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COPPER PRODUCTS

Copper is produced and sold in various forms across the value chain. Mines typically yield either copper concentrate from sulphide deposits or cathodes from oxide deposits. Concentrate is smelted into anodes and refined into cathodes, which are then processed into intermediate products, such as rods, bars, and tubes, and ultimately into final goods, including wires and widgets, by fabricators worldwide. Alongside mine output (primary supply), smelters and processors also use copper scrap (secondary supply).

COPPER PRODUCTION

Global mine output in 2023 was about 22 million tons, of which 18.2 million were as concentrate and 3.8 million as cathodes from leaching. Scrap added another 4.5 million tons, bringing the total supply to ~26.5 million tons. Chile and Peru accounted for 35% of mine supply, making regional labour disputes and political shifts (e.g., royalty debates) influential for global production. The DRC contributed ~12%, with the rest spread across other regions.

Table 1: Copper supply and demand by country (2023)

| Country | 2023 Production | % of Total |
|-----------------------|-----------------|------------|
| Chile | 5000 | 22.7% |
| Peru | 2600 | 11.8% |
| DRC | 2500 | 11.4% |
| China | 1700 | 7.7% |
| United States | 1100 | 5.0% |
| Russia | 910 | 4.1% |
| Others | 8190 | 37.2% |
| Total mine production | 22,000 | |
| Recyling | 4,500 | 17% |
| Total Cu supply | 26,500 | |

Source: Couloir Capital

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|-------------------|------------------|------------|
| Country | 2023 Consumption | % of Total |
| China | 14700 | 55.5% |
| India | 1700 | 6.4% |
| United States | 1690 | 6.4% |
| Germany | 1200 | 4.5% |
| South Korea | 849 | 3.2% |
| Japan | 835 | 3.2% |
| Others | 5,526 | 20.9% |
| Total consumption | 26500 | 100.0% |
| | | |
| | | |

On the demand side, China dominates as the largest copper consumer, accounting for more than half of global usage. This aligns with copper's major end-use applications, discussed in the next section. Other key demand centres include the European Union, Japan, India, South Korea, and several Southeast Asian nations.

SUPPLY AND DEMAND

Precise copper supply and demand figures are difficult to establish due to the industry's complexity. While listed companies report production in detail, significant volumes come from private firms, state-owned entities, artisanal mines, and recycled copper, which are harder to track. On the demand side, thousands of buyers (many of whom are private and partially reliant on scrap) make exact consumption data elusive. Estimates typically rely on company reports combined with import/export data to reconstruct past balances with reasonable accuracy.

HERE'S THE PROBLEM:

Copper is not being discovered fast enough to be mined to meet upcoming demand.

Primary Demand
Base Case Production Capability
Probable Projects

10 Million Tonne Deficit

15 10 10 1997 2002 2007 2012 2017 2022 2027

Source: Virtual Capitalist

Figure 1: Example of projections showing a big, looming supply deficit

FUTURE BALANCES

Forward-looking figures carry high uncertainty. Supply forecasts are based on production profiles of existing assets and likely new projects, while demand forecasts use economic growth, sectoral trends, and scrap usage estimates. Combining these yields market balance projections, suggesting either surplus, deficit, or equilibrium. Historically, markets stayed fairly balanced annually, with surpluses or deficits of only a few hundred thousand tons. Forecasts predicting large future deficits often overlook shovel-ready

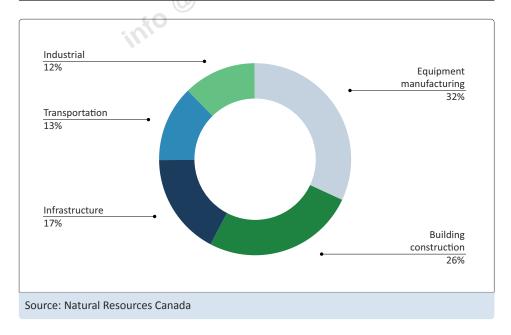
or marginal projects that re-enter production in high-price environments, as is currently the case. However, new mines tend to face long lead times before coming into production and often encounter local opposition, which increases the supply-side risk.

