

2011

COMMODITY RESEARCH REPORT



COPPER FUNDAMENTAL ANALYSIS

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Copper Outlook

Copper is one of the world's most widely used industrial metals and been in existence and used by the people 10000 years ago. Copper is one of the commodities that is more sensitive to the economic growth because of its broad usage spread all over the place from the living rooms to the huge industrial units.

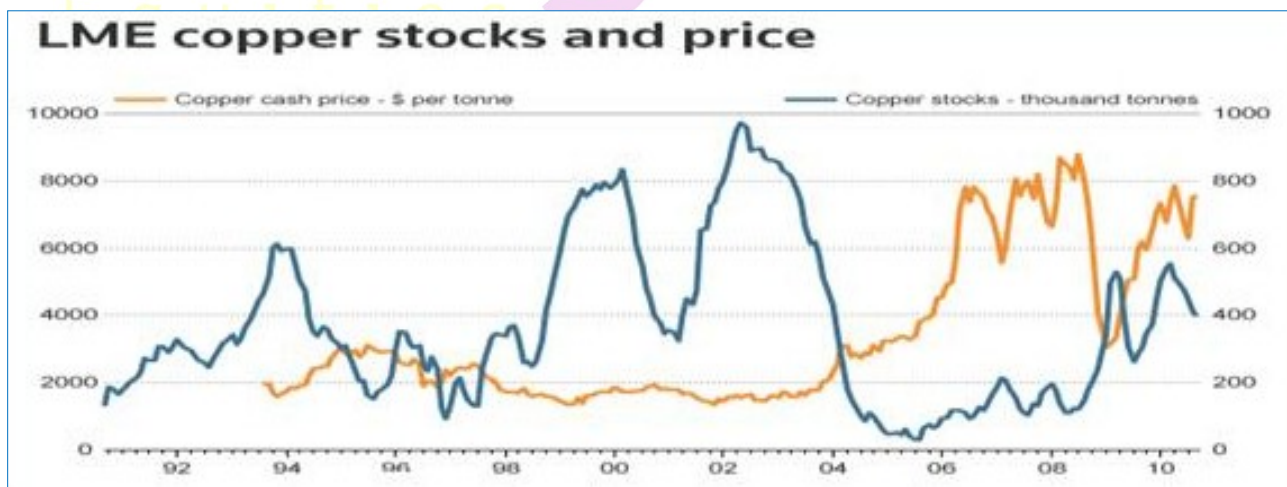
Copper ended the year 2010 with a decent gains making it one of the best performing among the base metals space. Performance of copper has been incredible in last two years. Copper has given whopping 190% absolute returns in the past two years and the demand from United States and Europe accelerated as the data indicates the recovery mode in the West, while surging high growth in emerging countries like China in East would boost the demand for the copper in the forthcoming years.



Factors affecting the copper prices

1. Events such as labour strikes, shipping problems, political unrest and disruptions in mining places will have a major effect on copper prices. Especially when these events occur in major copper producing countries like Chile and Peru, the effects will be vulnerable. In 2010, Collahuasi the third largest copper producing mine was facing a issue regarding wage dispute with the workers and strike lasted for 30 days. Strike started in the end of October and the copper price was at \$8190 a tonne and during the course of strike, the prices increased and on November 11th it touched \$8966. The impact of supply disruptions in large copper producing mines has severe impact on prices such as above case.
2. Natural calamities such as earthquakes and floods will affect the production in mines and transportation will be a constrain which will lead to supply issue. Recent earthquake in March 2010 at Chile effected the production of copper, which caused the prices to climb.
3. Demand for the industrial metal is also another important factor for the rise in copper prices. In 2002, there were huge inventory stockpiles in LME and Shangai exchanges. The demand was not much during that period and so prices fell to a large extent.
4. Inventory is an important factor which decides the price movement of the copper. Inventories and prices have an inverse relationship. If the inventories decline in LME warehouse, prices started to climb as the consumption is increasing and vice versa. In 2010, inventories have been falling throughout the year and the prices started to climb.
5. Low quality of ore is another problem faced by the miners and they are finding difficult to reach their production targets. Quality of ores has fallen by 26% in last two decades.
6. Economic data from China and US has major impacts on the copper prices. ISM Manufacturing PMI, Retail & Business sales, Building permits, new home sales are few important data released in US will have much impact on prices. China's PMI, Industrial production, Import and Export, GDP and inflation figures are the major ones which will affect the prices.
7. Project finance, the high interest rates may reduce the supply significantly and US dollar fluctuation is another major issue. Euro currency has an significant effect on copper prices as Euro's weightage in dollar index is high and so it has very high impact.

