









Overview of the communication tools

Sustainability Report 2018		
Brochures	Easy-to-understand brochure on environmental initiatives	Brochure on the compact overview of the company
	 <p>Sustainability Report 2018 (Book form and PDF file)^{1,2}</p>	 <p>Company Brochure (Book form and PDF file)¹</p>
	Brochure on the overall businesses and management for investors	 <p>Annual Report 2018 (Book form and PDF file)^{1,2}</p>
Website	Details on environmental initiatives	Details on the following subjects
	 <p>Environment & CSR http://www.nssmc.com/en/csr/</p>	 <ul style="list-style-type: none"> • Products • Research & Development • About NSSMC • Recruiting information <p>http://www.nssmc.com/en/</p>
	Details on business and management	 <p>Investor Relations http://www.nssmc.com/en/ir/</p>
Other publications	Various reports	Various reports for shareholders ¹
	<ul style="list-style-type: none"> • PR brochures "Quarterly Magazine: NSSMC"² • Picture book "A New Story About Iron"² • Technical articles and technical reports¹ 	<ul style="list-style-type: none"> • Fact Book • Financial Results • Securities Reports • Corporate Governance Reports • Reports for Shareholders
	 <p>Picture book "A New Story About Iron" (only in Japanese)</p>  <p>Fact Book 2018</p>	

¹ PDF files are available for downloading from the website.
² Printed copies are available upon request from the website.

Corporate profile

Company name	Nippon Steel & Sumitomo Metal Corporation	Capital	¥419.524 billion (Total number of shareholders: 436,620)
Head office	2-6-1, Marunouchi, Chiyoda-ku, Tokyo 100-8071, Japan Phone: +81-3-6867-4111	Stock listings	Tokyo, Nagoya, Fukuoka, and Sapporo
Date of Establishment	March 31, 1970	Number of employees	93,557 (consolidated basis)
President	Kosei Shindo	Group companies	377 consolidated subsidiaries and 114 equity-method affiliates



Cover photo
Kashima Works and Hometown Forest

Nippon Steel & Sumitomo Metal Corporation will change its name to "Nippon Steel Corporation" effective April 1, 2019.



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Printed in Japan



NIPPON STEEL & SUMITOMO METAL CORPORATION

Sustainability Report 2018

— In Step with Progress toward SDGs

Nippon Steel & Sumitomo Metal Corporation
Sustainability Report 2018 (April 2017–March 2018)



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Corporate Philosophy

Nippon Steel & Sumitomo Metal Corporation Group will pursue world-leading technologies and manufacturing capabilities, and contribute to society by providing excellent products and services.

Management Principles

1. We continue to emphasize the importance of integrity and reliability in our actions.
2. We provide products and services that benefit society, and grow in partnership with our customers.
3. We pursue world-leading technologies and manufacturing capabilities.
4. We continually anticipate and address future changes, innovate from within, and pursue unending progress.
5. We develop and bring out the best in our people to make our Group rich with energy and enthusiasm.

A Message from Top Management



Nippon Steel & Sumitomo Metal (NSSMC) announced in March 2018 the 2020 Mid-Term Management Plan for the three years from fiscal 2018 to fiscal 2020. Aiming at becoming the best steelmaker with world-leading capabilities, we will “forge manufacturing capability, address megatrends, and create the value of steel, while continuing to strengthen our superiority in technology, cost, and being global. Great waves of long-term, structural changes are washing over society and industries today. Examples include increasing needs for lightweight, high-strength automobiles, development of electric vehicles, realization of a hydrogen-oriented society, diffusion of renewable energy, establishment of safe, resilient urban infrastructure, and IT innovations, including AI, IoT, and big data. We aim to capture such megatrends and create the value of steel, while contributing to society by providing steel for a myriad of uses.

Contributing to the achievement of a sustainable society (by attaining sustainable development goals [SDGs]) is one of the initiatives of the new plan. Consistent with this, we believe it is important that we engage in our business activities in accordance with the SDGs adopted by the United Nations. The 17 SDGs include many environmental items. Having identified environmental management as a critical task for corporate management, based on its Environmental Management Policy, NSSMC has been fulfilling its commitment to contribute to the creation

of a society oriented toward environmental preservation and lower environmental impact. Steel, having high recyclability, is an eco-friendly material that can be reborn many times in whatever form is required and from the perspective life cycle assessment has extremely low environmental impact compared to other materials. Under the plan, by utilizing such advantages of steel as a material and by responding to continual growth in global steel demand, we adhere to our commitment to help realize a sustainable society and to remain actively tackling various environmental issues, including some at a local community level and others of global scale. These efforts include efforts on behalf of the maintenance and improvement of good living environments, the promotion of reduction and recycling of waste, measures that address global warming, and the maintenance and improvement of biological diversity.

Concerning global climate change, following accession to the Paris Agreement in November 2016, Japan has been working on a plan to cut national greenhouse gas emissions 26% from 2013 levels by 2030, and going forward, a long-term strategy toward 2050 is being developed. In accordance with these goals, NSSMC is promoting “three ecos,” namely, Eco Process (The way we manufacture is eco-friendly), Eco Products (What we produce is eco-friendly) and Eco Solution (Sharing our eco-solutions). The company also is steadily advancing the Action Plans for a Low-Carbon

Toward achieving the Sustainable Development Goals (SDGs)

Society. Moreover, from a longer perspective, we have been participating in the innovative steelmaking process (COURSE50), as well as doing basic research on the technology to transform CO₂ into usable materials and “Blue Carbon” to absorb and sequester CO₂ via ocean and coastal eco systems.

We keep reminding ourselves that environmental risk management, including prevention of unexpected events and accidents, is one of our overriding concerns for our sustainable operations, along with safety and disaster prevention. We comply with laws and regulations, adapt to ordinances, bylaws, and standards, and carry out measures to reduce environmental burden with due consideration to the situation at each point of operation. We will keep addressing the issues of environmental preservation in terms of hard and soft aspects.

In April 2019, we will change our name to Nippon Steel Corporation, opening a new chapter in our history. As a steel company that originated in Japan, we will strive to keep our position as the “best steelmaker with world-leading capabilities.” In the environmental and social area, we intend to continue to further enhance the quality of our environmental management by developing two-way communication with all stakeholders. Desiring to be ever more trusted and relied upon by society, we will fulfill our corporate social responsibility (CSR) to contribute to society by carrying out our corporate philosophy to “pursue world-leading

technologies and manufacturing capabilities, and to contribute to society by providing excellent products and services.”

This Sustainability Report contains details of our progress in environmental management, ongoing initiatives, and commitment to keep contributing to the realization of a sustainable society through environment matters.

A handwritten signature in black ink, reading "K. Shindo".

Kosei Shindo

Representative Director and President



NSSMC Group's Long-Term History of Innovations

Nippon Steel & Sumitomo Metal Corporation (NSSMC) has strived to introduce new products to society, by always appropriately adjusting to the changing times and making advances in steelmaking technology so as to better satisfy the needs of customers. We are committed to contribute to the development of society by further improving our advanced technology.

Steel supported high economic growth

1960s

[1964]
The Tokaido Shinkansen adopted NSSMC's railway wheels and axles, and drive system.



The Zero Series trains
Courtesy of Railway Technical Research Institute

[1969]
Supplied a massive quantity of foundation piles, materials for bridges, and other steel products in the construction of the Tomei Expressway.



Opening ceremony of the whole line
Courtesy of Central Nippon Expressway

Energy saving challenge

1970s

[1972]
Developed the world's first **continual annealing furnace**, integrating five annealing processes for automotive steel sheets into one continual process, and reducing manufacturing time from 10 days to 10 minutes.



[1976]
Developed the **Coke Dry Quenching (CDQ)**, enabled exhaust heat to be collected and used for power generation, and contained dust generation.
▶ p. 25

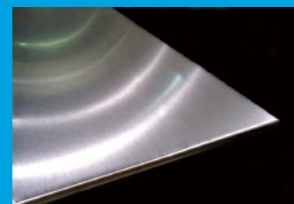


[1970s]
Developed the **power generation technology** to turn a turbine by blast furnace top gas pressure, with no use of fuel.

Respond to the yen's sharp appreciation

1980s

[1984]
Began production and sales of corrosion-resistance, lightweight, and high-strength **titanium**.



[1988]
Developed steel wires for **high-strength cables**, contributing to the construction of the Akashi Kaikyo (Strait) Bridge and other long bridges.



[1980s]
Developed **high-tensile steel sheets** for automobiles, contributing to reduction in weight of automobiles and to resultant improvement in fuel efficiency.

[1980s]
Installed **activated coke-type dry desulfurizing and denitrification equipment** to significantly reduce emissions of SOx and NOx.

Support in the era of concern for the global environment

1990s

[1994]
Participated in the **Kita-Kyushu Smart Community Creation Project** which aimed at town planning with the harmonious coexistence of communities and factories.



[1996]
Began production and sales of **steel house** with balanced features of seismic resistance, fire resistance, durability, and thermal retention.



[1996]
Developed **HIAREST steel** that is resistant to cracking at the time of collision of a ship in order to prevent oil leakage and pollution of the ocean.



[1999]
Developed **lead-free bars and wire rods** with ensured workability.

Support for customer's global expansion

2000s

[2000]
Began production and sale of **SuperDyma**, a highly corrosion-resistant hot-dip zinc-coated steel sheet that lasts four times longer than conventional products.



Exterior material of the new Kobe plant of Rock Field, Co., Ltd.

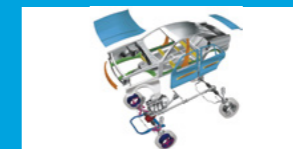
[2000]
Developed a **waste plastics full-recycling process using existing coke ovens** and began operation.



[2009]
Developed **CLEANWELL™ DRY1**, an eco-friendly premium connector for oil country tubular goods, not requiring use of a grease called dope, which contains a substance of concern.



[2000s]
Developed **ultra-high-tensile steel sheets** for automobiles, that contribute to both reduction in weight of automobiles and enhancement of collision safety. ▶ p. 14



Toward becoming the world-leading steelmaker with comprehensive strengths

2010s

[2010]
Expanded usage of biomass resources, such as used wood pallets, thinned forest wood, and other resources even including coffee grounds, as **coal alternative fuel for power generation**.



[2014]
Completed construction of the first commercial model of an **energy-efficient CO₂ separation and recovery facility** for a non-steelmaking area, at Muroran Works. CO₂ contained in the stack gas from blast furnaces or thermal power stations is separated and collected by use of a chemical absorption solution.



[2014]
Established the production and shipment system for the world's longest 150-meter-long rails.



[2015]
Developed **HRX19™ stainless steel**, enabling **high-pressure hydrogen** to be used for hydrogen stations and fuel cell vehicles. ▶ p. 15

[2016]
Conducted a verification test of an experimental blast furnace of the **COURSE50 project**, aimed at reducing CO₂ emission by hydrogen reduction. ▶ p. 26

Major events

[1963] Opening of the Meishin Expressway
[1964] Opening of the Tokaido Shinkansen Line
[1964] Tokyo Summer Olympics

[1970] Japan World Exposition (Osaka Expo'70)
[1972] Sapporo Winter Olympics
[1973] Shift to the floating exchange rate regime
[1973] The first oil crisis
[1978] The second oil crisis

[1982] Opening of the Tohoku and Joetsu Shinkansen Lines
[1985] The Plaza Accord
[1985] The International Exposition, Tsukuba, Japan
[1988] Opening of the Seikan Submarine Tunnel
[1989] Introduction of 3% consumption tax

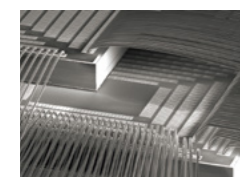
[1992] The United Nations Conference on Environment and Development (UN Earth Summit)
[1995] The Great Hanshin-Awaji Earthquake
[1997] Consumption rate hike to 5%
[1998] Nagano Winter Olympics

[2002] FIFA World Cup Korea/Japan
[2005] The 2005 World Exposition, Aichi, Japan
[2008] Lehman Shock (Global Financial Crisis)

[2011] The Great East-Japan Earthquake and Tsunami
[2011] Opening of the entire line of the Kyushu Shinkansen Line
[2012] Opening of the Tokyo Skytree
[2014] Consumption rate hike to 8%
[2015] Opening of the Hokuriku Shinkansen Line
[2016] Opening of the Hokkaido Shinkansen Line

NSSMC Group's Businesses

Based on the long accumulation of technology through steelmaking, the Nippon Steel & Sumitomo Metal Corporation (NSSMC) Group operates businesses in five areas: steelmaking, engineering, chemicals, new materials, and system solutions, with the core business being steelmaking.



New materials business 37.0 billion yen

Nippon Steel Sumikin Materials Co., Ltd., etc.

Based on materials expertise gained from steelmaking, Nippon Steel & Sumikin Materials provides original materials and components that are indispensable to leading-edge technology fields, with primary focus on the three areas of semiconductor and electronics industry materials and components, basic industrial materials and components and environmental and energy-related materials and components.



Chemicals business 200.7 billion yen

Nippon Steel & Sumikin Chemical Co., Ltd.,¹ etc.

Nippon Steel & Sumikin Chemicals is developing demand for functional materials for electronic materials such as for displays, epoxy resins, circuit boards, and organic electroluminescence (OEL), on top of a variety of original coal-based products, including needle coke and various aromatic products.



Engineering and construction business 294.2 billion yen

Nippon Steel & Sumikin Engineering Co., Ltd., etc.

Based on long-accumulated steelmaking and other technologies, Nippon Steel & Sumikin Engineering undertakes many projects worldwide in six fields: steelmaking plants; environment; energy; offshore steel structures; building construction and steel structures; and pipelines.



System solutions business 244.2 billion yen

NS Solutions Corporation, etc.

In keeping with the advent of widespread use of digital innovations in IT for business, NS Solutions provides IT business solutions, including uses of the cloud, IoT, and AI, to a wide range of sectors by applying its extensive insight and advanced practical IT capabilities acquired in the steel manufacturing business.

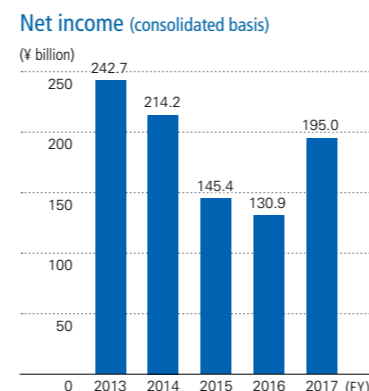
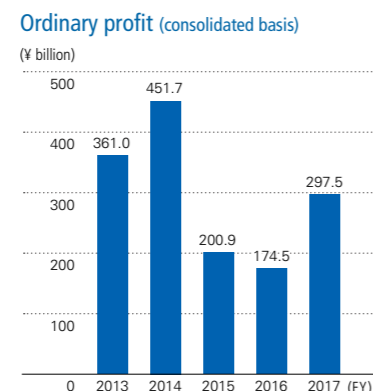
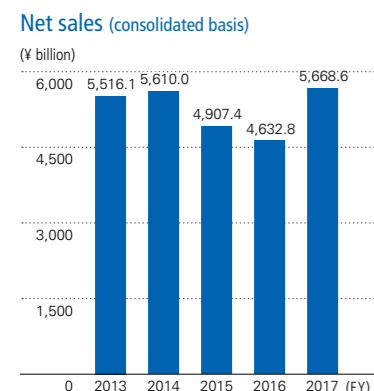
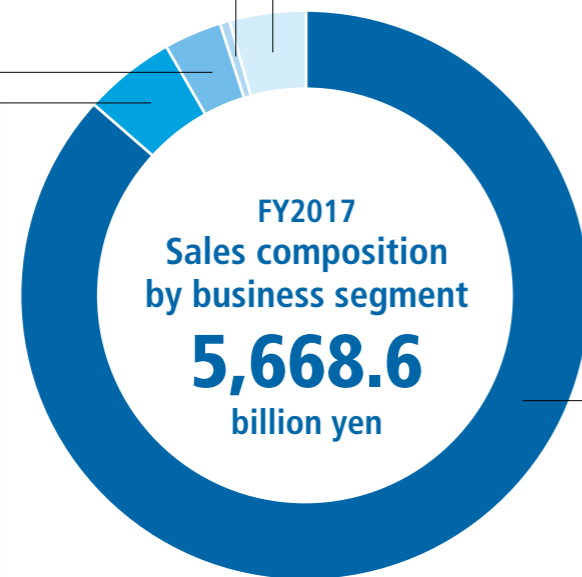


Steelmaking and steel fabrication business 5,017.2 billion yen

Nippon Steel & Sumitomo Metal Corporation, etc.

Enhancing technological superiority, NSSMC provides a variety of high-grade steel products (i.e., steel plates; flat products; bar & wire rod; construction products; pipe & tube; railway, automotive & machinery parts; and titanium & specialty stainless steel) to many customers in Japan and overseas.

¹ On October 1, 2018, Nippon Steel & Sumikin Chemical and Nippon Steel & Sumikin Materials scheduled to merge to form newly named Nippon Steel Chemical & Material.



The NSSMC Group is steadily progressing in establishing a global business structure that enables it to capture overseas growth markets and to readily respond to customers' overseas expansion.



1 JCAPCPL (India)

A joint venture formed with Tata Steel in 2014 to manufacture and sell cold-rolled steel sheets for automobiles.



2 NS-SUS (Thailand)

A subsidiary to manufacture and sell steel sheet products for automobiles, electric appliances, and construction. NS-SUS received the 2017 Advanced Special Award for Total Productive Maintenance (TPM) Achievement from the Japan Institute of Plant Maintenance (JIPM).



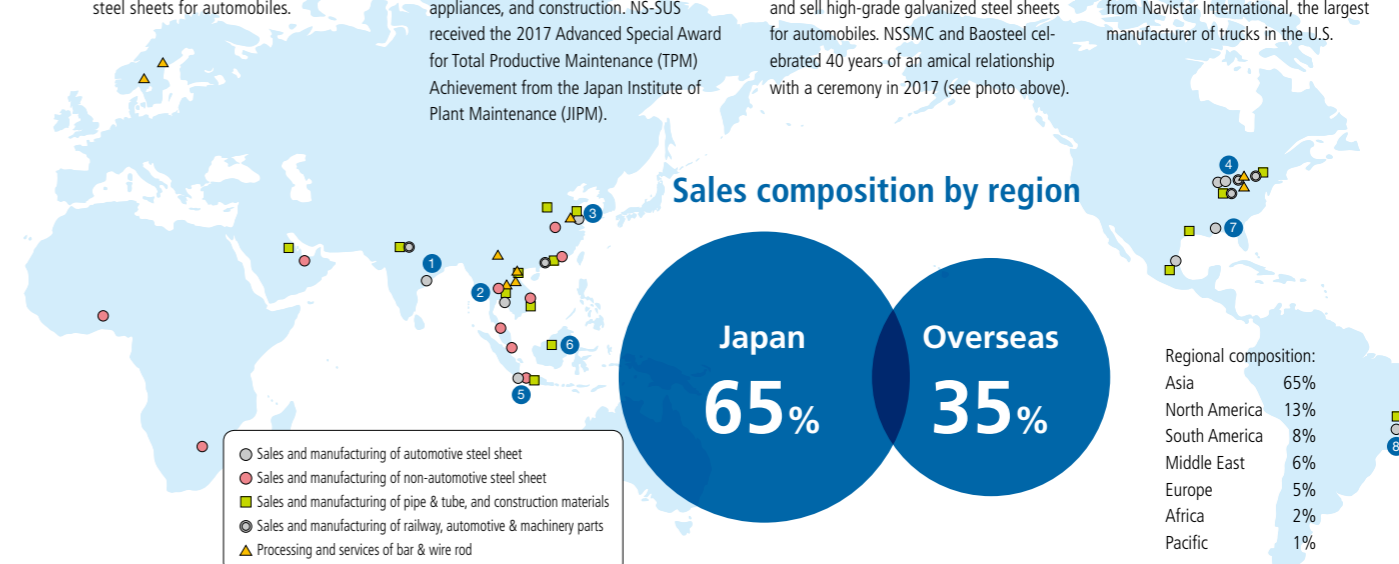
3 BNA (China)

A joint venture formed with Baosteel, which began operation in 2005 to manufacture and sell high-grade galvanized steel sheets for automobiles. NSSMC and Baosteel celebrated 40 years of an amical relationship with a ceremony in 2017 (see photo above).



4 Nippon Steel & Sumikin Crankshaft (USA)

Received the 2017 Diamond Supplier Award from Navistar International, the largest manufacturer of trucks in the U.S.



5 KNSS (Indonesia)

A joint venture with PT Krakatau Steel, an Indonesian government-owned steelmaker, that began production and sales of steel sheets for automobiles in July 2017.



6 VAM®BRN (Brunei)

A subsidiary that provides threading services for connections of the oil country tubular goods (OCTG) pipes. Began operation in November 2016.



