# COPPER MARKET OVERVIEW

## COMMODITIES TRADING CONCENTRATION

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## GENERAL PRESENTATION OF THE COMMODITY

Copper is one of the oldest metals known in the world. It is mainly used in electronics, equipment, building construction and infrastructure. Copper is the chemical element "Cu" number 29. It is, along with Gold, the only coloured metal due to its reddish-brown colour.

Copper has multiple utilities. It can be used for:

- Infrastructure (Railways, telecommunications, water supply, healthcare, constructions)
- Food chain (Fertilizer, refrigeration systems, transport, etc.)
- Medical devices (Surgical robots, ventilator component, surgical robots, etc)
- Manufacturing (Aerospace, defence, communication, cars)
- Technology (Smartphone, Computers, artificial intelligence)

The copper industry provides benefits to more than just the companies mining copper and fabricating products from it. Copper spurs employment in both local and regional economies for a wide range of jobs, from plumbers and electricians to automotive workers and electronic equipment manufacturers. These "downstream" sectors employ an enormous number of people and represent a larger part of the local, regional and world economies. [1]

Another known fact about copper is its antimicrobial property, making it interesting to use copper to reduce the spread of diseases (see how it could help to fight COVID-19 as per the World Economic Forum[1]).[2][3]

## MARKET STRUCTURE

Copper trade is led by categories of copper going from its "rawest" (ore) form to a clean, unalloyed and uncoated (refined) form. Producers use copper under its various development steps as a means of coordination between upstream and downstream production capacities.

The market of copper as such is more focused on a business to business basis, then, copper reaches households in a manufactured form (in cars, houses' infrastructure, electrical devices etc.).

We count around 2000 copper mines, plants and refineries all around the world according to the ICSG's Directory of Copper mines and plants[2] which makes copper's supply slightly fragmented. The supply of copper is categorized in the upstream, middle stream and downstream "segments". In the upstream segmentation, the main activities consist of working copper from the mine to refining it. The middle stream segmentation consists of the fabrication of semi-goods such as wire

[1] https://www.weforum.org/agenda/2020/08/could-copper-beat-covid-19-three-lessons-from-chile/ 28.09.20

[2] https://www.icsg.org/index.php/press-releases/finish/170-publications-press-releases/2941-2019-07-11-press-release-directory-copper-mines-plants - 30.09.20

mill, brass mill copper, brass mill alloy and foundry mainly. In the end, Copper is manufactured in end-use products such as communication devices, electronic components, cooling systems etc.

Another segmentation of the copper market is recycling. In this part, end-use products are selected and copper is extracted from the goods to recycle it. Smelting and refining turn the copper back for a new utilisation in the middle stream. According to the International Copper Study Group's 2019 Factbook, copper is one of the most recycled metals, it does not lose its chemical or physical properties during the recycling process. [4]

## HISTORY

The Industrial Revolution brought about a massive change in the production of copper and its alloys. In the first place, an insistent demand arose for more and better raw material. The 17th and 18th Centuries saw a vast improvement in this rate of output, largely arising from a quicker removal of impurities from the ore. [5]

## KEY DRIVERS IN COPPER MARKET, MARKET INFLUENCES

Globally, emerging markets play a big role since their emerging role implies infrastructure development which requires a lot of copper. To illustrate this, China is the main importer of copper due to its infrastructure development. Its demand plays a major role in the copper's market. Following their substantial recovery after Covid-19's first wave, their demand for copper has increased especially in April 2020, with a 13.9% higher level of imports than in April 2019.[6]

Other global market trends such as the growth in the market of electric vehicles which require more copper than petrol vehicles influence the copper market as it's demand therefore varies according to the trends. Another possibility is that copper could be proven to be efficient to fight CoronaVirus, which would improve the demand on the market.

