We welcome your views and questions regarding Sustainability Report 2018 as well as suggestions on how to make the next report even better.

Send your views on this report to:

Public Relations and CSR Department
JX Nippon Mining & Metals Corporation
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Fax: +81-(0)3-6213-3601
We contribute to the development of a sustainable economy and society through innovation in the areas of resources and materials.
JX Nippon Mining & Metals is a company in the field of nonferrous metals and a core member of the JXTG Group, which aims to become one of Asia’s leading energy, resources, and materials business groups.

Our mission is to provide to society stable supplies of materials, including copper, rare metals, precious metals, and other nonferrous metal resources, as well as electronic materials. Based on this social mission, we carry out a full range of organically connected business operations, from upstream resources development through midstream smelting and refining to downstream operations comprising electronic materials and recycling and environmental services.

Today, initiatives that set targets with specific deadlines to achieve sustainable societies, such as the Sustainable Development Goals (SDGs) and the Paris Agreement, are being promoted on a global scale.

In light of these trends, in 2018 the JX Nippon Mining & Metals Group undertook a review of the material issues for CSR activities, taking into account the connections of the Group’s business activities, including its supply chain, to the economy, the environment, human rights, and various other social issues. Besides clarifying the definitions of the material issues up to now, we added “Respecting human rights” and “Promoting community involvement and development” as new items, selecting issues in line with the Group’s business activities. Engagement with these issues will also contribute toward achievement of the goals defined as the SDGs. (See pages 27–28 for details.)

JX Nippon Mining & Metals Corporation Sustainability Report 2018

Message from the President

At the JX Nippon Mining & Metals Group, we are committed to contributing to the sustainable development of society through our business activities, including our supply chain, based on the social environment and the wishes of stakeholders.

Material Issues for CSR Activities

- Ensuring occupational health and safety
- Assuring product quality and safety
- Developing human resources
- Providing a rewarding work experience
- Promoting community involvement and development
- Using nonferrous metal resources effectively
- Establishing a recycling-oriented society
- Establishing a low-carbon society
- Insisting on full compliance
- Respecting human rights

Current State and Challenges of the Copper Business

Copper is central to our business operations. It is widely used in electrical wires and electrical circuits for electronic products, vehicles, and other applications because of its good electrical conductivity, ease of processing, thermal conductivity, and other advantages. Fundamental to human culture, copper is an indispensable metal resource for the future growth of society. Yet the regions where copper deposits are found are distributed unevenly and reserves are finite. We therefore need to make effective use of available resources by improving the extraction percentage and pursuing recycling initiatives, among other means.

Against this background, the JX Nippon Mining & Metals Group sees CSR activities as “nothing more or less than our business activities.” Our corporate social responsibility, in other words, is to achieve stable and efficient supply of high-quality copper and contribute to economic growth and a higher living standard, while addressing such social issues as reducing environmental impact and respecting human rights. To these ends, we are pursuing innovation in the productivity of resources and materials, drawing on the technology and knowledge we have accumulated over our history spanning more than a century.

What this means for our resources development business and smelting and refining business is that we pursue the efficient mining, concentration, and refining of copper ores, a finite natural resource, not letting any of the copper content go to waste. In our recycling and environmental services business, we seek to supplement natural resources by making use of end-of-life products discarded by society, from so-called urban mines. In our electronic materials business, we support progress in state-of-the-art devices by developing and supplying high-performance metallic materials, while also contributing to the development of a society using Internet of Things (IoT) and artificial intelligence (AI) technologies.
Message from the President

The business operations of the Group are carried out in accordance with the JX Nippon Mining & Metals Code of Conduct created in line with the JXTG Group Philosophy. This Code of Conduct—which is shared by both management and employees—also complies with international guidelines, including the principles of the International Council on Mining and Metals (ICMM), of which we are a member, and the Ten Principles of the United Nations Global Compact.

Medium-Term Management Plan for Fiscal 2017 to 2019

The Medium-Term Management Plan for the three years from fiscal 2017 to 2019 adopts fundamental policies for building a stronger and more stable business foundation on which to pursue the Group’s aim of becoming a global resources and materials company centered on copper.

The business operations of the Group are carried out in line with the JX Nippon Mining & Metals Code of Conduct created in line with the JXTG Group Philosophy. This Code of Conduct—which is shared by both management and employees—is also compliant with international guidelines, including the principles of the International Council on Mining and Metals (ICMM), of which we are a member, and the Ten Principles of the United Nations Global Compact.

Nonfinancial Factors

We believe that carrying out our daily operations with a common sense of purpose will maximize the success of the Group as a whole in our quest for innovation in the productivity of resources and materials. We are therefore focusing our efforts on instilling the Code of Conduct more deeply, through such means as distributing this sustainability report to all employees and conducting training.

Finances

In fiscal 2017, the Group’s revenue rose approximately 11% year on year to ¥988.4 billion due to such factors as a higher sales volume in the electronic materials business and increased collection volume in the recycling and environmental services business. Operating profit, on the other hand, saw a loss of ¥60.3 billion, down ¥89.0 billion year on year due mainly to the recognition of an impairment loss of ¥128.6 billion on noncurrent assets relating to the Caserones Copper Mine. (See pages 12–13 for details.)

In the copper smelting and refining business, the Saganoseki Smelter & Refinery of Pan Pacific Copper undertook a flash smelting furnace renewal for the first time since the start of operations in 1973. This will be followed by improvements to auxiliary equipment, enabling a planned 10% increase in copper concentrate processing capacity in fiscal 2019.

In the electronic materials business, thanks to further growth in smartphone demand, as well as increased server demand accompanying the expanding cloud services market, the sales volume of products used in these areas is rising. To meet this demand growth, we are increasing manufacturing equipment at sites including the Kurami Works and Hitachi Works, where treated rolled copper foils and high-performance copper alloys are produced, aiming to boost production capacity by approximately 30% in the first half of fiscal 2020 over fiscal 2017 levels. At the Isoshara Works as well, equipment for manufacturing sputtering targets for semiconductors is gradually being increased. Here, too, a rise in production capacity by around 30% in fiscal 2020 over fiscal 2017 levels is planned.

In the recycling and environmental services business, we are continuing to conduct commercial feasibility trials at the Tsuruga Plant on rare metal recycling from spent lithium-ion batteries.

In the titanium business, a new plant was completed for a titanium sponge joint venture in Saudi Arabia; the plant is expected to go into commercial production in fiscal 2018. A new factory producing nickel powder was also built on the grounds of the Wakamatsu Plant of Toho Titanium. This has resulted in a 50% rise in production capacity of fine nickel powder, a material in multilayer ceramic capacitors used for leading-edge electronic devices.

To open up one more growth strategy option, in July 2018 we acquired all shares in the German company H.C. Starck Tantalum and Niobium GmbH, jointly with the Japan Bank for International Cooperation. The tantalum and niobium products developed, manufactured, and sold by H.C. Starck have synergies with existing businesses of the JX Nippon Mining & Metals Group and offer the promise of new business expansion.

Caring Out Operations Based on a Corporate Code of Conduct That Meets International Standards

Seeking to reduce environmental impact, we set long-term targets of an 18% reduction in CO2 emissions by fiscal 2030 from fiscal 1990 levels, and reduction in the ratio of non-value-bearing waste volume to below 0.5% by fiscal 2030. To meet those targets, the 4th Medium-Term Action Plan (for fiscal 2016 to 2019) defines the goals of keeping the four-year total for CO2 emissions from domestic operations below 4.07 million tons, and achieving a ratio of non-value-bearing waste volume below 0.7%. Results achieved through fiscal 2017 met the targets both for CO2 emissions and for the ratio of non-value-bearing waste volume. (See pages 60, 69, and 71 for details.)

In meeting our corporate responsibility to society, we continue to carry out activities geared to the nature of Group businesses, with special emphasis on efforts to develop the next generation. During fiscal 2017, we participated in outside events, including booth displays for the University of Tokyo’s Komaba Research Campus Open House, and presented experiments and talks on copper for primary, middle, and high school students. During the summer break, we held science experiment classes and factory tours at five operating sites in Japan, providing students, their parents, teachers, and the general public with opportunities to experience the Group’s business and operational work. We also put on summer festivals, inviting not only the families of employees but also residents in surrounding communities. In these ways, we provided our stakeholders with many chances to learn about the Group. (See pages 41–42, 54–56, and 77 for details.)

Taking into account the social environment and the wishes of stakeholders, the Group is committed to contributing to the sustainable development of society through its business activities, including the supply chain, with a special focus on the material issues for CSR activities.

Shigeru Oi
President and Chief Executive Officer
Chairman of the CSR Committee
JX Nippon Mining & Metals Corporation
Nonferrous metals play an indispensable role as materials in contemporary life, and of all such metals, copper is particularly notable for its good electrical conductivity and ease of processing. Copper is therefore used in a wide variety of applications, from electrical wires, buildings, and consumer electronics such as air conditioners and refrigerators, to state-of-the-art electronic devices such as LCD televisions, PCs, and smartphones, and even in cars and trains.

Also found in many applications from industrial to everyday goods are light and strong titanium, made by the Toho Titanium Group, as well as highly corrosion-resistant and ductile rare metals such as tantalum and niobium, made by H.C. Starck Tantalum and Niobium GmbH.

See pages 11–19 for details on each of the Group's businesses.
Overview of JX Nippon Mining & Metals Business Segments

**Resources Development Business**
We mine copper ores by developing mines with a view to the mineral deposit potential.

**Exploration to development**
Following exploration to narrow down prospective sites to those with promising mineral deposits, we conduct more detailed studies to consider the feasibility of mine development from technical and economic standpoints. When the decision is made to go ahead with development, construction work starts on the infrastructure and ore processing facilities.

**Operation**
Mined ores having a copper grade of around 1% go through processes of crushing and grinding, followed by flotation to produce copper concentrate with a grade of around 30%, imported from overseas, is used as the raw material. From this, we produce refined copper by upgrading it to a purity of 99.99% in flash smelting furnace, converter, anode furnace, and electrefining processes.

Copper concentrate is poured successively into a flash smelting furnace, converter, and anode furnace, removing iron and sulfur content to create blister copper having a purity of around 99%. Electrolysis is then applied to the blister copper to produce refined copper of 99.99% purity for shipment.

**Refining Business**
Copper concentrate with a grade of around 30%, imported from overseas, is used as the raw material. From this, we produce refined copper by upgrading it to a purity of 99.99% in flash smelting furnace, converter, anode furnace, and electrefining processes.

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**Smelting and Refining Business**
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**Electronic Materials Business**
Starting with refined nonferrous metals manufactured in the smelting and refining processes, we perform the necessary processing, such as alloying, high purification, rolling, and surface treatment.

We provide electronic materials with a wide range of properties for use in electronic equipment, automotive, medical device, and other industries. Each of the products is manufactured based on advanced metal processing technologies developed over many years.

**Treated rolled copper foil**
Refined copper is melted and cast, followed by repeated rolling until its thickness is only about 6 to 150 microns. Being more bendable than electro-deposited copper foil, treated rolled copper foil is used in flexible printed circuit boards inside smartphones, for example.

**Copper sputtering targets for semiconductors**
Sputtering targets are made from refined copper by further purifying it and then employing processes that include forging, rolling, and surface treatment. Their end use is as a material for the extremely fine interconnects of semiconductor integrated circuits.

**Titanium Business**
In the Toho Titanium Group, a variety of titanium materials are manufactured from titanium ore and supplied to society. Products of the Group include titanium sponge, which is produced through smelting using a magnesium reduction method called the “Kroll process”; titanium ingots, which are made by melting and casting titanium sponge; high-purity titanium; and fabricated titanium products.

In addition, the Group is engaged in the catalysts and chemicals business based on the titanium smelting technology and the raw materials obtained from that process.

**Tantalum and Niobium Business**
H.C. Starck Tantalum and Niobium provides high-purity metal powders and oxides of tantalum and niobium, two rare metals indispensable in manufacturing capacitors, semiconductor materials, and communication devices such as surface acoustic wave (SAW) devices.

The company also supplies oxides for optical lens use and chlorides for semiconductors.

**Recycling and Environmental Services Business**
By recovering and reuseing nonferrous metal resources from end-of-life electronic devices and industrial waste, we are contributing to environmental conservation and to the realization of a recycling-oriented society.

Making use of domestic and overseas networks, we collect end-of-life electronic devices and industrial waste, which first undergo preprocessing as necessary, such as crushing, incineration, and melting. The resulting materials are then put through smelting and refining processes to recover refined copper, precious metals, rare metals, and other metals.

**Materials Business**
Starting with refined nonferrous metals manufactured in the smelting and refining processes, we perform the necessary processing, such as alloying, high purification, rolling, and surface treatment.

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In addition, the Group is engaged in the catalysts and chemicals business based on the titanium smelting technology and the raw materials obtained from that process.
The Medium-Term Management Plan (Fiscal 2017 to 2019)

The JXTG Group has drawn up a Medium-Term Management Plan for fiscal 2017 to 2019 and Group members are now engaging in achieving its goals. In drawing up this plan, the following basic aims were incorporated:

- In order to contribute to the development of society and economy and the creation of a sustainable and vigorous future, the Group endeavors to enhance its core businesses, promote innovation, and operate business globally.
- The Group will foster human resources with high ethical standards and willingness to take on new challenges, who are essential in promoting the above, to become one of the most prominent and internationally competitive comprehensive energy, resources, and materials company groups in Asia.

Business Results in Fiscal 2017 (April 1, 2017 to March 31, 2018)

During fiscal 2017, the global economy continued to enjoy moderate growth, as consumer spending remained strong in the US, China, Europe, and elsewhere. In this situation of global growth, the Japanese economy maintained a gradual recovery, as improved corporate earnings enabled increased private-sector capital investment, and consumer spending rebounded in an improving employment and income environment. The copper price on the London Metal Exchange (LME) generally trended within the range of 250 to 260 US cents per pound from the start of the fiscal year through June 2017. Thereafter, expectations for increased copper demand due to continued strength in the economy of China, the world's biggest copper consumer, along with the spread of electric vehicles, caused the price to rise starting in July, reaching 321 cents per pound in October. This was followed by a period of occasional weakness, but by the end of December, the price was up to 327 cents per pound, driven in part by expectations for large tax cuts in the US. From January to the end of the fiscal year in March, the price dropped due chiefly to a rise in US interest rates and concerns about US-China trade friction, closing the fiscal year at 303 cents per pound. As a result, the average price of copper during the fiscal year was 292 cents per pound, up 59 cents per year.

The yen-US dollar exchange rate averaged ¥111 for the fiscal year, representing a year-on-year weakening of the yen by ¥3.

In this business climate, the consolidated financial results of the JX Nippon Mining & Metals Group saw an 11.1% year-on-year rise in revenue to ¥968,425 million, but recorded an operating loss of ¥60,328 million due mainly to the recognition of an impairment loss on noncurrent assets relating to the Caserones Copper Mine operated in Chile.

Note: 1. The Company discloses financial information through its holding company, JXTG Holdings, Inc.
2. JXTG Holdings, Inc. has applied IFRS from fiscal 2017.
Business Overview

The Group’s business consists of five segments: resources development, smelting and refining, electronic materials, recycling and environmental services, and other. Operating profit (loss) trends per segment (billions of yen)

### Business Climate Indicators

#### Trends in key factors affecting Group performance are as indicated below.

<table>
<thead>
<tr>
<th>Segment</th>
<th>FY2016</th>
<th>FY2017</th>
<th>YoY change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resources development business</td>
<td>-22.8</td>
<td>-115.9</td>
<td>-93.1</td>
</tr>
<tr>
<td>Smelting and refining business</td>
<td>18.7</td>
<td>14.5</td>
<td>-4.2</td>
</tr>
<tr>
<td>Electronic materials business</td>
<td>15.7</td>
<td>28.3</td>
<td>+12.6</td>
</tr>
<tr>
<td>Recycling and environmental services business</td>
<td>4.9</td>
<td>5.1</td>
<td>+0.2</td>
</tr>
<tr>
<td>Other (Marun, Tabata Electric Wire and Cable, etc.)</td>
<td>6.5</td>
<td>5.8</td>
<td>-0.7</td>
</tr>
</tbody>
</table>

#### Resources Development Business

**Key Strategies**
- Maintain the stable operation of the Caserones Copper Mine
- Become more competitive by achieving thoroughgoing cost reductions at the Caserones Copper Mine

**Business Overview**

At the Caserones Copper Mine, which the Group has taken the lead in developing since acquiring mining property in 2006, copper concentrate production began in May 2014.

We have also invested in some of the world’s largest copper mines, including Los Pelambres and Escondida. Our equity entitled copper mine production totaled around 200,000 tons in fiscal 2017.

**Advances in Fiscal 2017**

The Caserones Copper Mine continued to operate at a loss in fiscal 2017, as in the previous fiscal year. Among contributing factors were the costs of natural disaster countermeasures, high production costs because some of the copper concentrate process operations were not yet stable, and the increase in various costs for ramping up to full production as early as possible. On May 1, 2018, a new Caserones Division was established to provide agile, centralized administration of the Caserones Copper Mine; the division is now working to overcome these issues.

Moreover, to generate synergies between the resources development business and the smelting and refining business and to strengthen business management, we decided to focus investment on assets of higher importance to the Company. We therefore increased our share of the Los Pelambres Copper Mine and transferred our share of the Collahuasi Copper Mine.

**Caserones Project**

- **Production years:** March 2013: Start of SX-EW refined copper production
  - May 2014: Start of copper concentrate production

| Segment Overview and Progress in Meeting Medium-Term Management Plan |
|--------------------------|--------------------------|
| **Key Strategies**        | **Notes**                |
| Maintain the stable operation of the Caserones Copper Mine | The Caserones Copper Mine commenced commercial operation in May 2014. It is to be closed in 2035 when its mineral resources are depleted. |
| Become more competitive by achieving thoroughgoing cost reductions at the Caserones Copper Mine | |

**Caserones Copper Mine**

- **Acquisition of mining property:** May 2006
- **Acquisition price:** US$4.2 billion
- **Initial investment amount:** US$2.4 billion
- **Production:** Copper: 3,550,000 t, SX-EW refined copper: 410,000 t
- **Mine life:** 28 years (2013 to 2040)
- **Total production volume:** 180,000 t/year (2013 to 2040)
- **Concentrate:** Copper concentrate 3,140,000 t, SX-EW refined copper concentrate 410,000 t

### Segment Information

The Group’s business consists of five segments: resources development, smelting and refining, electronic materials, recycling and environmental services, and other. Operating profit (loss) trends per segment (billions of yen)

<table>
<thead>
<tr>
<th>Segment</th>
<th>FY2016</th>
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<th>YoY change</th>
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<td>-0.7</td>
</tr>
</tbody>
</table>

#### Business Climate Indicators

#### Trends in key factors affecting Group performance are as indicated below.

<table>
<thead>
<tr>
<th>Segments affected</th>
<th>Indicators</th>
<th>Units</th>
<th>FY2016</th>
<th>FY2017</th>
<th>FY2014</th>
<th>FY2015</th>
<th>FY2016</th>
<th>FY2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resources development business</td>
<td>180,000 t/year</td>
<td>Copper concentrate</td>
<td>180,000 t/year</td>
<td>180,000 t/year</td>
<td>180,000 t/year</td>
<td>180,000 t/year</td>
<td>180,000 t/year</td>
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<td>180,000 t/year</td>
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<td>Electronic materials business</td>
<td>180,000 t/year</td>
<td>Copper concentrate</td>
<td>180,000 t/year</td>
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<td>Other (Marun, Tabata Electric Wire and Cable, etc.)</td>
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<td>Copper concentrate</td>
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<td>180,000 t/year</td>
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<td>180,000 t/year</td>
</tr>
</tbody>
</table>

### Revenue by Region

<table>
<thead>
<tr>
<th>Revenue by Region</th>
<th>FY2016</th>
<th>FY2017</th>
<th>YoY change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>98,21</td>
<td>103,4</td>
<td>+5.4</td>
</tr>
<tr>
<td>Rest of world</td>
<td>293,4</td>
<td>326,4</td>
<td>+11.2</td>
</tr>
<tr>
<td>China</td>
<td>257,4</td>
<td>272,4</td>
<td>+6.0</td>
</tr>
<tr>
<td>Rest of Asia</td>
<td>193,1</td>
<td>194,6</td>
<td>+0.8</td>
</tr>
<tr>
<td>North America</td>
<td>10,6</td>
<td>10,6</td>
<td>+0.0</td>
</tr>
<tr>
<td>Europe</td>
<td>4,4</td>
<td>4,4</td>
<td>+0.0</td>
</tr>
<tr>
<td>Other</td>
<td>10,3</td>
<td>10,3</td>
<td>+0.0</td>
</tr>
<tr>
<td>Total</td>
<td>995,1</td>
<td>1,036,4</td>
<td>+4.2</td>
</tr>
</tbody>
</table>
Business Overview

Our refined copper production capacity is among the largest in the world, at approximately 920,000 tons a year combined for Pan Pacific Copper's sites in Japan and LS-Nikko Copper in South Korea. We efficiently produce high-quality refined metal products, including copper and precious metals, and provide stable supplies to Asian markets where demand is expanding.

Advances in Fiscal 2017

We took measures to increase earnings, such as achieving more favorable sales prices and reducing costs and stabilizing operations at each of the smelting and refining facilities. During major regular maintenance at the Saganoseki Smelter & Refinery, we renewed the body of the flash smelting furnace used for 44 years since it was built in 1973. This task was completed on schedule, and measures to prepare for increased copper concentrate processing were carried out as planned.

Outline of Resources Development and Smelting and Refining Businesses

<table>
<thead>
<tr>
<th>Resources development business (overseas copper mines)</th>
<th>Smelting and refining business (numbers are refined copper production capacity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pan Pacific Copper (PPC)</td>
<td>650,000 tons (Japan)</td>
</tr>
<tr>
<td>LS-Nikko Copper</td>
<td>270,000 tons (South Korea)</td>
</tr>
<tr>
<td>Escondida (Chile)</td>
<td>160,000 tons</td>
</tr>
<tr>
<td>Los Pelambres (Chile)</td>
<td>450,000 tons</td>
</tr>
<tr>
<td>Tamano Smelter of Hibi Kyodo Smelting</td>
<td>200,000 tons*2</td>
</tr>
</tbody>
</table>

*1 Indirect ownership portion of JX Nippon Mining & Metals (as of March 31, 2018)
*2 PPC’s offtake of the total production capacity of 290,000 tons
*3 The amount corresponding to JX Nippon Mining & Metals’ equity share of the total production capacity of 680,000 tons

JX Nippon Mining & Metals Corporation Sustainability Report 2018

Electronic Materials Business

Key Strategies
- Improve profitability in existing fields
- Boost competitiveness by making use of IoT and AI

Business Overview

We develop and provide high-quality, high-performance electronic materials in a timely manner, drawing on our technological advantages related to nonferrous metals in areas including high-purity refining, high-density sintering, surface treatment, and precision rolling and fabrication. Our materials are matched to rapidly advancing needs in the electronic equipment and automotive markets, where we maintain high global shares.

Advances in Fiscal 2017

Along with the ongoing steady expansion in smartphone-related areas of demand, a larger cloud services market means continued high growth in areas of demand related to servers and data centers. As a result, sales volumes of most products increased year on year. Further demand growth is expected with the advance of the IoT and AI society and growth in fields related to eco-friendly vehicles, leading-edge information technology, and medical equipment. We are therefore investing in production capacity increases to meet future market needs. At the Kurami Works and Hitachi Works, among other sites where treated rolled copper foils and high-performance copper alloys are produced, we are boosting manufacturing equipment such as melting and casting equipment, rolling machines, annealing furnaces, and surface roughening lines. At the Ichihara Works, we are increasing equipment capacity for making sputtering targets for semiconductors (high-purity metal refining, melting, etc.).

Outline of Electronic Materials Business (Main Products and Applications)

Global Market Share of Our Principal Electronic Materials Products

JX Nippon Mining & Metals Corporation Sustainability Report 2018
Recycling and Environmental Services Business

Key Strategies
- Promote differentiation from competitors
- Enhance the global resource collection network

Business Overview
In the recycling business, the Group efficiently recovers copper, precious metals, rare metals, and other resources from recycled materials, harnessing the processes that utilize technologies from our smelting and refining business. In the environmental services business, we provide zero-emissions treatment of industrial waste materials to render them harmless without producing any secondary waste. In Japan, we established the Hitachi Metal-recycling Complex (HMC) Department of the Hitachi Works, engaging in the recovery of a wide variety of valuable metals. At the same time, we have been taking steps to strengthen our nationwide network with recyclers and hydrometallurgical refiners for collection and processing of recycled materials. By establishing bases outside Japan in the U.S. and Taiwan, and building stronger ties with major recyclers, we are seeking to increase the volume of collected materials.