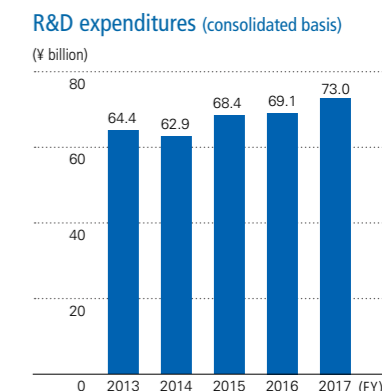
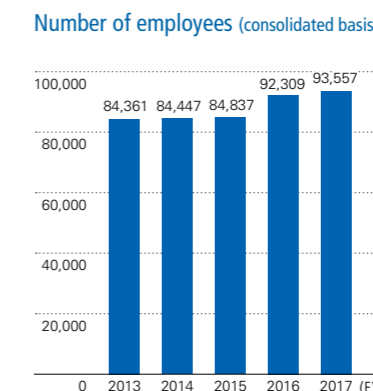
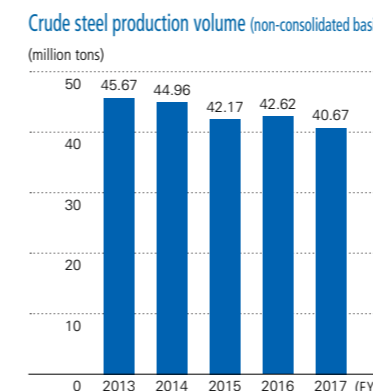
7 AM/NS Calvert (USA)

Acquired this plant, formerly operated by ThyssenKrupp, with ArcelorMittal in 2014. It can now provide ultra-high-tensile steel sheets and other high-performance products.



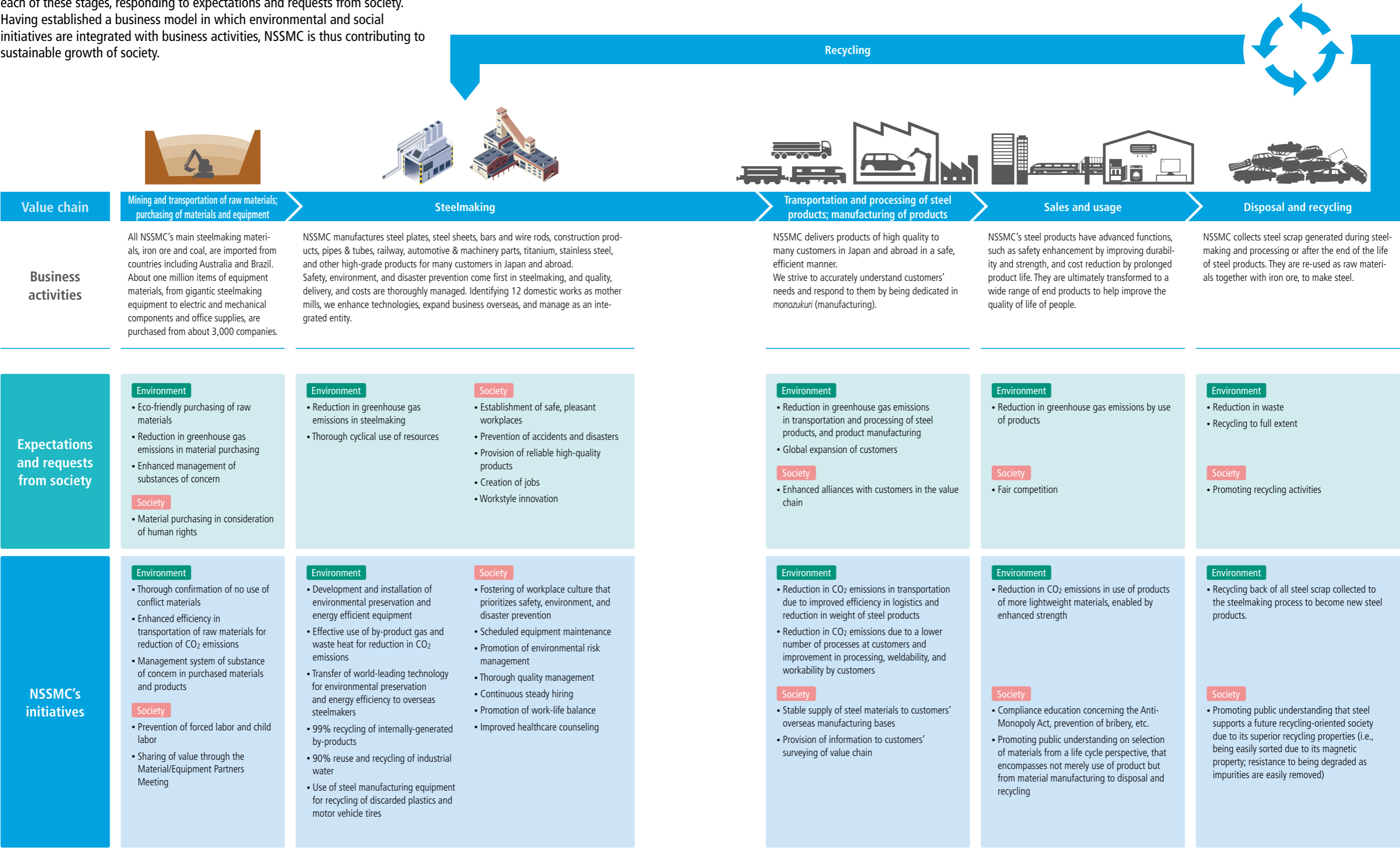
8 Usiminas (Brazil)

An integrated steelworks with a blast furnace that began operation in 1962. Established UNIGAL, a joint venture with Usiminas to manufacture galvanized steel sheets for automobiles in 1999.



NSSMC Group's Value Chain

The NSSMC Group conducts business activities making use of its strengths in each stage of the value chain in steelmaking, and is also engaged in initiatives in each of these stages, responding to expectations and requests from society. Having established a business model in which environmental and social initiatives are integrated with business activities, NSSMC is thus contributing to sustainable growth of society.



NSSMC Group's Contribution to SDGs

“Transforming our world: the 2030 Agenda for Sustainable Development,” was adopted at the United Nations Summit in 2015. This contains 17 Sustainable Development Goals (SDGs) and 169 targets.

The NSSMC Group's values are to “Pursue world-leading technologies and manufacturing capabilities, and contribute to society by providing excellent products and services.” We have been striving to cope with various initiatives so that we can play an important role in supporting social infrastructure through steelmaking.

We believe our contribution to developing a sustainable society through our initiatives also contributes to achieving the United Nation's SDGs, which are scheduled to be globally resolved by 2030.

Examples of specific initiatives

<div><div>SUSTAINABLE DEVELOPMENT GOALS</div><div>17 GOALS TO TRANSFORM OUR WORLD</div></div>	
<div><div>1 NO POVERTY</div><div><ul style="list-style-type: none">Job creation through establishment of operating companies in emerging countries p. 7Reduction of vulnerability to disaster based on use of Nonframe method (construction method to stabilize slopes without damaging the natural environment)</div></div>	<div><div>9 INDUSTRY, INNOVATION AND INFRASTRUCTURE</div><div><ul style="list-style-type: none">Pursuit of Eco Processes to help raise resource/energy efficiency and reduce environmental impacts pp. 20, 21Introduction of advanced technologies through bilateral cooperation (India, ASEAN, etc.) pp. 24, 25Use of steel slag in road materials and materials for civil engineering pp. 28, 29</div></div>
<div><div>2 ZERO HUNGER</div><div><ul style="list-style-type: none">Use of converter slag fertilizer, a by-product of steelmaking, to improve farming productivity and salt damage in farmland p. 35Provision of titanium and stainless steel, which have excellent seawater corrosion resistance, for seawater desalination plants, securing agriculture water</div></div>	<div><div>10 REDUCED INEQUALITIES</div><div><ul style="list-style-type: none">Thorough compliance training, such as for the Anti-Monopoly Act p. 39Eliminating unfair discrimination, based on the respect on human rights p. 42Expanded hiring of women and non-Japanese p. 42</div></div>
<div><div>3 GOOD HEALTH AND WELL-BEING</div><div><ul style="list-style-type: none">Promotion of air, water, soil risk management and chemical substance management pp. 30–33Development and provision of steel products that contain no substances of concern, such as lead and hexavalent chromium</div></div>	<div><div>11 SUSTAINABLE CITIES AND COMMUNITIES</div><div><ul style="list-style-type: none">Provision of various indispensable Eco Products for daily lives pp. 22, 23Provision of earthquake-resistance steel productsDevelopment of Nonframe method, which protects houses from disaster while maintaining views of nature</div></div>
<div><div>4 QUALITY EDUCATION</div><div><ul style="list-style-type: none">Promotion of employee training to raise skills (i.e., OJT, Off-JT, sending trainees to Junior College for Industrial Technology), hosting technology triathlon p. 42Study sessions for teachers, internship for students p. 43</div></div>	<div><div>12 RESPONSIBLE CONSUMPTION AND PRODUCTION</div><div><ul style="list-style-type: none">Promotion of air, water, soil risk management and chemical substance management pp. 30–33Full recycling of by-products, including slag, dust, and sludge pp. 28, 29Promotion of recycling of waste plastics and waste tires p. 29</div></div>
<div><div>5 GENDER EQUALITY</div><div><ul style="list-style-type: none">More hiring of women in production and other workplaces p. 42Establishment of infrastructure in manufacturing worksites for women to work comfortablyAwareness raising to prevent power harassment and sexual harassment in the workplace</div></div>	<div><div>13 CLIMATE ACTION</div><div><ul style="list-style-type: none">Pursuit of Eco Processes at the world's highest-level energy efficiency pp. 18–21Development and provision of Eco Products, such as high-tensile, light-weighted, energy-efficient steel sheets and light-weight railway wheels and axles for high-speed railways pp. 22, 23</div></div>
<div><div>6 CLEAN WATER AND SANITATION</div><div><ul style="list-style-type: none">Recycling and reuse of limited water resources p. 30Promotion of water quality risk management pp. 30, 31, 33Provision of titanium and stainless steel for seawater desalination plantsProvision of lining steel pipes for delivery of clean water</div></div>	<div><div>14 LIFE BELOW WATER</div><div><ul style="list-style-type: none">Regeneration of seaweed beds with the use of steel slag pp. 34, 35Promotion of sea area environmental improvement with the use of steel slag p. 28Voluntary clean-up activities at seashore nearby steelworksCollaboration with an NPO, “Mori wa Umi no Koibito” (participation in tree-planting, etc.) p. 43</div></div>
<div><div>7 AFFORDABLE AND CLEAN ENERGY</div><div><ul style="list-style-type: none">Efficient use of energy, such as 100% use of by-product gas pp. 20, 21Provision of materials for fuel cells that produce energy from hydrogenDevelopment and provision of steel materials for high-pressure hydrogen to support a hydrogen-oriented society pp. 15, 22</div></div>	<div><div>15 LIFE ON LAND</div><div><ul style="list-style-type: none">Promotion of air, water, soil risk management and chemical substance management pp. 30–33“Creation of Hometown Forests” to promote greenery within steelworks pp. 34, 35</div></div>
<div><div>8 DECENT WORK AND ECONOMIC GROWTH</div><div><ul style="list-style-type: none">Taikana Program (an experience-based safety education program) p. 43Promotion of health management programs for employees p. 43Enhanced measures to support the work-life balance, such as for the leave system and life support p. 43</div></div>	<div><div>16 PEACE, JUSTICE AND STRONG INSTITUTIONS</div><div><ul style="list-style-type: none">Raising awareness of and compliance with anti-bribery guidelinesElimination of antisocial forcesThorough confirmation of no use of conflict material p. 41Thorough management of security export control</div></div>
	<div><div>17 PARTNERSHIPS FOR THE GOALS</div><div><ul style="list-style-type: none">Eco solutions to transfer and spread environmental, energy-saving technologies to emerging markets pp. 24, 25Japan-India and Japan-ASEAN regular exchanges among public and private steel-related parties p. 24Support for human resources development to build an energy management system in emerging countries</div></div>

Steel supports society and simultaneously achieves multiple SDGs.

SDGs are interlinked. Many of the NSSMC Group's initiatives that address the issues are contributing to simultaneously achieving multiple SDGs, as shown below.

Steel is an indicator of affluence



Steel is indispensable in social infrastructure, such as buildings, vehicles, railway, ships, bridges, and power stations. It is also used everywhere in our everyday life from TV sets, refrigerator, washing machines and other home appliances to eating utensils such as forks and spoons, and cooking utensils such as microwave ovens, helping us to have a pleasant, convenient life. Steel also plays a crucial role in making our infrastructure resilient to natural disasters caused by earthquakes or abnormal weather associated with climate change. [9](#) [11](#) [13](#)

The amount of steel stock in Japan, which, in the form of social capital, is supporting our lives, exceeds 1.3 billion tons, or 10.7 tons per capita. The amount of steel stock in the world is estimated at around 30 billion tons (in 2015) but about merely 4 tons per capita. An increase in steel stock means that

an increase in steel products that help provide the social infrastructure needed to make people's lives to be more convenient and pleasant. Steel therefore is an indicator of affluence.

NSSMC exports outstanding steel materials for social infrastructure and for people's lives to Southeast Asia, India, Africa, and emerging countries elsewhere in keeping with the growth and development of society and improvement in living standards. We have also established companies in these countries, jointly with local partners, and have created local jobs. [1](#) [8](#)

As such, we will contribute to achieving SDGs by providing steel, a material, which is abundant as a resource and is highly recyclable and which supports sustainable society, in Japan and in the world.

Steel is a champion in recycling



The length of steel life differs by its end product: dozens of years for infrastructure, such as buildings and bridges; 5-10 years for consumer durables, such as automobiles and refrigerators; and up two years for steel cans. However, after the end of a product life, steel stock almost anywhere in the world can be collected as steel scrap and be reborn many times in whatever form is needed. Steel is therefore a sustainable material, which is abundant and easy to recycle. [12](#)

Steel production requires considerable energy, but all by-product gas generated in steelmaking process is collected and used as an energy source within a steelworks [7](#), and 90% of precious water resources used are recycled and reused [6](#). We are thus engaged in recycling even in our manufacturing process.

We are also engaged in recycling of by-products and waste generated in and out of the NSSMC Group, by utilizing the iron-making process. For example,

99% of steel slag, a by-product of steelmaking, is recycled and used in a wide range of applications, mainly as materials in cement and road materials [9](#) but also as slag fertilizer, contributing to improve farming productivity [2](#) and, when placed in desertified places in the sea, as a source of iron for kelp and other seaweeds, as well as fish living in such habitats, contributing to restoration of marine resources. [14](#)

Concerning waste generated in society, discarded plastics and motor vehicle tires are not burned but thermally decomposed and recycled, contributing to reduction in CO₂ emissions. [12](#) [13](#)

In short, steelmaking can be said to be a sustainable industry that does not waste resources.

Vigorously engaged in steelmaking



We have been hiring more women in production and other workplaces, and establishing infrastructure in manufacturing worksites for women to work comfortably. For example, we have in-house 24-hour nurseries in some workplaces. From a soft aspect, thorough-going compliance education, including raising awareness to prevent power harassment and sexual harassment in the workplace, is provided to employees. [5](#) [10](#) [16](#)

Heeding NSSMC's values that “Safety and health are the foremost precious value that supports business development,” we strive to ensure safety and health of employees. For example, we are promoting health management programs for employees and the Taikana Program (an experience-based safety education program). [3](#) [8](#)

In terms of workstyle, we are enhancing measures to support work-life balance, such as workplace-based support, the personal leave system, and life

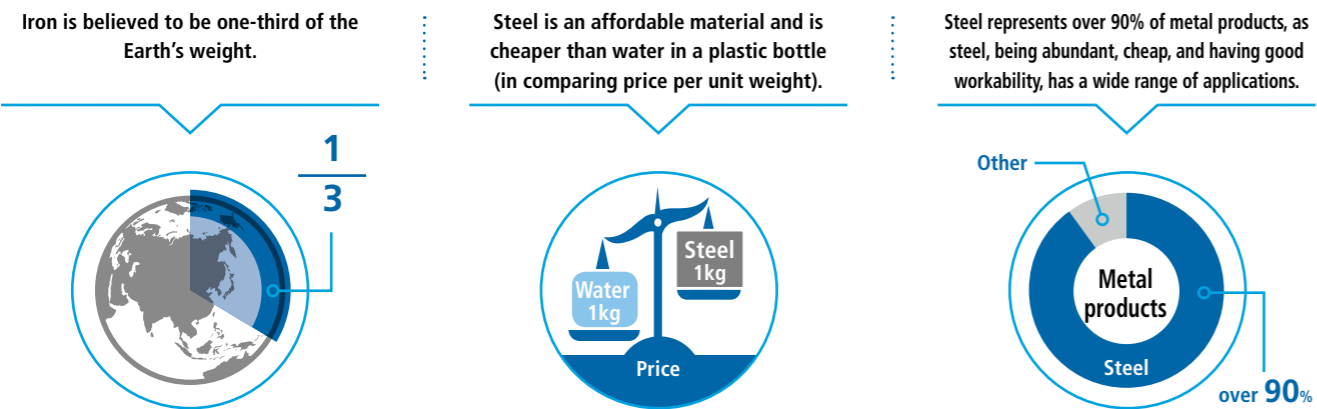
support. We also support employees' voluntary work improvement activities and have introduced an award system, so as to create workplaces that motivate employees. [8](#)

In steelworks in various locations, we play a role in vitalizing the community by conducting science classes, sending lecturers, hosting *Tatara* steelmaking experiments to promoting interest in manufacturing, and other activities. We also support community-based sport teams, especially for volleyball, rugby, judo, and baseball. In various parts of Japan, we hold sports classes for children and make our sport facilities available for them. [4](#) [15](#)

We are thus vigorously engaged in steelmaking, together with employees and communities. [17](#)

Advantages of Steel that Contribute to Sustainable Society

Steel is an abundant, easy to procure, and sustainable material



Steel is a sustainable material to be reborn in new steel products endlessly

One of distinctive features of steel is to be recyclable many times in whatever form.

Steel does not end its life even after the end of a life of a product made of steel.

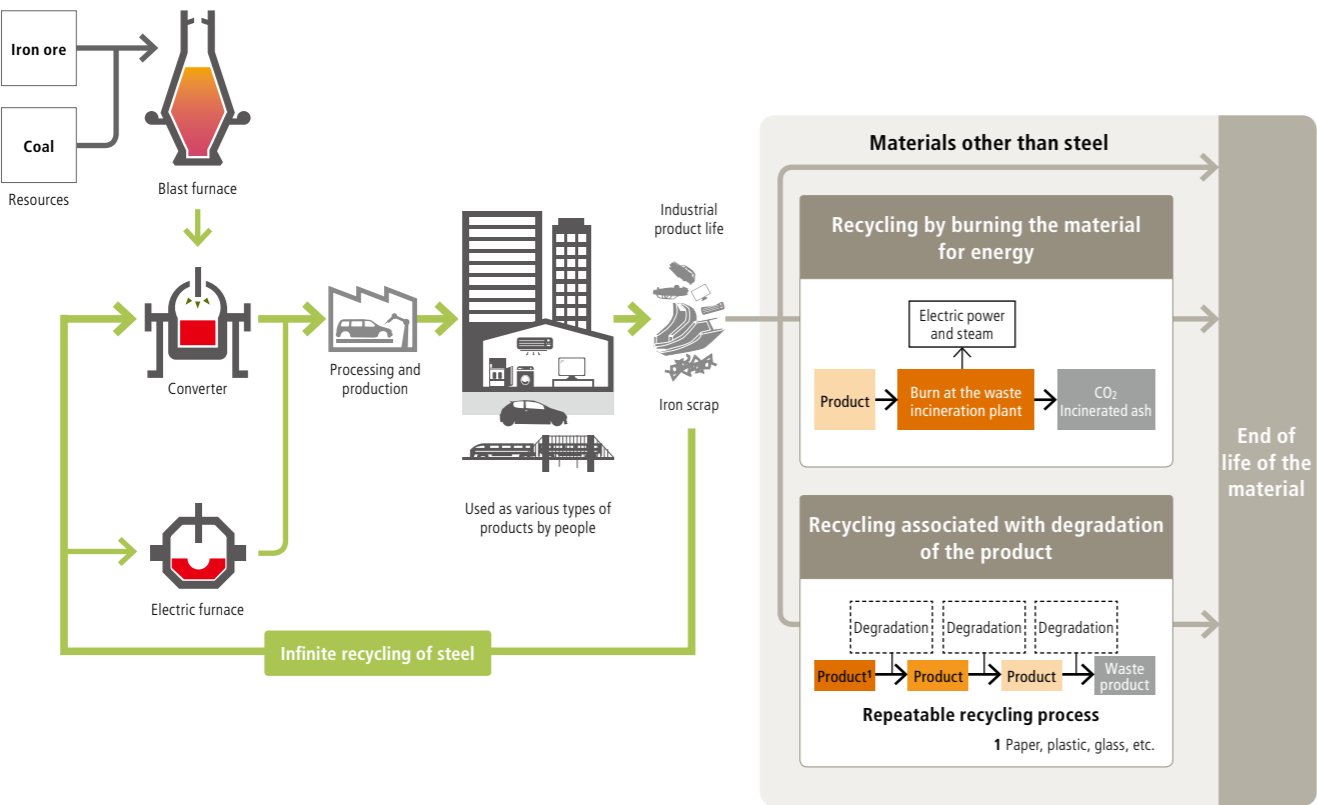
It becomes steel scrap to be recycled back to the steelmaking process, and is reused as a new product many times.

Steel can be easily sorted out from among other metals and materials (by use of a magnet).

Steel degrades little when recycled.

Steel can be recycled into various products.

