of copper increased by 3.34% at 19.15 million tonnes in 2015 as compared to 18.53 million tonnes during previous year. Chile continued to be the largest single producer of copper in 2015 with 30.1% share followed by China & Peru (8.9% each), USA (7.2%) and Australia (5%) (Table-16).

Table – 15 : World Reserves of Copper (By Principal Countries)

(Quantity in '000 tonnes of copper content)

Country	Reserves
World: Total (rounded)	720000
Australia	89000
Canada	11000
Chile	210000
China	28000
Congo (Kinshasa)	20000
Mexico	46000
Peru	81000
Russia	30000
USA	35000
Zambia	20000
Other countries	150000

Source: Mineral Commodity Summaries, 2017.

Table – 16 : World Mine Production of Copper (By Principal Countries)

(In '000 tonnes of metal content)

Country	2013	2014	2015
World: Total	18301	18534	19153
Australia	1001	966	964
Brazil	271	301	346
Canada	653	673	697
Chile	5776	5750	5764
China	1715	1777	1706
Congo, Dem.P.R.	922	1030	1039
Indonesia	509	377	577
Iran	223	217	245
Kazakhstan	454	472	474
Mexico	480	515	540
Peru	1376	1378	1701
Poland	429	421	426
Russia	725	740 ^e	740 ^e
USA	1250	1360	1380
Zambia	760	707	719
Other countries	1757	1851	1833

Source: World Mineral Production, 2011-2015.

World refined copper production was 23.05 million tonnes in the year 2015 which showed an increase of 0.6% from that of the previous year. China was the largest producer of refined copper with 7.96 million tonnes in the year 2015 (34.5% of world production) followed by Chile (11.6%), Japan (6.4%), USA (4.9%), and Russia (3.8%) etc.

The world consumption of refined copper was 22.65 million tonnes in the year 2015. China is the largest refined copper consuming country with 11.35 million tonnes (50.1% of world consumption) followed by USA (7.5%), Germany (5.4%), Japan (4.4%), and South Korea (3.1%).

International Copper Study Group (ICSG) estimated that world refined copper production would increase upto 23.6 million tonnes in 2017 and may further increase to 24.6 million tonnes in 2018. The ICSG expects world apparent demand in 2017 to remain essentially flat because China's apparent demand is expected to be flat (+0.5%). For 2017, the growth in world apparent demand is expected at around 1% with underlying Chinese Industrial demand growth expected at around 1%.

Argentina

Mine production at Argentina's only copper mine, the Alumbreira Mine decreased by 40% to 61,800 tonnes from 103,000 tonnes in 2014. Goldcorp cited higher gypsum content of ore, lower grindability of ore, and high stripping activity at the Bajo el Durazno pit as the reasons for the decrease in production.

Brazil

Copper mine production in Brazil increased significantly owing to a 58% increase in copper output at the Salobo Mine (Vale S.A.) to 1,55,000 tonnes from 98,000 tonnes in 2014. Vale completed a mine and concentrator expansion project at Salobo in the first half of 2014, which doubled the mine's production capacity of copper in concentrate to 2,00,000 tonnes per annum.

Chile

The National Copper Corporation of Chile, a Chilean state-owned company, operated seven mines that produced a combined total of 1.7 million tonne of mined copper and accounted for 30% of total

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mined copper production in Chile. The Escondida Mine (BHP Billiton Ltd., 57.5%; Rio Tinto plc, 30%; consortiums of Japanese of total mined copper production in Chile. The rest of Chile's mined copper output came from 17 other mines. The Ministro Hales Mine (Codelco), which began production in 2013, ramped up production by 69% to 2,38,000 tonnes in 2015 from 1,41,000 tonne in 2014. In its second year of production, the Sierra Gorda Mine (KGHM International Ltd., 55%; Sumitomo Metal Mining, 31.5%; Sumitomo Corp., 13.5%) increased output to 87,900 tonne from 12,700 tonne in 2014. These production increases were partially offset by smaller decreases in output at a number of mines. Refined copper production decreased by 2% (41,000 tonnes) to 2.69 million tonne owing to a 4% decrease in electrowon production, which was partially offset by a 3% increase in electrolytically refined copper production

China

Mined copper output in China decreased by 4% in 2015 compared with that of 2014 as mines with higher production costs reduced output after copper prices fell midway through 2015. Smelter and refined copper production, however, increased by 6% and 4%, respectively, owing to increases in smelting capacity during the previous years. In response to falling copper prices, 10 leading Chinese copper producers agreed to cut refined copper production in 2016 by 3,50,000 tonnes. The copper producers also announced that they would close high-cost and outdated operations over the next several years and proposed that the Government of China undertake programme to support the copper industry, such as purchasing surplus copper production and suspending the issuance of licenses for new copper smelters.

