

Mineral Resources Policy for Achieving Carbon Neutrality in 2050

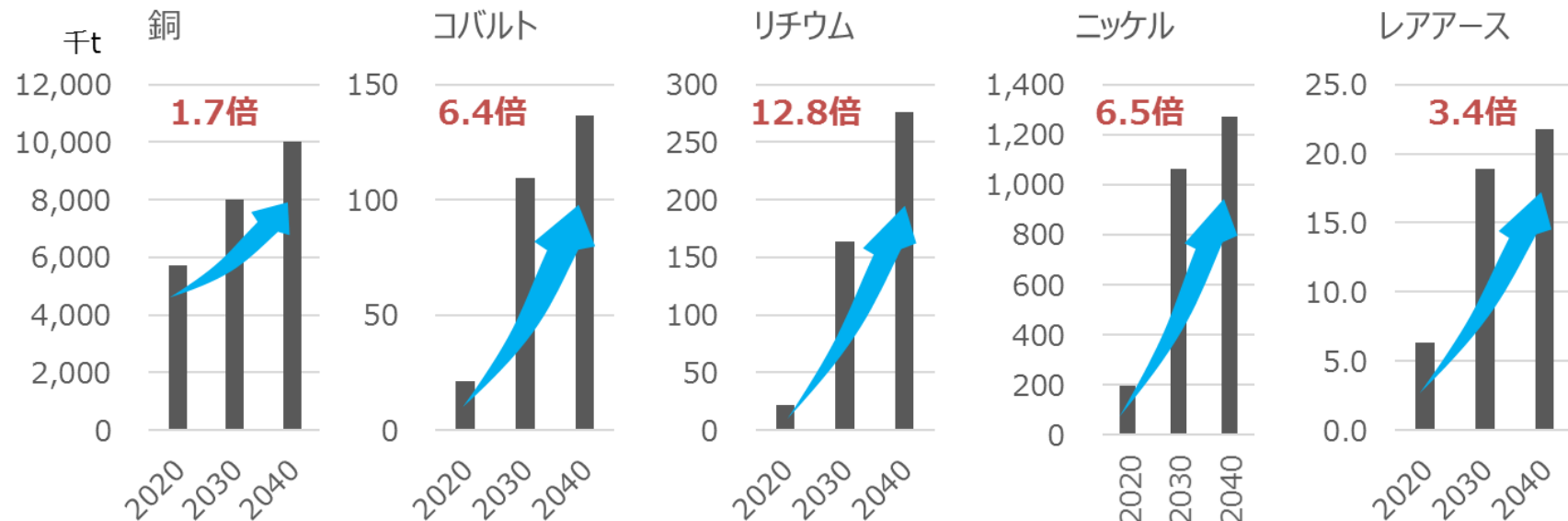
**Mineral and Natural Resources Division
Natural Resources and Fuels Department
Agency for Natural Resources and Energy**

(1) Recent Trends in Critical Minerals

(2) Future Direction in the Sixth Strategic Energy Plan

IEA Special Report on Critical Minerals

- In May 2021, the IEA released its first comprehensive special report on mineral resources, "Report on the Role of Critical Mineral Resources in the Clean Energy Transition."
- This report analyzes the demand outlook for copper, lithium, nickel, cobalt, and rare earths, which are important for renewable energy and other related technologies for the energy transition, by climate change action scenario.
- It also presents the challenges of securing a stable supply of mineral resources and policy advice for the realization of a decarbonized society.



Critical Materials and Minerals Meeting

- **The Critical Materials and Minerals Meeting** (formerly the Japan-U.S.-Europe-Europe Trilateral Critical Materials Meeting) started in 2011, mainly due to the price of critical materials (especially rare earths) beginning to rise in 2010. As part of Japan-U.S.-Europe-Australia-Canada cooperation, the meeting is held regularly to exchange information on policies, research and development, etc. related to critical materials.
- **In 2021, Japan will chair** the 11th meeting in June and the 12th meeting will be held online in December, jointly with the governments, universities, research institutes, and other related organizations in the U.S., Europe, Australia, and Canada.



The 11th meeting



The 12th Meeting

Policy Trends on Critical Minerals by countries <U.S.>

- U.S. efforts related to critical minerals have bipartisan support in Congress, and the policy direction is not expected to change after the change of administration.
- Japan continues to work with the U.S. to build a reliable and robust supply chain.



The Biden administration also plans to continue to strengthen the supply chain for critical minerals.

■ **Presidential Decree to Strengthen Supply Chain Resiliency:**

In June 2021, the U.S. Biden Administration released the results of the 100-day review based on the Supply Chain Presidential Decree signed in February. Short-term responses, long-term strategies, etc. are organized for the four target areas (semiconductors, batteries, critical minerals, pharmaceuticals, etc.). The Secretary of Defense is in charge of critical minerals, including rare earths. Recommendations for the mineral resources sector include (1) development of sustainability criteria, (2) promotion of recycling, (3) industry support programs, (4) dialogue with industry stakeholders, (5) promotion of research and development, and (6) enhancement of stockpiling. (6) Enhancement of stockpiling, and (7) Strengthening of alliances with allies and partners and transparency in the international supply chain.