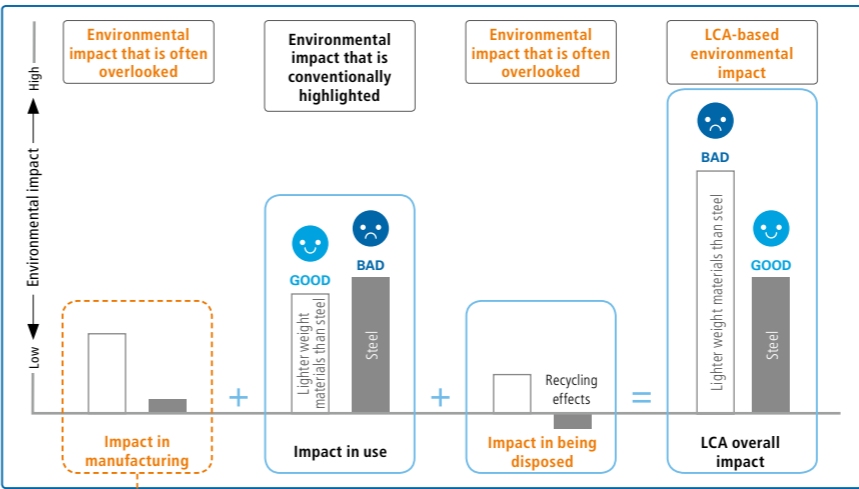
Steel therefore is an optimal material for recycling.



Steel is an outstanding material from the perspective of the Life Cycle Assessment

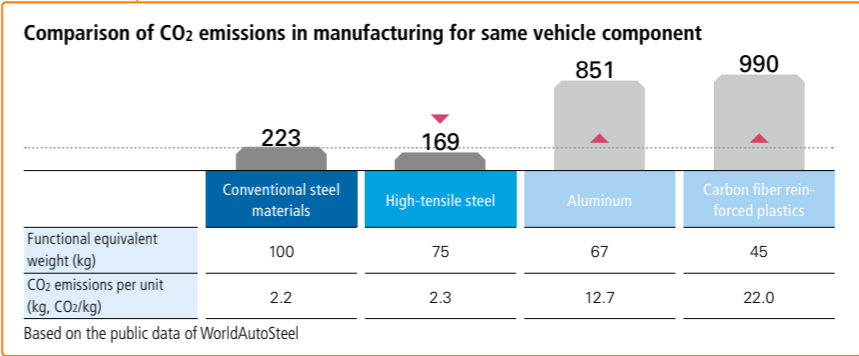
The Life Cycle Assessment method (LCA) is a way to evaluate environmental impact of a product over its entire life cycle. While many aspects of environmental impact cannot be seen, the LCA is an attempt to visualize the impact over the life cycle of a product, from production of its raw material to disposal and recycling of the end product. From the LCA perspective, steel can be regarded as a sustainable material with very low environmental impact relative to other materials.

Let's consider the overall life cycle



Some materials have low environmental burden in use but may have high environmental burden in the overall life cycle.

The Life Cycle Assessment (LCA) is therefore important.



While some materials are lighter than steel, steel has an extremely lower environmental burden in manufacturing.

Note: High-tensile steel is about 25% lighter than conventional steel and has a lower environmental burden.

VOICE

Ichiro Daigo
Research Associate, Graduate School of Engineering, University of Tokyo

We once estimated how many cycles steel products produced in Japan would be circulated through in the future. We used the stochastic process theory based on the flow of steel products in this case. As steel is used in various products, the number of years until products end their life and are recovered as scrap varies. We found that steel would be recycled at least five times on average in the future. This shows that compared with other materials, steel will be recycled many times. Steel will still continue to be used in 100 years without being disposed of.

I would like to find a way to use sustainable materials so that our descendants in many hundred years from now can enjoy a better life. That is the goal. What resources should this be based on? What materials should we use? How should we use them? How should we recycle them? I would like to design a society with sustainable materials.

Steel has many advantages, including abundance as a resource, high production efficiency, diversity in material features, and good recyclability. I think it is important to recognize that due to these advantages steel has been a basic material used in diverse applications. There is no doubt that steel will continue to be an essential structural material used as a basic material in society.

Technologies of Steel that Support Sustainable Society

Advanced IT technologies, fostered in steelmaking and steel products

NSSMC has been manufacturing steel products with outstanding properties while refining its IT technologies. We will continue to provide advanced IT technologies, fostered in steelmaking, and steel products to society and to support sustainable society.

Advanced IT technologies, including AI and IoT, fostered in steelmaking

In 1968 NSSMC pioneered in adopting a 24-hour, 365-day online system in steelmaking process. Since then, along with IT advancement, we have been working on advanced use of data, including collection and analysis of the massive volume of data generated in manufacturing workplaces, and their utilization with the intention of reducing cost and enhancing quality. At the same time, we are making use of AI to convey skills of veteran engineers to younger generation, and to make manufacturing and production facilities of steel products more optimally and more efficiently sustained and maintained.

In April 2016, a unit specialized in studying and promoting use of advanced IT was established within the Information System Division of the Head Office. Further in April 2018, another unit for big data analysis and AI research was formed within the research laboratories. Our organization has therefore become better engaged from conducting basic research up to use of advanced IT.

At present, these units are playing a key role in making arrangements for total optimization of manufacturing workplaces by use of advanced IT, as follows:

- 1) Arrangement to use the latest big data analysis method to sustain high-quality, stable manufacturing

- 2) Arrangement to automatically prepare a production plan (when to put which order to be executed by which manufacturing facility), replacing manual preparation by veteran workers, and efficiently giving instruction on production to a plant, based on the plan
- 3) Arrangement to use smartphones and the Internet of Things (IoT) so as to promptly and accurately give work instruction to workers, enable managers to remotely obtain safety-related information on subjects such as the location and health conditions of workers, and monitor the safety of workers.

- 4) Arrangements to maintain equipment in good condition by anticipating malfunction or problems of the equipment, based on operational information and the many sensors that have been installed.

We believe that such arrangements will allow us to deliver higher-quality products to customers more efficiently in a shorter time span and to provide safer, more pleasant workplace to employees.

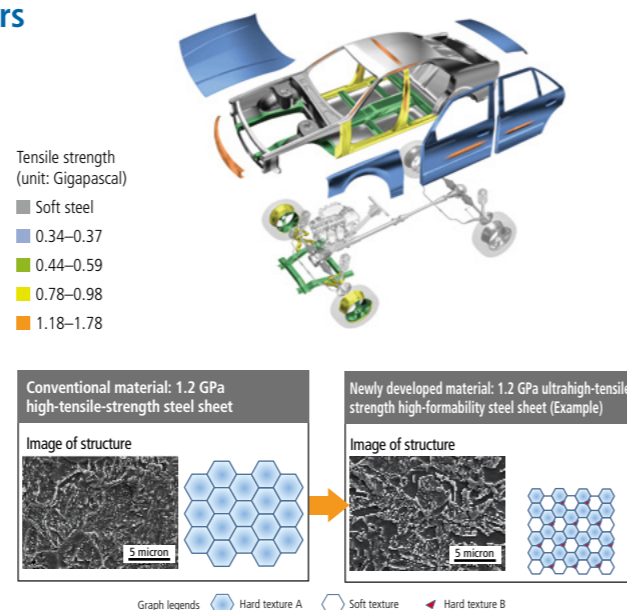
In cooperation with internal relevant divisions in charge of research, manufacturing, and equipment as well as NS Solutions and outside system vendors, we will make more sophisticated use of advanced IT in steelmaking and contribute to society by providing advanced IT technologies we have internally fostered, through group companies.

High-tensile steel¹ sheets for automobiles that contribute to both reduction in weight and assurance of safety of the driver and passengers

Steel sheets for automobiles are required to be light for better fuel economy and reduction of CO₂ emission, and at the same time to be strong enough to ensure the safety of passengers in case of a collision. The materials also need to be superior in workability, such as to be rolled out or pressed, in keeping with the design of the car body. In order to control the temperature-caused differences in steel's crystalline structure, temperature control in the heat treatment process of steelmaking must be precise. By blending soft crystalline texture and hard crystalline texture in a balanced manner, we have developed strong high-tensile steel with high formability.

Further, we have a plan to start operating a manufacturing facility for ultra-high-strength (1.5 Gigapascal-class) steel sheets in 2020.

¹ High-tensile-strength steel refers to the steel sheet which has tensile strength of 1.0 Gigapascal or more.



Stainless steel for high-pressure hydrogen environments, HRX19™—a revolutionary product for a Hydrogen-Based Society

For eco-friendly fuel-cell vehicles to become used in significant numbers requires certain infrastructure, including hydrogen stations, to be established. NSSMC and Nippon Steel & Sumikin Stainless Steel Pipe Co., Ltd. (NSSMC's fully-owned subsidiary), have jointly developed a stainless steel for high-pressure hydrogen environments, HRX19™, that has already been used for pipes, joints, and valves in the high-pressure hydrogen environments of hydrogen stations.

As hydrogen is a small molecule, it can be introduced into the metal but there it can cause brittleness and a tendency for fracture to occur. By blending additives to stainless steel and developing a new heat treatment method during manufacturing, HRX19™ overcomes the problem of embrittlement and both made a longer product life possible and improved the safety of pipes for hydrogen stations.

Moreover, HRX19™ is approximately twice as strong as conventional SUS316L stainless steel, enabling the design of thinner pipe

walls even for high-pressure hydrogen environments, and for pipes to be made with greater inside diameters, resulting in larger capacity and shorter hydrogen filling times. Furthermore, it is lightweight and provides the additional merit of reducing CO₂ emission while transported.

Moreover, welding can be done to HRX19™, without requiring joints, whereby a contribution is made to reduction of construction and maintenance costs.

Besides materials, Nippon Steel & Sumikin Pipeline & Engineering in the NSSMC Group is engaged in construction of hydrogen stations that use HRX19™ as material.



NSSMC's steel products support diffusion of renewable energy

SuperDyma™, suitable for the supporting mount for solar power panels

SuperDyma™ is an eco-friendly building material that is highly corrosion-resistant and lasts four times longer than conventional products. In particular it has recently been adopted for the supporting mount of solar power panels in various parts of Japan.

KATAMA™ SP use for solar power generation sites

KATAMA™ SP is a simple pavement material that makes use of steel slag's characteristics of compacting in reaction to water. Due to its weed control effect, KATAMA™ SP is used for pavement at mega-solar panel power stations, to help maintain power generation efficiency and reduce mowing.

Steel materials (floating platforms, mooring chains) for offshore wind power generation

Unlike onshore wind farms, which cause wind noise and emit low frequency wavelength sound, offshore wind farms are drawing attention as Japan, an island country, has a long coast line and strong offshore wind tends to be steady. The NSSMC Group is developing high-strength, corrosion-resistant steel material with good workability, as well as the construction technology, contributing to improvement of offshore wind farms.

Geothermal power stations and seamless pipes for geothermal power generation

Geothermal power generation is promising as renewable energy use of which results in low CO₂ emissions. Nippon Steel & Sumikin Engineering in the NSSMC Group has been responsible for the construction of production equipment and pipelines on nine of 17 large-scale geothermal power plants in Japan. The company thus has abundant construction achievements and knowhow.

Leveraging the technology accumulated in manufacturing OCTGs for deep-sea underwater oilfields where the steel is exposed to a highly-corrosive environment, NSSMC also provides seamless pipes, suitable to be used in geothermal power generation, which also involves a similar high-temperature, high-pressure, highly-corrosive environment.

Steel pipes, contributing to boost efficiency in pumped-storage hydroelectric power generation

This is a power generation method to make upper and lower reservoirs and release the pumped-storage water in the upper reservoir to the lower reservoir through turbines to produce electric power. In order to raise generation efficiency, high-strength, high-grade steel pipes were required to withstand increased water pressure due to greater elevation of water. NSSMC has successfully developed and commercialized Japan's first 100kg-class steel used for a pressurized water pipe.



NSSMC's Environmental Management

Environmental management is a corporate mission

Nippon Steel & Sumitomo Metal (NSSMC) is a corporation whose business activities exert a large influence on the environment. This is borne out by the fact that we consume approximately 5% of the total energy used throughout Japan. For this reason, we see comprehensive “environmental management” throughout the group companies as an integral part of our mission. We are dedicated to managing the company so as to reduce and minimize impact on the environment at all stages, from technological development work to the purchase of raw materials and equipment, manufacturing processes, transportation of products, and onward to their use, recycling and disposal.

Basic Environmental Policy

Under the principle of “Ecological Management,” NSSMC is committed to contributing to the creation of an environmental-preservation oriented society with lower environmental impact. For this purpose, the company will conduct business activities based on the viewpoint of environmental preservation in local communities, which includes the maintenance and improvement of good living environments and the promotion of reduction and recycling of waste. The company will also address challenges on a global scale including response to issues of global warming as well as the maintenance and improvement of biological diversity.

- 1 Reducing environmental impacts at every stage of operations (Eco Process)
- 2 Offering of environment-oriented products (Eco Products)
- 3 Proposing environmental preservation solutions from a global perspective (Eco Solution)
- 4 Development of innovative technologies
- 5 Development of a rich environment
- 6 Promotion of environmental relations activities

Three ecos and innovative technology development

NSSMC is promoting environmental management centered around four pillars of the three ecos and the company's innovative technology development, as stipulated in the Basic Environmental Policy. We have developed the 2020 Mid-Term Environmental Management Plan for the three years from fiscal 2018 and have been working on responses to diverse environmental challenges in five main areas. We believe promotion of these initiatives also contributes to achieving Sustainable Development Goals (SDGs). Going forward, from the perspective of SDGs, we will keep identifying and working on issues for which we can contribute through our business.



ECO PROCESS The way we manufacture is “eco-friendly”

NSSMC uses world-leading resources and world-leading energy efficiency to manufacture steel products and aims to develop eco-friendly steelmaking processes by further improving efficiency.



ECO SOLUTION Sharing our “eco-solutions”

We contribute to the reduction of CO₂ emissions and other environmental burdens on a global scale by diffusing our Group's world-class environmental and energy-saving technologies in Japan and overseas.



ECO PRODUCTS What we produce is “eco-friendly”

We produce and offer eco-friendly “products” using our world-leading technological capabilities, thus conserving resources and energy and thereby contributing towards building a sustainable society.



Development of Innovative Technologies

Based on the objective of offering to society technologies and products that contribute to the saving of resources and energy and the reduction in environmental burden, we are developing innovative advanced technologies from a medium- to long-term perspective.

2020 Mid-Term Environmental Management Plan

Under the Basic Environmental Policy, we have developed a mid-term environmental management plan for three years from fiscal 2018 to fiscal 2020 and are tackling many environmental challenges accordingly.

Environmental management system

- Enhance the environmental administrative system (i.e., environmental audits, plant audits)
- Conduct environmental management in coordination with group companies
- Promote standardization in manufacturing
- Promote environmental education for employees (i.e., improved environmental education tools)

Measures against climate change problems

- Promote the Initiatives for Achieving a Low Carbon Society
- Promote next-generation technology development
- Promote international alliances based on the policies and activities of the Japan Iron and Steel Federation
- Consider to set up long-term targets

Creation of a recycling-based society

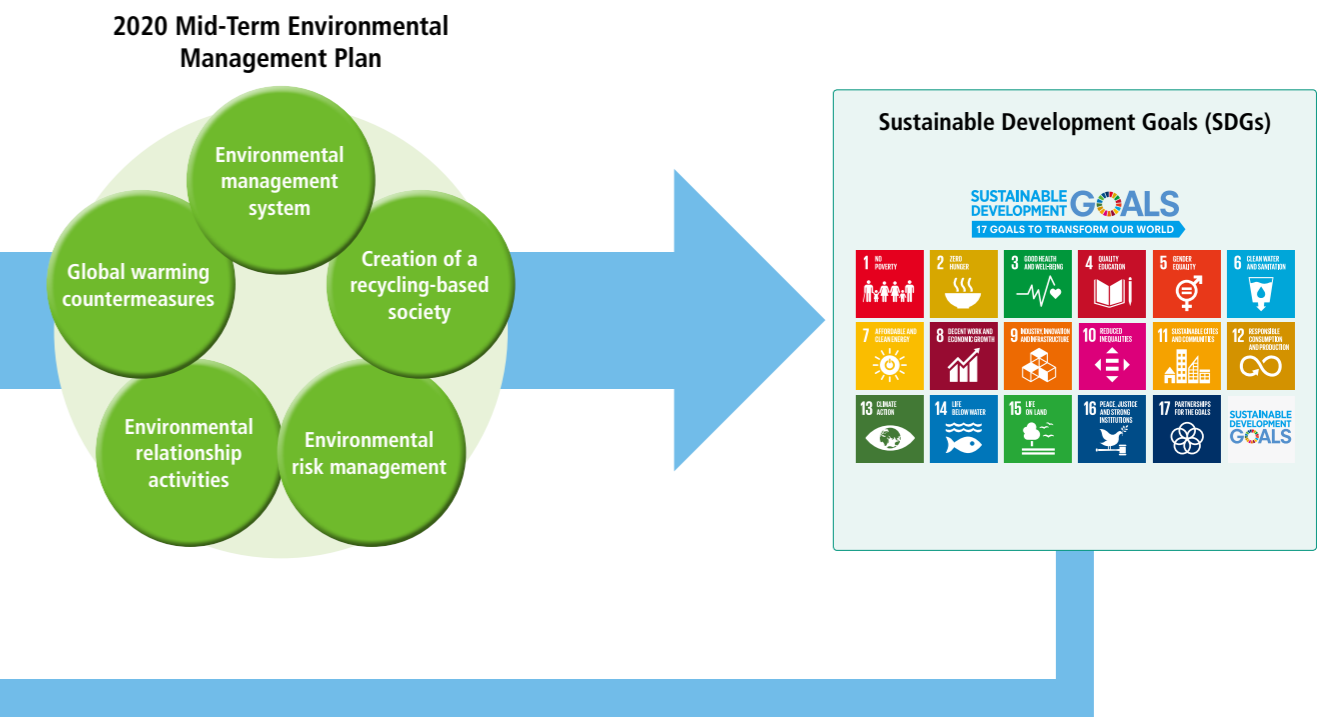
- Expand effective use of in-house generated resources; promote zero emission
- Promote recycling of outside waste (waste plastics and waste tires)

Environmental risk management

- Promote companywide discussion on environmental risk issues
- Respond to new environmental regulations

Environmental relationship activities

- Communicate actively with stakeholders on environmental issues
- Appropriate, timely disclosure of environmental information, so as to be continually trusted by society
- Secure bio-diversity and work for harmony with nature
- Provide opportunities to study the environment to people outside the company (i.e., sending lecturers)



Global Warming Countermeasures

CO2 emissions reduction through three ecos and innovative technology development

Nippon Steel & Sumitomo Metal Corporation (NSSMC) promotes energy conservation and CO2 emissions reduction throughout the entire supply chain: manufacturing, transportation, and final use of products. We also actively work at innovative technology development and transfer of established technology to our overseas operations, helping them to contribute to CO2 reduction over the medium- and long-term.

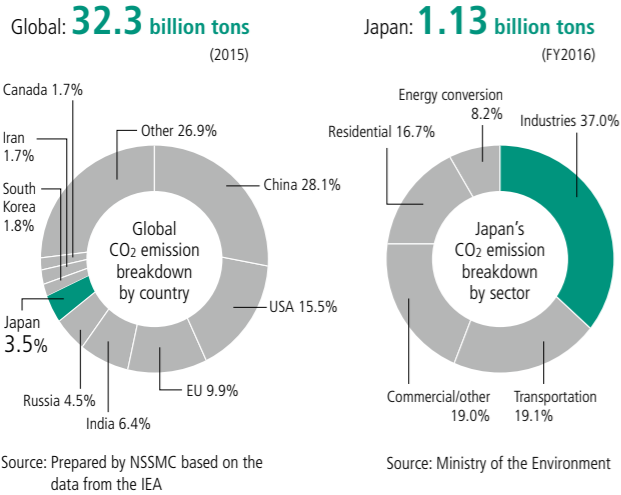
Continue CO2 emission reduction by implementing the three ecos

Based on the 32.3 billion metric tons of CO2 emissions from worldwide fossil fuel combustion in 2015, Japan's product emissions represent 3.5% of global CO2 emissions from combustion of fossil fuels. Japan also accounts for 2.5% of worldwide greenhouse gas emission, according to estimates by the International Energy Agency in 2014.

According to the latest data available, Japan's CO2 emissions from fossil fuel combustion amounted to 1.13 billion metric tons in 2016 and the industrial segment accounted for roughly one-third of that. As a member of the Japan Iron and Steel Federation, NSSMC has been playing a part in CO2 emission reduction of the industrial segment through implementing "Eco Process," and introducing "Eco Products" and "Eco Solution" in Japan and overseas.

From fiscal 2013 on, NSSMC has been participating in the Action Plans for the Realization of a Low-Carbon Society for further CO2 reduction by means of the three ecos. The Phase I of the Action Plans for a Low-Carbon Society targets a 5 million ton reduction in CO2 emissions by fiscal 2020. The Japan Iron and Steel Federation is focusing on a 3 million ton reduction in CO2 emissions at the steelmakers' own initiatives for maximum adoption of advanced technologies based on its production assumption. The additional 2 million ton reduction is to be achieved by an increase in the collected volume of waste plastics compared to fiscal 2005, as the amount of reduction in emissions.

