

India

**Neutral** (no change)

# Non Ferrous

## Copper - bullish but sustained 9000+ unlikely

- While the world has been crazily bullish on copper, an analysis of the primary metal as well as its scrap indicates that sustained prices over 9000+ is unlikely.
- The world has spotted 2,100mt reserves but at the same time, above the earth, the metal pool is 475mt which can be scrapped at a fraction of the mining cost.
- Copper intensity in an EV is 3.5x of a normal vehicle. Historically, vehicles have accounted for 28% of the consumption. Hence, demand to post a 3-4% CAGR.

### Copper analysis is incomplete without scrap (forms 32% of supply)

Almost all copper analysis done by the street misses one basic ingredient, i.e. scrap, which accounts for 32% of overall supply of the metal. ICU (an international copper study group) publishes authentic data on the same and hence, data sanctity of copper scrap is quite high. Please note that the used metal pool (i.e. copper contained in all the articles made since the metal was discovered) is around 475mt and it is scrapped at an average rate of 2.2% over a long span. A jump in copper prices increases the scrapping rate to as high as 2.6% and any collapse leads it to 2.1% as well. With prices of copper at ~US\$8,000-9,000/t, it means that its scrap can remain in the range of 2.2-2.3%. Please note that a 0.1% increase in the copper scrapping rate means an 0.5mt extra copper supply, which is nearly 3% of global demand. Hence, the importance of copper scrap cannot be overemphasized.

### An 3-3.5% increase in demand can support a price of ~US\$9,000/t

An overall increase in global copper demand of 3-3.5% (on the 2022 base of 32mt) means that copper production should increase by ~3.1-3.5% (around 1mt of copper) over the coming years. Out of this 1mt, 0.65mt needs to come from copper mines. However, if the mines fail to ramp up capacity, then every US\$300-350/t rise in copper prices can lead the incremental scrapping rate to go up by 0.1% (i.e. say from 2.2% to 2.3%), which can supply additional material to bridge the demand-supply gap. In this scenario, scrap elasticity with prices will determine the base as well as the cap for copper prices. A runaway rise in copper prices is unlikely and a steep fall is also out of the question. We believe that copper prices can remain at ~US\$8,500-9,000/t unless significant energy inflation increases the mining cost.

### Stable prices better for equity valuation; buy cos with good reserves

Markets never like volatility in earnings and such volatility is punished by a severe derating and vice versa. However, given that copper prices are likely to remain in the range of US\$8,500-9,000/t, the cash flow prediction is much easier, and financing of projects can also be much easier. We can witness a slew of new copper projects in the coming years, mostly in the unexplored regions, where political risks are high (but the copper grade is quite good). As the prices are likely to remain stable, investors can discount the political risk in their valuation parameters more easily. In the near term, copper companies can witness a re-rating but buy only those companies that have sufficient reserves.

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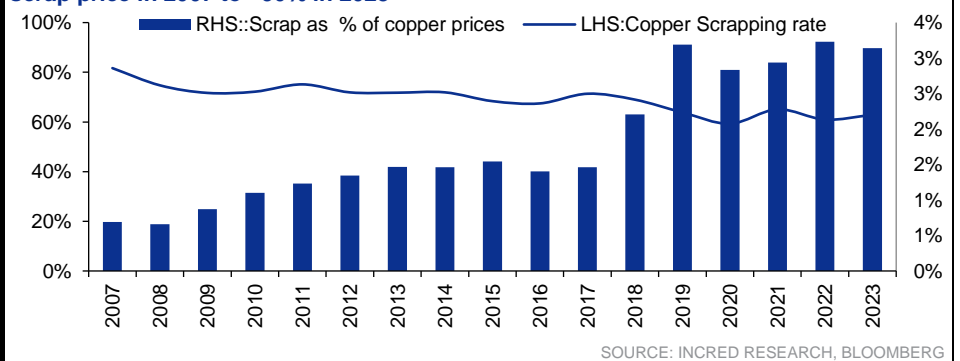
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**Figure 1: Nothing can explain the rising importance of copper scrap than the graph below – China's average price of imported copper has increased from 20% of copper scrap price in 2007 to ~90% in 2023**



