

26 Copper

Copper is an important non-ferrous metal having wide range of industrial applications. India is not self-sufficient in the resources 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 as well as imports.

HCL, a public sector undertaking, is the only integrated producer of primary refined copper in India.

Production of primary copper based on indigenous ore is characterised by high energy consumption because of low scale operation and minimal automation. The low-grade quality of Indian copper ores and nature of the ore body (narrow width and flatter inclinations), do not make large-scale mechanisation in underground mines a viable proposition. Hindalco (unit of Birla Copper) and Sterlite Industries (India) Ltd, the major copper producers in the private sector rely on imported copper concentrates. These companies also have copper mines in other countries as well. Another private sector company Jhagadia Copper Ltd also produces copper based on secondary route.

The domestic production of copper ore in 2007-08 has decreased by 1%, whereas the production of copper concentrate has increased by 6% over the previous year. There was a nominal decrease in production of copper blister (11%) and cathodes (2%) while continuous cast wire rods registered an increase of 3% in production.

RESOURCES

The total resources of copper ore as on 1.4.2005 as per UNFC system are estimated at 1.39 billion tonnes. Of these, 369.49 million tonnes (26.5%) fall under 'reserves' (proved and probable categories) while the balance 1.02 billion tonnes (73.5%) are 'remaining resources' (under feasibility, pre-feasibility, measured, indicated and inferred categories). Of the total ore resources, 28.03 million tonnes (2.0%) comprise ore containing 1.85% Cu or more and 622 million tonnes (44.61%) of 1% to below 1.85% Cu grade.

With regard to reserves, about 7.3 million tonnes (2%) and 346.7 million tonnes (93.8%) relate to above 1.85% Cu grade and 1% to below 1.85% Cu grade, respectively.

The total copper metal content in the resources is 11.4 million tonnes of which 4.38 million tonnes constitute reserves.

Largest resources of copper ore to a tune of 668.5 million tonnes (47.9%) are in the state of Rajasthan followed by Madhya Pradesh with 404.3 million tonnes (29%) and Jharkhand with 226.08 million tonnes (16.2%). Copper resources in Andhra Pradesh, Gujarat, Haryana, Karnataka, Maharashtra, Meghalaya, Orissa, Sikkim, Tamil Nadu, Uttarakhand and West Bengal accounted for about 7% of the total all India resources (Table-1).

EXPLORATION & DEVELOPMENT

GSI, MECL and State Directorate of Mines & Geology, Rajasthan were engaged in the exploration of base metals. In 2006-07, GSI carried out exploration for copper and associated mineralisation in Panchmahals and Vadodara districts in Gujarat; Mahendragarh district in Haryana; Chandrapur and Gadchiroli districts in Maharashtra; Betul district, Madhya Pradesh; and Alwar, Chittorgarh, Dausa, Jhunjhunu, Pali, Rajsamand, Sikar and Udaipur districts in Rajasthan. MECL conducted exploration in Singhbhum (East) district of Jharkhand, Multai in Madhya Pradesh, Bhilwara and Chittorgarh districts in Rajasthan, while DMG, Rajasthan conducted exploration in Ajmer, Banswara, Bharatpur, Jaipur, Sirohi and Udaipur districts.

In 2007-08, GSI carried out exploration for copper and base metals in Mahendragarh district, Haryana; Chandrapur district, Maharashtra; Ribhoi district, Assam; and Alwar, Bhilwara & Sikar districts, Rajasthan. The AMSE wing of GSI carried out exploration in Udaipur district, Rajasthan. MECL and DMG, Rajasthan, conducted mapping, drilling and sampling activities in 2007-08, details of which are furnished given in Table - 2.

**Table – 1 : Reserves/Resources of Copper as on 1.4.2005
(By Grades/States)**

(In '000 tonnes)

Grade/State	Reserves			Remaining resources					Total resources (A+B)			
	Proved STD111	Probable		Feasibility STD 211	Pre-feasibility STD221	Measured STD331	Indicated STD332	Inferred STD333				
		STD121	STD 122							Total (A)	Total (B)	
All India : Total												
Ore	135461	48178	185854	369493	3375	2230	13995	112019	158678	734637	1024934	1394427
Metal	1643.93	494.39	2245.65	4383.97	3.37	11.82	60.43	1052.47	1396.27	4509.39	7033.75	11417.72
By Grades												
Ore with 1.85 % & above Cu	2370	-	4952	7322	-	-	508	430	305	19466	20709	28031
Ore with 1.00 % to below 1.85 % Cu	124911	48178	173565	346654	-	-	3234	40083	45319	186695	275331	621985
Ore with (+)0.5% to below 1.00% Cu	636	-	2795	3431	-	2230	-	23366	78239	497228	601063	604494
Ore with (-)0.5% Cu	7544	-	4542	12086	3375	-	10253	48140	34815	31248	127831	139917
Metal	1643.93	494.39	2245.65	4383.97	3.37	11.82	60.43	1052.47	1396.27	4509.39	7033.75	11417.72
By States												
Andhra Pradesh												
Ore	686	338	433	1457	-	-	395	-	5396	1000	6791	8248
Metal	6.88	4.33	5.84	17.05	-	-	7.54	-	89.91	8.32	105.77	122.82
Gujarat												
Ore	-	4955	845	5800	-	-	-	129	-	7131	7260	13060
Metal	-	80.75	13.78	94.53	-	-	-	0.69	-	113.38	114.07	208.6
Haryana												
Ore	-	-	-	-	-	2230	-	-	-	15000	17230	17230
Metal	-	-	-	-	-	11.82	-	-	-	45	56.82	56.82
Jharkhand												
Ore	4464	42356	29075	75895	-	-	-	40307	66188	43692	150187	226082
Metal	39.2	400.45	278.82	718.47	-	-	-	490.55	631.85	562.7	1685.10	2403.57

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Table-1 (Concltd.)

Grade/State	Reserves				Remaining resources				Total resources (A+B)
	Proved STD111	Probable		Total (A)	Feasibility STD 211	Pre-feasibility		Inferred STD333	
		STD121	STD 122			STD221	STD222		
Karnataka									
Ore	963	2595	3558	-	-	-	7148	21948	30846
Metal	5.99	20.34	26.33	-	-	-	66.9	111.33	200.23
Madhya Pradesh									
Ore	101813	125336	227149	-	-	-	33150	94399	177199
Metal	1343.93	1641.9	2985.83	-	-	-	100.57	913.11	1169.43
Maharashtra									
Ore	-	2180	2180	-	-	-	1419	5982	7401
Metal	-	17.44	17.44	-	-	-	21.3	62.51	83.81
Meghalaya									
Ore	-	-	-	-	-	-	880	-	880
Metal	-	-	-	-	-	-	9	-	9
Orissa									
Ore	-	-	-	-	-	3234	722	2095	6051
Metal	-	-	-	-	-	40.55	3.2	20.69	64.44
Rajasthan									
Ore	27535	25327	52942	3375	-	10253	42794	542580	615515
Metal	247.93	266.62	515.64	3.37	-	10.25	469.37	2662.97	3466.44
Sikkim									
Ore	-	63	511	-	-	-	-	150	450
Metal	-	0.91	8.68	-	-	-	-	4.23	12.7
Tamil Nadu									
Ore	-	-	-	-	-	-	590	-	790
Metal	-	-	-	-	-	-	2.73	-	3.81
Uttarakhand									
Ore	-	-	-	-	-	-	390	660	4220
Metal	-	-	-	-	-	-	1.44	5.15	60.04
West Bengal									
Ore	-	-	-	-	-	113	-	-	113
Metal	-	-	-	-	-	2.09	-	-	2.09

Figures rounded off.