Advances in Fiscal 2017
Regarding the collection of recycled materials, both volume collected and margin increased thanks to the recovery in scrap market conditions resulting from the rise in metal prices. The grade of precious metals collected, however, continues on a downward trend as manufacturers seek to reduce the quantities of such metals used in products.

Outside Japan, we continue to carry out active collection efforts mainly in North America and Europe, with JX Nippon Mining & Metals USA as a base. Activities at the Zhangbin Recycling Center of Nikko Metals Taiwan are also gaining momentum. Meanwhile, we continue to conduct commercial feasibility trials on rare metal recycling from spent lithium-ion batteries.

At the five Group companies that perform services such as preprocessing of recycled materials and industrial waste treatment, the volume of collected waste and other materials was mostly unchanged from previous years. As for treatment of equipment containing low concentrations of PCBs, stable operations continued at JX Nippon Tomakomai Chemical, which also worked to increase the collection volume from inside and outside Hokkaido.

Titanium Business

Key Strategies
- Strengthen the titanium metal business by bringing the Saudi Arabia project to early commercial operation and establishing an optimal production system for titanium sponge
- Advance differentiation strategies in the catalysts and chemicals business and expand production capability

Business Overview
Titanium, a light, strong metal resistant to corrosion, has wide-ranging uses, from aircraft to desalination plants, electric power plants, and other applications. Group company Toho Titanium is engaged in the manufacture of titanium metals, as well as catalysts and electronic materials, using materials and technologies related to titanium production, such as catalysts for manufacturing polypropylene, and materials for electrodes and defectics in multilayer ceramic capacitors.

Advances in Fiscal 2017
The titanium metal business recorded stable performance overall, backed by robust production of aircraft, a main end use of titanium, and demand for general industry uses such as electric power. The catalysts and chemicals business also remained strong. The new plant has been completed for the titanium sponge joint venture in Saudi Arabia, and is expected to go into commercial production in 2018. In a separate initiative, a new plant was built to produce nickel powder used in multilayer capacitor electrolytes, raising production capacity by 50%.

Outline of Titanium Metal Business

Raw material
Material manufacturing
Processing
End products
Titanium ore
High-purity titanium
Sputtering targets for semiconductors
PCs, Mobile phones, Automobiles, etc.
Titanium sponge
Titanium metal products
Commercially pure titanium
Aircraft components (engines, fuselage materials, airframes, etc.)
Desalination plants, Electric power plants, LNG plants, etc.
Steel additives
Technology-Based Business: Developments in and after Fiscal 2017

Entry into the high-purity tantalum and niobium metal powders business

In July 2018, the JX Nippon Mining & Metals Group acquired all shares of H.C. Starck Tantalum and Niobium GmbH (“HCS TaNb”) in Germany. HCS TaNb is one of the world’s leading suppliers of tantalum and niobium powders and other products that are used in capacitors, semiconductor materials, and SAW devices, and the company’s quality technologies and strong marketing enable it to have its excellent product lineup. The full-fledged emergence of the IoT society is expected to bring about an enormous increase in the number of electronic parts and devices in use. By combining the technologies and market knowledge of JX Nippon Mining & Metals and HCS TaNb, we will be able to strengthen our sales and product development capabilities and pursue efficient management and other synergies, contributing to the advancement of the IoT society through stable supply of the materials.

Acquisition of shares in Toho Titanium Co., Ltd. and Tatsuta Electric Wire and Cable Co., Ltd.

In June 2018, JX Nippon Mining & Metals acquired the shares in Toho Titanium Co., Ltd. and Tatsuta Electric Wire and Cable Co., Ltd. that had previously been held by JXTG Holdings. By establishing direct capital relationships with these two companies and integrating them into our operating structure, we aim to achieve faster and more effective business development in the downstream areas of Group business. This will enable us to go beyond the existing businesses of these firms to take advantage of the synergies in new businesses, such as metal paste and next-generation semiconductor interconnect materials.

Participation in copper paste business for solar panels and electronic equipment

In June 2018, JX Nippon Mining & Metals acquired a 21.2% stake in Material Concept Inc., a Tohoku University spin-off. Up to now, the material used for the wiring and electrodes of solar panels, electronic equipment, and the like has been silver paste. The copper paste under technology development by Material Concept has conductivity similar to that of silver paste, but promises to be cheaper and greatly reduce material costs, raising expectations for its use as a viable alternative. The Company plans to participate also in commercializing copper paste and ramping it up to full mass production.

Developing Technology-Based Businesses (Developing and strengthening businesses that will be the mainstays of the future)

Key Strategies
• Develop markets, strengthen sales, and develop technologies in anticipation of the arrival of the IoT society
• Proactively devote management resources to promising areas

Of special note
The JX Nippon Mining & Metals Group is spending a total of ¥200 billion on implementing the Medium-Term Management Plan. This will consist mainly of strategic investment in growth fields in midstream and downstream operations, where demand is expected to expand greatly with the advance of IoT and other new technologies. Directions that future business expansion could take include intragroup collaboration (harnessing Group-held technologies), independent development, CVC (corporate venture capital), and M&As. By means of ongoing strategic investment in these directions, we plan to create new businesses, mainly in electronic materials, and obtain stable earnings.

Directions for business expansion

Intragroup collaboration
Independent development CVC M&As
JX Nippon Mining & Metals Group

Amount of capital investment in Medium-Term Management Plan (billions of yen)

<table>
<thead>
<tr>
<th>Strategic investment</th>
<th>70.0</th>
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</thead>
<tbody>
<tr>
<td>Maintenance and others</td>
<td>130.0</td>
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<tr>
<td>Total</td>
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</tbody>
</table>

Corporate Data

Company Name: JX Nippon Mining & Metals Corporation
Paid-in Capital: ¥75.0 billion (wholly owned by JXTG Holdings, Inc.)
Representative Director: Shigeru J. Ishihara, President and Chief Executive Officer
Revenue: ¥1,265.4 billion (Fiscal 2017, consolidated)
Head Office: 1-2, Chomei-cho, Chiyoda-ku, Tokyo 100-8104, Japan

Business Lines:
• Resources development
• Smelting and refining
• Electronic materials
• Recycling and environmental services

Employee (Consolidated): 1,271 (as of March 31, 2018)
Employee (Consolidated): 5,288 (as of March 31, 2018)

Domestic Operating Sites
• Hitachi Works (Ibaraki Prefecture)
• Kasuga Mines Co., Ltd.
• Kurobe Plant of Toho Titanium Co., Ltd.

Overseas Operating Sites
• Chile Office, Frankfurt Office

The JX Nippon Mining & Metals Group conducts business in Chile, Germany, China, South Korea, the United States, and other countries as well as Japan.
The Roots of CSR in the JX Nippon Mining & Metals Group

The roots of the JX Nippon Mining & Metals Group’s CSR go back to the place where JX Nippon Mining & Metals was founded—the Hitachi Mine (in Ibaraki Prefecture), first developed more than 110 years ago. Throughout the process of working to resolve the problem of smoke pollution at the Hitachi Mine, the Company maintained its stance of promoting community involvement and development as it strove to build up its business. It also created an environment in which mine employees could work with peace of mind and cultivated an ethos of respect for its employees. This approach was ahead of its time, but it lives on in the Group today.

Living in Harmony with Local Communities

How the smoke pollution problem became the occasion for building good relations with the local community

When the Hitachi Mine first went into operation in 1905, there was no established technology for effectively recovering sulfur dioxide generated from the sulfur content of ores in the smelting process. It was not long before the smoke emitted from the Hitachi Mine, which contained sulfur dioxide, began to cause withering of trees in the surrounding forests and widespread crop damage. Although it was an era in which Japan had not yet established laws concerning compensation for such cases, the management of the Hitachi Mine company, led by Yatomo Kado, the first head of general affairs, acted in good faith, paying damage compensation to the residents. As soon as someone reported damage, the Company stationed a forestry expert at an agricultural testing station and set up a smoke-monitoring station to restore forests in the surrounding mountains that had been devastated by smoke pollution. The Company also undertook a full-scale tree-planting program to restore forests in the surrounding mountains that had been devastated by smoke pollution. The Company stationed a forestry expert at an agricultural testing station and set up a smoke-monitoring station. As a result, the Government’s proposal was widely opposed within industry, government, and academic circles. Nonetheless, Kuhara decided to go ahead with the project, backed up by weather observations and experimental data. Construction of the giant stack required a total of nearly 27,000 workers and a massive financial investment. After it was completed in December 1914, what was then the world’s tallest stack at 155.7 meters did in fact succeed in dramatically reducing smoke pollution.

Tree-Planting Programs to Reforest the Devastated Mountains

The next project the Hitachi Mine undertook was to embark on full-scale tree-planting programs to restore forests in the surrounding mountains that had been devastated by smoke pollution. The Company stationed a forestry expert at an agricultural testing station and set up a smoke-monitoring station. As a result, the Government’s proposal was widely opposed within industry, government, and academic circles. Nonetheless, Kuhara decided to go ahead with the project, backed up by weather observations and experimental data. Construction of the giant stack required a total of nearly 27,000 workers and a massive financial investment. After it was completed in December 1914, what was then the world’s tallest stack at 155.7 meters did in fact succeed in dramatically reducing smoke pollution.

The Ethos of Community Involvement and Development Continues Today

As a result of these efforts, greenery returned to the mountains, and the city of Hitachi became famous throughout Japan as “the city of cherry trees.” In 1993, the stack suddenly collapsed, leaving only the bottom one-third in place. The repaired stack currently stands at a height of 54 meters, but the spirit of community involvement and development that it symbolizes continues to this day.

In the words of the mayor of Hitachi at the time, “The scale of the giant stack represented the scale of our predecessors’ aspirations. Even if the stack itself no longer looks the same, the spirit of community building that it stands for remains as strong as ever.”

Creating Environments Where Employees Can Work with Peace of Mind

Another CSR legacy instilled in the Group is our belief that employees are a company’s assets. Kuhara realized that to achieve business success at the Hitachi Mine, which was located in an area distant from urban regions, it would be important to provide an environment in which employees could work with peace of mind. He therefore focused his efforts on raising the standard of living at the mine, and set about putting in place the infrastructure to enable employees to live with their families. He accordingly built an entire community, providing not only housing but also schools, hospitals, a railroad, and recreational facilities.

Carrying on that philosophy, Yatomo Kado, as head of general affairs and general manager of the mine, believed in encouraging simplicity and fortitude, as well as simple hard work, while also thinking about the happiness of all employees. He made it a practice to investigate and resolve employees’ dissatisfaction or complaints regarding the mine, and worked to maintain harmony among workers both in the workplace and in employee housing.

The culmination of these efforts was the “friendly discussion group” he launched in 1920. The aim was for management and employees to hold talks focusing primarily on employee welfare.

In this environment that combined work and home, the Company organization built a climate of respect for employees, while a sense of togetherness took root among the employees themselves and the creation of “the Mine as One Big Family” was born. This philosophy lives on in the Group even today. Guided by these principles, we maintain an open, supportive working environment in which employees feel free to exchange opinions regardless of position, age, or gender.

Learning about the Roots of CSR in the JX Nippon Mining & Metals Group

The story of a company and community battling pollution, told in novel form

Naoki Prize-winning author Jiro Nitta wrote the novel Aru machi no takai entotsu (A tall stack in a town), telling the story of a community and company aiming for coexistence and mutual prosperity. The novel is based on the actual story of the Hitachi Mine and surrounding residents together confronting the smoke pollution problem. Woven into this story is the determined spirit of the mining company owner. It is a work that paints a vision of company-community relations, and brings the reader in touch with the roots of CSR in the Group. In 2018, shooting on a movie version of the novel began in the city of Hitachi where the story unfolded, and elsewhere. Production is underway, targeting release of the movie in 2019. It is hoped that the movie will be an opportunity for more people to become familiar with the novel.
Ensuring a stable supply of nonferrous resources and materials is our social mission. We are engaged in a wide range of operations from exploration, mining, smelting & refining to metal fabrication and electronic materials production. Based on “JXTG Group Philosophy” and complying with Code of Conduct stipulated below, we will continue to pursue technical rationality and efficiency and make improvements in quality & product properties and other matters in all aspects of our operations from development, production and marketing. At the same time, we will continue to promote recycling of resources and materials to achieve zero emission. This is our way of achieving continuous innovation in the productivity of resources and materials.

In the conduct of our business, we are committed to maintaining and enhancing a harmonious relationship with a wide range of stakeholders, including our customers and the communities in which we operate. We are committed to contributing to the sustainable development of society on a global scale.

1. Our social mission
   Based on continuous technological development and full awareness of our responsibilities in designing products, we will develop and produce a variety of products efficiently while minimizing waste. At the same time, we will promote recycling and reduce the impact of our operations on the environment. By doing so, we hope to obtain the satisfaction and trust of our customers and of society as a whole.

2. Compliance with laws and regulations and engagement in fair trade
   We will comply with domestic and/or overseas laws and regulations and will engage in fair, transparent, and free competition and trade based on the fulfillment of our social responsibilities.

3. Disclosure of corporate information and protection of personal information
   We will communicate not only with our shareholders, but also with the public at large, and will disclose corporate information in an active and equitable manner while focusing on the protection of personal information.

4. Creation of an optimum health, safety and working environment
   We will place top priority on health, safety, and disaster prevention and will ensure a comfortable working environment that respects employees’ personality, human rights, and individuality.

5. Environmental conservation
   Based on the awareness that tackling environmental issues is an essential requirement for corporate existence, we will engage in activities aimed at conserving the global environment, including biodiversity, in a voluntary, active, and continuous manner.

6. Enhancement and strengthening of risk management
   We will establish a risk management system based on scientific data to enhance and strengthen risk management.

7. Harmonious relationship with society
   We will commit ourselves to social contribution activities and work as a good corporate citizen to achieve a harmonious relationship with the rest of the society of which we are part.

8. International business operations
   In international business operations, we aim to contribute to sustainable development by protecting the fundamental human rights of people in countries and areas where we operate, and by respecting their cultures and customs.

9. Elimination of antisocial activities
   We stand firm against all antisocial forces and groups that threaten social order and safety.

10. Management responsibilities
    Management executives will take the lead in implementing this code of conduct and ensure it is thoroughly implemented across the Group. In the event of any non-compliance with the code of conduct, the management executives will investigate the causes, work to prevent reoccurrence, disclose information to the public promptly and accurately, and be held accountable for the event.
CSR Promotion System

CSR Committee and Subcommittees

The JX Nippon Mining & Metals Group has a CSR Committee, an advisory body to the president that formulates basic policies and action plans relating to its CSR activities. It also evaluates progress in implementing the plans and the Group’s performance from economic, environmental, and social perspectives. The committee is chaired by the president and consists of the members of the Company’s Executive Meeting. The committee meets twice a year, in principle, and in addition to formulating basic policies, promotion systems, and action plans for CSR activities, it reviews progress in implementing the relevant action. The findings of these reviews are used when formulating new policies, systems, and plans. In fiscal 2017, the committee met twice, on May 10 and October 23, 2017.

Under the CSR Committee are the Compliance Committee, the Safety and Environment Committee, and the Citizenship Committee. These committees formulate action plans for their respective areas of responsibility and review progress in implementing the relevant action, among other activities.

CSR Promotion Managers

CSR promotion managers are appointed at each of the Group’s operating sites and companies. They are responsible for ensuring that basic policies, promotion systems, and action plans for CSR activities are implemented faithfully in line with the actual conditions at each site and company. They formulate their own individual CSR plans and report on progress at CSR promotion manager meetings held twice a year. These meetings also function as opportunities to exchange information among participants.

Initiatives for Increasing CSR Awareness

CSR Workshops

We offer ample opportunities for face-to-face CSR training targeting Group officers and employees. In fiscal 2017, the following training was provided:

- Workshop entitled “The Latest Trends in CSR and Examples of CSR Activities at Operating Sites” (June 7, 2017)
- An instructor from sustainability consulting firm Cre-en inc. was invited to provide training based on actual examples of CSR activities in companies’ operating sites, including basic approaches to CSR and the latest trends.
- CSR officer workshop (March 9, 2018)

An instructor from SusTB Communications conducted a workshop aimed at deepening understanding of such topics as CSR, the SDGs, and ESG, including how to interpret sustainability reports.

CSR Surveys

Surveys of employees were conducted to determine the extent of employee awareness of CSR and involvement in its practice. (See pages 97-98 for the results.)

Publication of Sustainability Report 2017

Once a year, the Group publishes a sustainability report that compiles the policies and results of its CSR activities. This report is distributed to all Group officers and employees and to stakeholders. In fiscal 2017, 8,000 copies of the full report were printed in Japanese and 430 were printed in English. In addition, a total of 1,000 copies of the condensed digest version were printed in English, Chinese (simplified and traditional), Korean, and Spanish.

Our Relationship with Stakeholders

Taking into consideration the JXTG Group Philosophy, the JX Nippon Mining & Metals Code of Conduct, and the Group supply chain, we have identified the following stakeholders of relevance in undertaking our CSR activities. By accurately grasping the needs of various stakeholders and addressing these sincerely, we seek to gain the trust of society.

We recognize those groups as important partners in initiatives to realize a sustainable nonferrous metals industry, such as creating new technologies and developing future generations of human resources. We cooperate with such groups in developing technologies and human resources in fields related to the Group’s business.

Main Initiatives

Participation in the Endowed Research Unit for Nonferrous Metal Resource Recovery Engineering (JX Metals Endowed Unit) from 2012; administration of the Japan Mining Industry Association; activities in the Mining and Materials Processing Institute of Japan; participation in the International Institute for Mining Technology.

We go beyond simply observing laws and regulations to respond proactively, paying close attention to issues affecting the world as a whole, such as global warming.

Main Initiatives

Activities as ICMC member corporation; endorsement of and support for the Extractive Industries Transparency Initiative (EITI); promotion of business activities for meeting the SDGs.

In the Group’s CSR activities, we reflect the approaches of NPOs and NGOs undertaking distinctive programs, as necessary.

Main Initiatives

Collaboration in activities supporting development of the next generation and activities for protection of biodiversity.

We seek to build relationships of trust with suppliers as partners in carrying out our business, and to realize fair and equitable trading throughout the supply chain.

Main Initiatives

Communication through purchasing activities; provision of contact center for inquiries; conducting supplier surveys.
Review of Material Issues for CSR Activities

The JX Nippon Mining & Metals Group recently undertook a review of the material issues for CSR activities to reflect changes in the business climate surrounding the Group and in the needs of society as it targets greater sustainability.

In the review process, we looked at various CSR issues and analyzed their materiality from a combination of two standpoints: external (stakeholders') expectations and relevance to the Group's business (materiality).

On this basis, we identified issues to be accorded top priority, and these material issues now guide the Group’s CSR activities. Through ongoing communication with various stakeholders, we will aim to raise our corporate value.

Material Issues for CSR Activities: The Review Process

1. Determining social issues to be considered

After a comprehensive study of international guidelines (GRI Standards, ISO 26000, etc.), as well as global and domestic initiatives (EITI, ICMM, Responsible Business Alliance [RBA], the SDGs, Charter of Corporate Behavior, etc.), and trends among other companies in the industry, we identified 34 social issues to be considered.

2. Prioritizing from an external standpoint: Analyzing external (stakeholders') expectations

The 34 social issues identified in the first stage of the process were analyzed from the external standpoint of stakeholder expectations according to assessment weightings provided by ESG survey institutes and other factors. (Vertical axis in diagram below)

3. Prioritizing from the Group’s standpoint: Determining relevance to the Group’s business (materiality)

The relevance of each issue to the Group’s business (materiality) was determined based primarily on cross-divisional workshops (or discussions), exchanges of views in CSR promotion manager meetings and officer training sessions, and employee surveys. (Horizontal axis in diagram below)

4. Identifying material issues for CSR activities

We conducted assessments that combined external (stakeholders') expectations with relevance to the Group's business (materiality) to identify issues of particularly high materiality, and selected these as the material issues for our CSR activities. In identifying these material issues, deliberations took place in the CSR Committee, which is an advisory body to the president, and the choice of issues was approved by the Executive Meeting members including the president.

Identifying material issues for CSR activities

Our 10 Material Issues for CSR Activities

The JX Nippon Mining & Metals Group conducts its business activities with particular attention to the standpoints represented by the 10 material issues for CSR activities selected through the aforementioned review process.

For the peace of mind of society (pages 29–58) Related SDG items

Ensuring occupational health and safety P29–
Assuring product quality and safety P36–
Developing human resources P40–
Providing a rewarding work experience P47–
Promoting community involvement and development P53–

For protecting the environment (pages 59–84)

Establishing a low-carbon society P67–
Establishing a recycling-oriented society P70–
Using nonferrous metal resources effectively P74–

For earning trust as a corporation (pages 85–96)

Insisting on full compliance P87–
Respecting human rights P92–

Initiatives Relating to the SDGs

The Sustainable Development Goals (SDGs) are international goals and targets defined in the 2030 Agenda for Sustainable Development adopted at the United Nations Sustainable Development Summit in September 2015. They consist of 17 goals and 169 targets for achieving a sustainable world, targeting the year 2030. The JX Nippon Mining & Metals Group will contribute to achievement of the goals defined through the SDGs by taking action on our material issues for CSR activities.
Ensuring Occupational Health and Safety

From its inception, the Group has always considered the maintenance of occupational health and safety to be an essential condition for the continuation of its business, and it has endeavored to provide an environment where employees can work with peace of mind. The Group drew up the Basic Policy on Health and Safety aimed at the elimination of accidents and illnesses, and strives to foster a culture of safety.

Health and Safety Activities

Ever since its founding, the Group has endeavored to provide an environment where employees can work with peace of mind. On the theme of “Safety First,” the Group drew up the Basic Policy on Health and Safety aimed at the elimination of accidents and illnesses, and strives to foster a culture of safety.

JX Nippon Mining & Metals Basic Policy on Health and Safety

We place the highest priority on ensuring the health and safety of all people working at the JX Nippon Mining & Metals Group and thereby strive to create a safe and secure workplace.

1. We will continuously improve health and safety management levels through the establishment and efficient operation of the health and safety management system.
2. We will work to identify, eliminate, and reduce hazards and harmful factors in all areas of business operations and to ensure no accidents occur.
3. We will work to maintain and improve employees’ mental and physical health by ensuring good communication and a comfortable working environment.
4. We will actively provide information and education in order to develop human resources that can act spontaneously and have strong safety competencies.
5. We will not only comply with health and safety laws and regulations but also establish and observe necessary voluntary standards.

Management Policy on Health and Safety

The Group formulates the Management Policy on Health and Safety each fiscal year. The goals and key policy measures are set based on analysis of health and safety performance in the previous year. The policy is discussed and approved by the Central Health and Safety Committee and then promulgated across the Group.

Organization for Occupational Health and Safety Management

Meetings Related to Health and Safety

In compliance with the Industrial Safety and Health Act, the Group has formed health and safety committees at each operating site and in each Group company. At the Head Office, the Central Health and Safety Committee holds an annual meeting, attended by representatives of each business segment, in addition to the regular meetings held five times a year. Members go over various matters for health and safety, discuss the Management Policy on Health and Safety, and deliberate measures to prevent the recurrence of accidents. The meetings are chaired by the General Manager of the Environment & Safety Department. Health and safety patrols are conducted once a year, and Group safety staff meetings are held twice a year to discuss health and safety management status and measures and to exchange related information. Workshops are also held twice a year for employees performing actual operations. In cases where unique safety measures are found to be in place at a specific operating site or Group company, steps are taken to share these measures across the entire Group, such as by presenting implementation examples at Group safety staff meetings and conducting factory tours.

Environment and Safety Audits

Environment and safety audits are conducted by a team under the supervision of the president to examine operating sites directly run by the Company and major domestic Group companies. Issues discovered in the audits are reported to the president. The team also notifies the operating site of the issues, requesting improvements and following up by monitoring progress. Audits were conducted at 12 sites (including Group companies) in fiscal 2017. No major matters were identified.

Measures for Legal Compliance

To ensure full compliance with the latest revisions to laws and regulations concerning health, safety, and the environment, regular compliance inspections are performed by the Environment & Safety Department and by an outside organization, and a legal compliance monitoring system has been introduced to obtain the latest information on legal revisions on a weekly basis. When information on important legal revisions is obtained under this system, instructional handbooks and manuals are created and issued, facilitating a prompt response by each operating site. In addition, we have compiled instructional handbooks outlining laws, guidelines, notices, and other rules related to particular items in order to enhance understanding of legal requirements by those involved.
Health and Safety Activities

Safety Performance in 2017

Ocational Accidents, etc.