Policy Trends in on Critical Minerals by countries <EU>

- The EU is planning to establish a circular supply chain for critical minerals with third countries such as Canada and Africa, in addition to within the region.
- The EU is aiming to create international rules to counter the production of inexpensive critical minerals and materials, and it is important for Japan to cooperate in this area.



Promote the establishment of supply chains within EU as part of the drive to decarbonize the region, attracting related companies to the region.

Action Plan for Critical Raw Materials (Critical Minerals)

In September 2020, the European Commission published its Action Plan for Critical Raw Material (Critical Raw Material). Recognizing that "the transition to a green and digital economy and Europe's strategic independence require a diversified, sustainable, socially responsible, recyclable, and innovative supply chain for critical raw materials," the plan calls for (1) the creation of robust supply chains (mainly within the EU), (2) the recycling of resources, sustainable products, and innovation, and (4) diversification of resource procurement from third countries (Canada, Africa, etc.).

Policy Trends on Critical Minerals by countries <China>

- Since positioning rare earths as a national strategic commodity in the 1990s, China has been consolidating its rare earth industry to strengthen industrial competitiveness, protect the environment, and strengthen control of illegal mining. The country has gradually consolidated about 100 companies, including small and medium-sized enterprises, and reorganized them into six major groups in 2014. In September of this year, three of these groups announced plans to merge. It is expected that the group will be reorganized into the Beifang Rare Earth Group and other two major groups.



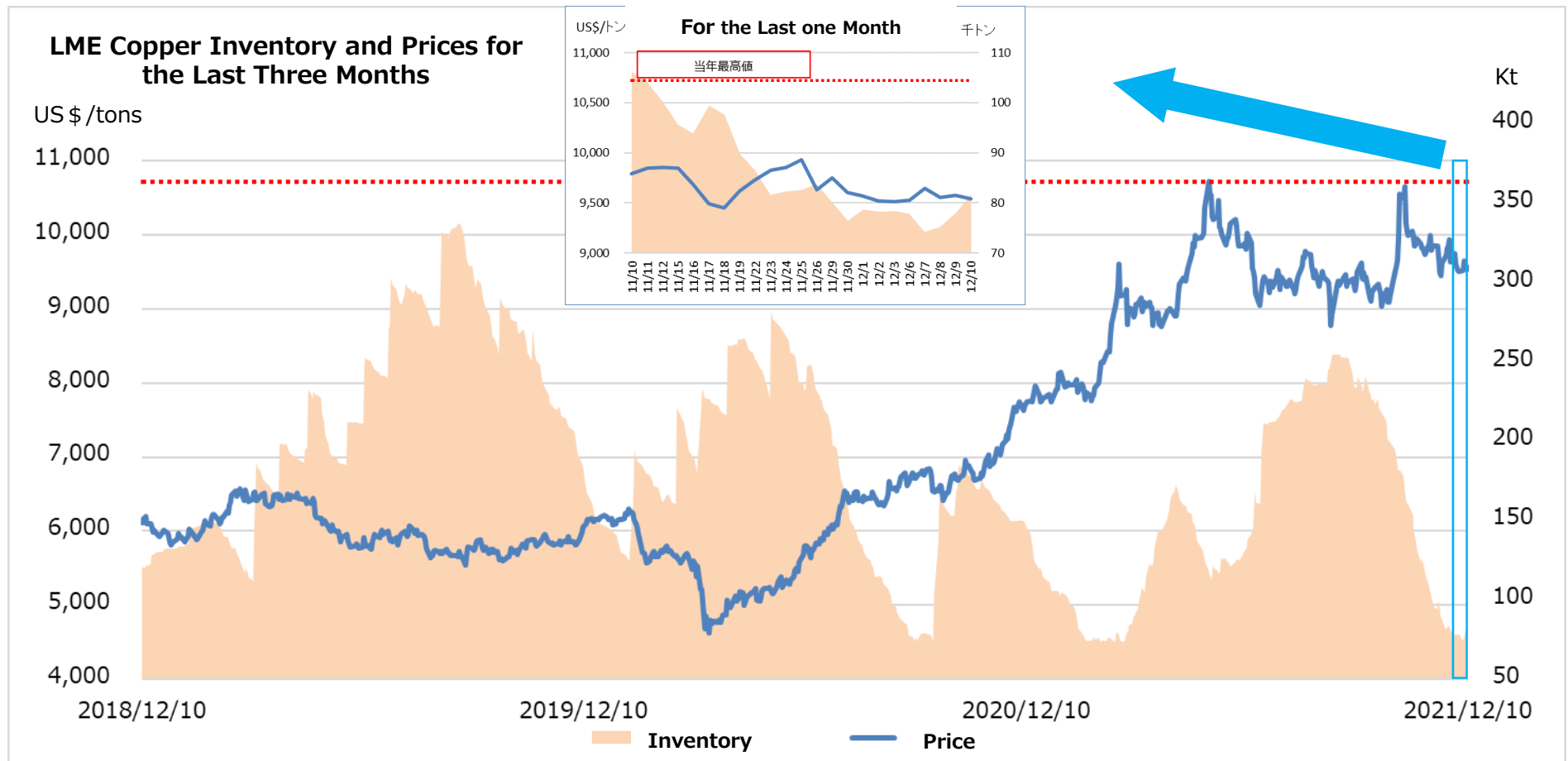
Promoting the enhancement of competitiveness through the consolidation of the domestic rare earth industry and the upgrading of the lithium-ion battery industry.

