In June 2016 NSSMC received the highest rating on “DBJ Environmentally Rated Loan Program” of Development Bank of Japan Inc. (DBJ) and recognized as “particularly innovative in its environmental efforts.”
Corporate Philosophy

Our Values
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.

Basic Environmental Policy (Established in October 2012)
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) pp. 10–19
2. Offering of environment-oriented products (eco products) pp. 20–24
3. Proposing environmental preservation solutions from a global perspective (eco solution) pp. 25–29
5. Development of a rich environment pp. 28–29
6. Promotion of environmental relations activities pp. 36–39

Environmental risk management
Promote environmental load reduction measures
Respond to new environmental regulations

Environmental management system
Enhance the environmental management system

Global warming countermeasures
Promote initiatives for a low-carbon society through the “three ecos and innovative technology development”

Creation of a recycling-based society
Expand use of resources generated in-house
Promote zero-emission

Mid-Term Environmental Management Plan (FY2015–FY2017)

Environmental and energy solutions
Apply the NSSMC Group’s power to environmental preservation and saving of resources and energy

Environmental relationship activities
Communicate actively on environmental issues

The role of steel in forming the future of the earth
Iron is believed to be one-third of the Earth’s weight. While the majority of iron exists in the Earth’s inner core, we have been fortunate to have an abundant resource of iron in the Earth’s surface layer. Steelmaking technology has a history as long as 4,000 years, but it was the Industrial Revolution in the 18th century and subsequent technological innovations that have enabled steel to be mass-produced and supplied at cheap prices. Since then, steel has been extensively used in goods for the daily life of people and the underlying infrastructure of the society, whereby the metal enriches people’s lives to an extent beyond estimation.

While steel demand is expected to keep growing, in good part due to improvement of living standards in emerging countries, we do not need to worry about a supply shortfall, given as there are ample reserves. Being recyclable, steel is a reliable material that will continue to be an essential part of our lives in the future.

Aiming to become the best steelmaker with world-leading capabilities, NSSMC has been dedicated to steelmaking with a particular emphasis on its contribution to preservation of energy and other resources, and steel-related reduction in environmental burden. We have also expanded our steelmaking technologies geographically, across the world. Going forward, we aim on properly capturing increasing global demand and providing our outstanding steel products to users all over the world, for the betterment of people’s lives.

Ecology-friendly steel and steelmaking will form a great part of the future of the earth.
NSSMC’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
36.2 billion yen
Nippon Steel Sunami Materials Co., Ltd., etc.

Based on materials expertise gained from steelmaking, Nippon Steel & Sumikin Chemicals develops original materials and components that are indispensable to leading-edge technology fields, with a 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.

Electronics industry materials and components
28.5 billion yen

Nippon Steel & Sumikin Chemicals business
181.8 billion yen
Nippon Steel & Sumikin Chemicals Co., Ltd., etc.

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

Chemicals business
181.8 billion yen
Nippon Steel & Sumikin Chemicals Co., Ltd., etc.

Nippon Steel & Sunami Materials Co., Ltd.

Steelmaking and steel fabrication business
4,283.9 billion yen
Nippon Steel & Sumitomo Metal Corporation, etc.

Enriching technological competency, 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.

Engineering and construction business
315.7 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; environmental and energy-related solutions; offshore structures; building construction and steel structures; pipelines; and new business and new technology.

System solutions business
218.9 billion yen
NS Solutions Corporations, etc.

Through consultation concerning clients’ information systems to solve their problems, NS Solutions provides comprehensive services from planning, proposal, design, and configuration services of a system to its managing and services, incorporating advanced technologies FinTech, IoT, and AI.

Sales composition by business segment
FY2015
Sales composition by business segment
4,907.4 billion yen

Steelmaking and steel fabrication business
4,283.9 billion yen
Nippon Steel & Sumitomo Metal Corporation, etc.

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

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.

Sales composition by region

Japan
61%

Overseas
39%

Main Bases

AMKNS Calvert (U.S.)
Acquired this plan, formerly AM/NS Calvert (U.S.), in March 2010. Began operation of a new galvanizing line in October 2015.

Sumititsa Brazil

SOI Thailand

NPF (Saudi Arabia)

CIRUS 53

AVICA (India)
Established a joint venture company with Tata Steel Limited for manufacture and sale of automotive cold-rolled steel sheets. Began operation in May 2014.

VLSM SPIN (Brunei)
Established company to provide threading services for connections of the oil-country tubular goods (OCTG) pipes for oil and natural gas development. Plans to begin operation in October 2016.

BVR (China)

Fiyu 552

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Fiyu 552
Aiming to Be Ever More Trusted and Relied Upon by Society

Nippon Steel & Sumitomo Metal (NSSMC) is proud of playing its role in society through providing steel that is vital for daily life and society as a whole. But in order to optimize its contribution to the betterment of society, it is indispensable for NSSMC to be ever more trusted and relied upon by society, and this requires continuous improvement in compliance to laws and regulations, as well as of capability in areas such as safety, environmental activities, and disaster prevention.

Having identified environmental management as critical for corporate management, based on our Ecological Management Policy, we have been fulfilling our commitment to contribute to the creation of a society oriented toward environmental preservation and lower environmental impact. We have been actively engaged in various environmental issues, which encompass some at the local community level to others of global scale. They 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.