Our safety record for 2017 is shown in the table below. The total number of occupational accidents at domestic operating sites declined for the second straight year, and accidents with lost work days or worse were reduced by half year on year.

<table>
<thead>
<tr>
<th>Category</th>
<th>2015</th>
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</tr>
</thead>
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<td>Fatal accidents (persons)*2</td>
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<td>0</td>
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<tr>
<td>Accidents with lost working days (persons)*2</td>
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<td>14</td>
<td>7</td>
</tr>
<tr>
<td>Accidents without lost working days (persons)</td>
<td>1</td>
<td>2</td>
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</tr>
</tbody>
</table>

Safety performance at domestic operating sites

- Frequency rate of occupational accidents (the number of casualties caused by occupational accidents per million hours of total actual work) and the accident severity rate (the number of work days lost per thousand hours of total actual work) are smaller for the Group's operating sites.
- There were no physical injuries due to fires or explosions.

(For reference) In 2017, the frequency rate of occupational accidents and the accident severity rate of all businesses in Japan were 0.016 and 0.016, respectively. (Source: Ministry of Health, Labour and Welfare, “Survey on Industrial Accidents”)

Achievements of Health and Safety Activities in 2017 and Remaining Issues

As a key policy measure in our Management Policy on Health and Safety for 2017, we chose “Creating a culture of safety.” The aim is to have each operating site (workplace) take the lead in implementing measures centered on the key safety activities to create a culture of safety in their own workplace and eliminate accidents there.

Activities to Build a Safety Culture

Definition of a Safety Culture

Safety culture is the assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, protection and safety issues receive the attention warranted by their significance.

(Adapted from the definition by the International Atomic Energy Agency [IAEA])

The Group has undertaken various activities toward creating a culture of safety, having made “Safety First” part of the Basic Policy on Health and Safety, and having adopted the above definition of safety culture.

Despite these efforts, in 2016 there was a fatal accident at a Group company, following an earlier one in 2014. Through 2016, the frequency rate of occupational accidents and the accident severity rate of all businesses in Japan were 0.166 and 0.09, respectively. (Source: Ministry of Health, Labour and Welfare, “Survey on Industrial Accidents”)

In 2017, therefore, the Group sought to eliminate serious accidents by endeavoring to create a culture of safety centering on the above-noted key safety activities.

Promoting Physical and Mental Health

The Group realizes how important it is that all employees are able to maintain good physical and mental health as they work. We also recognize the significance of good mental health in ensuring an enjoyable life for employees and their families as well as heightening productivity and making the work experience more fulfilling.

The Group set up counseling services for providing face-to-face, telephone, and online counseling to support employees and their families in maintaining good mental health. In addition, employee stress checks are provided annually. In fiscal 2017, they were provided for 2,568 JX Nippon Mining & Metals employees and 3,289 employees of Group companies. Workshops on improving the working environment and other such events are held as necessary, as we take various measures to reduce stress and provide a better place to work.

Other Activities

Presentations on Safety Improvements

At JX Nippon Coil Center, presentations are held to showcase examples of measures taken at the initiative of on-site workers specifically to improve safety.

Representatives of workers at each site give explanations of improvements in the workplace (including demonstrations), followed by an assessment of their responses to questions by a panel of reviewers made up of executives and managers. Having presentations take place in the workplace reduces the feeling of distance between reviewers and presenters, improving workplace cohesion and safety awareness, while helping to improve communication between workers and management.

Safety Commendations

A safety commendation system exists at operating sites directly run by the Company and domestic affiliated companies. Through this system, the president officially commands operating sites that have continuously operated without an accident for a designated period, the length of the period being determined according to the number of personnel. In fiscal 2017, commendations were given to the following five sites: Shimoda Hot Springs, Toyoha Mine, Hokushin Mining, JX Metals Precision Technology Kakegawa Works, and JX Metals Trading Kurami Office.

Operating Sites That Have Obtained OHSAS 18001 Certification

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Operating sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiscal 2009</td>
<td>Hitachi Smelter, Pan Pacific Copper Co., Ltd. (including Hitachi Kyocho Smelting Co., Ltd., Yamano Smelter)</td>
</tr>
<tr>
<td>Fiscal 2009</td>
<td>Kurami Works (including Kurami Office of JX Nippon Foundry Co., Ltd.)</td>
</tr>
<tr>
<td>Fiscal 2010</td>
<td>Isahara Works (including Isahara Administration Office of JX Nippon Foundry Co., Ltd.)</td>
</tr>
<tr>
<td>Fiscal 2011</td>
<td>Miehama Works (including Miehama Office of JX Nippon Foundry Co., Ltd.)</td>
</tr>
<tr>
<td>Fiscal 2011</td>
<td>Sasakono Works (including Sasakono Office of JX Nippon Foundry Co., Ltd.)</td>
</tr>
<tr>
<td>Fiscal 2013</td>
<td>Naka Works and Kakagawa Works of JX Metals Precision Technology Co., Ltd.</td>
</tr>
<tr>
<td>Fiscal 2014</td>
<td>Longhat Works of Neko Metals Taiwan Co., Ltd.</td>
</tr>
</tbody>
</table>

Initiatives for Improving Risk Assessment

The latest report on industrial accident occurrences makes clear this year’s efforts to raise the level of risk assessment, focusing also on “identification of risk sources” and “imagining accident scenarios,” inviting outside instructors (representatives of The Japan Industrial Safety and Health Association) to provide guidance sessions and follow-up training from time to time.

Besides continuing to offer training and guidance sessions, as well as follow-up training, we will seek to create safer working environments by developing key workers who can confirm the suitability of risk assessment and provide guidance at work sites.

Follow-up training by an instructor from The Japan Industrial Safety and Health Association (at Hitachi Smelter)
Health and Safety Activities

JXTG Group Safety Education Center

Role as an Educational Facility of the JXTG Group

To eliminate accidents, enhancing the risk sensitivity and safety awareness of individual employees is essential. Risk sensitivity means the ability to correctly recognize risks as dangerous. Sharpening this ability leads employees to follow rules and keep away from dangers. The Safety Education Center attempts to raise risk sensitivity by providing trainees with simulated experiences of accidents that have actually occurred in the past so that they can come to recognize the dangers instinctively. Around half of all accidents are recurrences of past accidents. For this reason, continuing training at the center is an effective way to reduce the number of accidents that occur.

Further efforts are being made to raise the quality of the education, by building a more effective curriculum while improving the teaching skills of instructors.

Examples of Experiential Risk Training at the Safety Education Center

Introduction of Virtual Reality (VR) Technology for Experiential Risk Training

The effectiveness of safety education by means of simulated risk experiences depends on (1) making trainees feel what it is like to be involved personally in an accident, and (2) making them think about the psychological state of victims, causes, and accident-prevention measures. To enhance this effectiveness, VR technology has been introduced for four kinds of experiential risk training: steam explosion, being struck by heavy machinery, entanglement in a high-speed rotor, and falling from a high place. By creating a vivid impression that an occupational accident is occurring right in front of the trainees, this technology enables more realistic and practical experiential risk training. The introduction of VR in safety education is a new initiative, by which trainees will learn necessary knowledge, such as typical circumstances following an accident, psychological analysis of victims, and methods for avoiding accidents. The training has been well received by trainees and plans are being made to introduce additional VR experiences.

Benefits of Training at the Safety Education Center and Strengthening of Supplementary Education at Operating Sites

During the period from January 2013 when the center was established to March 31, 2018, the total number of trainees had reached 7,791. The annual accident rate per 1,000 employees for those who have undergone the training is around half that of those who have not; moreover, the types of accidents covered by the curriculum have been declining in frequency. Such results show the clear benefits of this education. Due to the center’s limited capacity to accommodate trainees, however, it currently takes three to four years to provide training to all employees and others working in the Group, including subcontractors. To prevent a drop in risk sensitivity during this time among those who have undergone training, similar safety education programs have been started at individual operating sites. The educational content is tailored to the situation at each operating site, such as its accident history and rules. Furthermore, education of the instructors responsible for experiential risk training at each site raises their ability as promoters of safety and enhances their skills.

Training of these safety education instructors is the responsibility of the Safety Education Center. Through the training, they learn guidance principles and classroom skills from the three viewpoints of leadership, motivation, and communication.
Preventing Collisions between Heavy Machinery and People

Verification Trial at Saganoseki Smelter & Refinery, Pan Pacific Copper

Currently, the Group is setting standards for prevention of collisions between equipment such as heavy machinery and workers or other people. As a further measure for preventing such accidents, a pioneering verification trial was conducted at the Saganoseki Smelter & Refinery of Pan Pacific Copper to study the possibility of introducing a worker safety system employing RFID technology in large-scale heavy machinery on the manufacturing floor.

The trial tested the system’s efficacy during heavy machinery work inside the hold of a copper carrier ship. The first step was to confirm the functioning of the sensor and its capability by verifying the effects of magnetic field strength and obstacles on detection distance. Next, automatic braking was tested and confirmed.

While these tests showed some variability in braking distance due to conditions such as magnetic field strength, environmental factors such as obstacles, and the machinery operator’s actions, the reliability and effectiveness of this system as a safety measure were confirmed. Based on the trial results, we are aiming for full introduction of the WS System in the Saganoseki Smelter & Refinery during fiscal 2018.

At the Saganoseki Smelter & Refinery, we were quick to conduct trial introduction of a WS System aimed at preventing collisions between heavy machinery and people. The heavy machinery in which the system was installed for the trial was a wheel loader, used for scooping operations in the hold of a copper carrier ship. This is a workplace with a high risk of collisions, since the wheel loader gathering up copper concentrate operates alongside workers scraping off the copper concentrate, in a narrow space.

Since rules on separation of people and vehicles are strictly enforced in the hold, during the trial there were no cases of the vehicle stopping due to detection of a worker behind it. Near the bow of the ship or other narrow parts of the hold, however, workers must sometimes approach very close to the side of the heavy machinery, and there were cases where such movements were detected. When the heavy machinery stops because it detects someone in the vicinity, the brake will not be released until the person moves away. In this regard, it was confirmed to be a highly effective system.

To prevent collisions between heavy machinery and people, first and foremost it is necessary for the operator of the machinery to confirm that there are no people in the vicinity; but as an added precaution, we will be installing this system with the aim of preventing such collisions.

Toshihiro Hayashi
Senior Engineer,
Environment & Safety Dept.
Saganoseki Smelter & Refinery
Pan Pacific Copper Co., Ltd.

Assuring Product Quality and Safety

Use of AI and IoT is advancing throughout society, causing demands from the customers to whom we supply products to become ever more sophisticated, diverse, and stringent. As it becomes more important than ever to assure product quality and safety, the JX Nippon Mining & Metals Group is working to further enhance its quality management framework. Accordingly, the Quality Control Department has been established as an independent organization responsible for quality control operations for the entire Group. In addition, a Quality Control Committee that includes top management as members reviews the full range of quality control activities, resulting in a highly comprehensive and effective organizational structure.
Assuring Product Quality and Safety

As society's use of IoT and AI advances, customers have become more demanding than ever with regard to product safety and quality. In the JX Nippon Mining & Metals Group, we seek to raise quality performance and customer satisfaction by building and operating an organizational structure for the provision of high-quality products, including acquisition of ISO 9001 certification.

1. Grasp the requirements of customers and society correctly in order to offer products and services that customers can trust and that satisfy their needs.

2. Improve and maintain quality in all processes from development, design, and production to delivery, while paying due attention to safety and environmental conservation.

3. Establish a quality management system, carry out continual improvements, and develop human resources.

4. Comply with all pertinent laws and regulations of Japan and other countries, and provide customers and society with accurate information on quality.

Establishment of Quality Management Systems and Their Implementation Based on the PDCA Cycle

The Group has developed quality management systems (QMS) that implement as a means of putting the Basic Quality Policy into practice. The plan-do-check-act (PDCA) cycle is faithfully applied to the Group's QMS implementation, as continual improvements are made to achieve better quality. Both domestic and overseas operating sites have obtained ISO 9001 certification, the international standard for quality management systems.

JX Nippon Mining & Metals Group Basic Quality Policy

The JX Nippon Mining & Metals Group hereby sets forth, and acts in observance of, this Basic Quality Policy in order to contribute to the development of a sustainable society while recognizing that its social mission is to stably supply nonferrous metals and materials.

1. Grasp the requirements of customers and society correctly in order to offer products and services that customers can trust and that satisfy their needs.

2. Improve and maintain quality in all processes from development, design, and production to delivery, while paying due attention to safety and environmental conservation.

3. Establish a quality management system, carry out continual improvements, and develop human resources.

4. Comply with all pertinent laws and regulations of Japan and other countries, and provide customers and society with accurate information on quality.

Enhancing Quality Auditing from a Third-Party Viewpoint

The Quality Control Department was established in January 2018 to plan, propose, and execute measures for maintaining and improving quality control throughout the Group, as we seek to enhance our quality management framework. At the same time, a Quality Control Committee was formed to confirm that the quality management framework is functioning effectively and to share issues.

Development of Human Resources to Provide High-Quality Products and Services

The Group undertakes human resource development to make all employees aware of the need to focus on customers and to encourage employees' active participation in continual improvement activities.

We believe that quality is the responsibility of all employees, not only in departments that contribute directly to profitability, but in back-office departments as well. We therefore have a dedicated department that provides quality control education based on original training manuals throughout the year for all employees, from new hires to senior management.

Features of Quality Control Education

• An education system enabling training programs to be selected according to employees' work roles
• Content specially designed to enable use of the quality control methods in actual workplaces
• Employees learn how to determine the true causes of quality problems by logical thinking and take the lead in solving them

Sharing of Quality-Related Information across Operating Sites

Recognizing the high importance of internal communication in implementing the quality management system, we provide opportunities for information sharing among different employee levels and divisions. Information sharing among divisions takes place in various ways, including sharing quality assurance managers' meetings, which are held bi-weekly. At these meetings, quality assurance managers report on quality-related losses and complaints that have occurred, and describe quality improvement efforts at their sites, enabling this information to be shared throughout the Group.

Note: The Group's Basic Quality Policy has been formulated in line with the JX Nippon Mining & Metals Code of Conduct.
Assuring Product Quality and Safety

Quality Management of Electronic Materials Products to Ensure High Quality and Reliability

At a time of heightening awareness of quality control among corporations, the Quality Control Department was formed in the Technology Group with the aim of enhancing the Group’s organizational structure for quality management. The role of the new department is to collaborate and cooperate with related parties in promoting initiatives for solving important quality issues common to the entire Group.

To assure customers of quality, we need to ensure that customer demands are being met at each operating site. The Quality Control Department therefore periodically monitors, analyzes, and evaluates the situation at each site, formulating and implementing improvement policies as necessary. To this end, I believe it is important to confirm whether the quality management system at a site is being implemented effectively by actually observing operations and checking records. Whenever possible, I plan for us to visit each site for frank and open talks with local managers and workers on their vision of ideal quality control, aiming to earn trust as a Quality Control Department.

Kazuaki Yoshioka
General Manager,
Quality Control Department,
Technology Group
JX Nippon Mining & Metals Corporation

Becoming a Trusted Quality Control Department

At a time of heightening awareness of quality control among corporations, the Quality Control Department was formed in the Technology Group with the aim of enhancing the Group’s organizational structure for quality management. The role of the new department is to collaborate and cooperate with related parties in promoting initiatives for solving important quality issues common to the entire Group. To assure customers of quality, we need to ensure that customer demands are being met at each operating site. The Quality Control Department therefore periodically monitors, analyzes, and evaluates the situation at each site, formulating and implementing improvement policies as necessary. To this end, I believe it is important to confirm whether the quality management system at a site is being implemented effectively by actually observing operations and checking records. Whenever possible, I plan for us to visit each site for frank and open talks with local managers and workers on their vision of ideal quality control, aiming to earn trust as a Quality Control Department.

Kazuaki Yoshioka
General Manager,
Quality Control Department,
Technology Group
JX Nippon Mining & Metals Corporation

For the peace of mind of society

Material Issues

Assuring Product Quality and Safety

Awards Received from Our Customers

Each year, we receive awards from customers in recognition of our stable supply of high-quality products, promotion of business continuity planning, and other efforts. In fiscal 2017, we received the following four awards.

From Samsung Electronics, South Korea: Best Contribution Award
From ON Semiconductor, USA: Platinum Perfect Quality Award
From STMicroelectronics, Switzerland: Best Supplier Award 2016
From Global Foundries Fab, Germany: Appreciation Award

Receiving the Best Contribution Award

Quality Management of Electronic Materials Products to Ensure High Quality and Reliability

Product development stage
Quality evaluation systems have been developed to analyze physical properties, surface conditions, purity, and other characteristics of products, by introducing analytical equipment and establishing evaluation techniques. Only products that have been confirmed to possess the necessary levels of quality can advance to the mass production stage.

Manufacturing process design stage
By introducing systems utilizing travel sheets, statistical process control, and other methods, we have developed a strict quality control regime, covering every stage from the acceptance of raw materials to the shipping of products.

Mass production stage
We have developed analysis systems that enable thorough and continuous inspections of products. We adhere strictly to internal standards developed for each product. Data from inspections is fed back to development and manufacturing divisions through a statistical quality control system to maintain and improve the quality and reliability of our products.

For the peace of mind of society

Material Issues

Assuring Product Quality and Safety

Developing Human Resources

It is essential for the JX Nippon Mining & Metals Group to develop and utilize the employees involved in day-to-day operations if it is to maximize its corporate value. By creating personnel systems that value the diversity of employees working in Japan and abroad, and by enhancing education programs, we are providing a foundation enabling employees to make the most of their abilities.
Developing Human Resources

The JX Nippon Mining & Metals Group believes it is essential to develop human resources who can ensure the future stable acquisition and supply of indispensable nonferrous metal resources and materials. We have therefore begun directing strong efforts at engaging the young, of high school age and below, who will be responsible for carrying on with this mission. A few examples of these efforts are introduced here.

Summer STEM Challenge 2017
During the summer break, the Isohara Works, the Hitachi Works, the Kurami Works, and Pan Pacific Copper’s Sagasoke Smelter & Refinery and Hibi Smelter held plant tours and experimentation sessions for junior high school students. Engineers active in these factories gave enjoyable presentations to the students about the fascination of copper, a metal without which today’s society would not exist, and about the appeal of science and technology-related occupations.

- Hitachi Works (measuring pH of solutions)
- Isohara Works (instant freezing of flowers using liquid nitrogen)

Nikkei Education Challenge
Sponsor: Nikkei Inc.
The Company participated in this event, in which businesspeople from various industries provided real-world lessons for high school students so that they could learn about the current state of Japan’s economy and technology, and experience the dynamism of society. The Company was represented by an instructor from rolled copper foil marketing, who talked on the topic of rolled copper foil, describing the activities of B-to-B companies and the fascination of B-to-B marketing. He conveyed with enthusiasm how sharing the satisfaction of achieving goals with colleagues is the best part of his work.

Power of Innovation 2018
Sponsor: Educa & Quest Inc.
Power of Innovation is a three-day training camp-style project for students from junior high and high schools, and colleges of technology. This year’s event took place from March 16 to 18, 2018, offering a chance for participants to devise solutions to actual problems in society with the cooperation of businesses. Participants heard talks on real society, took part in team workshops where they tackled issues for society assigned as their “missions” by cosponsoring companies, and gave final presentations. The mission assigned by the Company was to solve social issues making use of the power of copper in any way they wished. It was a good opportunity to help the many participants better understand and think about the importance of copper as a nonferrous metal resource.

Phase 2 Initiatives of the Endowed Unit for Nonferrous Metal Resource Recovery Engineering (JX Metals Endowed Unit)
In Phase 2 of the JX Metals Endowed Unit, which began in January 2017, public relations efforts touting the appeal of the nonferrous metals field are being directed at the general public, especially young people of high school age and below. (See page 76 for details.)

Copper PR by JX Nippon Mining & Metals Mascot Character “Coppy the Kappa”
Copper is a material essential to the convenient life we enjoy today. Yet it receives little attention, as it is generally covered or used inside devices and is therefore not directly visible. In an attempt to make copper more familiar to the younger generation, we conduct PR using the mascot character Coppy the Kappa via pamphlets and a special website. The pamphlets are made available at the Nippon Mining Museum and at the Science Museum in Tokyo’s Kitanomaru Park, as well as being distributed at various events. The website is designed to help young people learn about copper.

Website for young people: “Learn about Copper with Coppy the Kappa”
http://www.nmm.jx-group.co.jp/copper/ (in Japanese only)
Promoting Development of Human Resources

The Company takes a proactive approach to developing its employees, who are important stakeholders. We endeavor to provide a wide-ranging education to our personnel, offering a variety of educational programs that address five key areas of development: managerial skills, specialist skills, skills for global readiness, self-development, and other skills and awareness. Strengthening the Education System to Support the Energizing of Individuals and Organizations

After examining the existing education system to identify areas that needed supplementing, in the 2016 and 2017 fiscal years we launched a new system and new training programs, aimed at transforming the mind-set and improving the skills of employees as the business climate continues to undergo constant change. These include (1) boosting managerial skills by providing new training for intermediate-level managers (targeting the general manager class); (2) adding new coordinator training to expand opportunities for boosting managerial skills; (3) facilitating overseas study to boost specialist skills and managerial skills (either to earn a master’s or doctoral degree at an overseas graduate school, or to obtain an MBA); and (4) launching Self-Innovation Support, a new scheme for the Company to assist with self-development.

Our Education System

Examples of Educational Programs Implemented in Fiscal 2017

(Training for Young Employees Who Completed University or Graduate School)

<table>
<thead>
<tr>
<th>Program</th>
<th>Target employee group</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>First-year language training</td>
<td>Those interested among graduates of university or graduate school in their first year with the Company</td>
<td>About five months of study through language correspondence courses matched to foreign-language level (TOEIC score) for self-development purposes. A language other than English may be chosen as needed.</td>
</tr>
<tr>
<td>Overseas training</td>
<td>All graduates of university or graduate school in their second year with the Company</td>
<td>Eight weeks of study at overseas language schools, etc., matched to foreign-language level (TOEIC score) university-level classes in Europe or the U.S., or training in Chinese, Korean, or Spanish at overseas language schools.</td>
</tr>
<tr>
<td>Short-term study-abroad language program</td>
<td>Persons requiring a certain level of language competence for their work</td>
<td>Four to 12 weeks of study in English, Chinese, Korean, or Spanish at overseas language schools, etc.</td>
</tr>
<tr>
<td>Overseas training</td>
<td>Persons requiring a certain level of language competence for their work</td>
<td>Language training suitable work hours for persons desiring to study Chinese, Korean, Spanish, or another language for self-development who have received approval from their manager two-hour weekly classes, tuition paid by the Company.</td>
</tr>
<tr>
<td>TOSSEC testing</td>
<td>TOSSEC test administered annually</td>
<td>TOSSEC test administered annually</td>
</tr>
<tr>
<td>Study abroad (resumed in fiscal 2017)</td>
<td>Those recommended by supervisors for each job category and selected by the Council for Utilization of Human Resources</td>
<td>Study at a university or graduate school—outside Japan—for enhancing work-related knowledge, learning technology skills, and fostering insight. These courses are divided broadly into the following two types.</td>
</tr>
</tbody>
</table>

Overview of the Educational Programs for Global Readiness at JX Nippon Mining & Metals

The Company has prepared various educational programs for global readiness aimed at developing human resources who can advance its global operations and make the Company more globally minded.
Promoting Development of Human Resources

Self-Innovation Support

To address the desire of employees for further self-growth, the Company reviewed its existing self-development system and established the Self-Innovation Support scheme, which offers broad latitude in terms of costs and program content.

Application Process for Self-Innovation Support

Under this scheme, employees themselves apply for their preferred external self-development program, and take it with Company approval. When the program has been completed, the Company subsidizes half the costs, up to a limit of 500,000 yen per program.

Unlike the prior self-development support system, this one offers broad latitude, so that employees will make effective use of the private time created by improving their work-life balance. Previously, employees chose from programs readied by the Company in advance. Under this new scheme, so long as certain conditions are met, such as the relevance of the program to company operations and taking the program outside working hours, employees can choose from a broad range of programs including language study, qualifications, degrees, or development of various skills. In this way, the scheme is able to meet the desire of employees for self-development more effectively than before.