■ Merger of three rare-earth-related companies in China

In September 2021, rare-earth giant Wu Mining Rare Earth (CMRE) announced that its parent company, Wu Mining Group, is "negotiating a strategic restructuring of rare-earth-related assets" with aluminum giant Chinalco and the government of Luzhou City, Jiangxi Province.

Copper Price Trends

- Reached record highs in May 2021 due to supply concerns over the prospect of a mining strike and new mining royalty bill in Chile and inflows of speculative funds, etc. In mid-October 2021, supply concerns over power shortages in China and soaring global energy prices, as well as tight inventories influenced by speculators, led to a temporary sharp rally.

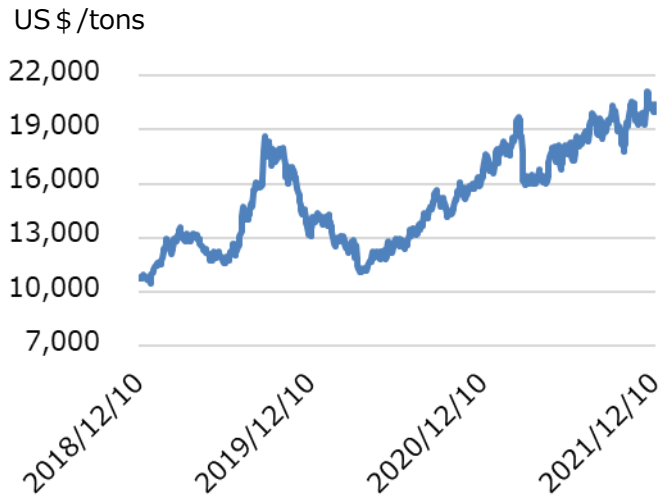


Trends in battery metal prices

- Nickel, lithium, and cobalt prices continue to rise as demand for EVs is expected to grow.
- LFP-type lithium-ion batteries, which do not use nickel and cobalt, are rapidly gaining popularity in China.
- Since lithium is required for all types of lithium-ion batteries, the price increase is sharp.

<Nickel

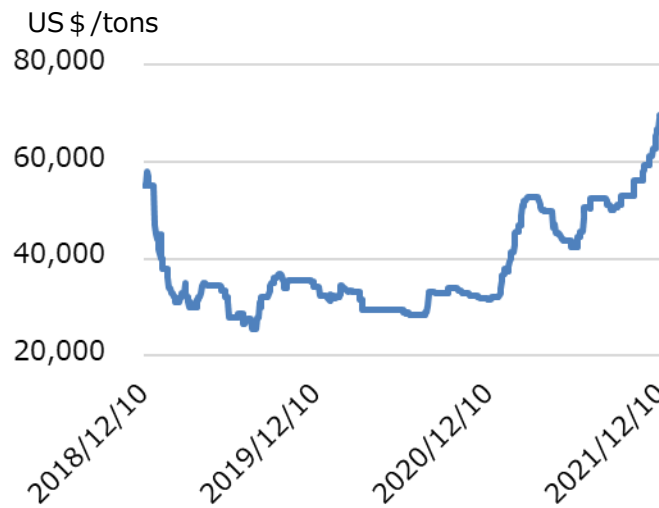
Nickel prices for the past three years



Main applications are special steel (stainless steel), lithium-ion batteries (cathode materials), magnetic materials (speakers, monitors, etc.)

