

Analysis Of Copper's Market And Price-Focus On The Last Decade's Change And Its Future Trend

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Abstract: it is important to analyse the major players within a copper supply chain, as well as current market dynamics, relevant international guidelines, major impacts affecting the sustainability of the whole system and policy drivers affecting its price on the global market. Focus on understanding major and provisional factors affecting copper price on the market, long-term copper prices are determined by the fundamentals of supply and demand. Short term however, are driven by financial market and other variables. Through analysis of the major factors and present market dynamics, global copper consumption increased since 1970, regardless of the economic slump in 2007-2009, growth is likely to continue chiefly driven by increasing demand in China and India. Since 2004 the price of copper on the global market increased drastically, its consumption was mainly concentrated in developed industrial countries. The economic situation of developed countries has a greater impact on copper prices, addition of Asian nation's increased urbanization and industrialization. Forecasts remain progressive as Asia advance with urbanization and industrialization plans. Anticipated to account for a major growth in global copper in the next 20 years, will present a large task to double copper supply output. Urbanization and industrialization will continue to surge copper demand, projected to overcome global copper production, high demand but lesser supply on the market. The decline of copper supply would cause a mounting deficit in turn increase demand by 2025. Asia's level of economic activity and urbanization is far from complete, it will be a chief source of copper demand in the decades to come.

Keywords: CAGR, capital investment, Copper, grade, industrialization, market, resource nationalism, urbanization.

1 INTRODUCTION

Globally, the market for copper is one of the largest of all metals behind iron and aluminium. The size of the global market for refined copper is over US\$150 billion every year, Copper has been a material component in the growth of human civilizations for thousands of years. Copper is easy to work with, an efficient conductor of heat and electricity, corrosion resistant and its abundant. The US Geological Survey (USGS) estimated in 2013 global land based copper resources of over 3.1 billion tons of which 690 million tons were listed as reserves. These estimates have more than doubled since 1970 as annual world mined copper production has increased. As an added benefit, reprocessing contributes significantly to the amount of refined copper available, with estimates ranging from 20-30% of annual refined copper production. Copper plays an important role in our industrial production and copper wire has a great impact on the telecom industry. But the copper price, more or less, limits the development of the above two industries. In order to promote the development of our industry, there is need for us to understand the factors affecting copper price.

2 Factors affecting copper price

Factors affecting copper prices include supply, demand, pressure on commodity markets and current stockpiles already in place. Given these variables, and the fact that many operate independently of the others, the variability price copper often

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experiences is something many expect to continue in a long term. While these factors lead to a wide range of copper prices over time, there are influences that also affect each of these areas and contribute to the overall price to a lesser degree.

2.1 Demand

One of the biggest factors affecting the price of copper is the demand. Copper is a material used in a great deal of applications, including new construction and remodelling. If economies are growing, then the demand for new construction and more copper also grows along with it. Building accounts for approximately half of all copper use, with engineering accounting for nearly 25%, and electrical applications accounting for approximately 17%. Growth in Asian economies in particular which account for 50% of all copper use, is another important factor (Black 2015).

2.2 Supply

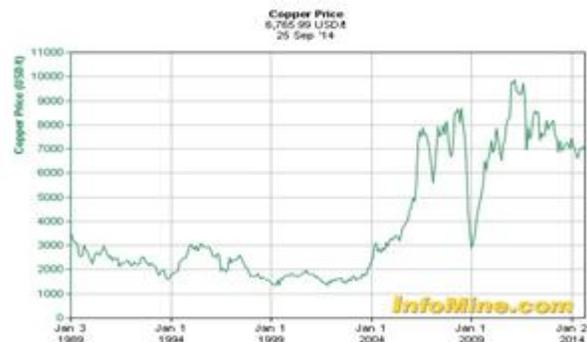


Fig.1. Source: InfoMine.com

Supply may increase or decrease over time, the trend tends to show an overall decrease in the amount of copper being mined. Copper production comes mainly from America, Europe, and Asia, which combine for more than 90% of the copper produced in the world. As less copper is produced, the more precious of a commodity it becomes and thus the higher

copper prices tend to be. Counteracting this effect is the mining of more copper, finding new supplies of copper, finding other price-competitive materials that can substitute copper.

