

Initiatives to Promote the 3Rs (Reduce, Reuse, Recycle)

Basic Approach

As part of our efforts to contribute to the development of a recycling-oriented society, the JXTG Group promotes the effective use of resources and the reduction, reuse, and recycling of waste within the Group. We also contribute to waste reduction and resource recycling in greater society through our recycling and environmental services business.

For information on our environmental management structure, see pp. 28–29. Information on our targets can be found in the Medium-Term Environmental Management Plan section on p. 28.

Major Initiatives

Industry-Academia Collaboration

In recent years, the number of researchers and engineers in Japan working in fields related to smelting, refining and recycling nonferrous metals has been declining. In response to this situation, JX Nippon Mining & Metals, in collaboration with the Institute of Industrial Science, the University of Tokyo, launched the Endowed Unit for Nonferrous Metal Resource Recovery Engineering (JX Metals Endowed Unit) with the aim of unifying the forces of industry, academia and government to energize the industry and raise the level of its efforts. Through industry-academia collaboration, the JX Metals Endowed Unit carries out various initiatives for the development of human resources to work on the utilization and development of smelting and refining technologies and in the fields of nonferrous base metals and rare metals.

For details, see pp. 76–81 of Sustainability Report 2018 published by JX Nippon Mining & Metals.

Research and Development Initiatives

JX Nippon Mining & Metals built a testing facility in Tsuruga City, Fukui Prefecture in 2010 to develop recycling technologies for lithium ion batteries. It is now working on developing technologies for recovering rare metals such as cobalt and lithium from these batteries.

For details, see pp. 82–83 of Sustainability Report 2018 published by JX Nippon Mining & Metals.

Initiatives to Reduce Waste ♥

In fiscal 2017, waste totaled 1.535 million tons, and landfill waste after recycling and reuse efforts totaled 9 thousand tons, a reduction of 2 thousand tons versus the previous fiscal year. The waste-to-landfill ratio was 0.6%, indicating that we continue to achieve zero emissions (waste-to-landfill ratio of less than 1%).

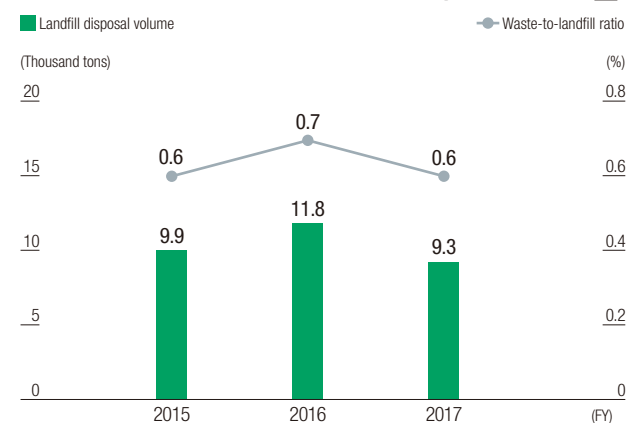
Specific initiatives for waste reduction include transforming the collected particulate matter and sludge released from oil refineries back into raw materials for cement, and the repeated use of neutralized slag¹ at our smelting and refining facilities.

In addition, we use LCA methodology² in evaluating the development of certain lubricant products.

Zero emissions has also been highlighted as a Group objective in the JXTG Group Medium-Term Environmental Management Plan and environmental targets. With this in mind, we will continue to implement proper waste management and recycling programs.

- 1 Neutralized slag: Product generated by the neutralization reaction in the smelting process.
- 2 LCA methodology: LCA is an acronym for life cycle assessment. LCA methodology involves quantitatively evaluating the environmental effects of product manufacturing throughout the entire life cycle, from procurement of raw materials to manufacturing, transport, use, and disposal.

Waste-to-Landfill Ratio and Landfill Disposal Volume ♥



Note: For detailed data, see p. 79 of the Data section.

♥: Indicates the Group's top CSR priorities. Please see p. 9.

Initiatives for the Effective Use of Resources

The JXTG Group is working to reduce its use of raw materials by streamlining production and expanding the use of recycled raw materials.