As the main exporter of copper, Chile does obviously have an important role to play in this market. In South American producing countries, politics and governments play a big indirect role. Indeed, through the political decisions taken, the mines, refineries and plants related to copper (and other metals) production use their impact on the countries' trade balance to change the internal situation inside the country. In that way, strikes (such as the 43 days strike in Escondida's mine, world's biggest copper mine in Q1 2017) are a more or less frequent event happening in South America, threatening the production level if too many strikes occur. Unions do also play a certain role in those strikes and, therefore, in the well-being of this sector.

Standards are an important influence on the copper market. 2 different companies involving themselves in a transaction might have different standards regarding the copper being purchased, especially if the two companies are based in a different "standard" zone such as American Standards or UK Standards [7] so those need to be specified by each company involved in transactions to ensure satisfaction on both sides of the transaction.

States do also have a major influence on the exploitation of this commodity, considering they initially own the land on which copper is being mined. Each country assumingly has its own politics and regulations concerning the management of a mine and the working conditions of its employees, which might on a certain scale influence the produced quantity of copper.

## LARGEST PRODUCING NATIONS – KEY PLAYERS

Chile is the main producer of ore copper by far with almost 6'000k metric tons produced in 2019. China and Peru are then the biggest producers, with respectively ~2'500k and ´~1'700k metric tons produced in 2019, as per ICSG's 2019 factbook data. Chile represents 27.2% of the world's copper mining production [8] (over the 20.6million tons produced in 2018).
Ore copper coming from Chile is produced by mines mainly owned by big companies such as BHP Billiton, Glencore plc, Freeport McMoRan Copper & Gold Inc, Anglo American and Codelco, which is 100% State-Owned. (Worldwide production 2018: 20.6mio metric tons).

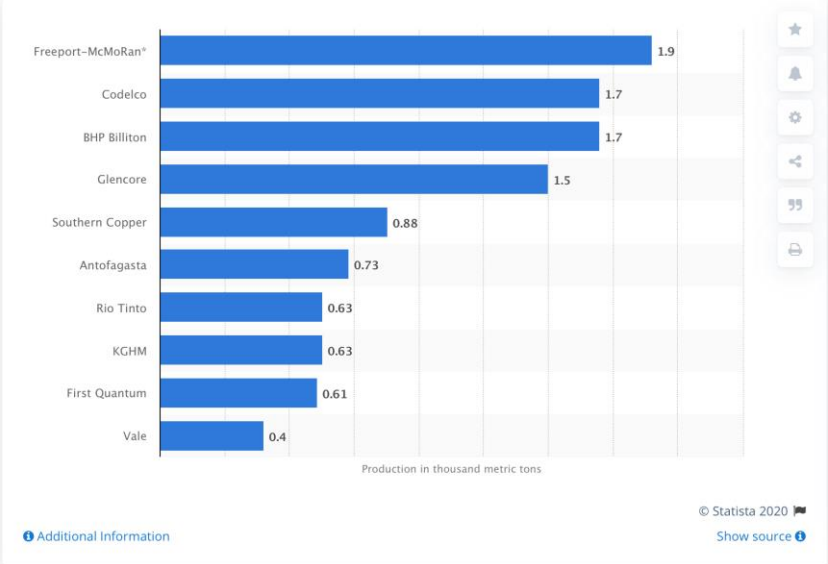
China is the main producer in copper smelter production (smelting consists of the 3rd step leading to refined copper) and refined copper production (metal containing at least 97.5% of copper [10]).

Smelting copper processing coming from China (~8'500k metric tons) is mainly proceeded by entirely- or partially- State-Owned Chinese smelters such as Jiangxi Copper Corp., Jinchuan Non-Ferrous Metal and Co and Tongling Nonferrous Metals Corp. (Worldwide production in 2018: 20.1mio metric tons)

Refined Copper processing coming from China (~9'300k metric tons) is mainly proceeded by, as for Smelted copper, entirely- or partially- State-Owned Chinese refineries including Jiangxi Copper Corp and Jinchuan Non-Ferrous Metal and Co. (Worldwide production 2018: 24.1mio metric tons including 4mio tons of recycled copper)

We can therefore assess that governments do actually have a big influence on the market for copper worldwide, especially Chilean and Chinese governments, the 2 main players in supply and demand of copper.