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Table – 2 : Details of Exploration Activities for Copper, 2006-07 & 2007-08

Agency/ State/District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks
		Scale	Area (sq km)	No. of boreholes	Meterage		
2006-07							
GSI							
Gujarat							
Panchmahals & Vadodara	Khandia- Masabar and its extension areas	-	-	-	-	-	Preliminary investigaion shows presence of chalcopryrite, bornite and malachite stains and galena speck from quartz veins.
Haryana							
Mahendragarh	Golwa area	-	-	2	-	-	Mineralised zone averaging 0.4 Cu x 7.5m and 0.35 Cu x 4.0 m has been intersected at a vertical depth of 120 m confirming depth persistence of mineralisation.
-do-	Gongutana	-	-	-	-	-	Two channel sample lines recorded copper mineralisation averaging 0.39% Cu x 17.5 m and 0.30% Cu x 12.5 m.
Madhya Pradesh							
Betul	Biskhan area	-	-	1	-	-	Boreholes intersected two sulphide rich zone between 22.75 m & 75.00 m depth and 14.50 m & 156.60 m depth represented by sphalerite, chalkopryrite and pyrite.
-do-	Khari area	-	-	-	-	-	Detailed mapping and soil & bedrock samples were collected.
-do-	Muariya Block	-	-	-	-	-	Total resources of base metal re-assessed to 1.32 million tonnes from 0.8 million tonnes with 7.6% Zn; 1.73% Pb; 0.75% Cu.
Maharashtra							
Chandrapur	Thanewana Copper Prospect	-	-	6	-	-	Mineralised zones encountered in boreholes and the maximum value of Cu is 3.66% at depth between 135.30 m and 137.40 m. A drill indicated resource of 1.13 million tonnes of ore with 1.1% Cu has been estimated.
-do-	Dubarpeth - Karanji block	-	-	2	-	-	One copper zone of 1.48 m width having 0.70% Cu was intersected by one borehole. A drill indicated resource of 0.35 million tonnes of ore with 0.67% Cu has been estimated.
Chandrapur & Gadchiroli	Southern extension of Thanewasna block	-	-	-	-	-	Analysis of soil samples from B-horizon on 25 m x 100 m grid indicated feeble values for Cu: 10 to 100 ppm; Pb: 20 to 125 ppm and Zn: 40 to 225 ppm.
Rajasthan							
Alwar	Todi-ka-Bas area	-	-	1	-	Channel sample	Sample along profile CS-1 analysed 169 ppb to 1600 ppm Cu.
Chittorgarh	Jabarkiya Block	-	-	1	-	-	Borehole intersected four zones of chalkopryrite mineralisation with Cu values ranging from 0.20% to 0.49% and width ranging from 1.0 m to 3.15m.

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Table - 2 (Contd.)

Agency/ State/District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks
		Scale	Area (sq km)	No. of boreholes	Meterage		
Dausa	Dogeta-Bas area	-	-	-	-	Channel sample	Sample indicated copper value from 59 ppm to 1500 ppm.
-do-	Dhani-Basri	-	-	-	-	-	Reserves have been recalculated and enhanced from 3.20 million tonnes in 2004-05 to 3.80 million tonnes with 1.18% Cu and 1.53 g/t gold.
Jhunjhunu	Manaksas-Jodhpura area, South Khetri Copper Belt	Large scale	-	-	-	-	The analytical data of geochemical samples indicated moderate value of copper.
-do-	Neori West Block (Central Khetri belt)	-	-	2	-	-	Specks and stringers of chalcopyrite are present from 326 m to 332.55 m depth with 0.3% - 2.5% (VE) Copper in one borehole.
-do-	Pacheri Kalan block, NE of Khetri Copper Belt	-	-	1	-	-	Pyrite veins and a few chalcopyrite specks were noticed between 218 m and 224.45 m depth with 0.20% - 0.30% Cu (VE)
Pali	Kot area	-	-	-	-	-	The analytical results are awaited.
Rajsamand	Gangas Block, Josma Bhupat Sagar Belt	-	-	3	-	-	Mineralised zones aggregating 7.05 m width with 0.50% Cu (VE); 2 m and 4.45 m width with 0.5% Cu (VE); 2 m and 9.60 m width with 0.5- 1% Cu (VE) were reported A resource of 0.80 million tonnes of Cu with av. grade of 0.5% of Cu have been estimated.
Sikar	Mina ka Nangal,	-	-	2	-	-	First borehole intersected a zone showing streaks and stringers of chalcopyrite, pyrite, bornite covellite from 73.70 m to 102.50 m depth. Second borehole showing dissemination of chalcopyrite, pyrite & bornite from 60 to 63 m with 0.2 to 0.3 Cu (VE) was intersected.
-do-	Panchokharkhara	-	-	3	-	-	Three mineralised zones within amphibole marble showing malachite stains and bornite specks were intersected.
-do-	Baleshwar - Dariba Belt	1:10,000	-	-	-	-	Mineralised zone extends for about 4 km on western limb and 2 km on the eastern limb with a width of 20 m to 25 m. Bedrock samples analysed 193 ppm to 0.11% and 163 ppm to 0.39% Cu on eastern limb.
-do-	Halowala Johra block, (South Khetri Copper Belt)	-	-	-	-	-	Three mineralised zone intersected are 6.20 m, 9.15 m and 14.50 m wide with 0.43%, 0.2%, 0.5% to 0.8% Cu (VE) respectively
-do-	Halowala Johra Block (Phase-II) (South Khetri Copper Belt)	-	-	-	-	-	Mineralised zones of 6.45 m width with 0.2%, to 0.3% Cu (VE) was intresected.

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Table - 2 (Contd.)

Agency/ State/District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks
		Scale	Area (sq km)	No. of boreholes	Meterage		
Sikar	Baniwala-ki-Dhani, Kundla-ki-Dhani, Dokan and Dakan North blocks						18.17 million tonnes resources of copper with 0.45% Cu was augment-ed in Baniwala-ki-Dhani block. In Dokan block, resources have been calculated to be 25.56 million tonnes with 0.38% Cu. In Dokan North block and Kundala-ki-Dhani ore resources have been calculated as 5.60 million tonnes with 0.30% Cu and 1.93 million tonnes with 0.28% copper respectively.
Udaipur	Bara Sarpatia block, Parsola area.	-	-	-	-	-	The pyritiferous zone is about 15 m wide.
DMG, Rajasthan							
Ajmer	N/V Naulakha, Tantiya, Hathibotta, Srinagar,	-	-	3	713	187	Chalcopyrite and arsenopyrite were intersected in three boreholes. Samples analysed Cu: 5 ppm to 1.62%; Zn: 2.5 to 121 ppm; Ag: 0.9 to 16 ppm and Au: 0.045 to 0.289 ppm.
-do-	N/V Chhachhundra, Bandanwara, Jorawarpura Chawandia Ekalsingha	1:50,000 1:10,000 1:2000	100 15 1	1	280	Spot:33 Line:126 Core:56	Base metal mineralisation intersected in boreholes. Spot sample analysed Cu: 37 ppm to 0.25%; Au: 0.4 to 0.742 ppm; Ag: 0.90 to 69 ppm; Zn: 15 to 4075 ppm; Pb:286 to 962 ppm and Co: 37 ppm to 0.19%
Banswara	N/V Lorda, Kushalgarh area	1:50,000 1:10,000	150 10	- -	60 -	- -	The area was explored for rock phosphate and basemetal/noble metals. Analytical results are awaited.
Bharatpur	Khankera, Kair, Bagrain	1:50,000 1:10,000 1:4000		50 10 1	- - -	12 -	Primary indication of copper mineralisation in the form of profuse malachite staining was reported.
Jaipur	N/V Morda & Javali	-	-	1	139	12	To locate tin & base metals.
Sirohi	Golia & Pipala	1:50,000 1:10,000 1:2,000	100 10 1	-	-	328	Extension of base metal mineralisation have been located in well cuttings and gossan.
Udaipur	N/V Kal-ki-Kui Kodarwadia area, Teh: Dhariawad	1:2000 1:10,000 1:50,000	1.5 21 205	-	-	170	Geochemical/stream sampling/old working pit sample analysis shows Au: 0.2 to 1.6 ppm; Cu: 15 to 7515 ppm; Zn: 49 to 16200 ppm and Pb: 17.5 to 78.5 ppm.
MECL							
Jharkhand							
Singhbhum(E)	Ramchandrapahar	1:1000	1	18	3000	1112	Exploratory drilling proved occurrences of five lodes lensoid in nature. Ore resources of 2.02 million tonnes with Cu-0.88% at 0.5% cut off were estimated.

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Table - 2 (Contd.)