2.3 Hedge funds

The increase in various hedge funds that have a focus, or at least a partial focus on commodities also affects copper prices. Managers of these funds look at data and try to determine supply and demand statistics. This obviously has a real-world link, such funds can increase instability in copper prices, especially in the short term. In the past, prices tended to change more gradually but there are more spikes, both high and low in the current marketplace.

2.4 Commodity markets

Copper prices began rising in late-2003 due to strong demand, falling stocks and the impact of earlier capacity closures when prices were low. Strong Chinese and Indian demand growth has been a main contributor to higher prices. However, numerous supply shortfalls due to strikes, technical problems, lower ore grades and delays in bringing on new copper projects has been the main factor that have kept stocks frequently low and propelled prices to record nominal rise in 2006.

2.5 Stockpiles

Stockpiles help to offset some of those pressures on copper prices, may be used with more regularity. Copper stockpiles reached their lowest levels in six years in 2010, which led to higher prices that year. As long as demand continues to outpace production then copper prices will likely continue to remain high. The use of existing copper stockpiles is however a short-term solution to pricing pressures.

3 GLOBAL MARKET TREND

3.1 China's and India's massive urbanization plans

Long-term prospects remain bright as China and India, the world's largest copper consumer nations, forge ahead with massive urbanization plans, as a result markets expect prices to stand at above US\$6167/t through the next decade. Looking at a recent study Wood Mackenzie estimates a price of US\$6,607.5/t by 2020 and beyond, while analysts and investors predict an average of US\$6424/t for 2018-2022. In the last 10 years copper price on the international market, has increased significantly (Fig. 1.), the copper market has shown a discrepancy throughout the year 2012 nevertheless the improbability affecting the global economy. Estimation of the world's refined copper shortfall was at 199,000Mt for 2012 and 133,000Mt (metric tons) for 2013. The decline in 2013 shoots from slower rates of supply and demand growth while financial market instability may keep demand down in the coming years, the structural flow in demand is expected to continue in the long term. Copper prices performed rather erratic after the last 5 year's record average of US\$ 8,778/t (Fig.2.), the highest since 1966 and the second-highest since 1935. Prices averaged US\$7,552.6/t in December 2011, climbed back up to US\$8,439.2/t in March 2012 driven by the unfavourable state of the global economy.

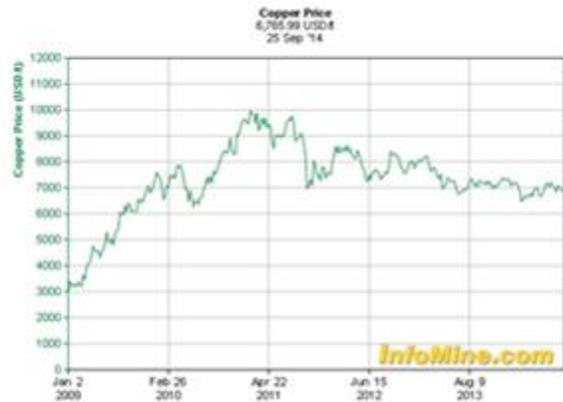


Fig.2.Source; InfoMine.com

In 2014 copper prices went through four distinct periods (Fig. 3.), prices averaged US\$ 6,668/t in March, steadily rose to US\$6,671/t in April, in May the price reached approximately US\$6,884/t and in June dropped to US\$6,806/t, the price picked up to US\$ 6,874.73/t in September-October.