COPPER OUTLOOK

The pie chart below outlines the various end uses of copper by sector. Equipment manufacturing is the largest end use (32%) for the metal, followed by building construction (26%) and infrastructure (17%). While copper is used in an innumerable number of widgets, copper cables and wires are one of the largest demand drivers for the red metal. The overarching theme regarding copper is its central role in all aspects of electricity, from transmitting energy to where it is required, to the cabling in our cars and appliances. With the pace of electrification of our economies holding steady, the outlook for copper demand remains strong.

Table 2: End uses of copper by sector (2023)

| Sector | Tonnage [kt] | % of Total |
|-------------------------|--------------|------------|
| Equipment manufacturing | 8,480.00 | 32 |
| Building construction | 6,890.00 | 26 |
| Infrastructure | 4,505.00 | 17 |
| Transportation | 3,445.00 | 13 |
| Industrial | 3,180.00 | 12 |
| Total | 26,500.00 | |



GREEN ECONOMY

The green economy represents a shift from fossil fuels to renewable energy, with electrification, particularly electric vehicles (EVs), serving as a major driver. This transition impacts power grids, which must adapt to transmit electricity from often remote wind and solar farms to consumers, requiring extensive cabling. Because renewable generation depends on the weather, storage systems are needed to capture excess energy for later use. The combination of renewables, storage solutions, and EV battery chemistry will influence demand for various battery metals, which are covered separately below.

For copper, the main demand growth will come from EVs, charging infrastructure, and solar and wind projects. A Goldman Sachs forecast (2021) estimated that by 2030, there would be an additional 2.4 million tons from EVs, 0.15 million tons from charging stations, 1.5 million tons from solar, and 1.3 million tons from wind, totaling approximately 5.35 million tons. Relative to the 26.5 million tons supplied globally in 2023, this represents a 20% increase in demand from green economy sectors alone within seven years.



Figure 2: Image of copper cable containing over 60% copper by weight

PRICE

Copper on the London Metals Exchange (LME) is currently at prices around the 10,000 USD/t mark. Supply-side pressures are keeping prices elevated, reflected in very low TC/RC figures in the copper concentrates market, and only exacerbated by the recent force majeure declaration at Freeport-McMoRan's Grasberg operation, one of the world's largest copper mines.

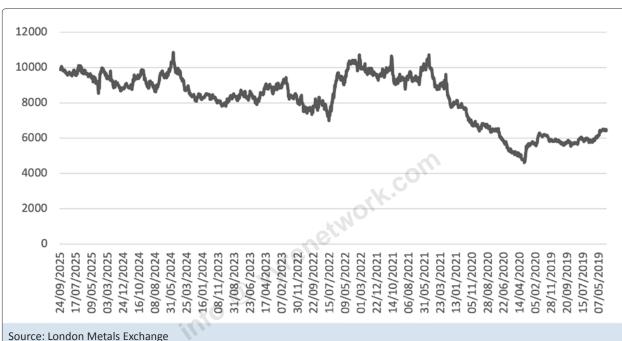


Figure 3: Copper LME cash settlement price since 2019

In a high-price environment, more scrap enters the market, which can weigh on the demand for primary copper. High prices also spur investment across the copper upstream sector, from exploration to mine restarts and expansions. The latter is the quickest way to boost supply, while new developments typically take years to come online.

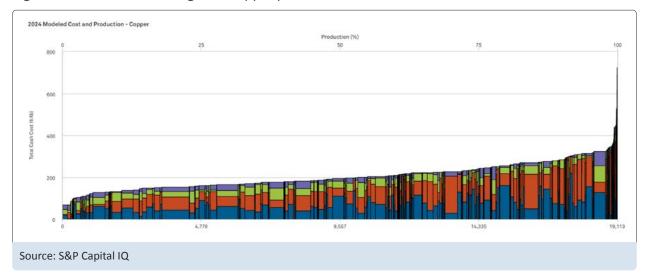


Figure 4: Cash cost curve of global copper production (2024) in US\$/t

Examining the cash cost curve and current prices, a significant portion of global copper production is profitable on a cash cost basis. Although this curve doesn't capture all-in sustaining costs (AISC), it highlights that many producers are enjoying strong cash margins, evident in debt repayments, balance sheet improvements, and plans for expansions, developments, and acquisitions. However, many argue that the incentive price —the level needed to justify new project development — must be much higher, in the range of US\$12,000–15,000 per ton, to incentivize new production.