Regarding global climate change, the United Nations Framework Convention on Climate Change (UNFCCC), or COP21, was held in Paris in December 2015, and produced the Paris Agreement. By this, all the countries, including emerging countries, agreed on a framework to deal with greenhouse gas emissions mitigation. In Japan the government has compiled a plan to cut greenhouse gas emissions by 26% from the fiscal 2013 level by fiscal 2030 and I believe that we must make sincere efforts to achieve this Intended Nationally Determined Contribution. In 2016, the Plan for Global Warming Countermeasures was adopted by Japan as the basis for implementing its contribution. The Plan has identified the Initiatives for Achieving a Low Carbon Society, which was initially voluntarily prepared by Japan’s industrial and business community, as a major plan for the private sector. The NSSMC Group will continue its ongoing efforts to achieve its targets for 2020 and further for fiscal 2030 to accelerate its efforts for reduction of CO2 emission, by keeping foremost the three “ecos,” namely eco process, eco products and eco solutions, and the “development of innovative technologies.”

Aiming to Be Ever More Trusted and Relied Upon by Society

Kosei Shindo
Representative Director and President
NSSMC makes ecological innovations with the “three ecos and innovative technology development”

**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 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.

**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.

**Major events**

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.

**Nippon Steel & Sumitomo Metal Corporation**

We are committed to contribute to the development of society by further improving our advanced technology.

**NSSMC’s environmental management**

We are committed to contribute to the development of society by further improving our advanced technology.

1960’s

Steel supported high economic growth

- Enhanced dust collection systems
- Adoption of railway switches and sales equipment for the Tokei Shinkansen Line (1964)
- Use of steel sheet for consumer durables such as cars, cookers, and color TVs
- Utilization of electrical steel sheets (1966)

1970’s

Energy saving challenge

- Development of Coke Dry Quenching (CDQ) (1970)
- Development of the Top-Pressure Recovery Turbine (1971)
- TN 14 (3G) began operation (1982)
- ICI (U.S.) began operation (1992)

1980’s

Respond to the year’s sharp appreciation

- Dry desulfurizing and desulfurizing systems using activated carbon (1980)
- Development of a new generation of tomatolike demand management of power and steam, and a power production system
- Developed Rotary Hearth Furnace (2000)
- Developed regenerative burners (1996)

1990’s

Support in the era of concern for the global environment

- Steel tubes for automobile door impact safety (1994)
- SuperDyma® (2000)
- High-speed railway for heavy freight

2000’s

Support for customer’s global expansion

- Advanced waste water risk management (i.e., installation of waste water cleaning plants) (1990)
- Developed SteelHouse (1996)
- Developed Rotary Hearth Furnace (2000)
- Developed regenerative burners (1996)

2010’s

Toward becoming the world leading steelmaker with comprehensive strengths

- Expansion of usage of biomass resources (2010)
- Developed Rotary Hearth Furnace (2000) using wood pellets for percolation, thick steel, coffee grounds, and other resources as coal alternative fuel for power generation
- HRX™ stainless steel for high-pressure hydrogen (2015)
- 9% Ni steel plate for LNG tanks

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

- Opening of the Akashi Kaikyo Bridge (1998)
- High-strength steels for automobiles (1999)
- RESIST steel (1996)
- Recycled dust and sludge, generated in steelmaking process (1996)
- Highly-efficient GTCC power generation (2004)
- R&D costs up by more than by conventional thermal means, using the same amount of fuel
NSSMC’s value chain contributes to society with its “three ecos”

NSSMC creates value for society at every stage of the life cycle of steel with its “three ecos.”

Recycling

Raw materials mining
Steelmaking
Transportation
Processing and production
Usage
Disposal

Overseas

Resource-saving by enhancing the strength of materials and reducing their weight

Demonstrate the equivalent performance with less use of precious rare metals

Provide high-strength steel materials most suitable to exploration and transportation of raw materials

Steel production at the world’s top-class energy efficiency

Significant improvement in production efficiency as the latest technology enabled dephosphorization and decarburization to be performed by one converter instead of two.

Using by-product gas generated within the works, the NSSMC Group generates electric power, 41% of which is supplied to local communities.

Use steel slag, by-products of steelmaking for materials for cement, broken-up pieces of pavement, etc.

Transfer of Japan’s world-leading environmental conservation and energy preservation technologies to overseas steelmakers

Prepared VIEWKOTE® steel sheet

Supply materials that make it easy for customers to process, weld, and work on materials, and save production processes

Prepainted VIEWKOTE® steel sheet

Supply steel materials most suitable for LNG carriers and carriers for raw materials, contributing to marine safety and enhanced fuel economy

Provide steel materials most suitable for automobiles, contributing to energy preservation and reduction in CO₂ emissions at the point of use of products, due to reduction in product weight caused by enhanced material strength

Titanium sheet for aircraft

Steel materials for offshore wind power generation

Steel products have some superior functionalities, and steel materials have superior recyclability. Steel scrap is a vital raw material for the production of new steel products.

Steel materials for offshore wind power generation

Theoretically infinite recycling

The end of a product life does not end the life of steel as material.

Steel products for offshore wind power generation

Stable supply of NSSMC’s eco products to its customers’ overseas production bases

Stable high-tensile steel for automobiles

High-tensile steel for automobiles

Recycling rate of steel materials for automobiles

94% (Estimate on steel materials for automobiles in Japan in fiscal 2011)

Theoretically infinite recycling

92% (Japan Steel Can Recycling Association; fiscal 2014)

[Reference]

| Aluminum cans | 87% (FY2014) |
| PET bottles  | 86% (FY2013) |
| Glass bottles | 67% (FY2013) |
| Drink cartons | 45% (FY2013) |
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.

NSSMC uses iron ore mined overseas, coal as an iron ore reductant, and scrap generated by society as its main raw materials for steel production. By-product gases, such as coke oven gas generated by dry distillation of coal 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 84% of the electricity it uses at steelworks, 88% of which is from internally generated energy sources such as waste heat and by-product gases. 90% of water used for cooling and cleaning products and manufacturing equipment is repeatedly re-used.