## Copper - bullish but sustained 9000+ unlikely

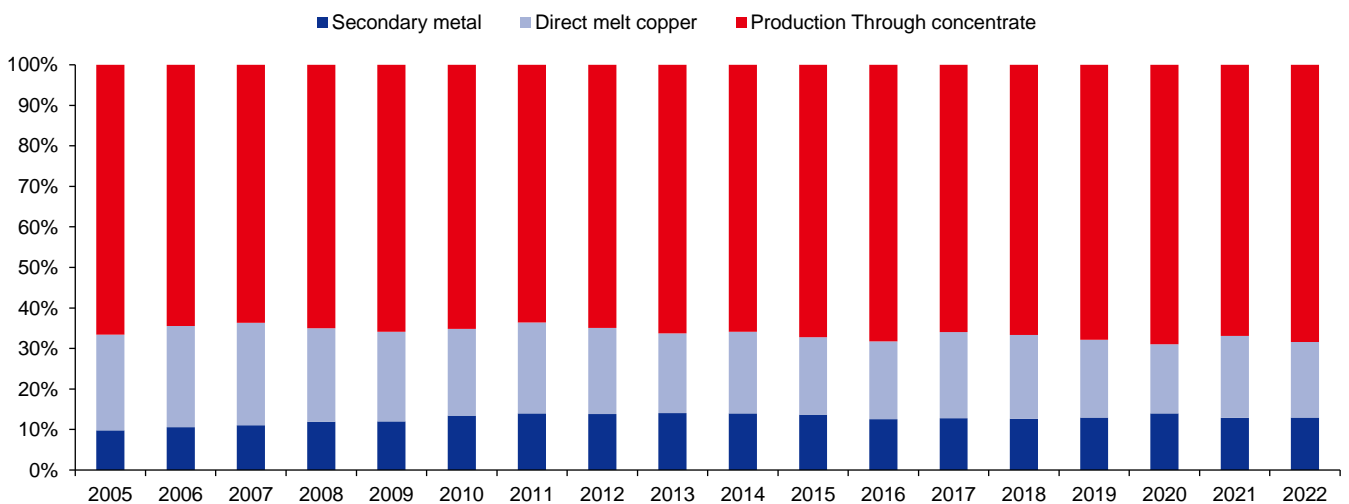
We are bullish on copper, but we don't agree with most street estimates of a 10-20% shortage in the coming 8-10 years. While the street looks at refined metal's demand-supply position, we have added an additional parameter of secondary copper availability.

### Primary metal's demand-supply estimates not enough

Most of the analysis done by the street have only primary metal demand-supply positions for both copper and aluminium as the demand-supply estimates of secondary copper are not easily available. The analysis is mostly statistical, but in the near term (6-12 months) the supply of copper scrap depends only on the recent changes in its price. Please note that there is 475mt of used copper above the earth. This metal can be easily scrapped. Normally, 32% of the overall copper consumption comes from scrap. While this is the long-term trend, in the near term, price changes determine the scrap availability.