Indonesia

Mine production in Indonesia increased by 54% owing to increased production at PT Freeport Indonesia's mines in the Grasberg minerals district and at PT Newmont Nusa Tenggara's Batu Hijau Mine. PT-FI increased production by 16% in 2015 from that of 2014 to 3,41,000 tonnes of recoverable copper (2,95,000 tonnes in 2014 and 4,21,000 tonnes in 2013). Production was

interrupted in 2014 in response to a Government-imposed export tax. In January 2014, the Government of Indonesia announced that exports of copper concentrate would be banned beginning in January 2017 and, from that time on, copper concentrates would need to be processed into metal before being exported. It was also announced that before January 2017, a gradually increasing export duty would be applied to copper concentrate.

PT-FI agreed to develop new copper smelting capacity in Indonesia and provided a \$115 million assurance bond to go towards the development of a copper smelter. PTNNT more than tripled mined copper output to 2,24,000 tonnes in 2015 (71,000 tonnes in 2014 and 73,000 tonnes in 2013) mainly owing to higher ore grades as the company accessed phase 6 ore for the first full year and higher metal recovery and throughput.

In April 2014, Finders Resources Ltd. (Australia) commissioned a 3,000 tonnes per annum SX-EW demonstration plant on Wetar Island and was in the process of building a 25,000 tonnes per annum SX-EW facility. By yearend 2014, Finders Resources produced 1,400 tonnes of copper at Wetar, and in 2015 it produced 1,200 tonnes. The company projected that the mine would produce 1,55,000 tonnes of cathodes over a 10.5 years mine life.

In 2015, electrolytically refined copper production at PT Smelting (Mitsubishi Materials Corp., 60.5%; PT-FI, 25%; Mitsubishi Corporation Unimetals Ltd, 9.5%; JX Nippon Mining and Metals Corp., 5%), which was Indonesia's only electrolytic refinery, decreased by 14% to 1,98,000 tonnes from 2,32,000 tonnes in 2014. Operations at PT Smelting were suspended from July to September 2015 for maintenance work and, once production restarted, output was only 80% of capacity until November so that repairs could be made to an acid plant cooling tower.

Kazakhstan

The 1,00,000 tonnes (33%) increase in refinery production was thought to be a result of increased refinery production at the Zhezkazgan refinery, although reported production data were not available for that refinery for 2015. In October 2014, Kazakhmys plc (United Kingdom) completed restructuring that included selling some of its

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assets in Kazakhstan, including the Zhezkazgan refinery, to Cuprum Holding (the Netherlands). At that time, Kazakhmys changed its name to KAZ Minerals plc.

Mexico

The Buenavista Mine (Southern Copper Corp.) increased copper in concentrate output by 22% to 1,62,000 tonnes and electrowon output by 31% to 1,23,000 tonnes in 2015 and accounted for 58,000 tonnes of the 79,000 tonnes increase in total mine production in Mexico. Production increased at Buenavista as a result of a capital investment program, which added a third SX–EW plant in June 2014 and a new concentrator that began production in September 2015.

Mongolia

Oyu Tolgoi produced 2,02,000 tonnes of copper in 2015, 36% more than that in 2014 as the mine continued to ramp up production. Turquoise Hill forecast the mine's copper production to range between 1,75,000 and 1,95,000 tonnes in 2016.

Peru

The Antamina Mine (BHPBilliton, 33.75%; Glencore, 33.75%; Teck Resources Ltd., 22.5%; Mitsubishi Corp., 10%) increased copper in concentrate production by 13% to 3,91,000 tonnes in 2015 from 3,45,000 tonnes in 2014 owing to higher mill throughput. Output of copper in concentrate at the Antapaccay Mine (Glencore) increased by 21% to 2,02,000 tonnes in 2015 from 1,67,000 tonnes in 2014 owing to the restart of the Tintaya mill in May 2015. The Cerro Verde Mine (FCX, 53.56%; SMM Cerro Verde Netherlands B.V., 21.0%; Compania de Minas Buenaventura S.A.A., 19.58%; other shareholders, 5.86%) increased production of combined copper in concentrate and electrowon copper by 9% to 2,47,000 tonnes from 2,27,000 tonnes in 2014 owing to the completion of a mine expansion project in September 2015. The Toromocho Mine (Chinalco Mining Corporation International), which was commissioned in 2013, ramped up production of copper in concentrate by 159% to 1,82,000 tonnes of copper in concentrate in 2015 compared with 70,300 tonnes in 2014.