INVERSE RELATION BETWEEN COPPER STOCKS AND PRICE

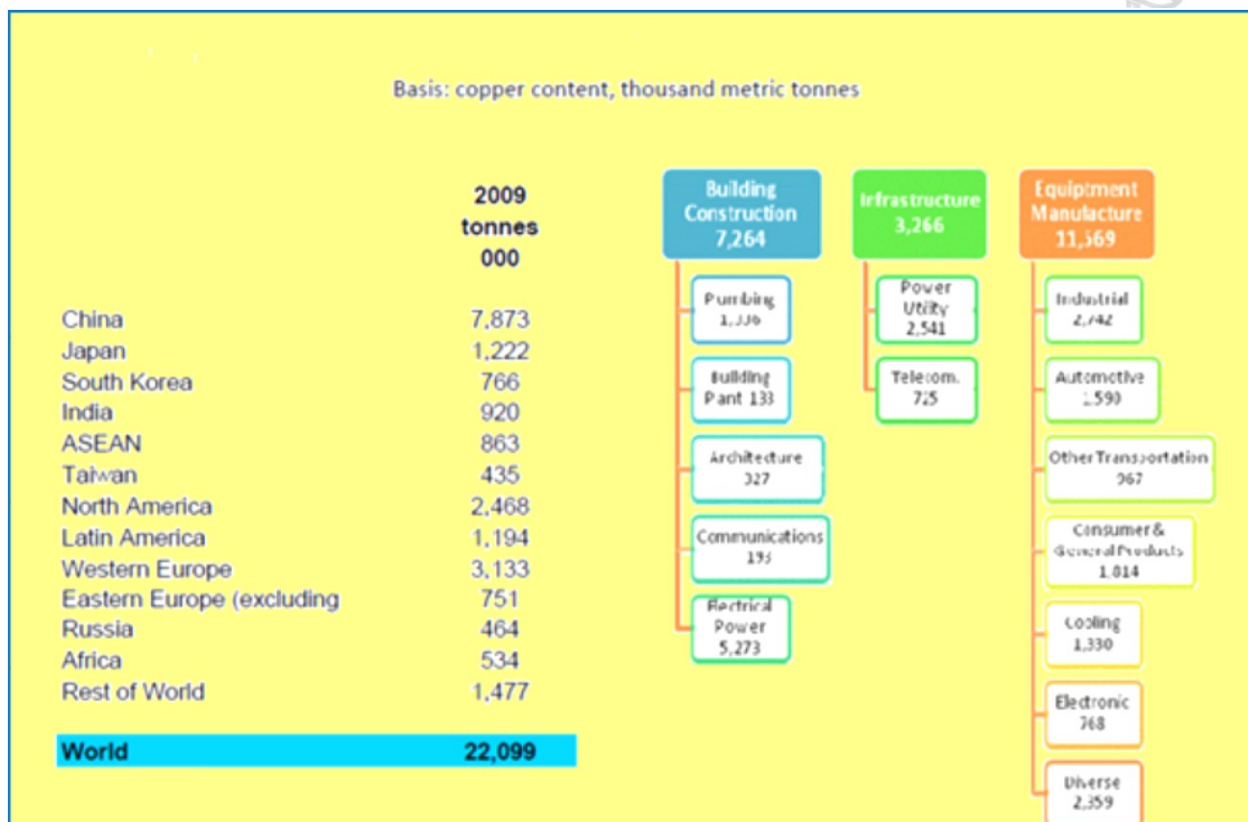


Source: Reuters

Major Uses of Copper

- Copper is a metal which is ductile and a very good thermal and electrical conductor, it is used in number of fields like Architecture, Automotive, Electrical, building wire, energy efficient, tube, pipe & fittings, Fuel & gas, Industrial machines & products, telecommunications.
- Residential construction is about two thirds of the building construction market. An average single family home uses 440 pounds of copper. Copper is the material of choice for plumbing, taps, valves and fittings in homes. Electrical uses of copper, includes power transmission and generation, building wiring, telecommunication, and electrical and electronic products.
- Today, the average mid-size automobile contains about 22.5 kg (50 lbs) of copper, while luxury cars on average contain around 1,500 copper wires totaling about 1.6 km (1 mile) in length. Copper is also used extensively in new generation airplanes and trains. New high-speed trains can use anywhere from 2 to 4 tonnes of copper, significantly higher than the 1 to 2 tonnes used in traditional electric trains.

MAJOR USES OF COPPER: USAGE BY END –USE SECTOR AND REGION, 2009



Source: International Copper Association

Copper production:

Copper is produced in many countries and not a rare metal. Copper supply is made up of from two sources, the majority 88% comes from primary production, the new copper that is mined from the ground and remaining 12% is secondary supply. Secondary supply comes from recycling copper scrap.

Primary supply involves mining copper ores, which generally come in two forms, copper sulphides or copper oxides. Depending on the type of ore mined, the ore is processed by one of two methods. Copper sulphide ore is first concentrated then smelted and then refined; each of these stages is a separate process and can be carried out at a different location. Copper oxide ore is crushed and the copper is then extracted from the crushed ore by dissolving the copper in acid and then collecting the copper from the acid via electrolysis. This process is called Solvent extraction-electro winning, SXEW for short. SXEW accounts for some 15% of primary copper production.

Each stage of copper production is tradable, for example a copper mine may mine the ore and produce copper concentrate which it then sells on to a custom smelter, the smelter may then produce blister copper which is copper ingot of about 98% purity. However most of today's technologies require virtually pure copper, or copper of 99.95% purity. As a result, smelted copper needs to be refined. Copper scrap generally enters the copper production process just before the refining stage.

With such a large and diverse market it is a surprise element that copper's fundamentals are continuously changing and so does the price. The copper prices changes constantly as the market attempts to balance supply and demand at any given time. These price fluctuations generate risk and opportunity to different participants in the market and the metal exchanges around the world provide the means for all those involved with the market to either hedge their risk or take on risk as an investor/speculator.



Copper mine in Chile



Copper statistics 2010

Fundamental Outlook

Global Scenario

In the current scenario, the primary factor that influences the prices of the copper is the demand supply equation. Inventories of copper in warehouses of LME have shrunk by 25% in 2010, and in Shanghai Futures exchanges inventories fell around 30% in 2010. Inventories are now around 379250.00 tonnes, down by around one third since April and the largest decline in inventories since 2004.

In 2011 there is going to be a shortage of 400000 tonnes of copper, as economic activity is expected to increase the demand faster than the growth of the refined production.

In 2010, the mine production was at 16.2 Million metric tons, 2% increase from the previous year. Capacity utilization rates are expected to remain unchanged at 81%, though the expectation is that in 2011 mine production will increase about 800000 tonnes. There are few major obstacles such as production disruptions from project delays, technical problems and labour and political unrest.

Overall in 2011, refined usage is expected to increase in the all major world markets, with global demand is expected to increase by 4.5%. Industrial demand for china, the major consumer of copper is expected to grow by 6% in 2011.