Leading copper miners worldwide in 2018, by production output (in million metric tons)




[10]

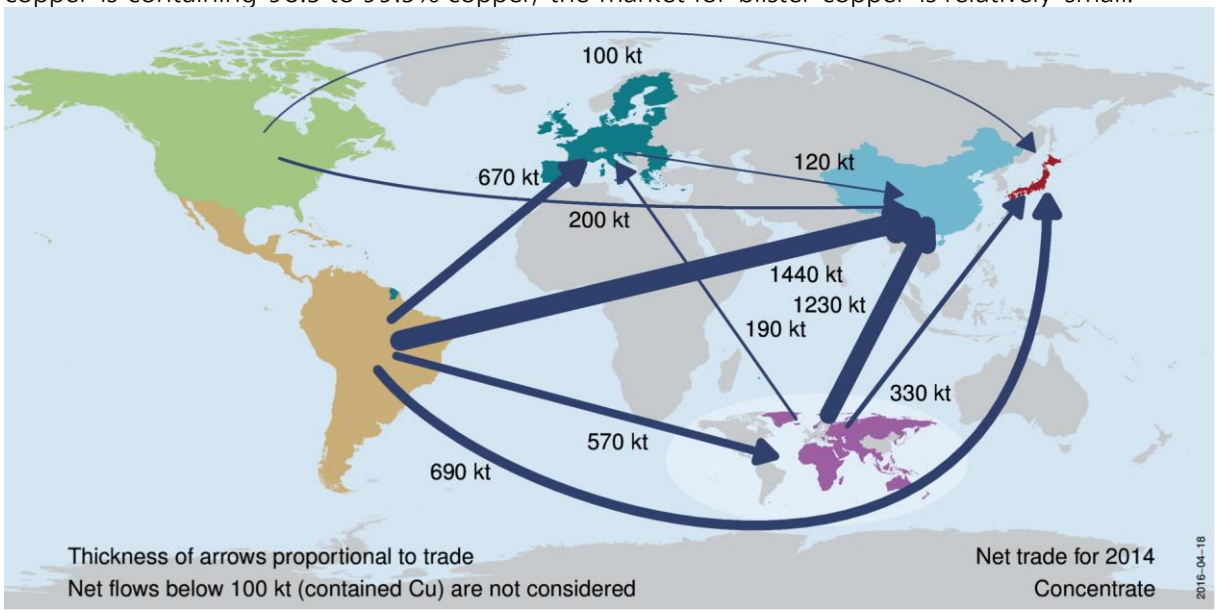
## TRADE FLOWS INVOLVED

Copper can be extracted from its ore by:

- Underground: sinking a vertical shaft into the Earth to an appropriate depth and driving horizontal tunnels into the ore.
- Open-pit: 90% of ore is mined by this method. Ores near the surface can be quarried after removal of the surface layers. The ore is treated with dilute sulfuric ac recovered by electrolytic refining.

Afterwards, the ore is crushed and ground and goes through a lot of processes to have as a result an ore containing 25% of copper by mass. It is called concentrated copper.
It is valuable enough to ship to other plants and other countries for processing. For example, China, Germany and Japan are major copper producers that use concentrate from around the world.

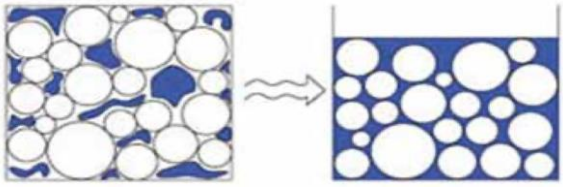
Copper concentrates grade typically around 25-35% copper and are sold in powder form. Concentrates are either smelted and refined in-house or are sold to smelters. Quality of concentrates needs to be addressed in the sales contract, which can be quite complex. Blister copper is containing 98.5 to 99.5% copper, the market for blister copper is relatively small.




