Indian Copper Supply Challenges & Opportunities

By

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Chairman and Managing Director
Hindustan Copper Limited

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Structure

- Refined Copper Producers in India.
- Mineral Potential
  - A Snapshot

- Indian Copper Scenario
  - Production
  - Key Challenges
  - Opportunities

- Hindustan Copper
  - Profile
  - Investment opportunities
1. Hindustan Copper Limited - Govt. of India owned, the only vertically integrated copper producer in India and holds all existing mining leases for copper mining in India. Earstwhile Jagadia Copper Limited acquired by Hindustan Copper Limited.

1. Sterlite Industries (Vedanta) & Hindalco Industries (Birla Copper) - are two other shore based companies in the private sector.
Mineral Potential

- Land Mass for Mineral exploration ~ 3.14 Million Sq kms
- Total OGP (obvious geological potential) ~ 0.571 Million Sq kms
- Positive paradigm shift in exploration policies
  - Thrust on Exploration - Formed National Mineral Exploration Trust
  - Thrust on Mineral Development
  - Encouraging private investment

Ministry of Mines through GSI has started - Project ‘UNCOVER’ - To identify deep-seated and concealed mineral deposit

Huge Investment opportunities for Exploration of Base and Strategic Minerals
OBVIOUS GEOLOGICAL MINERAL POTENTIAL (OGP) AREAS CONTAINING ALL THE MINERAL BELTS OF INDIA
Copper Resources and Reserves in India

- Total **Resources** of **Copper Ore** is estimated 1510 Million tonnes - 12.16 million tonne contained copper

- **207.8** Million tonne fall under **Reserves** category- avg grade 1.2% - 2.73 million tonne contained copper

- **1302.2** Million tonne fall under **Resources** category, require further exploration
Refined Copper Production

‘000 tonne

2014: 765
2015: 791
2016: 796
2017: 845
Refined Copper - Demand

Consumption Expected to double in next 7 years
India’s copper consumption is concentrated in Electrical industry in contrast with the rest of the world which is concentrated in Building and Construction.
Per Capita Consumption

Govt. Programmes will Boost the Demand
Projected per capita refined copper consumption will be doubled in next 7 years

Metal demand ~ 1.5 million T

World Average
India in 2017
India in 2025
Growth Drivers

- Increased thrust of Govt. in “Make in India” programme which will propel manufacturing sector growth rate.

- Increased investment in Powers sector:
  - Upgradation of power distribution sector
  - Harnessing of renewable sources.

- National Motor Replacement Program: Government Initiative to replace low efficiency motors with high efficiency motors in India:

- Railways:
  - 100% electrification of rail routes 37,500 track kilometers
  - Construction of dedicated rail freight corridors - Plan construction of six freight corridors, 10,000 km of DFC traversing the entire country.
Growth Drivers

**Housing Sector**
- Housing for all leading to rapid urbanization,
- Building of smart cities - 100 Smart City scheme launched

**Transport sector**
- Highways - National Highways Development Programme approved in Oct 2017

Ports - 112 ports capacity expansion projects, involving total investment of 10 bn US$ 39 projects under implementation,

**Growing demand of consumer goods and automobiles.**
- Under the National Electric Mobility Mission Plan 2020-Target of putting 6 million electric & hybrid vehicles per year on the road by 2020.
- Penetration of Air Conditioners.
## Future copper demand in Critical sectors.

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Role of copper</th>
<th>Aproximate Annual Potential by year 2026</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power (Wire &amp; cables)</td>
<td>Most Preferred metal for conductors •Conductor for Transformers, Generators &amp; Power equipments. •House wire Cables, Building &amp; Power cables.</td>
<td>473 KT</td>
</tr>
<tr>
<td>Auto</td>
<td>Electrical application in the vehicle •Wiring Harness, casting components, internal wiring ,etc.</td>
<td>156 KT</td>
</tr>
<tr>
<td>Construction</td>
<td>Key raw material for modern architectural designs •Piping, Earthing, Plumbing, Building Wires etc.</td>
<td>36 KT</td>
</tr>
<tr>
<td>Railways</td>
<td>Electrical Transmission &amp; applications •Over head conductors, internal wiring, Rolling stock, OHE infra (High speed train, Metros etc)</td>
<td>3 KT</td>
</tr>
<tr>
<td>Consumer Goods</td>
<td>Electrical applications •Electrical Home Appliances, Pump &amp; Motors etc.</td>
<td>83 KT</td>
</tr>
<tr>
<td>Solar Energy</td>
<td>Conductor for solar energy •Solar panels, Cabling, Solar Heaters</td>
<td>32 KT</td>
</tr>
<tr>
<td>Electronics</td>
<td>Ensuring high conductivity •Specialized Wire ,Copper foils, Circular Boards etc.</td>
<td>120 KT</td>
</tr>
</tbody>
</table>
Copper today is a 8 billion US dollar industry in India having created 50,000 direct and indirect jobs and growing at a CAGR 5-7% per annum. **India has a huge growth potential in copper consumption for the next 20-25 years as the government increases focus on smart cities, rapid urbanization and investments in infrastructure.**

