Special Feature 1

Sustainable Copper Vision

The JX Nippon Mining & Metals Vision for Sustainable Copper

Why is Copper Required?

Copper is an essential material for achieving carbon neutrality, thereby copper suppliers and users are regarded as Green Enablers.

Upstream Change in Power generation mix

Power generation mix reliant mainly on fossil fuels such as coal and gas > Emergence and expansion toward renewable energy sources such as wind and solar power

4x Renewable energy requires about four times more copper per MW of generating capacity than fossil fuels

- Fossil fuels: Up to 1 ton/MW
- Renewable energy: Up to 4 tons/MW

Mid-Stream Expanded transmission and distribution

Power supply through centralized transmission and distribution systems of electricity > Transmission to decentralized transmission and distribution systems

2x Decentralized network requires about twice as much copper as compared to the conventional supply grid

- Centralized: Up to 10 tons/km
- Decentralized: Up to 20 tons/km

Downstream Shift in electricity usage

Vehicle design and supply chain creation using internal combustion engines as the energy source > Conversion of energy sources in connection with the spread of environmental friendly vehicles (EVs, FCVs*, etc.)

*Fuel cell vehicles

4x Electric Vehicles incorporate and use about four times more copper than internal combustion engine vehicles

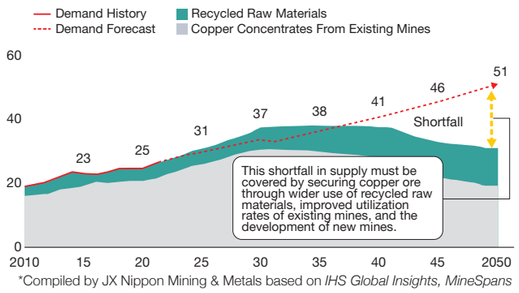
- Internal combustion engine vehicles: 24 kg/vehicle
- Electric Vehicles: 94 kg/vehicle

What is Sustainable Copper?

Meeting increasing demand for copper requires an increased supply of copper ore and recycled raw materials

While demand for copper will continue to grow over the long term, the supply of copper ore and recycled raw materials from existing mines is limited, and the supply-demand balance for copper is likely to be very unstable. This delicate balance is why copper ore and recycled raw materials will be essential in meeting the demand for copper, without which the world cannot achieve decarbonization.

Projected Future Demand by Source (Refined Copper, Units: Millions of tons)



*Compiled by JX Nippon Mining & Metals based on *IHS Global Insights, MineSpans*

KEYWORDS

Carbon Footprint (CFP): The amount of greenhouse gas emissions throughout the entire life cycle of a product or service, from procurement of raw materials to disposal and recycling, converted to CO_2

Green Hybrid Smelting for Sustainable Copper that fulfills two missions

Achieving Two Missions in Parallel

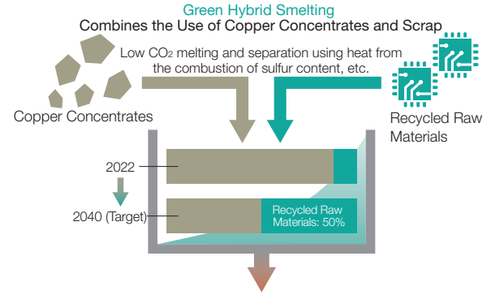
Offer a Stable Supply System to Support Growing Demand

Conduct ESG-Oriented Production and Supply (Decarbonized, Circular Economy, Etc.)

- **Stable Supply Capacity**
  Ensure stable supply capacity to meet growing copper demand by a hybrid combination of copper concentrates and scrap raw materials
- **Reduce Carbon Footprint (CFP)**
  Maximize the utilization of heat from the combustion of sulfur content, etc., contained in copper concentrates and use renewable energy in mines and smelters, etc.
- **Increase Percentage of Recycled Raw Materials**
  Increase the percentage of recycled raw materials (input ratio of raw materials or content ratio in products) to 50% or more through technological development, the establishment of a raw materials collection system, etc.
- **Promote Responsible Procurement**
  Acquire the Copper Mark* (industry ESG standard), etc.
- **Make Capital Investments**
  Continue to invest in facilities to increase production of high-performance copper products that support higher percentages of recycled raw materials, greater energy efficiencies, etc.

* In March 2022, the Saganoseki Smelter & Refinery and Hitachi Works of JX Metals Smelting Co., Ltd. began procedures to obtain Copper Mark certification. Copper Mark is an international accreditation for responsible copper production. This is the first attempt by a company in the Japanese nonferrous metal industry to earn this accreditation.

Green Hybrid Smelting



JX Nippon Mining & Metals Copper Products

We supply copper products through Green Hybrid Smelting. Both copper concentrates and scrap can be used as raw materials. The heat generated by the copper concentrates itself can be used to melt recycled materials, making fossil fuels virtually unnecessary.