### Copper scrap forms ~32% of overall copper usage➤

Figure 2: Scrap accounts for 32% of overall copper consumption



SOURCE: INCRED RESEARCH, COMPANY REPORTS

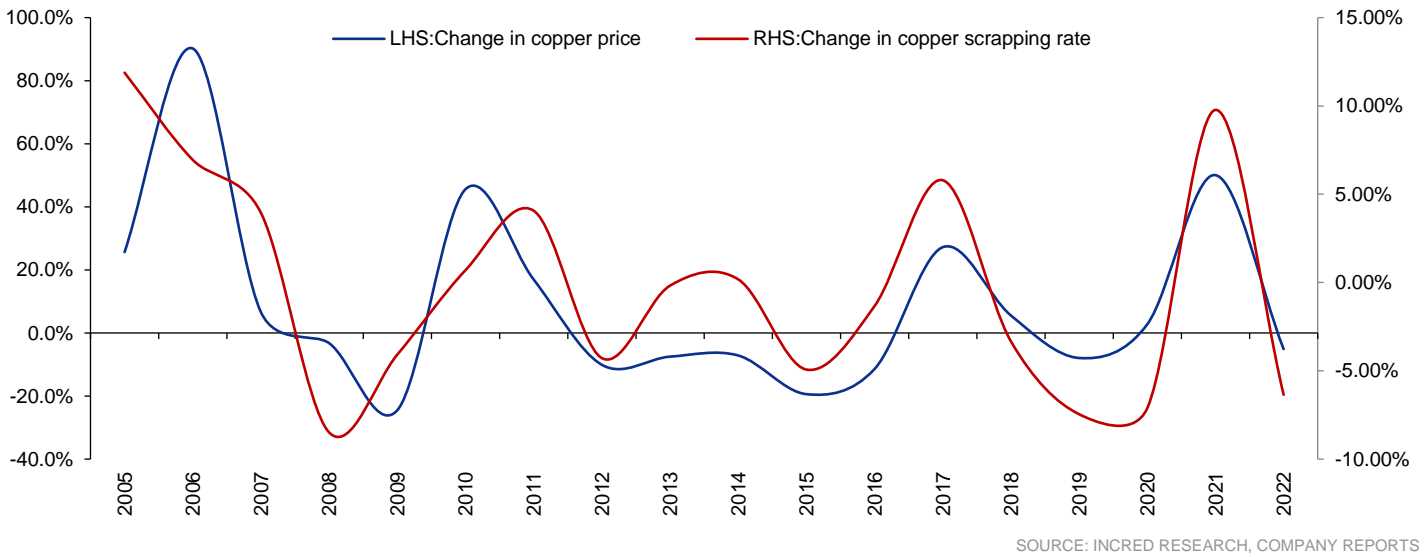
### Scrap is used in two forms - to make copper anode and to directly melt copper scrap ➤

Copper scrap comes in two forms: 1) It is put directly in the smelter to come out in form of copper anode. After it comes out of the smelter, the copper anode must go through electrolysis to get pure copper. 2) Direct melt copper scrap - this type of scrap is directly melted to form pure copper.

### Over the years, copper scrap prices have witnessed a direct correlation with the change in copper prices ➤

Changes in copper prices have accentuated the impact on copper scrap availability. Please see the graph below for the impact on copper scrap availability vis-a-vis the change in copper prices.

**Figure 3: Copper price changes have accentuated the impact on copper scrapping rate; please note that as of now, global used metal pool of copper is around 475mt and hence, even a 0.1% delta in the scrapping rate can change the global supply by 0.5mt, which is ~1.7% of the current global refined metal demand**