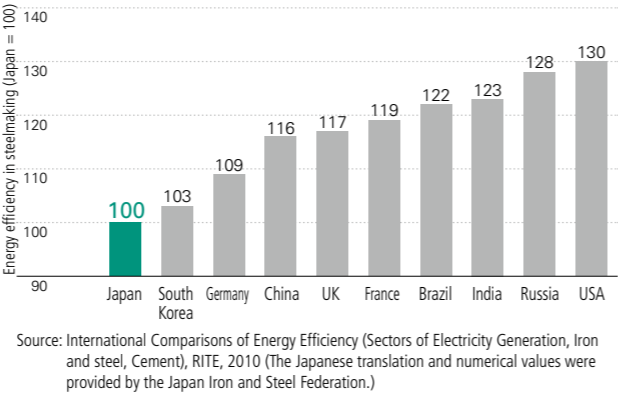
Breakdown of CO2 emissions from fossil fuel combustion



Realizing the world's top-class energy efficiency

Since the first oil crisis in 1973, NSSMC and Japan's steel industry have intensively invested in technology for better energy conservation in production processing, and in technology to collect energy. Specifically, we promoted innovation in processing, by introducing continuous casting machines and continuous annealing furnaces, and improvement in processing such as by direct hot charging and automatic burning control. Regarding energy collection, by-product gas generated in processing of coke ovens, blast furnaces, converters, and other areas have been collected and reused highly efficiently; exhaust heat and exhaust pressure from Coke Dry Quenching (CDQ), regenerative burners, and Top Pressure Recovery Turbines (TRT) have also been collected; and use of waste plastics and other waste substances have been promoted. Starting in 2010, the Super Coke Oven for Productivity and Environmental Enhancement toward the 21st Century (SCOPE21) was developed, and high-efficiency by-product burning power generation facilities were introduced as a part of unrelenting efforts in energy conservation. These steady efforts have led to Japan's steel industry achieving significant energy conservation and the world's top-class energy efficiency.

Energy efficiency in steelmaking by country (2015)



Japan Iron and Steel Federation's Action Plans for a Low-Carbon Society ("Three ecos and innovative technology development")

	Eco Process	Eco Products	Eco Solution
CO2 emission reduction plans	Aim at improving energy efficiency	Contribute to emission reduction when steel materials are used in final products	Contribute to worldwide energy reduction by technology transfer and diffusion
Phase I FY2020	3 million tons + α ^{1,2}	34 million tons	70 million tons
Phase II FY2030	9 million tons ¹	42 million tons	80 million tons

¹ "CO2 Ultimate Reduction in Steelmaking Process by Innovative Technology for Cool Earth 50" (COURSE50) p. 26

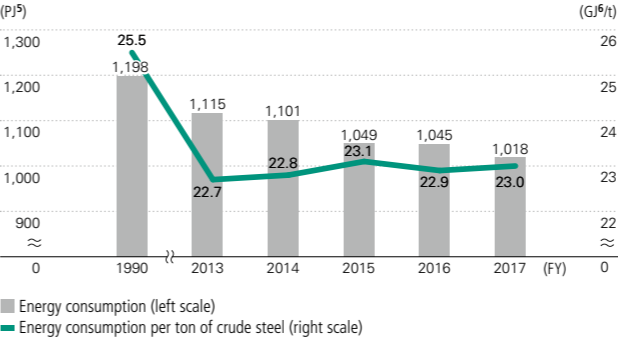
² The target reductions in CO2 emission volume are based on a certain crude steel production assumption. The primary focus is on a 3 million ton reduction in CO2 emissions by steelmakers' own initiatives for efficient use of energy and other ways. Concerning collection of waste plastics and other ways, only an increase in the collected volume compared to fiscal 2005 is counted as the amount of reduction in emissions.

NSSMC's current energy-conservation initiatives

NSSMC has been working on energy conservation from diverse starting points: improving efficient use of energy generated in steelmaking process; making operational improvements in each process; renovation of aged coke ovens and other equipment; introduction of high-efficiency power generation facilities and oxygen plants; conversion to regenerative burners in heating furnace; and use of waste plastics and waste tires. As a result of these continual efforts, the NSSMC Group (NSSMC and affiliated electric furnace companies³) consumed 1,018 PJ of energy and emitted 88 million tons (preliminary)⁴ of CO2 in fiscal 2017, which represented reduction of 15% and 14% respectively compared to fiscal 1990.

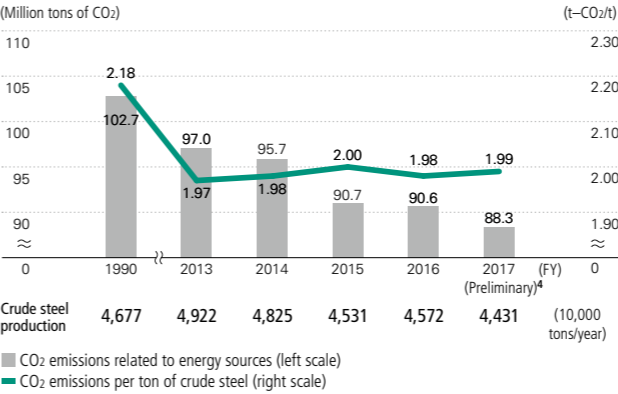
³ Affiliated electric furnace and other companies: Osaka Steel Co., Ltd., Godo Steel, Ltd., Nippon Steel & Sumikin Stainless Steel Corporation, Nippon Coke & Engineering Co., Ltd, 5 cooperative thermal power companies, and 2 sanso centers, and others.
⁴ A provisional value based on the assumption that the CO2 level in a unit of purchased electricity in fiscal 2017 is the same as in fiscal 2016.

NSSMC's energy consumption



⁵ PJ indicates peta-joules (10¹⁵ joules). A joule is a unit of energy, or amount of heat.
⁶ GJ indicates giga-joules (10⁹ joules)

NSSMC's energy-derived CO2 emissions



Promoting innovative technology development

Along with the three ecos, we have been working on the CO2 Ultimate Reduction in Steelmaking Process by Innovative Technology for Cool Earth 50 (COURSE50) Project, from the perspective of CO2 emission reduction over the mid- to long-term. Further, we are undertaking R&D, aimed at developing dramatically new CO2 reduction technology, including reuse or sequestering of CO2. p. 26

Work to achieve further CO2 emission reduction by raising efficiency in logistics

Maintain and further improve NSSMC's high modal shift ratio⁷ of 94.2%; improve transportation efficiency by using larger vessels (changing from 700 tons to 1,500 ton vessels) in domestic coastal transport and taking other measures; and improve fuel economy by introducing energy-saving timetable management, lightweight vehicles, etc.

Logistics sector's ton-kilometer achievements for FY2017⁸

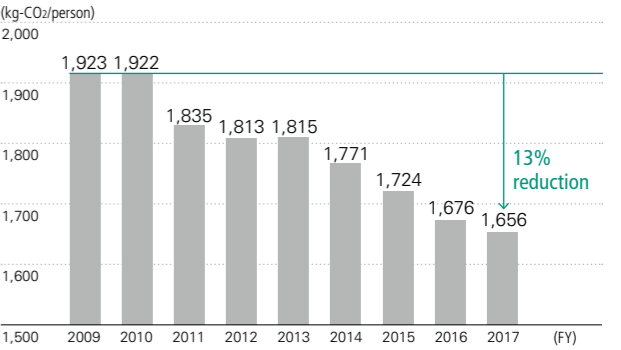
	Transportation quantity: 10,000 tons/year	Million ton-kilometers/year	g-CO2/ton-kilometers (Reference)
Ship	1,907 (54%)	12,970 (88%)	39
Railway	8 (0%)	53 (0%)	25
Truck and trailer	1,605 (46%)	1,700 (12%)	211
Total	3,520 (100%)	14,723 (100%)	

⁷ Modal shift rate: A modal shift indicates the domestic freight transport shift from truck carrier to coastal shipping and railroad carrier as a countermeasure against global warming. A modal shift rate is a percentage of cargo volume transported over a distance of 500 km and more by rail or sea (including ferry) (as defined by the Ministry of Land, Infrastructure, Transport and Tourism).
⁸ ton-kilometer: Total sum of the weight of load (ton) transported multiplied by transport distance (km). The reference amounts (in grams) of CO2 emissions per ton-kilometer travelled are the average for all industries (Ministry of Land, Infrastructure, Transport and Tourism)

Promote energy saving efforts in offices and at home

A policy of lights-out during lunch breaks, a business-casual dress code during summer, eco-no-working days, etc. has been implemented in offices. So as to encourage employees make energy-saving efforts at home and actually reduce emissions, keeping records in a Household Energy Diary has been promoted.

CO2 emissions of households using the Household Energy Diary



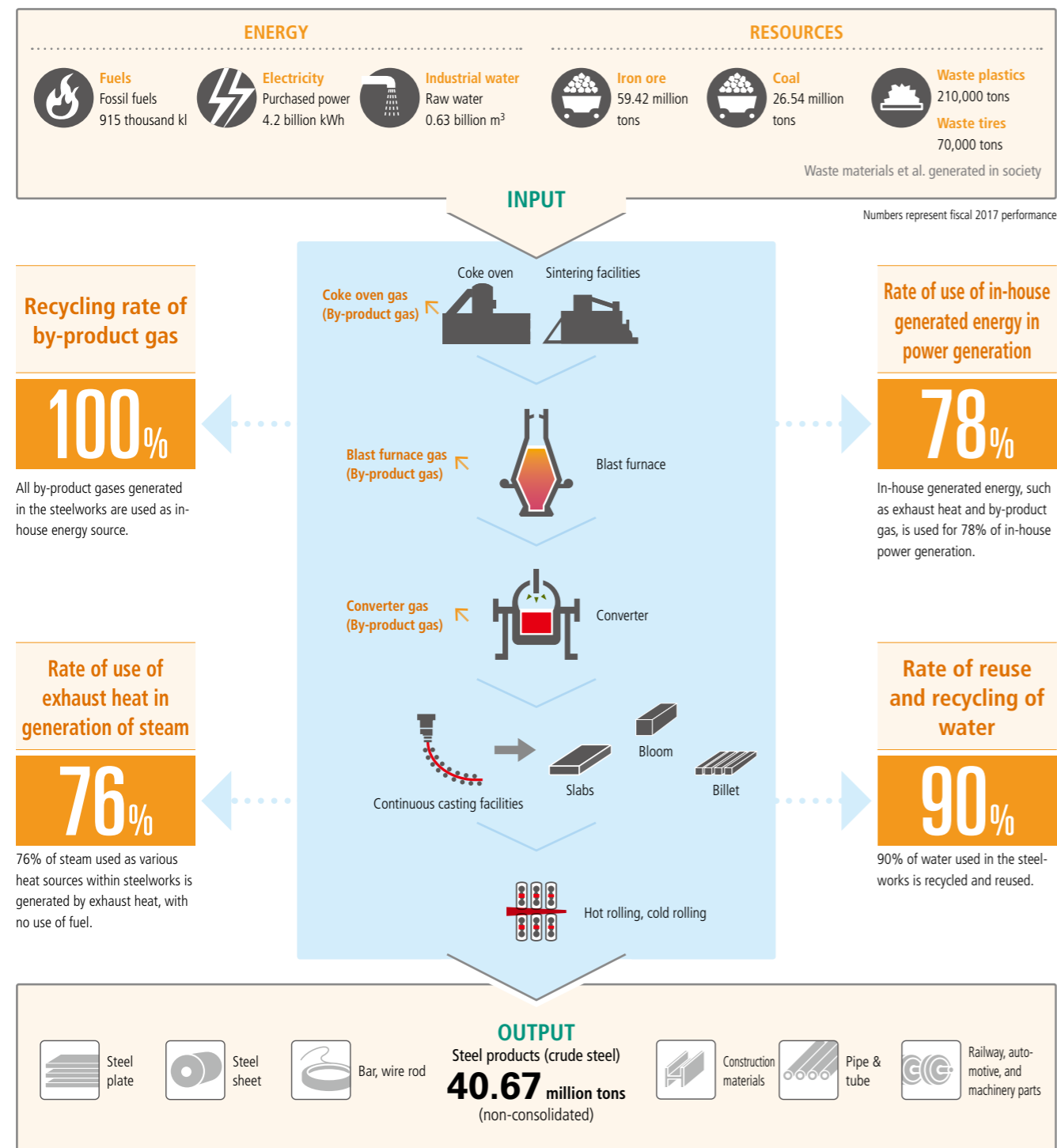


Global Warming Countermeasures

ECO PROCESS The way we manufacture is “eco-friendly”

Not wasting any energy

Nippon Steel & Sumitomo Metal Corporation (NSSMC) is committed to reduction of the environmental burden created by production activities and manufacturing processes. We make continuous efforts in all processes to not waste limited resources and energy.



As its main raw materials for steel production, NSSMC uses iron ore mined overseas, coal as for reduction¹ of iron ore, and scrap generated by society.

By-product gases, such as coke oven gas generated when coal is thermally cracked in an oxygen-free environment in the coke manufacturing process and blast furnace gas generated from blast furnaces, are fully utilized as fuel gas for steel heating furnaces or energy sources for power generation plants on the premises of steelworks.

In addition, NSSMC itself generates 88% of the electricity it uses at steelworks, 78% of which is from internally generated energy sources such as waste heat and by-product gases. By not wasting but

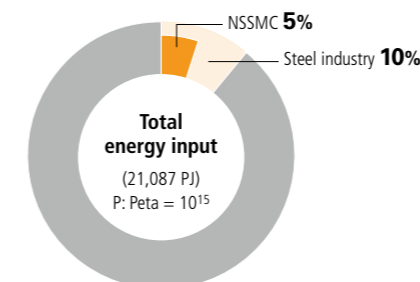
utilizing energy generated within the steelworks, we do our part to reduce CO₂ emissions. 90% of water used for cooling and cleaning products and manufacturing equipment is repeatedly re-used. [p. 30](#)

We are also engaged in the recycling of various types of by-products generated by society or other industries by utilizing our steelmaking processes that are carried out at high temperature and high pressure. In recent years, we have been actively recycling waste plastics, waste tires, and other waste materials. Reuse of these waste, which are traditionally landfilled or incinerated, as raw materials or energy in steelmaking processing is another way that we reduce CO₂ emissions. [p. 29](#)

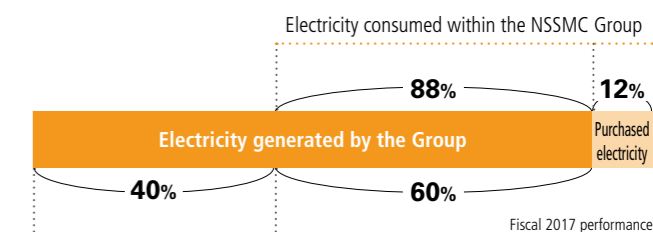
¹ Reduction: Chemical reaction to remove oxygen from an oxide.

Energy inputs

NSSMC's share in Japan's total energy input (FY2016)



Source: "General Energy Statistics" by the Agency for Natural Resources and Energy JISF (Japan Iron and Steel Federation)



NSSMC internally generates **88%** of the electricity it uses.

NSSMC supplies **40%** of internally-generated electricity to the local community.

Blast furnaces are huge reactors, using coal



Iron ore and coal are the main raw materials fed into a blast furnace. Iron ore is melted in a huge furnace (height, about 100 meters) and steel is reduced and extracted, but what kind of role does coal play? The main ingredient of coal is carbon, but before it is fed into a blast furnace, it is thermally decomposed in the absence of oxygen (carbonized), effective ingredients such as hydrocarbon oil and gas are separately extracted, and it is turned into coke with high strength and high carbon purity. However, the iron included in iron ore is present as iron oxides. In the blast furnace, a chemical reaction called reduction, which removes oxygen from these iron oxides, occurs, and the carbon in the coke functions as a reducing agent. **Coal is not burned as a fuel but rather is the ingredient used to cause a chemical reaction.**

At present, as there is no reducing agent to replace coal in the industrial production of steel, the generation of CO₂ resulting from the reduction reaction caused by carbon cannot be avoided (iron oxide + carbon → iron + CO₂).

Nevertheless, as the Japanese steel industry, including NSSMC, has promoted energy-saving measures such as making effective use of the by-product gases and heat generated in the steelmaking process, it has realized the highest energy efficiency in the global steel industry and at the same time is controlling the CO₂ emissions. We may therefore conclude that making steel in Japan is ecologically wise.

Furthermore, for the above-mentioned COURSE50, we are engaged in R&D activities aimed at using hydrogen as a reducing agent partially replacing coal in industrial production (iron oxide + hydrogen → iron + water). [p. 26](#)

ECO PRODUCTS What we produce is “eco-friendly”

Our Group's products have advanced functions and reliability, which are based on our superior technological capabilities, and are used in diverse areas including energy, transportation and construction equipment, and household products. They typically help our customers become more efficient while making their products lighter or lengthening product life. That translates into the saving of resources and energy, and into a reduction in CO₂ emissions at the point of use at our customers, thereby contributing to lessening the environmental burden.

NSafe™-Hull, a highly ductile steel plate for shipbuilding

NSafe™-Hull has excellent ductility and substantially improves a ship's collision safety by absorbing more energy and having a higher anti-rupture performance than conventional steel. It contributes to protecting cargo and preventing oil leakage that could otherwise result in severe environmental pollution.



ABREX™ Series abrasion-resistant steel plate

The ABREX™ Series abrasion-resistant steel plate is 3–6 times harder than ordinary steel and wears out less. It is eco-friendly and enables extension of the maintenance cycle of machinery and weight reduction of the product for which it is used.



©Volvo

High-strength wires for suspension bridges

High-strength wires are widely adopted in long-span suspension bridges across major straits in Japan and abroad. By realizing compact bridge designs and shorter construction periods, these wires help curb CO₂ emissions and contribute to the prevention of global warming.



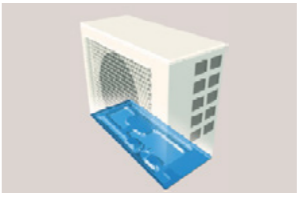
Roofs made of titanium sheets

NSSMC's titanium building materials contribute to safety and security (i.e., through their contribution to enhanced safety of work in high places; seismic resistance enhancement by mitigating loads on roofs; and less impact on surroundings as a result of being environmentally friendly). In addition, these NSSMC products enable advanced design, provide superior discoloration resistance, have a long product life, and reduce maintenance cost.



SuperDyma™

SuperDyma™ is highly corrosion-resistant and lasts four times longer than conventional products. As coating and painting on cut-end surfaces are unnecessary, all such costs are eliminated. The sheets weigh less, and are an eco-friendly building material well suited for various applications.



Air-conditioner outdoor unit (bottom plate)

Electrolytic zinc-coated steel sheet

Featuring corrosion resistance and aesthetic appeal, the electrolytic zinc-coated steel sheet is used in the back covers of flat screen TVs and other electric appliances. Reduction of CO₂ emissions has been achieved by eliminating some coating processes, enabling thinner coating, and adopting a special lowtemperature drying coating.



ZINKOTEM™ Black being used in the back cover of a flat screen TV



Wheelsets (wheels and axles) for high-speed railways

NSSMC manufactures almost all wheels and axles used by railways in Japan. We are pursuing weight reduction by developing hollow axles, for example, and contributing to energy conservation in railway transport.



Hat-type steel sheet piles

Hat-type steel sheet piles are adopted in various applications, including earth-retaining walls for rivers, quay walls, and cut-off walls. The piles weigh 7–11% less than conventional U-shaped hollow axles, for example, and contributing to energy conservation in railway transport.



The world's longest 150-meter railway rails

Rails for railways are ordinarily cut into 25-meter standard lengths for shipment to customers. The 150-meter rails reduce the number of joints between rails, which are one of the causes of noise and vibration that affect the comfort of passengers. It also reduces requirements for welding.



NSSMC's 150-meter railway rails are adopted for the Hokkaido Shinkansen (bullet train) Courtesy of Hokkaido Railway Company

Seamless pipe for steel accumulators

This seamless pipe has the strength and toughness needed for high-capacity accumulators used in hydrogen stations. Together with HRX19™ stainless steel for high-pressure hydrogen environments, this pipe is contributing to the realization of a hydrogen-oriented society.



Photo: The Japan Steel Works, Ltd.

Permanent magnet-type retarder

NSSMC's permanent magnet-type retarder is installed as the auxiliary brake system on many heavy-duty trucks and buses. Once the retarder is installed, the frequency of accelerating or decelerating of the speed decreases, which results in better fuel efficiency, while the frequency of applying the foot brake decreases, reducing brake dust caused by abrasion.



Steel tire cord

Radial tires for automobiles use wires made with steel cords that are as thin as three human hairs. Use of NSSMC's steel tire cords enables to reduce weight of tires. This is another way to help preserve the global environment through improved fuel efficiency.



Image: Bridgestone Corporation

Stainless steel clad sheets

Use of a material combined of stainless steel and aluminum for the induction-heating pots of rice cookers enables a reduction of electricity consumption due to higher heat efficiency than the conventional rice cookers that apply heat at the bottom of pots mainly made of aluminum. This is because outer stainless steel produces heat while the inner aluminum has excellent thermal conductivity for conveying heat.



Tinplate for beverage and food cans

Tinplate for beverage and food cans can be recycled many times. Moreover, it helps protect food safety due to its strength, and its thinness minimizes container weight, thereby contributing to improving transportation energy and efficiency.