When one ton of iron is produced, the amount of by-products generated exceeds 600 kg, but the steel slag, dust, and sludge are reused in-house as raw materials, or are used by society or other corporations as raw materials for cement, construction materials, and so forth. These efforts have resulted in the achievement of a very high recycling rate of approximately 99%.

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.
**Global warming countermeasures**

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.

**Achieved the world’s top-class energy efficiency**

Japan's steel industry invested ¥3 trillion in plant and equipment in the 1970s and 1980s and realized 20% energy saving. From 1990 to 2012, ¥8 trillion was invested to achieve 10% energy saving.

**Continue CO₂ emission reduction by implementing the three ecos**

Following the Voluntary Action Plans, the industry is now participating in the Action Plans for the Realization of a Low-Carbon Society.

**Work to achieve further CO₂ emission reduction through development of innovative technology**

The industry aims at technological development for about 30% CO₂ emission reduction, by adoption of an innovative steelmaking process (COURSES).6

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

Maintain and further improve NSSMC's high modal shift ratio of 95.8%; 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.

**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.

**Achieved the world’s top-class energy efficiency**

From the first oil crisis until around 1990, NSSMC intensively promoted continuous processes, exhaust heat recovery, and other measures, all to enable significant energy conservation. This has led to NSSMC and Japan’s steel industry as a whole achieving the world’s top-class energy efficiency.

**Continue CO₂ emission reduction by implementing the three ecos**

Based on the 32.2 billion metric tons of CO₂ emissions from worldwide fossil fuel combustion in 2013, Japan’s production represents 3.8% of global CO₂ emissions from combustion of fossil fuels. Japan also accounts for 2.7% of worldwide greenhouse gas emissions, according to estimates by the International Energy Agency in 2010.

According to the latest data available, Japan’s CO₂ emissions from fossil fuel combustion amounted to 11.9 billion metric tons in 2014 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-processes,” and introducing “eco-products” and “eco-solutions” in Japan and overseas.

In the Voluntary Action Plans up to fiscal 2012, energy consumption for fiscal 2008 through fiscal 2012 was reduced by 11.1% relative to the fiscal 1990 level. CO₂ emission in total was reduced by 11.2% in volume and CO₂ emission per ton of crude steel was reduced by 10.0%, achieving participants’ goals.

From fiscal 2013 on, NSSMC has been participating in the Action Plans for the Realization of a Low-Carbon Society for further CO₂ emission reduction by means of the three ecos. The industry-wide efforts are made to achieve the Phase I goal of CO₂ emission reduction of 5 million tons by fiscal 2020 by fully implementing state-of-the-art technologies.

**Promote innovative technology development**

In addition to promoting the three ecos, the industry has worked at developing the innovative steelmaking process (COURSES) from a medium- to long-term CO₂ emission reduction perspective. From 2023 onward, under the Action Plans for a Low-Carbon Society, the global warming countermeasures will be steadily implemented on the basis of the three ecos and COURSES.

**Japan Iron and Steel Federation’s Action Plans for a Low-Carbon Society**

Japan’s steel industry has made to achieve the Phase I goal of CO₂ emission reduction of 5 million tons by fiscal 2020 by fully implementing state-of-the-art technologies.

**Breakdown of CO₂ emissions from fossil fuel combustion**

Global: 32.2 billion tons (2013)

Japan: 1.19 billion tons (2013)

**Energy efficiency in steelmaking by country**

Comparing when Japan is assumed to be 100

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<tr>
<td>Energy consumption (100)</td>
<td>100</td>
<td>104</td>
<td>112</td>
<td>117</td>
<td>121</td>
<td>123</td>
<td>124</td>
<td>125</td>
<td>126</td>
<td>106</td>
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**NSSMC’s environmental management**

NSSMC’s environmental management is based on three ecos: “energy saving efforts in offices and at home,” “continue CO₂ emission reduction by implementing the three ecos,” and “promote innovative technology development.” The most effective measure against global warming is energy conservation, and therefore NSSMC is striving to improve energy efficiency by using energy generated in steelmaking processes, including power generation through use of by-product gas or exhaust heat recovery, or by reusing waste plastics and discarded tires. As a result of these efforts, the NSSMC and affiliated electric furnace companies6 consumed 1,048 PJ of energy and emitted 91 million tons (preliminary) of CO₂ in fiscal 2015.

** NSSMC’s energy consumption (1000 tons) (** *)**

1. Annual proportion of energy consumption per ton of crude steel (reference: NSSMC’s energy consumption 2014)
2. Resource: NSSMC’s environmental management

** NSSMC’s energy-derived CO₂ emissions (Million tons of CO₂ (** )**

1. CO₂ emissions related to energy sources (left scale)
2. CO₂ emissions per ton of crude steel (right scale)
3. Source: NSSMC’s environmental management

**Energy consumption (left scale)**

1. Industrial processes per capita (1000 tons)
2. Energy consumption per ton of crude steel (reference: NSSMC’s energy consumption 2014)
3. Source: NSSMC’s environmental management

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<th>Mode of transportation</th>
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**Transportation quantity:** Total sum of the weight of load (ton) transported multiplied by transport distance (km)

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Contributing to creation of a recycling-oriented 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 engaging 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 are generated for every ton of iron produced. In fiscal 2015, NSSMC produced 42.17 million tons of crude steel and generated 24.71 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 380,000 tons but maintained a very high recycling rate of 99%. By-products generated and the amount finally disposed

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 process (coke oven) at the Ministry of Land, Infrastructure, Transport and Tourism.