Green Hybrid Smelting has been selected as one of the 26 most noteworthy examples of Japan's circular economy initiatives in *Case Studies (2022)* published by the Japan Partnership for Circular Economy, which was established by the Ministry of the Environment, the Ministry of Economy, Trade and Industry, and Keidanren.

What Measures Will We Take?

We will pursue four measures to evolve and gain wider use of Sustainable Coppers.

1 Reduce CFP

Reduce CFP in Copper concentrates mining and the transportation value chain
- Convert construction equipment used in mines to electric power
- Use electricity derived from renewable sources
- Improve efficiencies and optimize transportation, etc.

2 Increase recycling ratios

Develop technologies to increase the ratio of recycled raw materials for copper products and bolster raw materials collection systems
- Develop technologies to increase the ratio of recycled raw materials
- Expand facility capacity to increase recycled raw materials collection, etc.

3 Promote responsible procurement and other measures

Engage in a wide range of ESG measures, including sustainable sourcing, and certification acquisition
- Pursue measures that consider and encourage global environmental conservation, human rights, and contributions to local communities
- Acquire Copper Mark and other certifications that meet ESG standards set by the International Copper Association (ICA)

4 Form Green Enabling Partnerships

Evolve and gain wider use of sustainable copper
- Form partnerships with companies that work together to promote sustainable copper, and accelerate the transition to decarbonized and circular economies
- Engage in product and scrap collection, raw materials reuse, and joint technology development with partners, etc.

Four Measures to Evolve Sustainable Copper

1 Reduce CFP

Reduce Scope 1 and 2 CO_2 emissions

We are striving to reduce Scope 1 CO_2 emissions (fuels and industrial processes) through energy conservation, fuel conversion, and carbon capture and recycling. In connection with Scope 2 emissions (electricity), we completed the switch to CO_2-free electricity or renewable electricity sources at the Caserones Copper Mine, the Saganoseki Smelter & Refinery and Hitachi Works operated by JX Metals Smelting Co., Ltd., and other major sites in Japan and overseas. We reduced CO_2 emissions significantly as a result of these efforts. We are also considering the generation of our own renewable energy sources.

Reference Special Feature 2: The JX Nippon Mining & Metals Group Climate Change Strategy ⇒ P37

The Caserones Copper Mine has reduced CO_2 emissions significantly by switching to electricity derived from renewable sources

Scope 3 CO_2 Emissions Reduction

The JX Nippon Mining & Metals Group strives actively to reduce Scope 3 CO_2 emitted from other companies within our supply chain. For example, the Group is considering a conversion to EVs and FCVs, latest technologies for transportation (see below), and the introduction of alternative fuels in connection with our logistics activities. Mines other than the Caserones Copper Mine in which we have an equity stake are pursuing CO_2-free electricity and the electrification of heavy machinery.

Case Study: New Technologies in Ocean Transportation

In collaboration with BHP, a major mineral resources company, we are looking into installing rotor sails on the KORYU, the JX Nippon Mining & Metals Group copper concentrates and sulfuric acid cargo ship. Rotor sails are a type of ship propulsion mechanism that uses the Magnus effect to convert pressure differences generated by the rotating cylinders on the hull into dynamic lift. We expect this mechanism to reduce CO_2 emissions by 5% as a result of fuel savings. Final safety verifications are underway, and we expect to install and begin operations in summer 2023 at the earliest.

KORYU After the Installation of Rotor Sails

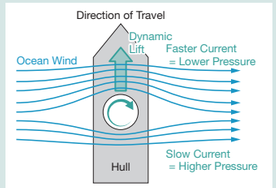


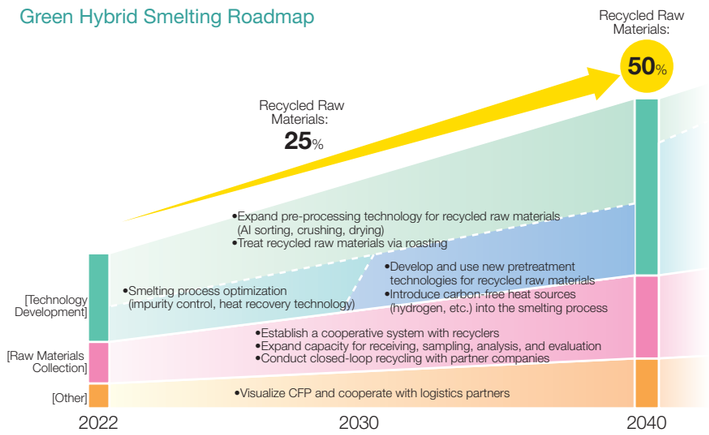
Image of Magnus Effect

Dynamic lift is generated when the wind strikes a rotating object

2 Increase recycling ratios

Our flash smelting furnace process not only uses the reaction heat of the raw copper concentrates efficiently to dissolve raw materials, but also uses the excess reaction heat to melt the recycled raw material, eliminating the need for fossil fuels or other resources. We pursue the optimal combination of copper ore and recycled materials through our Green Hybrid Smelting to achieve sustainable production of copper. Here, we aim to evolve Green Hybrid Smelting that uses 50% or more recycled raw materials (input ratio of raw materials or content ratio in products) by 2040. The table on the right shows specific issues and measures.