ECO SOLUTION Sharing our “eco-solutions”

Technical cooperation and technology transfer promoted on a worldwide scale

With the understanding that the transfer of Japan’s advanced energy-saving technologies overseas can be one of the most effective ways to globally reduce CO₂ emissions, Nippon Steel & Sumitomo Metal Corporation (NSSMC) is participating in many energy-saving and environmental initiatives in Japan and overseas. For example, we work with the World Steel Association and directly with countries such as China and India.

Contribute to reduction of CO₂ emission on a worldwide scale

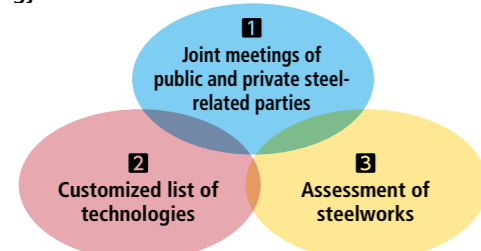
Japan’s steel industry, including NSSMC, plays a leading role in the Global Sectoral Approach¹, a worldwide initiative to preserve the environment and conserve energy based on technologies accumulated in the steelworking industry. Japan’s steel industry can contribute to reduction of CO₂ emission on a worldwide scale by transferring its advanced energy-saving technologies to emerging countries where there is the potential to improve energy efficiency. The reduction effects of CO₂ emission by transfer of Japanese steelmakers’ energy-saving technologies have amounted to 54.58 million ton reduction in CO₂ emissions per year in total. This is equivalent to about one-third of CO₂ emissions of Japan’s entire steel industry.

¹ Global Sectoral Approach is a method to help solve global warming problems by seeking CO₂ reduction potential based on sector-specific technologies and adopting the world’s best energy-saving technologies.

Japan’s steel industry’s international cooperation in energy conservation

As a core member of the Japan Iron and Steel Federation (JISF), NSSMC is involved in multinational projects such as those for the Environment Committee of the World Steel Association. In addition, the JISF is promoting **1** joint meetings of public and private steel-related parties, **2** preparation of customized list of technologies, and **3** assessment of steelworks as to energy-saving status. These are the three pillars of collaboration for bilateral energy-saving and environmental cooperation with India, Southeast Asia, and other countries and regions.

The three pillars of international cooperation in energy conservation



1 Joint meetings of public and private steel-related parties

In the bilateral meetings of public and private steel-related parties of an emerging country and JISF, information, ideas, and comments on various conditions of the country and Japan are shared. Based on the results of preparation of the list of technologies and on the assessment of steelworks, activities have been undertaken to facilitate transfer of Japan’s energy-efficient technologies to the country at an early stage. The JISF also provides detailed technical information and financial aspects of steelmaking. By fiscal 2017, joint meetings have been held eight times in India and 10 times in six ASEAN countries.



ASEAN (from 2014)
ASEAN-Japan Steel Initiative

2 Customized list of technologies

The customized list of technologies is a list of energy-efficient technologies, which are identified as appropriate for the target country or region, and the provided information included a technology outline and supplier information. The list was prepared for the purpose of promoting Japan’s energy-efficient technology transfer and is used as reference in doing assessment of steelworks.



3 Assessment of steelworks

In the assessment of steelworks specifically regarding their energy saving status, experts in this field in Japan’s steel industry visit the foreign steelworks in order to make proposals on technology based on the list and to give advice on operational improvement according to the utilization status of facilities. The experts also analyze the status of energy usage by using an international standard, ISO14404, which specifies calculation methods for the CO₂ intensity of steelworks. Up to fiscal 2017, the JISF has conducted assessment of 10 steelworks in India and 13 steelworks in six ASEAN countries.

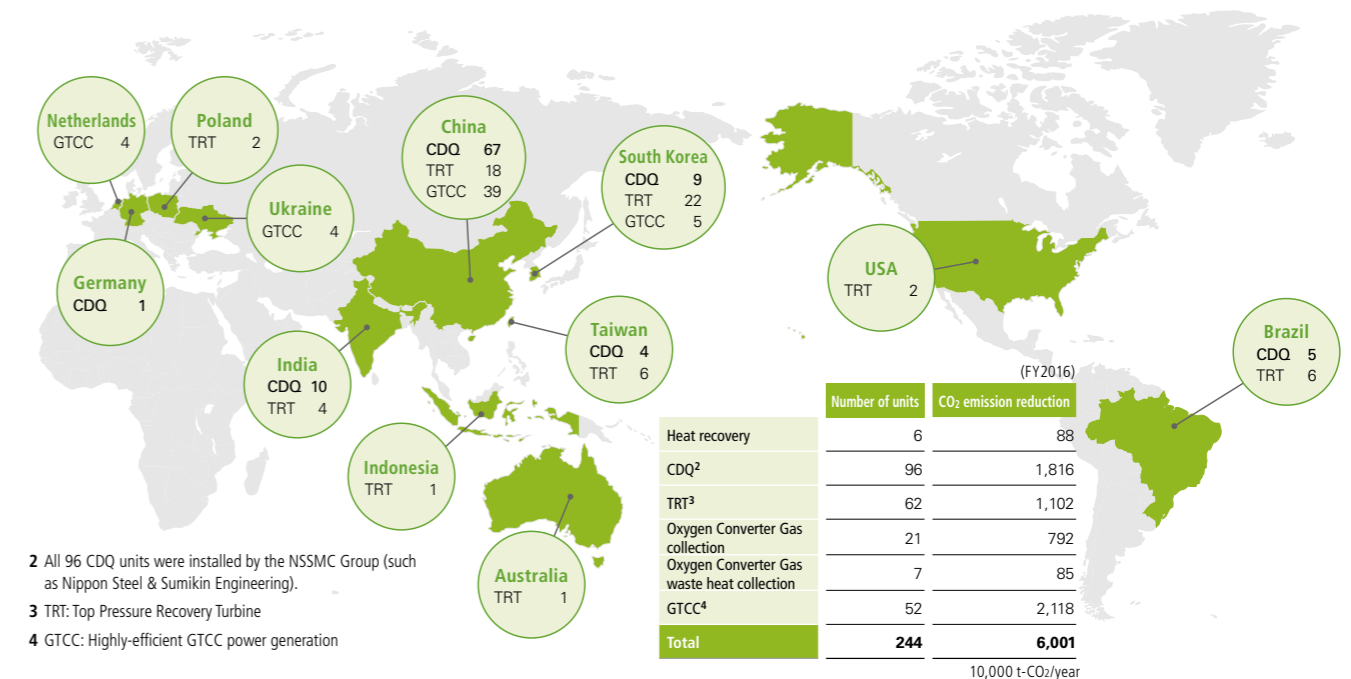


NSSMC also participates in the Climate Action Program of the World Steel Association, which uses universal methods to calculate and report on the CO₂ emitted by steelworks. We have been selected as a Climate Action member. Recently, quite a few customers have sought confirmation that their steelmakers are Climate Action members.



Climate Action member certificate

Japanese steel industry’s energy-saving technologies are spreading globally (units installed in numbers)

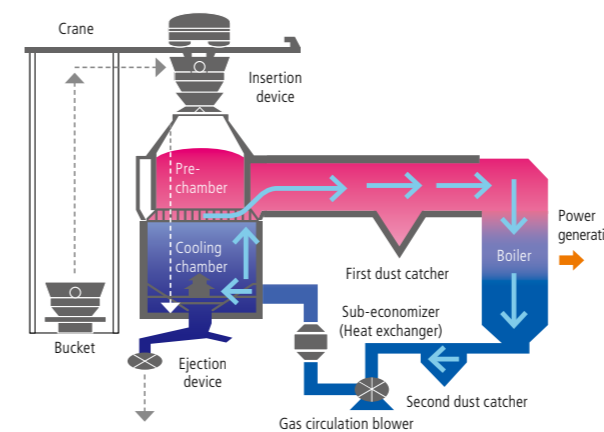


² All 96 CDQ units were installed by the NSSMC Group (such as Nippon Steel & Sumikin Engineering).

³ TRT: Top Pressure Recovery Turbine

⁴ GTCC: Highly-efficient GTCC power generation

Coke Dry Quenching (CDQ): system and features



Hot coke made in the coke oven is transported in a bucket to the CDQ equipment where it is injected from its top part down to the chamber. The coke is quenched with inert gas, while the hot gas (approx. 950°C) from the exhaust heat is collected, and transferred to the boiler where it generates steam for power generation. The hot gas can be fully recycled by being quenched and circulated back to the chamber. By not using water as a cooling medium, the CDQ method raises the strength of the coke and contributes to stable operation of the blast furnace, an increase in tapping quantity, and reduction in consumption of the reducing agent.

VOICE



Keigo Akimoto
Group Leader/Chief Researcher
Research Institute of Innovative
Technology for the Earth

Analysis conducted by the research institute I belong to has demonstrated that Japan’s steel industry has the world’s top-class energy efficiency. **p. 18** Such outstanding energy efficiency has led to significant contribution in controlling the amount of CO₂ emissions. In contrast, the steel industries in China, representing about a half of the global steel output, as well as industries in India, Southeast Asia, and Latin America have relatively low energy efficiency and hence have significant room to reduce CO₂ emissions. Steel products being indispensable in establishing social infrastructure, they are being used in a wide range of applications in society. Global steel demand is therefore anticipated to keep increasing. Against such a background, transfer of outstanding environmental and energy conservation technology of Japan’s steel industry to the steel industry in emerging countries greatly contributes to reduction in CO₂ emissions in these countries and is extremely important as a measure against climate change. NSSMC and other member companies of the Japan Iron and Steel Federation have played a leading role in standardizing a method of calculating CO₂ emissions. They are also engaged in preparation of the customized list of technologies for each country and in the assessment of steelworks bilaterally with India and ASEAN countries. I expect that NSSMC, to be conscious of being an environmental leader in the world steel industry, will further enhance these initiatives and contribute to worldwide reduction in CO₂ emissions.

Development of Innovative Technologies

Research & development for global warming prevention

With the aim of preventing global warming, Nippon Steel & Sumitomo Metal Corporation (NSSMC) is taking on a challenge in the form of the “CO₂ Ultimate Reduction in Steelmaking Process by Innovative Technology Project,” in addition to making efforts to reduce CO₂ by further improving its world’s highest energy efficiency. We are also involved in medium- to long-term R&D activities, on use of CO₂ as raw material; production of hydrogen from renewable energy; and sequestering of CO₂ in the oceans and coastal ecosystems.

The COURSE50 Project (Technological Development and Innovative Steelmaking Process)

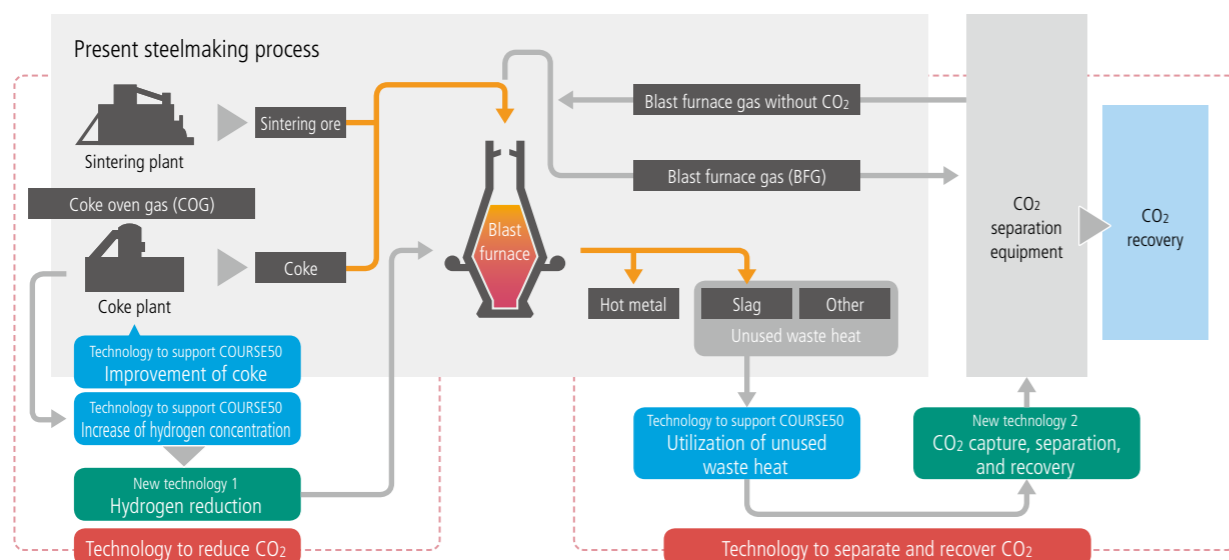
Since fiscal 2008, four blast furnace steelmakers including us, and Nippon Steel & Sumikin Engineering, have been working on the “CO₂ Ultimate Reduction in Steelmaking Process by Innovative Technology for Cool Earth 50 (COURSE50) Project” which is aimed at developing dramatically new CO₂ reduction technology. Its goal is to develop technology to reduce CO₂ emissions in the steelmaking process by 30% through technology that reduces iron ore using hydrogen amplified coke oven gas to curb CO₂ emissions from blast furnaces as well as technology that uses hitherto-unused exhaust heat to separate and recover CO₂ from blast furnace gas. Following the Step 1 of Phase I (i.e., tests of the hydrogen reduction process at a test blast furnace in Sweden) which greatly contributed in the development of element technology, our main focus in the Step 2 of Phase I (fiscal 2013–2017), was to verify technology to reduce CO₂ emissions from a blast furnace in a comprehensive manner. By using a 12 m³ test blast furnace constructed at the Kimitsu Works, in 2017 we achieved the 10% target

in reduction of CO₂ emissions from a blast furnace by combining the technology to control blowing that offsets the endothermic reaction of hydrogen with the control of raw materials. Concerning development of high-efficiency processes to separate and collect CO₂, we were able to achieve the world top-class amount of heat per unit. We are now undertaking Step 1 of Phase II, mainly targeting scale expansion, and are leading R&D efforts of the COURSE50. Main areas of concentration include pursuit of potential use of hydrogen by using the test blast furnace; preparation for raising the scale of blowing; further enhancement in efficiency of CO₂ separation and recovery processes; and development of highly-efficient heat exchanges.



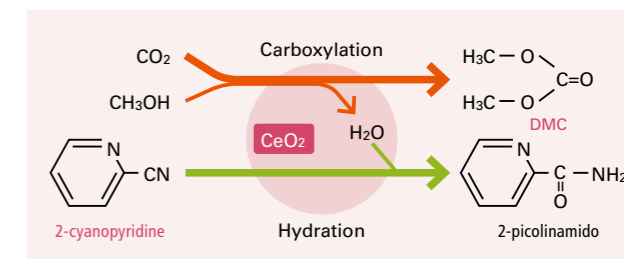
COURSE50 test blast furnace

Environmentally Harmonized Steelmaking Process Technology Development “COURSE50”: Structure and Features



Technology development to sequester CO₂ as useful substance

Carbon Capture and Utilization (CCU) has recently been highlighted as a way to recycle CO₂ as a useful carbon resource. Through joint research with Tohoku University, we are developing a process to produce dimethyl carbonate (DMC) from CO₂. DMC is widely used as raw material for high-performance plastics and as electrolytic solution for lithium batteries. Recently, we have developed a dehydration agent called 2-cyanopyridine, which enables low-pressure, low-temperature, high-efficiency reaction, resulting in an effective use of CO₂. While the conventional production method requires phosgene, a toxic gas, a new method is safer with no use of phosgene. Our future target is to make an alliance between a steel plant and a plastic plant.

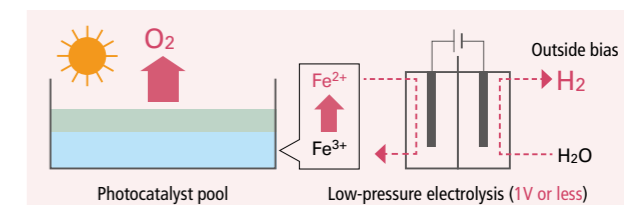


Reaction formula to synthesize DMC from CO₂

Development of a new hydrogen production process, which contributes to reduction in CO₂ emissions

Many CCU processes require hydrogen in sequestering CO₂ as useful substance. Through a joint research undertaking with the National Institute of Advanced Industrial Science and Technology, NSSMC has developed the technology of artificial photosynthesis to produce hydrogen through electrolyzing water. This technology converts Fe³⁺ to Fe²⁺ when oxygen is photocatalytically generated by solar energy. Fe²⁺ then enables production of hydrogen by using only about one-half of the electricity needed by ordinary processes. We have developed a new type of photocatalyst and have achieved the world’s top-level efficiency. Looking ahead, we plan

to enhance stability in photocatalyst and to refine the water electrolysis equipment so that we can go to the stage of a verification test.

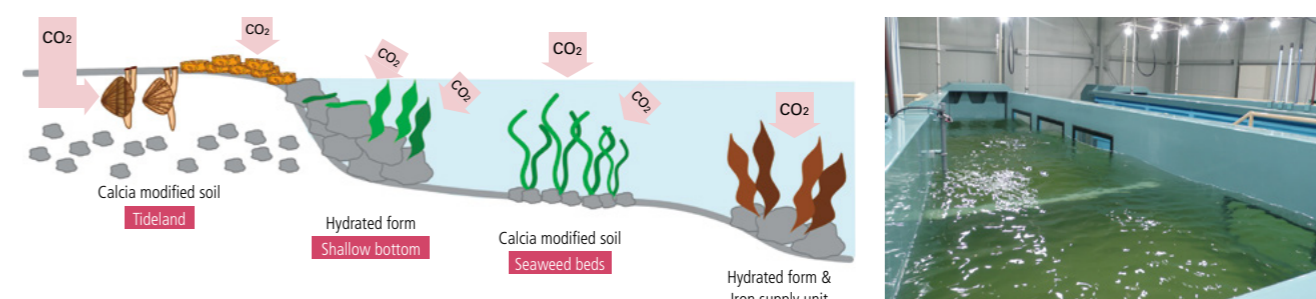


Energy-saving hydrogen production process that uses sunlight (conceptual rendering)

From “Creation of Sea Forests” to “Blue Carbon”

NSSMC has been working on scientific interpretation of the effectiveness and safety of using steel slag for the creation of sea forests. [▶ p. 34](#) As an extension of such technology, we have launched a basic research project on blue carbon (the carbon captured and sequestered by oceans and coastal ecosystems), which has started to attract attention

as a measure to ameliorate the effects of climate change. As the first step, we began by accumulating basic data by using our own large-sized water tank (Sea Lab), in which steel slag was used to form a shallow bottom, a tideland, seaweed beds, etc. to simulate the coastal environment and to see how much CO₂ will be sequestered.



Use of steel slag to improve coastal environment and to fix CO₂

Sea Lab. (Marine environment simulator)

[For reference] NSSMC’s R&D capacity

Approximately **800** researchers in the R&D group; Approximately **29,500** patents, issued in about **70** countries

Contributing to Creation of a Recycling-oriented Society

Recycling of in-house by-products and waste generated by society

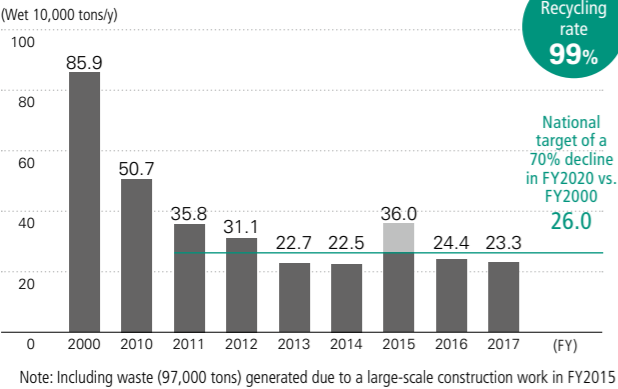
Nippon Steel & Sumitomo Metal Corporation (NSSMC) not only works for the realization of zero emissions and low environmental impacts, and recycling of in-house by-products, but also is actively engaged in recycling of waste generated by society or other industries, by utilizing its iron-making process.

Promotion of in-house zero emissions

By-products generated and the amount finally disposed

In the iron-making process, over 600 kg of by-products, such as steel slag, dust, and sludge, are generated for every ton of iron produced. In fiscal 2017, NSSMC produced 40.67 million tons of crude steel and generated 23.29 million tons of by-products. The majority of these by-products were recycled inside and outside the company. NSSMC's final disposal of industrial wastes amounted to approximately 230,000 tons and maintained a very high recycling rate of 99%.

NSSMC's final disposal amounts



Effective use of steel slag

Steel slag is almost entirely utilized. Approximately 70% of blast furnace slag is used for cement, while steelmaking slag is used for materials for road bases, civil engineering work, fertilizer, soil improvement, etc.

"Blast furnace cement," a mixture of pulverized blast furnace slag and ordinary Portland cement, contributes to a 40% reduction of CO₂ emissions during manufacturing, since the cement-making process can be omitted. It also exhibits superior long-term strength and is registered as an Eco Mark product. Due to the effects of reduction in mining of natural crushed stone and less energy consumption in the cement making process, steel slag products are designated as a "designated procurement item" under the Green Purchasing Law, and included in the Common Specifications for Civil Engineering Work compiled by the Ministry of Land, Infrastructure, Transport and Tourism.