Agency/ State/District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks
		Scale	Area (sq km)	No. of boreholes	Meterage		
Madhya Pradesh							
Multai	Banskhapa- Piparia (Sub-block-II)	1:1000	1	6	1250	200	The exploration was carried out to upgrade reserves & grade estimated by GSI. Preparation of Geological Report (GR) is underway..
Rajasthan							
Bhilwara	Sanganer	1:2000	5	17	2604	804	Exploration established mineralisation of over 1500 m strike length & 100 m depth. Ore zone thickness vary from 2.0 to 9.0 m with 1.02% to 1.43% Cu. Preparation of GR is in progress.
-do-	Devtalai (Phase-II)	1:1000	1	17	3003	794	Exploration established the vein quartz of over 700 m strike length and 200 m depth. Ore zone thickness varied from 1m to 2.50 m with 0.50% to 2.93% Cu.
Chittaurgarh	Dariba(Akola)	1:1000	1	15	2375	362	Three major lodes were established of which Central & Western are promising. Reserves of 2.635 million tonnes with 0.8% Cu were estimated.
2007-08 GSI Haryana							
Mahendragarh	North of Gangutana	-	-	5	First level 200 m apart	-	Sulphide mineralisation in the form of bornite, chalcopyrite and rare specks of chalcocite was recorded in three boreholes with average Cu values of 0.35%, 0.37% and 0.26% respectively. Two boreholes intersected 9.0 m and 7.5 m wide zones with average Cu values of 0.18%. The mineralisation has been established over a cumulative strike length of 1.4 km to the north of Gangutana village.
Maharashtra							
Chandrapur	Dubarpeth Karanji block	-	-	-	-	-	No boreholes intersected any minerals zone except sporadic dissemination of sulphide mineralisation. The analytical results are awaited.
-do-	Govindpur	-	-	--	-	-	The geophysical resistivity and IP survey shows promising zones. Soil samples analysed Cu: 75 ppm and Zn up to 100 ppm.
Meghalaya							
Ri-bhoi	Southwest Umpyrtha	-	-	-	-	-	The investigation was planned to test the strike continuity of poly-metallic mineralisation. The analytical results of samples are awaited.

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Table - 2 (Contd.)

Agency/ State/District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks
		Scale	Area (sq km)	No. of boreholes	Meterage		
Rajasthan							
Alwar	Todi-ka-Bas area	-	-	3	-	-	First borehole intersected four mineralised zones (i) 4.05 m x 0.47% Cu, (ii) 1.0m x 0.24% Cu (iii) 4.0 m x 0.26% Cu and (iv) 1.0 m x 1.12% Cu at 0.2% Cu Cut off between depth 239.85 m and 276.05 m. Second borehole intersected disseminations, stringers, streaks and occasional fractures, filling of pyrite, pyrrhotite, chalcopyrite, bornite, covellite intermittently between 180.95 m and 376.80 m depth.
Bhilwara	Salampura block	-	-	-	-	-	Drilling to test Pur Banera belt the prominent geochemical anomalous zone for Cu, Pb and Zn in the southern part of the block extending over a strike length of 1.6 km has commenced.
Jhunjhunu	Maota Block, Central Khetri Belt.	Large scale	-	-	-	-	The magnetic, SP, IP and resistivity surveys carried out have shown high chargeability zones. Analytical results are awaited.
Pali	Kot area	-	-	-	-	-	The analytical results of bedrock samples have not shown any promising mineralised zone.
-do-	Dhikan block	-	-	-	-	-	Investigation for 1500 m long and 3-4 m thick gossan zone was taken up. About 78 channel samples representing 500 m strike length indicated presence of Cu from 153 ppm to 0.77% and Zn from 28 ppm to 0.20% over a width varying from 2.50 m to 7.50 m.
Sikar	Mina-ka-Nangal	-	6	-	-	-	First three boreholes in northern part intersected two mineralised zone with fine dissemination of chalcopyrite, pyrite and bornite. Other three boreholes in southern part did not intersect mineralised zone.

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Table - 2 (Contd.)

Agency/ State/District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks
		Scale	Area (sq km)	No. of boreholes	Meterage		
Sikar	Panchokharkhara area	-	6	-	-	-	First borehole intersected all the three zones at 17.35m to 23.35 m, 61.50 m to 71.50 m and 74.50 m to 82.50 m depth with 2 to 7 m thickness with Cu content of 0.13% to 0.30%, 0.11% to 0.28% 0.11% to 0.64% respectively. Second borehole intersected three mineralised zones with Cu content from 0.3% to 0.5% at depths that ranged from 42.50 m to 51.50 m, 59.50 m to 78.50 m, 104.0 m to 156.0 m and depth Third borehole intersected zones at 66.65 m 92.0 m and 127.45 m depth. Other three holes did not intersect any significant mineralised zones.
-do-	Dariba block	Detailed mapping					Discontinuous mineralised zones having malachite stains were reported.
-do-	Nimod area	-	-	2	-	-	Two mineralised zones extending for more than 3 km strike length were delineated. Analytical results of bedrock samples show Cu values of 0.05% to 0.32% and Au from 0.05 ppm to 0.30 ppm. Boreholes indicated low values of Cu mineralisation.
-do-	Nimod Extension block	Detailed mapping	-	-	-	-	The mineralised zone is about 20 m wide with bornite, chalcocite, chalcopyrite and pyrite. Analytical results showed poor Cu, Pb and Zn values.
-do-	Mahawa block	-	-	-	-	-	Investigation to assess a 800 m long and 30-35 m wide mineralised zone that was delineated during 2005-06 is underway. A 10-15 m wide zone showing malachite has been observed.
-do-	Halowala Johra West block, South Khetri Copper belt	-	-	7	-	-	Investigation was taken up to test the West block, north western part of 1200 m long shear zone over a strike of 350 m. Out of six boreholes, five boreholes intersected copper zones varying in width from 1.0 m to 16.0 m with metal content from 0.3% to 1.3% Cu. One borehole drilled at the northwestern end of shear zone intersected occasional sulphide mineralisation at different depths from 128.50 m to 164.50 m.

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Table - 2 (Contd.)

Agency/ State/District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks
		Scale	Area (sq km)	No. of boreholes	Meterage		
Sikar	Baniwala-ki-Dhani Kundla-ki-Dhani, Dokan and Dakan, North blocks	-	-	-	-	-	Copper resources re-estimated are as under: Baniwala-ki-Dhani : 2003-04 : 18.17 mt. with Cu% 0.45 2007-08 : 20.18 mt. with Cu% 0.47 Kundla-ki-dhani 2005-06 : 1.93 mt. with Cu% 0.28 2007-08 : 2.71 mt. with Cu% 0.37 Dokan 2005-06 : 16.85 mt. with Cu% 0.38 2007-08 : 42.41 mt. with Cu% 0.40 Dakan North 2005-06 : 5.60 mt. with Cu% 0.30 2007-08 : 19.96 mt. with Cu% 0.37
Udaipur	Beras-Wali-ka Khera block of Anjani Bedawal area.						Re-evaluation of aerogeophysical anomalies and integrated survey were undertaken. The lithological and stream samples from Wali-ka-Khera and Beras analysed 0.15% to 0.19% Cu and 3% Cu respectively.
DMG, Rajasthan							
Ajmer	N/V Naulakha, Tantiya, Hathibotta, Srinagar	-	-	2	628	Core:343 Line:300	Pyrite & chalcopyrite mineralisation were intersected. Reserves of about 1 million tonnes with 1% Cu were estimated.
-do-	N/V Chhachhundra, Bandanwara, Jorawarpur Chawandia, Ekalsingha	1:50,000 1:10,000 1:10,000	100 10 1	2	504	Spot:43 Line:20	Analysis of 18 spot samples showed Cu:18 to 5250 ppm; Au: 0.40 to 9.70 ppm; Zn 31 to 70 ppm; Pb : 95-284 ppm; and Co : 22-175 ppm.
Alwar	N/V Lohit, Mahanput- ki-Dhani, Meeralpur & Machi	1:50,000 1:10,000 1:2,000	150 10 1	-	-	60	Staining of malachite and azurite are found.
Banswara	N/V Varita, Dogul, Kalimari, Tamatia, Baropi, Gorda and Daliyar, Teh.Shatul	1:10,000 1:2000		10 1	-	18	-
-do-	N/V Kharwa, Undwara, Lakheri and Khadli- para, Teh.Ghatal.	1:10,000 1:2000		10.2 1.2	-	28	-
-do-	N/V Padar, Amjhora, Dhaman, Dewal Dist: Dungarpur; Bhanwariya, Talai, Kushalpara	1:10,000 1:2000		10 1		24 22 Chip sample	-
Chittorgarh	Satola, Bhervi and Dholapani	1:50,000 1:10,000	150 10	-	-	32	Slag heaps n/V Bacheri, Charliya, Amba and Dholapani were noticed. A float sample of specularite bearing quartzite was sent for analysis.

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Table - 2 (Concl'd.)