India is expected to be the 6th largest copper market by 2020 with major consumption sectors being - Electrical, Transport and Telecommunications. It is a strategic sector where copper demands is and will be from smart cities, power, transmission and defense. Total global consumption for copper is 26.7 million MT out of which India contributes 4% of this total as of 2014.
Challenges & Opportunities
Key Challenges (1/3)

Dependence on Imports

- Huge mismatch between India’s processing requirement and limited copper mining capacity.
- Existing custom smelters based in processing of imported concentrate.
- The domestic demand for copper is expected to double over the next 7 years, aggravating dependence on imported concentrate.
Key Challenges (2/3)

- Development and growth of copper value added product (downstream) industry to meet domestic requirements (copper foils, sheet, profiles, tubes):
  - Access to capital and technology on competitive terms
  - Skill development and quality certifications
- Up-gradation of smelting technology and processes
  - Capability to process low grade and complex concentrates in a cost effective manner
- Driving Sustainable Growth
  - Technology, feed stock & Renewable energy focus.
- Low per capita consumption of refined copper
Key Challenges (3/3)

- Raw materials quality:
  - Declining ore grades
  - Higher Impurities in concentrate
  - Wide variation

- Process/ Energy efficiency - To remain competitive:
  - Key for cost optimization
  - Precious metals and By products recovery

- Environment protection:
  - SO2 capture
  - Impurities recovery/ neutralization
  - Waste management

- Sustainability
  - Converting waste to wealth - Copper ore Tails, Copper slag, waste rock.
Opportunities
Demand Growth

- Capacity Building in base metal mining & project execution.
- Potential to develop new mines - through green field exploration.
- “Make in India” Programme - Boost to manufacturing sector.
- High growth of GDP - Create additional demand for copper metal.
- Smart City Initiatives - Boost to infrastructure.
- Opportunities to develop capacities in value added down stream segments.
Hindustan Copper Ltd – At a Glance

- Established: 9th Nov 1967
- Government of India holding: 76.05 (%)
- Listed in National Stock Exchanges

Five Operating Units:
- Six operating mines (5 u/g + 1 O/c) - combines ore capacity - 3.8 mn T
- Primary smelter & refinery - capacity 49,500 T PA
- 1 Secondary smelter & refinery plant - capacity 50,000 TPA
HCL Expansion Initiatives

- Enhance mine production capacity- (plan to quadruple its mine capacity to 20 MTPA in next 6 years) - Capex of 800 mn $ firmed up

- Exploration in existing mines for discovering additional reserves - plan 30 mn $ spend in next three years

- Beneficiation of copper tails to recover minerals - Technology developed

Resources & Reserves 623 Mt
Proved & Probable - 411 Mt
Mines Production Ramp Up

Ore '00 K tonnes

CAGR – 30%

Avg. ore grade ~ 1%
Opportunities – Upcoming Projects

- MDO contract for 3.0 MTPA mine and concentrator plant
- Tenders for mine construction incl shaft sinking, equipping and development on EPC basis.
- Up-gradation of existing beneficiation plants located at Malanjkhand (2.5 MTPA) and Khetri (1.8 MTPA).
- New Copper ore beneficiation plant of 3 Mta at Malanjkhand.
- Mine operation contract for a 5 million tonne per annum capacity mine.
Opportunities – Upcoming Projects

- Requirement of oxide copper concentrate / copper cement / low sulphur copper concentrate. The annual requirement is 80,000 tonnes.

- Indepth Exploration of our mines beyond 600 meters depth.

- Appropriate paste filing technology for backfilling Malanjkhand under ground Mine.

