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.
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.

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 biodiversity.

1. Reducing environmental impacts at every stage of operations (eco process) pp. 10–19
2. Offering of environment-oriented products (eco products) pp. 20–23
5. Development of a rich environment pp. 28–29
6. Promotion of environmental relations activities pp. 36–39

Structure of the Report

1 NSSMC’s Businesses

We aim at becoming the world-leading steelmaker with comprehensive strengths. p. 2

2 Basic approach to NSSMC’s environmental management

Through three ecos and the development of innovative technology, NSSMC is determined to help resolve challenges for a sustainable society. p. 6

3 How NSSMC’s corporate management supports environmental management

We seek for ever-improving operational management, and to be trusted by society. p. 32

Corporative profile

Company name: Nippon Steel & Sumitomo Metal Corporation

Date of Establishment: March 31, 1970

Chairman: Shoji Muneoka
President: Kosei Shindo
Capital: ¥419,524 billion
(Total number of shareholders: 517,918)
Stock listings: Tokyo, Osaka, Nagoya, Fukuoka, and Sapporo
Number of employees: 84,447 (consolidated basis)
Group companies: 356 consolidated subsidiaries and 105 equity-method affiliates

Cover photos: (Top) Muroran Works and Hometown Forest
(Bottom from left) Toyota Motor Corporation’s “MIRAI,” NSSMC’s titanium foil (p. 26)
JR East’s Hokuriku Shinkansen, NSSMC’s high-speed railway wheel and axle (p. 21)
YZF-R1 of Yamaha Motor Co., Ltd., Connecting rod made of NSSMC’s titanium alloy (p. 20)
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.

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.

- **System solutions business**: 206.0 billion yen
- **New materials business**: 36.4 billion yen
- **Chemicals business**: 212.7 billion yen
- **Engineering and construction business**: 348.6 billion yen
- **Steelmaking and steel fabrication business**: 4,939.2 billion yen

The NSSMC Group operates five main businesses, and many of their products are sold overseas.

Net sales (consolidated basis) (¥ billion)

- **2010**: 4,109.7
- **2011**: 5,512.1
- **2012**: 4,090.9
- **2013**: 5,564.2
- **2014**: 4,389.9

Ordinary profit (consolidated basis) (¥ billion)

- **2010**: 43.0
- **2011**: 56.6
- **2012**: 38.7
- **2013**: 69.3
- **2014**: 70.9

Net income (consolidated basis) (¥ billion)

- **2010**: 14.0
- **2011**: 17.3
- **2012**: 6.9
- **2013**: 22.7
- **2014**: 22.8

Crude steel production volume (consolidated basis) (million tons)

- **2010**: 32.0
- **2011**: 37.5
- **2012**: 30.8
- **2013**: 30.3
- **2014**: 36.4

Number of employees (consolidated basis)

- **2010**: 46,698
- **2011**: 48,160
- **2012**: 48,160
- **2013**: 48,160
- **2014**: 48,160

R&D expenditures (consolidated basis) (¥ billion)

- **2010**: 10.8
- **2011**: 12.7
- **2012**: 12.9
- **2013**: 12.9
- **2014**: 12.9

The NSSMC Group has steadily progressed in establishing a global business structure that enables it to capture overseas growth markets and to readily respond to customers’ overseas expansion.
A Message from Top Management

I would like to start this message by saying that we at Nippon Steel & Sumitomo Metal (NSSMC) sincerely regret the great trouble and inconvenience caused to those concerned by the Nagoya Works power failure accidents and the smoke generation after the coke fire accident in 2014. We investigated the causes of the accidents and identified areas for improvement and lessons to be learned. Reflecting on those issues, we are sincerely committed to go back to basics, prevent recurrence of similar accidents, and strive hard to enhance our overall manufacturing bases.

In March 2015, NSSMC announced its Mid-Term Management Plan for fiscal 2015-2017. As we are in an environment which keeps changing, ever more quickly, on a global scale, we must go ahead and distinguish ourselves from our competitors by placing particular emphasis on “technology,” “cost,” and “being global.” By doing this we intend to firmly establish our position as the best steelmaker with world-leading capabilities.

For many years, based on our “Ecological Management,” we have been fulfilling our commitment to contribute to the creation of a society oriented toward environmental preservation and lower environmental impact, under the principle of “Basic Environmental Policy.” Under our new Mid-Term Management Plan, NSSMC will continue to address various environmental issues from the local community level to the global scale by keeping foremost in our activities the “three ecos,” namely eco process, eco products and eco solutions, and the “development of innovative technologies.” The issues encompass the maintenance and improvement of good living environments, the promotion of reduction and recycling of waste, measures to address global warming, and the maintenance and improvement of biological diversity.