<Cobalt

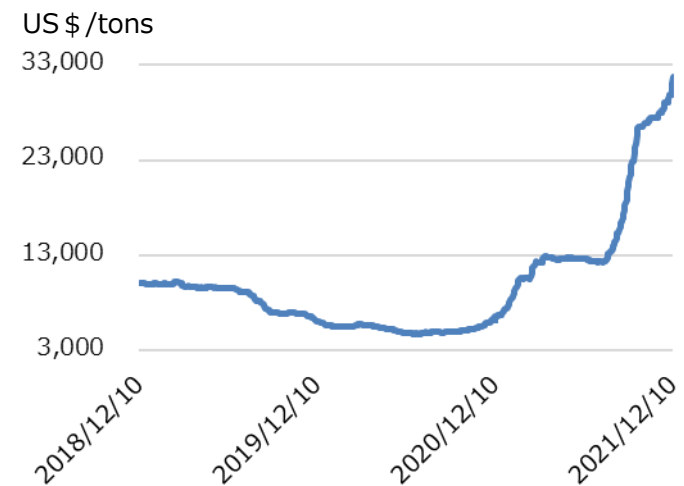
Cobalt prices for the past three years



Main applications are lithium-ion batteries (cathode materials) and super alloys (turbine blades).

<Lithium

Lithium prices for the past three years

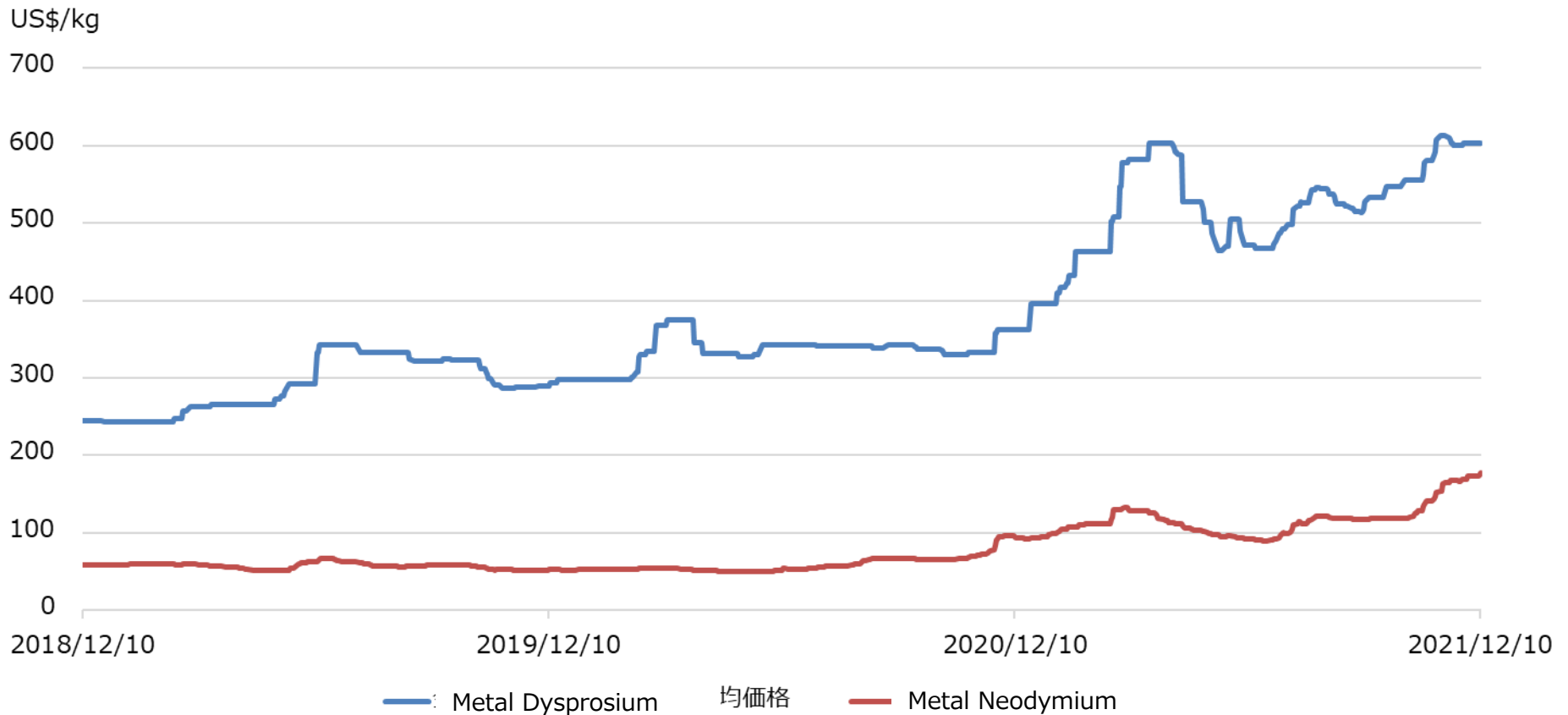


Main applications are lithium-ion batteries and additives for glass

Trends in Rare Earth Element Prices

- **For rare earths**, supply concerns due to the enforcement of China's Export Control Law and other factors from the first half of 2021, as well as strong domestic demand for EVs in China, pushed up prices

Rare earth Prices for the Last Three Months



Major applications include permanent magnets and motors (electric vehicles, etc.), glass additives and abrasives, ceramics, capacitors, filters, sensors (electronic and electrical products), catalysts (for oil refining and automotive exhaust gas)

(1) Recent Trends in Critical Minerals

**(2) Future Direction in the Sixth
Strategic Energy Plan**

Positioning in the Sixth Strategic Energy Plan (related to mineral resources)

Quote

“5. Toward 2030 with a view to 2050 Policy Responses

(9) Promotion of securing a stable supply of energy and mineral resources with an eye toward a carbon-neutral era

(vi) Securing mineral resources

- The government will strengthen risk money support to secure the mineral resources needed to realize a carbon neutral society.
- The government will increase support for smelters to strengthen the supply chain.
- The government will support efforts to maximize the use of recycled resources.
- The government continues to work on stockpiling rare metals.