FORECAST TO 2011									
REGIONS (1000 t)	MINE PRODUCTION			REFINED PRODUCTION			REFINED USAGE		
	2009	2010	2011	2009	2010	2011	2009	2010	2011
Africa	1,185	1,308	1,529	672	919	1,152	306	313	344
N.America	1,933	1,883	2,142	1,758	1,691	1,827	2,048	2,143	2,228
Latin America	7,034	7,196	7,528	3,935	3,972	4,109	502	593	611
Asean-10	1,179	1,055	844	544	536	593	687	730	760
Asia ex Asean/CIS	1,504	1,629	1,715	7,044	7,578	7,997	10,540	10,744	11,300
Asia-CIS	519	517	539	450	456	512	105	111	114
EU-27	729	783	809	2,510	2,680	2,763	3,096	3,299	3,394
Europe Others	774	806	855	995	1,038	1,070	775	813	839
Oceania	1,021	1,057	1,115	445	409	475	130	135	139
TOTAL	15,877	16,235	17,076	18,356	19,278	20,498	18,189	18,882	19,729
Adjustment for Primary Feed Shortage 1/						-334			
Allowance for Disruptions 2/					-197	-870			
World	15,877	16,235	17,076	18,356	19,081	19,293	18,189	18,882	19,729
% change	2.19%	2.26%	5.18%	0.86%	3.95%	1.11%	0.74%	3.81%	4.49%
Refined Production - Usage Balance							167	200	-435

1/ Based on a formula for the difference between the projected copper availability in concentrates and the projected use in primary refined production; 2/ Based on supply deviations over the previous 5 years.

Source: [International Copper study Group](#)

Copper’s Exchange Traded Fund

Copper is the industrial metal adding up to the list of Gold and silver where the investment demand is in surge for the metal. As a result the year 2010 saw major players entering into the copper ETF’s such as JP Morgan and Black rock. JP Morgan has filed with SEC and going to launch the physically backed ETF, with maximum holdings of 61800 tonnes of metal stored in bank’s Henry Bath warehouses. Black rock plans to issue up to 12,120,000 shares and the metal will be stored in LME’s registered warehouses. Blackrock’s initial unit of the iShares Copper Trust Fund will consist of 2,500 shares called a basket, backed by 25 tonnes of copper. Physically backed copper exchange traded funds could draw about 300000 metric tonnes on account of success of these ETF’s. The shortage of copper is expected in 2011, considering only the industrial demand, but once the investment demand kicks in the gap between demand and supply will widen.

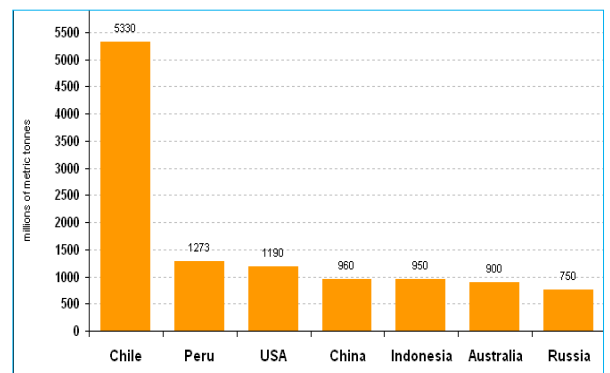
World copper production

Copper demand in all parts of the world is increasing and expected to increase in the forthcoming years. Global production of copper was 18356 (Kt) in 2009 and increased to 19278 (Kt) in 2010. The increase in production over year on year was 5% to 6% this year.

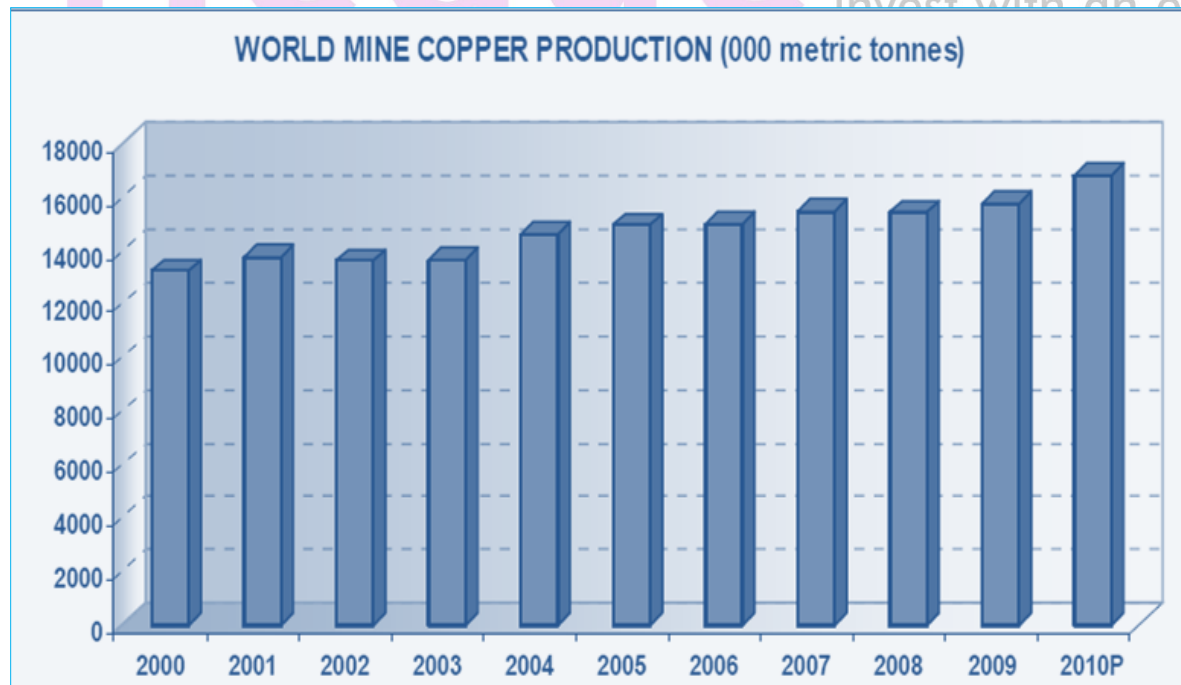
Copper Mine production

Though the copper mine production is increasing; they are unable to match with the demand arising for the metal. No major mines are coming on stream and the ones that would involve in mine production are in smaller range of 50 -200 ktpa. The copper mine production in Latin America has increased to 7 million tonnes last year from 750 thousand tonnes in 1960. Chile accounted for one third of world copper mine production in 2009 with mine output of nearly 5.4 million tonnes.