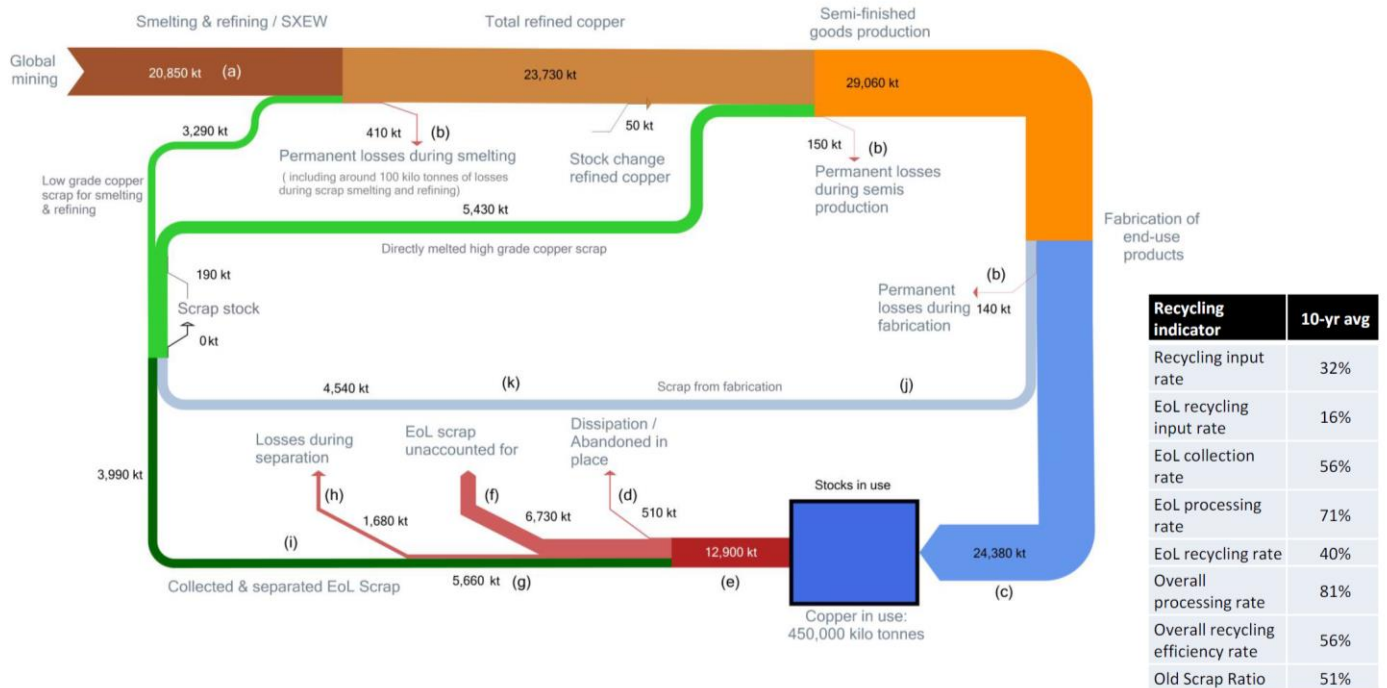


**Copper study institute publishes a very interesting copper flow report which can help understand the importance of scrap**

**Figure 4: International copper study group has published a detailed copper flow model in the global economy**

**INDUSTRY GLOBAL FLOWS OF COPPER (2018) AND DERIVED RECYCLING RATES**

Figures produced for the International Copper Association by Fraunhofer ISI based on Environ. Sci. Technol. 47 (12), pp. 6564–6572 (freely available under <http://dx.doi.org/10.1021/es400069b>).