(vii) Promote measures for energy and mineral resources in domestic offshore areas, etc.

- The government will promote the establishment of production technologies for seabed resources.”

Strengthen JOGMEC's financial support to achieve carbon neutrality

- Considering the demand of some minerals will be becoming sharp to achieve carbon neutrality, JOGMEC will provide additional risk money support.

Menu	Existing condition
Exploration Loan	Loan Ratio Base metal: 70% Rare metals and uranium: 80%
Equity financing in exploration	Equity ratio: up to 50%
Overseas development debt guarantees	Guaranteed percentage: 90% Min. Guarantee fee: 0.4-1.55%
Equity financing in overseas metal mining	Equity ratio: up to 50%

◆ Direction for Strengthening Support

- Increase JOGMEC's equity ratio.
- Support low-carbon initiatives in overseas mining and other projects involving Japanese companies.



Battery
**Lithium, cobalt
Cerium etc.**

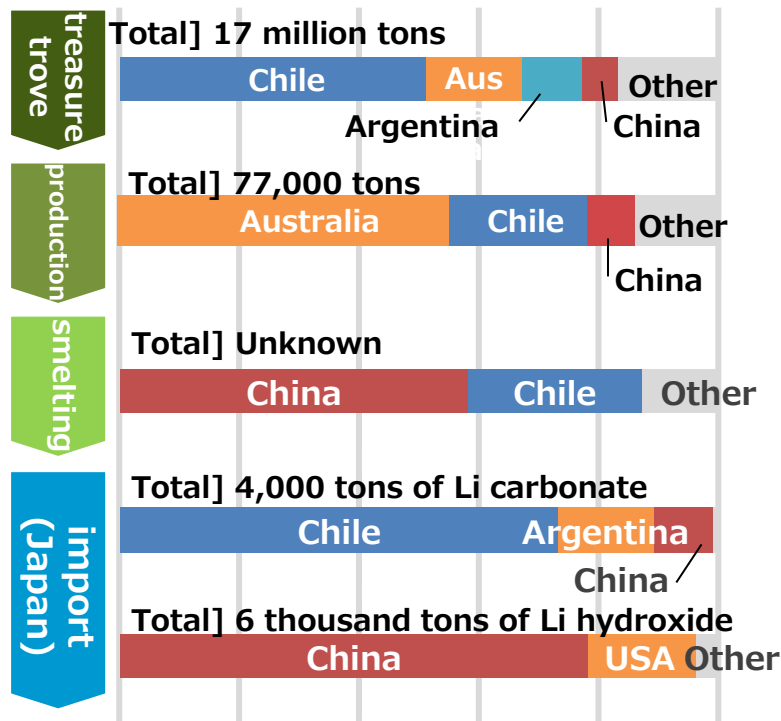


Drive motor
Neodymium
Dysprosium, etc.

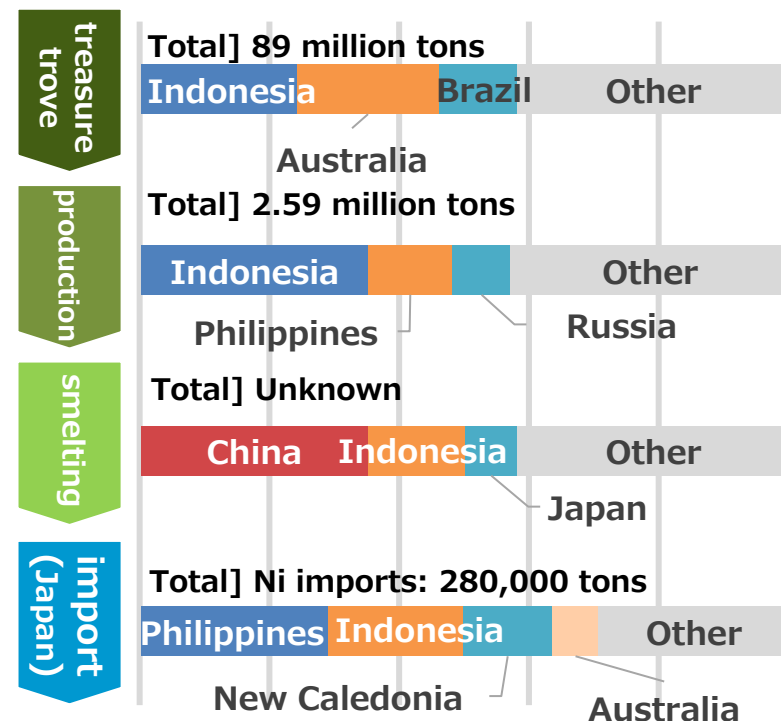
Direction of JOGMEC to strengthen supply of risk money (1)

- In addition to resource development risk, the projects targeting rare metals have significant risks such as demand fluctuation, and the number of companies that can proactively invest in mining is limited. For this reason, it may be necessary to strengthen risk money support for rare metals so that JOGMEC can provide investment support more than 50%, while taking into account the risk status of individual projects.