<table>
<thead>
<tr>
<th>Applications made</th>
<th>Examples of programs applied for</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st round (Oct.-Dec. 2016) 14</td>
<td>English conversation, U.S. certified public accountant, patent attorney, small and medium-sized enterprise management consultant, university leadership program, courses at business school</td>
</tr>
<tr>
<td>2nd round (Mar.-Nov. 2017) 9</td>
<td></td>
</tr>
</tbody>
</table>

Comments by an Employee Who Received Self-Innovation Support

At the Kurami Works, where I am assigned, we have constantly been working at full capacity in recent years because of the many orders for rolled copper products and other products used as materials in smartphones. What is more, the products we manufacture have changed greatly since around 2011, when I joined the company. These rapid changes in my environment made me acutely aware of the risk that I myself might lose sight of what I really needed to do because I was looking at the work in front of me from the narrow standpoint of my own workplace alone. That is why I decided to study at the BBT (Business Breakthrough) University to systematically learn about basic business administration, something I had not yet experienced in my career in science and technology.

BBT University is an online school, where classes and discussions with classmates all take place online. There is also a smartphone app that lets you take classes and carry on discussions from your phone. This means you can proceed with the studies at your own pace, whenever or whatever you like, which suits me perfectly.

Classes at the university are not limited to business administration, but cover a wide range including accounting, organizational theory, and liberal arts. Among these are RTDCS (Real Time Online Case Study) classes, where every week we consider what we would do about specific issues if we were the president of an existing company. Thanks to these classes, I am now able to think about my work from the higher perspective of what I would do as a manager or general manager, rather than from my current position, broadening the scope of my thinking as I engage in my work.

Next, I plan to work on my thesis in preparation for my graduation. After graduation, I would also like to study the next technology trends such as AI and machine learning. In the longer term, since the environment is likely to change even further, I am thinking about studying business administration again to acquire an MBA.

Comments by a Participant in Overseas Study

At the graduate school in the U.S., I am now attending, I am in the Metallurgical and Materials Engineering Program, learning about methods for metal material processing and strengthening. I plan to write a graduate thesis on the topic of developing stronger copper alloys, and am now spending my days conducting related experiments and writing papers.

Before I came abroad to study, my job at the Kurami Works included improving the copper alloy production processes, developing new copper alloys, and dealing with customers. Then I transferred to the Market Development Department in the Functional Materials Division of the Electronic Materials Group at Head Office, making use of my experience at the Kurami Works to expand sales of copper alloys from an engineering standpoint. Maintaining close communication with domestic and overseas customers and with our manufacturing people, I sought to determine the technical issues faced by customers and made various proposals, helping to resolve the issues. In the course of those efforts, I was keenly aware that customers’ demands in terms of copper alloy performance were becoming more advanced and complex, and that they required a faster pace of development. I was therefore extremely grateful for the opportunity afforded me by this overseas study program: it inspired me to want to improve my problem-solving ability and advance my skills as an engineer through deeper and more systematic study of materials engineering and become an engineer who can play a role on the global stage.

My overseas study period is two years, of which the first year comprises mainly coursework. Classes start at 8:00 a.m. each weekday morning. In between classes, there is preparation and review, homework, and studying for tests. In preparation for writing my graduate thesis, I am also busy drawing up a research plan, reading related academic papers, and readying test samples, as I devote all my time to improving my capabilities.

When I graduate and return to the Company, I want to make the most of the systematic knowledge of materials engineering I acquired in the program, as well as my cross-cultural communication abilities, to work with customers in Japan and overseas on timely development of innovative new products.
Providing a Rewarding Work Experience

The JX Nippon Mining & Metals Group endeavors to provide a workplace where employees are able to make the most of their abilities—a workplace full of the vitality that comes from maintaining physical and mental health, which we recognize as a strong advantage for ensuring the Company’s sustainable growth.

Along with implementing appropriate personnel evaluation systems, we seek to improve these systems so as to allow diverse human resources to choose a variety of work styles.

Personnel Systems

The Company has designed personnel evaluation systems consisting mainly of Competency Evaluation, Performance Evaluation, and Self-Statement systems.

Creating Appropriate Personnel Evaluation Systems

The Company has introduced a Competency Evaluation System based on competency models and a Performance Evaluation System centered on management of missions and goals.

In Competency Evaluation, employees are interviewed by their supervisors based on competency items determined by the nature of their work and job grade. The resulting assessment of whether they have the necessary competency is used in deciding promotions.

For Performance Evaluation, employees meet with their supervisors to discuss the extent to which they attained missions and goals agreed on with the supervisor at the beginning of the fiscal year, and the degree of challenge presented by the goals. Their performance is then evaluated, and the results of these evaluations are reflected in employee bonuses. The competency model and performance evaluation items for managerial staff have been restructured so that 50% of the items evaluated relate to personnel management.

Self-Statement System

A Self-Statement System was introduced to help the Company understand the aspirations of individual employees and reflect them in personnel development and elsewhere. Under this system, employees submit this statement on the specified form once a year, looking back on their work and indicating their ambitions, as well as other matters of relevance, such as any reason why they cannot accept job transfers that would involve moving residence and how long that will remain the case.

Initiatives Promoting Diversity

The Group values diversity in both human resources and work style. In compliance with relevant laws and regulations in Japan and overseas, the Group is pursuing initiatives including the continued employment of workers aged 60 and older, hiring of persons with disabilities, and promotion of active participation in the workplace by women. By creating programs enabling childcare and family care leave, and time off for international volunteering, we provide an environment that supports various work styles.

Compliance with the Act on Promotion of Women’s Participation

(2) We have introduced new and revised systems aimed at creating workplace environments in which a diverse range of personnel can do fulfilling work, so that all employees including women have the opportunity to perform to the best of their abilities. These include a new system for returning to work following leaves, revision of childcare and family care leave systems, and introduction of telecommuting.

Workplaces Where Women Play Significant Roles

As of March 31, 2018, a total of 1,168 female employees were working in the Group worldwide. Of these, approximately 29% occupy managerial positions (supervisor class and above). JX Nippon Mining & Metals employs 259 female employees (including part-time workers), of whom approximately 25% are in managerial roles. There are no gender differences in base pay.
For the peace of mind of society

Material Issues

Providing a Rewarding Work Experience

Initiatives for Providing a Rewarding Work Experience

Enhancing Childcare and Family Care Systems

At JX Nippon Mining & Metals, we are working to energize individuals and organizations, with the aim of strengthening business while adapting to changes in the business climate and making major strides toward the future. Since fiscal 2016, we have revised various personnel systems and taken measures to change awareness, from the two standpoints of strengthening personnel management and development, and creating environments in which a diverse range of personnel can do fulfilling work. We will continue monitoring and studying these systems, making further changes as necessary, and rolling them out flexibly.

One aspect of initiatives for creating environments in which a diverse range of personnel can do fulfilling work is making the working environment one where even employees with commitments such as childcare or family care can make the most of their abilities. To this end, we introduced new or revised systems as described here.

Overview of Childcare and Family Care Systems

<table>
<thead>
<tr>
<th>Pregnancy/childbirth</th>
<th>Childcare/parenting</th>
<th>Family care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre- and post-childbirth time off</td>
<td>Maternity allowance, additional onetime maternity benefit, childcare leave benefit (employment insurance)</td>
<td>Family care leave benefit (employer’s insurance)</td>
</tr>
<tr>
<td>Special measures for women during pregnancy and within one year after childbirth</td>
<td>Maternity allowance, additional onetime maternity benefit, childcare leave benefit (health insurance)</td>
<td>Family care leave allowance</td>
</tr>
<tr>
<td>Exemption from overtime work exceeding limit</td>
<td>No change</td>
<td>Return-to-work grant</td>
</tr>
<tr>
<td>Exemption from overtime work</td>
<td>Exemption from overtime work</td>
<td>Return-to-work grant</td>
</tr>
<tr>
<td>Shorter workday, parental leave eligibility, employment guarantees</td>
<td>Parent leave allowance for childcare concierge service</td>
<td></td>
</tr>
<tr>
<td>Maternity leave allowance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data relating to Diversity (JX Nippon Mining & Metals)

Use of childcare leave program in fiscal 2017

<table>
<thead>
<tr>
<th>No. of employees using program in fiscal 2017</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eligible to use program*</td>
<td>606</td>
<td>626</td>
<td>1232</td>
</tr>
<tr>
<td>Eligible to use program even when not employed</td>
<td>606</td>
<td>626</td>
<td>1232</td>
</tr>
</tbody>
</table>

Retention rate after return from childcare leave (Percentage of those still employed 12 months after return from leave)

<table>
<thead>
<tr>
<th>No. of employees returning to work in fiscal 2018</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 months after leave</td>
<td>330</td>
<td>326</td>
<td>656</td>
</tr>
</tbody>
</table>

Status of rehiring efforts in fiscal 2017

<table>
<thead>
<tr>
<th>No. of employees returning to work in fiscal 2018</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 months after leave</td>
<td>330</td>
<td>326</td>
<td>656</td>
</tr>
</tbody>
</table>

Persons with disabilities as a percentage of the workforce in fiscal 2017

<table>
<thead>
<tr>
<th>No. of employees with disabilities</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.08%</td>
<td>330</td>
<td>326</td>
<td>656</td>
</tr>
</tbody>
</table>

Maintaining Good Labor-Management Relations

Labor unions have been formed at nearly all Group companies in Japan. At each Group company, good relations built on mutual trust are maintained between management and employees. At regular meetings between representatives of management and the labor union, management discloses details of the company’s business; while at the Health and Safety Committee meetings, causes of union, management discloses details of the company’s business; meetings between representatives of management and the labor organization. Recognizing health and safety as a particularly important theme to be confirmed between management and labor, 90% of Group companies with labor unions include matters relating to health and safety in their labor agreements.

When changes are made in the company organization or business activities, adequate time is given to preliminary explanations and discussions before conducting the necessary procedures, in accordance with the labor agreement.

In fiscal 2017, there were no strikes. As my parents were busy caring for their own parents, I was in a situation where I could not obtain adequate help with childcare from them. I also felt it was important to spend time with our child in the initial period after birth. So I obtained eight months of childcare leave. Every day went by quickly during the leave period, filled with bottle-feeding, diaper-changing, bathing duties, reading picture books, and caring for our child in other ways, as well as doing housework. It took a while to get over the initial nervousness in dealing with an infant, but after about six months I became used to the life of caring for a child, and my wife was also able to relax a bit physically and mentally. Based on this experience, for people like me who cannot obtain support from their family, I recommend taking at least six months of childcare leave. When you spend time looking after your child, there are many things that don’t go as planned. I believe the experience helps you develop patience and endurance, while learning how to multitask, all of which come in handy at work as well. When obtaining childcare leave, I consulted my supervisor at an early stage. To ensure that my work would continue to be carried out smoothly after I went, I drew up a list of points to explain to the facilities I was in charge of maintaining and passed this on to the person substituting for me. Having obtained the understanding and cooperation of my colleagues, I was able to embark on childcare leave free of worries. I am truly grateful for this.

Since the time my daughter entered kindergarten, I have been enthusiastic about using the Company’s childcare support programs. In our household, both of us work, so when regular kindergarten hours are over, our daughter stays in the daycare service offered by the kindergarten, and during summer or other times when the kindergarten is closed, she stays in a private run temporary daycare center. Every month, we make use of the childcare subsidies program to cover part of the cost of these daycare services. This is especially helpful for the temporary daycare service, which is quite a burden because it costs more than regular daycare. Thanks to such subsidies offered by the Company, a couple like us have the additional option, besides daycare centers, of sending our child to kindergarten.

To find a daycare center offering temporary daycare, we took advantage of the childcare concierge service. After contacting the service and exchanging information by email, we received suggestions for a number of daycare centers that met our wishes. Although we did the follow-up inquiries and applications ourselves, our burden as a working couple with little free time was eased considerably by having the search for a daycare center with temporary daycare performed on our behalf. We are now using temporary daycare at one of the daycare centers first suggested to us by the childcare concierge service.

As time passes and our daughter grows older, there will no doubt be various new concerns and uncertainties, but by making effective use of the childcare support programs offered by the Company, we as a couple hope to continue balancing our parenting responsibilities with our work.
Introduction of Telecommuting

In January 2018, we began offering the option of telecommuting, as an initiative for creating environments in which a diverse range of personnel can do fulfilling work.

By making use of this program, employees can cut their commuting time and reduce the physical burden of commuting, while acquiring more time for childcare or family care, for themselves, or to spend with their families. The program is also expected to raise productivity by, for example, enabling telecommuters to concentrate undisturbed on such tasks as creating documents, and by standardizing tasks in the workplace and promoting paperless office work.

In addition, telecommuting demands the ability to pre-plan work and exercise self-management more effectively than ever before. In administering this program, both telecommuters and their colleagues in each workplace are required to understand the importance of making sufficient advance arrangements with colleagues, and of ensuring proper communication through contact and reporting during the use of the program.

Program Overview

Eligibility

Employees and others with at least one year of service, who have obtained the approval of their supervisor

Hours

Employees can work from home for up to two days a week, with the same starting and ending times as for regular work at the workplace.

Telecommuting method

Employees are required to make the employee’s workplace PC and home PC connected, and to report the use of the telecommuting program

Comments from a User of the Telecommuting Program

Yuran Sato
Assistant Manager
Nursery Service Department
Poppins Corporation

As we have a child in elementary school and both my wife and I work, our child normally goes to a private after-school care service when regular school hours are over. Unlike a daycare service, however, after-school care service hours are short, especially during summer or other long breaks, even though children in the lower grades cannot be left alone at home.

Just when we were fretting about what to do during these long breaks, the telecommuting program started up. Thinking I would be able to work without leaving our child alone at home, I obtained the understanding of my workplace supervisor and colleagues, and began using the telecommuting program.

While I was initially concerned about whether I could get work done at home, when I actually tried it out, remotely operating my office PC, I was surprised at how smoothly things went. My concentration improved, and I felt I was making progress in my work. Moreover, by eliminating the two-hour round-trip commute, I had time to take our younger child and from dayscare, spending time with our children that I would not otherwise be able to, and easing my wife’s burden as well.

With the current telecommuting program, you have to get your supervisor’s approval beforehand. Personally, I feel it would be even more useful if we could use it for special emergencies, such as when your child’s class is called off due to the flu (even though your own child does not have it).
Promoting Community Involvement and Development

Since the inception of the business at the Hitachi Mine, the JX Nippon Mining & Metals Group has emphasized the spirit of maintaining good relations with local communities in performing its business operations. Keeping alive that spirit today, Group companies actively carry out social contribution activities in accordance with the Code of Conduct, seeking coexistence and prosperity with society as good corporate citizens. Through corporate citizenship activities rooted in the local community and effective communication with local residents at each of our operating sites in Japan and overseas, we endeavor to forge relationships of trust with the societies in which we conduct our business.

Social Contribution Activities

For fiscal 2017, the Group adopted a corporate citizenship policy of carrying out social contribution activities geared to the nature of the Group’s businesses, undertaking social contribution activities and interactions rooted in the local community at each of our operating sites in Japan and overseas. These activities are planned and assessed by the Citizenship Committee, an organization under the CSR Committee, in meetings every six months.

Social Contribution Activities in Japan

All the Group operating sites in Japan actively engage in social contribution activities in their respective communities.

Cleanup Campaigns

- **JX Nippon Tsuruga Recycle**
  - Participating in Cleanup in the Company Vicinity and in Local Volunteer Activities
    - In support of the Operation Cleanup Fukushima initiative promoted throughout Fukushima Prefecture, the company engages in cleanup activities in the area around the company premises.
    - It also plays an active role in local volunteer activities, such as the cleanup campaign at the Kei no Matsubara beach, a nationally designated place of scenic beauty (June: beach cleaning, November: cleaning fallen leaves in the pine grove); cleanup at Mikuta Goko lakes (twice during the year); and waterway management at the Nakakurei Wetlands (once during the year).

- **Isohara Works**
  - Improving the Appearance of the Environment around the Plant
    - The Isohara Works organizes after-hours cleanup sessions around the plant as part of its regular activities to improve the appearance of the local environment. A total of 250 persons from each of the departments participated during fiscal 2017, conducting cleanup activities along nearby sidewalks and around the Kitaibaraki civic baseball field, among other places.

- **Kurami Works**
  - Participation in Sagami River Cleanup Campaign
    - The town of Samukawa (in Kouza-gun, Kanagawa Prefecture) organized a Sagami River Cleanup Campaign aimed at furthering understanding of community contributions and environmental issues. The Kurami Works provided 104 participants, including employees and their family members, helping to promote communication between the company and the local community.

Educational activities and Plant Tours

- **Hitachi Works**
  - Cooperation with Outside Institution for Learning and Training
    - In July 2017, the company cooperated in offering the Fiscal 2017 Training Course on Mining Development sponsored by the International Institute for Mining Technology. Held for the 10th time, this course seeks to foster and improve capabilities for comprehensively promoting mineral resources development. Undergoing the training this time were 27 young employees of nonferrous metals companies and trading companies. The company was responsible for teaching about the role of boring in metal resource exploration. The classroom session was followed up by a visit to the company’s Odate site to see actual boring equipment.
    - Then in September, the company cooperated in practical training at the Odate site of 25 students from the Faculty of International Resources Sciences of Akita University. The site general manager explained the company’s business, the workings of a boring machine, and how rock core samples are mined using the wireline method, among other topics, while giving the participants hands-on experience at the facility.

- **JX Nippon Exploration and Development**
  - Cooperation in Student Training at a Smelting and Refining Site
    - In October 2017, the company cooperated in this training session as an event sponsored by the Kansai Branch of the Mining and Materials Processing Institute of Japan. A group of 36 persons, mainly professors and students from Kyoto University, visited the company, where they observed the processes for recycling automobile shredder dust in a gasification melting furnace. They also listened to presentations by young engineering staff on the company’s involvement in recycling and environmental services.
**Events**

**Hitachi Works, Kurami Works, Isoshara Works, Sagosanoki Smelter & Refinery of Pan Pacific Copper, and Toho Titanium**

**Summer Festivals**

Each year the Group plans and puts on summer festivals, inviting families of employees as well as residents of surrounding communities.

The festivals are enlivened by refreshment stands run by employees, lotteries, and local children playing instruments and dancing. Some of the festivals include traditional arts and fireworks shows. For the local residents, these events have become a much-anticipated summer tradition.

**JX Nippon Tsuruga Recycle**

**Firefly Watching Event**

Firefly watching is an annual event the company has been offering for more than a decade. In 2017, the scope of this activity was greatly expanded, with new participations by employees as well as residents of the Tsuruga district who lost their homes to flooding of the Copiapó River.

**Sponsorship of Youth Baseball Tournaments: the “JX Nippon Mining & Metals Cup”**

In fiscal 2017, the Group hosted baseball classes for local kindergartners and nursery schools as one of its volunteer activities. In fiscal 2017, having received requests from seven schools, more than in other years, the team hosted classes in which the participants experienced the fun of baseball through ball throwing practice and intramural games.

**Donations to Local Communities**

The Group donates to local communities for many different causes, including providing kimchi to low-income households, and visiting orphanages and shelters. Support for volunteer activities conducted by a group of Samsung Electronics subcontractors, engaging in dialog with the Collas, the indigenous people living in the area around the mine site, endeavoring to build up trust and protect their rights. There have been no cases since that time of violations of the rights of local residents.

**Social Contribution Activities outside Japan**

**Activities at the Caserones Copper Mine**

Introduction here are initiatives by SMD Minera Lumina Copper Chile (MLCC), operator of the Caserones Copper Mine in the Republic of Chile.

**Assistance with Improving Crop Irrigation Techniques**

MLCC took part in a project to help farmers in the Copaipó Valley improve their irrigation techniques for securing precious water resources, and provided funding assistance. This project, which began in 2013, has been a major success, helping to reduce water resource use by 10% while maintaining crop quality and not impacting yields.

**Support for Acquiring Specialized Skills**

In January 2016, MLCC provided on-site training aimed at developing industrial machinery maintenance technicians to 20 Los Lores High School students at the Caserones Copper Mine, and issued completion certificates to the trainees taking part. MLCC cooperates in this and other programs that will help young people living around the city of Tierra Amarilla find employment in large mines or agricultural companies locally.

**Assistance to Surrounding Regions Suffering Damage from Torrential Rains and Heavy Snowfall**

In May 2017, MLCC provided assistance in the form of drinking water, food, charcoal, blankets, and other items to residents in the area near the mine who suffered damage from heavy rain and snow. The company also provided container houses and a shared storage facility to five households in the Harritos district who lost their homes to flooding of the Copiapó River.

**Donations to areas affected by torrential rain and mudflows in Peru**

Donations to nearby elementary schools (supporting children in low-income families with living expenses), including providing kimchi to low-income households, and visiting orphanages and shelters.

**Support for Temporary Citizen Registration Office in the Caserones Vicinity**

MLCC worked with the citizen registration office in setting up a temporary local office to cooperate in distribution of identification cards to residents of the area around the Caserones Copper Mine. This initiative targeted residents of the Tierra Amarilla district and surrounding areas who face difficulty in traveling all the way to central Copiapó City for the registration procedure. Identification cards were created and distributed to more than 500 persons free of charge.

**Donations to Local Communities**

The amount of donations by overseas Group companies is converted to yen using the exchange rates of the Group in fiscal 2017 were ¥0.3 billion * (¥0.11 billion in Japan and ¥0.19 billion outside of Japan). * The amount of donations by overseas Group companies is converted to yen using the exchange rates at the end of fiscal 2017.

**Other Activities**

<table>
<thead>
<tr>
<th>Company</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>JX Nippon Mining &amp; Metals Philippines, Inc. (Philippines)</td>
<td>Participation in Biên Hòa’s park project to plant mangroves around the Laguna de Bao湾 lake.</td>
</tr>
<tr>
<td>JX Nippon Mining &amp; Metals Korea Co., Ltd. (South Korea)</td>
<td>Support for educational and training programs conducted by the Jeju Island Government aimed at improving child labor and providing materials needed for education, along with educational opportunities and workplace safety.</td>
</tr>
<tr>
<td>Nippon Mining &amp; Metals (Shanghai) Co., Ltd. (China)</td>
<td>Donations to nearby elementary schools (supporting children in low-income families with living expenses).</td>
</tr>
<tr>
<td>Pan Pacific Copper Exploration Peru, S.A.C.</td>
<td>Donations to areas affected by torrential rain and mudflows in Peru.</td>
</tr>
<tr>
<td>Compania Minera Cucharas S.A. (Peru)</td>
<td></td>
</tr>
</tbody>
</table>
Commitment to Our Suppliers

The Group is committed to fulfilling its corporate social responsibilities throughout the entire supply chain. Based on the JX Nippon Mining & Metals Group Basic Procurement Policy, we strive to build relationships of cooperation and trust with suppliers by conducting transparent and fair transactions with them.

Partnering with Suppliers

Based on the JXTG Group Philosophy and our Code of Conduct, we engage in procurement activities based on the below policy as part of our CSR initiatives.

JX Nippon Mining & Metals Group Basic Procurement Policy

1. Comply with laws, regulations, and rules and engage in fair transactions.
   - Respect the letter and spirit of relevant laws and social norms in executing business operations.
   - Conduct purchasing activities based on fair evaluations.
   - Maintain appropriate relationships with business partners based on the highest ethical values.

2. Protect intellectual property rights.
   - Strictly control personal information obtained in the course of procurement activities.
   - Do not illegally obtain or illegally use intellectual property, including the patents, utility models, designs, and trademarks of third parties, and do not infringe such rights.

3. Build relationships with business partners based on mutual understanding and trust.
   - Provide business partners with high reliability and satisfaction through accurate, fast, and highly transparent activities.
   - Endeavor to achieve robust communication with business partners and consistently promote creativity and innovation through advanced ideas.
   - Contribute to the development of a sustainable society by promoting the purchase of environmentally friendly materials and machinery.

4. Follow the below principles regarding conflict minerals.
   - Do not engage in raw materials procurement that contributes to illegal activities in conflict-affected regions or to human rights infringements through such illegal activities.
   - Respect the guidance of the Organisation for Economic Co-operation and Development related to raw materials procurement from conflict-affected areas, and control supply chains in an appropriate manner.

Promotion of Green Purchasing

The JX Nippon Mining & Metals Group has drawn up the Green Purchasing Policy, which dictates that the reduction of environmental and social impacts is taken into account when making decisions on purchasing materials and equipment necessary to its business operations. Based on this policy, we have also drawn up Green Purchasing Guidelines setting specific requirements for choosing suppliers.