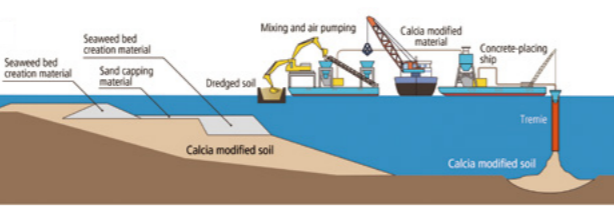
NSSMC's pavement materials, KATAMA™ SP, taking advantage of characteristics of steel slag, are used for forest roads and farm roads, as well as for weed preventive pavement to be installed near

mega-solar panel installations and other locations. pp. 15, 35

Geo-Tizer™ made of steel slag can be mixed with soft soil (mud, such as surplus excavated soil from construction sites or farmland soil) to reform the soil to make it usable. Unlike conventional soil-improvement materials (i.e., cement and lime), this soil produces less dust, significantly controls CO₂ emissions, and is less expensive, enabling reduction of construction cost. The remediated soil is outstanding in compacting and can also be easy to be dug again, without being excessively solidified.

Calcia modified soil, a mixture of steelmaking slag and dredged soil, has the beneficial effects of improving the strength and inhibiting the elution of phosphorus, the generation of hydrogen sulfide, etc. in dredged soil. It has also been used to improve the marine environment, including restoration of seaweed beds and creation of wetlands and tideland. In addition, NSSMC's Beverly™ iron supply units, which are composed of steel slag and humus made from waste wood, provides iron needed for seaweeds to flourish, promoting regeneration of an area of the sea bed that had lost much of its living organisms. p. 34

Moreover, as steel slag contains nutrition that helps plants grow, it is also widely used as fertilizer, contributing to improving farming productivity. p. 35



Recycling of dust and sludge

To recycle the dust and sludge generated in the iron manufacturing process to be used as raw materials, NSSMC operates a dust reduction kiln (RC: Resource circulating oven) at Kashima Works and a rotary hearth reduction furnace (RHF) at Kimitsu Works, Hirohata Works, and Hikari Works¹. This enables us to recycle all internally-generated dust. In March 2009, we obtained special approval for RHF under the Waste Disposal Act to carry out recycling of externally-generated dust as well.

¹ Hikari Works: Transferred to Nippon Steel & Sumikin Stainless Steel Corporation.



By-products and recycling

By-product	Process of generation	Amount generated (wet weight – million tons)		Recycling application	Recycling rate	
		FY2016	FY2017		FY2016	FY2017
Blast furnace slag	Components other than iron melted in blast furnace	12.29	11.90	Blast furnace cement, fine aggregate, road base, etc.	100%	100%
Steelmaking slag	Substances other than steel generated in the steelmaking process	5.33	5.14	Road base, civil engineering materials, fertilizer, etc.	99%	99%
Dust	Fine dust collected with a dust collector	3.30	3.10	Raw materials for use in-house and also zinc refining	100%	100%
Sludge	Water treatment sludge, residue from plating solution, road cleaning sludge	0.41	0.40	Raw materials for in-house use	89%	85%
Coal ash	Ash from coal-fired power plants	0.48	0.47	Cement raw materials	100%	100%
Waste furnace materials	Refractories from steelmaking facilities and furnace facilities	0.27	0.34	Reuse, road base, etc.	66%	76%
Others	Scale, etc.	1.71	1.94	In-house use, others	97%	99%
Total		23.80	23.29	Total recycling rate	99%	99%

Recycling of waste generated by society

Recycling of waste plastics and waste tires

NSSMC collects plastic containers and packaging collected used at general households and treats them at the coke ovens at seven steelworks to be recycled 100%, complying with the Act for Promotion of Use of Recycled Resources.

NSSMC has established a system to receive waste plastics from municipalities nationwide and is handling about 200,000 tons per year, equivalent to roughly 30% of waste plastics collected all over Japan. The cumulative amount for fiscal 2000–2017 is approximately 2.89 million

tons, equivalent to 9.25 million tons in terms of reduction in CO₂ emissions. Recently, we have begun to recycle chemical fibers and food trays mainly into plastic products under the same Recycling Act.

Discarded tires are fully recycled in the Hirohata Works as raw material in the Scrap Melting Process and through thermal decomposition in the gasification recycling facility. The treated amount is 120,000 tons per year, meaning recycling of roughly 10% of discarded tires in Japan.



Promotion of Environmental Risk Management

Promotion of environmental risk management

NSSMC is promoting management of environmental risk with the aim of continually enhancing preservation of the environment in various regions, with due consideration of environmental risks, which differ by each steelworks and factory, and with due consideration to compliance with Japan’s Air Pollution Control Act and other regulations. We also are engaged in reducing environmental risk throughout the Group.

Activities for reducing environmental risks

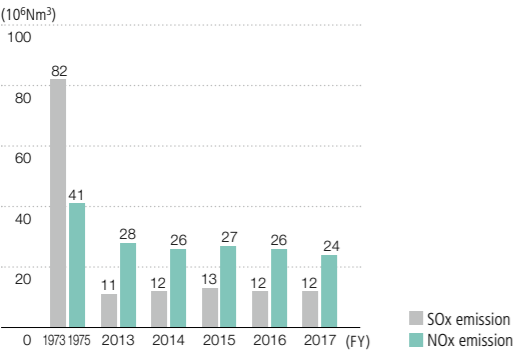
Atmospheric risk management

In order to reduce emissions of sulfur oxides (SOx) and nitrogen oxides (NOx), NSSMC is taking measures such as using low-sulfur fuel, adopting low NOx generating burners and installing effective equipment, including equipment that reduces SOx and NOx emissions. To curb emissions of soot and dust generated from factories and raw material yard, we try to enhance their collection by installing dust collectors and prevent scattering of particles by installing windscreens and sprinklers, based on air pollution risk analysis through scientific simulation. We also conduct constant monitoring and regular patrols to ensure that no abnormal emissions are released outside.

With regard to mercury, it is contained in waste gas is effectively captured by dust collectors or is absorbed by activated coke or activated charcoal so as to reduce mercury emission in the air. In April 2018, the Revised Air Pollution Control Act became effective and has regulated the mercury concentration in emission gas for waste incinerators. Our facilities conform to the regulations.

For sintering furnace and electric furnace for steelmaking, the Revised Air Pollution Control Act specifies companies to promote voluntary initiatives to control emission of mercury. NSSMC’s sintering furnaces and electric furnaces have already installed emission gas treatment systems that are effective in capturing mercury. In April 2018 the Japan Iron and Steel Federation established a voluntary management standard concerning mercury concentration and decided to regularly measure the amount of emission, and evaluate as well as disclose the status of achievement of the voluntary standard. Through such efforts, we strive to prevent emission of mercury into the air.

Emission of SOx and NOx



Water risk management

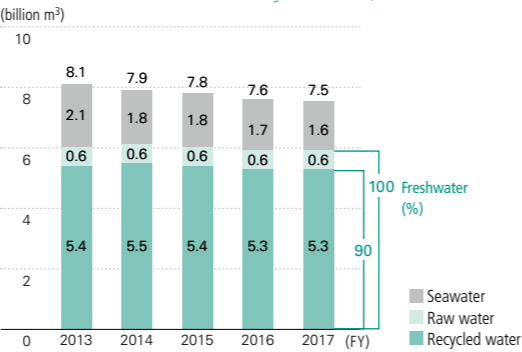
NSSMC uses approximately 6 billion m³ of freshwater a year at all of our steelworks and factories combined. Approximately 90% of this is re-circulated or reused. We try not to waste precious water resources, and to control wastewater discharge. To achieve this, we make daily efforts to maintain and improve the performance of wastewater treatment equipment, and the inspection and control of wastewater quality.

In consideration of the importance of preventing water pollution, we have installed devices such as detectors, control valves, and emergency water storage pits. We also strive to check, repair, and maintain equipment in order to prevent water pollution, and to train our personnel in methods of checking of operations and controlling work procedures.

Moreover, our steelworks have taken measures, such as to install a large storage tank so that water tainted with iron ore powder would not directly be released into the sea even if our steelworks were struck by a local torrential rain caused by weather abnormality.

If there is a crack in an embankment facing the sea, there is a risk of a leakage of groundwater with unknown contaminants. In order to prevent this, the embankment is regularly inspected from the sea side to maintain and manage it in a sound condition. In areas with potential risk of leakage of water which may exceed permissible levels of contaminants, a board or sheet water barrier may be installed so as to prevent leakage even if a crack develops on the embankment.

NSSMC's water consumption (excluding power generation facilities)



Prevention of scattering of materials and dust

Spraying of water and chemical in coal yards

Water and chemical are sprayed on piles of iron ore and coal to restrain the scattering of raw materials.

Sprinkler trucks

These trucks spray water on the road and empty lots or clean the road within works to restrict the secondary scattering of dust.

Road cleaning trucks

Windbreak net at yards

A windbreak net is installed to reduce the strength of wind and restrain the scattering of raw materials.

Electric dust collectors

Dust generated in the burning process is collected by two types of dust collectors (electric or with bag filter), depending on the characteristics of the dust (i.e., particle size distribution, emission gas concentration.)

Dust collectors with bag filters

Countermeasures against air pollution

Wet type desulfurization equipment

The wet desulfurization method enables SOx in emission gas to be eliminated.

Active coke dry type desulfurization equipment

The dry desulfurization and denitrification methods, using active coke, enables SOx and NOx in emission gas to be eliminated.

Low NOx regenerative burners

Burners featuring reduced levels of NOx generation and outstanding fuel savings have been installed.

Environmental measures at steelworks

Water purification; prevention of abnormal waste water

Waste water coagulating sedimentation treatment equipment

Fine undissolved matter is coagulated into bigger masses by chemical treatment, permitted to settle, and is removed.

Filtration equipment (secondary treatment)

Undissolved residues in the treated waste water are filtered by a sand layer and removed.

Rainwater effluent treatment facility

Undissolved residue from rainwater is coagulated and eliminated.

Pressurized flotation system

Floating oil is removed by tiny bubbles formed by released air.

Waste water automatic monitoring equipment

The water quality of waste water is automatically monitored.

Activated sludge treatment equipment

Organic matter is decomposed and eliminated by bacteria.

Waste water closing gate

Waste water flow is shut in case of trouble.

Checking of embankments

The embankments are regularly inspected from the sea side to find potential issues.

Repair of the damaged area of embankment

Damaged areas found by inspection are promptly repaired to maintain and manage the embankment in a sound condition.

Promotion of Environmental Risk Management

Soil risk management

We are taking appropriate measures in compliance with the Soil Contamination Countermeasures Act, guidelines issued by the Ministry of the Environment, local government ordinances, and so on. We report to the local government when performing landform modification work such as excavation which is required to be reported. We conduct pollution surveys when needed.

Starting in fiscal 2018, the Revised Soil Contamination Countermeasures Act is being enforced in stages will be expanded. We will continue to comply with relevant ordinances.

Management of discharged chemical substances

Comprehensive management of discharge

NSSMC appropriately manages and tries to improve the production, handling, and discharge or disposal of chemical substances in accordance with the PRTR Act¹, Chemical Substance Control Law², and other laws concerning the management of chemical substances as well as the procedures employed. According to the targets of the PRTR Act, we thoroughly manage the material balance, which includes the amount of chemical substances handled, the amount discharged to the environment, and disposable amount. Similarly, we take care in managing the Volatile Organic Compounds (VOC³), which are said to cause photochemical oxidants and suspended particulate matter. In complying with the Chemical Substance Control Law, we identify and provide notification of the amounts of production and sales of the targeted chemical substances.

NSSMC also took the lead to promote use of alternatives to steelmaking materials and equipment that contain hazardous materials such polychlorinated biphenyl (PCB) and mercury. We have been replacing or disposing of possibly risky parts and materials, according to safe handling standards.

Management of discharged based on the PRTR Act

In 1999, two years before the enforcement of the PRTR Act, NSSMC began surveying chemical substances according to the voluntary control manual developed by the Japan Iron and Steel Federation (JISF). At present, in compliance with the PRTR Act, we monitor 462 chemical substances and try to control their emission and improve the way we manage it. In fiscal 2017, there were 52 target substances for notification and the emission amount was 429 tons into the atmosphere and 29 tons to public water areas, while the disposal amount of mostly manganese, chrome, other metals, and their compounds to outside of the steelworks was 6,317 tons in aggregate.

Every year, data is compiled by each steelworks and experience in carrying out reduction measures is shared with other steelworks. In addition, the compiled results are disclosed on our website.

We have similarly been working at reducing VOCs. In fiscal 2009, the 30% reduction target relative to fiscal 2000 was achieved but we have since then continued efforts for further reduction.

Voluntary priority control of select chemical substances

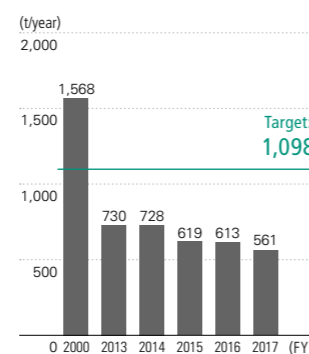
• Dioxin

Some of our facilities, such as sintering facilities and incineration facilities, are a source of emissions of dioxin into the atmosphere. All these facilities have satisfied the emission concentration standard and have achieved the voluntary reduction target, based on the JISF guidelines, relative to fiscal 1997 by a large margin. Since then low emission levels have been maintained.

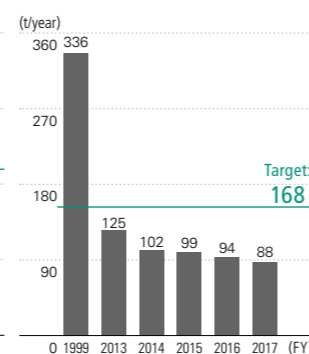
• Benzene, tetrachloroethylene, dichloromethane

We developed a voluntary reduction plan of hazardous air pollutants specified in the environmental standard, with the exception of trichloroethylene which we did not handle. As a result of our undertaking, we have already reached the targets for all three pollutants and have maintained the target levels.

Emission of VOC



Benzene



- 1 PRTR Act: An abbreviated name of the Act on Confirmation, etc., of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof. PRTR stands for Pollutant Release and Transfer Register.
- 2 Chemical Substance Control Law: An abbreviation of the Law Concerning the Examination and Regulation of Manufacture of Chemical Substances.
- 3 Volatile organic compounds (VOC): Organic chemical compounds emitted into the atmosphere in the form of gases, which are considered to be the source of undesirable airborne particles and photochemical oxidants, which became subject to control under the Air Pollution Control Act of 2004, as amended.

Appropriate treatment of industrial waste

Appropriate treatment of industrial waste

In order to appropriately handle industrial waste generated in our business activities, we thoroughly carry out (1) management by sorting industrial waste depending on the status of its occurrence, (2) appropriate selection and continuous management of collectors, transporters, and disposal contractors, and (3) appropriate management of Manifests (industrial waste management documentation).

In order to enhance compliance in waste treatment by appropriately managing the Manifests, all NSSMC steelworks and offices have adopted the e-Manifest system and fully utilize it for waste management.

We also evaluate collectors, transporters, and disposal contractors based on our internal rules and conduct on-site inspections at pre-determined frequency, so as to continuously and appropriately ensure proper management.

Examples of environmental initiatives at steelworks

Electronic Manifest

Manifest system

This is a system for waste generators to track the flow of hazardous industrial waste shipments to collectors, transporters, and disposal contractors, so as to ensure appropriate handling and to prevent illegal dumping.

The waste generators are required to use the manifest system and to confirm that the industrial waste is appropriately handled up to final disposal by contractors.

Benefit of the e-Manifest system

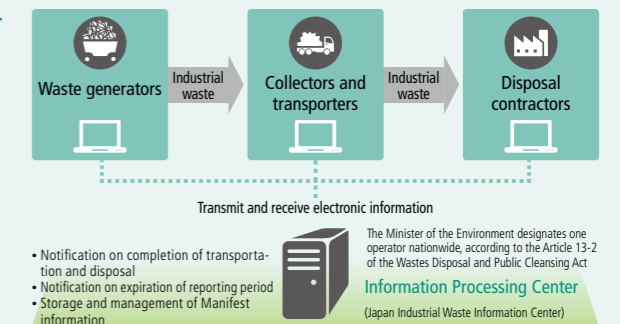
The e-Manifest system is a scheme in which the three parties, namely, waste generators, collectors and transporters, and disposal contractors, exchange e-Manifest information on the network via the government's information processing center.

As the items required by law are systematically controlled, inappropriate treatment, such as consigned treatment without a contract or treatment of unauthorized items, can be prevented.

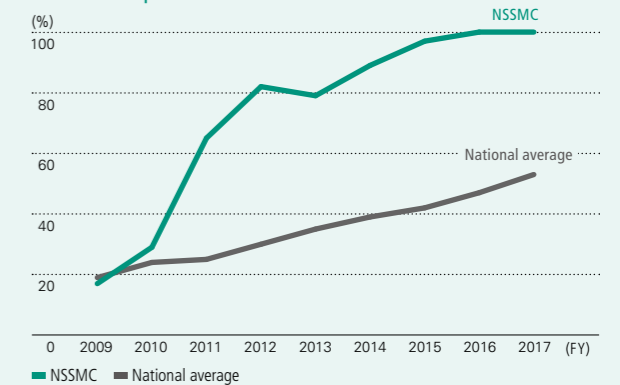
In addition, as the three parties can browse and monitor the status of Manifest registration and reporting online, the Manifest is reliably managed in a proper way and inappropriate treatment of industrial waste can be prevented, contributing to enhanced compliance.

As a waste generator, all NSSMC steelworks and offices have adopted the e-Manifest system and fully utilize it for waste management.

Flow of e-Manifest



Ratio of adoption of e-Manifest



Addressing water risks: Measures against local torrential rain and water leakage of embankments

Measures against local torrential rain

In recent years, the frequency of local torrential rainfalls, due to weather abnormality, has been increasing. Once the amount exceeds the limit of run-off and wastewater treatment capacity, a huge amount of rainwater that has fallen in the vast premises of a steelworks could directly flow to the sea. In a storage area of raw materials in particular, there was a risk that water tainted with iron ore powder or coal dust could flow into the sea. We have therefore identified such risk areas within the steelworks and have installed large-sized storage tanks to collect and store the rainwater, as a measure to prevent abnormal water discharge in case of a local torrential rain or other abnormal conditions.

Measures against water leakage of embankments

Steelworks are located facing the sea and have extremely long embankments. If there is a crack in the embankment, there is a risk of a leakage of groundwater of unknown water quality. In order to prevent this, we use a boat to regularly inspect the embankment. When a damaged area is found through the inspection, it is promptly repaired to maintain and manage the embankment in a sound condition. A water barrier will be installed on the land side of embankments having potential risk of leakage of water which may exceed permissible levels. When deemed important, we also will install a well and pump out groundwater so as to lower its level on the land side. These are examples of measures taken to prevent water leakage even if a crack develops in the embankment.



Rainwater storage tank

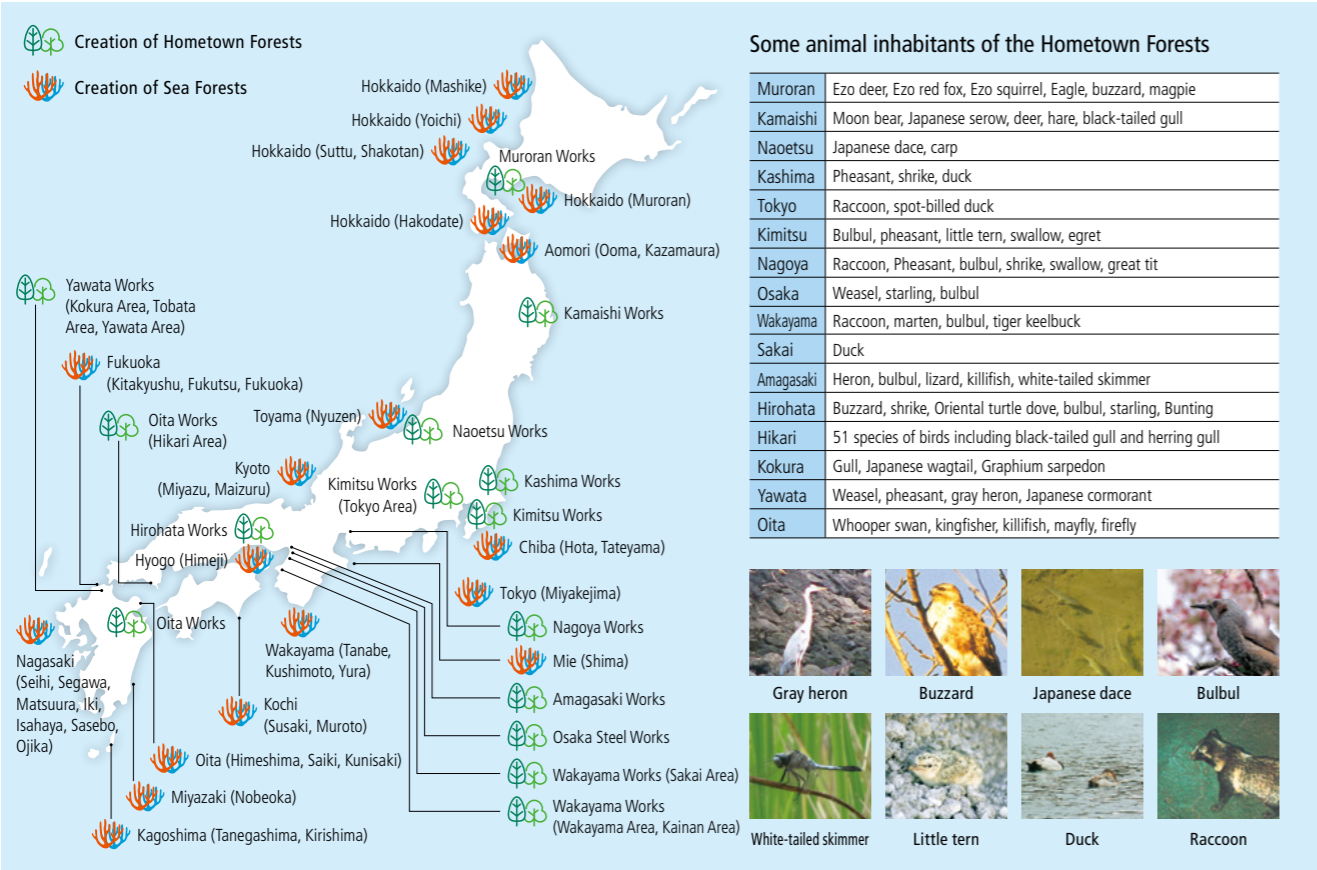


Inspection of the embankment

Initiatives on Conservation of Biodiversity

"Creation of Hometown Forests" and "Creation of Sea Forests"

As a member of Nippon Keidanren (Japan Business Federation), NSSMC participated in preparing the "Declaration on Biodiversity by Nippon Keidanren," published in March 2009, and has taken initiatives according to its declaration and action policy. Among them, interesting programs thus far are "Creation of Hometown Forests" and "Creation of Sea Forests," the world-leading pioneer projects.