- Geophysical survey of leasehold area of HCL.
Thank You

India
## CoT Project Details

### Expected Results of the Proposed Plant at Malanjkhand

<table>
<thead>
<tr>
<th>Products Recovered</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper Ore Concentrate</td>
<td>360 Tonne</td>
</tr>
<tr>
<td>Gold</td>
<td>950 Gram</td>
</tr>
<tr>
<td>Silver</td>
<td>9.5kg</td>
</tr>
<tr>
<td>Silica Sand</td>
<td>5,500 Tonne</td>
</tr>
<tr>
<td>Magnetite Concentrate</td>
<td>60 Tonne</td>
</tr>
<tr>
<td>Total Rejects</td>
<td>4079.98 Tonne</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10,000 Tonne</strong></td>
</tr>
</tbody>
</table>

The processing method comprises of the following:

i. Spiral Concentration
ii. Magnetic Separation
iii. Table Concentration
iv. High Value Mineral Recovery
v. Precious Metal Recovery
### Mine Expansion Projects
#### A Snapshot

<table>
<thead>
<tr>
<th>No</th>
<th>Mine</th>
<th>Investment US$ mn</th>
<th>Scheme</th>
<th>Capacity Mta</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Current</td>
<td>After Expansion</td>
</tr>
<tr>
<td>1</td>
<td>Malanjkhand</td>
<td>402.78</td>
<td>New UG mine -Largest base metal UG mine</td>
<td>2.0</td>
</tr>
<tr>
<td>2</td>
<td>Khetri</td>
<td>55.56</td>
<td>Expansion – Increasing Depth (300mtrs)</td>
<td>0.5</td>
</tr>
<tr>
<td>3</td>
<td>Kolihan</td>
<td>62.50</td>
<td>Expansion – Increasing Depth (120 mtrs)</td>
<td>0.5</td>
</tr>
<tr>
<td>4</td>
<td>Surda</td>
<td>48.61</td>
<td>Expansion – Increasing Depth (150 mtrs)</td>
<td>0.4</td>
</tr>
<tr>
<td>6</td>
<td>Rakha</td>
<td>69.44</td>
<td>Re-opening</td>
<td>Nil</td>
</tr>
<tr>
<td>7</td>
<td>Kendadih</td>
<td>13.19</td>
<td>Re-opening</td>
<td>Nil</td>
</tr>
<tr>
<td>5</td>
<td>Banwas</td>
<td>20.83</td>
<td>Development of New Mine</td>
<td>Nil</td>
</tr>
<tr>
<td>8</td>
<td>Chapri Sideshwar-</td>
<td>69.44</td>
<td>New Mine</td>
<td>Nil</td>
</tr>
<tr>
<td>9</td>
<td>Dhubani Pathargora</td>
<td>21.53</td>
<td>New Mine</td>
<td>Nil</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>763.89</td>
</tr>
</tbody>
</table>
India’s trade map

The export growth of copper & its articles since 2010 is CAGR 6.79% whereas import growth is CAGR 17.37%.
Indian Copper Scenario
A Summary

- Indian domestic copper mine supply is the weakest link in Supply chain of copper industry and will continue to remain so.

- Under Exploration:
  - Only 20,000 sq.km. area explored out of a potential 60,000 sq.km
  - Reserve to production and reserve to resource ratio low.

- India has limited copper ore reserve contributing about 2% of world reserves.

- All major deposits were explored in sixties and seventies.

- Mining production is just 0.2% of world’s production, whereas refined copper production is about 4% of world’s production.

- Opportunity to increase ore production through expansion and green field exploration.

- Indian Refining capacity higher than local demand – net exporter of refined copper.
From above graphical representation it is clear that Urban Housing demand will be fulfilled only 54% till Q2 (2018-2019).

Factors for copper demand enhancement in India
Factors for copper demand enhancement in India

METRO RAIL PROJECTS

DELI & NCR
(Faridabad to Ballabgarh)
3.205 km | 580 crore
(Nalagarh-Dhansa)
1.18 km | 565 crore
(Kalindi Kunj-Botanical Garden)
3.062 km | 907 crore
(Noida City Centre-Noida Sec 62)
6.675 km | 1,967 crore

UTTAR PRADESH
(Noida Metro)
29.707 km | 5,503 crore

HARYANA
Rapid Metro (Private Initiative)
(Sikanderpur-Sec 56, Gurugram)
6.6 km | 2,143 crore

GUJARAT
(Ahmedabad Metro)
35.96 km | 10,773 crore

MAHARASHTRA
(Pune Metro)
31.254 km | 11,420 crore

UTTAR PRADESH
(Lucknow Metro)
28.88 km | 6,928 crore

MAHARASHTRA
(Nagpur Metro)
38.22 km | 8,680 crore

TAMIL NADU
(Chennai Metro)
9.05 km | 3,770 crore

During 2014-18, Metro Projects with total length of 195 km have been approved at a cost of ₹1,183 crore.
"The Ministry of New and Renewable Energy (MNRE) has planned a detailed trajectory so as to meet the target of **100 GW by 2022**. A capacity of 23.12 GW was already installed up to July 2018. Projects of around 10 GW are under implementation and tenders for additional 24.4 GW have been issued," Power and New and Renewable Energy Minister R K Singh said in a written reply to the Rajya Sabha.