WORLD COPPER PRODUCTION BY COUNTRY, 2009

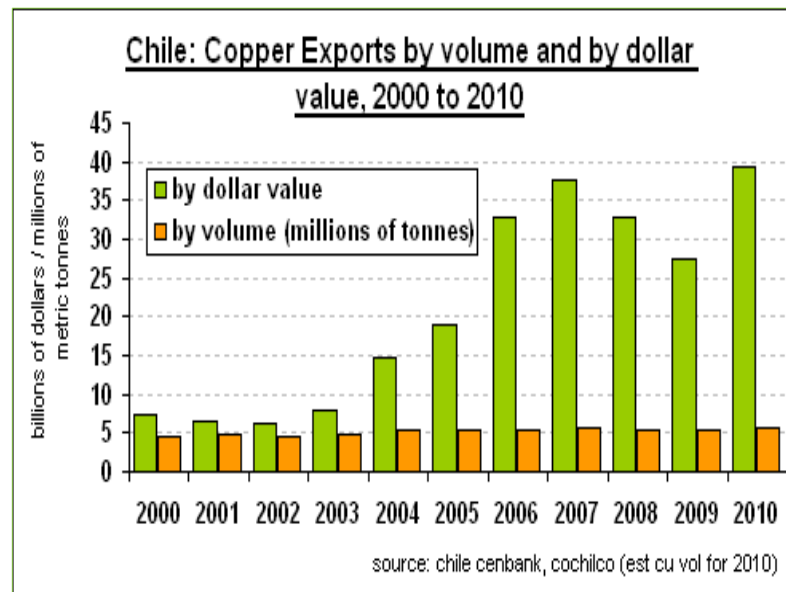


Source: Chile Central Bank



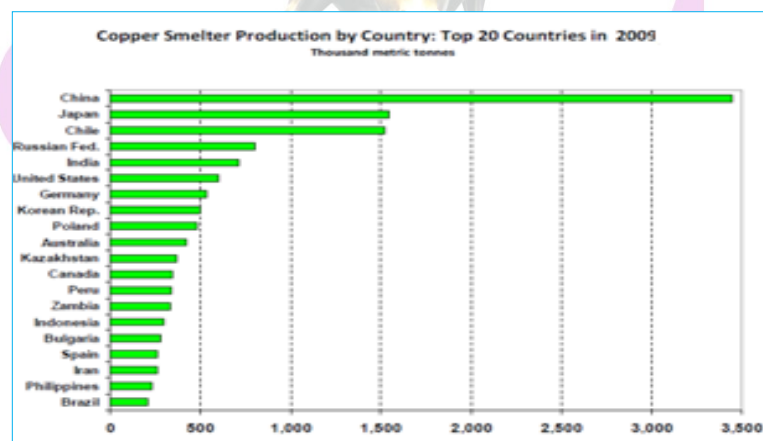
Chile copper production

Chile is the major producer of copper over decades. Chile has been producing nearly 28% of the world's total copper and any events occur here will have a major impact on prices of copper throughout the world. More than 56% of copper exports has been made by Chile in 2010 and more or less the volume has been the same over the years. The volume fluctuates between 4.6 m and 5.6 m metric tons of copper exported every year. Chile's copper exports value have increased by thirty three billion dollars in 2010 because of the rising world prices. Chile is the top producing country 53,30,000 metric tonnes approximately 27% of total copper output in 2009. Peru follows with 12,73,000 metric tonnes and USA produces 11,90,000 metric tonnes of the total output in 2009. In previous decade USA was in second position but later on the production declined and Peru captured the second spot. Other countries were more or less in the same position. Peru government is spending huge sum of money in mining exploration and we can see the country's production share increasing in the forthcoming years.



Copper smelter production

Smelting is the process used to produce copper metal. In 2009, world smelter production reached 14.5 million tonnes. Primary smelters use mine concentrates as their main source and secondary copper smelters use copper scrap as their main feed. Asia's share of world copper smelter output has increased from 27% in 1990 to over 52% in 2009 as smelter production in China expanded rapidly on demand. America's smelting production has decreased over the years to 3 million metric tonnes. In 2009, China accounted for 24% of the smelter output, followed by Japan, Chile and Russia.



Source : International Copper Study group

Copper smelters in China and Japan, the major smelters have increased the refining charges from the global mining companies for 2011. Pan pacific copper, one of the world's largest copper smelter has increased the refining charges to \$80 per metric ton and 8 cent per pound and it indicates 72% increase over 2010. Chinese production of refined copper was 4,793,000 tons in 2010, up 12% from 2009. Chinese smelter producers have also increased their capacity expansion from 5, 00,000 to 6, 00,000 tonnes in 2011 on note of higher demand this year. In 2011 major smelter refiners are charging high rates for mining companies on high demand expectations.