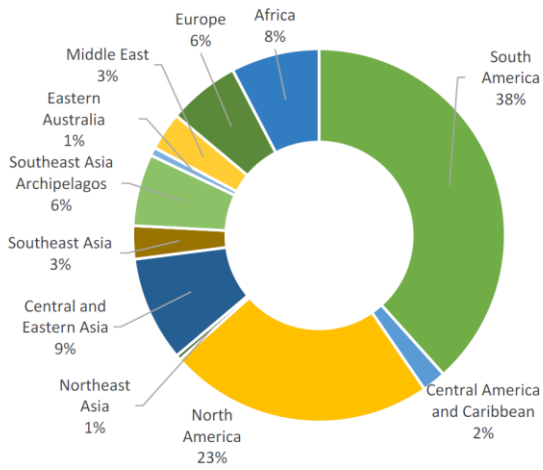


SOURCE: INCRED RESEARCH, INTERNATIONAL COPPER STUDY GROUP

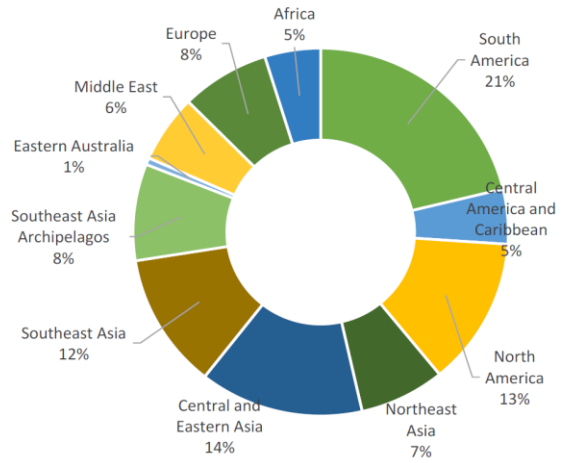
**Globally, most of the undiscovered resources are in the southern hemisphere ➤**

**Figure 5: Most of the undiscovered resources of copper are in the southern hemisphere**

**A. Identified Copper Resources, world total=2,100Mt**



**B. Undiscovered Copper Resources, World total=3,500Mt**



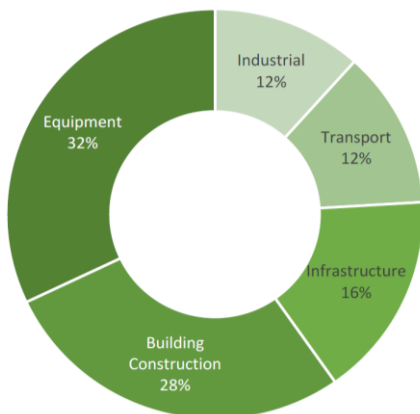
1/ Assessment of Undiscovered Copper Resources of the World, 2015. Scientific Investigations Report 2018–5160 Version 1.2, Dec2021 <https://pubs.er.usgs.gov/publication/sir20185160>

SOURCE: INCRED RESEARCH, INTERNATIONAL COPPER STUDY GROUP

**Till now, most of the copper has been used in infrastructure projects but going ahead, electric vehicles or EVs can account for a big share of the pie ➤**

**Figure 6: Till now, the main usage of copper has been in infrastructure projects**      **Figure 7: Conventional cars use only 23kg of copper per car but EVs use at least 83kg or 3.5x**

**End Use**



SOURCE: INCRED RESEARCH, COMPANY REPORTS

**Copper Use in EVs**

- Conventional cars 23kg
- Hybrid electric vehicles (HEV) 40 kg
- Plug-in hybrid electric vehicles (PHEV) 60 kg
- Battery electric vehicles (BEVs) 83 kg
- Hybrid electric bus (Ebus HEV) 89 kg
- Battery-powered electric bus (Ebus BEV) 224-369 kg (depending on the size of battery)