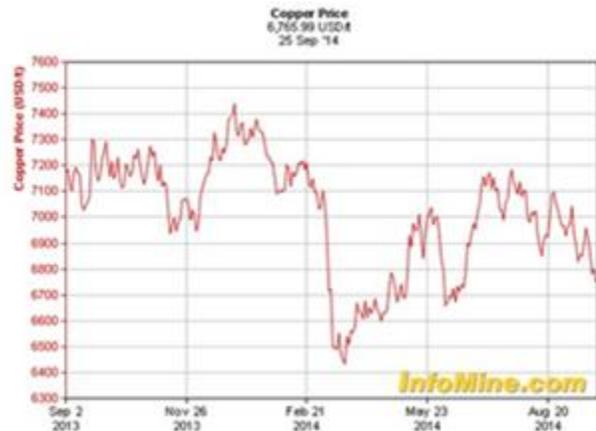


Fig.3.Source; InfoMine.com

3.2 India's copper demand

India is one of the top 20 major producers of copper worldwide, but falling prices of copper on the global market would also benefit India, it is one of the world's biggest importers of the metal, alongside China, Japan, South Korea and Germany. As a result, instability in prices of the metal on the LME has an important bearing on Indian copper trading. Typically, over 30% of India's copper demand comes from the telecom sector and 26% from the electrical sector. In addition, the building and construction, engineering, transport and consumer durables sectors are major consumers of copper in India. These sectors stand to benefit the most from lower prices of copper. The Indian copper industry grew by nearly 50% in 2011, India has become a net exporter of copper after being a net importer during the last decade, even as the country is not a major producer of copper ore but produces the refined forms of copper. A decade ago, the Indian copper industry consisted of a single state-owned company and now the copper industry takes up about 3% of the global market for copper. In 2011, India's copper demand estimation grew by at least 7% following a similar forecast in 2010, fed by the power sector. Conferring to India's 11th five year plan (2007-2012),

the country's power generation sector made a huge investment with 150 power projects for the various stages of installation. Inception of the 12th five year plan (2012-2017) urbanization and industrialization is expected to grow, refined copper demand is expected to grow at CAGR 7-8% yearly till 2025(Fig. 4.) Growth will continue to increase due to industrial development, construction, power, telecommunications and automobile sectors.

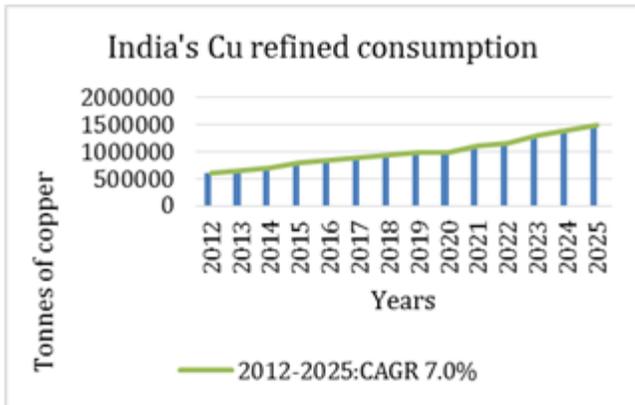


Fig.4.India's refined copper consumption

3.3 China's copper demand

Over recent decades, China has experienced rapid economic growth and a related sharp increase in its rate of urbanization. The speed of this transition, along with the sheer size of China's population, has resulted in China being an increasingly significant driver of global growth and mineral resource demand over the past decade. China's copper demand picked up in the summer season of 2014 with the first five months outputs of power generation equipment and air conditioners, recording year-on-year growth rates of 16% and 20% respectively. The strong demand has been caused by a near term urbanization plan and a surge of infrastructure investment in China, which includes State Grid's RMB400bn (US\$64bn) investment budget for power distribution and China Railway's RMB800bn (US\$127bn) investment target in railway construction where copper is widely used in contact wire to provide railway communication. AME estimates China's demand for copper to grow at a year-on-year growth rate of 3.5%, offsetting the risk of liquidation of invisible stocks in the Shanghai bonded warehouses. Financial deals in China are likely to be shaken by the recent Qingdao port probe over an alleged fraud of collateral obligations used to secure loans. However, the speculated reduction of bonded warehouse inventory has not been observed, with observed stocks stabilizing between 700–800kt. As copper has been widely used as a tool for trade finance, it is a possible case that the Chinese government would like to regulate the existing market instead of prohibiting it. If so, the financial demand for copper in China may continue to grow and the market risk associated with bonded warehouse collapse will be largely moderated. China at the moment is a major market and consumer, accounts for about 35% of the world's copper consumption and the figure is growing at a rate of over 6% CAGR expected to rise to over 50% by 2025 (Fig.5).