"Creation of Hometown Forests"

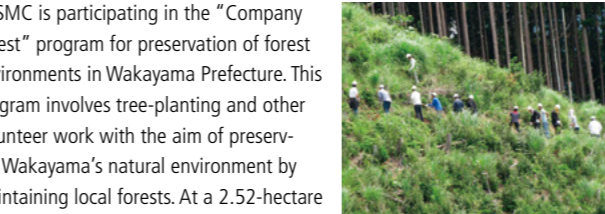
Reproducing "the grove of a village shrine" and nurture biodiversity
We have carried out the "Creation of Hometown Forests" projects at our steelworks and factories in Japan under the guidance of Dr. Akira Miyawaki (professor emeritus of Yokohama National University), with the aim of facilitating harmonious coexistence between nature and humans. This project comprises research on the natural vegetation inherent to a certain area in a nearby grove associated with a historical shrine (*Chinju-no-mori*), careful selection of suitable trees, growth of their saplings in pots, and planting them in designated places by local residents and our employees. This was the first project by a private company in Japan to create a forest that harmonizes with the local scene and is based on an ecological approach. This is one way we try to raise the awareness of our employees regarding the environment. At present, our forests in aggregate have grown to total around 900 ha (about the size of 190 Yankee Stadiums).
Wild birds and animals visit the forests we make and maintain at our steel works sites across Japan. Wild birds and animals inherent to the land return to the forests. Thus, the "Creation of Hometown Forests" helps conserve biodiversity, and sequester CO₂.

"Creation of Sea Forests"

Implemented in 37 spots in Japan to improve sea desertification
Sea desertification, a problem of the sea bed losing ability to support life due, in the case of Japan, to a decline in kelp, brown seaweed, and other varieties of seaweed, is happening along about 5,000 km of the coast in various parts of Japan. To offset a part of the decline in the supply of iron from nature, which is said to be one of the causes for sea desertification, NSSMC has developed and uses the Beverly™ Unit to promote regeneration of seaweed beds. The Beverly™ Unit provides iron ions, which are required for growing seaweeds, in the form of humic acid iron. Humic acid iron is the combination of iron ions and humic acid in the soil of a land forest. By using steel slag and humic substance originated from waste wood, we artificially generate the humic acid iron and provide it to help develop a seaweed bed.
Safety of the Beverly™ Unit has been certified by the Safety Check and Certification System of steel slag products, stipulated by the National Federation of Fisheries Cooperative Associations.

Participating in Wakayama Prefecture's "Company Forest"

NSSMC is participating in the "Company Forest" program for preservation of forest environments in Wakayama Prefecture. This program involves tree-planting and other volunteer work with the aim of preserving Wakayama's natural environment by maintaining local forests. At a 2.52-hectare privately-owned forest we have rented in Nakahechi-cho, Tanabe City, a project named "Nippon Steel & Sumitomo Metal Forest" calls for planting and cultivating approximately 5,000 broad-leaf trees. Daily maintenance is entrusted to the Nakahechi-cho Forest Cooperative, while our employees participate in works such as tree planting and underbrush cutting.
Further, NSSMC's pavement materials, KATAMA™ SP made of steel slag, a by-product in the Wakayama Works, are used for forest roads in Wakayama Prefecture.



"Creation of Hometown Forests" in the area of each steelworks

Tree-planting by new employees
In the Kimitsu Works in Chiba Prefecture, new employees plant trees every year as a part of their environmental education. Several species of evergreen broadleaf trees are planted.



Promoting greenery within a plant in an urban-type steelworks
The Osaka Steel Works in Osaka Prefecture is promoting "wall surface greenery" and "roof greenery" in order to contribute to easing the urban heat island phenomenon there and to preserve energy by reducing rises in temperature inside the building.

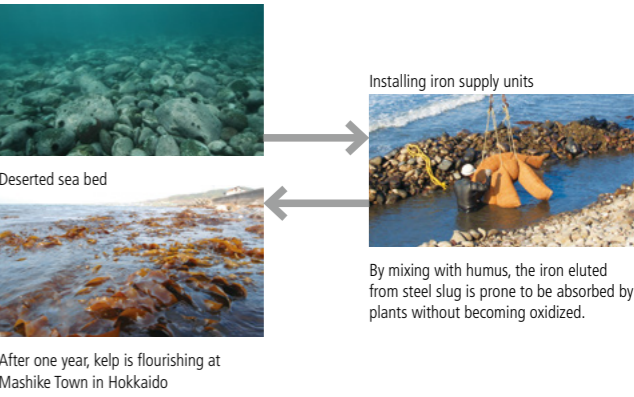


Participating in environmental preservation activities in communities having steelworks
Employees of the Muroran Works in Hokkaido participate in a townspeople's tree-planting festival hosted by Muroran City, with children, in the city every year. They are also involved in mowing of weeds and planting of saplings in a 400-meter-long flowerbed within the city.



"Creation of Sea Forests" began in Mashike Town

A decline in kelp seabed due to lack of iron on the coast of the Sea of Japan in Hokkaido had been identified long ago. As a countermeasure, NSSMC has developed the Beverly™ Unit, an iron supply material, through joint research with the University of Tokyo.
We began experimental use of the product in Mashike Town, Hokkaido in 2004, continued observing development for more than 10 years, and confirmed restoration of a kelp seabed and its subsequent preservation. In 2014 the project was expanded to a 300-meter-long coastline. We have confirmed growth of the kelp seabed every year as well as an increase in concentration of iron, expansion of seaweed area, and an increase in the harvest of sea urchin. If we can contribute to sustainable recovery of fishery not only by a restoration of the sea bed but also by returning of but also herring for spawning in the restored kelp seabed in addition to sea urchins, and if the desertified sea bottom areas can be thus restored, the effect to steadily support bio-diversity can also be anticipated.



Steel slag being used for rice cultivation

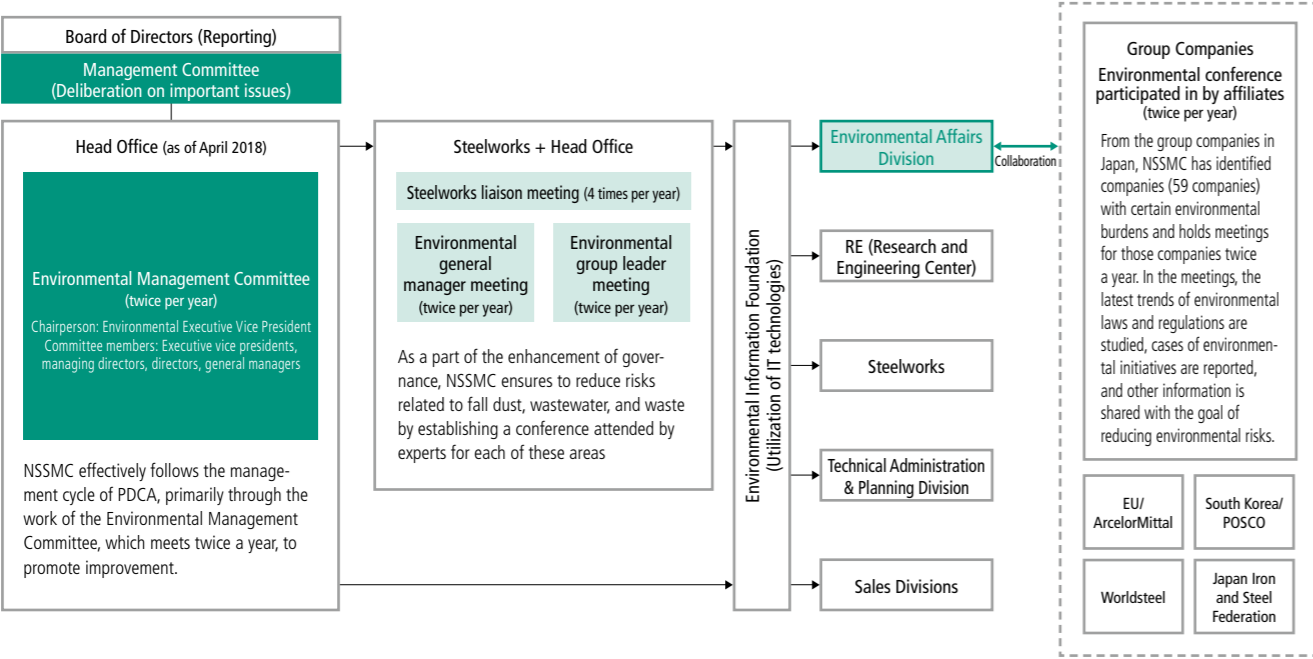
Steel slag, a by-product of steelmaking, contains nutritional matter that helps grow plants. It is therefore used as a fertilizer for rice cultivation, dry-field farming, and pasture grass.
Silica contained in steel slag promotes photosynthesis by keeping leaves upright and improving their light receiving orientation, while iron is effective in preventing root rot and leaf blight. The steel slag also contains phosphoric acid, manganese, boron, and various other components of fertilizer.
NSSMC donated converter slag fertilizers to cooperate for research by Tokyo University of Agriculture for salt removal in farmland in the Soma area of Fukushima Prefecture, which was devastated by the earthquakes and tsunami of March 2011. The slag fertilizers has proved effective in rapid and efficient salt removal. The restoration of rice fields also means to restore habitats for birds, frogs, and various other living things.



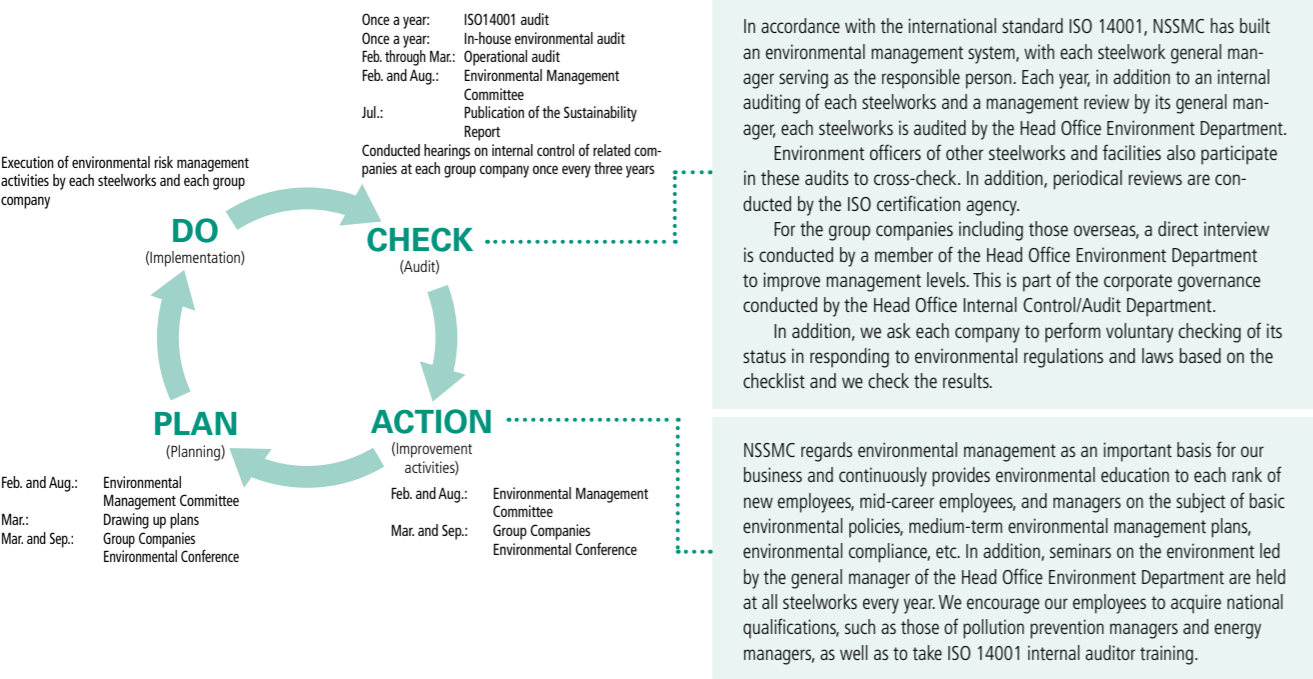
Promotion of Environmental Management

Nippon Steel & Sumitomo Metal Corporation (NSSMC) has built an environmental management system that includes not only its own steelworks and factories, but also its group companies in Japan and abroad. Activities to reduce environmental risks are promoted by combining internal and external audits and following the plan-do-check-act (PDCA) cycle.

Environmental management system



Annual environmental management cycle



Environmental accounting

Philosophy of environmental accounting

NSSMC has adopted environmental accounting to be used as guidelines for corporate activities, and to accurately track the environmental costs and effects. The iron and steel industry is an equipment-intensive industry. We have achieved environmental preservation and energy conservation by installing environmental-friendly equipment such as dust collectors and improving the efficiency of production equipment. Costs of environmental preservation are quantified by adding the costs of capital investment associated with environmental measures, energy-saving measures, and recycling measures to expenses incurred to preserve the environment.

Environmental preservation costs

Capital expenditures for environmental preservation amounted 19.8 billion yen in total for FY2017: 17.8 billion yen for investment in equipment for environmental measures and 2 billion yen for investment in energy-saving equipment. The aggregate amount accounted for approximately 5% of the total cost of equipment investment.

As environmental measures, we invested in preventive measures for dust emissions, visible smoke emitted from steelworks stacks, abnormal water discharge from drain outlets, and leakage of water from the revetments and quay walls at steelworks.

For saving of energy, measures were taken to improve the efficiency of heating furnaces as well as overall energy-saving measures in each manufacturing process.

In fiscal 2017, the environmental preservation costs totaled 85.3 billion yen, including 41.6 billion yen in atmospheric pollution prevention costs, 11.5 billion yen in water pollution prevention costs, and 10.6 billion yen in environmental R&D costs.

Among the environmental preservation costs, atmospheric prevention costs including measures to prevent scattering of dust generated at steelworks accounted for the largest share. We also promote in-house recycling to reduce expenses on waste disposal.

Effects of environmental preservation

It is difficult to quantify environmental preservation effects in monetary terms, since such calculation would require many assumptions. Therefore, environmental preservation performance is reported as effects vs. costs of taking environmental measures in this report and on our website.

For example, reduction in energy consumption is shown on page 19; water consumption volume, on page 30; and various resources spent, on page 20. For atmospheric substances, SOx and NOx emissions are shown; for water quality and soil, individual performance indicators are used; for hazardous chemical substances, actual reduction volume of substances such as dioxins, benzene, and VOCs are stated; and for waste products, reduction in final disposal volume is stated.

NSSMC will continue efforts to improve accuracy in environmental accounting and use it as a management benchmark to effectively invest in equipment and attempt to further preserve the environment and conserve energy.

Environmental preservation costs

Item		Definition	FY2017	
			Capital investment	Expense
Pollution Prevention Costs	Countermeasures against air pollution	Dust collection equipment running costs, maintenance costs, exhaust gas desulfurization and denitration treatment, raw materials yard dust preventive measures costs, etc.	16.4	41.6
	Countermeasures against water pollution	Electricity charges incurred for treatment of waste water discharged from steelworks, chemical costs, maintenance costs, working expenses (excluding expenses required for treatment of circulated water)	1.4	11.5
Global Warming Prevention Costs	Energy saving measures	Running costs and maintenance costs of energy-saving facilities	2.0	3.0
Costs of Recycling Resources	Treatment of by-products and industrial waste	Expenses incurred in landfill work, incineration, and treatment of by-products and industrial waste commissioned to third parties	—	7.4
	Treatment of general waste from business activities	Expenses incurred in the treatment of general waste from business activities	—	0.6
Environmental Management Activities Cost	Construction of EMS and acquisition of ISO14001 certification	Expenses required for the construction and maintenance of EMS	—	0.03
	Monitoring and measurement of environmental loads	Expenses required for monitoring air, water, etc., at steelworks	—	1.2
	Personnel expenditures related to environmental measures	Personnel expenditures for employees in charge of environmental matters	—	2.5
Research and Development Costs	Development of Eco Products	R&D costs (including personnel costs) for environment-friendly steel products	—	3.6
	Development of products which have low environmental impact during manufacture	Development costs (including personnel costs) required for measures for by-products and energy conservation technology during manufacture	—	7.0
Social Activity Costs	Greening, supporting environmental organizations, and advertising	Expenses required for creating green areas at steelworks, environmental publicity, and participation in exhibition	—	2.7
Other Environmental Costs	SOx levy	Payments to health damage prevention businesses specified by the Law Concerning Pollution-Related Health Damage Compensation and Other Measures	—	4.2
Total			19.8	85.3
Reference: Net income (consolidated basis)			195.0	

Targets and Achievements in FY2017

[Evaluation legend] ○: Largely achieved, △: Not achieved

Corporate Governance Structure

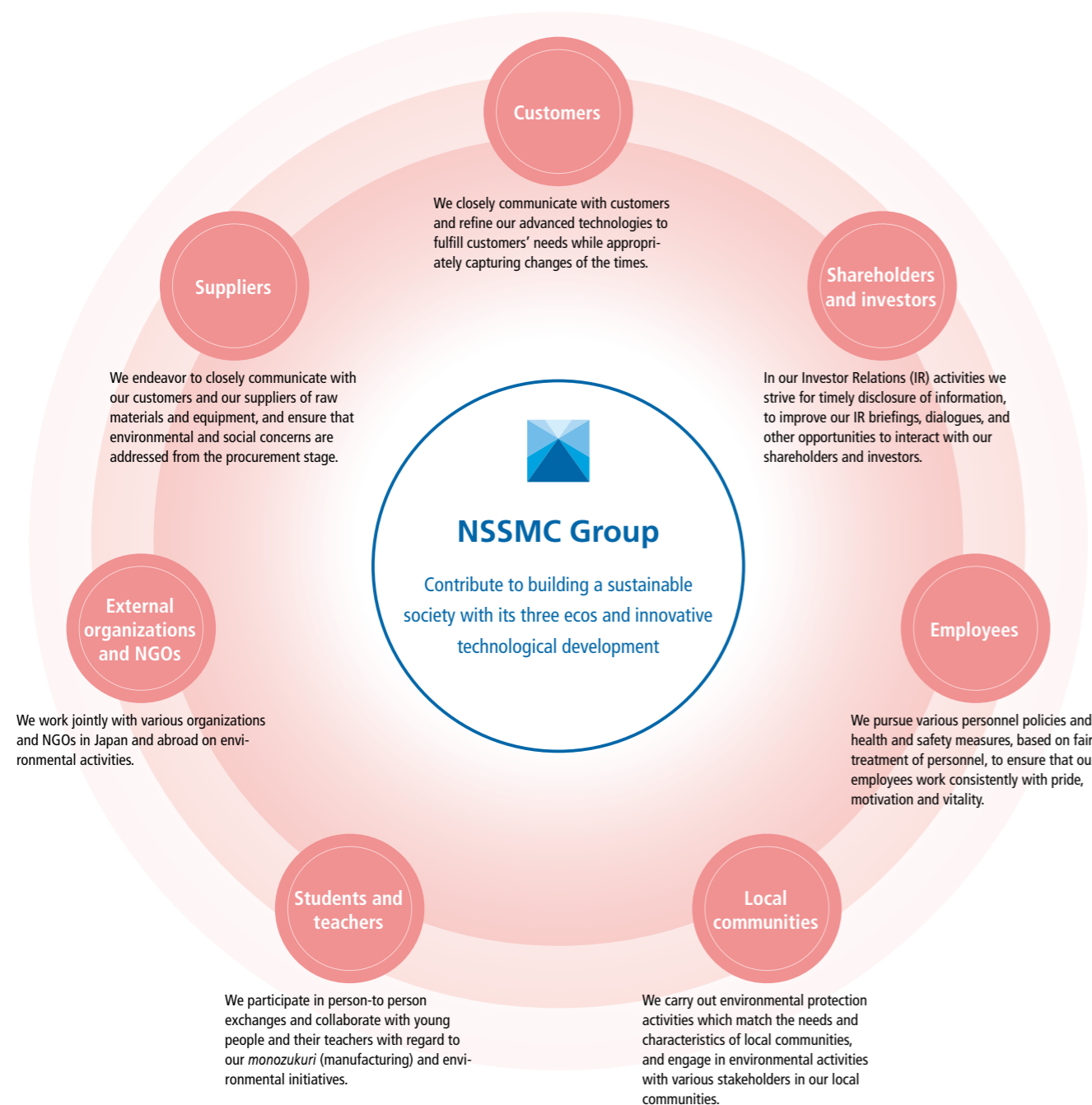
Corporate governance structure and internal control system

¹ All Outside Directors and all Outside Audit & Supervisory Board Members are registered as independent directors at financial instruments exchanges in Japan.