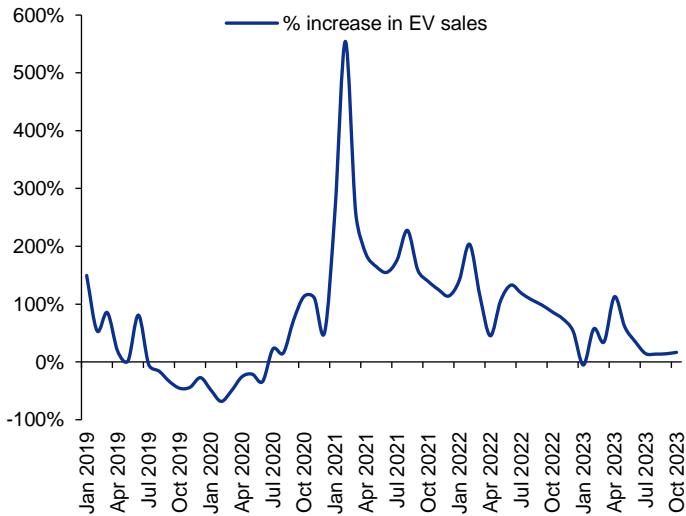
Source: ICA



SOURCE: INCRED RESEARCH, COMPANY REPORTS

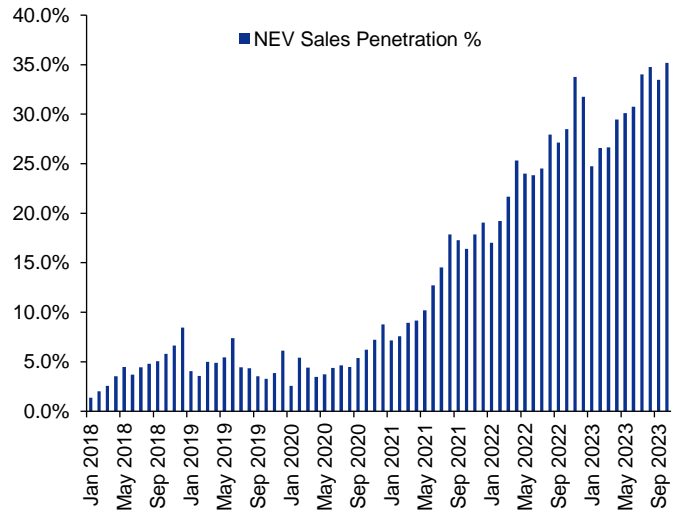
**China ramps up EV penetration which, to some extent, has supported copper demand ➤**

**Figure 8: EV sales in China are rising**



SOURCE: COMPANY REPORTS, INCRED RESEARCH

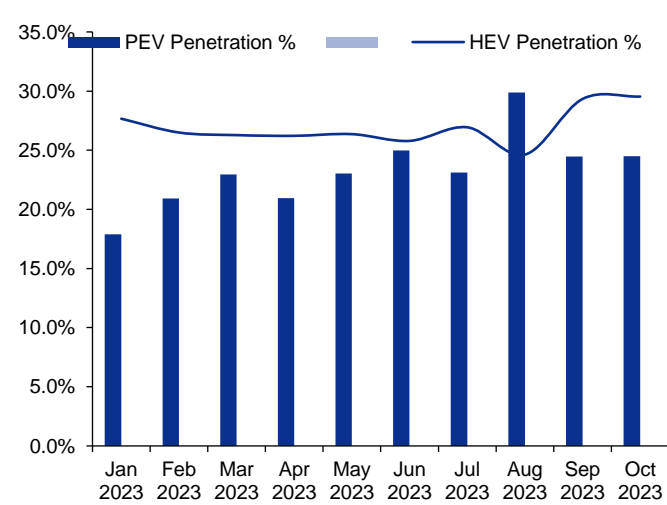
**Figure 9: Within new car sales, EV penetration is close to 40%**



SOURCE: COMPANY REPORTS, INCRED RESEARCH

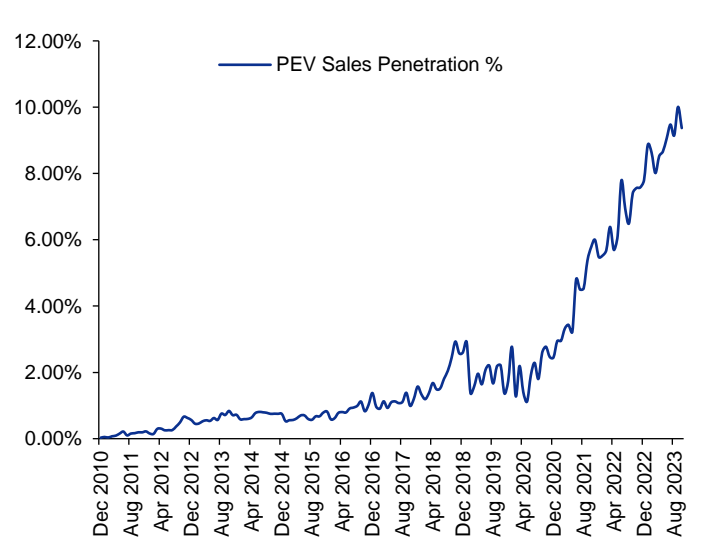
**EV penetration in new car sales is also quite high in Europe, but it's lagging in the US ➤**