Steel slag is almost entirely utilized. Approximately 70% of blast furnace slag, fine aggregate for use in road bases, civil engineering work, fertilizer, soil improvement, etc. For example, Calcium modified soil, a mixture of steel slag and dredged soil, has the beneficial effects of improving the strength and inhibiting the elusion 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. NSSMC’s pavement materials, KASAMAS™ 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.

Blast furnace cement, a mixture of pulverized blast furnace slag and ordinary Portland cement, contributes to a 40% reduction of CO 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 product 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.

Recycling of waste plastics

NSSMC recycles 100% of plastic containers and packaging and all discarded tires by using them in the steelmaking processes.

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NSSMC generates approximately 125,000 tons of plastic waste annually (Wet 10,000 tons/y) including waste (97,000 tons) generated due to a large-scale construction work in FY2015.

NSSMC’s environmental management

NSSMC’s final disposal amounts

NSSMC’s environmental management

Thermal decomposition enables 100% effective re-use of plastics

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NSSMC’s environmental management

NSSMC recycles 100% of plastic containers and packaging and all discarded tires by using them in the steelmaking processes.

Recycling of waste plastics

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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 are also 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 wind screens 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.

**Water quality 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.

**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 landfill modification work such as excavation which is required to be reported. We conduct pollution surveys when needed.

**Chemical substances discharge control**

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, Volatile Organic Compounds (VOC)³ voluntary management, and other laws concerning the management of chemical substances as well as following the voluntary management procedures set by the Japan Iron and Steel Federation (JISF) and NSSMC.

NSSMC also took the lead to promote use of alternatives to steel-making materials and equipment that contain hazardous materials such as asbestos and polychlorinated biphenyl (PCB). We have been replacing or disposing of possibly risky parts and materials, according to handling standards that ensure safety.

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 Pollution 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 atmospheric risk management

**Example of Environmental Initiatives at Steelworks**

NSSMC has implemented measures on facilities to prevent abnormal water discharge to outflow from steelworks in case of operational trouble.

**Response when abnormal water discharge occurs**

1. Order to stop factory water discharge
2. Automatic monitoring facility for discharged water
3. The abnormal water discharge occurs.
4. Pump
5. Water drain shut-off gate
6. Water drain shut-off gate

**Development and commercialization of technology for zero emissions in the integrated steelworks (Nagoya Works)**

In the iron-making process, over 600 kg of by-products are generated for every ton of iron produced. These by-products include steel slag, dust, and sludge, the majority of which are recycled in and out of the company. Sludge, however, was conventionally disposed in landfill as it was difficult to recycle. Its low recycling rate was a bottleneck in promoting zero emissions. This led NSSMC’s Nagoya Works to make progress in development and commercialization of comprehensive recycling (see the table below) and has realized zero emissions, contributing to reduction in the disposal volume and less usage of natural resources by utilizing iron content of sludge.

This project received the Ministry of Economy, Trade and Industry Minister’s Award for Resources Recirculation Technologies and Systems in 2015.

1. Mulling-by-product sludge collected from industrial wastewater
2. Conventional treatment
3. New treatment

- Cold-rolled wastewater treatment sludge to be fully recycled
- The sludge contains metals other than iron and could be a raw material.
- Fully recycled. The wastewater treatment separation process removes iron with other metals. Recycled water is reduced due to enhanced desalination and the composition is optimized for sludge to be recycled as an iron source.
- The sludge is in cold-rolled thermal plants containing substantial fluorine and is difficult to be recycled.
- Generation of fluorine and other residues is reduced. Less sludge is generated and sludge is recycled as an iron source.
- Oil-contained mulling sludge to be fully used as fuel
- Some oil-contained sludge is generated in the cold-heading process, is inactivated by outside vendors.
- Oil-contained sludge is burned and devolatilized, and fully reused as fuel by blending with other waste oil with high heat potential.

NSSMC also took the lead to promote use of alternatives to steel-making materials and equipment that contain hazardous materials such as asbestos and polychlorinated biphenyl (PCB). We have been replacing or disposing of possibly risky parts and materials, according to handling standards that ensure safety.
Environmental measures at steelworks

**Steelworks and major products**

<table>
<thead>
<tr>
<th>Products</th>
<th>Steelworks</th>
<th>Kamakura Works</th>
<th>Kawasaki Works</th>
<th>Yawata Works</th>
<th>Ube Works</th>
<th>Nagoya Works</th>
<th>Sakai Works</th>
<th>Hiroshima Works</th>
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**Raw material yards**

- **Prevention of scattering of materials**
  - Coal yard operations: The surface of coal piles is pressed to restrain the scattering of coal fines.
  - Water spraying in coal yards: Water is sprayed on piles of coal ore and coal to restrain the scattering of raw materials.
  - Rainwater tank (for spraying): Rainwater is not wasted but used for spraying in coal and ore yards.

**Upstream operation (iron and steelmaking)**

- **Prevention of scattering of dust; desulfurization and denitrification**
  - Electro dust collectors: Dust generated in the burning process is collected by two types of dust collector (electro or bag filter), depending on the characteristics of the dust (i.e., particle size distribution, emission gas concentration).
  - Dust collectors with bag filters: Dust collectors with bag filters are used to collect dust.
  - Wet type desulfurization equipment: The wet desulfurization method enables SOx in emission gas to be eliminated.
  - Active coke dryer type desulfurization equipment: The dryer desulfurization method enables SOx in emission gas to be eliminated.