In addition, the Group periodically conducts green purchasing surveys of suppliers, which include items regarding their use of banned substances in the manufacturing process, the presence of banned substances in supplied products, and procurement from companies with human rights problems. In fiscal 2017, the surveys were conducted from January to December 2017, covering 449 suppliers that account for 95% of the value of the items purchased and accounted by the Company, as well as JX Nippon Environmental Services and Pan Pacific Copper. Responses were received from 435 suppliers, for a response rate of 98.88%. Survey results are reflected in supplier reviews as applicable.

Confronting the Problem of Conflict Minerals

The Group’s Basic Procurement Policy includes a clause on avoidance of conflict minerals, and we have established and operate management systems to appropriately address this issue.

What Are Conflict Minerals?

“Conflict minerals” is the general term for minerals that are mined illegally, in most cases in conflict-affected regions, providing a source of funds for local armed groups. The use of these minerals may lead to the prolonging of conflicts and cooperation with conflicts and the expansion of human rights abuses and dehumanizing acts.

Global Moves to Impose Trade Restrictions

Global moves to restrict trade of conflict minerals began in the late 1990s, and today various organizations have devised rules and programs. In 2011, the Organisation for Economic Co-operation and Development established the Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas, advising corporations and others to manage their own operations so as to avoid involvement in the trade of conflict minerals. In the United States, from 2013 the Dodd–Frank Wall Street Reform and Consumer Protection Act obligated companies listed on the U.S. stock exchanges to submit reports on their usage of specific conflict minerals (tin, tantalum, tungsten, and gold) to the Securities and Exchange Commission. The aim of such measures is to stop companies from using conflict minerals through information disclosure and social pressure. The European Union and other organizations are moving to introduce a conflict minerals management and certification system.

Group Response to the Issue

In line with these global trends, industry organizations relevant to the Group (including the LBMA*1 and RBA) have established monitoring programs for eliminating conflict minerals. These programs request that companies cooperate with surveys and undergo external audits by an independent organization. Pan Pacific Copper, a producer of gold bullion, has established and operates a management system for supply chain due diligence that calls for the following actions to be taken:

1. Performing supply chain due diligence before purchasing mineral raw materials (confirming the place of origin of the materials, assessing risks, confirming materials after delivery, confirming distribution routes, preserving relevant documents, etc.).
2. Notifying suppliers of the policy on exclusion of conflict minerals.
3. Conducting in-house education on supply chain due diligence and its background.
4. Conducting internal audits and undergoing external audits.

The implementation status of supply chain due diligence is audited by an independent organization specified by the LBMA, and the results are reported to the LBMA. As a result of following these procedures, the gold bullion produced at Pan Pacific Copper’s Saganoseki Smelter & Refinery is included on the LBMA’s Good Delivery List. At the same time, the Saganoseki Smelter & Refinery has been included on the RMAP Conformant Smelters list compiled by the RBA and GSFI—recognition that it is taking proper measures to exclude conflict minerals. More recently, in September 2017, the LBMA announced its Responsible Silver Guidance, asking for proper due diligence in the silver supply chain. In response, the JX Nippon Mining & Metals Group has determined to follow this Guidance, setting rules and taking other steps to achieve conformance in fiscal 2018.

*1 LBMA: London Bullion Market Association. An industry association composed of financial institutions and others that deal in gold bullion. Inclusion in this association’s Good Delivery List is viewed as a guarantee of high-quality and reliability.
*2 GSFI: Global e-Sustainability Initiative (a trade association of the information and communications technology industry in Europe).
*3 The RBA and GSFI together created the Responsible Minerals Assurance Process (RMAP) certification program, based on their relationship with the electronic and communications equipment industry, where the risk of conflict mineral use is especially high.
Basic Environmental Policy

As a comprehensive manufacturer of nonferrous metal resources and materials, the JX Nippon Mining & Metals Group is carrying out the following initiatives aimed at contributing to environmental conservation on a global scale through innovation in the productivity of resources and materials.

1. Promotion of technology development that will improve productivity of resources and materials

We will work to utilize resources effectively by developing technologies that will enable higher yield and extraction percentage, quality improvement, shorter process steps, recycling and energy saving, as well as by developing environment-friendly materials and products.

2. Active engagement in environmental conservation

Going beyond compliance with environmental regulations, we will strive to further reduce the impact of our operations on the environment. To this end, we will work to develop technologies for environmental conservation and work actively and continuously for environmental conservation.

3. Enhancement of employees’ awareness of environmental conservation

We will work to raise each employee’s awareness of environmental conservation through provision of environmental management education.

4. Elimination of waste in operations

We will work to eliminate waste and save resources and energy at every stage of our operations.

Disclosure of information

We will disclose the state of our environmental conservation-related operations in an active and fair manner in order to further enhance communication with stakeholders.

Action Plan for Environmental Protection

We have drawn up an Action Plan for Environmental Protection as outlined below, to implement the Basic Environmental Policy.

Approach to environmental protection

1. Environmental protection organization

The general manager of the Company’s Environment & Safety Department is in charge of coordinating and promoting environmental protection efforts in the Group. Recognizing that on-site personnel should be responsible for ensuring environmental protection, the top managers at each operating site serve as supervisory environmental managers. At the same time, we are working to enhance the effectiveness of the Environment Measures Committees and to advance mutual understanding between labor and management regarding environmental protection.

2. Environment management systems

An ISO 14001-compliant environmental management system is in place at all Group operating sites. Through top-management commitment to environmental and safety management, we have continuously strengthened environmental conservation measures and working to reduce environmental risks. Through management by front-line employees, and through adherence to the Basel Convention, we are continuously enhancing the impact of our environmental protection measures.

3. Environmental auditing

In order to maintain and continuously strengthen environmental protection at the Group operating sites, we are taking steps to effectively audit the impact of our operations on the environment, and to develop countermeasures to address any such issues.

Measures to be taken

We are committed to understanding the measure indicated on the right to minimize the environmental impact of the Group’s business activities.

Environmental conservation at our overseas businesses

1. Environmentally friendly operations in our overseas business activities

We will work to continuously improve the environmental impact of our overseas business activities. In addition to adhering to the Basel Convention, we will take steps to ensure that our exporting and importing partners do not harm the environment.

Emergency response measures

1. Emergency response manuals and drills

Emergency response manuals and procedures are in place at the Groupwide level, along with those at the business-group and operating-site levels. Emergency drills are carried out.

2. Response to environmental accidents

Reporting procedures are in place at the Groupwide level, along with those at the business-group and operating-site levels. Emergency drills are carried out.

Environmental Targets

Along with the management in the 4th Medium-Term Action Plan, we are carrying out actions to meet the long-term targets for 2030.

Long-term targets

1. CO2 Reduction and Energy Conservation: By fiscal 2030, reduction in CO2 emissions by 18% from fiscal 1990 levels

(a target set after the Japanese government’s new targets were incorporated in the Paris Agreement at COP21 in 2015)

2. Ratio of Non-Value-Bearing Waste Volume: By fiscal 2030, ratio of non-value-bearing waste volume of less than 0.5%

Results for the 4th Medium-Term Action Plan (fiscal 2016 to 2019)

1. Energy and CO2

Cumulative allowable CO2 emissions in Japan of less than 4.07 million tons for the four years from fiscal 2016 to fiscal 2019

2. Waste

Ratio of non-value-bearing waste volume of less than 0.5% (fiscal 2019)

3. Environmental management

Compliance with revisions to ISO 14001 (Environmental Management Systems), and scheduled implementation of compliance inspections and environmental auditing

4. Environmental targets

Performance (fiscal 2017) Performance (fiscal 2019) Summary

<table>
<thead>
<tr>
<th>Target area</th>
<th>Environmental targets</th>
<th>Performance (fiscal 2017)</th>
<th>Performance (fiscal 2019)</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy and CO2</td>
<td></td>
<td>853 thousand tons (Target achieved)</td>
<td>858 thousand tons (Target achieved)</td>
<td>Due to energy-saving measures and other efforts, domestic CO2 emissions in fiscal 2017 were 858 thousand tons, 161 thousand tons less than the single-year target of 1,019 thousand tons, achieving the target.</td>
</tr>
<tr>
<td>Waste</td>
<td></td>
<td>0.4% (Target achieved)</td>
<td>0.4% (Target achieved)</td>
<td>Due to thorough implementation of waste management and reduction of waste, recycling, and reuse efforts, the ratio of non-value-bearing waste volume in fiscal 2017 was 0.4%, achieving the target.</td>
</tr>
<tr>
<td>Environmental management</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compliance with revisions to ISO 14001 (Environmental Management Systems), and scheduled implementation of compliance inspections and environmental auditing</td>
<td>Comprehensive inspections performed at nine operating sites, along with environmental and safety audits at 11 sites (Target achieved)</td>
<td>Comprehensive inspections performed at nine operating sites, along with environmental and safety audits at 12 sites (Target achieved)</td>
<td>Of the 16 operating sites that have acquired ISO 14001 certifications, transition to the 2015 version was completed by 10 sites in fiscal 2017. The remaining six sites will complete the transition during 2018. In addition, 2017-2018 comprehensive compliance inspections and environmental and safety audits were implemented as planned.</td>
<td></td>
</tr>
</tbody>
</table>

*1 We are working to reduce annual allowable emissions from the above listed domestic operating sites by 15% below the fiscal 1990 limit. Of the 16 Medium-Term Action Plan, we are working to reduce emissions by 15% from the fiscal 1990 level by fiscal 2020.

*2 From the energy-saving measures and other efforts, the ratio of non-value-bearing waste volume in fiscal 2017 was 0.4%, achieving the target.

*3 Of the 16 operating sites that have acquired ISO 14001 certifications, transition to the 2015 version was completed by 10 sites in fiscal 2017. The remaining six sites will complete the transition during 2018. In addition, 2017-2018 comprehensive compliance inspections and environmental and safety audits were implemented as planned.

Note on numerical data in this section

Due to rounding, numbers presented here may not add up precisely to the totals provided.
Environmental Management Systems

The JX Nippon Mining & Metals Group has established environmental management systems in line with ISO 14001 standards for ensuring achievement of the Action Plan for Environmental Protection, which was drawn up reflecting the Basic Environmental Policy. A multi-level organizational structure has been created, including various committees and subcommittees, in which everyone, from senior management headed by the president to employees at operating sites and affiliated companies, is working together to promote environmental conservation and avoid environmental risk.

Operating Sites That Have Obtained ISO 14001 Certification

<table>
<thead>
<tr>
<th>Domestic</th>
<th>Overseas</th>
</tr>
</thead>
</table>

Compliance with Environmental Laws and Regulations

The JX Nippon Mining & Metals Group monitors and analyzes the impacts of its business activities on the environment and endeavors to reduce these impacts. An overview of our efforts in this area is given here.

Environmental Accidents

In fiscal 2017, there was one environmental accident, as indicated below. Necessary measures have been taken to address this accident and to make sure there is no recurrence.

<table>
<thead>
<tr>
<th>Date</th>
<th>Place</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 2017</td>
<td>Hitachi Works</td>
<td>Water leaked from a crack in a drainage thickenor in the Daion area, resulting in the flow of alkaline drainage water into the river system.</td>
</tr>
</tbody>
</table>

Environmental Assessment of Suppliers

The Group promotes environmental conservation in the entire supply chain including suppliers. Based on the Group’s Green Purchasing Guidelines, suppliers are asked to create an environmental management system to reduce their environmental impact. Additionally, green purchasing surveys are conducted periodically to confirm implementation by major suppliers. (See page 58 for details.)

Environmental Education

Activities in the areas of health and safety, and environmental protection, are planned, promoted, and reviewed by the Safety and Environment Committee, an organization under the CSR Committee. The Safety and Environment Committee meets once every six months.

Role of the Safety and Environment Committee

Periodic education, training, and drills are conducted for each employee level at the Head Office and individual operating sites, to spread awareness regarding the Basic Environmental Policy, the Action Plan for Environmental Protection, and applicable laws and regulations.

Transition to ISO 14001:2015

Of the 16 domestic operating sites that have acquired ISO 14001 certification, transition to the 2015 version was completed by 10 sites in fiscal 2017. The remaining six sites will complete the transition during 2018.

Mass Balance Table for the Group (Fiscal 2017)

<table>
<thead>
<tr>
<th>INPUT</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials</td>
<td>Energy (terajoules)</td>
</tr>
<tr>
<td>Primary raw materials</td>
<td>Fuel</td>
</tr>
<tr>
<td>Domestic operating sites</td>
<td>Total of domestic operating sites</td>
</tr>
<tr>
<td>Overseas operating sites</td>
<td>Total of overseas operating sites</td>
</tr>
<tr>
<td>Total</td>
<td>2,407</td>
</tr>
<tr>
<td>Recycled raw materials</td>
<td>Electricity*</td>
</tr>
<tr>
<td>Domestic operating sites</td>
<td>Total of domestic operating sites</td>
</tr>
<tr>
<td>Overseas operating sites</td>
<td>Total of overseas operating sites</td>
</tr>
<tr>
<td>Total</td>
<td>252</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Principal products</th>
<th>Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper concentrate¹</td>
<td>SOx (1,000 tons)</td>
</tr>
<tr>
<td>Refined copper</td>
<td>Domestic operating sites</td>
</tr>
<tr>
<td>Gold</td>
<td>Total of domestic operating sites</td>
</tr>
<tr>
<td>Silver</td>
<td>Scope 1</td>
</tr>
<tr>
<td>Platinum</td>
<td>Scope 2</td>
</tr>
<tr>
<td>Palladium</td>
<td>Total of overseas operating sites</td>
</tr>
<tr>
<td>Other metals (selenium, tellurium)</td>
<td>Scope 1</td>
</tr>
<tr>
<td>Electro-deposited and treated rolled copper foil</td>
<td>Scope 2</td>
</tr>
<tr>
<td>Copper alloy, special steel strips, etc.</td>
<td>Total of overseas operating sites</td>
</tr>
<tr>
<td>Titanium sponge</td>
<td>Total</td>
</tr>
<tr>
<td>Sulfuric acid (by-product)</td>
<td>Chemical substances (release and transfer)</td>
</tr>
<tr>
<td>92 thousand tons</td>
<td>Domestic operating sites</td>
</tr>
<tr>
<td>654 thousand tons</td>
<td>Total of domestic operating sites</td>
</tr>
<tr>
<td>34 tons</td>
<td>Scope 1</td>
</tr>
<tr>
<td>297 tons</td>
<td>Scope 2</td>
</tr>
<tr>
<td>498 kilograms</td>
<td>Total of overseas operating sites</td>
</tr>
<tr>
<td>2,458 kilograms</td>
<td>Scope 1</td>
</tr>
<tr>
<td>308 tons</td>
<td>Scope 2</td>
</tr>
<tr>
<td>8 thousand tons</td>
<td>Total of overseas operating sites</td>
</tr>
<tr>
<td>38 thousand tons</td>
<td>Scope 1</td>
</tr>
<tr>
<td>19 thousand tons</td>
<td>Scope 2</td>
</tr>
<tr>
<td>1,577 thousand tons</td>
<td>Chemical substances (domestic only)</td>
</tr>
<tr>
<td>¹ Not including the Group’s equity shares</td>
<td></td>
</tr>
</tbody>
</table>

Our Business Activities and the Environment

The JX Nippon Mining & Metals Group monitors and analyzes the impacts of its business activities on the environment and endeavors to reduce these impacts. An overview of our efforts in this area is given here.
Environmental Risk Management

Fundamental Policy

Air and water systems are key influencers of human health and living environments. In carrying out its business operations, the JX Nippon Mining & Metals Group gives top priority to protecting the environment relating to these two systems. In addition to abiding by all relevant laws, regulations, ordinances, and agreements, we have set and monitor our own voluntary standards to reduce environmental impact. At the same time, we implement the plan-do-check-act cycle to reduce environmental risks.

Activity Results in Fiscal 2017

Preventing Air Pollution

The Group monitors waste gas emissions at all operating sites in compliance with laws, regulations, ordinances, agreements, and voluntary standards. In fiscal 2017, emissions of both sulfur oxides (SOx) and nitrogen oxides (NOx) in the Group decreased from fiscal 2016 levels. Principal reasons for the decrease in SOx emissions were the reduced number of operating days at the Saganozaki Smelter & Refinery of Pan Pacific Copper due to regular maintenance, and the improvement in desulfurization rate at the sulfuric acid plant of Hibi Kyodo Smelting. The latter is the reason for the reduction in SOx emission intensity.

SOx Emissions*1

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic operating sites</th>
<th>Overseas operating sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>4.3</td>
<td>0.2</td>
</tr>
</tbody>
</table>

BOD Emissions*2

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic operating sites</th>
<th>Overseas operating sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>0.7</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Preventing Water Pollution

The Group monitors water discharge at all operating sites in compliance with laws, regulations, ordinances, agreements, and voluntary standards. The COD*3 and BOD*4 levels are shown below.

COD*3

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic operating sites</th>
<th>Overseas operating sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>386.2</td>
<td>126.2</td>
</tr>
</tbody>
</table>

BOD*4

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic operating sites</th>
<th>Overseas operating sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>28.8</td>
<td>10.1</td>
</tr>
</tbody>
</table>

Chemical Management

At operating sites with significant release and transfer of chemicals, the Group strictly adheres to the Act on Confirmation, Etc., of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof (PRTR Act). Also, as part of our environmental management activities, we are working to reduce the environmental impact by setting targets for decreasing the release and transfer volumes of applicable chemical substances.

Volumes of Release and Transfer of PRTR Substances

<table>
<thead>
<tr>
<th>Year</th>
<th>Release volume</th>
<th>Transfer volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>0.59</td>
<td>0.46</td>
</tr>
</tbody>
</table>

Regarding the Group’s total release and transfer volumes of chemical substances to be reported in compliance with the PRTR Act, the volume released into the air in fiscal 2017 increased by 17 tons from the previous fiscal year. This was due mainly to an increase in tonale release by Toho Titanium. Meanwhile, transfer volume increased by approximately 214 tons. The chief reason was that tonale, which until recently had been a substance of value, came to be treated as a waste material by Toho Titanium.

Detoxification of PCB-Containing Equipment

The Group carries out disposal of equipment containing high concentrations of PCBs, using the services of Japan Environmental Storage & Safety Corporation. Disposal is expected to be completed during 2018, with the exception of operating sites in Tokyo and Kanagawa where treatment is behind schedule. We have also been detoxifying equipment containing low concentrations of PCBs by entrusting a private-sector facility under a systematic program that began in fiscal 2012. In March 2014, JX Nippon Tomakomai Chemical received certification from the Minister of the Environment to provide a low-concentration PCB waste treatment service, and carries out detoxification of Group equipment containing low concentrations of PCBs.

Compliance with the REACH Regulation

The European Union’s Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH Regulation) came into effect in June 2007. Based on precautionary principles, the purpose of this regulation is to standardize the management and identification of chemicals that are distributed within the EU, and to monitor their risks and clarify their environmental impact. The Group respects the intent of the REACH Regulation, and has complied with preliminary registration of products that are subject to the regulation.

Environmental Management

Sustainability Report 2018
Management of Closed Mines

From its founding in 1905, the JX Nippon Mining & Metals Group was engaged in mining operations across Japan. By ensuring a steady supply of nonferrous metals and other resources, we contributed to Japan’s economic growth. Today, however, nearly all the mining operations have been stopped* due to the depletion of mineral resources. Currently, the Group is working to maintain and restore the natural environment in and around the closed mines. One such effort is the treatment of acid mine drainage (AMD).

* Currently, the Kasuga Mine in Kagoshima Prefecture is the only Group mine in Japan still operating.

Management Work at Closed Mines

Of the 39 closed mines managed by the Company, AMD treatment is an ongoing obligation at 12 mines pursuant to the Mine Safety Act. JX Nippon Mining Ecomanagement is responsible for the work at these mining sites, including AMD treatment and the management of tailings dams.

The work mainly consists of treating the highly acidic mine drainage generated from the mines and tailings dams, which contain heavy metals, and maintaining and preserving the tailings dams and galleries of the mining sites. The operation of treatment facilities has to be kept up 365 days a year, since AMD is generated continuously after a mine is closed. This is a result of the chemical reaction of rainwater and other water with ores remaining in the mine and tailings in the dams.

How AMD Occurs

AMD from closed mines consists of pit water rising up from inside the mine and effluent discharged from tailings dams or other mine facilities. It occurs as a result of rainwater and other water coming into contact with materials such as ores remaining after the mine is closed, the nearly altered rock, and flotation tailings that have accumulated in the dams. These ores and altered rock contain iron, zinc, manganese, and other metals in the form of sulfide minerals, as a result of bonding with sulfur. These sulfide minerals are oxidized in the presence of oxygen and dissolve in water in the form of metal ions, hydrogen ions, or sulfuric acid ions, causing the drainage water to become highly acidic.

Construction Work to Protect Tailings Dams from Earthquakes and Torrential Rain

After the Great East Japan Earthquake, starting in fiscal 2012 we began conducting voluntary risk assessments of all tailings dams under management of the Group relative to a Level 2 earthquake (seismic motion of the maximum intensity conceivable for the particular area both now and in the future). At the same time, we assessed their stability to localized torrential rain of the kind that has become increasingly common in recent years, as well as the possible downstream impact of the outflow of tailings from the dams. After determining the risks by means of these voluntary inspections, we set priorities for those tailings dams identified as requiring further measures and began the necessary construction work starting in fiscal 2013.

The construction work includes soil stabilization to ensure earthquake resistance and building new drains to obtain sufficient drainage capacity during torrential rain.

1. Locations of Countermeasures Implemented in Fiscal 2017

<table>
<thead>
<tr>
<th>Earthquake-related:</th>
<th>Hanawa Mine, Nakanoosawa Tailings Dam (downstream method)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torrential rain-related:</td>
<td>Namariyama Mine, Oyu 1st and 2nd Tailings Dams (upstream method)</td>
</tr>
</tbody>
</table>

2. Locations of Countermeasures Planned for Fiscal 2018

<table>
<thead>
<tr>
<th>Earthquake-related:</th>
<th>Namariyama Mine, waste rock storage facility (ongoing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torrential rain-related:</td>
<td>Kawazu Mine, Horinouchi Tailings Dam (upstream method)</td>
</tr>
</tbody>
</table>

Upstream Method (raising embankment height)

Downstream Method
Establishing a Low-Carbon Society

Since the Paris Agreement was adopted at the COP21 United Nations Conference on Climate Change, there have been increasing demands on corporations to become actively involved in reducing emissions of greenhouse gases through such means as setting long-term reduction targets.

The JX Nippon Mining & Metals Group seeks to reduce the environmental burden of its business pursuits as much as possible. Our Basic Environmental Policy goes beyond compliance with environmental regulations, calling for development of energy-saving technology to help prevent global warming. We make clear our management of environmental targets in our Medium-Term Action Plan and elsewhere, endeavoring to reduce our environmental burden each fiscal year.

Fundamental Policy

Global warming is bringing about frequent abnormal weather, rising sea levels due to changing climate patterns, and other impacts. Furthermore, it is feared that the significant impact on ecosystems may undermine the sustainable development of society as a whole.

The JX Nippon Mining & Metals Group has defined long-term targets for reducing emissions of CO2 and other greenhouse gases, which we are pursuing by promoting energy conservation and expanding the use of renewable energy. (See page 60 for details.)

Activity Results in Fiscal 2017

Energy Consumption and Energy Consumption Intensity in Manufacturing Activities

In fiscal 2017, the Group’s overall energy consumption in terms of its calorific value was 28,950 terajoules, compared with 28,778 terajoules in fiscal 2016. The further rise in the Caserones Copper Mine operating rate was one of the major factors resulting in an increase of 172 terajoules. Around 48% of the Group’s total energy consumption at operating sites in Japan is accounted for by energy consumed at smelters and refineries, where energy consumption intensity in fiscal 2017 remained at around the same level as in the previous fiscal year. The Group will continue to take active measures for reducing energy use and improving efficiency. As an example of such measures, at the Tamano Smelter of Hibi Kyodo Smelting, the oxygen production systems were upgraded to a single system adopting the latest technology. The resulting improved energy efficiency led to a reduction in electricity usage by a total annual calorific value of 275 terajoules.

At our overseas operating sites as well, we are taking steps to reduce energy consumption, such as optimizing the number of cooling towers in operation, installing pump-inverter control equipment, introducing high-efficiency air conditioners, and carrying out phased replacement of conventional lighting with LED lamps. We will continue to pursue additional reductions in energy use and improve waste heat recovery by installing energy-efficient equipment.

* Energy consumption is calculated using coefficients in accordance with the Act on Rationalizing Energy Use, for both domestic and overseas operating sites.

Fiscal 2017: Electricity (indirect): Domestic 13,592 Overseas 8,675
Electricity (indirect) includes thermal energy (steam, hot water, cold water) supplied by third parties.
Fuel (direct): Domestic 4,066 Overseas 2,617

Note: A terajoule is one trillion joules, a unit of energy.