**Figure 10: Penetration of EVs in new vehicle sales is quite high in the EU**



SOURCE: INCRED RESEARCH, COMPANY REPORTS

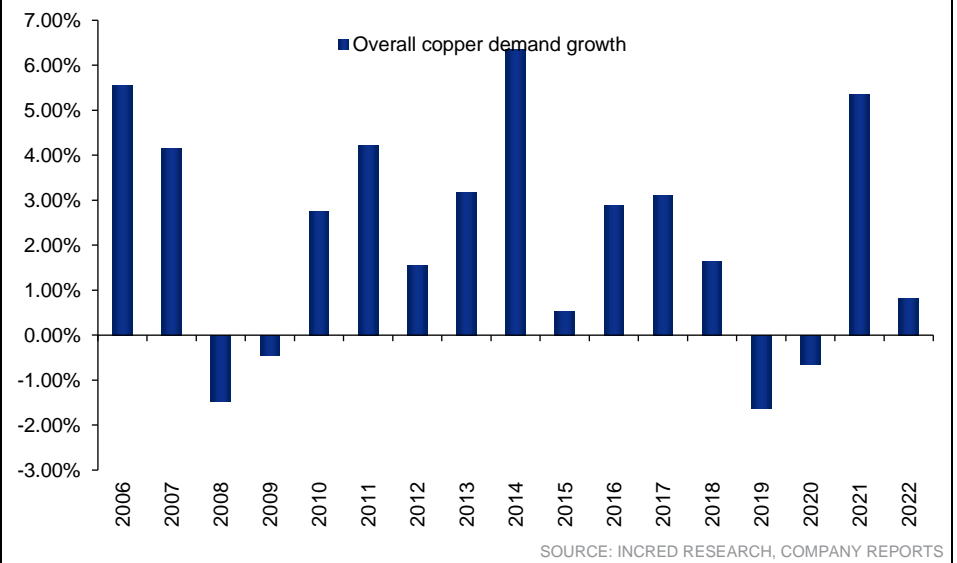
**Figure 11: However, the US is still lagging behind at 10%**



SOURCE: INCRED RESEARCH, COMPANY REPORTS

Hence, as climate concerns peak, we can expect US electric vehicle or EV penetration to increase, which can support a 3% copper demand growth ➤

Figure 12: Last 18 years' average copper demand growth has been ~2%, which can increase to 2.5-3%



However, don't expect any big shortage in copper supply ➤

Even if copper prices remain at ~US\$9,000/t and the copper scrapping rate at 2.2% (last data when the copper price was at US\$9,000/t), then also scrap generation will keep rising and therefore, mining production need to post a 3.1% CAGR, which is easily achievable.