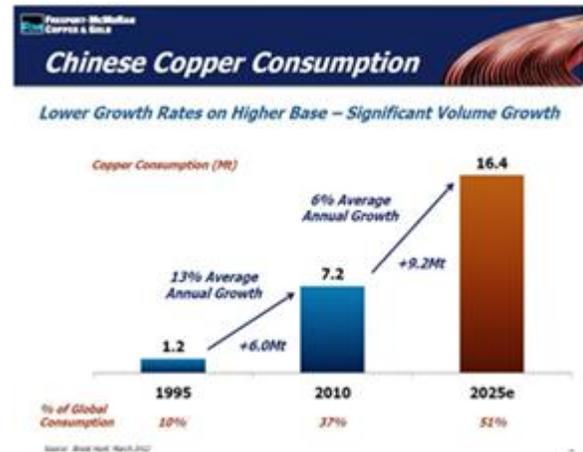


Fig.5.China's Global Consumption towards 2025; source: Brook Hunt, 2012

3.4 Resource nationalism

On the supply side, there is once again a rising trend of 'resource nationalism' in the copper industry, leading to project delays and supply disruptions. This has been proved in a number of developing countries where there are government desires to declare more control over natural resources sited in their territories.

3.4.1 Mongolian Tax Authority claim

Early 2014, Rio Tinto's 650ktpa OyuTolgoi copper mine received an audit from the Mongolian Tax Authority claiming unpaid tax, penalties and disallowed entitlements associated with the initial development. Rio Tinto claimed they had paid all taxes and charges as required under the investment agreement and Mongolian law. Resolution was reached by September 2014, this delayed the 350ktpa underground expansion feasibility study, and hence this will drop the supply of copper.

3.4.2 Mining codes Amendment; Zambia and DRC

Zambian government reviewed mining taxes to boost government revenue because of "inadequate" contributions from the mining sector. Early 2014 the government initiated a 10% export duty on unprocessed concentrates, this has led to the stockpiling of at least 300kt of copper concentrate due to limited domestic smelting capacity. Given the uncertainty of the tax regime, First Quantum, the operator of the 160ktpa Kansanshi copper complex in Zambia, threatened to delay \$1billion in investment for project expansion. The DRC and Zambia are amending their mining codes to enable the government to raise taxes and implement a 35% minimum ownership threshold for state shareholding in projects.

3.4.3 Indonesian export ban

Little progress was made to the Indonesian export ban recently. Indonesia is drafting a new mining export tax that would more than halve the base rate (originally proposed to gradually ramp up to 60% until 2016) to be paid by miners. However, it is still unsure whether miners will accept the new terms, furthermore, Newmont the operator of the 115ktpa BatuHijau project recently announced that it is preparing to seek arbitration against the Indonesian government in international court, bringing more uncertainties

over when and how the issue will be resolved.

3.4.4 Suspension of Chilean key mining projects

However uncertainty prevailed following the suspension of several key copper projects, most of which are expected to contribute to an increased copper capacity in 2012-2025. The revised and delayed copper projects include the expansion of Phase III Collahuasi, Hypogene Quebrada Blanca, Relincho, Inca de Oro, Santo Domingo and Phase II Andina. The impact of these delays is expected to result in a reduced copper production of 8.1Mt rather than the 8.4Mt originally projected by 2020. Conferring to a report by Comisión Chilena Del Cobre (COCHILCO), the delays experienced by the various projects were due to:

External factors;

- Effort in ensuring power supplies below current costs, Chile's power generation capacity currently is at 17,000 megawatts. Estimated that the country will need at least 30,000 megawatts of power by 2020 to keep up with the increased demand primarily from mining projects.
- Improving the environmental impact assessment and obtaining permits to build infrastructure required for the project.

Internal factors;

- High costs considered for investment and/or operation, which would force companies to redefine their respective projects. Some of the projects, such as Pascua-Lama, have forced miners to re-evaluate their respective projects.

4 DISCUSSION

China and India have an urban population of 50% and 30% respectively. Both countries have massive construction projects designed to bring urban population levels closer to 70% which prevails in most industrialised countries. Further urbanization and industrialization of China and to a lesser extent India, will continue to increase copper intensity, projected to overcome annual global copper production in a few years' time, in that there will be more demand but less supply of the commodity on the market.

4.1 International Economic Situation

Copper consumption is mainly concentrated in the developed industrial countries. The economic state of these countries such as USA, Japan, Western Europe and other countries has a greater effect on copper prices. Generally, if the economy situation is good, the demand for copper will increase, then the copper price will rise and vice versa.

4.2 Producing Countries' Production Status

Chile has the most abundant copper resource and it is also the world's largest copper exporter. Zambia and Zaire in central Africa are important copper producers and the copper they produced are almost entirely used for export. So, these countries production status has a large impact on the world's copper market. However, the political situation in these three countries is turbulent and the labour disputes happen quite often, which increase the instability of the global copper price.