Breakdown by Fuel Type

<table>
<thead>
<tr>
<th>Material</th>
<th>Domestic</th>
<th>Overseas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerosene (kl)</td>
<td>1,982</td>
<td>—</td>
</tr>
<tr>
<td>Light oil (kl)</td>
<td>2,645</td>
<td>7,382</td>
</tr>
<tr>
<td>Class A heavy oil (kl)</td>
<td>9,253</td>
<td>591</td>
</tr>
<tr>
<td>Class B and C heavy oil (kl)</td>
<td>43,502</td>
<td>9,625</td>
</tr>
<tr>
<td>Reclaimed oil (kl)</td>
<td>1,941</td>
<td>—</td>
</tr>
<tr>
<td>LPG/butane (t)</td>
<td>5,133</td>
<td>6</td>
</tr>
<tr>
<td>LNG (t)</td>
<td>4,919</td>
<td>—</td>
</tr>
<tr>
<td>Coal (t)</td>
<td>9,074</td>
<td>—</td>
</tr>
<tr>
<td>Petroleum coke (t)</td>
<td>2,977</td>
<td>—</td>
</tr>
<tr>
<td>City gas (1,000 m3)</td>
<td>16,467</td>
<td>9,367</td>
</tr>
</tbody>
</table>

For protecting the environment
Energy Conservation

CO2 Emissions from Energy Consumption for Manufacturing Activities

In fiscal 2017, the Group’s total CO2 emissions from energy consumption in Japan and overseas were 1,602 thousand tons of CO2. There was a slight rise in CO2 emissions from energy consumption over fiscal 2016, resulting from a higher operating rate at the Caserones Copper Mine. Approximately 48% of the Group’s total energy consumption in Japan is accounted for by energy consumed at smelters and refineries. Through the consolidation of facilities, improved production efficiency, and other measures, the Group reduced CO2 emission intensity at these sites to 0.86 in fiscal 2017, down approximately 40% from 1.34 in fiscal 1990.

Emissions from electricity consumption are converted to equivalent CO2. Emissions from fuel consumption are converted to equivalent CO2.

Expansion of Renewable Energy Usage

Hydroelectric power generation in the Group traces back to 1907, when its predecessor Kuhara Mining operated. Today, we carry out power generation operations at the Kakinosawa Hydroelectric Power Plant and sell the electricity generated to specified-scale electricity utilities. From October 2014 to June 2015, the facilities of the Kakinosawa Hydroelectric Power Plant were upgraded to enable more effective use of valuable water resources. The plant is now operating stably with increased power generation capacity thanks to upgraded facilities such as turbines, generators, and power receiving and transforming equipment. A photovoltaic power generation facility with capacity of 240 kilowatts went into operation in April 2013 at the Kakegawa Works of JX Metals Precision Technology. At Shimoda Hot Springs, a binary power generation system making use of heat from hot springs was installed, going into operation in March 2018. Photovoltaic power generation is also carried out at the Hibi Smelter of Pan Pacific Copper.

CO2 Emissions Other than from Energy Consumption, and Other Greenhouse Gas Emissions from Manufacturing Activities

Three operating sites in the recycling and environmental services business submit reports on the emissions of CO2 from sources other than energy consumption as well as the emissions of other greenhouse gases. In fiscal 2016, such emissions totaled approximately 57 thousand tons of CO2. In fiscal 2017, this amount grew by 37 thousand tons to around 94 thousand tons of CO2 (consisting entirely of CO2 emissions from sources other than energy consumption).

Energy Consumption and CO2 Emissions in the Logistics Stage

In fiscal 2017, energy consumption in the logistics stage of applicable Group companies in Japan was 603 terajoules and CO2 emissions in that stage were 42.5 thousand tons of CO2.

Establishing a Recycling-Oriented Society

The JX Nippon Mining & Metals Group seeks to reduce the environmental burden of its business pursuits as much as possible. Our Basic Environmental Policy calls for conserving resources, promoting recycling, and reducing waste materials. We therefore take steps to use recycled resources as raw materials, utilize by-products, and reduce the volume of final disposal by recycling waste materials.
Initiatives for Effective Resource and By-Product Use and Waste Reduction

Fundamental Policy

The JX Nippon Mining & Metals Group is committed to helping prevent the depletion of natural resources and reducing the discharge of waste materials. We therefore strive to make effective use of water resources, use recycled resources as raw materials, utilize by-products, and reduce the volume of final disposal by recycling waste materials.

Activity Results in Fiscal 2017

Usage of Recycled Resources as Raw Materials

The ores and other natural resources extracted from nature are finite and must be preserved for future generations. The Group is expanding usage of recycled resources as raw materials.

Reuse and Reduction of Waste Materials

Of the total volume of waste and sellable materials the Group generated in fiscal 2017, 84% was reused internally. Of the final total volume of waste materials discharged, the volume of final disposal, excluding the volume recycled externally or otherwise used, was 5.7 thousand tons, an increase of 800 tons from the previous fiscal year. The main cause of this increase was the rise in volume of final disposal at the Caserones Copper Mine.

Use of By-Products

In fiscal 2017, the Group produced 3,213 thousand tons of by-products. Slag is utilized as a sandblasting material, a cement material, a caisson filler, or as an aggregate for wave-dissipating blocks. Iron concentrate and gypsum are used in cement.

Use of By-Products

Of the Group’s water usage in fiscal 2017, seawater accounted for 78% of the total. Of the volume of water discharged into the sea, water usage at domestic operating sites in fiscal 2017 decreased 10% year on year. Overseas, water usage decreased 30% year on year.

Water Usage

<table>
<thead>
<tr>
<th>Water Source</th>
<th>Fiscal 2016</th>
<th>Fiscal 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tap water</td>
<td>201.5</td>
<td>181.3</td>
</tr>
<tr>
<td>Groundwater</td>
<td>143.6</td>
<td>127.9</td>
</tr>
<tr>
<td>Rainwater</td>
<td>9.9</td>
<td>12.2</td>
</tr>
<tr>
<td>Total</td>
<td>354.0</td>
<td>347.6</td>
</tr>
</tbody>
</table>

Water Usage Intensity at Smelters and Refineries

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tap water</td>
<td>127.5</td>
<td>132.6</td>
<td>126.2</td>
<td>130.5</td>
<td>137.4</td>
</tr>
<tr>
<td>Groundwater</td>
<td>27.3</td>
<td>30.3</td>
<td>32.6</td>
<td>33.6</td>
<td>35.9</td>
</tr>
<tr>
<td>Rainwater</td>
<td>2.6</td>
<td>3.1</td>
<td>3.4</td>
<td>3.9</td>
<td>4.0</td>
</tr>
<tr>
<td>Total</td>
<td>156.4</td>
<td>164.0</td>
<td>163.2</td>
<td>167.8</td>
<td>176.3</td>
</tr>
</tbody>
</table>

Water Discharge Volume

<table>
<thead>
<tr>
<th>Water Source</th>
<th>Fiscal 2016</th>
<th>Fiscal 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tap water</td>
<td>152.1</td>
<td>150.0</td>
</tr>
<tr>
<td>Groundwater</td>
<td>117.4</td>
<td>114.4</td>
</tr>
<tr>
<td>Rainwater</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Total</td>
<td>269.5</td>
<td>264.4</td>
</tr>
</tbody>
</table>

Water Discharge Volume Intensity at Smelters and Refineries

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tap water</td>
<td>174.1</td>
<td>174.4</td>
<td>177.6</td>
<td>182.4</td>
<td>186.5</td>
</tr>
<tr>
<td>Groundwater</td>
<td>15.1</td>
<td>15.3</td>
<td>15.6</td>
<td>15.9</td>
<td>16.0</td>
</tr>
<tr>
<td>Rainwater</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Total</td>
<td>190.5</td>
<td>190.0</td>
<td>193.5</td>
<td>198.6</td>
<td>203.8</td>
</tr>
</tbody>
</table>

For protecting the environment

Material Issues → Establishing a Recycling-Oriented Society

JX Nippon Mining & Metals Corporation Sustainability Report 2018
JX Nippon Mining & Metals is taking part in the Tokyo 2020 medal project conducted by the Tokyo Organising Committee of the Olympic and Paralympic Games, through NTT Docomo, Inc. and the Japan Environmental Sanitation Center (JESC), which are co-operating in the project. The Group, having long directed its business activities at building a recycling-oriented society, supports the purpose of this project to help build a sustainable society. It is hoped that this project will be an occasion for the general public to become aware of the importance of recycling nonferrous metals, and that it will give impetus to worldwide efforts to recycle resources.

About the Tokyo 2020 Medal Project

The Tokyo Organising Committee of the Olympic and Paralympic Games is conducting the Tokyo 2020 medal project to manufacture the medals for use at Tokyo 2020 from small electronic devices such as discarded mobile phones. Through this project, the committee plans to have approximately 5,000 gold, silver, and bronze medals made for the Olympic and Paralympic Games.

Role of the Group

1. The JX Nippon Mining & Metals Group is using its smelting, refining, and metal processing technologies to produce silver and bronze as medal materials from the recycled materials provided by NTT Docomo and the JESC.

Smelting, Refining, and Processing of Bronze Medal Material

Red brass, a copper and zinc alloy used as the material for bronze medals, is manufactured in sheet form. After the recycled material has undergone smelting and refining to produce refined copper at the Saganoseki Smelter & Refinery and Hitachi Refinery of Pan Pacific Copper, the copper is mixed with zinc and alloyed at the Kurami Works, where it is also put through hot rolling and other processes.

2. JX Metals Trading and JX Nippon Tsuruga Recycle have been contracted by the JESC to collect small electronic devices for this project as accredited recyclers under the Act on Promotion of Recycling of Small Waste Electrical and Electronic Equipment.

3. We are cooperating in the collection efforts by placing boxes throughout Japan for collecting mobile phones and small appliances.
Developing Resources by the JX-Iodine Process

Reserves of copper and other nonferrous metals, while essential to the abundant life of contemporary society, are finite. Mines today are increasingly developed at higher elevations and in more remote locations, while the grade of ores is declining. Another problem is rising resource nationalism in various parts of the globe. As a result, even greater importance than before is being attached to effective resource use. In our resources development business and smelting and refining business, the Group is pursuing the efficient mining, concentration, and refining of copper ores, seeking effective use of limited nonferrous metal resources.

Background

Over the years, the grade of copper ores available throughout the world has been declining. Much of the copper ore mined these days is low-grade ore of less than 1% copper content. Low-grade ores for which ordinary flotation processes are not economically feasible have therefore not been exploited as resources. Among these, primary copper sulfide ores have been considered particularly difficult ores from which to leach out the copper. We developed the JX-Iodine process as an original technology for efficiently leaching and recovering copper from these ores, and are moving closer to commercialization.

The JX-Iodine Process

This is a relatively simple process for oxidative leaching of copper from primary copper sulfide ores. Key features of the process are the addition of iodine as a catalyst and use of iodine recovery equipment along with the SX-EW equipment used for conventional heap leaching.1 While taking advantage of the technological features, the process complies with various environmental regulations and is designed with due consideration for environmental protection. The JX-Iodine process is original technology that will contribute to effective use of limited copper resources and their stable and efficient supply, while bringing a technological advantage to the resources development business of JX Nippon Mining & Metals.

The JX-Iodine Process

- Heap leaching: A process of piling up ores that have been crushed in a heap and pouring resources development business of JX Nippon Mining & Metals.
- SX-EW: Solvent extraction and electrowinning.
- JX-iodine process: Original technology developed by JX Nippon Mining & Metals.
- Reagents: Iodine used as a catalyst.
- Key features: Efficient use of limited copper resources, stable and efficient supply, and technological advantage.
- Environmental regulations: Compliant with various environmental regulations.

Recovering Copper by the JX-Iodine Process

Heap-leaching experiments in Chile to verify the JX-Iodine process

Endowed Research Unit for Nonferrous Metal Resource Recovery Engineering (JX Metals Endowed Unit)

In recent years, the number of researchers and engineers in Japan working in fields related to smelting, refining, and recycling nonferrous metals has been continually decreasing. In response to this situation, JX Nippon Mining & Metals, in collaboration with the Institute of Industrial Science, the University of Tokyo, launched the Endowed Research Unit for Nonferrous Metal Resource Recovery Engineering (JX Metals Endowed Unit) with the aim of unifying the forces of industry, government, and academia toward energizing the industry and raising the level of its efforts. In the Endowed Unit, these unified forces have been carrying out various initiatives, from using and extending smelting and refining technologies to develop new environment-friendly recycling technologies for nonferrous base metals and rare metals, to developing the human resources in charge of the work in this field.

Overview of Activities

A major focus of activities in Phase 1, which began in January 2012, was on providing various opportunities for learning about nonferrous metals. During the five-year period, symposiums and workshops were held nine times, attended by a total of 1,600 persons from industry, government, and academia. As a result of these activities, the Endowed Unit can now be seen as one of Japan’s leading platforms built through industry-government-academia collaboration in the field of nonferrous metal smelting, refining, and recycling.

Phase 2, started in January 2017, continues the Phase 1 initiatives, while also emphasizing public relations to highlight the importance and future potential of the nonferrous metals field to the general public, especially young people of high school age and below. The aim is to secure the human resources who will lead the next generation and thereby contribute to the creation of a recycling-oriented society. In addition, the unit is actively engaging in new initiatives, including collaboration with other universities.
Endowed Research Unit for Nonferrous Metal Resource Recovery Engineering (JX Metals Endowed Unit)

Examples of Activities in Fiscal 2017

Activities Aimed at High School Students

“The Friday Special Lecture for High School Students” (May 2017)

At this lecture, held by the College of Arts and Sciences of the University of Tokyo, Professor Okabe gave a presentation titled “Future Materials: Titanium and Rare Metals.” More than 150 persons were in attendance at the lecture, which was also streamed live on the Internet to 37 high schools throughout Japan. Professor Okabe went beyond talking about rare metals and other nonferrous metals, carefully explaining such matters as the difference between “science” and “engineering” in academic fields. The lecture was designed to understand introduction to the ores, netic wave shielding. Visitors high thermal conductivity and properties of copper such as its understand introduction to the ores, netic wave shielding. Visitors high thermal conductivity and properties of copper such as its

Activities Aimed at Primary and Middle School Students

Exhibit at “UniLab” (August 2017)

At the UniLab (University Laboratory) event, an experimental science class for primary and middle school students held by the Faculty of Science and Engineering of Waseda University, a joint exhibit was presented by the research laboratory of Professor Tokoro and the JX Metals Endowed Unit, where third- and fourth-graders could experiment with gold-plating on copper sheets. The experiment placed the interest of participants. They thought about the electrical conductivity of materials to choose the electrode for plating, and to affix seals on copper sheets to see the difference between plated and non-plated areas.

Symposium on Minor Metals in Nonferrous Metal Smelting (November 2017)

Nine lecturers from industry, academia, and government were invited to speak at the convention hall of the Institute of Industrial Chemists and Chemical Engineers, with the joint support of the Faculty of Science and Engineering, Waseda University, and the JX Metals Endowed Unit, was attended by more than 50 high school students. In Part 1, Professor Tokoro gave a presentation on separation technologies for extracting metal resources, and on applications of high school science to actual society. Part 2 started off with an experiment in which metal ions were identified in a solution prepared in advance. The participants tried to determine the metal using the reagent reaction as a clue. Students then toured the laboratories and facilities as they learned about the importance and appeal of this field of study.

Activities and Symposium for the General Public

Booth Display at the University of Tokyo’s Komaba Research Campus Open House (June 2017)

At the two-day Open House, the Company and the JX Metals Endowed Unit, collaborating with the university’s Office for the Next Endowed Unit, and the JX Metals Endowed Unit, where third- and fourth-graders could experiment with gold-plating on copper sheets. The experiment placed the interest of participants. They thought about the electrical conductivity of materials to choose the electrode for plating, and to affix seals on copper sheets to see the difference between plated and non-plated areas.

Symposium on Minor Metals in Nonferrous Metal Smelting (November 2017)

Nine lecturers from industry, academia, and government were invited to speak at the convention hall of the Institute of Industrial Science, the University of Tokyo. Around 160 persons attended the event, which featured distinguished talks and active discussions on the future vision and challenges of mining, production and recycling of minor metal resources, such as molybdenum, rhenium, and bismuth, which are by-products of nonferrous metal smelting and refining processes.

Extension Special Lecture for High School Students (July 2017)

This lecture, organized by the Kanto Branch of the Society of Chemical Engineers, with the joint support of the Faculty of Science and Engineering, Waseda University, and the JX Metals Endowed Unit, was attended by more than 50 high school students. In Part 1, Professor Tokoro gave a presentation on separation technologies for extracting metal resources, and on applications of high school science to actual society. Part 2 started off with an experiment in which metal ions were identified in a solution prepared in advance. The participants tried to determine the metal using the reagent reaction as a clue. Students then toured the laboratories and facilities as they learned about the importance and appeal of this field of study.

Issues for the Nonferrous Metals Industry

Komatsuzaki To begin, I would like to ask you to talk about current issues for the nonferrous metals industry as seen from the corporate standpoint and from the university standpoint.

Yuki Six years since the start of the Endowed Unit, let me first of all take a look back at Phase 1. There were two objectives in starting the unit. The first was to help create a recycling-oriented society through surveys and research on the engineering for recycling metal materials essential to industry. The second was to contribute in the long term to human resource development in a wide range of related fields, not limiting the efforts to one university and one corporation, and to form a base for leading-edge research and industry-academia collaboration. Human resource development, not limited to one university and one corporation, was seen as an important issue from the start.

Among the major achievements of the five years of activities in Phase 1 were the symposiums we held, each time gathering more than 200 professionals from industry, government, and academia. I believe that even the students and young researchers who visited these events up close could appreciate that they were extremely lively, but at the same time we were keenly aware of the limits to the role of symposiums. As computers have progressed in recent years, electronic parts and devices have taken on highly advanced functions. And the development and supply of the lead-edge materials used in these parts and devices relies on high-purity, high-quality nonferrous metals. Even so, young people show little interest in materials or the nonferrous metals industry, and the number of university researchers and courses related to nonferrous metals has been decreasing. From the corporate standpoint, we feel a strong sense of impending crisis: unless we break out of this situation, the supply of advanced functional materials will become hard to maintain.

Sustained growth of the materials industry requires securing human resources to support it. As I mentioned earlier, we have seen human resource development as an important issue. In order to develop human resources, however, you have to first secure human resources to develop. Thinking that approaching students at the university level may be too late, therefore, in Phase 2 our focus turned to helping primary, middle, and high school students, and their parents to understand the importance and appeal of the industry.

Tokoro I watched the Phase 1 activities from the sidelines and felt that the high quality of the symposiums provided wonderful opportunities for networking and exchanges in our field. It is also true that the university students were stimulated by these opportunities. The university is gradually becoming more successful at conveying the appeal of this field to students who are interested in the ores, netic wave shielding. Visitors high thermal conductivity and properties of copper such as its
have already chosen it, and developing their abilities. Although we have a wide range of well-rounded programs for students once they have entered the university, however, we had nothing for the pre-university stages, so lately we have also begun approaching primary, middle, and high school students. Thanks to the Endowed Unit, such activities have little by little become more active, for which I am very happy. Before they decide on a university, students choose a field of interest by gathering quite a lot of different information, which means that we too must effectively convey to them the importance and appeal of this field.

One more thing lacking in human resource development, I feel, is education after students graduate from university, or even after they complete graduate school, to develop the elite who will lead this field forward. Various schemes are needed for nurturing the elite. To facilitate the advancement of people who have overall knowledge of this field and appreciate its appeal, for example, it will be important to get them involved in large projects or leading-edge research, and to provide opportunities for looking anew at the results through outreach activities.

Yuki From the corporate standpoint, securing and developing human resources does not necessarily mean only those people who will enter the corporate world. The process could not exist without the educational environment for developing such people, as well as educators and researchers. As Professor Tokoro said, elite education is highly important for developing the next generation.

Initiatives for Developing the Next Generation of Human Resources

Komatsuzaki A focus of Phase 2 is communicating information about the nonferrous metals industry and the appeal of this field. It is also about creating a mechanism for helping young people, whether primary, middle, or high school students to feel this attraction and become interested in the field. The mechanism would, in due course, educate them and develop them further as members of the elite or professionals after they graduate from university. Then there is industry–academia collaboration as well. All this presents quite a big topic to address.

Next, looking back at the initiatives during the past 18 months of Phase 2, I would like to ask you what you see as the good points and points needing improvement. Let me ask you first about the topic of activities for developing the next generation.

Yuki As part of the activities at UniLab,1 (see page 77 for details), the highly unique mascot Coppy the Kappa made an appearance. This mascot also enthralled the University of Tokyo’s Komaba Research Campus Open House2 event, with young children hugging it and high schoolers calling it by name. Then in 2018, a science class was held for the first time, in which high school students enjoyed experimentation with copper smelting and refining. This was another big success. A good result from the corporate standpoint is the fact that the importance of these kinds of events is increasingly recognized not just in the Head Office but throughout the Company, as demonstrated by the participation of young engineers from the Technology Development Center, for example.

The problem is, the results of developing the next generation become evident only in the future, making it very difficult to assess the results through observation. Yet, we feel a sense of impending crisis that, unless we do this now, the talent pool will continue to shrink. We believe what is important at this time is to continue with our effort.

Tokoro It has been an extremely fulfilling experience for me, as I and students from my lab took part in the extension class for high school students in the UniLab events. I feel the students putting on the events also learned a lot. They were highly effective events for human resource development on both sides.

Since we are academics, we all tend to rely on logic to convey things correctly, but when it comes to young people in particular, the lower their age, the greater the need to appeal to intuition. In that sense, having a mascot with an intuitive appeal is extremely important.

The Spread of Industry–Academia Collaboration

Komatsuzaki What are your views on industry–academia collaboration?

Yuki Along with the new initiatives, symposiums for professionals are being continued in Phase 2, and the fact that these activities are increasingly gaining momentum is a plus in terms of establishing a firm base for the Endowed Unit.

As for collaboration, in April 2017, right after the start of Phase 2, an endowed class titled “Laboratory of Non-ferrous Extractive Metallurgy” was established by Mitsubishi Materials at Kyoto University. Then in April 2018, a joint research department was created with Sumitomo Metal Mining in the Institute of Multidisciplinary Research for Advanced Materials of Tohoku University. The first of these targets those who, after joining a company, decide to return to studying nonferrous metal smelting and refining. Our Company is also taking part in this, as it looks set to become an activity of the industry as a whole. The latter, in addition to heightening basic knowledge of and interest in nonferrous metals through joint research, is creating opportunities for getting in touch with the world of manufacturing through factory tours and seminars. I believe it is important that both the Endowed Unit and endowed classes, each with their own characteristics, energize the nonferrous metals industry and help to secure and develop human resources. The notion of not limiting our efforts to one university and one corporation, which we had when Phase 1 began, is starting to become a reality now, after six years. A framework of collaboration and cooperation with the Mining and Materials Processing Institute of Japan will also become increasingly important going forward.

Tokoro The fact that the trend of endowed classes is spreading to other universities and corporations is evidence of how the Endowed Unit is putting out its message with major impact. For a long time the university has experienced a “postdoc” problem among young researchers, and the problem is not limited to this field. With so many researchers wanting to remain in the university but facing a lack of postdoctoral positions, a negative spiral often results in which students decide not to go on to pursue a doctorate because they feel they won’t be able to remain in the university after they complete their studies. I have hopes for industry–academia collaboration as a way of giving these young people a place to be active in the research area and, through outreach activities, an opportunity to grow. It would be good if through industry–academia collaboration, programs could be created from a systematic and long-term perspective to enable young people to carry on research with peace of mind. As academic societies and associations would play a major role in such programs, I would like to ask them also to play coordinating and leadership roles.

Discussion Participants

Chiharu Tokoro Professor, Faculty of Science and Engineering, Waseda University Project Professor, Endowed Research Unit for Nonferrous Metal/Resource Recovery Engineering, the Institute of Industrial Science, the University of Tokyo

Norio Yuki Executive Officer Deputy General Manager Technology Group JX Nippon Mining & Metals Corporation

Kan Komatsuzaki Executive Officer in charge of the Administration, Legal, and Public Relations & CSR Departments General Manager Administration Department General Manager, Secretariat JX Nippon Mining & Metals Corporation

Yuji Narazaki General Manager, Public Relations & CSR Department JX Nippon Mining & Metals Corporation

Roundtable Discussion on Phase 2 of the JX Metals Endowed Unit

For protecting the environment...
Tokoro As Professor Tokoro noted, I feel that it is important to think from a wide perspective and to create a mechanism that facilitates the involvement of groups like the Japan Mining Industry Association and the Mining and Materials Processing Institute of Japan.

