



Copper & the Global South Navigating Change in the G20 Era

Copper: Shaping a Sustainable Future for the Global South and Beyond

▲ G20 India Summit Highlights Inclusivity and Global Cooperation

The G20 India summit serves as a testament to an evolving world order that places inclusivity and global representation at its core. The invitation extended to the African Union for the first time underscored the belief that a prosperous future for our planet demands the recognition of all voices. This aligns with India's G20 presidency motto, "Vasudhaiva Kutumbakam," which translates to "One Earth, One Family, One Future."

▲ Copper's Crucial Role in Climate-Conscious Industrialization

Amidst the global shift towards sustainability, the key to progress, particularly in regions like the Global South, is climate-conscious industrialization. Copper, often dubbed the "red gold," plays a pivotal role in numerous sectors driving global economies. Its exceptional properties, including durability and corrosion resistance, make it indispensable in power generation, transportation, construction, and electronics. Additionally, it fuels the demand for copper in energy transition technologies like electric vehicles and solar panels.

▲ Meeting Ambitious Carbon Emission Targets with Copper

Copper stands poised to assist governments in achieving ambitious targets for net-zero carbon emissions by 2070. Notably, copper's environmental footprint is lower than that of other metals like iron, steel, or aluminum.

▲ Meeting Rising Copper Demand: A Global Challenge

Global demand for copper is on the verge of a significant surge, with projections suggesting it could double by 2035, reaching 50 million metric tons. Supply from existing and projected mining activities is expected to meet only 80% of this demand by 2030. This surge is propelled by the widespread adoption of renewable energy technologies and the electrification of transportation through electric vehicles (EVs).

▲ Copper's Vital Role in Renewable Energy and Electrification

Copper's significance in renewable energy is undeniable. India, for instance, aims to

achieve 500 GW of renewable energy capacity by 2030, relying heavily on copper for efficient energy conversion. Technologies like solar and wind generation rely heavily on copper for efficient energy conversion. The generation of 1 MW of power through solar photovoltaic and onshore wind platforms requires over 3,000 kg of copper. Offshore wind is even more copper-intensive, necessitating over 8,000 kg per MW. Additionally, the rapid electrification of transportation, driven by the EV revolution, significantly bolsters copper demand due to its essential role in battery production and charging infrastructure.

▲ India's Copper Challenge and Opportunities

India, a prominent member of the G20, has increasingly relied on copper imports, primarily due to the suspension of Sterlite Copper's Tuticorin smelter operations in 2018. However, the anticipated reinstatement of Vedanta's Konkola Copper Mine in Zambia and the upcoming copper factory by the Adani Group in Gujarat offer hope to alleviate India's copper deficits partially. Upon a favorable Supreme Court order India could potentially unlock 40% of idle copper production capacity at Tuticorin, revitalizing India's copper supply chain.

▲ Addressing Climate Change through Responsible Resource Management

The pace of the global transition to low-carbon energy systems is pivotal in limiting global temperature rise to below 2°C above pre-industrial levels. However, this transition introduces complexities, notably the heightened demand for essential minerals as low-carbon technologies replace their fossil fuel counterparts. It is crucial to ensure the equitable distribution of minerals globally, catering to the needs of nations lacking domestic reserves.

▲ Seizing Green Windows of Opportunity: A Path to Sustainable Development

In the evolving landscape of developing

economies, the pursuit of a greener future presents both challenges and unprecedented opportunities for economic development. This green transformation hinges not only on technological advancements but also on fundamental changes in policies and institutions. Green Windows of Opportunity represent gateways to sustainable development for developing nations, provided they navigate these complexities with well-crafted policies and international collaboration. Copper, with its crucial role in sustainable growth and climate action, remains a linchpin in this journey toward a brighter, more inclusive future for the Global South and the world at large.

▲ Promoting Sustainable Copper Extraction and Processing: A Path to Decarbonization

Copper, a metal with a storied history of contributing to the rise of ancient civilizations and powering contemporary technologies, occupies an irreplaceable role in various industries. However, like any mining sector, copper extraction and processing need to deal with handling environment sustainably. This challenge has the potential to undermine genuine economic development in the Global South, which relies heavily on this crucial metal as a foundation for a sustainable future. Moreover, the attainment of commitments outlined in the Paris Agreement to combat climate change and various United Nations' Sustainable Development Goals hinges on copper's unique properties.

▲ A Crucial Turning Point: Meeting Copper Demand Sustainably

Renewable energy technologies like solar panels, wind turbines, and electric vehicle batteries-critical components of the energy transition and vital for limiting global temperature rises to no more than 2°C-rely heavily on copper availability. Consequently, the demand for copper is poised to rise by nearly 45% by 2031 as countries seek to modernize and reduce their carbon footprints. India, for example, sees its copper demand increasing by 25% each year.