JX Nippon Mining & Metals promotes the effective use of resources by efficiently recovering copper, precious metals, and rare metals from recyclable resources, drawing from processes that harness technologies developed in our smelting business over more than a century. In fiscal 2017, 252 thousand tons of the 2.659 million tons of raw materials used in the company's business activities were recycled resources.

Recycling and Environmental Services Business

Contributing to the Realization of a Recycling-Oriented Society through Our Recycling and Environmental Services Business

JX Nippon Mining & Metals is engaged in an integrated range of businesses related to copper and other nonferrous metals. These businesses encompass resource development, metal smelting and refining, electronic materials, and recycling and environmental services. Our recycling and environmental services business, which is a "vein" of this value chain, includes environmental services for detoxifying industrial waste and the recycling of materials containing nonferrous metals into refined metals. Utilizing the key features and strengths of this business—zero emissions, proprietary treatment processes based on smelting and refining technologies, and a global collection network—we contribute significantly to the development of a sustainable, recycling-oriented society.



Hitachi Metal Recycling Complex (HMC) Department of Hitachi Works

Key Features and Strengths of the Recycling and Environmental Services Business

(1) Zero Emissions

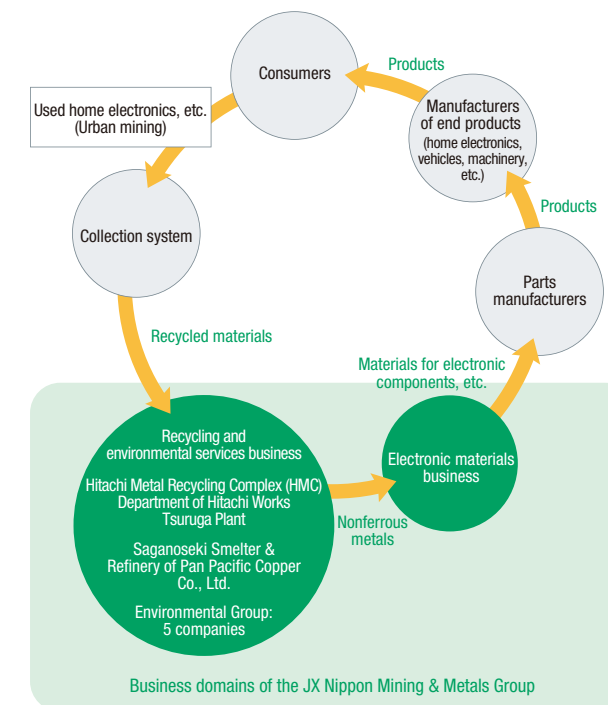
In the processes for detoxification of industrial waste and conversion of recycled materials into reusable resources as refined metals, we are pursuing zero emissions, where no

secondary waste that requires landfill disposal is produced. Iron and other ferrous metals other than nonferrous metals are recovered as slag and used as raw materials for cement and other purposes. By preventing the generation of secondary waste, we are reducing our environmental impact.

(2) Proprietary Treatment Processes Based on Smelting and Refining Technologies

The recycling of nonferrous metals is carried out using uniquely developed, efficient and reliable treatment processes, which are based on the technologies we have developed over many years through our operations at mines, smelters, and refineries. At the Saganoseki Smelter & Refinery of Pan Pacific Copper Co., Ltd., which boasts Asia's largest treatment capacity for recycling copper and precious metals, energy is conserved by using the excess heat generated from copper concentrate smelting for melting recycled materials.

Resource-Recycling Initiatives in Pursuit of Zero Emissions



(3) Global Collection Network

At Tomakomai (Hokkaido), Hitachi (Ibaraki Prefecture), Mikkaichi (Toyama Prefecture), Tsuruga (Fukui Prefecture), and Saganoseki (Oita Prefecture), we are recycling and detoxifying recycled materials and industrial waste collected through the nationwide collection network we have built. As the amount of scrap generated in Japan has declined, we are enhancing our collection operations overseas and have established a collection and pre-treatment site in Taichung, Taiwan, and an operating site in Arizona, the United States.