Supply Chain Status [Lithium]



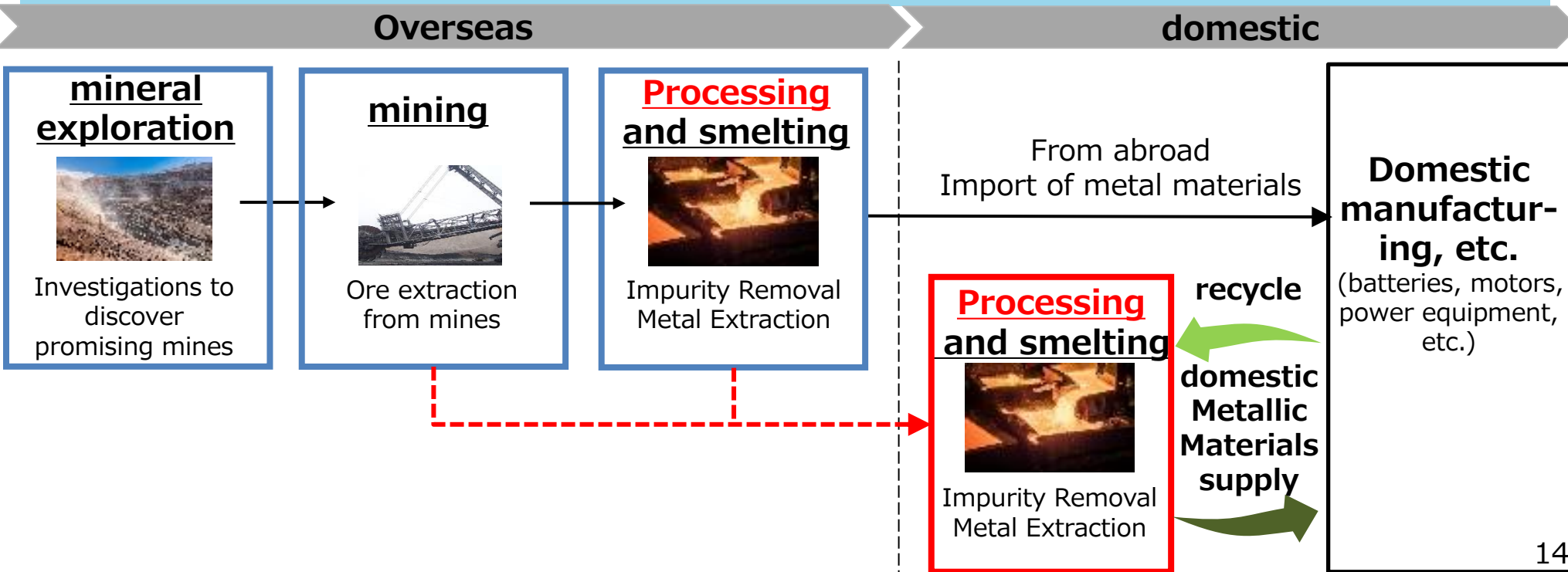
Supply Chain Status [Nickel]



[Source] Reserves and production: USGS 2020; smelting: IEA; imports: Trade Statistics 2019.

Direction of JOGMEC to strengthen supply of risk money (2)

- Domestic smelters are the cornerstone of the mineral resources supply chain, performing diverse functions such as supplying high-quality metal ingots, recovering rare metals as by-products, and recycling resources through recycling.
- Risk money support for domestic processing and smelting operations may also be necessary to reduce the risk of resource supply from overseas, promote the recycling of useful resources contained in used products, etc., and realize a stable supply of minerals to domestic manufacturing industries.



Development of Domestic Marine Resources (1)

Sea-floor polymetallic sulphides

- Potential has been identified in the relatively shallow seafloor in the waters around Okinawa and Izu/Ogasawara.
- To develop production technology, the world's first successful mining and pumping pilot test was conducted in 2017.