▲ Navigating the Energy Conundrum in Copper Production

Copper industry emissions from mining to cathode making is only 0.2% of the global emissions in 2018. In the case of copper production, various stages such as mining, milling, smelting, converting, and refining require substantial amounts of energy. Energy requirements vary depending on mine characteristics and smelter type.

▲ A Collaborative Approach to Sustainable Copper Production

Achieving a substantial increase in copper production, which is pivotal to the energy transition, requires collaboration among all stakeholders, including operators, innovators, and governments. No single entity possesses all the solutions. The present imperative is to invest in sustainable manufacturing practices and research and development to enhance copper recycling and reduce its environmental impact. While nearly one-third of the global demand for copper is met through metal recycling, the recycling of electric vehicle batteries remains minimal. The establishment of a robust global market for recycling these batteries could help decrease the demand for new copper. Innovations in this domain can assist the Global South, which is in the early stages of adopting electric vehicles, in achieving its climate goals.

▲ Empowering Local Communities for a Sustainable Copper Future

Equally crucial is the understanding of local communities in the copper mining & operations region. It is essential to create a vibrant ecosystem that includes and educates community members while ensuring their safety and livelihoods and minimizing the impact on the local habitat.

▲ The Path Ahead for Copper: Challenges and Opportunities

The copper industry faces both challenges and opportunities as it navigates these issues on its quest to explore potential solutions for a greener tomorrow. Meanwhile, as the world collectively strives toward a sustainable future, copper's role in shaping the economic and environmental landscape of the Global South will continue to be of paramount importance.

Looking Forward: A Sustainable Blueprint for the Copper Industry

- ❖ Promoting Responsible Copper Manufacturing Practices
- ❖ India's Copper Import Dependency
- ❖ Energy Security and Renewable Integration
- ❖ Digital Technologies and Robotics
- ❖ Copper Demand Drivers
- ❖ Transparent Reporting
- ❖ Universal Industry Standards
- ❖ Balancing Sustainability and Mining
- ❖ Community Engagement
- ❖ Responsible recycling

As we move forward, creating a sustainable blueprint for the copper industry is essential. This blueprint encompasses promoting responsible manufacturing practices, addressing India's copper import dependency, ensuring energy security and renewable integration, embracing digital technologies and robotics, understanding copper demand drivers, implementing transparent reporting, developing universal industry standards, balancing sustainability with mining, and actively engaging with local communities. By working collaboratively and innovatively in these areas, the copper industry can play a pivotal role in shaping a sustainable future for the Global South and beyond.

Modern Copper Smelters: Pioneering Green Technology for Sustainable Production

The Essential Role of Copper

The Ministry of Mines, in its report on "Critical Minerals of India," emphasized the significance of copper in the country's mineral landscape. Hindustan Copper Limited (HCL), a crucial player in the KABIL Joint Venture, operates four copper production units and possesses substantial reserves and resources catering to 10% of domestic demand. Notably, many of the 23 critical minerals identified are either associated with copper as minerals or are involved in the processing of copper concentrate by copper-producing companies. This underscores the need for a comprehensive strategy involving Hindustan Copper Limited (HCL), Vedanta, and Hindalco to harness the potential of these critical minerals, which hold significant importance.

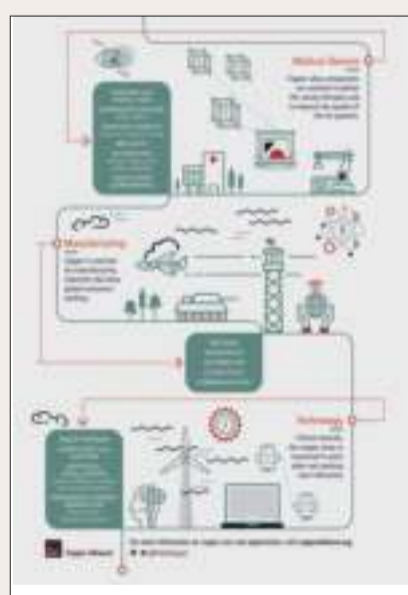
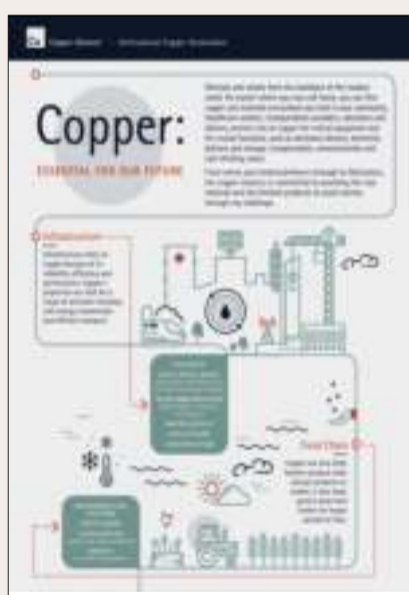
The selection of critical minerals is based on two major factors - economic importance and supply risk, which underscore their critical role in various industries.