Agency/ State/District	Location Area/ Block	Mapping		Drilling		Sampling (No.)	Remarks
		Scale	Area (sq km)	No. of boreholes	Meterage		
Jaipur	N/V Matasula, Dhaula, Gol , Pachapur	1:50,000 1:10,000 1:4000	110 10 1	-	-	44	Noble metal, base metal indications are noted in the form of gossan, slag and malachite staining. Chemical analysis of samples revealed presence of Cu, Ag & Au.
-do-	Morda, Jawali	-	-	3	396	192	Mineralisation encountered at varying inclined depths. Analysis of samples is awaited.
Pali	N/V Jadan, Kharadi	1:50,000 1:10,000	100 20	-	-	5	Chemical analysis of samples analysed Cu: up to 440 ppm, Pb:1299 ppm; Zn: 482 ppm and Ag: 17 ppm.
Sikar	N/V Bamrara, Kairpura and Saladipura	1:50,000 1:10,000 1:4000	100 10 1.10	-	-	53	Base metal indications were observed in rock debris of three wells.
Sirohi	Teh. Pindwara	1:10,000 1:2000	10 1	-	-	55	Geophysical survey of 10 line km was undertaken.
Udaipur	N/V Kun, Kodarwadia and Barothi-Savankuri	1: 50,000 1:10,000 1:2000	100 10 2	-	-	58	The rocks show malachite staining and encrustations . Analysis of a few samples showed Cu: 16 to 760 ppm; Pb: 84 to 500 ppm; and Zn: 30 to 100 ppm.
MECL							
Jharkhand							
Singhbhum(E)	Dhobani mine area	1:1000	1.25	20	4000	1500	The thickness of lode zone varies from 3-4 m width with Cu: 0.8 to 1%.
Rajasthan							
Bhilwara	Sanganer	1:2000	5	2	268	100	Mineralisation over 1500 m strike length and 100 m depth was observed. Ore zone thickness varies from 2.0 to 9.0 m with 1.02 to 1.43% Cu. A reserve of 17.21 million tonnes was established with 0.32% Cu.
Chittorgarh	Devtalai (Phase-II)	1:1000	1	17	3003	794	A reserve of 1.58 million tonnes with 1.15 to 1.35% Cu was established and reserves of 502 kg of gold were also established.
Dausa	Dhani-Basri	1:2000	1	16	4215	714	Detailed exploration revealed two lodes varying in thickness from 6.17 m to 12.60 m with +1% Cu. Gold content in ore is 1 g per tonne. Preparation of Geological report is in progress.
Jhunjhunu	Satkui	1:2000	1.50	6	2972	330	Boreholes intersected mineralised zone having thickness 2 to 3 m with 0.80% to +1% Cu.

PRODUCTION & PRICES

Copper Ore and Concentrates

The production of copper ore at 3.24 million tonnes in 2007-08 decreased marginally by 1% from that in the previous year. The metal content in the ore produced in 2007-08 works out to 32,979 tonnes as against 33,554 tonnes in 2006-07. During the year under review, 2.79 million tonnes of ore was treated for obtaining copper concentrates as against 3.26 million tonnes in 2006-07.

Production of copper concentrates at 1,58,555 tonnes in 2007-08 increased by about 6% as compared to that in the previous year. Madhya Pradesh was the leading producer of copper concentrates, accounting for about 52% of the production in 2007-08, followed by Rajasthan with 47% of the production. Nominal quantity of 1,550 tonnes of copper concentrates was also reported from Jharkhand. The number of reporting mines in 2007-08 remained the same as in 2006-07.

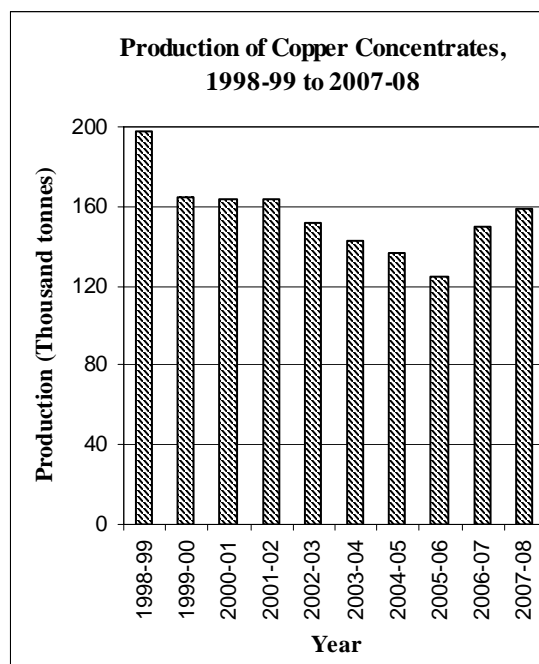
Grade Analysis

The copper content in the ore produced was 1.02% Cu in 2006-07 and 2007-08. All India average metal content of ore treated in 2007-08 works out to 1.00% Cu as against 1.02% in the preceding year. The copper content in the ore treated varied from state to state. It was 1.04% Cu in Rajasthan, 0.99% Cu in Madhya Pradesh and 0.85% Cu in Jharkhand. The average metal content in the concentrate produced works out to 21.75% Cu in 2007-08 as against 20.09% Cu in the previous year. The copper concentrate produced in Madhya Pradesh in 2007-08 was of the grade 27.01% Cu followed by Jharkhand 23.48% Cu and Rajasthan 15.99% Cu (Tables - 3 to 7).

The average daily employment of labour in copper mines in 2007-08 was 2,506 as against 1,661 in the preceding year. Domestic prices of copper concentrates are furnished in Table-8.

Copper Metal

Hindustan Copper Ltd produces copper metal from the ore produced at their captive mines as well as from imported concentrates. Sterlite



Industries (India) Ltd and Hindalco Industries Ltd produce copper metal from imported copper concentrates (Table-9).

The production of copper blister decreased by 11% and copper continuous cast wire rods registered an increase of 3%, respectively, in 2007-08. Similarly, production of copper cathodes decreased by 2% in the current year. Production of copper electrolytic wire bars was not reported in 2007-08 and in 2006-07 (Tables-10 to 13).

Annual average domestic prices of copper in 2006-07 and 2007-08 are furnished in Table-14.

Table – 3 : Principal Producer of Copper Concentrates, 2007-08

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

COPPER

**Table – 4 : Production of Copper Ore, 2006-07 and 2007-08
(By States)**

(In tonnes)

State	2006-07			2007-08 (p)		
	Ore produced	Cu%	Metal content	Ore produced	Cu%	Metal content
India	3273906	1.02	33554	3242371	1.02	32979
Madhya Pradesh	2270122	1.03	23496	2192665	1.01	22228
Rajasthan	1000419	1.00	10023	1002792	1.03	10343
Sikkim *	3365	1.04	35	-	-	-
Jharkhand	-	-	-	46914	0.869	408

* The production of ore relates to multimetal ore production containing Cu, Pb and Zn.

**Table – 5 : Copper Ore Treated, 2006-07 and 2007-08
(By States)**

(In tonnes)

State	2006-07			2007-08 (p)		
	Ore treated	Cu%	Metal content	Ore treated	Cu%	Metal content
India	3257540	1.026	33429	2793604	1.006	28098
Madhya Pradesh	2154691	1.035	22301	1951128	0.995	19418
Rajasthan	1102849	1.009	11128	796120	1.041	8285
Jharkhand	-	-	-	46356	0.852	395

**Table – 6 : Production of Copper Concentrates, 2005-06 to 2007-08
(By States)**

(Quantity in tonnes; value in Rs. '000)

State	2005-06		2006-07		2007-08 (p)	
	Quantity	Value	Quantity	Value	Quantity	Value
India	125392	2508963	149584	3117098	158555	3825408
Madhya Pradesh	60774	1430395	79066	1718333	81858	2183565
Rajasthan	64461	1074530	70384	1394379	75147	1582896
Sikkim	157	4038	134	4386	-	-
Jharkhand	-	-	-	-	1550	58947

**Table – 7 : Production of Copper Concentrates, 2006-07 and 2007-08
(By Sector/States/Districts)**

(Quantity in tonnes; value in Rs. '000)

State/District	No. of mines	2006-07			No. of mines	2007-08 (p)		
		Quantity	Cu %	Value		Quantity	Cu %	Value
India/Public sector	4	149584	20.09	3117098	4	158555	21.75	3825408
Madhya Pradesh/ Balaghat	1	79066	26.51	1718333	1	81858	27.01	2183565
Rajasthan/Jhunjhunu	2	70384	12.91	1394379	2	74147	15.99	1582896
Sikkim/East Sikkim	1	134	23.8	4386	-	-	-	-
Jharkhand/ Singbhum (East)	-	-	-	-	1	1550	23.48	58947