Figure 13: The growth required in mining production is ~3.1% CAGR

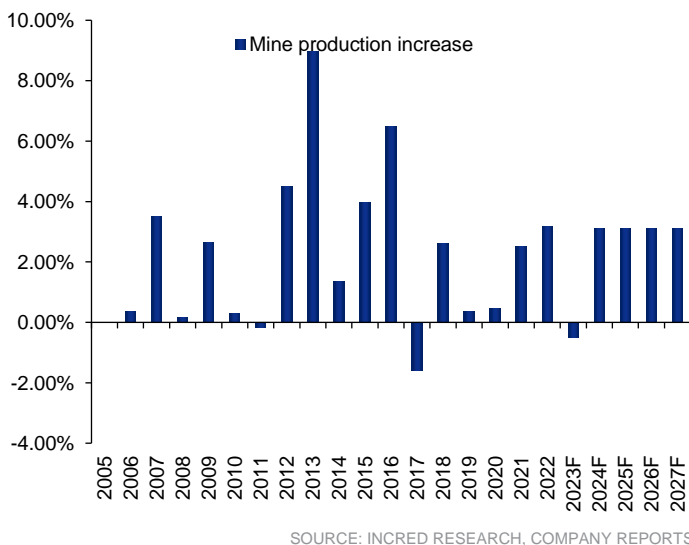
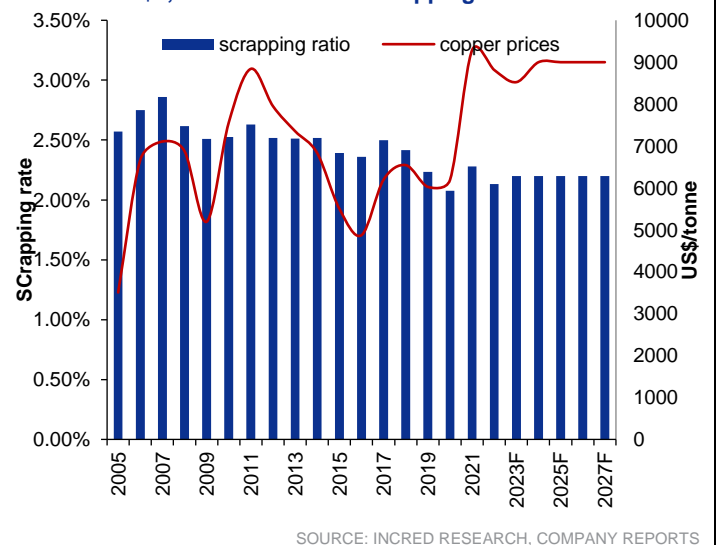
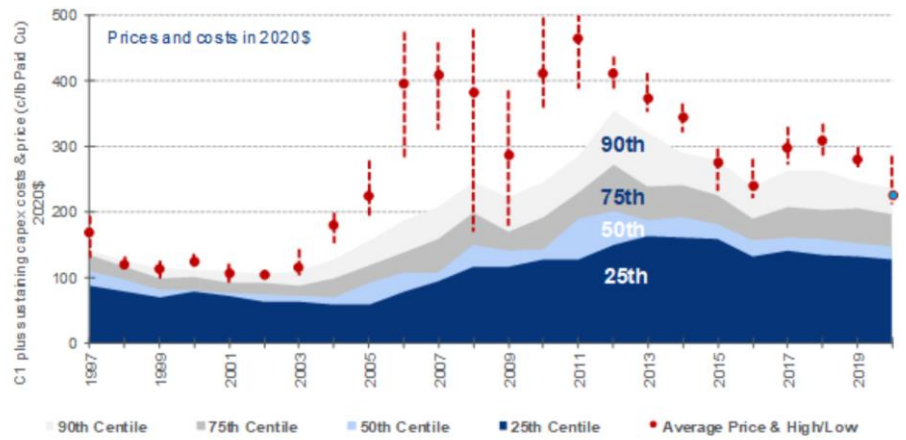


Figure 14: However, copper price needs to be supported at the level of ~US\$9,000/t to achieve a scrapping rate of 2.2%



**New mines, mostly open cast with a copper grade of around 0.2-0.3%, are viable at US\$9,000/t ➤**

**Figure 15: Most of the new mines as well as old mines are viable at cash cost of US\$7,000-7,500/t; if one accounts for a reasonable return on capex as well, then also US\$9,000/t is a very good price for copper**



Source: Wood Mackenzie

SOURCE: INCRED RESEARCH, [HTTPS://AFRICANMININGMARKET.COM/COPPER-SUPPLY-RESPONDING-TO-A-GLOBAL-PANDEMIC-AND-LOWER-PRICES/5949/](https://africanminingmarket.com/copper-supply-responding-to-a-global-pandemic-and-lower-prices/5949/)

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