TOP 20 COPPER SMELTERS BY CAPACITY, 2010

Thousand Metric tonnes

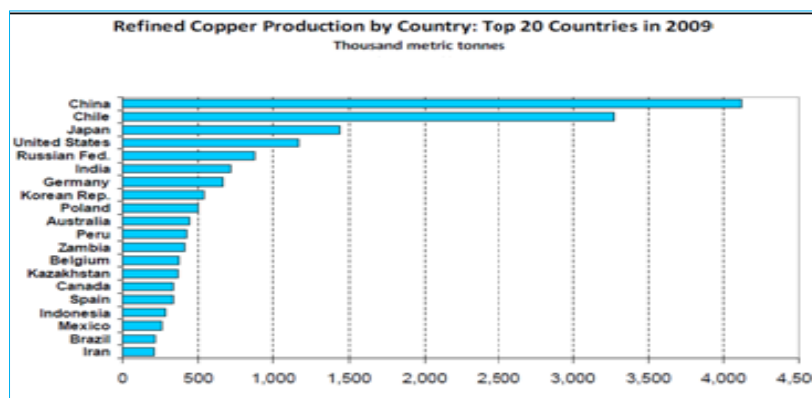
RANK	SMELTER	COUNTRY	CAPACITY	OWNERS
1	Guixi	China	900	Jiangxi Copper Corp.
2	Birla Copper	India	500	Birla Group
3	Codelco Norte	Chile	460	Codelco
4	Saganoseki/ Ooita	Japan	450	Pan Pacific Copper Co. Ltd
5	Hamburg	Germany	450	Aurubis
6	Besshi/ Ehime	Japan	450	Sumitomo Metal Mining Co. Ltd.
7	Norilsk	Russia	400	Norilsk G-M
8	Jinchuan	China	400	Jinchuan Non- Ferrous Metal Co.
9	El Teniente	Chile	400	Codelco Chile
10	Altonorte	Chile	390	Xstrata plc
11	Sterlite Smelter	India	380	Vedanta
12	Ilo Smelter	Peru	360	Southern Copper Corp
13	Yunnan	China	350	Yunnan Copper Industry Group (Local Government)
14	Onsan II	Korean Republic	340	LS-Nikko Co. (LS, Nippon Mining)
15	Onahama/ Fukushima	Japan	322	Mitsubishi Materials Corp.
16	Huelva	Spain	320	Atlantic Copper S.A. (Freeport McMoran)
17	Garfield	United States	320	Kennecott (Rio Tinto)
18	Naoshima/ Kagawa	Japan	306	Mitsubishi Materials Corp.
19	Mount Isa	Australia	300	Xstrata plc
20	La Caridad	Mexico	300	Mexicana de Cobre S. A. (Grupo Mexico)

Source : International Copper Study Group

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Refined Copper production

Refinery Production in 2009 increased to nearly 18.4 million tonnes, including 2.9 million tonnes of secondary refined Production. Copper extracted from mainly low grade oxide ores, through solvent extraction or sx-ew represents 18% of the total copper refined production. Refined copper produced from low grade ores has been on rise, increasing from 1% of the world refined copper production in 1960 to 18% of the world output in 2009. Region with the highest output of copper has changed from America in 1990 to Asia in 2009 around 8050 kt.



TOP 20 COPPER REFINERIES BY CAPACITY, 2010

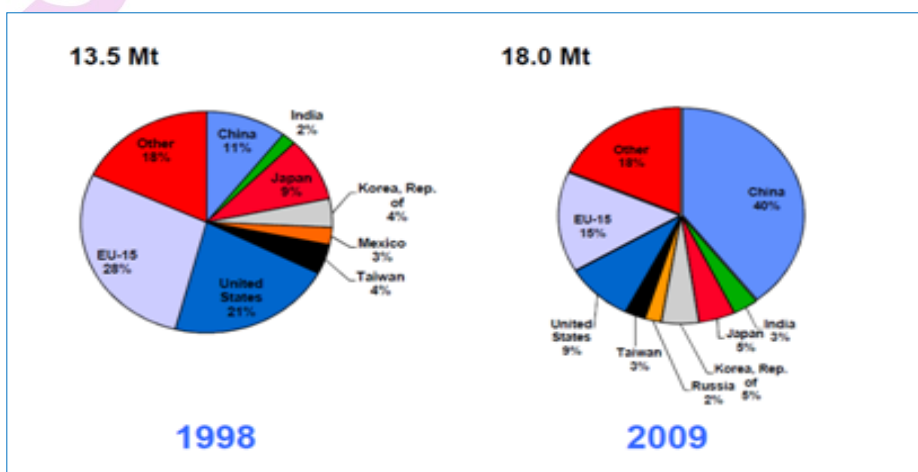
Thousand Metric tonnes

RANK	REFINERY	COUNTRY	CAPACITY	OWNERS
1	Guixi	China	900	Jiangxi Copper Corporation
2	Yunnan Copper	China	500	Yunnan Copper Industry Group
3	Birla	India	500	Birla Group Hidalgo
4	Chuquicamata Refinery	Chile	490	Codelco
5	Codelco Norte	Chile	470	Codelco
6	Toyo/Niihama	Japan	450	Sumitomo Metal Mining Co. Ltd.
7	Amarillo	United States	450	Grupo Mexico
8	El Paso	United States	415	Freeport-McMoRan Copper & Gold Inc.
9	Jinchuan	China	400	Jinchuan Non Ferrous Co.
10	Las Ventanas	Chile	400	Codelco
11	Hamburg	Germany	395	Aurubis
12	Sterlite	India	380	Vedanta
13	Pyshma	Russia	380	Uralelectromed
14	CCR Refinery	Canada	380	Xstrata plc
15	Ilo Copper	Peru	360	Southern Copper Corp.
16	Jinlong	China	350	Tongling NonFerrous Metal Corp.
17	Morenci	United States	350	Freeport-McMoRan Copper & Gold Inc./
18	Escondida	Chile	350	BHP Billiton, Rio Tinto Corp, Japan Escondida
19	Olen	Belgium	345	Aurubis
20	Onsan Refinery	Korean Republic	330	LS-Nikko Co.