The Constancia Mine (HudBay Minerals Inc.) began commercial production in the second

quarter of 2015 and produced 1,06,000 tonnes of copper concentrate by yearend. Hud Bay purchased the Constancia project in 2011, and the company projected that the mine would produce an average of 82,000 tonnes per annum of copper in concentrate over a mine life of 22 years

FOREIGN TRADE

Exports

The exports of copper from India is in various forms, such as, copper ore & concentrates, refined copper, copper & alloys, brass & bronze, scrap, cement copper, mattes and powder & flakes.

Exports of copper ores and concentrates drastically increased by many folds to 11,432 tonnes in 2015-16 as against only one tonne in 2014-15. China was the sole exporter country. Exports of refined copper decreased to 3,19,601 tonnes in 2015-16 from 3,68,025 tonnes in 2014-15. Export of refined copper mainly to China (67%), Malaysia (12%), Singapore(7%), and UAE (6%). Export of copper and alloys (including brass & bronze) was at 4,15,782 tonnes in 2015-16 as against 4,62,183 tonnes in 2014-15. Export of copper (scrap) were at 3,091 tonnes in 2015-16 as against 4,037 tonnes in 2014-15 (Tables-17 to 24).

Imports

The imports of copper in the country are in the form of copper ore & concentrates, refined copper, copper & alloys, brass & bronze, scrap, cement copper, mattes, blister, worked (bars, rods & plates), etc.

During the year 2015-16, imports of copper ores and concentrates increased at 1.89 million tonnes as compared to 1.70 million tonnes in 2014-15. Chile with a share of 38.7% was the leading supplier followed by Indonesia (13.4%), Australia (10.5%), Brazil (8.3%) and Canada (7.9%). Imports of refined copper decreased in 2015-16 at 32,492 tonnes as against 37,610 tonnes in 2014-15. Japan (32%), Congo (18%), Malaysia (16%) and Chile (8%) were the main supplier of refined copper. Out of total imports in 2015-16, copper & alloys comprised 4,09,387 tonnes and copper (scrap) 58,777 tonnes. (Tables - 25 to 33).

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**Table – 17 : Exports of Copper Ores & Conc.
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	1	10	11432	712919
China	-	-	11431	712910
Finland	1	9	1	7
Netherlands	-	-	-	2
UK	++	1	-	-

**Table – 18 : Exports of Refined Copper
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	368025	149495221	319601	111740622
China	280068	114722238	213971	73875814
Malaysia	31201	12135316	38307	14400164
Singapore	6998	2558891	22496	7917257
UAE	16285	6537005	19271	6521045
Chinese Taipei/ Taiwan	1698	644955	8631	3053794
Saudi Arabia	2009	783990	4791	1621523
Thailand	350	140393	3897	1435772
Oman	6	2655	3618	1327689
Vietnam	5447	2216529	3904	1327318
Korea, Rep. of	-	-	300	115681
Other countries	23963	9753249	415	144565

**Table – 19 : Exports of Copper & Alloys
(Including Brass & Bronze) : Total
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	462183	205730340	415782	161726798
China	283827	115629118	219655	74889851
UAE	33717	23982915	31542	17012138
Malaysia	33318	13396122	39840	15032550
USA	17123	8406894	15051	9369921
Singapore	8314	3857438	23650	8952773
Saudi Arabia	6354	3615763	9094	4329165
Chinese Taipei/ Taiwan	1802	701653	8996	3204767
Qatar	579	438887	5594	2087593
Thailand	1312	661498	5080	2058713
UK	3382	2348851	3081	2039415
Other countries	72455	32691201	54199	22749912