Karnataka topped the installed solar energy capacity chart at 5.16 GW followed by Telangana at 3.4GW and Andhra Pradesh at 2.56 GW as on July 31, 2017, the minister noted.

National Institute of Solar Energy (NISE) has assessed the solar power potential of the country at 748 GW.

Solar energy output in the country was 25.87 billion units in 2017-18, which was higher than 13.49 billion units in 2016-17, 7.44 billion units in 2015-16 and 4.59 billion units in 2014-15, it stated.
Prime Minister Narendra Modi on Sept 07, 2018 declared that the government will soon come out with a policy on electric vehicles and alternative fuel technology to give a thrust to e-mobility in India.

The Prime Minister called the industry to invest in the manufacturing of electric vehicles and the required charging infrastructure. “Charge mobility is the way forward, we want to drive investment into batteries to smart cities to electric mobility, The Prime Minister’s comments come in the backdrop of demand from almost all domestic and international automakers for a policy roadmap on electric vehicles so that investments can be planned.

India originally had the ambition of having all new vehicles on Indian roads powered by electricity by 2030. This, however, has been scaled down to 15% of total vehicle sales in the next five years which is realistic and achievable target.
Sales of electric vehicles to 2035

Source: Wood Mackenzie, Product Markets Service
# Material intensity factors in electric vehicles

<table>
<thead>
<tr>
<th>Increase Cu</th>
<th>Decrease Cu</th>
</tr>
</thead>
</table>
| **Battery** | • Higher energy density chemistries (NMC)  
• Thinner current collectors (thinner Cu foil) |
| • Larger battery capacity  
• Increasing EV range  
• Number of cells/pouch, more Cu foil layers  
• Smaller cells  
• Number of modules, more busbar connections |
| **Electric Motor** | • Permanent magnet motors  
• Aluminium as substitute |
| • Induction motor  
• Cu rotor |
| **HV Wire** | • Wiring cooling  
• Power electronics switches  
+ Powertrain Integration  
+ Lower voltage (48V) |
| • Higher Power  
• +Larger vehicle (Bus) |
| **LV Wire** | • Printed electronics  
+ Wireless sensors |
| • More electronics  
+ Energy Harvesting |
India's Imports of Copper Ores & Concentrates (Kilotonnes)

- 2010: 2323.44
- 2011: 2190.19
- 2012: 2290.04
- 2013: 2040.16
- 2014: 2371.44
- 2015: 2402.51
- 2016: 2372.37
- 2017: 2471.00
ICSG (International Copper Study Group) conference at Lisbon, Portugal

Copper Production – Smelting/Refining

‘000 tonnes

India is a Net exporter of Refined Copper
## HCL Operating Units

### Khetri Copper Complex (KCC)
- **State:** Rajasthan
- **Inception:** 1967
- **Facility:** Mining (underground), Beneficiation, Smelting & Refining
- **Product:** Copper Concentrate & cathode
- **Capacity:** Ore -1.0 mn tonnes p.a.
  - Cathode - 31,000 tonnes p.a.

### Indian Copper Complex (ICC)
- **State:** Jharkhand
- **Inception:** 1924, Nationalized in 1972
- **Facility:** Mining, Beneficiation Smelting & Refining
- **Product:** Copper concentrate & cathode
- **Capacity:** Ore -0.4 mn tonnes p.a.
  - Cathode - 18,500 tonnes p.a.

### Gujarat Copper Project (GCP)
- **State:** Gujarat
- **Acquisition:** 2015
- **Facility:** Copper smelting & Refining
- **Product:** Copper cathode
- **Capacity:** Cathode – 50,000 tonnes p.a.

### Malanjkhand Copper Project (MCP)
- **State:** Madhya Pradesh
- **Inception:** 1982
- **Facility:** Mining (opencast), Beneficiation
- **Product:** Copper Concentrate
- **Capacity:** Ore -2.0 mn tonnes p.a.

### Taloja Copper Project (TCP)
- **State:** Maharashtra
- **Inception:** 1988
- **Facility:** Continuous casting
- **Product:** Copper wire rod
- **Capacity:** 60,000 tonnes p.a.