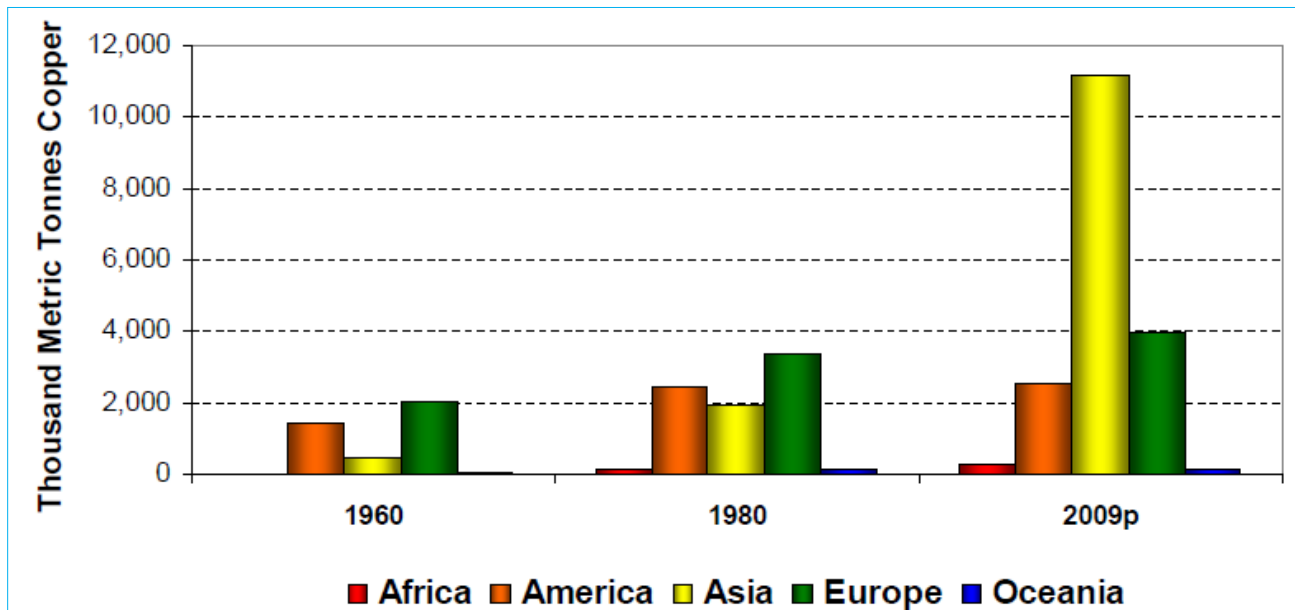
Source: International Copper study Group

World Copper consumption

Copper consumption has been increasing over the years, especially huge demand from China and other Asian markets. Copper consumption has been increasing yoy on continuous demand from all over the world as the developing countries are in need of more copper because of robust growth seen there. According to ICGS, The copper market for 2011 is expected to show a deficit of about 400000 tonnes as increased economic activity is expected to boost the demand in copper end use market.



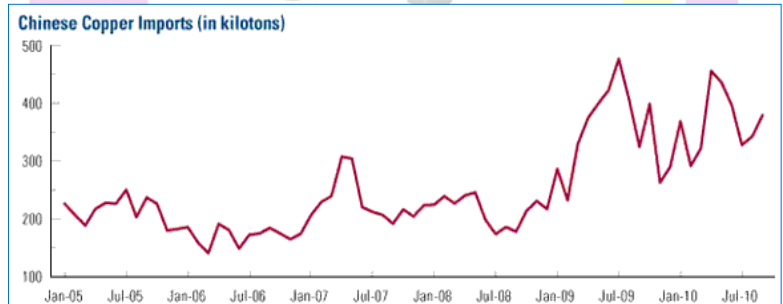
Source: Copper Development Association

REFINED COPPER USAGE BY REGION - 1960, 1980 & 2009

Source: [International Copper study Group](#)

China's Demand

China is almost to triple its annual use of copper to 20 million tons in 25 years, that's all more than the total copper produced today, according to CRU a London-based metals and mining consulting firm. Rising demand will create a potential global shortage of 11 million tons a year by 2035. Outlook for copper is mainly dependent on Chinese consumption as the country is growing at a rate of 9.9% between 1980 and 2010. IMF has predicted the Chinese economy to grow at an annual rate of 9.7% over the next five years.

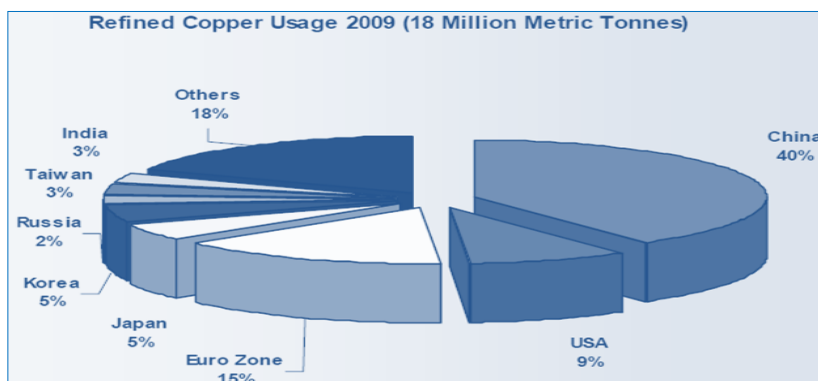


Source: [BMO capital markets](#)

Facts & Reasons:

- The number of kilograms of copper consumed per capita in China last year was 3.9, compared with 6.5 for the U.S. and 8.6 for Japan. As China is developing, consumption per person may rise to 5 kilograms by 2015.
- Chinese copper consumption has increased from 1.8 million tonnes in 2000 to 6.5 million tonnes in 2009, an average annual growth rate of 15%.
- In next five years, each of 1.3 billion Chinese consumers would use 12 pounds of copper annually. The total figure comes to 7.076 million tonnes per year, nearly total half of the total mine production for 2010.