**Table – 20 : Exports of Copper (Scrap)
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	4037	1485483	3091	985340
Germany	2064	730625	882	241284
Japan	566	209255	588	188585
UAE	72	27689	411	133217
China	167	70095	317	122160
Chinese Taipei/ Taiwan	38	13898	197	73378
Philippines	327	121767	134	45745
UK	92	34512	127	42014
Spain	344	148006	74	25739
Latvia	-	-	72	23296
Portugal	146	55371	77	20435
Other countries	221	74265	212	69487

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**Table – 21 : Exports of Copper & Alloys
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	419833	175408914	379489	137136897
China	283180	115317727	219031	74575742
Malaysia	31924	12677913	38729	14638505
UAE	22791	11785236	23978	9443533
Singapore	7728	3171642	22915	8112141
USA	9817	4252898	7986	4699994
Chinese Taipei/ Taiwan	1746	676970	8786	3123530
Saudi Arabia	4424	2204027	7074	2788028
Thailand	1208	597978	4920	1977696
Qatar	463	331729	5429	1972908
Oman	801	403068	4291	1632560
Other countries	55751	23989726	36350	14172260

**Table – 22 : Exports of Brass & Bronze
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	37033	28447662	31917	23316754
UAE	10829	12163420	7135	7431763
USA	7303	4153260	7065	4669604
Saudi Arabia	1929	1411190	2020	1540773
UK	1764	1173209	1836	1269442
Singapore	536	667959	728	836968
Germany	1139	740245	1201	754453
Netherlands	1160	702926	1145	625498
Australia	654	328404	562	313808
Iran	484	332914	469	311553
Sweden	256	186299	381	305799
Other countries	10979	6587656	9375	5257093

**Table – 23 : Exports of Brass & Bronze (Scrap)
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	1228	355853	1285	287807
Malaysia	534	148988	686	157850
Germany	234	85068	190	57121
Korea, Rep. of	118	31150	197	41477
Hong Kong	98	10599	165	16051
France	32	13382	21	7273
Singapore	7	957	7	3664
UAE	25	6570	18	3625
Japan	-	-	1	435
Saudi Arabia	-	-	++	160
Australia	++	4	++	43
Other countries	180	59135	++	108

**Table – 24 : Exports of Copper
(Cement Copper Precipitated)
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	++	41	13	7520
Thailand	-	-	13	7520
Malta	++	41	-	-

**Table – 25 : Imports of Copper Ores & Concentrates
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	1702247	285028249	1886199	262965392
Chile	927084	153102437	730694	105454397
Indonesia	115603	23463018	252949	41733553
Australia	157642	33691521	198170	28087129
Canada	87681	14062273	148448	20068679
Brazil	90929	14013835	155803	16930280
Peru	131856	14129783	92409	12129995
Eritrea	63789	13016312	73462	9877503
Lao, Pd. Rep	24724	3813330	32792	3536507
Mexico	-	-	17774	3287729
Unspecified	-	-	127329	14779231
Other countries	102939	15735740	56369	7080389

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**Table – 26 : Imports of Refined Copper
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	37610	16010904	32492	12201780
Japan	2998	1312243	10253	3741835
Congo	7324	3014646	5820	2233127
Malaysia	5579	2347191	5274	1940834
Chile	6710	3036702	2500	1047330
UAE	1513	615637	2003	674863
Hong Kong	-	-	1010	488187
South Africa	1842	782140	1104	378353
Tanzania	2156	944252	1052	370113
Congo Dem. Rep.	1421	559883	562	220972
Australia	249	111136	504	187405
Other countries	7818	3287074	2410	918761

**Table – 27: Imports of Copper & Alloys
(Including Brass & Bronze) : Total
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	490190	196576602	619885	215201927
UAE	98410	39045124	103616	35718559
Zambia	34559	14216217	92613	29168207
Malaysia	38274	16597262	62469	23118170
Russia	43485	18919025	51500	18888574
China	28700	12448722	25628	10695518
Germany	24293	10210218	24852	9255582
Saudi Arabia	24854	8598667	27640	8743978
Thailand	14326	6711661	18613	7620399
Vietnam	9218	4370256	19030	7544338
UK	20644	5845625	26146	6801093
Other countries	153427	59613824	167778	57647509