[Underwater submarine polymetallic sulphides]



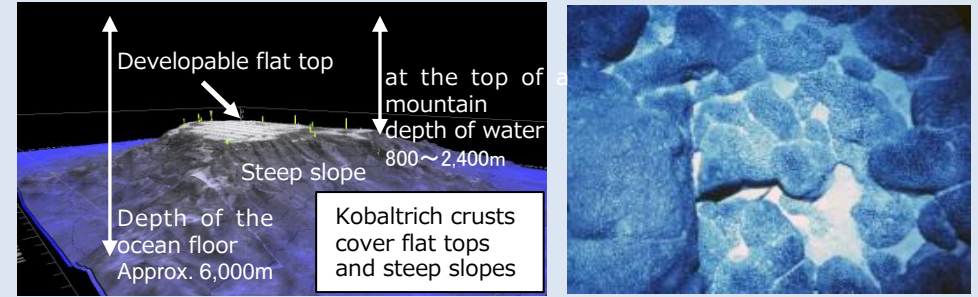
Image of technology development



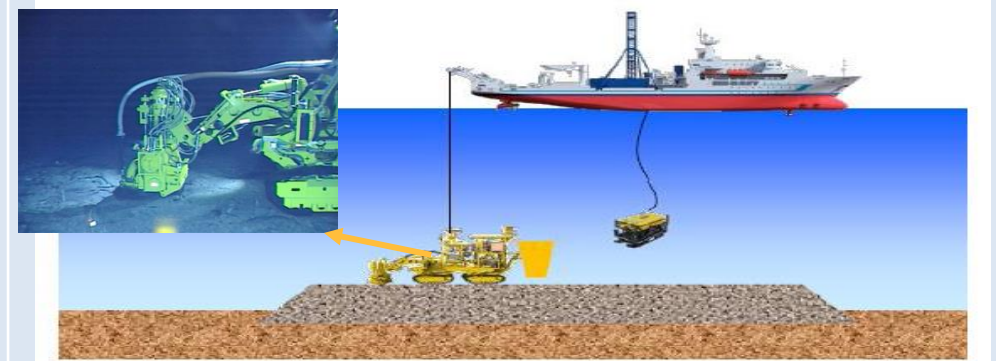
Cobalt-rich crust

- In 2020, drilling performance tests were conducted at Takuyo No. 5 kaishan, and the company succeeded in recovering ore pieces containing rare metals such as cobalt and nickel for the first time in the world.

[Cobalt-Rich Crust Presence.]

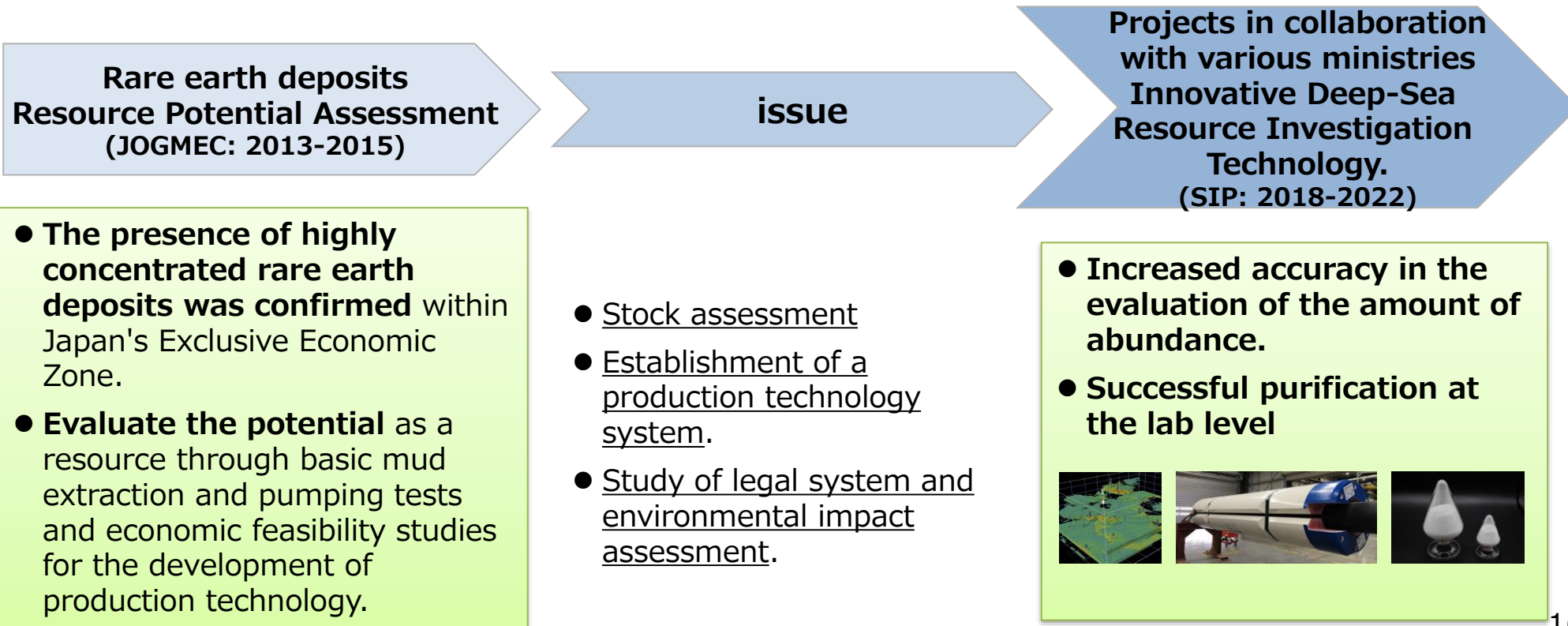


[Drilling performance test].