- Government is spending huge sums of money on copper intensive power infrastructure in rural areas will continue through 2012.China’s government is insisting and promoting on electric cars, which are twice as copper intensive as normal vehicles.
- State Grid Corp. of China, the country's largest electricity distributor, will absorb one million tons of copper a year until 2015 and 6,00,000 tons of refined copper went into home appliances alone last year.



China consumes around 40% in current scenario, but a decade ago countries like US and Euro zone consumed around 50% when their economy was expanding. At that time China’s share was just 11% and in 2008 China bought lot of physical metal in order to meet the robust growth for their infrastructure needs, when other countries were selling off.

India’s Demand:

India’s copper consumption is expected to increase 15%, the highest growth rate because of phenomenal growth in sectors such as electricity, consumer electronics, Industrial machinery, equipment and construction. Copper demand for the country is at 650000 tonnes by the end of 2011 as compared to 565000 tonnes in 2010.Total copper consumption is estimated at 720000 tonnes in 2011.

	Announced	Approved	EPC agreed
India	21,670	8,219	5,654
Rest of Asia	10,222	6,590	3,489
Total	31,892	14,809	9,143
Source: Platts			

Table: Power projects in progress during 2010

Facts & Reasons:

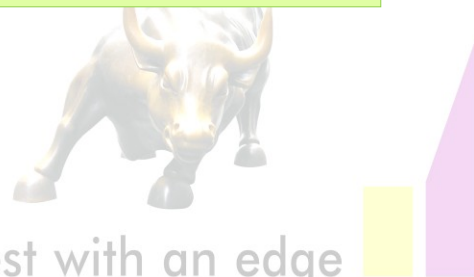
- The annual per capita consumption of copper in India is 0.47 kg, which is very less when compared to china’s 5.4 kg and world’s average of 2.7 kg.
- According to 11th Five year plan power generation capacity addition is expected to be 78,700 Mega watts during the period (2008-2012).
- Based on this data, copper requirement is estimated at 0.8 million tonnes between 2008 & 2012 and 0.81 million tonnes between 2013 and 2017.Due to copper’s high electrical conductivity, a prime application of copper is in wires and cables used to carry power and telecom signals.
- The transport equipment and industrial equipment manufacturing sectors, which consume nearly 35 % of the country’s total copper output, are likely to drive demand of the red metal this year.
- According to the International Energy Agency, India's power production is expected to rise by 15-20% annually and to meet that, India needs to invest \$1.25 trillion by 2030 into energy infrastructure. From this new infrastructure, India's annual copper demand is expected to more than double.

MAJOR INTERNATIONAL TRADE FLOW OF REFINED COPPER 2009

Source: [International copper study group \(ICGS\)](#)

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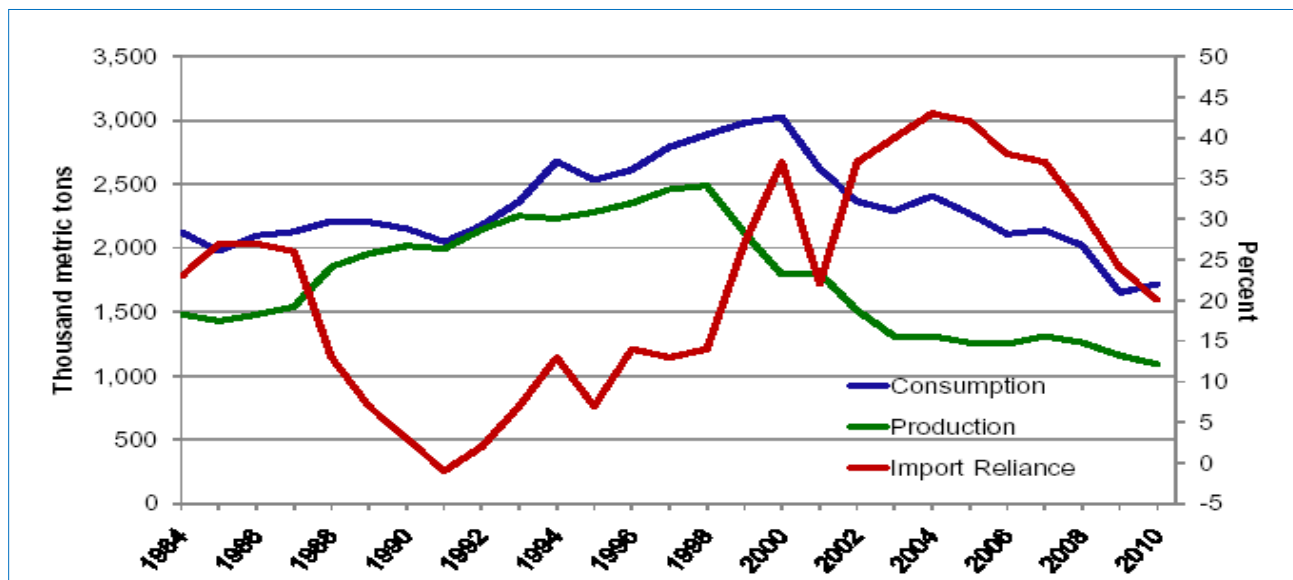


Chile is the gravitational force when dealing with copper whether it is copper production or exports. They export the copper and the major importer will be China, which is the largest consumer and the largest producer of Smelting copper and refined copper. Though the copper deposits are present in China, the resources are not sufficient and so they have to import. Smelted copper and refined copper are imported by China and refining process is also done to meet its demand.