Regarding the global climate change issue, 2015 is an important year as the United Nations Climate Change Conference, or COP21, will be held in Paris, to achieve a universal agreement on a new framework to be used from 2020. While the Japanese government is discussing the matter in preparation for the Conference, Japan’s steel industry as well as the business community in general have just organized the Phase II of their initiatives for achieving a Low-Carbon Society with a 2030 target, and have made commitment to society. The NSSMC Group will continue its ongoing efforts to achieve its target for fiscal 2020 and to accelerate its efforts for reduction of CO2 emission with a long-term view of the future.

We keep reminding ourselves that environmental risk management is one of the critical challenges for our sustainable operations. 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 condition of each business base. We will keep enhancing our capability to address the issues of environmental preservation in terms of hard and soft aspects.

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. Our specific CSR concerns include compliance with laws and regulations and risk management in areas of safety, environment, disaster prevention, among others. We also intend to continue to further enhance the quality of our ecological management by developing two-way communication with all stakeholders, i.e., local communities, customers, shareholders, investors, researchers, and environmental NGOs.

This Sustainability Report introduces NSSMC’s progress in ecological management and details of our various initiatives mentioned above. We hope that you take a look at it and let us learn from your candid opinions regarding our environmental and other activities.

Kosei Shindo
Representative Director and President
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.

**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.

- Enhanced dust collection measures
  - Adopted dual collectors and significantly controlled generation of dust and sent
  - Introduced converter furnaces
  - The rolling process time was reduced from 3 to 4 hours to 30 minutes, saving production by 10 times.

- Introduced continuous casting machines
  - Boosted energy efficiency by continuous processing of mold-injection, heating, and rolling.

**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.

- Adaptation of railway wheels and axles and power generation equipment for the Tokaido Shinkansen trains (1964)
- Use of steel sheet for consumer durables such as cans, car bodies, and color TVs
- Oriented electrical steel sheets (1960)

**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.

- The Nippon Steel Pipe began operations (1905)
- “Creation of Hometown Forests” began (1971)

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.

- Introduction of computer control of blast furnace operation (1968)
- Continuous annealing furnace
  - Shortened the processing time from 10 days to one day

- The steel industry’s first online system began operation (1972)

- TCMC’s Mechanical Control Process for plate rolling (1985)

- Realised the increased strength and productivity improvement by meltscale control of rolling and water cooling.
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.”
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, among electricity used in steelworks, 90% of self-generated power was fueled by recovered waste heat and by-product gas. 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- to 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, ¥18 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).

- Work to achieve further CO2 emission reduction by raising efficiency in logistics
  Maintain and further improve NSSMC’s high modal shift ratio of 95.7%; 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.

**NSSMC’s changes in energy consumption**

![NSSMC's changes in energy consumption](https://www.kankyo-kakeibo.jp/ (only in Japanese))

**NSSMC’s energy-derived CO2 emissions**

![NSSMC's energy-derived CO2 emissions](image)

**Logistics sector’s ton-kilometer achievements for FY2014**

![Logistics sector’s ton-kilometer achievements for FY2014](image)

**Energy efficiency in steelmaking by country (2012)**

![Energy efficiency in steelmaking by country (2012)](image)

**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.

**Global CO2 emissions from fossil fuel combustion**

![Global CO2 emissions from fossil fuel combustion](image)

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

![Breakdown of CO2 emissions from fossil fuel combustion](image)

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, or by reusing waste plastics and discarded tires. As a result of these efforts, the NSSMC and affiliated electric furnace companies consumed 1,100 PWh of energy and emitted 96 million tons (preliminary) of CO2 in FY2014.

6 Affiliated electric furnace companies and other companies: Dongha Steel Co., Ltd., Gade Steel Ltd., Nippon Steel & Sumitomo Stainless Steel Corporation, Nippon Steel Works Ltd., Nippon Coke & Engineering Co., Ltd., Three Cooperative Thermal Power Companies (Kyoto, Osaka and Oita) and two Sanso Centers (Hagoe and Oita).

7 The target reduction in CO2 emissions were based on a certain crude steel production assumption.
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 waste, but also is actively engaged in recycling of by-products 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 FY2014, NSSMC produced 44.96 million tons of crude steel and generated 26.05 million tons of by-products. The majority of these by-products were recycled inside and outside the company. Approximately 230,000 tons were ultimately disposed, making our recycling ratio reach 99%.