4.3 Seasonal Factor

The seasonal fluctuation of copper price is quite obvious.

Usually, copper price in January is the lowest, and it will reach its peak in August, the copper price will be fluctuating year in year out.

4.4 Substitutes' price

In telecommunication industry, copper is an important raw material but the promotion and application of fibre-optic technology has challenged the status of copper. Copper price is determined by the combination of several factors, we cannot affect copper price. But we can change our way of thinking such as recycling scrap copper. This will not only get rid of the changeable copper prices but also can protect the environment.

4.5 Temporary factors

There have been temporary factors that have restrained investments in new capacity and delayed new projects, namely

- Shortage of skilled labour and equipment
- Higher wage demand and strikes
- Environmental groups
- Higher prices for energy and materials

Higher prices for energy, materials and wages are expected to contribute to higher costs in future, augmented by increasing costs of new developments in more difficult regions. These will be partly offset by development of new technologies.

4.6 Aging mines, lower grades in new projects

Older existing mines, the base of copper supply have increasing costs with production rates stagnating or even declining because of lower grade. Half of the world's copper reserves are more than 50 years old and four of the seven largest copper producers are over 70 years old. Declining copper grades means a much larger relative scale of required mining and milling operations, growing proportion of mining projects are in remote areas of developing economies where there's little to no existing infrastructure (Fig. 6). As grade drops the amount of rock that must be moved and processed per ton of produced copper rises dramatically, while using more energy that costs several times more than it used to. This leads to delay of certain copper projects i.e. Chilean key mining projects.



Fig.4. Industry Head Grade Trends

4.7 Environmental group and labour risks

Shortage of skilled labour and labour strikes are serving to keep

supply low while demand grows. Improvement of environmental impact assessments and obtaining permits to build infrastructure required for new projects is a major concern, which face serious opposition from environmental groups, who by far been wildly successful in suspending several key projects in Chile.

4.8 Lower economic attractiveness of new projects

Copper mining has become an especially capital intensive industry, the average capital intensity for a new copper mine in 2000 was between US\$4,000-5,000 to build the capacity to produce a ton of copper, now capital intensity is net worth of \$10,000/t, on average for new projects. Capital intensive Greenfield projects in geo-political risky developing countries requiring noteworthy infrastructure investment beyond the ordinary scope of the mining operations are associated with a higher risk of delays and Capex. Capex (capital expenditure) costs associated with the development and construction of open-pit and underground mines are rising because:

- Declining copper ore grades means a much larger relative scale of required mining and milling operations
- Growing proportion of mining projects are in remote areas of developing economies where there's little to no existing infrastructure.
- Increasingly expensive to bring new mines, especially new copper mines on line and run them.

5 LONG TERM OUTLOOK ON COPPER SUPPLY

Long term copper prices are determined by the fundamentals of supply and demand, short term however are determined by financial market and other variables such as hedge funds, political risks, government policies. Copper supplies are likely to exceed demand in 2014 and 2015, we further expect this situation to persist for 2016 and 2017. This is less than an ideal environment for promoting rising copper prices. However, the economics of copper mining have changed radically over the last 11 years. Operating costs for the sector have risen markedly while the copper grades have, and are expected to continue to decline. Moreover, copper inventories are also near slumps preventing prices from moving back to pre-2004 depressions. Over the 10 year estimate period, copper price are likely to rise as capital costs and regulatory risks for large scale mining development projects have become significant hurdles depressing investment into future production.

5.1 Resource nationalism

Countries already affected by some level of nationalization Zambia, Mongolia and Indonesia, account for 10% of global copper concentrate supply. Similar situations may also take place in several countries which are subject to high political risks i.e. South Africa, DRC, and Philippines. The copper production in these high political risk regions is currently approximately 2.5Mtpa, 17% of global copper in concentrate supply.

5.2 Mined Copper Supply

Looking at the long term outlook on copper supply 2011-2025, from the global mined output of 2010 which was about 16.7million Mt (Fig. 7). Global mined copper supply is expected to decline to 15.7million Mt by 2025. This projection is based on the baseline of production in 2010 plus expansion and projects under construction, less reductions due to depletion and declining copper grades. It is projected that supply will

peak in 2015 to about 21.0 million Mt and begin to drop due to depleting ore bodies and lower grades. The rate of depletion is much greater than the rate of discovery of new copper deposits, the decline of output copper supply would cause a growing shortfall. In turndemand in 2025 is expected to rise to about 28.3million Mt.