[11]

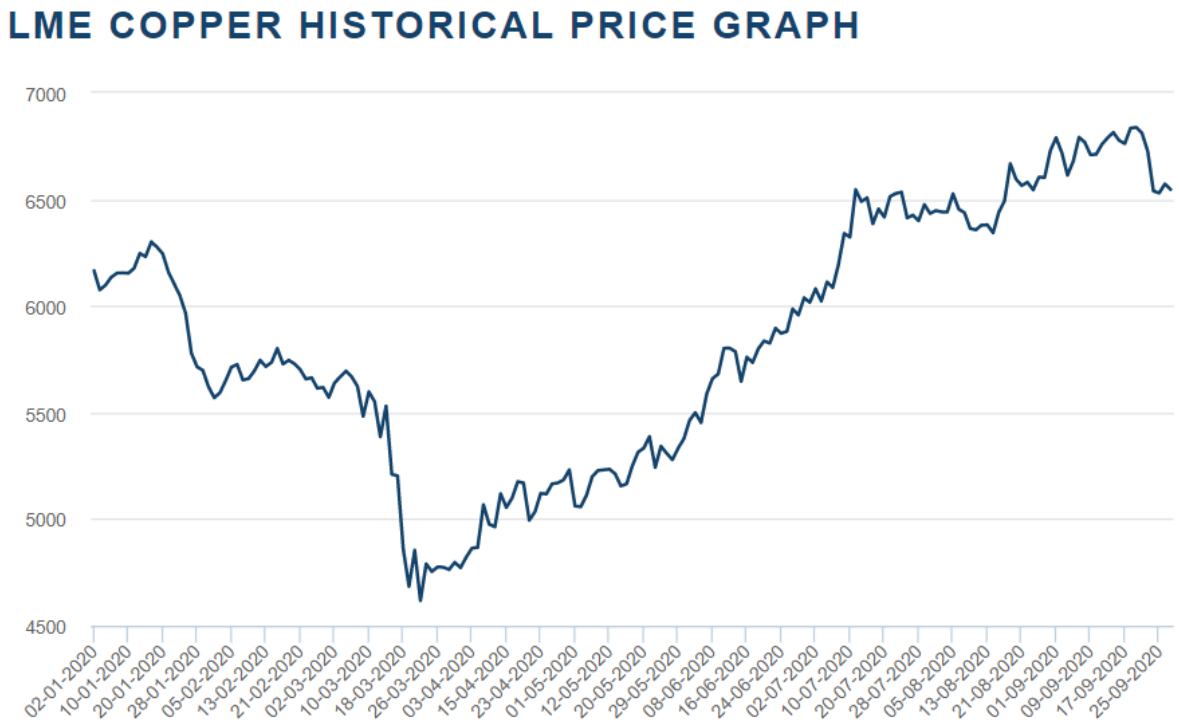
One big problem when transporting copper is called liquefaction. Although they often look dry in appearance at the time of loading, these cargoes contain moisture in between the particles. At the time of loading, the cargoes are usually in their solid-state, where the particles are in direct contact with each other and, therefore, there is the physical strength of resistance to shear strains. During ocean transport, cargoes are exposed to agitation in the form of engine vibrations, ship's motions and wave impact, resulting in compaction of the cargo. This leads to a reduction of the spaces between the particles. If compaction is such that there is more water inside the cargo than there are spaces between the particles, the water pressure inside the cargo can rise sharply and press the particles apart. The effect of this process is a transition from a solid-state to a viscous fluid state in which all or part of the cargo can flatten out to form a fluid surface. In this condition, cargo may flow to one side of the ship with a roll one way but not completely return with a roll the other way, progressively leading to a dangerous list and potentially the sudden capsizing of

the vessel. It will move inside the cargo creating an unbalanced weight and when the moisturize's level is back to normal it will create an unbalanced weight in the cargo, leading the vessel to sink if no precautions are made beforehand. [12]



## PRICE

Copper is a commodity used in the production of all the sectors of the economy, such as power generation and transmission, constructions, electronics and machinery. The price of copper is largely influenced by the global economy.