Tokoro Yes, it really has to be an all-Japan effort.

An All-Japan Effort to Aim for Industry Advancement

Komatsuzaki I would be interested in hearing any ideas you might have about making the activities of the Endowed Unit even better.

Yuki I would definitely like to advance collaboration with the Mining and Materials Processing Institute of Japan. But rather than leaving things up to academic societies, the corporate side will also need to participate proactively. We need to step up cooperation further with academic societies and associations so that not only the Mining and Materials Processing Institute but also the metals and chemical engineering fields handling leading-edge materials can strongly advocate the importance of these materials and draw the attention of young people in these fields. The keyword, once again, is all-Japan.

Also, for the Endowed Unit, “university students” basically means University of Tokyo students. If we are going to make the effort to put on a symposium, it would be even better to have undergraduate and graduate students from all over Japan take part in some capacity or other, seeing it as collaboration among the various students.

And what I would like to have young people think about is media strategy—how to drum up interest by, for example, making use of a mascot.

Narazaki Since the activities of the Endowed Unit are mainly carried out in direct contact with primary and middle school students, we benefit from being able to directly observe their reactions and what interests them. Aiming for the next target—the general public—involves appealing to them via the Internet and images, but with this approach it can be difficult to see the reaction of the audience. Fundamental to thinking about this is extending information about our field from the simple facts to a connected narrative, and from there to the full picture. And it is at the extension class for high school students that we are taking it even further, to the “movie” level. Right now, we are taking various simple factual elements as our initial focal points, aiming first to move on to the narrative stage, and then to the full picture.

Komatsuzaki As we further build up industry-academia collaboration, we need to strengthen ties between this Endowed Unit and other units, taking a truly all-Japan approach toward advancing the entire nonferrous metals industry. Thank you all very much.

At the Tsuruga Plant* of JX Nippon Mining & Metals, commercial feasibility trials on lithium-ion battery recycling have been underway since April 2010.

What Are Lithium-Ion Batteries?

Lithium-ion batteries are essential to our daily lives. When people think of lithium-ion batteries, the typical image that comes to mind is batteries in small, portable devices; yet they are also used in electric vehicles including hybrid cars, in buses, trucks, and trains, and as backup power sources in aircraft and artificial satellites.

An advantage of lithium-ion batteries is their rechargeability. Their high energy density results in large charging capacity despite their compact size. What is more, they can be recharged by repeated toping up.

While these batteries are today used in many different applications, the continued availability of their raw materials is in question.

Lithium-ion batteries are made from lithium along with nickel, cobalt, manganese, and other metals. These are all what are called rare metals, with relatively limited reserves worldwide. They are also difficult to separate as single metals, and costly to recover.

Cobalt, in particular, is produced not only in small amounts, but also in limited regions, raising concerns about future availability shortages.

Development of Lithium-Ion Battery Recycling Technology in the Company

With the aim of developing lithium-ion battery recycling technology, JX Nippon Mining & Metals built a commercial feasibility trial plant in 2010 in Tsuruga, Fukui Prefecture, where we have been carrying out technology development ever since.

When the plant first went into operation, testing began on using as a raw material the scrap generated in the process of manufacturing cathode materials (in which rare metals are used), one component of lithium-ion batteries.

Scrap generated in the production manufacturing process at factories or other facilities is called primary scrap, while secondary scrap is from products at the end of their life following use in our daily lives.

Compared to primary scrap, secondary scrap requires a more advanced level of recycling technology, since the routes for collection of discarded products are many and varied, and the kinds and percentages of metals contained in the products vary.

After carrying out technology development for recycling of primary scrap, we began developing technology for secondary scrap recycling in around 2014, testing the recycling of end-of-life lithium-ion batteries from laptops, cell phones, tablet PCs, and other devices.

As a result, in addition to the recovery of nickel and cobalt, we have succeeded for the first time anywhere in recovering lithium, for which recovery was believed particularly difficult, from end-of-life batteries.

* The Tsuruga Plant is on the premises of JX Nippon Tsuruga Recycling Ltd.
Process of Lithium-Ion Battery Recycling

To recover the metals cobalt, nickel, and lithium, the end-of-life lithium-ion batteries are first incinerated (roasted) and the battery casing and the organic materials used as electrolyte are removed. Next, crushing and separation are performed, and powder called battery powder is recovered. The battery powder contains cobalt, nickel, lithium, and other metals in concentrated form. The powder is dissolved in acid, resulting in a mixed metal solution. Technology called solvent extraction is used to separate and recover each of the metals mixed together in the solution. Solvent extraction is a separation and recovery technique in which a solution and oil (organic solution) are mixed together, and metal ions in the solution are transferred from the solution into the oil. By using different types of oils and adjusting the pH of the solution, it is possible to transfer only the desired metal from the solution to the oil. It is also possible to return the desired metal from the oil to a solution.

At the Tsuruga Plant, this technology is used to separate and recover each metal from a solution of mixed metals, successfully recovering cobalt, nickel, and lithium.

Looking Ahead

Today the world of automotive vehicles is in the midst of major change. In China and Europe, there is a clear trend away from gasoline-powered to electric vehicles, with active entry into the market even by companies that are not traditional automakers. The batteries used in these vehicles are also lithium-ion batteries. Demand for the raw materials used in lithium-ion batteries will grow increasingly, making them harder to obtain.

Drawing on its technological advantages, JX Nippon Mining & Metals will advance lithium-ion battery recycling as a new source of this metal to continue its contributions to realization of a sustainable society.

VOICE

For Promoting Technological Progress

Junichi Arakawa
Coordinator
ART Section
JX Nippon Tsunaga Recycle Co., Ltd.

After engaging in the development of lithium-ion battery recycling technology at the Technology Development Center, I have been involved in the commercial feasibility trial at the Tsuruga Plant since 2012. We configured the process for recycling end-of-life lithium-ion batteries by combining the sales and marketing capacity to collect the raw material, the development capacity involved in process improvement, and the shop-floor capacity to operate the plant. I believe each of the people in charge of these various aspects carried out their roles with a sense of responsibility, resulting in a successful outcome. Since the Tsuruga Plant currently uses end-of-life lithium-ion battery scrap as raw material, measures to deal with impurity are essential. As the volume of scrap to be processed grows, the amount of impurity to be removed also increases, so we are constantly under pressure to develop impurity removing technology.

Today, when electric vehicles are becoming more commonplace, I feel that the role of the Tsuruga Plant is spreading beyond Japan to the wider world. By continuing our efforts to promote effective use of resources, we would like to contribute to the sustainable growth of society.

Initiatives for Biodiversity Conservation

Plans for Tree Planting and Biology Research at the Caserones Copper Mine

At the Caserones Copper Mine, plans are being carried out to plant 48,200 seedlings of 15 native flora species in an area spanning 143,511 hectares (1.43 square kilometers), for the purpose of protecting plants that may be impacted by the mine operations and conserving biodiversity. The areas being planted are those around Ramadilla on the mine site and the off-site areas around Marenco and Amaranus. The work is expected to be completed in 2019. Among the types of flora being planted are Amanccay (Balbactia pedunculata), Carbonilco (Corda decandra), and Retamo (Suaeda chilensis).

In addition to these, monitoring of native plants such as Acorilo (Buddlea suaveolens), Flor del minera (Centarea cachnahrainsi), and Babylauhen (Haplopappus baylahueri) is being conducted to obtain information on their biological growth.

Reforestation Activities in Japan

The Group has been carrying out reforestation activities, especially at the sites of closed mines, with the cooperation of local communities. We will endeavor to conserve and improve biodiversity by continuing these activities.

Closed Oe Mine Site (Niko Town, Hokkaido)

Maintenance of this site has been ongoing since fiscal 2008, working with the local Votex Forestry Cooperative. In fiscal 2017, based on a five-year plan that began in fiscal 2013, maintenance was performed to ensure sufficient forest road width (for a distance of approximately 8 kilometers), and underbrush was cleared in places that have been reforested (approximately 17 hectares).

Closed Toyoha Mine Site (Sapporo City, Hokkaido)

Responding to requests from local community associations, the tailings dam site at the closed Toyoha Mine has been transformed into a scenic forest. Japanese white birch growing naturally on this site are being thinned and trees are being planted in the resulting spaces. To preserve and maintain the scenic appearance, in fiscal 2017 weeding was carried out across an area covering 1,400 square meters.

Closed Kameda Mine Site (Hakodate City, Hokkaido)

Retorestation of this site has continued since fiscal 2007, working with the local Koriyama City Forestry Cooperative. In fiscal 2017, 2,400 saplings were planted in an area of about 1.2 hectares where the ground had been prepared in the previous fiscal year for tree planting. In addition, ongoing forest restoration work was carried out, such as cutting and underbrush clearing in a previously reforested area of approximately 5 hectares, and the opening of a utility road.

Closed Takatama Mine Site (Koriyama City, Fukushima)

Since fiscal 2009, we have been cooperating with the city of Nanyo on a project to improve the scenic beauty of a section of the Ringu district. This Ryuju Satoyama Re-forestation Project is also seen as a measure for revitalizing the local region. In fiscal 2017, underbrush was cleared in a previously reforested area of 2.7 hectares, along with conducting surveys of sapling growth, as efforts focused on ensuring the health and vitality of the forest. Walking paths were also improved, steps were installed, and other measures were taken to make the forest more walkable.
Corporate Governance System

Board of Directors

The Company has established the Board of Directors to discuss matters stipulated in laws, regulations, and the Articles of Incorporation, as well as other important management issues. The Board is composed of the president and seven other directors (all male). Auditors also attend Board of Directors meetings and can offer their opinions.

Executive Meeting

The Company has established an Executive Meeting as an advisory body to the president. The Executive Meeting consults on matters important for the management of the Company. The status of operational execution and other issues are also reported and communicated to it. The Executive Meeting consists of the president and executive officers designated by the president. Full-time auditors also attend the Executive Meeting and can offer their opinions.

Auditors

Auditors attend Board of Directors meetings, Executive Meetings, and other important meetings, offering their views as necessary for raising the effectiveness of audits. They also review important documents and meet with officers and employees of JX Nippon Mining & Metals and each Group company, endeavoring to keep aware of the execution of duties by officers and employees. In addition, auditors receive regular reports from the Internal Audit Department and independent auditors regarding auditing plans and their implementation status and results, while coordinating with these parties by exchanging views and information.

Corporate Governance Structure of the JX Nippon Mining & Metals Group

Compensation for Directors

The directors of JX Nippon Mining & Metals receive a monthly fixed compensation for their role, and variable performance-based bonus payments. Bonus amounts are based on the consolidated business results of JX Nippon Mining & Metals as well as JXTG Holdings. We do not have a retirement benefit program for directors. In July 2017, a stock remuneration plan was introduced. A Board Incentive Plan (BIP) Trust is employed for this stock remuneration plan, whereby shares in JXTG Holdings acquired by the BIP Trust are granted to directors as part of their compensation, based on their executive position.

Management of Group Companies

Each Group company is placed under the jurisdiction of the appropriate operating or corporate department of the Company based on its business line, and the execution of its operations is managed and supervised by that department. Important matters pertaining to the management of individual Group companies are communicated to the Company via the supervising department, and these matters are referred and reported to Board of Directors meeting, the Executive Meetings, and other important meetings as necessary.

Internal Control System

The JX Nippon Mining & Metals Group has drawn up a basic policy for the establishment and operation of an internal control system, laying down rules on such matters as corporate governance, compliance, internal auditing, and risk management. Based on this policy, we have established an internal control system that ensures operations are carried out efficiently and properly.

Internal Control Council

To develop and operate the Group's internal control system, we set up the Internal Control Council as an advisory body to the president, with the role of monitoring the status of internal controls and holding discussions to address issues as necessary. As a rule, the council meets once a year.

Internal Control Promotion Committee

The Internal Control Promotion Committee was set up for advising and assisting with the duties of the Internal Control Council. The committee's responsibilities include monitoring internal control activities. As a rule, the committee meets twice each fiscal year, once in the first half and once in the second half of the year.

Internal Auditing

Internal auditing is carried out across the entire JX Nippon Mining & Metals Group to investigate, study, and assess the status of business administration, operations, and assets preservation from the standpoints of their legality, efficiency, and effectiveness. The Internal Audit Department is responsible for these functions. The Internal Audit Department draws up a medium-term policy at about three-year intervals and drafts auditing plans for each fiscal year, carrying out internal auditing systematically. Internal auditing of Group companies is conducted with the collaboration and cooperation of auditors sent from the Company to Group companies. Based on the results of the audits, improvements are recommended as needed, and implementation of the recommended measures is tracked. Auditing results and findings are reported to the relevant Group company and to the president of JX Nippon Mining & Metals, as well as being reported as necessary to the Executive Meeting.
For earning trust as a corporation

Material Issues

Insisting on Full Compliance

The JX Nippon Mining & Metals Group recognizes that earning the trust of stakeholders is essential to carrying out its business, and it therefore endeavors to enhance the integrity and transparency of its management through corporate governance. To make sure those efforts are effective, we have established and implement an appropriate internal control system, carry out periodic checks, and are proactively engaged in ensuring compliance.

Compliance Initiatives

The JX Nippon Mining & Metals Group insists that officers and employees comply fully with laws, regulations, and other rules. We are building an organizational structure for compliance, aimed at ensuring corporate activities are conducted fairly, and at increasing public trust in the Group. To those ends, we are implementing a multilayered system of checks, providing relevant rules and regulations, and enhancing education to raise awareness, among other initiatives. In fiscal 2017 as in previous years, there were no adverse dispositions from regulatory authorities (license revocation, orders for improvement, fines, etc.) for violations of laws and regulations with respect to those governing bribery and anti-competitive behavior.

Performance regarding Key Compliance Goals in Fiscal 2017

1. Provision of compliance rules and ensuring full compliance

(1) Checking and improving the implementation of compliance rules
We determined the extent to which compliance rules were being implemented at each Group company, and took steps to rectify organizational or operational issues that were identified.

(2) Taking steps to eliminate association with antisocial forces and implementing anti-bribery measures
Audits were conducted at the Company and at Group companies to confirm the extent to which measures for eliminating association with “antisocial forces” (the term used to refer to organized crime groups in Japan) and anti-bribery measures were in place and being followed.

(3) Program for ensuring compliance with laws for prevention of unfair competition
Given the growing trend in countries around the world to make competition laws more rigorous, the JX Nippon Mining & Metals Group established a program to ensure compliance with such laws. The program specifies checks that must be made prior to attending gatherings of competing firms or engaging in transactions that may violate competition laws, and mandates regular reporting by managers to the office in charge. Audits of the program’s implementation status during fiscal 2017 again verified that it is generally being carried out properly.

2. Effective response to matters identified in inspections of environmental and safety-related compliance and labor compliance

In fiscal 2017, we conducted inspections of environment- and safety-related compliance and labor compliance.

3. Enhancing compliance knowledge and awareness among officers and employees

(1) Level-specific compliance education
Compliance education was given for officers of the Company, management-level employees, and newly appointed managers, with content geared to their respective roles and responsibilities. A total of 25 sessions were provided for approximately 450 persons.

(2) Education on quality assurance
Education was begun at Group operating sites on responsibility for quality assurance. In fiscal 2017, two sessions were conducted at the Head Office for approximately 20 persons in charge of quality control. Similar sessions are being given at Group operating sites in fiscal 2018.

(3) Education on laws and legal affairs
After Group head offices and operating sites, 11 sessions were given for approximately 300 persons. Topics covered included internal control, security export control, and the Stamp Tax Act.

4. Implementation of compliance inspections and effective response to matters identified

Besides addressing matters identified in the compliance inspections conducted in fiscal 2016, we carried out inspections in fiscal 2017 in order to determine the status of legal compliance in each department, operating site, and affiliated company. These included investigations, questionnaires, interviews, self-statements, environment and safety audits, reports of close calls, and the above-noted inspections of environment and safety-related compliance and labor compliance.
Compliance Committee

Measures related to compliance in the Group, including basic policy, priority issues for the fiscal year, and education, are determined at meetings of the Compliance Committee (held twice a year as a rule). The committee consists mainly of the JX Nippon Mining & Metals president and officers in charge of compliance at each department of the Company and at major Group companies in Japan and overseas. It receives reports on the status of compliance from each department of the Company and from Group companies. Based on these reports, the committee evaluates the risk of fraudulent acts, legal violations, and other misconduct related to business operations, and reflects its conclusions primarily in setting priority issues and formulating educational plans.

Whistleblower Program

To increase the reliability of the whistleblower program in the Group, we asked an external organization to take over responsibility for accepting reports under the program and adopted a policy of accepting anonymous reports. We have also taken a range of measures to spread awareness of the program throughout the Group, such as displaying posters to publicize the program at operating sites, handing out pocket editions of the Group Philosophy to all employees, creating a section on the Company intranet dedicated to the program, and including the program in compliance education sessions.

In fiscal 2017, multiple reports were confirmed. Necessary measures were carried out for all incidents in accordance with relevant rules and regulations, while taking due care to protect the whistleblowers.

Information Management

1. Protection of personal information
The Group strives to properly handle personal information by setting forth Personal Information Protection Rules and taking other necessary measures based on the situation at each Group company.

2. Management of confidential information
We have drawn up the JX Nippon Mining & Metals Group Basic Policy on Confidential Information Management and taken other measures to manage information properly, geared to the situation at each Group company and the materiality of the information it handles.

3. Information security
We have drawn up the JX Nippon Mining & Metals Group Information Security Regulations and accompanying Information Security Guidelines, and we implement security measures governing the use of computers, networks, and USB memory devices in the Company.

Risk Management

Dealing with risks is more important than ever in a business environment undergoing major change. The JX Nippon Mining & Metals Group is seeking to further strengthen its risk management system in response to this reality.

Risk Management Council

The Risk Management Council, an advisory body to the president, comprehensively identifies risks for the Group, selects significant risks, and deliberates ways of responding to them. Given the diverse risks that exist in our business, we have engaged Attorney Hideaki Kubori as an advisor to the council to help energize the discussions. Mr. Kubori is the founding partner of Hibiya Park Law Offices and one of the leading authorities on corporate governance in Japan.

As a rule, the council meets twice a year. In fiscal 2017, however, because of the nature of its activities, it met each quarter for a total of four meetings.

Activities in Fiscal 2017

We carried out the following activities to improve the Group’s risk management during fiscal 2017.

1. Addressing significant risks
We selected and addressed significant risks based on risk surveys conducted in fiscal 2016. To address these risks, we formed working groups for respective significant risk. The working groups investigated the current situation, studied rules for operation, and reported to the Risk Management Council. At the same time, the necessary rules and regulations were drawn up, and training programs were provided.

2. Selecting significant risks (risk surveys)
Potential risks in the Group were revealed through risk surveys and the results were used to select significant risks to be addressed in fiscal 2018.

3. Raising risk awareness
To enhance risk sensitivity of the Group’s officers and employees, we conducted training for top management and general manager-level employees at the Head Office and main operating sites. Also training was conducted at Group companies in China.
Business Continuity Planning Initiatives

As part of its risk management, the JX Nippon Mining & Metals Group has drawn up a BCP*1 designed to ensure continuation of operations and early recovery in the event of a major earthquake.

By providing regular training, identifying and working to solve issues, and refining the basic plans for business continuity, we will aim for a transition from BCP to BCM*2 focused on continual improvement.

*1 BCP: Business Continuity Plan/Planning
*2 BCM: Business Continuity Management

Initial response to a major earthquake

The Company has introduced a safety confirmation system to promptly check on the safety of employees and their family members in the case of a major earthquake, as well as checking if employees' homes have been damaged.

Employees can use the system to report damage even when they are at home or otherwise away from Company premises, making use of their mobile phones, PCs, or other devices.

Business transceivers are provided in the homes of disaster response team members as a means of communication in case a major earthquake occurs in the Tokyo area at night or on a holiday and a member is unable to make it to the Head Office. Managerial staff members are assigned an ID for remote access from their home PC to a company PC, enabling remote operation of in-Company systems.

As a measure to deal with employees who are unable to return home due to a disaster, a minimum of three days' worth of food, water, and other supplies for employees are stored at each operating site.

BCP Training

BCP training is conducted at the JX Nippon Mining & Metals Head Office, operating sites, and affiliated companies, assuming an earthquake with local seismic intensity at each site of 6+ on the Japanese scale of 1 to 7.

From the end of fiscal 2016 through fiscal 2017, training took place at the Head Office and main operating sites (Isohara Works, Hitachi Works, Kurami Works, and Pan Pacific Copper [Hibi Smelter and Saganoseki Smelter & Refinery]), confirming response procedures in line with the basic plans, action plans, and other guidelines. The training brought to light unexpected situations as well as the need for provision of additional equipment and supplies. These issues are being addressed and the basic plans and other plans are being revised accordingly.

Identifying issues and refining the basic plans

Progress with training and other activities was reported at each business group and operating site, and information was shared about remaining issues. It was decided to address these issues, refine the basic plans, and verify them in subsequent training, applying the plan-do-check-act cycle to the process.

Respect for Human Rights

The JX Nippon Mining & Metals Group Code of Conduct states, “In international business operations, we aim to contribute to sustainable development by protecting the fundamental human rights of people in countries and areas where we operate, and by respecting their cultures and customs.”

For the Group, carrying out sound business practices, while respecting the human rights of local residents, employees, customers, business partners, and all others involved in the supply chain, is seen as a major premise for our continued operation.

We are holding explanatory meetings for local residents, interviewing employees and business partners, and taking other steps toward ensuring our business activities are conducted with all due consideration for human rights. Aiming to create a corporate climate where human rights are respected, we are also actively engaged in educational activities.
Respect for Human Rights

The JX Nippon Mining & Metals Group Code of Conduct states, “In international business operations, we aim to contribute to sustainable development by protecting the fundamental human rights of people in countries and areas where we operate, and by respecting their cultures and customs.” We are enacting initiatives to ensure respect for human rights, drawing on international norms such as the United Nations Global Compact, the International Labour Organization (ILO) Declaration on Fundamental Principles and Rights at Work, and the United Nations Guiding Principles on Business and Human Rights.

Respect for Human Rights: Principles and Rules

JXTG Group

The JXTG Group Code of Conduct includes the following statements on human rights.

- We shall not infringe on human rights through our business activities. We respect internationally accepted human rights standards and diversity, acknowledging differences pertaining to gender, age, nationality, race, ethnicity, skin color, culture, thought, religion, belief, political opinions, sexual orientation, and the presence or absence of disability.
- We shall not engage in any type of discrimination or harassment.
- We shall not engage in any forms of forced labor or child labor.
- We shall not engage in business transactions which may lead to the prolongation of conflicts, human rights violations, or inhumane acts.

JX Nippon Mining & Metals Group

The JX Nippon Mining & Metals Group Compliance Regulation likewise states explicitly the commitment to prohibiting unjust discrimination, preventing harassment, protecting personal information, and preventing child labor, forced labor, and other abuses.

Prohibition of unjust discrimination

JX Nippon Mining & Metals Group Company and its Officers and Employees etc. shall not discriminate against employees for (including but not limited to) hiring, payment of salary, working hours, work conditions or business terms due to (including but not limited to) race, nationality, sex, age, religious belief, social status or physical features.

Prevention of harassment

JX Nippon Mining & Metals Group Company and its Officers and Employees etc. shall proactively engage themselves in creating a harassment-free environment, and shall refuse to accept sexual harassment (including gender harassment) and/or power harassment.

Protection of personal information

JX Nippon Mining & Metals Group Company and its Officers and Employees etc. shall comply with the Personal Information Protection Law and related regulations and internal rules, adequately protect the personal information of (including but not limited to) customers, business partners and employees, and in situations whereby such personal information needs to be managed, manage it with the utmost care.

Prevention of child labor and forced labor

JX Metals Group Company and its Officers and Employees etc. shall not associate themselves directly with child labour and/or forced labour, and shall put efforts to contribute to solve such issues.

Respecting the Human Rights of All Stakeholders

Employees

Approximately 3,300 employees work in the Group worldwide. By means of annual fact-finding at each Group company, we confirm and enforce our absolute prohibition against any form of forced labor or child labor. Furthermore, we strictly observe each country’s labor laws and regulations governing pay, working hours, and other conditions. As our business becomes even more global, we will continue to create environments where employees can work with peace of mind.