**Downstream operation (rolling; heat treatment; surface treatment)**

- **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 matter in the treated waste water are filtered by a sand layer and removed.
  - Measurement of waste water quality: Water is regularly collected and the regulated contents are measured.
  - Waste water closing gate: Waste water flow is shut in case of trouble.
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.
Automobiles, electric appliances, buildings, bridges, and various other industrial products made of steel support our living.

Each such industrial product has its service life. After they fulfill their lives, many of the non-steel materials are discarded, due to problems in quality or economic efficiency, or recycled in a limited way. In contrast, steel materials are recycled as scrap and reborn as new steel products. This type of recycling is called “closed loop recycling.”

While converter furnace steel materials are mainly made of iron ore, which is a natural resource, and scrap, the sole main material for almost all electric furnace steel materials is scrap.

Some people tend to mistakenly think that electric furnace steel material is recycled material, whereas the converter furnace steel material is not. In fact, scrap is also used in the converter furnace steel material. Steel products, including both of those materials, are recyclable resources to be collected as scrap and to be reborn as a new product.

Steel can be reborn many times in whatever form

Around 90 million vehicles are manufactured each year in the world and will be discarded in the future. If the materials for these vehicles could not be recycled, the earth will eventually be overloaded with unutilized waste.

Automakers aim to reduce environment burden by improving fuel efficiency of vehicles. In addition to present technology for enhanced efficiency of engines and automotive electrifications, weight reduction of the car body is an important measure. In pursuit of enhanced safety and improved performance of electrical components, automobiles tend to become heavier. In order to satisfy various needs and requirements, weight reduction of car bodies is desired more and more.

In recent years, aluminum, plastic, carbon fiber-reinforced plastics (CFRP) and other materials which are lighter than steel have been adopted for car bodies for the improvement of fuel efficiency (reduction of greenhouse gas emissions while driving). However, materials for vehicle bodies need to be equipped not only in terms of the level of CO2 emissions reduction by higher fuel efficiency. The amount of CO2 emissions for the entire life of a vehicle, namely from material manufacturing to disposal of the vehicle, needs to be considered.

This is called “Life Cycle Thinking.” “Life Cycle Assessment” (LCA), a technique to assess environmental impacts for all stages of a product’s life, has been adopted internationally. Based on the LCA technique, alternative lightweight materials to steel reduce the amount of CO2 emissions in driving but emit more CO2 during material manufacturing.

If the car body material is changed from ordinary steel to thinner high-tensile high-strength steel, the lighter car body results in less CO2 emission in driving and the reduction of steel in use also results in less CO2 emission in manufacturing. Hence the amount of reduction in CO2 emission for the entire life cycle can be more than when other lightweight alternative materials are used.

Car making according to LCA-based environmental specifications

Steel materials can be said to be precious eco-materials for the creation of a recycling-oriented society as all steel materials can be recycled over and over again.
The commercial launch of fuel cell vehicles (FCV) which run on hydrogen instead of gasoline, and construction of the first hydrogen stations for fueling FCVs, began in the year under review. Progress has been made recently toward the realization of a Hydrogen Society. Japan’s steel industry, including NSSMC, plays a leading role in the Global Sectoral Approach*, 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 around 50 million tons per year in total. This is equivalent to 4% reduction in Japan’s annual CO2 emission. Japan’s steel industry, including NSSMC, is working on various projects to introduce Japan’s advanced technology in this area to other countries.

**Contributing to a Hydrogen-Based Society**

The NSSMC Group provides advanced materials for the realization of a Hydrogen-Based Society.

**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. Nippon Steel & Sumikin Pipeline & Engineering in the NSSMC Group has entered the hydrogen station construction business. Its first hydrogen station using HRX19™ was constructed in Shioi, Tokyo in March 2016.

**Technical cooperation and technology transfer promoted on a worldwide scale**

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. Efforts to standardize these calculation methods as ISO have been spearheaded by the Japanese steel industry. This had resulted in international standardization of the procedure as ISO14404 “Calculation method of carbon dioxide emission intensity from iron and steel production” in March 2013. It has enabled steelworks not participating in the World Steel Association to calculate CO2 intensity using universal methods. This marked the first step forward in greatly facilitating the global sectoral approach sought by the steel industry.

**Standardization of methods to calculate CO2 emission**

As a member of the Japan Iron and Steel Federation, NSSMC is participating in multinational and bilateral projects for energy saving, in cooperation with the Japanese government.

**Contribute to reduction of CO2 emission on a worldwide scale**

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 a longer product life possible and improved the safety of pipes for hydrogen stations. Moreover, HRX19™ is approximately twice as strong as conventional SUS316 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 with HRX19™, without requiring joints, whereby a contribution is made to reduction of construction and maintenance costs.

**Multinational and bilateral collaboration**

As a member of the Japan Iron and Steel Federation, NSSMC is participating in multinational and bilateral projects for energy saving, in cooperation with the Japanese government.

**Technical cooperation and technology transfer promoted on a worldwide scale**

In 2016, NSSMC’s briefing on the comparison of CO2 emissions in India and Japan was held in Tokyo. In cooperation with public and private steel-related parties, NSSMC is promoting the diffusion of ISO14404 through the initiatives taken by Japan and India. NSSMC’s briefing on the comparison of CO2 emissions in India and Japan was held in Tokyo in February 2016.

**Contribute to reduction of CO2 emission on a worldwide scale**

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, the Global Superior Energy Performance Partnership (GSEP), and directly with countries such as China and India.