COPPER

Table – 8 : Prices of Copper Concentrates, 2005-06 to 2007-08

(Value in Rs. per tonne)				
Grade	Market	2005-06	2006-07	2007-08
25% Cu Eqvlt.	Ex-mine Malanjkhand (Madhya Pradesh)	23536.45	21732.87	26701.08
Copper Concentrate	f.o.r. Ghatsila (Jharkhand)	1486.00	2347.00	NA

Table – 9 : Producers of Copper, 2007-08

Name and address of the producer	Location	
	State	District
M/s Hindustan Copper Ltd, Tamra Bhavan, 1, Ashutosh Chowdhury Avenue, Post Box No.10224, Kolkata – 700 019.	Rajasthan Jharkhand	Jhunjhunu Singhbhum (East)
M/s Hindalco Industries Ltd, Century Bhawan, Dr. Annie Besant Road, Mumbai – 400 025, Maharashtra.	Gujarat	Bharuch
M/s Sterlite Industries (India) Ltd, B-10/4, Waluj M.I.D.C., Industrial Area, Waluj, Aurangabad – 431 133, Maharashtra.	Tamil Nadu Dadra & Nagar Haveli (U.T.)	Thoothukudi Chinchpada (Silvassa)
Jhagadia Copper Ltd, 747, GIDC Industrial Estate, Post Box No. 14, P.O. Jhagadia – 393 110 Distt: Bharuch, Gujarat.	Gujarat	Bharuch

Table – 10 : Production of Copper, 2005-06 to 2007-08

(In tonnes)				
Year	Copper blister	Copper cathodes wire bars	Copper electrolytic	Copper CCWR*
2005-06	310694	529248	1383	289185
2006-07	50735	510623	-	275795
2007-08 (p)	45346	501485	-	283570

* CCWR - Continuous Cast Wire Rods.

**Table – 11: Production of Copper (Blister), 2006-07 and 2007-08
(By States/Plant)**

(Quantity in tonnes)					
State	Plant	2006-07		2007-08	
		Quantity	Value	Quantity	Value
India		50735	-	45346	-
Jharkhand	Surda ICC	16031	-	16904	-
Rajasthan	KCC	25557	-	28442	-
Tamil Nadu	Sterlite	9147	-	-	-

COPPER

**Table – 12 : Production of Copper (CCWR), 2006-07 and 2007-08
(By States/Plant)**

(Quantity in tonnes; value in Rs. '000)

State	Plant	2006-07		2007-08	
		Quantity	Value	Quantity	Value
India		275795	91621081	283570	90999023
Gujarat	Hindalco	106293	35828168	122217	40141783
Maharashtra	HCC Taloja	43736	17573908	58008	19297200
Tamil Nadu	Sterlite	125766	38219005	103345	31560040

**Table – 13 : Production of Copper (Cathodes), 2006-07 and 2007-08
(By States/Plants)**

(Quantity in tonnes; value in Rs. '000)

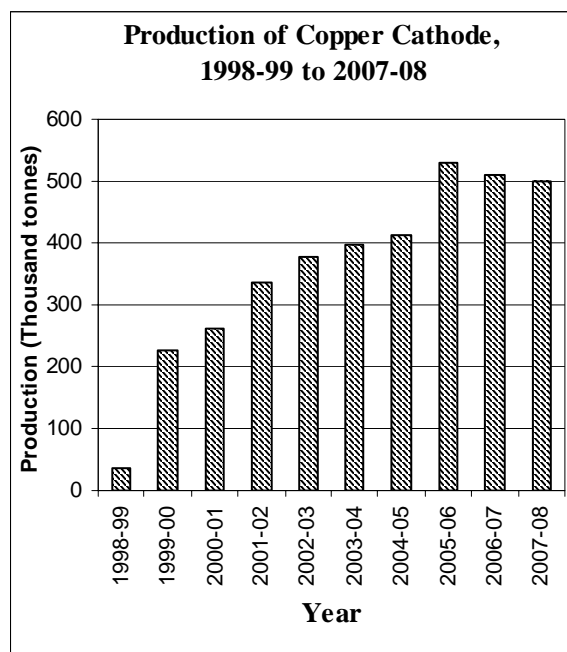
State	Plant	2006-07		2007-08	
		Quantity	Value	Quantity	Value
India		510623	161803160	501485	156929980
Gujarat	Hindalco	290426	92732885	320929	101444589
	Jhagadia (Swil)	13918	5129825	6566	2164939
Jharkhand	Surda ICC	14266	4486257	16847	5378646
Rajasthan	KCC	24258	9151991	27896	8784686
Tamil Nadu	Sterlite	167755	50302202	129247	39157120

**Table – 14 : Prices of Copper, 2005-06 to 2007-08
(Domestic Markets)**

(In Rupees per quintal)

Grade	Market	2005-06	2006-07	2007-08(p)
Wire scrap	Mumbai	25957	32391	34895
Utensil scrap	Mumbai	23762	30064	32921
Wire rod	Mumbai	25881	32209	39442
Wire bar	Mumbai	28110	34736	39442
Cathode	Mumbai	26690	29418	39479
Birch	Mumbai	24114	31950	NQ
Redberry	Mumbai	23400	31859	NQ
Wire scrap	Delhi	26067	31709	34900
Wire rod	Delhi	24538	NQ	NQ
Wire bar	Delhi	26738	33195	37400
Wire	Delhi	24262	31636	33374
Mixed scrap	Delhi	23533	29200	32411

Source : Minerals and Metals Review.



MINING & MILLING

HCL, a Central Government undertaking, has integrated operations starting from detailed exploration of mineral deposit to the development of the mines, mining, smelting, refining of copper and also recovery of by-products. It operates the Indian Copper Complex (ICC) in the Eastern Sector in Jharkhand, the Khetri Copper Complex (KCC) in the Western Sector in Rajasthan and Malanjkhand Copper Project (MCP) at Malanjkhand in Balaghat district, Madhya Pradesh in the Central Sector. Bhotang and Pachey-Khani mines in Sikkim are operated by SMC. Copper ore is being treated by froth flotation process to produce more than 16% copper in concentrate. The concentrate is then smelted by flash-smelting technique of Outokumpu of Finland at Khetri to produce 99.9% copper.

Hindustan Copper Ltd

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 18 to 20 m and a crown level is developed 9 m below upper main level. Width of the stope across the ore body is governed by its thickness. Stope drilling is done by 57 mm dia.

drifter machine. A slot raise is prepared within the stope limit connecting crown level to extraction level. Slot raise is then widened to full width of the stope. Stope rings are blasted using the free face of the slot. When blasting of stope rings is completed, stope pillar rings are blasted. After completion of the stope and pillar rings, rib and crown pillars are blasted at a time. After recovery of rib pillar and crown pillar ore, the sill pillar is blasted from hanging wall to foot wall.

Another mining method 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 is done by BBC120F drifter machine. Sequence of blasting remains the same as in the sub-level open stoping method.

HCL has a total of 3.2 million tpy ore capacity, 1.2 million tpy at KCC and 2.0 million tpy at MCP. HCL has a total milling capacity of 5.57 million tpy copper ore for producing concentrates. The company operates concentrator plants in Rajasthan, Jharkhand and Madhya Pradesh with 2.02 million tpy, 2.00 million tpy and 1.55 million tpy capacity, respectively.

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

KCC has four projects under the complex at Khetri, Kolihan and Chandmari in Jhunjhunu district and Dariba in Alwar district, all commissioned between 1973 and 1975 of which presently the former two are in operation. Chandmari copper project is not in operation since 2002. KCC has also a concentrator plant having a capacity of 2.02 million tonnes per year at Khetri in Jhunjhunu district, Rajasthan. It has facilities to recover gold, silver, nickel and sulphuric acid. However, HCL has planned to suspend operation at Precious Metal Recovery (PMR) plant, as export of anode slimes containing gold and silver directly is found economically advantageous. HCL is considering opening a new copper mine at Banwas in Rajasthan through contract mining with foreign partners.

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

ICC has Mosabani Project under this complex in East Singhbhum district, Jharkhand. Application for surrender of Rakha mining lease of ICC has also been submitted to Government of Jharkhand. All the mines under Mosabani mining lease have been closed and allowed to lapse from 15.6.2004 by not renewing the leases except for Surda mine (388.68 hectares) which was proposed to run through workers co-operative in terms of decision taken in Tripartite meeting with Ministry of Labour and Ministry of Mines, Government of India. The proposal was submitted to Government of Jharkhand on 5.6.2004.