Development of Domestic Marine Resources (2)

- In recent years, the potential for rare earth mud has been identified in the western Pacific.
- Rare earth elements had not been expected to be developed domestically so far, and therefore, under the current Mining Law, rare earth elements were not subject to the establishment of mining rights (prospecting rights, mining rights).
- It is necessary to establish a system to ensure that these domestic resources are properly maintained and managed, and that they are developed by appropriate development entities.

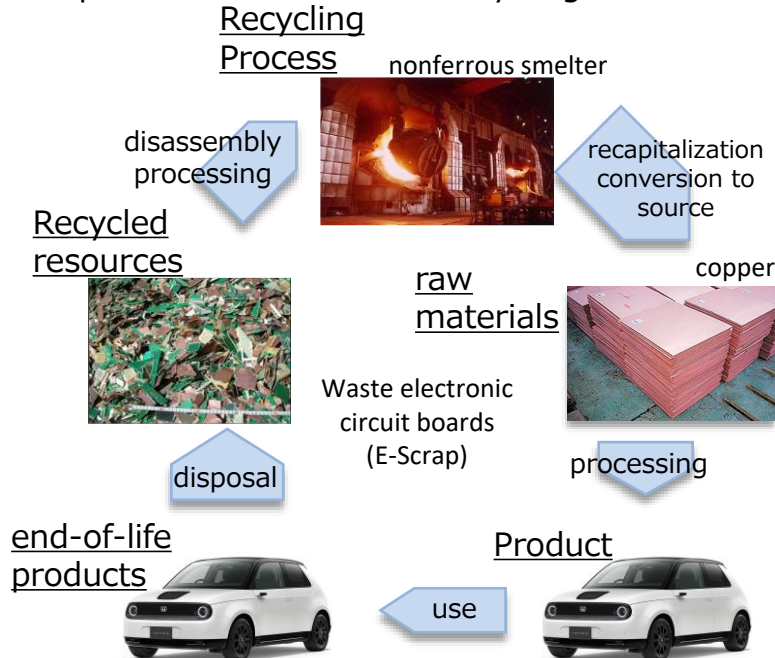


Understanding material flow, including recycling

- To ensure a stable supply of copper and rare metals, it is important to promote a shift to a resource-recycling society in the nonferrous metals sector by maximizing the use of recycled resources as well as primary resources such as ores. However, data on metal recycling is not well developed.
- JOGMEC will conduct a survey on material flow related to metal recycling in Japan to lay the foundation for considering necessary policies.

Survey to understand material flow including recycling

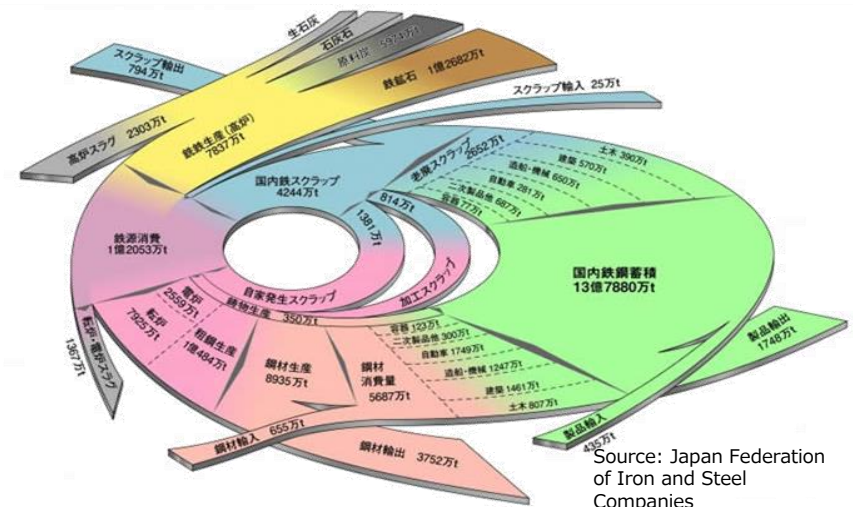
<Example of material flow for recycling



Source: Honda Motor Company, Japan Mining Industry Association, Sumitomo Metal Mining Co

output

<Existing Material Flow Analysis
Steel Circulation Chart in Japan



Referring to existing material flow analysis in other industries, we will

Create material flow including nonferrous mineral resource stock 17