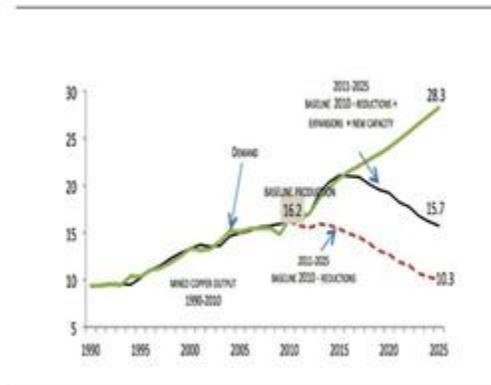


Fig.5. Global Mined Copper Output (Million MT/Year). Source: based on Wood Mackenzie

6 LONG TERM OUTLOOK ON DEMAND

Copper demand is a function of three major segments:

6.1 Real economic growth

6.1.1 Transportation Systems

Conferring to the Copper Development Association the average vehicle contains over 23kg of copper and even more for electric cars. The average railroad train uses 5000kg of copper. While electric subway cars, trolleys, and busses contain a weighted average of 1043kg. When these numbers are combined with farm and industrial equipment, as well as airplanes. It shows that copper is a major commodity in modern industrial development.

6.1.2 Industry

Much of developing Asia is transitioning from rural based economies towards urban manufacturing based economies that require increasing amounts of commodities including copper. As China's economy continues to emerge, there are other Asian nations looking to emerge i.e. Indonesia, Malaysia, Philippines and Vietnam, these experienced recent geopolitical struggles, yet many have made substantial progress since the late 1990's. In particular, Indonesia and Vietnam appear to offer strong industrial growth potential (Fig. 8). The global manufacturing growth is expected to rise at an average of 4.5%/year towards 2025.

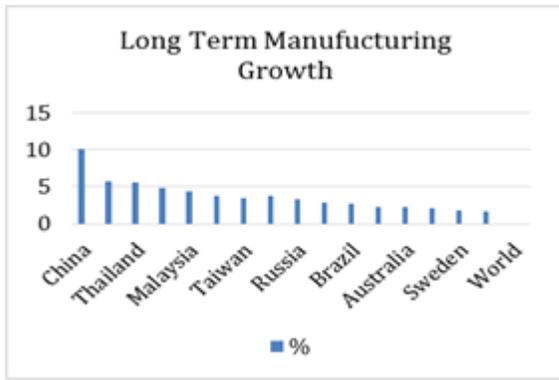


Fig.6. Long Term Manufacturing Growth %

6.2 Urbanization

Building Construction in China and India will continue to require massive infrastructure investment as urbanization continues. Quantity of copper use will be substantially higher during expansion and construction of physical infrastructure than in developed economies. In China, between 2002 and 2012 over 178 million people moved into urban centres. BHP reports copper usage intensity in China increases by a factor of 2-3 times when comparing urban centres to rural villages. KPMG expects on average 15million people to move into urban centres every year in China between now and 2030. Copper wiring and piping, as well as copper alloys are used extensively in both commercial and residential construction. Hence the demand for copper is projected to grow drastically by 2022 (Fig.9.), this in turn will raise the copper price even further by 2020. In Power & telecom infrastructure copper is one of the best metals for conductivity and corrosion resistance. Though silver is a better conductor and gold more stable, the price differential of these two metals relative to copper prohibits substitution. Therefore, copper is ideal for power cables, building wiring, and telephone wire.