India Resources Limited of Monarch Gold Company Ltd, Australia through its alliance with Hindustan Copper Ltd. (HCL) has undertaken the mine development of Surda Copper Mine and Mosabani Concentrator Plant introducing modern mining and processing equipment. The mine has started production of copper ore and concentrates from January 2008. Mining is currently underway in eight stopes with the ramp-up of production to an initial target of 450,000 tpy at a forecast average grade of 1% Cu. The Company's plan is to achieve stable annualised mine production of 450,000 tonnes and possibly to increase to a longer term target of 900,000 tonnes per annum via decline development. Copper concentrates production has also started at Mosabani Concentrator Plant from January 2008. All copper concentrate produced at Surda is sold to HCL with the concentrate delivered to the near by Maubhandar Works, part of ICC. The current production is limited only by existing shaft hoisting capacity and meets only 47% of the concentrator capacity.

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

MCP has the largest hard rock open-pit mechanised mine in the country at Malanjkhand, Balaghat district, Madhya Pradesh, having an

annual capacity to produce 2 million tonnes ore with a matching concentrator plant. It is the single largest copper deposit in the country contributing 80% to the HCL's total copper ore production. Prominent deposits in MCP are Malanjkhand, Shitalpani, Gidhri Dhorli, Jatta and Garhi Dongri. The concentrates produced by this plant are sent to KCC and ICC for smelting. It was proposed to increase the mine output from 2 to 2.3 million tonnes ore per year. HCL has applied to Government of Madhya Pradesh for development of underground mining at Malanjkhand.

Sikkim Mining Corporation

SMC produces multimetal ore, viz, copper-lead-zinc and concentrates. The Bhotang mine has ore production capacity of 100 tpd and Pachey-Khani mine 20 tpd. Copper concentrates are sold to the HCL, Maubhandar and zinc concentrates to HZL, Visakhapatnam. Lead concentrate is not saleable at present due to high bismuth content (0.6 to 0.7%). The lead concentrate also contains appreciable silver value.

INDUSTRY

HCL, a public sector company, was the only producer of primary refined copper till 1997. The installed capacity for refined copper production at its two integrated smelters was around 47,500 tpy. The other two producers of primary copper from imported concentrates now are M/s Hindalco Industries Ltd and Sterlite Industries of Vedanta Group, having annual capacities of 500,000 tonnes and 400,000 tonnes of refined copper, respectively. The 50,000 tpy capacity smelter of Jhagadia Copper Ltd (formerly SWIL Ltd) has become operational. The total installed capacity is thus 997,500 tpy. Besides, continuous cast wire rod plants are operated by HCL, Sterlite and Hindalco. In addition, M/s TDT and M/s Finolex also have continuous cast wire rod plants based on imported copper. Details regarding smelter capacity and production of copper cathode are given in Table - 15.

COPPER

Table – 15 : Capacity and Production of Copper Smelters

(In '000 tonnes)

Smelter/Location	Annual Capacity	Production	
		2006-07	2007-08(p)
TOTAL	997.5	510.7	501.4
1. Hindustan Copper Ltd	47.5	38.6	44.7
i) Khetri Copper Complex, Dist. Jhunjhunu, Rajasthan.	31	24.3	27.9
ii) Indian Copper Complex, Ghatsila, Dist. East Singhbhum, Jharkhand.	16.5	14.3	16.8
2. Sterlite Industries (India) Ltd., Thoothukudi, Tamil Nadu.	400	167.8	129.2
3. Hindalco Industries Ltd, Dahej, Dist. Bharuch, Gujarat.	500	290.4	320.9
4. Jhagadia Copper Ltd, (Formerly SWIL Ltd), Dist. Bharuch, Gujarat	50	13.9	6.6

Hindustan Copper Ltd

Besides smelters and refineries at Khetri in Rajasthan and Ghatsila in Jharkhand, HCL has a plant producing continuous cast copper wire rods at Taloja in Maharashtra. The total installed smelting capacity of two smelters and refineries of HCL is about 47,500 tpy. HCL also produces by-products like gold, silver, sulphuric acid, nickel sulphate, selenium and tellurium in small quantities.

Khetri Copper Complex (KCC)

This smelter with a capacity of 31,000 tpy is located at Khetri in Jhunjhunu district, Rajasthan. HCL has taken up technological upgradation and debottlenecking scheme of KCC smelter and refinery leading to enhancement of the capacity

from 31,000 to 45,000 tpy. The Government has given clearance to this proposal but due to continuous losses, HCL is not in a position to allot fund.

In addition, KCC has sulphuric acid and phosphatic fertilizer plants.

Indian Copper Complex (ICC)

A 16,500-tpy 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 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.

Taloja Copper Project

The plant with a capacity of 60,000 tpy continuous cast wire rods (CCWR) is located at Taloja in Maharashtra. It commenced commercial production in April 1991. The installed capacity can be increased to 80,000 tpy in future.

The status of private sector smelter plants is as follows :

Sterlite Industries (India) Ltd

The Sterlite Industries (India) Ltd. having an installed smelter capacity of 4,00,000 tpy copper anodes is located at Thoothukudi in coastal Tamil Nadu. It is based on 'Isasmelt' technology using imported concentrates. A new cathode refinery of 120,000 tpy and 90,000 tpy rod plant have also been built up at Thoothukudi for exports from nearby ports. The company has set up the copper refinery of 180,000 tpy copper cathodes capacity and 150,000 tpy rod mill at

Chinchpada, Silvassa in the Union Territory of Dadra & Nagar Haveli. Anode 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.

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 part of production of cathodes is used for production of continuous cast wire rods. In the process of extraction of copper metal, sulphuric acid, phosphoric acid, gold and silver were recovered as by-products. The entire requirement of copper concentrates was met through imports.

Jhagadia Copper Ltd (formerly SWIL Ltd)

SWIL Ltd. has been renamed Jhagadia Copper Ltd w.e.f. 5-1-2006 and its smelter has been installed at Jhagadia in Bharuch district of Gujarat. This scrap-based electrolytic smelter to make cathodes has a capacity of 50,000 tonnes per year and additional 20,000 tpy capacity for copper anodes. About 6,000 tonnes output are used by the company in its processing units producing wires, strips, etc., about 20,000 tonnes get exported and the remaining 24,000 tonnes are sold in domestic markets. The plant has been set up in technical collaboration with Boliden Contech AB of Sweden.

Metdist

This company was in the process of setting up a smelter with a capacity of 150,000 tpy copper cathodes at Rampara-Rajula in Amreli district, Gujarat, in technological collaboration with Mitsubishi, Japan.

CONSUMPTION & USES

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 compared with 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 heat sinks help remove heat from transistors and keep computer processors operating 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 (International Copper Study Group) 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. Reported end use consumption of copper during 2006-07 and 2007-08 was 232071 tonnes and 232428 tonnes respectively as against 213196 tonnes in 2005-06. The industrywise consumption of copper in 2007-08 was 80,855 tonnes (35%) in cable and winding wires, 50,724 tonnes (22%) in semis and alloys, 13,415 tonnes (6%) in electricals, 3,539 tonnes in auto ancillary and 9,194 tonnes in other industries. Consumption of copper scrap was 74,702 tonnes (Table - 16). The apparent consumption of copper is given in Table-17.

Apparent consumption in various industries have been computed on the basis of production of refined copper (cathodes), import and exports of refined copper, copper refined/copper worked, copper scrap and copper powder and flakes. The apparent consumption during 2006-07 was 225,253 tonnes which rose to 264,196 tonnes in 2007-08.

COPPER

Table – 16 : Reported Consumption of Copper, 2005-06 to 2007-08

(In tonnes)

End use	2005-06	2006-07	2007-08
Total	213176	232069	232429
Cable and winding wires	74392	78775	80855
Semis & alloys	42625	52715	50724
\Electricals	10908	13435	13415
Auto ancillary	5597	3731	3539
Others*	9334	9361	9194
Scrap	70320	74052	74702

* Include chemicals, coinage, defence, diecasting, railways, rolled products, etc.