**Table – 28 : Imports of Copper & Alloys
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	298967	133578287	409387	154428569
Zambia	34456	14173858	92613	29168207
UAE	67094	28352754	74221	26960949
Malaysia	29447	13620381	50031	19599606
Russia	43450	18908541	51462	18873619
China	24295	10590920	19396	8947454
Vietnam	9171	4347120	18973	7515706
Thailand	9933	5073604	14813	6277670
Japan	13794	6413153	14415	5822659
Indonesia	4274	1860972	13110	5020359
Congo P. Rep.	10905	4463276	11718	4371386
Other countries	52148	25773708	48635	21870954

**Table – 29 : Imports of Copper (Scrap)
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	53848	21283695	58777	20062953
Saudi Arabia	14021	5687812	18057	6390121
UAE	16538	6603105	17634	5848600
Kuwait	1834	749376	3248	1098283
Qatar	2774	1132558	2765	992525
Thailand	2427	934945	1882	697691
South Africa	1675	538981	2034	672616
Malaysia	1462	594902	1655	563674
Germany	890	316656	1255	435975
Jordan	1055	408256	840	306152
USA	1124	379274	1110	289136
Other countries	10048	3937830	8297	2768180

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**Table – 30 : Imports of Brass & Bronze
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	24369	10868131	28597	10903116
Malaysia	5142	1769128	6163	1859814
China	4404	1857308	6232	1748064
Germany	2872	1650170	2703	1403098
USA	572	353855	2075	1040727
Japan	2785	1561475	1695	914233
Nepal	1915	725542	1828	625746
Korea, Rep. of	798	357300	1404	593798
Thailand	1572	589171	1562	559871
Chinese Taipei/Taiwan	1237	498537	1409	463600
Netherlands	254	126005	639	286832
Other countries	2818	1379640	2887	1407333

**Table – 31 : Imports of Brass & Bronze (Scrap)
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Countries	113006	30846271	123124	29807289
UK	19087	5103368	22668	5395901
USA	10044	2930298	14005	3557830
Germany	12881	3442301	13787	3260318
UAE	13888	3764119	11406	2787642
Saudi Arabia	10809	2901851	9577	2351164
Malaysia	2223	612851	4620	1095076
Netherlands	2755	771296	3979	956415
Poland	4742	1248682	3363	778739
Spain	3325	891606	2802	691436
Soth Africa	722	199937	2478	599880
Other countries	32530	8979962	34439	8332888

**Table – 32 : Imports of Copper (Cement Copper Precipitated)
(By Countries)**

Country	2014-15		2015-16 (P)	
	Qty (t)	Value (₹ 000)	Qty (t)	Value (₹ 000)
All Countries	5	3089	-	-
Thailand	5	3009	-	-
Malaysia	++	80	-	-
Other countries	-	-	-	-

COPPER

**Table – 33 : Imports of Copper & Alloys
(Excluding Brass & Bronze and Scrap)
(By Items)**

Item	2014-15		2015-16 (P)	
	Qty (t)	Value (₹'000)	Qty (t)	Value (₹'000)
All Items	298967	133578287	409387	154428569
Blister & Other Unrefined Copper	37337	15279121	88791	27906082
Copper & Alloys: worked (Bars, Rods, Plates, etc.)	71534	33688427	72470	31265622
Copper & Alloys: Worked, Nes	6064	4866604	6340	5322650
Copper & alloys: unwrought Excl, Brass & Bronze	1590	734872	1600	628063
Copper Mattes	21	13652	15	9811
Copper Powder & flakes	653	457788	748	471737
Copper Refined: Copper Worked	132815	57843552	187673	70001302
Electroplated Anode of Nickel	11303	4638979	19026	6582214
Master Alloys of Copper	40	44388	232	39308
Refined Copper	37610	16010904	32492	12201780

FUTURE OUTLOOK

Increased urbanisation in India from 30% to 34% by 2020 and higher beyond is likely to push the demand for copper higher. Thus, copper demand in India should grow at 6% to 7% per annum over the coming two decades. It will be continuously met by a combination of improving technology, exploration of newer deposits and recycling, as copper does not lose any of its physical and chemical properties on recycling. As

per Government publication "Technology Roadmap Materials", India could be the 2nd largest copper market by 2025, with a quantity of 2.7 million tonnes due to Government of India has targeted the Electrical Sector at growth rate of 12-15%, Transport sector at growth rate of 45%, Air conditioning & Refining sector at 10% growth rate and other newer sector (copper motor rotor, medical gas supply, water meters, desalination, tubing in geothermal heat pumps, solar heating system etc.) at 15% growth rate.