Stakeholder Engagement

The NSSMC Group treasures its partnership with all its stakeholders and aims to improve its corporate value by enhancing its relationships with them through better exchanges and communication.

We hope to help all stakeholders understand the importance of “*monozukuri* (product manufacturing)” and our various initiatives on environmental issues and through that understanding to be a company trusted by them all the time. For those objectives, we seek to offer sufficient opportunities for constructive communication, ensure timely disclosure of information, and continue to make social contribution activities that are closely tied to local communities. We also strive to create workplaces in which employees can work with pride and enthusiasm, and fulfill our corporate social responsibilities as a member of society.



Together with customers and suppliers

We endeavor to closely communicate with our customers in automobiles, electric, shipbuilding, construction, civil engineering, and other sectors as well as suppliers of raw materials and equipment, ensuring that environmental and social concerns are addressed at all levels of our supply chain.

Quality management

Quality management is one of the most important aspects in obtaining the trust and satisfaction of customers in the provision of products and services. All of our relevant employees are engaged in thorough quality management.

In coordination with product units and steelworks, the Company's Quality Assurance Department promotes measures to cope with Groupwide quality control and assurance issues. We also make efforts to standardize or systemize ways to enhance and assure quality, and carry out capital spending. The quality management structure for all Group companies including overseas ones is based on the autonomous quality enhancement activities of the relevant section of each product unit and steelworks, which are then internally monitored and checked. Furthermore, NSSMC has received certifications from external institutions such as for ISO 9001 and Japanese Industrial Standards (JIS), boosting our credibility.

Enhancing customer satisfaction

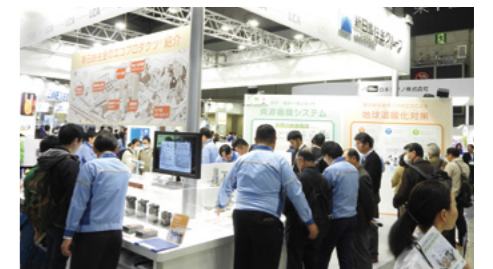
In general, it is customers who do the final processing of steel products. NSSMC thus contributes to quality enhancement of customers' products by providing them with comprehensive solutions including proposals on process technologies, in addition to improving the quality of materials.

As an example, high-tensile steel sheets for automobiles are required to satisfy needs for weight reduction to lessen environmental impact and for vehicle body stability. They are thin, strong, and hence difficult to process. Based on our long relationships of trust with customers, we are engaged from the design and development stage of automobile bodies, use our forming, joining, and analysis technologies, and develop easy-to-process steel materials with high performance. At the same time, we propose a wide range of solutions, including methods of processing, which utilize steel materials' properties, shapes, and structures.

In addition to activities “before service,” we provide “after service,” in which our engineers visit customers' manufacturing sites on a regular basis, bring back the “voices of customers” to their own worksites, and thus ensure further improvement in developing steel materials.

Communicating with customers through exhibitions

As a place for dialogue with customers, we participate in the Highly-functional METAL EXPO, the New Environmental Exposition, the Eco-Pro Exhibition, and numerous other exhibitions. We strive to make our existing and potential customers better understand that NSSMC's products' outstanding features such as high strength, durability, and corrosion resistance, as well as eco-friendliness in reduction of environmental impact through preservation of resources and energy, and lower CO₂ emissions. ▶ pp. 22, 23 Steel being an outstanding material from the perspective of Life Cycle Assessment ▶ pp. 12, 13 is another point we want to emphasize to customers.



NSSMC's booth at the Eco Products 2017

Together with suppliers

As stipulated in the Charter of Corporate Behavior by Keidanren, we have set up internal rules, including an appropriate purchasing policy, which put us on record as fully considering resource protection and environmental preservation. In order to promote purchasing activities toward achieving SDGs by the entire supply chain, we are enhancing cooperation with each supplier. In fiscal 2018, we hosted the first Material/Equipment Procurement Partners Meeting and shared our purchasing policy that emphasizes the following: thorough compliance; product safety, ensuring of quality, cost, and delivery (QCD) and advancement of technology development capability; consideration of human rights, labor environment, safety, and health; environment conservation; and thorough information management.

Based on the Life Cycle Assessment concept, NSSMC is taking initiatives in reducing environmental impacts at various points along the supply chain. In keeping with rising demand for tighter management of chemical substances, we have created management standards for 16 toxic chemical substances, including cadmium, jointly with customers and suppliers. We then established a system to manage substances of concern contained in purchasing materials.



Material/Equipment Procurement Partners Meeting

Stakeholder Engagement

Together with shareholders and investors

In our Investor Relations (IR) activities we strive for timely disclosure of information, to improve our IR briefings, dialogues, and other opportunities to interact with our shareholders and investors.

Measures to enhance dialogues

For shareholders, NSSMC strives to proactively provide information and cooperatively respond to questions raised by them at the General Meeting of Shareholders. In addition, we regularly hold corporate briefings and plant tours, and publish information brochures to promote shareholders' understanding and enhance communication with them. For institutional investors we host briefings on quarterly results briefings and a mid-term management plan, visits to steelworks and research centers, and other events, to discuss our strategies, businesses, operating performance, and other issues. Small meetings with investors, various conferences, and visits to overseas institutional investors are other means for enhancing communication.



Visit to steelworks

Together with employees

We pursue various personnel policies, based on fair treatment of personnel, to ensure that our employees work consistently with pride, motivation and vitality. We are implementing various health and safety measures so that employees can do their jobs in safe and secure workplaces.

Respect for human rights

In compliance with the Universal Declaration of Human Rights and other international norms on human rights, NSSMC conducts business ethically, while paying full heed to human rights issues arising with the increasing globalization of the economy. We give due attention to the rights of workers, and staunchly oppose the use of forced or child labor. These are prerequisites of our corporate activities. We have also prohibited as unjust the discriminatory treatment of workers based on nationality, race, belief, creed, gender, age, sexual orientation, and disability. In addition, we give careful consideration to the traditions and culture, business practice, and labor practice of each country or region as we accelerate overseas business development.

Ensuring diversity in human resources

NSSMC is proactively hiring women and non-Japanese. We are promoting diverse measures so as to build workplaces in which a diversity of people, including seniors and women, are empowered. As a part of such approach, we opened a 24-hour childcare center for use by shift work employees who are in a childbearing or child raising period. This was in the Oita Works, Kimitsu Works, and Yawata Works; we are planning to open another childcare center in the Nagoya Works in October 2018.



Childcare center (Kimitsu Works)

Fostering personnel and skill transfer

Based on the belief that the development of excellent personnel is a prerequisite for the production of excellent products, NSSMC is actively rolling out programs to strengthen the overall capabilities of each employee. In addition to the on-the-job training as a base, various types of off-the-job training sessions are conducted. Veteran employees are relaying their accumulated skills and know-how to young workers in manufacturing worksites. On top of steady hiring of employees, the method of transferring skills has been evolved into systemized teaching methods, which include visualized work procedures and comprehension tests.

Leveraging its world top-class technological prowess, we also aggressively expand overseas growth markets, such as Southeast Asian countries, such as Vietnam, Thailand, and Indonesia, as well as the Middle East, and North and South Americas. Many of our employees are working together with local employees and employees of our joint venture partners. In order to develop employees who promote our overseas business expansion, we put efforts into international education, such as intercultural learning programs and study abroad programs.



Nippon Steel & Sumitomo Metal School (name for education targeted young employees)

Efforts toward labor safety and health management

In keeping with the corporate philosophy that "safety and health are the most valuable factors that take precedence over all other things and they are the basis that supports business development," we have firmly kept our manufacturing priorities (such as that safety, environment, and disaster prevention comes first) in all of our activities. We have been improving our Occupational Safety and Health Management System (OSHMS) and strive to make safe and secure workplace. The Basic Policy on Safety and Health is applied to NSSMC as well as to related or subcontracting companies. Under the OSHMS, we make a policy, targets, and a plan on the safety and health policy, implement a PDCA cycle, and drive continuous improvement.

Regarding health management, besides improving healthcare counseling for employees, we make efforts for early detection and appropriate actions in the area of mental health.



Taikan Program (an experience-based safety education program)

Promotion of balanced work-life

NSSMC complies with labor laws and regulations of each country and strives to create the work environment that allows each and every employee to do his/her best. We promote balanced work-life by encouraging employees to fully use their paid holidays and to reduce long working hours under an appropriate working hour management, in cooperation with labor unions. We also provide diverse welfare programs to support employees' personal life and numerous measures for individual departments depending on their business conditions, such as to setting a no-overwork day.

Together with local communities

We carry out environmental protection activities which match the needs and characteristics of local communities, and engage in environmental activities with various stakeholders in our local communities, including outside groups, NGOs, students, and teachers.

Providing Education on Manufacturing and the Environment

NSSMC finds it important to be involved in educating young people and their teachers, who are helping prepare our future generations. We try to help them better understand the appeal of "monozukuri (product-manufacturing)" and our various initiatives concerning environmental issues. With the aim of showing children the joy of product manufacturing, NSSMC has been holding demonstrations on "tatara ironmaking" — Japan's indigenous ironmaking technique — and science experiment classes at our steelworks and nearby schools in Japan every year. For many years, we have been offering internship opportunities to students to help them learn our business and gain some work experience. In fiscal 2017, a total of 1,171 students from universities and technical colleges participated in the intern program at our steelworks and research centers throughout Japan, and the program was favorably received.

¹ Tatara ironmaking is a traditional Japanese method of making iron that uses iron sand as the source material. A bellows is used to help burn charcoal to make iron.



Demonstrations on "tatara ironmaking"

Contributing to the community (Collaboration with an NPO, "Mori wa Umi no Koibito")

Since 1989, Mr. Shigeatsu Hatakeyama, a fisherman cultivating oysters and scallops in Kesennuma City, Miyagi Prefecture, and the Chairman of the NPO, "Mori wa Umi no Koibito" (which literally means "The forest is longing for the sea, the sea is longing for the forest") who received the United Nations Forest Heroes Award in 2012, along with his fellow fishermen, commenced "Mori wa Umi no Koibito" campaign to plant trees in the vicinity of the upper reaches of the Okawa River, which flows into Kesennuma Bay. In June 2018, approximately 1,600 students and others, including employees of our Group, joined their tree-planting festival.



"Mori wa Umi no Koibito" tree-planting festival

Support for the arts

The Nippon Steel & Sumitomo Metal Arts Foundation operates the Kioi Hall (in Chiyoda-ku, Tokyo) and holds classical concerts by Kioi Sinfonietta Tokyo, the resident orchestra of the hall. The foundation also makes the hall available for traditional Japanese music performances; there are few places where such performances are common. The objective is to help popularize traditional Japanese music. In 2017, in order to familiarize children and their parents with the fascination of such music, we held a participative program named "Welcome to the world of traditional Japanese music. Enjoy Japanese musical instruments!" in which people who were not musicians joined in Japanese musical instrument workshops with professional musicians.



Kioi Hall Chamber Orchestra Tokyo © Tomoko Hidaki

Third-party Opinion



Yuko Sakita
Journalist and environmental counsellor

Overall environmental management

I was struck by a subtitle “Together with SDGs” on the cover of this Sustainability Report 2018, and took it as a clear indication of NSSMC’s commitment to contributing to a sustainable future.

The global population has exceeded 7 billion and is expected to reach 9.8 billion by 2050. Increased activities of people have significant impacts, such as climate change, depletion of natural resources, crises of bio-diversity, and other environmental problems as well as serious problems concerning food, education, human rights, labor, and other issues.

Moreover, as mentioned in “A Message from Top Management,” great waves of long-term, structural changes are now washing over society and industries. IoT and other IT innovations are realizing Society 5.0 while particularly in Japan, regional revitalization is much desired to solve problems of the aging of the population and declining birthrate, as well as weakening of depopulated regions. Against such a background, I complement NSSMC’s declaration to “Create the value of steel, while contributing to society by providing steel.”

In the 2020 Mid-Term Management Plan announced in March 2018, NSSMC stated it will particularly focus on environmental management by “aggressively addressing to environmental issues from a local level up to a global level and contributing to the achievement of a sustainable society.” I highly regard the accuracy of its viewpoint as a company being in key basic industries supporting Japan and as an energy-consuming company that has always pursued the best available environmental measures.

Specifically, looking at “NSSMC Group’s Long-Term History of Innovation through Steelmaking,” I became aware that NSSMC has a history of technological development in response to requests from user companies on matters of environmental performance and enhanced safety measures since the 1960’s when steel supported high economic growth in Japan.

Along with market growth and user companies’ overseas expansion, NSSMC too has established overseas production bases. Today overseas business represents 35% of NSSMC’s total sales in its main steelmaking business and four other areas, and domestic business represents 65%. This means that NSSMC has firmly established a management base for contributing to the sustainability of the world through steel.

From the perspective of the 17 Sustainable Development Goals (SDGs) adopted by the United Nations in 2015, NSSMC’s measures are well balanced from economic, environmental, and social aspects. Going forward, if similar checking on idiosyncratic and harmonious management is conducted within each country or by each steelwork and office in Japan, I foresee that NSSMC will get a clearer picture on contribution to local communities.

This Sustainability Report emphasizes that steel is an optimal recyclable material to be reborn many times in whatever form is needed during an era focused on efficiency in resources. I would like to encourage NSSMC to further pursue both aspects of the significance of steel: namely the recyclability and the development of advanced steel products, such as stainless steel to be used for high-pressure hydrogen stations.

Specific environmental management measures

NSSMC adopts a mid-term management plan every three years and effectively follows the plan-do-check-act (PDCA) management cycle. It also contributes to the world by promoting three ecos, namely, Eco Process, Eco Products, and Eco Solution, and innovative technology development. I would like to see this stable approach to be continued for many years to come.

Under the Paris Agreement, a global agreement on alleviating climate change, Japan has pledged to cut greenhouse gas emissions by 26% from the fiscal 2013 level by fiscal 2030. This is not a final goal and the next target of 80% reduction by fiscal 2050 has also been planned. I believe that NSSMC’s initiatives begun up to now could enable it to reach the 2030 target, but the 2050 target might be difficult to achieve.

I am anticipating NSSMC, as a company consuming about 5% of Japan’s total energy consumption, takes up further challenges with COURSE50, which promotes technology development for drastic CO₂ emission reduction in steel production. I sincerely hope that NSSMC will show a problem-solving model in the world steel industry by using the technology to reduce iron ore using hydrogen amplified coke oven gas to curb CO₂ emissions in steelmaking process from blast furnaces, raising efficiency in the CO₂ separation and collection processes, pursuing potential use of hydrogen, and other developments.

Toward the realization of a recycling-oriented society, NSSMC has promoted in-house zero emissions by recycling 99% of internally-generated by-products. This is very impressive. Nowadays, elimination of plastic waste is becoming a global issue. It is important to collect and recycle waste plastics of not only container packages but also various products. In promoting the 3R campaign (Reduce, Reuse and Recycle), recycling of plastic materials through chemical recycling plays an important role in society.

In response to the Revised Air Pollution Control Act, NSSMC, as a member of the Japan Iron and Steel Federation, helped establish a scheme to evaluate and disclose the status of achievement of voluntary management standard concerning mercury concentration by regularly measuring the amount. I praise this response to chemical substance risks.

In the areas of biodiversity, NSSMC has for many years been undertaking the creation of hometown forests based on natural, native vegetation of the vicinity of a steelworks, restoring nature, including animals and plants. In recent years, NSSMC has launched new initiatives, such as the Creation of Sea Forests, to further social contribution. I would like to encourage continuation of these great efforts.

Social reporting

Last but not least, engagement with stakeholders, or cooperation with all types of stakeholders, is important to be trusted in society. I understand that NSSMC has prohibited as unjust the discriminatory treatment of workers based on nationality, race, belief, creed, gender, and disability. I would like NSSMC to incorporate an international perspective, by reflecting the United Nations’ Guiding Principles on Business and Human Rights, for example.

Awards received in FY2017 (in chronological order)

Award name	Sponsor	Detail
Awards from customers		
Excellent Supplier Award 2016 (11th time)	TTX Company (U.S.A.)	Supply of high-end railway wheels for high-load-bearing freight cars with a long service life and excellent performance in load bearing and resistance to wear (NSSMC, Standard Steel)
Procurement Partners Forum 2017 Premier Partner Award (6th consecutive year)	Fuji Xerox Co., Ltd.	Delivery of eco-friendly, high-performance, low-carbon, non-lead free-cutting steel and surface-treatment steel sheets. Highly evaluated in terms of technology, quality, stable supply and the management attitude concerning environmental management (NSSMC)
Excellent Partners Meeting 2017 ECO-VC Gold Award (8th consecutive year)	Panasonic Corporation	Development of highly-corrosion-resistant coated sheets, adopted in outdoor units of air conditioners (NSSMC)
Diamond Supplier Award 2017	Navistar International Corporation (U.S.A.)	Outstanding contribution of high-grade precision-machined crankshafts in quality, delivery, technology and cost (Nippon Steel and Sumikin Crankshaft)
Awards from governments and institutions		
The Seventh Monodzukuri Nippon Grand Award “Special Prize”	Ministry of Economy, Trade and Industry	Development of permanent magnet-type retarder as the auxiliary brake system on commercial-use trucks and buses (NSSMC)
The Second Award for Enterprises and Workplaces with Pleasant Working Environments and High Productivity “Award of Excellence”	Ministry of Health, Labour and Welfare	Achievement of high goals by team by visualizing happiness of individual workers, and understanding and helping each other, and improvement in productivity by manufacturing high-value-added products (Nittetsu Sumikin Kozai)
2017 ENAA Engineering Commendation Award	Engineering Advancement Association of Japan	Development of spherical sliding bearing (NS-SSR™) and its adoption in large-sized distribution warehouses (Nippon Steel & Sumikin Engineering)
The 43rd Outstanding Environmental Equipment Award “Chairman’s Award”	The Japan Society of Industrial Machinery Manufacturers	High-efficiency industrial waste power generation boiler with shot cleaning equipment (Nippon Steel & Sumikin Engineering)
2017 Awards for Resources Recirculation Technologies and Systems “METI Minister’s Award”	Japan Environmental Management Association for Industry	Establishment of a resource recycling system by alloy iron melting furnaces, enabling recycling of the entire chrome resources (NSSMC)
The 35th IT Encouragement Award	Japan Institute of Information Technology	Use of advanced IT to visualize moving vessels in the domestic integrated optimization project of allocation of ships (NSSMC)
The 64th Okochi Memorial Production Grand Prize	Okochi Memorial Foundation	Development of eco-friendly high-productivity stainless steelmaking process (NSSMC)
2017 Advanced Special Award for TPM Achievement	Japan Institute of Plant Maintenance	All-participating initiatives to promote voluntary maintenance and enhance planned maintenance and management levels (NS-Siam United Steel)
Top 100 Global Innovator 2016 (6th consecutive year)	Clarivate Analytics (U.S.A.)	Selected as one of the top 100 innovative companies in the world based on the number of patents, global nature, etc. (NSSMC)

Editorial policy

This Sustainability Report is the 21st since the former Nippon Steel Corporation issued what is the first sustainability report by a Japanese steel manufacturer, in 1998. The report presents NSSMC’s progress in ecological management and details of our various initiatives.

Period covered

The period covered in the report is fiscal year 2017 (from April 2017 to March 2018). For some activities, the period from April 2018 to June 2018 is included.

Scope of report

- Environmental and social aspects: Activities of NSSMC and its group companies in Japan and overseas
- Economic aspects: The Annual Report 2018 (issued in June 2018) also covers the contents of the economic report.

Reference for guideline

- GRI (Global Reporting Initiative) “Sustainability Reporting Standards”
- “Environmental Reporting Guidelines,” by the Ministry of the Environment



NSSMC’s Logotype

The central triangle in the logo represents a blast furnace and the people who create steel. It symbolizes steel, indispensable to the advancement of civilization, brightening all corners of the world. The center point can be viewed as a summit, reflecting our strong will to become the world’s leading steelmaker. It can also be viewed as depth, with the vanishing point representing the unlimited future potential of steel as a material. The cobalt blue and sky blue color palette represents innovation and reliability.

Nippon Steel & Sumitomo Metal Corporation

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