**Table – 17: Apparent Consumption of Copper
(Based on Production of Refined Copper, Imports and Exports)**

(In tonnes)

Item	2006-07	2007-08
I) Total Production (Cathodes)	510,623	501485
II) Total Imports (including scrap, flakes & powder))	76,013	80,158
III) Total Exports (copper & scrap)	361,383	317,447
IV) Apparent Consumption	225,253	264196

SUBSTITUTES

Copper is vulnerable to substitute on price ground, technical superiority or weight. Aluminium substitutes for copper in various products, such as, electrical power cables, electrical equipment, automobile radiators and cooling/refrigeration tubing. Optical fiber substitutes copper in some telecommunication applications. Plastics also substitute copper in water pipe, plumbing, fixtures and many structural applications.

WORLD REVIEW

The copper prices continued to register steep rise owing to surge in demand and despite occurrences of spurts of precipitous decline in its stocks at LME. LME annual average copper price which was at US \$ 3,683.64 per tonne in 2005 rose to US \$ 6,730.60 per tonne in 2006 and further rose to US \$ 7,126.35 in 2007. Demand for copper is likely to rise at an increasingly fast

pace as China and other parts of Asia catch up with the western world.

The world reserve base of copper metal is assessed at 940 million tonnes. Chile has the largest share, accounting for 38% world reserve base, followed by USA & China (7% each), Peru (6%), Australia & Poland (5% each) and Mexico, Zambia & Indonesia (4% each) (Table-18).

The world mine production of contained copper rose to a level of 15.1 million tonnes in 2006 and 15.5 million tonnes in 2007 from 14.9 million tonnes in 2005. Chile continued to be the largest producer of copper in 2007 contributing about 36%, followed by USA & Peru (8% each), China & Australia (6% each) and Russia (4%) (Table-19).

WORLD PRICES

Annual Average Prices

Prices recorded at the London Metal Exchange (LME) during 2003 to 2007 are given in Table-20.

COPPER

**Table – 18 : World Resources of Copper
(By Principal Countries)**

(In '000 tonnes of copper content)

Country	Reserve base
World : Total	940000
Australia	43000
Canada	20000
Chile	360000
China	63000
Indonesia	38000
Kazakhstan	20000
Mexico	40000
Peru	60000
Poland	48000
Russia	30000
USA	70000
Zambia	35000
Other countries	110000

Source : Mineral Commodity Summaries, 2008.

**Table - 19 : World Mine Production of Copper
(By Principal Countries)**

(In '000 tonnes of metal content)

Country	2005	2006	2007
World : Total	14900	15100	15500
Australia	935	878	871
Canada	595	603	589
Chile	5321	5361	5557
China	776	889	946
Indonesia	1064	818	797
Kazakhstan	402	446	407
Mexico	429	334	338
Peru	1010	1048	1190
Poland	512	497	452
Russia	640	675	690
USA	1140	1220	1188
Zambia	465	516	523
Other countries	1611	1815	1952

Source : World Mineral Production, 2003-2007.

**Table – 20 : London Metal Exchange Prices of
Copper, 2003 to 2007**

(In US \$ per tonne)

Year	Average
2003	1779.87
2004	2868.34
2005	3683.64
2006	6730.60
2007	7126.35

Source : World Metal Statistics

Australia

In 2006, there were two copper projects under implementation/commitment - at Mount Isa (Queensland) and Browns Oxide project (Northern Territory). There were 12 other projects under feasibility studies in Queensland, New South Wales, South Australia and Western Australia. Oxiana Ltd's pre-feasibility study indicated that the Prominent Hill mine was to be developed as an open pit mine with 8 million tpy capacity. Commencing in 2008 and producing at the rate of 90,000 - 100,000 tpy of copper, as per the pre-feasibility report, it will have an initial mine life of nine years,

Brazil

In addition to Sossego copper mine which is in operation, CVRD Group has four other copper projects at various stages of development. Feasibility studies were concluded for the 118 Project (64 million tonnes at 0.95% Cu). The anticipated start-up date was 2007. The other projects, namely Salobo, Cristalino and Alemao are in pre-feasibility stage.

Canada

Aur Resources Inc was to develop the Duck Pond copper-zinc deposit on a fast-track basis and production was to begin in late 2006 with 18,600 tpy of copper contained in concentrates. The average annual output from the Voisey's Bay mine during the first phase is approximately 38,550 tpy of copper. Teck Cominco Ltd was to

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extend the mine life at the Highland Valley copper mine by five years by pushing back the pit wall of the mine and releasing additional ore.

China

China was to add 2.05 million tonnes of capacity reaching 3.7 million tpy refined copper by 2007. Jiangxi Copper now has a capacity of 400,000 tpy, ranking it among the top ten producers of the world.

Indonesia

PT Freeport Indonesia (PTFI) and PT Newmont Nusa Tenggara (PTNNT) account for around 88% of Indonesia's copper production. PTNNT operates a world-class Batu Hijau copper/gold mine on the island of Sumbawa.

Iran

At NICICo's (National Iranian Copper Industries Co.) world-class Sungun porphyry copper deposit near Ahar town in north western Iran, an open-pit mine and a concentrator with 150,000 tpy capacity of copper concentrate was commissioned in mid-2006. There are eight expansion projects related to copper concentrates/metals, etc. being undertaken by NICICo.

Thailand

Puthep Co. Ltd, a joint venture with Pan Australian Resources NL, has plans to develop two copper deposits in Loei Province in northeast Thailand. A prefeasibility study completed by Pan Australian in 1999 and updated since then indicates that Puthep has the potential to become a viable heap-leach and solvent extraction electrowinning (SX-EW) copper mine, with the potential to produce over 25,000 tpy of copper cathode.

Zambia

Mining at Konkola underground mine was affected by poor ground conditions and lack of developed reserves and at the Chingola underground mine by lower grades. Vedanta Resources plc has earmarked US \$ 400 million for the development of Konkola Deep Mining Project

(KDMP). KDMP has the capacity to increase total mine ore production at Konkola from current levels of 1.5 million tpy to a maximum of around 6 million tpy. A modern copper smelter with 300,000 tpy capacity after expansion is presently under construction at Nchanga mine. The smelter will cater to the additional output from KDMP and other new mines in the country. Mopani Copper Mines plc (MCM), First Quantum Minerals Ltd (FQM), Chibuluma Mines plc, NFC Africa Mining and Equinox Minerals Ltd are the other companies which were engaged in various developmental activities in copper sector of Zambia.

FOREIGN TRADE

Exports

Export of copper ores and concentrates decreased drastically to 565 tonnes in 2007-08 as against 44,645 tonnes in 2006-07. Export were mainly to China Germany and Bangladesh. Export of copper and alloys (incl. brass & bronze) was at 4,15,618 tonnes in 2007-08 as against 4,50,212 tonnes in 2006-07. Out of the total exports of copper & alloys in 2007-08, which were 3,74,822 tonnes, brass & bronze constituted 39,548 tonnes, copper (scrap) 443 tonnes and brass & bronze (scrap) were 805 tonnes. Exports were mainly to China (19%), Saudi Arabia (14%), UAE (12%), Malaysia (10%), Thailand (6%) and Oman (5%), (Tables - 21 to 27).

Imports

During the year 2007-08, imports of copper ores and concentrates was slightly less at 19,14,178 tonnes as against 27,07,369 tonnes in 2006-07. Chile with a share of 40% was the leading supplier followed by Australia (25%), Indonesia (6%) and Brazil & Iran (5% each). Imports of copper and alloys (incl. brass & bronze) increased to 2,27,322 tonnes in 2007-08 from 1,93,130 tonnes in 2006-07. Out of total imports in 2007-08, copper & alloys comprised 1,07,782 tonnes, copper (scrap) 24,252 tonnes, copper alloys (scrap) 19 tonnes, brass & bronze 19,060 tonnes and brass & bronze (scrap) 76,209 tonnes. Imports were mainly to UK (9%), Germany & UAE (8% each), Russia (7%), China (6%) and Saudi Arabia (5%) (Tables - 28 to 36).