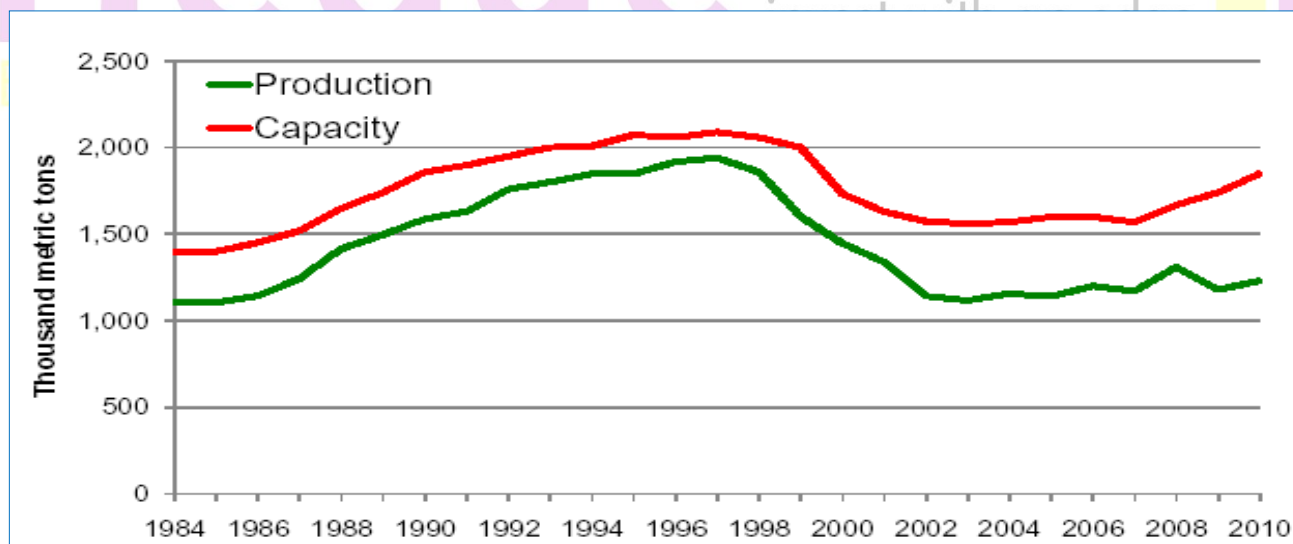
US Consumption, production & Imports:

US consumption has been steadily decreasing over the decade from 3 million tons in 1998 to 1750 million metric tonnes in 2010. Demand has been shifting from the developed markets to the emerging markets in last decade because of the major expansion and structural changes being done from the infrastructure to life style of the people. Refined copper consumption has declined from 21% in 1999 to 9% of the total world consumption. Though the US has the capacity to increase the production, they have been heavily relying on imports for the copper consumption. From the below graph we can see, the production is close to 1250 tonnes but the mine capacity is close to 2000 tonnes.

REFINED COPPER CONSUMPTION & PRODUCTION & IMPORT RELIANCE



U.S. MINE PRODUCTION & CAPACITY



Source: [Copper Development Association](#)

In the last nine years, copper consumption in the U.S declined by around 38% to 17, 99,000 short tons in 2009 due to weak economic conditions. U.S imports of refined copper during the same period declined by 47% owing to declining domestic consumption. While exports jumped from 26,000 shorts tons in 2001 to 83,000 short tons in 2009 mainly to China, the largest consumer of the red metal. Recent economic data shows good signs of recovery in the US markets, and Fed reserve has planned to purchase \$600 billion worth of bonds from June 2011 to improve the economic growth and demand for copper is expected to rise again.

In United States, the mine production is viable but the refineries are in shortage and cannot meet the demand of the refined copper. In this situation they have to export the Copper ore to other leading refineries such as China & Japan. Most of the demand for US is met by imports.

Risks & Concerns

Though the fundamental of Copper is quite strong and prices are expected to climb on account of demand supply dynamics, there are certain risks involved. In case of sovereign debt crisis arise in Euro zone, the demand will be hit and industrial production will take setback and it effects the global situation. Recent inflation in emerging economies and if the problem goes out of control, central banks will take aggressive steps to control and the demand for copper will be hit. Fundamental outlook for copper is given in this report on the basis of prevailing normal conditions in the global economy. In case of any uncertainty, the situation for copper may change.

Recommendation:

Copper is one of the most fundamentally strong commodities, which finished the year 2010 with impressive gains of 35% and looking still strong for the future. The major factor driving the price up is the accelerating demand and shrinking stockpiles in the exchanges. In 2011, copper will diverge and follow its own fundamentals and demand will expand 6.4% to 19.79 million tons. Demand from the largest consumer China, will be subdued in the initial months of 2011 because of Lunar (Chinese) New Year and inflation concerns but later on demand will pick up from the emerging economies and the developed economies. In 2010, the major demand came in from China, but in 2011 the demand is fast arising from the developed economies where the recovery is seen in faster mode and good industrial and economic data is seen along with the demand from the emerging countries.

Labour issues and lower quality ore are already troubling mining companies to achieve their forecasted targets. Declining inventories and New physically commodity backed ETF will drive the prices. After having an excellent run in 2010, we expect the prices to cool off in the initial months of 2011 to set the stage for the rally, which will be a good opportunity to accumulate and invest in the red metal.

Considering all these factors and the fundamentals, we expect copper to reach the levels of \$ 11500 per tonne based on the demand and supply scenario where shortfall is expected and the perishing inventories in London metal exchange and Shanghai exchanges.

ANALYST NOTES

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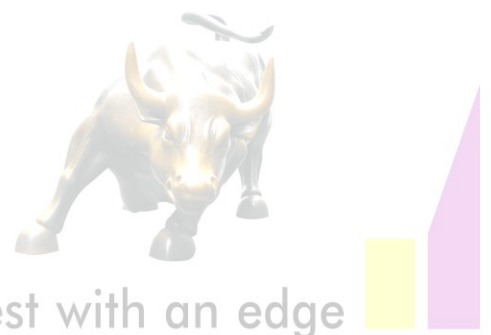
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