The Indian Critical Minerals Identification process tries to address five core objectives:



Source: Report of the Committee on Identification of Critical Minerals, Ministry of Mines (June 2023)



National Green Tribunal Act, highlighting the unwavering commitment to environmental compliance.

Technological Advancements

Technological advancements have facilitated a considerable reduction in air, water, and land pollution, charting a trajectory for the copper smelting industry towards enhanced sustainability and environmental conscientiousness. Across the globe, widely used smelting technologies are ISASMELT and Flash technologies. Sterlite Copper has adopted ISASMELT technology for its smelting processes. ISASMELT process is an energy-efficient smelting process that was jointly developed from the 1970s to the 1990s by Mount Isa Mines (a subsidiary of MIM Holdings and now part of Glencore) and the Government of Australia's CSIRO. It has relatively low capital and operating costs for a smelting process. ISASMELT is installed in smelters around the world including Australia, USA, Belgium, Germany, Great Britain etc. Flash smelting process was developed by Outokumpu in Finland and first applied at the Harjavalta plant in 1949 for smelting copper ore. Birla Copper in India has adopted the Flash technology for its smelting processes.

These developments illustrate the copper industry's commitment to sustainability, and with the adoption of advanced technologies and stringent environmental practices, it is well-positioned to play a pivotal role in shaping a more eco-conscious industrial future.

However, in order to achieve the desired objective, the complete value chain from exploration to manufacturing to recycling needs to be addressed, which may be considered as the main pillars of the critical minerals value chain.

In today's rapidly evolving industrial landscape, sustainability has become a paramount concern, particularly in metal production, where environmental issues have been continuously improved. Contrary to misconceptions, modern industrial practices are driving a transformative shift towards sustainability and environmental responsibility.

Zero Liquid Discharge (ZLD) Practices

Modern copper smelting facilities are at the forefront of sustainability efforts. They have embraced Zero Liquid Discharge (ZLD) practices to prevent surface or groundwater pollution, thereby safeguarding ecosystems including marine ecology. Notably, the Tuticorin

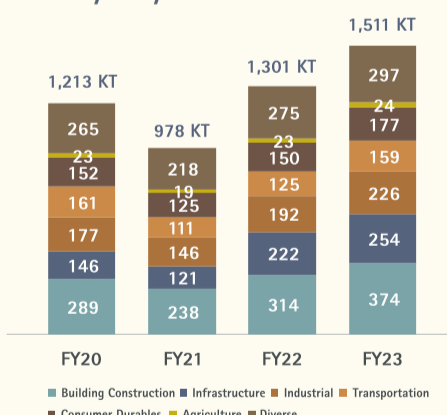
Smelter in India has been a pioneer in implementing ZLD since 1997, investing nearly \$80 million in such practices when they were rare globally. The plant's wastewater undergoes rigorous treatment in an effluent treatment plant, followed by reverse osmosis, ensuring every drop is recycled back into the plant. These innovations have made copper smelting more sustainable and environmentally friendly.

Stringent Environmental Regulations

Modern copper smelting plants operate within stringent environmental regulations and are subjected to real-time monitoring. Continuous Ambient Air Quality Monitoring Stations (CAAQMS) and Continuous Emission Monitoring Systems (CEMS) are meticulously installed and connected to state pollution control boards (SPCB) and the Central Pollution Control Board (CPCB) servers. Violations of environmental norms can result in substantial penalties and environmental compensation (EC) under the

GDP growth drives India's copper demand

Copper demand grows by 16% y-o-y in FY23



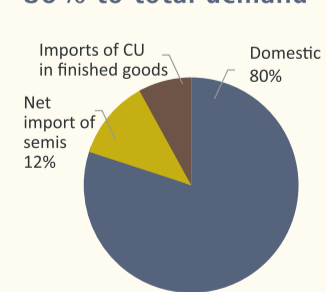
India's demand is 40% of total world refined copper demand



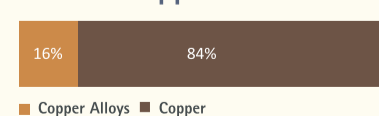
Refined copper contributes to 65% of total demand in India



Domestic copper semis production contributes 80% to total demand



Copper alloys cater to 16% of total copper demand



Clean energy transition 160% growth in sales of Electric Vehicles. Renewable energy growth has led to 21% y-o-y growth in solar PV installations & 100% growth in wind energy installations in FY23	Building sector Indian residential real estate market has witnessed growth of over 30% vis a vis last year in both value and volume terms	Transportation Post COVID and re-installation of supply chain results in automotive sector growth of 14%	Infrastructure Increased power demand of 40 GWh driven by growth in economic activities in rural as well as urban areas. Infrastructure capital expenditure from central and state governments grows by 34%	Consumer Durables Correcting in subdued demand post covid has resulted in consumer durable sector growing by 18% in FY23
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