Green Hybrid Smelting Roadmap



Case Study: Expanding Raw Materials Collection Systems

(1) Using AI to physically sort e-waste (waste home appliances and electronic devices) at the Hitachi Works
(2) Expanding raw materials collected at the JX Metal Smelting Co., Ltd. Oita Recycling Logistics Center
(3) Increasing the collection of raw materials by expanding our recycling center in Taiwan (Changpin Recycle Center)
(4) Acquired all shares of eCycle Solutions Inc., Canada's largest e-waste collection and processing company

eCycle
For a better world.

3 Promote responsible procurement and other measures

The Saganoseki Smelter & Refinery and Hitachi Works operated by JX Metals Smelting Co., Ltd. are working toward Copper Mark certification under an audit of 32 ESG criteria (see list at right) as defined by the International Copper Association (ICA).

Saganoseki Smelter & Refinery, JX Metals Smelting Co., Ltd.

Hitachi Works, JX Metals Smelting Co., Ltd.

The Group is also bolstering ESG initiatives by conducting activities in accordance with the RBA Code of Conduct. Of the sites that underwent VAP audits to assess compliance with the RBA Code of Conduct, the Isohara Works and the Chigasaki Plant of Toho Titanium Co., Ltd. received a perfect score of 200 points, being awarded Platinum status, the highest status under the RBA certification program.

1. Compliance with laws and regulations
2. Ethics
3. Stakeholder engagement
4. Supplier relations
5. Child labor
6. Forced labor
7. Freedom of association and collective bargaining
8. Discrimination
9. Gender equality
10. Work hours
11. Remuneration
12. Occupational health and safety
13. Grievance system
14. Environmental risk management
15. Greenhouse gas emissions
16. Energy consumption
17. Water management and conservation
18. Waste management
19. Deposition site management
20. Contamination, pollution
21. Biodiversity, protected areas
22. Mine closure planning
23. Community health and safety
24. Community development
25. Small-scale mining
26. Human rights
27. Security and human rights
28. Indigenous rights
29. Land acquisition and resettlement
30. Cultural heritage
31. Mineral resources supply chain due diligence
32. Transparency and disclosure

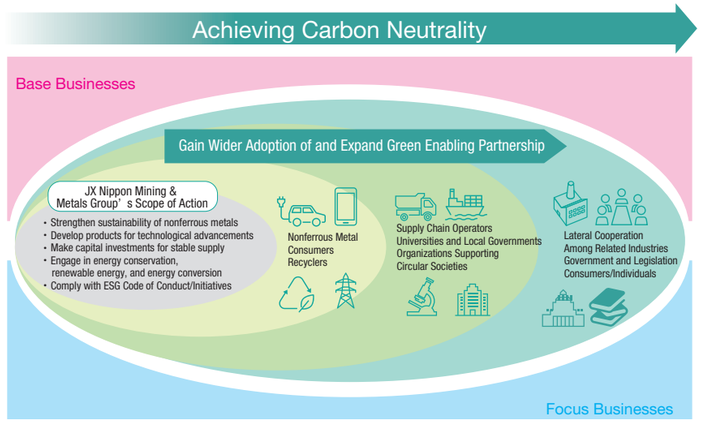
4 Form Green Enabling Partnerships

We form Green Enabling Partnerships with companies who work together to promote sustainable copper. Through these partnerships, we accelerate the transition to decarbonized, circular economies as well as engage in product and scrap collection, the raw materials reuse, and joint technology development.

GREEN ENABLING PARTNERSHIP

Green Enabling Partnership Logo

Green Enabling Partnership Concept



KEYWORDS

Scope 1: Direct greenhouse gas emissions from in-house fuel use and industrial processes
Scope 2: Indirect greenhouse gas emissions from the use of electricity, heat, and steam supplied by other companies
Scope 3: Greenhouse gas emissions of other companies related to business activities (e.g., use and disposal of products) other than Scope 1 and Scope 2
Responsible Business Alliance (RBA): An industry association consisting mainly of electronics manufacturers and their suppliers, including many of our customers in the advanced materials field. The RBA works to improve social, environmental, and ethical aspects of the global supply chain