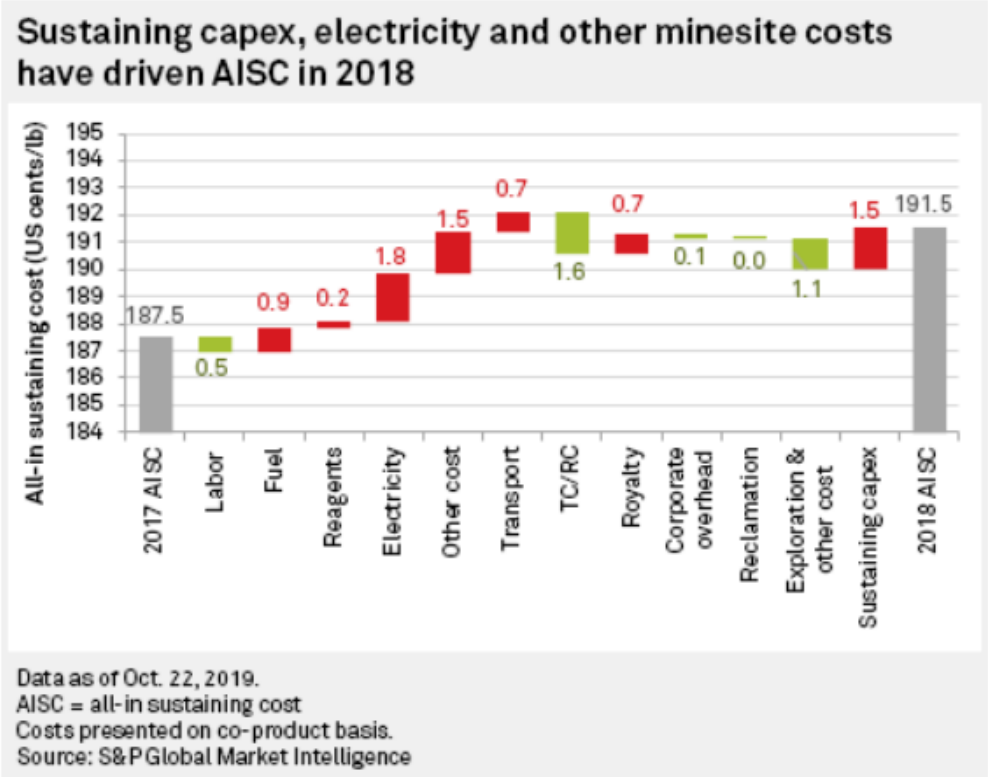

Title: The price of copper on the London Metal exchange. The price on the Y-axis is in US dollar per ton. [13]

The graph shows a huge drop in the price at the 10.03.2020. This drop is due to the COVID-19 pandemic that slowed the global economics thus the global production.

One of the major impacts on the price of mining Copper is the strength of the currency compared to the dollar. When there's a strengthening of the local currency compared to the US dollar the cost of the copper level up.
One of the reasons for the copper price is the demand and the supply. Since Chile is responsible for 27% of the copper production, a shortage coming from Chile will impact the price negatively.

## COST CURVES

The major cost of production of the copper can be seen on this graph




The cost to produce one LB of copper in 2018 is 1.91 dollars so to produce a kg of copper the cost is 4.21 dollars [14].

One of the main cost of the production of copper is the oil price. Copper needs approximately 30% of energy during the process of extraction. If the price of oil goes up the cost of production will follow.

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