Business Partners

We conduct green purchasing surveys each year of suppliers and other business partners based on the JX Nippon Mining & Metals Group Basic Procurement Policy. Among the matters confirmed in these surveys are elimination of forced labor and child labor, and compliance with the prohibition against purchasing conflict minerals. (See page 58 for details.)

Efforts to Raise Awareness of Human Rights among Officers and Employees

To create a corporate climate where human rights are respected, the Group makes efforts to raise awareness and educate officers and employees about relevant issues. Each year, improvements to the educational program are made based on the content during the previous fiscal year. In fiscal 2017, we offered all the JX Nippon Mining & Metals Group officers and employees an e-learning course created for all JXTG Group employees. The course content taught that corporate activities can have a major impact on the human rights of stakeholders.

Mine Development and Respecting the Human Rights of Local Residents

Development and operation of mines can have a particularly significant impact on the surrounding environment. It is therefore essential to pay due consideration to the human rights of local residents and implement measures to ensure coexistence and cooperation with local communities. Ever since its origins as the Hitachi Mine, the JX Nippon Mining & Metals Group has always made a point of being a good neighbor, and its CSR is rooted in this commitment. (See pages 21-22 for details.)

Today, SCM Minera Lumina Copper Chile, the operator of the Caserones Copper Mine, applies a basic three-point policy for supporting local communities: respect for life, respect for the community and environment, and respect for current law. In keeping with this policy, from the project launch in 2007, the operator began holding explanatory meetings and engaging in dialog with the Collas, indigenous people living in the area around the mine site, endeavoring to build up trust. With respect to water resources in particular, which are vital both to local agriculture and to the mining operations, the operator provides support in various forms such as improving reservoirs. (See page 56 for details.)

- Hours of human rights education given in fiscal 2017
  1,312 hours

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- Hours of human rights education given in fiscal 2017
  1,312 hours
For earning trust as a corporation and to ensure transparency of their activities, JX Nippon Mining & Metals has formulated its Code of Conduct in accordance with the ICMM Principles for sustainable development, and works to solve the issues described in these principles and the ICMM Position Statements that supplement them. ICMM member companies are required to ensure transparency of reporting on their sustainability efforts. The Company prepares its sustainability reports and discloses its initiatives in accordance with the Core option defined in the GRI Standards.

ICMM 10 Principles
1. Apply ethical business practices and sound systems of corporate governance and transparency to support sustainable development.
2. Integrate sustainable development in corporate strategy and decision-making processes.
3. Respect human rights and the rights of indigenous peoples and local communities affected by our activities.
4. Implement effective risk-management systems and strategies based on sound science and which account for stakeholder perceptions of risks.
5. Pursue continual improvement in health and safety performance with the ultimate goal of zero harm.
6. Pursue continual improvement in environmental performance, such as water stewardship, energy use and climate change.
7. Contribute to the conservation of biodiversity and integrated approaches to land-use planning.
8. Facilitate and support the knowledge base and systems for responsible design, use, re-use, recycling and disposal of products containing metals and minerals.
9. Pursue continual improvement in social performance and contribute to the social, economic and institutional development of communities.

Endorsement of and Support for the EITI
The Extractive Industries Transparency Initiative (EITI) is a multi-stakeholder process that promotes transparency and accountability in the extractive industries by establishing and implementing standards and processes that the industry employs in the flows of funds from extractive industries, such as oil, natural gas, and metal mining, to the governments of resource-producing countries. The aim of EITI is to prevent corruption and conflicts, promoting responsible resource development that will lead to poverty reduction and growth. JX Nippon Mining & Metals, with its involvement in global resources development, endorses the EITI and actively supports its activities.

The EITI Principles
1. We share a belief that the prudent use of natural-resource wealth should be an important engine for sustainable economic growth that contributes to sustainable development and poverty reduction, but if not managed properly, can create negative economic and social impacts.
2. We affirm that management of natural resource wealth for the benefit of a country’s citizens is in the domain of sovereign governments to be exercised in the interest of their national development.
3. We recognise that the benefits of resource extraction occur as revenue streams over many years and can be highly price dependent.
4. We recognise that a public understanding of government revenues and expenditure over time could help public debate and inform choices.
5. We recognise that the benefits of resource extraction occur as revenue streams over many years and can be highly price dependent.
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10. We recognise that the benefits of resource extraction occur as revenue streams over many years and can be highly price dependent.

ICMM Position Statements
- Mining and Protected Areas
- Indigenous Peoples & Mining
- Principles for Climate Change
- Policy Design
- Transparency of Mineral Revenues
- Mining Partnerships for Development
- Water Stewardship
- Tailings Governance
- Mercury Risk Management

ICMM International Council on Mining & Metals

Communication with Industry Organizations
The JX Nippon Mining & Metals Group plays key roles in various industry organizations, making active use of the opportunities for communication with associated stakeholders.

<table>
<thead>
<tr>
<th>Organization</th>
<th>Role within the organization</th>
<th>Overview and activities of the organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan Mining Industry Association (JMA)</td>
<td>Vice chairman, director, etc.</td>
<td>The JMA represents companies engaged in the resource development and/or smelting and refining of nonferrous metals. With a view to the sound growth of the industry, it conducts surveys and other research on improving technologies, disseminates and publicizes knowledge, and proposes policies to government agencies, with respect to resource development, smelting and refining, and recycling. The JX Nippon Mining &amp; Metals Group is a governing member, serves on various committees, and participates in running the association.</td>
</tr>
<tr>
<td>The Sulphuric Acid Association of Japan</td>
<td>Chairman</td>
<td>The association works toward the growth of the sulfuric acid industry and promotes friendly relations and mutual benefits for sulfuric acid manufacturers. The Company serves on the Operations Committee and the General Affairs Committee, is involved in surveys and reports on sulfuric acid supply and demand conditions, and takes part in governance of the association.</td>
</tr>
<tr>
<td>Japan Copper and Brass Association (JCBA)</td>
<td>Director</td>
<td>The JCBA is an industry association of companies manufacturing copper alloy products, namely plates, strips, pipes, and wires made by melting and rolling copper and copper alloys. By encouraging contacts and cooperation among members, it promotes the progress and growth of the rolled copper industry as a whole. The Group serves on the Road Map Committee, is involved in developing new demand and improving quality, and as a member of the Statistics Subcommittees, is involved in surveys and reports on market sizes.</td>
</tr>
<tr>
<td>Japan Society of Never Metals</td>
<td>Director</td>
<td>By conducting surveys and research, collecting and providing information, and promoting fellowship and cooperation among relevant organizations in Japan and overseas, it aims for the sound growth of the new metals industry and related industries. As a member of the Compound Semiconductors Subcommittee and the Target Subcommittee, the Company is involved mainly in market size surveys and reports and in making proposals to government agencies. The Company also works to improve health and safety as a member of the Safety Committee.</td>
</tr>
<tr>
<td>Japan Catalyst Recycling Association</td>
<td>Chairman</td>
<td>The association is made up of companies engaged in the reuse of catalysts and aims to promote the recycling of precious metals, rare metals, and other metal resources through the proper treatment of spent catalysts, etc. It conducts surveys and compiles statistics on recycling, and holds regular training sessions to improve technologies and promote friendship among members. The Company provides the chairman of the association, serves on the Public Relations Committee, and is involved in issuing survey reports and organizing general meetings.</td>
</tr>
</tbody>
</table>

As of June 2018

Participation in the United Nations Global Compact
JX Nippon Mining & Metals joined the United Nations Global Compact in August 2008. We support the Ten Principles on human rights, labor, the environment, and anti-corruption, and are committed to realizing these ideals.

Ten Principles of the United Nations Global Compact

Human Rights

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Businesses should support and respect the protection of internationally proclaimed human rights; and make sure that they are not complicit in human rights abuses.</td>
</tr>
<tr>
<td>2</td>
<td>Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining; the elimination of all forms of forced and compulsory labor; the effective abolition of child labor; and the elimination of discrimination in respect of employment and occupation.</td>
</tr>
</tbody>
</table>

Environmental Performance

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Businesses should support a precautionary approach to environmental challenges; undertake initiatives to promote greater environmental responsibility; and encourage the development and diffusion of environmentally friendly technologies.</td>
</tr>
</tbody>
</table>

Anti-Corruption

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Businesses should make sure that they are not complicit in human rights abuses.</td>
</tr>
</tbody>
</table>

Participation in Initiatives
As a Member Company of the ICMM, JX Nippon Mining & Metals, in accordance with the ICMM Principles for sustainable development, and works to address the issues described in these principles and the ICMM Position Statements that supplement them. ICMM member companies are required to ensure transparency of reporting on their sustainability efforts. The Company prepares its sustainability reports and discloses its initiatives in accordance with the Core option defined in the GRI Standards.

Communicating Internationally

In seeking solutions, we believe that all stakeholders have important and relevant contributions to make—including governments and their agencies, extractive industry companies, service companies, multilateral organisations, financial organisations, investors, and non-governmental organisations.
CSR Surveys

Surveys of employees were conducted as described below to determine the extent of employee awareness of CSR and involvement in its practice.

<table>
<thead>
<tr>
<th>Method</th>
<th>Conducted by means of a questionnaire distributed with Sustainability Report 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timing</td>
<td>October to December 2017</td>
</tr>
<tr>
<td>Respondents</td>
<td>5,517 employees at 31 domestic operating sites (93% of the 5,933 employees who received the questionnaire)</td>
</tr>
</tbody>
</table>

(1) Results relating to understanding, feeling of resonance with, and awareness of the JXTG Group Philosophy and JX Nippon Mining & Metals Code of Conduct

Understanding, resonance, and awareness all remained at a high level, similar to that for the fiscal 2016 survey.

A. Understanding/resonance (whether respondents felt that they understood the Code of Conduct and it resonated with them)

<table>
<thead>
<tr>
<th>Fiscal 2016</th>
<th>Fiscal 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>I understand it, and it resonates. 69%</td>
<td>I understand it, and it resonates. 69%</td>
</tr>
<tr>
<td>I neither understand it nor does it resonate. 9%</td>
<td>I neither understand it nor does it resonate. 10%</td>
</tr>
</tbody>
</table>

B. Employee awareness (whether respondents felt that employees were aware of the Code of Conduct in their own organizations and workplaces)

<table>
<thead>
<tr>
<th>Fiscal 2016</th>
<th>Fiscal 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes 21%</td>
<td>Somewhat 57%</td>
</tr>
<tr>
<td>Not really 20%</td>
<td>Not really 17%</td>
</tr>
</tbody>
</table>

(2) Results relating to employee awareness of CSR action plans

A. Understanding/Resonance

<table>
<thead>
<tr>
<th>Fiscal 2016</th>
<th>Fiscal 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>I understand it, and it resonates. 61%</td>
<td>I understand it, and it resonates. 61%</td>
</tr>
<tr>
<td>I neither understand it nor does it resonate. 9%</td>
<td>I neither understand it nor does it resonate. 10%</td>
</tr>
</tbody>
</table>

B. Employee awareness

<table>
<thead>
<tr>
<th>Fiscal 2016</th>
<th>Fiscal 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes 21%</td>
<td>Somewhat 57%</td>
</tr>
<tr>
<td>Not really 20%</td>
<td>Not really 17%</td>
</tr>
</tbody>
</table>

(3) Requests and suggestions for Sustainability Report 2018

Each fiscal year when producing the sustainability report, the survey results on the previous year’s report go into deciding the makeup. In the fiscal 2017 survey, more than 300 comments were received. Some of the most common requests and the responses implemented in Sustainability Report 2018 are introduced here.

Special features on timely topics would be welcome.

- In the Topics sections and elsewhere, we incorporated features on our engagement in IoT and AI, our quality management framework, and human resource development, all of which were popular requests.

The sheer comprehensiveness of the contents makes it quite a challenge to read it all. Could you improve this somehow, such as by liberal use of photos?

- We tried to make the contents easy to read through and conducive to repeated reading by, for instance, improving the layout using photos and diagrams, while maintaining the completeness of the reports.

Also, we decided to publish the GRI content index on our website only for the reader’s convenience. The organization of the table of contents has undergone major changes compared to the fiscal 2017 version. Each of the material issues to be communicated has its own section, while we have tried hard to make the contents readable and easy to understand.

Including comments by employees helps the reader form a concrete image of the company and identify with it.

- We tried to include as many employee opinions as possible from various divisions.
- We had these employees talk about what they are thinking and feeling as they go about their regular work. Since the aim is to deepen the reader’s understanding, we urge everyone to read these comments.

(4) How Sustainability Report 2018 was produced

We analyzed survey results on the sustainability report issued last year.

We reflected those results in the organization and editorial policy of this year’s sustainability report.

We carried out the actual editorial work.

The organization and editorial policy were approved by the CSR Committee, an advisory body to the president.
CSR Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basel Convention</td>
<td>The official name is the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. It is an international treaty setting conditions such as approval and advance notice when exporting hazardous wastes, and requirements such as reimporting in the case of improper export or disposal. (Source: Ministry of Economy, Trade and Industry)</td>
<td>P60</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>The variability among all living organisms, including diversity within species, between species, and of ecosystems. (Source: Convention on Biological Diversity)</td>
<td>P24, 26, 60, 84, 96</td>
</tr>
<tr>
<td>Compliance</td>
<td>Observance of laws and regulations. Laws and regulations include the statutes, ordinances, rules, and conventions prescribed by public institutions, and also in-company rules such as articles of incorporation and various regulations, as well as contracts and agreements made with those outside the company.</td>
<td>P4, 25, 27, 28, 43, 85, 85, 87, 88, 89, 93</td>
</tr>
<tr>
<td>Conflict minerals</td>
<td>Mineral resources mined in conflict-affected regions, mostly in Africa. The U.S. Dodd-Frank Wall Street Reform and Consumer Protection Act defines these minerals as tantalum, gold, tin, and tungsten, as well as their derivatives, mined in the Democratic Republic of the Congo or surrounding countries. These minerals are believed to be a source of funding for conflicts in the region.</td>
<td>P57, 58, 94</td>
</tr>
<tr>
<td>CSR</td>
<td>Corporate social responsibility: the responsibility when conducting corporate affairs to make decisions that properly address the needs of all kinds of stakeholders, in awareness of how a company's activities impact society, rather than simply pursuing financial gain. (Source: Green Purchasing Network)</td>
<td>P1, 2, 4, 6, 21, 22, 25, 26, 27, 28, 43, 54, 57, 61, 85, 94, 97, 98</td>
</tr>
<tr>
<td>Global Compact</td>
<td>A voluntary initiative officially launched at the United Nations Headquarters in New York in 2000, encouraging businesses to adopt certain principles of conduct. Participating corporations commit to putting into practice 10 globally established principles in the four areas of human rights, labor, the environment, and anti-corruption. (Source: Convention on Biological Diversity)</td>
<td>P5, 93, 96</td>
</tr>
<tr>
<td>Governance</td>
<td>Corporate governance: a corporate management system for raising corporate value by improving competitiveness and preventing fraudulent acts. (Source: Green Purchasing Network)</td>
<td>P1, 6, 85, 86, 87, 90, 95</td>
</tr>
<tr>
<td>Green purchasing</td>
<td>A form of CSR procurement. Giving priority in purchasing to products and services with the smallest possible environmental impact, and to suppliers who strive to reduce their environmental impact. (Source: Green Purchasing Network)</td>
<td>P58, 61, 94</td>
</tr>
<tr>
<td>GRI</td>
<td>Global Reporting Initiative: an institution established in 1997 aimed at improving the quality, credibility, and comparability of sustainability reporting. It publishes guidelines on global standards of reporting. The GRI is a United Nations Environment Programme partner, and is headquartered in Amsterdam, the Netherlands.</td>
<td>P1, 98</td>
</tr>
<tr>
<td>GRI Standards</td>
<td>The sustainability reporting standards issued by the GRI in October 2016. (Source: Green Purchasing Network)</td>
<td>P1, 27, 95</td>
</tr>
<tr>
<td>Internal control</td>
<td>A system for establishing and implementing rules and controlling an organization to prevent in advance improper or illegal actions in the pursuit of business objectives.</td>
<td>P6, 85, 86, 87, 88</td>
</tr>
<tr>
<td>Lockout</td>
<td>The temporary closing of a business establishment (offices, factories, etc.) by an employer in a labor dispute, refusing to allow employees to come to work and denying them payment of wages, to counter a strike or similar action by labor.</td>
<td>P49</td>
</tr>
<tr>
<td>FDCA cycle</td>
<td>A management approach for maintaining and raising quality and promoting ongoing efforts to improve operations, by repeating the cycle of plan, do, check, and act.</td>
<td>P37, 63, 91</td>
</tr>
<tr>
<td>PRTR Act</td>
<td>A legal system that governs chemicals with the potential of harming human health and ecosystems. Under the system, business operators keep track of and report to the government the amounts of these chemicals that are released from their operating sites to the environment (air, water, soil) and transferred as waste outside their operating sites. The government then compiles and makes public the amounts released and transferred, based on the reported data and estimates. (Source: Ministry of Economy, Trade and Industry)</td>
<td>P64</td>
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</table>

Other Matters

<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
<th>Page(s)</th>
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<tbody>
<tr>
<td>PRTR Act</td>
<td>A legal system that governs chemicals with the potential of harming human health and ecosystems. Under the system, business operators keep track of and report to the government the amounts of these chemicals that are released from their operating sites to the environment (air, water, soil) and transferred as waste outside their operating sites. The government then compiles and makes public the amounts released and transferred, based on the reported data and estimates. (Source: Ministry of Economy, Trade and Industry)</td>
<td>P64</td>
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<tr>
<td>Resource nationalism</td>
<td>The policy of countries wanting to control and develop the natural resources within their borders on their own.</td>
<td>P75</td>
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<td>SDGs</td>
<td>Sustainable Development Goals: international development goals and targets adopted at the United Nations Sustainable Development Summit in September 2015. Consisting of 17 goals and 169 targets, the SDGs provide important guidelines for the international community to eradicate poverty and achieve a sustainable world by 2030, based on the concept “No one will be left behind.”</td>
<td>P4, 25, 26, 27, 28</td>
</tr>
<tr>
<td>Specified-scale electricity utilities</td>
<td>Of the businesses supplying electricity, those that supply electricity on a retail basis to customers in need of 50 kilowatts or more of high-voltage power. (Source: Cabinet Office)</td>
<td>P69</td>
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<td>SOC</td>
<td>Statistical quality control: a quality control technique using statistical methods that, rather than measuring the quality of individual products, measures the quality-based characteristics of the production process as a whole (materials, equipment and machinery, work, products), and controls quality by confirming their distribution (variability).</td>
<td>P39</td>
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<td>Stakeholders</td>
<td>All those affected, for better or worse, by corporate activities. Stakeholders are many and varied, including shareholders, investors, suppliers, customers, consumers, and employees. (Source: Green Purchasing Network)</td>
<td>P1, 3, 6, 24, 25, 26, 27, 43, 59, 87, 94, 95, 96</td>
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<td>Sustainability</td>
<td>The ability to last. For corporations striving for the sustainable growth of society and their own growth into the future, business administration must take account of economic, environmental, and social impact.</td>
<td>P1, 5, 25, 26, 95, 97, 98</td>
</tr>
<tr>
<td>Type 2 Designated Energy Management Factory</td>
<td>As defined in the Act on Rationalizing Energy Use, a production plant consuming an amount of energy (heat and electricity) equivalent to a minimum of 1,500 kilowatts and a maximum of less than 3,000 kilowatts of crude oil per year. (Source: Cabinet Office)</td>
<td>P1, 60</td>
</tr>
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<td>Work–life balance</td>
<td>Harmony between professional and personal life. Meeting work responsibilities and finding a sense of accomplishment and satisfaction in work, while also choosing and achieving a satisfying life in the home or community from among diverse possibilities, at each stage of life including child-rearing, middle age, and older age. (Source: Cabinet Office)</td>
<td>P4, 8, 73</td>
</tr>
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<td>Urban mine</td>
<td>Nonferrous metals that are subject to recycling, after being extracted from natural ores, going through smelting and refining processes, and being used in various forms in human economic activities.</td>
<td>P43</td>
</tr>
<tr>
<td>Zero emissions</td>
<td>A concept advocated by the United Nations University calling for full use of resources and reduction of waste to as close to zero as possible, with the aim of creating a sustainable recycling-oriented society. In this report, it is used chiefly to mean “discharging no secondary waste that is subject to landfill in a final disposal site.”</td>
<td>P17, 24, 74</td>
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</table>
Independent Assurance Report

To the President and CEO of JX Nippon Mining & Metals Corporation

We were engaged by JX Nippon Mining & Metals Corporation ("the Company") to undertake a limited assurance engagement of the environmental and social performance indicators marked with √ for the period from April 1, 2017 to March 31, 2018 included in its Sustainability Report 2018 (the "Report") for the fiscal year ended March 31, 2018, the Company's self-declaration that the Report is prepared in accordance with the Global Sustainability Standards Board's GRI Sustainability Reporting Standards ("GRI Standards") at a core level, the alignment of the Company's policies to the International Council on Mining and Metals ("ICMM")'s 10 Sustainable Development ("SD") Principles and the applicable mandatory requirements set out in ICMM position statements, the Company's identification and prioritization of material issues, and the Company's approach and management of its material issues.

The Company's Responsibility

The Company is responsible for the preparation of the Indicators in accordance with its own reporting criteria (the "Company's reporting criteria"), as described in the Report, self-declaring that the Report is prepared in accordance with the criteria stipulated in the GRI Standards, reporting on the alignment of the Company's policies to the ICMM's 10 SD Principles and the applicable mandatory requirements set out in ICMM position statements, reporting on the Company's identification and prioritization of material issues, and reporting on the Company's approach and management of its material issues.

Our Responsibility

Our responsibility is to express a limited assurance conclusion on the Indicators based on the procedures we have performed. We conducted our engagement in accordance with the International Standard on Assurance Engagements (ISAE) 3000, Assurance Engagements Other than Audits or Reviews of Historical Financial Information" and the "ISAE 3410, Assurance Engagements on Greenhouse Gas Statements" issued by the International Auditing and Assurance Standards Board. The limited assurance engagement consisted of making inquiries, primarily of persons responsible for the preparation of information presented in the Report, and applying analytical and other procedures, and the procedures performed vary in nature from, and are less in extent than for, a reasonable assurance engagement. The level of assurance provided is thus not as high as that provided by a reasonable assurance engagement. Our assurance procedures included:

- Interviewing the Company's responsible personnel to obtain an understanding of its policy for preparing the Report and reviewing the Company's reporting criteria.
- Inquiring about the design of the systems and methods used to collect and process the Indicators.
- Performing analytical procedures on the Indicators.
- Examining, on a test basis, evidence supporting the generation, aggregation and reporting of the Indicators in conformity with the Company's reporting criteria, and recalculating the Indicators.
- Visiting two of the Company's domestic factories selected on the basis of a risk analysis.
- Evaluating the Company's self-declaration that the Report is prepared in accordance with the GRI Standards at a core level against the criteria stipulated in the GRI Standards.
- Assuring the alignment of the Company's policies to the ICMM's 10 SD Principles and the applicable mandatory requirements set out in ICMM position statements through documentation reviews and interviews.
- Interviewing the Company's responsible personnel and reviewing documents with respect to the Company's process of identifying and prioritizing its material issues.
- Interviewing the Company's responsible personnel and reviewing documents with respect to the Company's approach to and management of its material issues.
- Evaluating the overall presentation of the Indicators.

Conclusion

Based on the procedures performed, as described above, nothing has come to our attention that causes us to believe that:

- the Indicators in the Report are not prepared, in all material respects, in accordance with the Company's reporting criteria as described in the Report;
- the Company's self-declaration that the Report is prepared in accordance with the GRI Standards at a core level does not conform to the criteria stipulated in the GRI Standards;
- the Company's policies are not aligned to the ICMM's 10 SD Principles and the applicable mandatory requirements set out in ICMM position statements as described on page 96;
- the Company has not identified and prioritized its material issues as described on pages 27-28; and
- the Company has not approached and managed its material issues as described on pages 11-19, 24-25, 29-30, 38-40, 43, 47-48, 53-54, 56, 59-61, 67, 70-71, 74, 87-89 and 92-94.

Our Independence and Quality Control

We have complied with the Code of Ethics for Professional Accountants issued by the International Ethics Standards Board for Accountants, which includes independence and other requirements founded on fundamental principles of integrity, objectivity, professional competence and due care, confidentiality and professional behavior. In accordance with International Standard on Quality Control 1, we maintain a comprehensive system of quality control including documented policies and procedures regarding compliance with ethical requirements, professional standards and applicable legal and regulatory requirements.
We welcome your views and questions regarding Sustainability Report 2018 as well as suggestions on how to make the next report even better.

Send your views on this report to:
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