NSSMC’s final disposal amounts

Recycling 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 steelmaking processes. The rest is used for forest roads and farm roads, as well as for weed beds and creation of wetlands and tideland. 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 beds and creation of wetlands and tideland. 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 beds and creation of wetlands and tideland.

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 heart reduction furnace (RHF) at Kimitu Works, Hirohata Works, and Hikari Works. 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.

By-products and Recycling

Recycling of waste plastics and waste tires

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

Recycling of waste plastics and waste tires

Nippon Steel & Sumitomo Metal Corporation Sustainability Report 2015

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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 windscreeners 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 6.2 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.

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.

Chemical substances discharge control
Comprehensive control of discharge
NSSMC appropriately manages and tries to improve the production, handling, and discharge or disposal of chemical substances in accordance with the PRTR Act, Chemical Substance Control Law, Volatile Organic Compounds (VOC) 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 steelmaking 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 Public 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 become subject to control under the Air Pollution Control Act of 1994, as amended.

Steelmaking manufactures tons of steel with dimensions measured in microns and nanos
Visitors to steelworks may be surprised by the gigantic production facilities and products. Despite such largeness, steel-making is controlled in units of microns and nanos.

As the metallic structure of steel changes by the temperature and the speed of change in temperature, finely-tuned temperature control is necessary for us to be able to produce the quality of materials our customers require. Production method and know-how to bring out such diverse characteristics is based on the analysis technology that explores the nature of materials.

At our research institutes, structural change of materials caused by external great force, heat, or other stress factors are observed and measured by using electronic microscopes and other devices. A variety of materials can be designed by predicting changes on those materials. Based on such basic research, we can come out with products having the characteristics required by our customers.

As such, NSSMC also analyzes possible internal changes in steel during the manufacturing process, making best use of its world-class facilities and know-how, and manufacture many tons of eco products to specifications in units of microns and nanos.

Case of Akashi Kaikyo (Strait) Bridge
The Akashi Kaikyo Bridge, the longest suspension bridge in Japan (4 km in length), has been realized by NSSMC’s high-strength steel cables, which were developed by using the analysis technology at the level of microns and nanos.

Case of high-tensile-strength steel materials
Steel sheets for automobiles are required to be light for better fuel economy and reduction of CO2 emissions, 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 steel-making 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.
Environmental measures at steelworks

NSSMC is implementing a variety of environmental measures against the range of risks inherent to each of its steelworks and manufacturing sites. In addition, many steelworks have been working on the “Creation of Hometown Forests” to preserve the natural environment.

**Raw material yards**

- 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 iron ore and coal to restrain the scattering of raw materials.

**Upstream operation (iron and steelmaking)**

- Prevention of scattering of dust; desulfurization and denitrification:
  - Electric dust collectors:
  - Wet type desulfurization equipment:
    - The wet desulfurization method enables S0x in emission gas to be eliminated.
- Water purification; prevention of abnormal waste water:
  - Filtration equipment (secondary treatment): Undissolved residues in the treated waste water are filtered by a sand layer and removed.

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

- Waste water closing gate: Waste water flow is shut in case of trouble.
- Waste water automatic monitoring equipment: The water quality of waste water is automatically monitored.

**Local environmental activity**

In cooperation with local residents, employees clean the nearby beach.
Our Group’s products, having advanced or highly specialized functions, technological capabilities, and reliability, 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.

NSSMC’s eco-friendly products help reduce environmental burden

NSSMC’s environmental management

ECONOMY PRODUCTS (What we produce is “eco-friendly”)

Titanium alloy connecting rods of supersport motorcycles (Transportation and construction machinery)

NSSMC’s proprietary Al-5%, Fe-1%, Ti-based alloy contributes to weight reduction of the connecting rod, which consumes reciprocating motion of the piston into rotating motion of the crankshaft, and to smarter use of precious resources.

Corrosion-resistant SuperDyma™ galvanized sheets

SuperDyma™ is highly corrosion resistant and lasts four times longer than conventional products. According to planning and out-cut surfaces are unnecessary, all such costs are eliminated. The sheets’ weight less, and are eco-friendly building material well suited for various applications.