**Standardization of methods to calculate CO2 emission**

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. Efforts to standardize these calculation methods as ISO have been spearheaded by the Japanese steel industry. This had resulted in international standardization of the procedure as ISO14404 “Calculation method of carbon dioxide emission intensity from iron and steel production” in March 2013. It has enabled steelworks not participating in the World Steel Association to calculate CO2 intensity using universal methods. This marked the first step forward in greatly facilitating the global sectoral approach sought by the steel industry. NSSMC is promoting diffusion of ISO14404 through the initiatives taken by Japan and India, Japan and Southeast Asia, and other relations.
Overseas steel industry’s CO₂ emission reduction effects by introducing Japan’s energy-saving equipment (accumulated up to fiscal 2014, JISF)

The NSSMC Group’s technologies significantly contribute to overcome the environmental challenges of many countries throughout the world. We are cooperating in energy-saving and other environmental initiatives in China, India, and elsewhere in the world, in the belief that the international technical transfer of our superior energy-saving technologies is highly effective in reducing CO₂ emissions and in other environmental countermeasures undertaken on a global scale. In India, especially, we are participating in a feasibility study for project that would be part of the joint crediting mechanism (JCM), an international technology-centered program initiated by the Japanese government.

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

* All 90 CDQ units were installed by the NSSMC Group (such as Nippon Steel & Sumikin Engineering).

VOICE

Mr. Tan Ah Yong  
Secretary General, SEAISI (South East Asia Iron and Steel Institute)

Supported by robust economic growth in each member country, ASEAN members’ steel consumption has been increasing year after year. At the same time, with the growing globalization of the steel industry, there is a greater awareness among the steelmakers in the region of the need to ensure the sustainable development of the industry in all aspects.

It is in recognition of the above that the ASEAN-Japan Steel Initiative (AJSI) was launched in 2013 to promote cooperation with regard to energy-saving and environmental protection. As part of this initiative, steel plant diagnoses were conducted by experts from NSSMC and other Japanese steelmakers at 11 electric furnace plants in the ASEAN region. On each occasion, the respective steel plants received advice on operational improvements and technology recommendations from the Japanese experts. Following that, some steel plants are now considering the adoption of the Japanese advanced energy-efficient technologies.

Additionally, in March 2016, the South East Asia Iron and Steel Institute (SEAISI) welcomed lecturers from NSSMC at its annual Traveling Seminar held in five member countries of SEAISI. These lecturers contributed towards the development of human resources and knowledge in the member companies of SEAISI.

The above are some examples of how the AJSI can contribute to enhance the ASEAN steel industry’s competitiveness through cost reduction by the adoption of energy-saving measures. As the ASEAN steel industry is being increasingly urged to do more in the areas of energy saving and environmental preservation, we hope that the NSSMC Group will continue to extend its cooperation to SEAISI.
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.

Some initiatives on conservation of biodiversity

Initiatives on conservation of biodiversity

“Creation of Hometown Forests”

Reproducing a forest similar to a nearby grove of the village shrine in steelworks

We have carried out the “Creation of Hometown Forests” projects at our steelworks and factories in Japan under the guidance of Dr. Akira Miyawaki, Director of the Japanese Center for International Studies in Ecology (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, 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 960 hectares (about the size of 200 Yankee Stadiums).

Conserving biodiversity and sequestering CO2

Wild birds such as bulbuls and eagles gather and animals such as Ezo red fox and deer 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 to a decline in kelp, brown seaweed, and other varieties of seaweed, is happening along about 5,000 km of the sea shore 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 “Behavioral Series,” iron supply units composed of steel slag, humus, and soil and steel slag and has been promoting regeneration of seaweed beds by use of these units.

R&D efforts for nurturing living creatures

NSSMC’s Advanced Technology Research Laboratories has a division called the Environment Research Laboratory, located in Futtsu City, Chiba Prefecture. The lab has installed a marine environment simulator called Sea Lab (photo on the right) and has been engaged in scientifically ascertaining the effectiveness and safety of utilizing steel slag for creating sea forests. In addition, the lab is striving to develop and sell by using seaweed, which has proliferated as a result of sea forest creation, another of our initiatives. As it has also been known that not only seaweed but also steel slag can be useful to help grow rice and other agricultural products, research to use steel slag as fertilizer on farmland is also under progress.

Some animal inhabitants of the Hometown Forests

Photos of birds and animals on this page were photographed within NSSMC’s steelworks.

Wild birds such as bulbuls and eagles gather and animals such as Ezo red fox and deer return to the forests. Thus, the “Creation of Hometown Forests” helps conserve biodiversity, and sequester CO2.

Some animal inhabitants of the Hometown Forests

Some animal inhabitants of the Hometown Forests

Some animal inhabitants of the Hometown Forests

Photos of birds and animals on this page were photographed within NSSMC’s steelworks.
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.

Environmentally harmonized steelmaking process technology development “COURSE 50”

Since fiscal 2008, four blast furnace steelmakers including us, and Nippon Steel & Sumitomo Engineering, have been working on the “CO₂ Ultimate Reduction in Steelmaking Process by Innovative Technology for Cool Earth (COURSE 50) 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.

Regarding iron ore hydrogen reduction technology, by fiscal 2012, we comprehended hydrogen reduction characteristics at a laboratory bench level, participated property eludication and performance qualification tests of the hydrogen reduction process at a test blast furnace in Sweden, and conducted verification tests of hydrogen amplification of coke oven gas at the Kitami Works. With regard to CO₂ separation and recovery technologies, verification tests of CO₂ separation and recovery from blast furnace gas were conducted at the Kitami Works, while low-temperature exhaust heat recovery verification tests were conducted at Kashima Works, among others. These tests played a substantial part in obtaining desired research results of Phase 1. In Phase 2 (fiscal 2013–2017), our main focus is to verify technologies to reduce CO₂ emissions from a blast furnace in a comprehensive manner. A 12 m³ test blast furnace was constructed within the Kitami Works and completed two hot trial operations. Starting in fiscal 2016, we are committed to R&D efforts, mainly in the following research areas: test blast furnace research with the aim of establishing a blowing-in technology that maximizes effects of hydrogen reduction; additional verification tests that target optimal hydrogen amplification of coke oven gas (Muroran Works); a project to enhance efficiency of CO₂ separation and recovery processes; and a project to develop highly-efficient heat exchanges.