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**Table – 21 : Exports of Copper Ores & Conc.
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	44645	107149	565	16912
China	-	-	368	14917
Germany	-	-	110	1420
Bangladesh	-	-	80	524
Zambia	-	-	7	47
UK	++	++	++	2
Bahrain	50	276	-	-
Belgium	26000	57404	-	-
Japan	18200	48367	-	-
UAE	55	116	-	-
USA	340	986	-	-
Other countries	-	-	++	2

**Table – 22 : Exports of Copper & Alloys
(Including Brass & Bronze) : Total
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	450212	137613388	415618	117438156
Saudi Arabia	76049	23553821	56968	17721815
China	76050	24114928	78319	16181966
UAE	55375	17007640	49417	14938502
Malaysia	21430	6794941	40476	12090175
Thailand	20183	5894020	26652	8114716
Oman	24537	7419861	21614	6712762
Chinese Taipei/ Taiwan	27941	8217003	20313	6169820
Singapore	25228	8498472	19430	5971257
Hong Kong	15255	4749702	11871	3581648
USA	13564	3278487	9267	2428454
Other countries	94600	28084513	81291	23577041

**Table – 23 : Exports of Copper & Alloys
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	393695	123165668	374822	106719803
Saudi Arabia	74780	23216505	55858	17396540
China	72652	23371429	76216	15686262
UAE	50487	15865595	46483	14179376
Malaysia	20179	6443363	39416	11798742
Thailand	17547	5439573	25877	7918551
Oman	24387	7390211	21481	6676834
Singapore	24598	8307598	19140	5884733
Chinese Taipei/ Taiwan	25043	7497384	18281	5668388
Hong Kong	10327	3347579	9893	3017095
Indonesia	8482	2864983	8565	2621063
Other countries	65213	19421448	53612	15872219

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

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	363	84554	443	130690
Spain	-	-	124	41373
China	71	18621	79	24534
Portugal	51	17545	60	18976
UAE	41	3204	68	12542
Korea, Rep. of	17	2033	19	9953
Belgium	-	-	20	8631
USA	8	1264	35	7477
Canada	3	2022	2	371
Germany	7	1897	1	303
Sweden	146	35043	-	-
Other countries	19	2925	35	6530

**Table – 25 : Exports of Brass & Bronze
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	52361	13605797	39548	10407066
USA	8484	1908178	5566	1386918
UAE	3371	840186	2824	736621
Germany	2166	588380	2316	719577
UK	2661	791437	2201	648038
Hong Kong	4920	1401350	1978	564553
Chinese Taipei/ Taiwan	2878	714595	2032	501432
China	2321	532865	1713	409399
Italy	1724	544872	1333	397217
Australia	1471	426084	1060	285398
France	1576	456950	949	273810
Other countries	20789	5400900	17576	4484103

**Table – 26 : Exports of Brass & Bronze (Scrap)
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	3793	757369	805	180555
China	1006	192013	311	61771
Germany	204	41020	81	22060
Sweden	50	9903	62	21530
Italy	-	-	98	20610
Netherlands	775	156052	72	15947
Philippines	-	-	36	11586
UAE	1476	298655	42	9963
Belgium	100	21070	25	5615
UK	30	6414	1	163
Korea, Rep. of	94	18680	-	-
Other countries	58	13562	77	11310

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**Table – 27 : Exports of Copper
(Cement Copper Precipitated)
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	10	1190	18	3784
USA	10	1190	18	3784

**Table – 28 : Imports of Copper Ores & Conc.
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	2707369	238407046	1914178	161774736
Chile	940501	82408954	774494	67481453
Australia	562767	42005045	477708	34802392
Indonesia	395526	40189094	115179	12436620
Brazil	116400	11075378	101738	9000635
Iran	34338	2937367	91205	7149118
Papua New Guinea	128106	11831661	59484	6068302
Peru	54684	4395441	57761	4927994
Canada	43809	5598985	42211	4114534
Argentina	66893	5849010	41048	3882425
Unspecified	93531	9073889	-	-
Other countries	270814	23042222	153350	11911263

**Table – 29 : Imports of Copper & Alloys
(Including Brass & Bronze) : Total
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	193130	501089321	227322	60908805
Russia	9474	3003445	15987	5058328
Germany	12200	3444295	18535	4893448
UAE	28703	6115286	17886	4426164
China	10683	3462271	13021	4262445
UK	19225	4118564	19857	4013135
Malaysia	8384	2329618	9284	2728672
Bhutan	9105	2624038	8500	2561007
Saudi Arabia	7275	1435094	12477	2465329
USA	9703	2138181	9382	2368017
Sri Lanka	11171	3968353	4474	1222345
Other countries	67207	468450176	97919	26909915

**Table – 30 : Imports of Copper & Alloys
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	77647	26449920	107782	35173017
Russia	9322	2964703	15713	4985138
China	8921	3039951	10822	3637788
Bulgaria	-	-	10009	3026741
Bhutan	9105	2624038	8500	2561007
Australia	1724	587148	6710	2163855
Germany	3085	1286442	4932	1899805
Malaysia	4399	1493369	5519	1775242
Thailand	2888	1151579	3845	1400204
Korea, Rep. of	4043	1426446	3627	1202559
Sri Lanka	9577	3553096	3790	1058663
Other countries	24583	8323148	34315	11462015

**Table – 31 : Imports of Copper (Scrap)
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	31204	6672834	24252	6219185
UAE	8435	2177666	8353	2421048
Saudi Arabia	4283	923228	2743	756003
Malaysia	2900	618511	2135	545631
UK	2143	360720	1618	405203
Bahrain	645	185388	755	208392
USA	844	162026	760	180048
Singapore	1121	238241	744	175706
Kuwait	1167	232503	497	150448
Germany	887	179316	1232	136296
Sri Lanka	1126	293582	319	90369
Other countries	7653	1301653	5096	1150041

**Table – 32 : Imports of Copper Alloys & Scrap
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	36	6718	19	533
France	16	3130	-	-
Korea, Rep. of	-	-	19	533
Malaysia	20	3588	-	-

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**Table – 33 : Imports of Brass & Bronze
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	11539	3563684	19060	5797611
Germany	4488	1303628	5155	1535471
Nepal	686	130469	2256	714295
China	1274	400353	1843	598965
Australia	38	13943	1950	598816
Japan	758	321068	1137	418620
Malaysia	427	131075	905	285437
UAE	263	50692	1314	278896
USA	443	139227	721	199507
Chinese Taipei/Taiwan	397	125410	566	157910
Switzerland	317	132486	328	134732
Other countries	2448	815333	2885	874962

**Table – 34 : Imports of Brass & Bronze (Scrap)
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	72704	13415776	76209	13718459
UK	15702	3249302	16729	3058064
Saudi Arabia	2992	511287	9569	1641201
Germany	3740	674909	7216	1321876
UAE	19396	3685489	6569	1212561
USA	6367	1024751	5805	1072541
Sweden	1048	208365	2373	419383
Canada	1029	202585	2871	417278
Belgium	1627	282940	1637	307157
Romania	1415	278777	1356	254357
Unspecified	1642	310297	1522	304525
Other countries	17746	2987074	20562	3709516

**Table – 35 : Imports of Copper (Cement Copper Precipitated)
(By Countries)**

Country	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Countries	105	7305	150	22220
Singapore	20	1212	63	9495
Zaire Rep/Congo Democratic Republic	-	-	18	4903
Malaysia	85	6093	46	3384
Unspecified	-	-	23	4438

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**Table – 36 : Imports of Copper & alloys (Excluding Brass & Bronze and scrap)
(By Items)**

Item	2006-07		2007-08	
	Qty (t)	Value (Rs. '000)	Qty (t)	Value (Rs. '000)
All Items	77647	26449920	107782	35173017
Blister & other unrefined copper	3656	915350	5786	1485424
Copper & alloys: worked (bars, rods, plates, e tc.)	20150	7409206	38312	13109147
Copper & alloys: worked, NES	6069	2771794	3705	1839357
Copper & alloys: unwrought	1740	568465	1540	504051
Copper mattes	65	19648	11	1203
Copper powder & flakes	340	177080	885	288325
Copper refined: copper worked	31675	10038669	39216	12530457
Electroplated anode of nickel	1074	351727	2452	654680
Master alloys of copper	84	45490	70	53134
Refined copper	12794	4152491	15805	4707239

FUTURE OUTLOOK

With the liberalised policies of the Government, the Indian copper sector has registered a quantum rise in production. The present installed capacity of refined copper has reached at around ten lakh tonnes per year. India's position has shifted from being a net importer of copper to a net exporter. The main demand for refined copper is in the electrical and electronic sectors, construction sector, consumer durables and transport sector. As the per capita consumption of copper in the country is low at about 0.3 kg compared to the usage of 10 kg copper

in developed countries, there are certain potential upcoming areas like infrastructure development and railways, power sector, especially rural electrification and information technology sector which may boost the internal demand for copper. At the same time, potential export markets for refined copper in the Middle-East and South-East Asian countries may be fully tapped.

As per XI Five Year Plan, Planning Commission of India, domestic demand of copper is expected to grow at about 6% per annum while production of copper is expected to increase by 15.1% per annum on account of new capacities being added by private players.