Wheelsets (wheels and axles) for high-speed railways (Railway, automotive, & machinery parts; Transportation and construction machinery)

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

External-dimension constant H-shape (Hyper-Beam)

NSSMC’s HYPERBEAM H1515 (1515 × 1515 × 15) is a high-performance materia steel for use in construction. It makes structural design with increased earthquake resistance possible. Weighing about 15% less than the comparable conventional steel, it is also economically efficient. This steel is contributing to Japan’s National Resilience Initiative, specifically for the enhancement of social infrastructure.

Low noise gear units

NSSMC’s gear units have reduced the level of noise by about 10 decibels compared to conventional products. This was achieved by raising the precision of the meshing of gears, which resulted in reducing noise-producing vibrations.

Steelmaking slag (KATAMA™ SP)

KATAMA™ SP is a superior material that features sufficient strength for use as paving, which can be placed simply by compaction with water. As this material is not to be disposed by landfill and needs formation efforts, it can help decrease maintenance repair and other related costs.

Ni-7% steel sheet for LNG storage tanks

Steel sheet for storage tanks needs to have high-fracture toughness and strength under extremely low temperatures and lives. For this reason, steel that obtains a higher percentage of quenched hardenability is used. The ultrahigh Ni-7% steel has obtained the amount of 34% quenched hardenability about 35% heat treatment performance equivalent of high-strength medium carbon steel.
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.*

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. 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 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.

### Materials production

- **Iron ore**
- **Coal**
- **Electric furnace**
- **Blast furnace**

### Car making according to LCA-based environmental specifications

**Car body made of conventional steel sheet**

<table>
<thead>
<tr>
<th>Material</th>
<th>Weight of material (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>2.3</td>
</tr>
<tr>
<td>Aluminum</td>
<td>1.3</td>
</tr>
<tr>
<td>Magnesium</td>
<td>1.1</td>
</tr>
<tr>
<td>CFRP</td>
<td>0.6</td>
</tr>
<tr>
<td>LFRP</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Car body made of high-tensile steel**

<table>
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</table>

**Car body made of lightweight and other material car body**

<table>
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<th>Material</th>
<th>Weight of material (kg)</th>
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</table>

**CO2 emissions when vehicle is driven**

- **Car body made of conventional steel sheet:** 100 kg CO2e
- **Car body made of high-tensile steel:** 75 kg CO2e
- **Lightweight and other material car body:** 45 kg CO2e

**CO2 emissions at time of manufacturing**

- **Conventional steel sheet:** 130 kg CO2e
- **High-tensile steel:** 100 kg CO2e
- **Lightweight and other material car body:** 45 kg CO2e

**Viewpoint based only on vehicle fuel efficiency requirements**

- **How about CO2 resulting from material manufacturing and recycling?**
- **Low**
- **High**

**Consideration from manufacturing to material recycling**

In addition to the driving stage (vehicle fuel efficiency), it is necessary to consider the entire life cycle, including the manufacture and recycling of materials.

**IF the car body is lightened, CO2 emissions can be reduced**

- **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 CO2 emission in manufacturing.**

**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 emission in driving but emit more CO2 during material manufacturing.**
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, the Global Superior Energy Performance Partnership (GSEP), and 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 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 in total. This is equivalent to a 4% reduction in Japan’s annual CO2 emission. Japan’s steel industry, including NSSMC, is currently working on various projects to introduce Japan’s advanced technology in this area to other countries.

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.

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 has 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.

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.

Overseas steel industry’s CO2 emission reduction effects by introducing Japan’s energy-saving equipment (Fiscal 2013, JRF)

The steel industry in India is undergoing rapid development, building new steel works and introducing new equipment with the aim of 300 million tons of crude production by 2025. At the same time, we are facing serious environmental issues such as air and water pollution. In such an environment, the NSSMC Group is contributing to the industry by introducing the CDQ project and other eco-friendly technology to India. When I visited the Kirtilas Works in Japan, I was impressed with how byproduct gases and waste heat are used for energy saving. Environmental conservation is indispensable in sustainable development of the steel industry. Serving as an intermediary between Japan and India, I am determined to contribute to energy saving and environmental improvement of the Indian steel industry.

Country/Region Year of launch Major activities and topics in fiscal 2014
China 2005 Exchange between experts on advanced technologies for energy saving and environmental preservation
India 2011 Exchange among public and private steel-related parties Prepared the List of Energy-Saving Technologies suitable for India NSSMC’s depiction of the methods to calculate CO2 emission in Delhi, in March 2015
U.S., EU, China, India, and South Korea 2011 OECD’s Steel Sector Working Group (with Japan as the chair) Discussion on steelworks energy issues with public and private participants of various countries NSSMC’s depiction of ISO14404-based energy management in Paris, in September 2014
ASEAN 2013 Exchange among public and private steel-related parties Prepared the List of Energy-Saving Technologies suitable for AS/NZS Evaluation of Nippon Steel’s steelworks in Singapore

CO2 reduction units

Total 50.62 million tons per year
**Contributing to a Hydrogen-Based Society**

The NSSMC Group provides advanced materials for the realization of a hydrogen-based society.