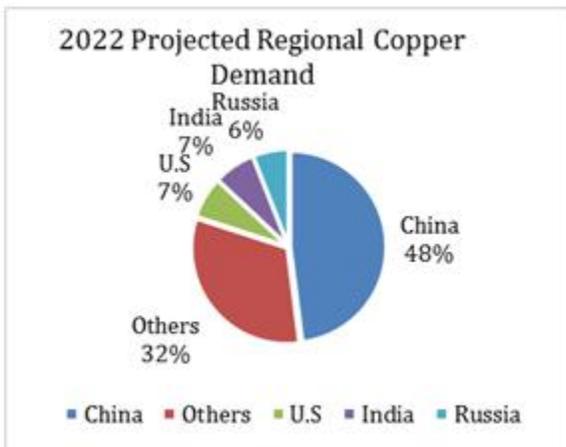


Fig.7. Projected Regional Copper Demand

6.3 Capital Investments

Energy supply and environmental concerns, combined with increasing efficiencies and decreasing system costs for renewable energy technologies, will continue to fuel renewable energy growth over the long term. Renewable energy plants require more amount (Kgs) of copper per megawatt (MW) of

capacity added than traditional fossil fuel plants (FFPs) and nuclear power plants (NPPs). Aluminium substitution for land based renewable technologies is a concern. However, the corrosion resistance of copper is important for offshore wind, which is likely uneconomic in the current environment but whose benefits should ensure eventual development along the US seaboard.

7 CHALLENGE IN THE MINING INDUSTRY

The mining industry is facing a dramatic change, one that greatly affects our industry, an exceptional change that creates an enormous challenge and a massive opportunity. The world is rapidly becoming urbanized, with an extra 1.4 billion people predicted to move into cities within 20 years. Yet the population shift will be worldwide, it is being led by China and India. People who move to cities require houses, roads, schools, power stations and stadiums, and gain the wealth to purchase user goods, such as refrigerators, cars, and air conditioners, hence more demand for metal. It is estimated that the typical per-capita requirement for metal products is 155 kg for China’s rural people and 817 kg for China’s urban dwellers. Demand for all base metals, mostly iron, copper, and aluminium, will likely double from 2010 to 2025, due largely to this population shift. It is also projected that the world will consume as much copper in the next 25 years, as it has during the last century. China’s iron ore imports are expected to double from 2010 to 2016, following many years of growth that has made China the world’s largest consumer of traded iron ore, copper and aluminium, together with nickel, steel and coal. Satisfying this huge growth in demand is the mining industry’s greatest challenge, must be confronted head-on. The industry needs to work differently to keep pace with this growing demand. The old ways will not be good or fast enough, change is essential, mine output rates must increase. Current resources must be extended to yield more. Lower-grade reserves must be selected. Exploration and discovery must become more effective, search for new high-value reserves must accelerate. These outcomes must be delivered during a global industry skills shortage and against a background of diminishing surface deposits and rising costs. Higher outputs must be achieved at lower unit costs. Working against the need for lower costs are increasing energy costs, the threat of climate change, and the higher cost of mining deeper ore bodies and lower ore grades, probably in more challenging geopolitical location. Error! Reference source not found..

8 CONCLUSIONS

The industrialization of China and India is changing the economic world order, anticipated to account for more than half of the growth in global copper over the next decades. China accounting for almost half of the growth and representing the bulk of the increase, is clearly the new force in commodity demand and presents a large task to the metals industry to increase output over the next two decades. Gradually we will see falling average grades being mined, mines becoming deeper, more remote and come with increased political and nationalization risk. Extraction of metals from the mined ore will become more complex and expensive, even more considering the effects of increased energy costs, cost of technology innovation to power mining will be very high. China the major market and consumer accounts for about 35% of the world’s copper and projected to rise to 50% by 2020

as hundreds of millions more people migrate from the country to cities, bolstering the need for infrastructure. Prices are expected to rise as a result, there is a possibility that they will be a 50% gain in copper prices over the next few years. China, India and other developing countries have the potential to absorb higher demand for metals than predicted, and this would increase the strain on the respective industries to develop new supplies. However, prices are expected to be cyclical, and not become permanently higher at anywhere near recent price levels. Despite its per capita consumption of mineral commodities still being relatively low compared with advanced economies, China is now the largest market in the world for aluminium, steel and copper. China consumes 35% of the world's copper expected to rise to 50%, China and India projected above 50% global copper growth, will set a challenge to double copper supply output. Urbanization and industrialization will continue to increase demand, insistently overcome annual global copper supply by 2019. Decline in output copper supply would cause a growing shortfall in turn increase demand by 2025, projected to rise to about 28.3 million MT/year. It concludes that, since the conjunction of China's and India's level of economic activity and urbanization relative to more developed countries is far from complete, they will continue to be a major source of demand for copper in the next decade.

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