Environmentally harmonized steelmaking process technology development “COURSE 50”: Structure and Features

Present steelmaking process

Consisting of sintering, coke production, blast furnace operation and refining, the sintering plant converts iron ore, limestone, coal, and other additives into sinters (a mixture of iron oxide and other materials), and the coke plant converts coal into coke. These sinters and coke are then charged into the blast furnace, which sinters and reduces iron oxide (Fe₂O₃) in the sinter to iron (Fe) oxide, which is then refined into iron metal in the refining process.

Next generation coke-making technology “SCOPE21”

Coke, which is thermally decomposed in the absence of oxygen (carbonization), is indispensable in production of steel materials. As raw materials for coke, high-quality coking coal has long been used. However, for this type of caking coal used in steelmaking there are very low reserves and they are in limited areas of the world, compared to general coal used as fuel. Thus, we are facing a credible threat of a surge in price of the coal.

“SCOPE 21” is the next-generation coke-making technology developed as a national project to better address resource problems and open up great potential. For the first time in the world, this technology has enabled the raising of the blending ratio of poor-caking coal up from 20% as in the conventional method to 50%. This is a promising innovative technology that can contribute to the stable supply of energy in the future.

There are three basic processes in the SCOPE21 technology: coke pretreatment, carbonization (destructive distillation of coke by blocking oxygen down), and heat collection. During the coal pretreatment process, the rapid preheating enables to improve coke quality, shorten coke-making time, achieve high energy-saving effects, and ultimately contribute to CO₂ reduction. NOx (nitrogen oxides) in the exhaust gas in the coke oven can also be reduced by 30%, further improving environmental conditions.

We began operation of the first commercial model that fully embodies the innovative environmental technology “SCOPE 21” at the Oita Works in May 2018. Based on this experience, the second commercial model began operation at the Nagoya Works in June 2013. Both models have been operating smoothly up to the present.

Next generation coke-making technology “SCOPE21”: Structure and Features

Coke production

The next-generation coke-making technology “SCOPE21” embodies the innovative environmental technology “SCOPE 21” at the Nagoya Works.

R&D group of approximately 800 researchers

Total number of patents held

Approximately 25,000 patents issued in around 70 countries

Column

Blaze furnaces are huge reactors

Iron ore and coal are the main raw materials fed into a blast furnace. Iron ore is melted in a huge furnace (height, about 150 meters) and steel is reduced and extracted, but what kind of role does coal play? The main ingredient of coal is carbon, but 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 a fuel but rather the ingredient used to cause the 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 a blast furnace steel industry, including NSSMC, has promoted energy-saving measures such as making effective use of 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.

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).
Environmental Governance

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 its own environmental risks are promoted by combining internal and external audits and following the plan-do-check-act (PDCA) 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 management system

NSSMC effectively follows the management cycle of PDCA, primarily through the work of the Environmental Management Committee, which meets twice a year, to promote improvement.

Environmental preservation costs

Capital expenditures for environmental preservation amounted 18.9 billion yen in total for fiscal 2015: 9.2 billion yen for investment in equipment for environmental measures and 9.7 billion yen for investment in energy-saving equipment. The aggregate amount accounted for approximately 4% 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 2015, the environmental preservation costs totaled 87.7 billion yen, including 43.4 billion yen in atmospheric pollution prevention costs, 11.6 billion yen in water pollution prevention costs, and 10.3 billion yen in environmental R&D costs.

Among the environmental preservation costs, atmospheric pollution prevention costs include 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 under “promotion of measures against global warming.” Water consumption volume and reductions in water consumption and various resources spent are shown under “water quality risk management” and “energy and material balance,” respectively. For atmospheric substances, NOx and SOx emissions are shown; for water quality and soil, individual performance indicators are used; for hazardous chemical substances, actual reduction volume of substances such as dioxin, 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.

Annual environmental management cycle

NSSMC regards environmental management as an important basis for our business and continuously provides environmental education to each rank of new employees, mid-career engineers, and managers on the subject of basic environmental policies, medium-term environmental management plans, environmental compliance, etc. In addition, seminars on the environment are led by the general manager of the Head Office Environment Department at all steelworks. We encourage our employees to acquire national qualifications, such as those of pollution prevention managers and energy managers, as well as to take ISO 14001 internal auditor training.
**Corporate Governance**

The NSSMC Group aims to respond to confidence and trust extended by shareholders, business partners, and all other stakeholders, and to achieve healthy sustainable growth and medium- to long-term improvement in corporate value. For that purposes, the Group has established a corporate governance structure appropriate for its businesses.

With the aim of creating a recycling-oriented society, we maintain a high recycling rate of 99% by reducing the volume of final disposal through increased recycling of by-products. With regard to environmental risk management, the management cycle is efficiently implemented with the Environmental Management Committee at the core of its efforts, raising the level of environmental management of the entire group. Eco products and eco solutions were successfully developed and offered to the market in an active manner.

**Environmental governance**

- **Environmental governance structure and internal control system**
  - General Meeting of Shareholders
  - Board of Directors (12 Directors and 1 Outside Director)
  - Audit & Supervisory Board (Statutory and 4 Ordinary Audit & Supervisory Board Members)

- **Corporate governance structure**
  - Corporate Policy Committee
  - Responsible division
  - Companywide Committees
  - Internal Control & Audit Division
  - Compliance
t

**Targets and achievements in fiscal 2016**

After achieving goals of its voluntary action plan (fiscal 2008 to fiscal 2012) on measures against global warming, Nippon Steel & Sumitomo Metal Corporation (NSSMC) are committed to continue working on energy saving to achieve the goals in the context of action plans for a low-carbon society.

In addition, the Group has established a corporate governance structure appropriate for its businesses.
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.

The NSSMC Group

Contribute to build a sustainable society with its three ecs and innovative technological development

Training program for teachers in the private sector

NSSMC participates in a training program organized by Japan Institute for Social and Economic Affairs and gives instruction to teachers every summer, to facilitate their understanding of the steel industry’s role in the society and the attractiveness of monozukuri (manufacturing).

We work jointly with various organizations and NGOs in Japan and abroad in environmental activities.

External organizations and NGOs

Risk Taikan (Experience-based) Education Program

NSSMC cooperates with the concept 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 been working hard at making safe and secure workplaces.

Employees

The partner awards were established to extend our appreciation to our suppliers’ efforts in quality and cost improvement in procurement of materials and equipment. We also wish to encourage them to make proposals more actively in the future.

We participate in various exchanges and communication with our customers and our suppliers of raw materials and equipment, and ensure that environmental and social concerns are addressed at all levels of our supply chain from procurement and production to sales.

Business partners

We endeavor to closely communicate with our customers and stakeholders in the steel industry and allow them to better understand our business.

Customers

NIPPON STEEL & SUMITOMO METAL CORPORATION Sustainability Report 2016

We will continue to implement projects that are based on our environmental policy and strive to make the NSSMC Group a company that is trusted by all stakeholders.

Shibukawa-Taikan (Experience-based) Education Program

As a part of its efforts, our Taikan program enables employees to experience risk through simulation.

We will continue to actively engage in CSR activities, and build an exemplary and sustainable NSSMC Group.

Social Report

We participate in various health and safety measures so that employees of our company, as well as their families, can live consistently with pride, motivation and vitality.

We pursue various personnel policies, based on the treatment of personnel, to ensure that our employees work consistently with pride, motivation and vitality.

 NSSMC hires many women in various positions, including manufacturing workplaces. As a way to support early return from maternity and infant care leave, an in-house daycare center was established in the Oita Works.

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.

We make various disclosures of information and strive for timely disclosure of information, to improve our CSR initiatives, dialogues, and other opportunities to interact with our stakeholders and investors.

In our Investor Relations (IR) activities we strive for timely disclosure of information, for our customers and stakeholders.

Approx. 500,000 shareholders in total

We invite shareholders to take tours of our steelworks in various locations and attend IBC international industry meetings to provide shareholders with opportunities to learn about our business.

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was identified as one of the global critical issues, since the global demand for natural resources is projected to double by 2050. In case of steel, however, its overall life cycle has already been evaluated and a closed recycling loop has been formed. I was amazed to learn that NSSMC’s in-house recycling rate of resources is 98% and the domestic recycling of steel materials for automobiles is 94%. In my view, it is important to properly announce this type of information. By the way, reusing a coke oven has resulted in need for NSSMC to dispose of the bricks, which are unusual in that they cannot be recycled. As a result, the amount of their final disposal turned out to be the only reported environmental item which showed a slight increase. I believe that such information disclosure is too helpful to make the entire data more reliable.

Regarding leading-edge initiatives of eco products, advanced materials for fuel cells and steel for high-pressure hydrogen environments (that would improve the safety of hydrogen stations) are mentioned. I found this information is particularly important as we yet have little accurate information that relates to needs of safety in the hydrogen-oriented society, despite some major moves to promote realizing such society, ahead of the 2020 Tokyo Olympic and Paralympic Games.

In the areas of eco solutions for solving issues in global cooperation, NSSMC has been promoting transfer of superior energy-saving technologies of Japan’s steel industry. Its proactive initiatives, such as sending lecturers to the South East Asia Iron and Steel Institute (SEASI), shows another important direction.

The session on the environmental risk management explained the comprehensive control of chemical substance discharge, which unfortunately did not mention the issues related to mercury. Japan is aiming to take a lead in an international agreement in action based on the Minamata Convention on Mercury. While steelmaking facilities are not considered “mercury-emitting facilities” that are covered under the air pollution regulations, they also emit the similar, relatively significant amounts of mercury. That is why some of those facilities voluntarily strive to restrain emissions and discussions have been made. I would like to urge NSSMC to continue proper monitoring in this regard.

Social initiatives

Last year when I first read NSSMC’s Sustainability Report, I wrote that I would like to see mentioned such topics as the passing on of technology to the next generation and the establishment of a good working environment for women. This year, I was very pleased to find such information, including the establishment of an in-house daycare center and the award system, which proves that the PQA cycle is being effectively implemented.

NSSMC is making constant efforts at the “Creation of Hometown Forests” and the “Creation of Sea Forests,” both of which are intended to utilize inherent ecosystems in the surrounding areas of 16 steelworks around the nation. They are wonderful initiatives. Over time, some endangered animals may become established in some of those areas. I hope that NSSMC will continue those initiatives concerning biological diversity, working closely with local residents.

Environmental report

During the G7 Ise-Shima Summit held in Japan in May 2016, the realization of a recycling-oriented society with highly efficient use of resources...