### Advanced materials for fuel cell vehicles

Toyota Motor Corporation launched the Mirai, its first fuel cell vehicle (FCV) that runs on hydrogen instead of gasoline, and construction of the first hydrogen stations for fueling FCVs began. Progress has been made recently toward the realization of a hydrogen society.

A fuel cell is a device that converts the chemical energy from a fuel into electricity through a chemical reaction of positively charged hydrogen ions with oxygen in the air. A fuel cell vehicle uses a fuel cell to power its on-board electric motor. As a fuel cell vehicle emits only water but no CO₂ while running, it is considered a promising, ultimate eco-friendly vehicle.

![Fuel cell vehicle (FCV)](image)

**Basic structure of a fuel cell vehicle**

*FC stack + Hydrogen tank*  
*Motor*  
*Battery*

However, fuel cells are located in highly corrosive environments and require materials with high corrosion resistance. Using an unusually versatile material, that has outstanding lightness, strength, and corrosion resistance, NSSMC has developed a method of manufacturing special rolled titanium foil to cope with the corrosion. Our material has been adopted for fuel cell parts (the parts that make up the cells inside the fuel cell stack) of the Mirai fuel cell vehicle produced by Toyota Motor Corporation.

Just like an electric vehicle and a hybrid vehicle, a fuel cell vehicle is powered by a motor, a device that converts electrical power to motive force. NSSMC’s electromagnetic steel sheet is used in the motor core and contributes to world-class efficiency of this part. Our electromagnetic steel sheet has also been adopted for Toyota’s Mirai fuel cell vehicle.

In addition to components that are used specifically in FCVs, such as the above, other NSSMC materials are used in FCVs. They include our high-tensile high-strength steel sheets that help reduce automobile weight while ensuring collision safety performance.

### Electrolysis of water

![Electrolysis of water](image)

Water \[\rightarrow\] Hydrogen \[\rightarrow \text{Motor} \rightarrow \text{Battery}\]

**Fuel cell (reverse reaction to the electrolysis of water)**

![Fuel cell](image)

Water \[\rightarrow\] Oxygen \[\rightarrow\] Electricity \[\rightarrow\] Hydrogen

**Material needed for a hydrogen-based society**

**Infrastructure such as hydrogen stations**

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

Diffusion of eco-friendly fuel-cell vehicles 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 where it can cause brittleness and a tendency for fracture to occur. In a high-pressure environment, this issue becomes more problematic. By blending additives to stainless steel and developing a certain 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™, whereby a contribution is made to reduction of construction and maintenance costs. This is in sharp contrast to the case of SUS316L which requires coupling pipes with screws, and requires hundreds of joints and a large number of construction processes to build one hydrogen station.

HRX19™ is therefore the most appropriate material for high-pressure hydrogen pipes and can be used for pipes in hydrogen stations, dispensers, and fuel cell vehicles. NSSMC is committed to providing steel materials to help accelerate the construction of infrastructure needed for the realization of a hydrogen-based society.

### Provide hydrogen stations

Nippon Steel & Sumikin Pipeline & Engineering Co., Ltd. in the NSSMC Group has entered the hydrogen station construction business. The company has contributed to the establishment of energy infrastructure such as natural gas pipelines and LNG plants for over 50 years. In the field of hydrogen infrastructure as well, it has experience in constructing a hydrogen station at the 2005 World Exposition in Aichi, Japan, and in constructing the first hydrogen pipelines in Japan for the Kitakyushu Hydrogen Town project. In addition to these advanced engineering achievements, the company formed an alliance with U.S.-based Air Products and Chemicals, Inc.—the world’s leading company in the supply of hydrogen—in February 2014, and will contribute to the realization of a hydrogen society through the construction of hydrogen stations with excellent safety and reliability.

### Evaluation technology used in high-pressure hydrogen gas environments

Nippon Steel & Sumikin Technology Co., Ltd. in the NSSMC Group also support the realization of a hydrogen-based society by engaging in the business of evaluating materials used in hydrogen stations and fuel cells, through tensile tests, fatigue tests, and other tests in high-pressure hydrogen gas environments.

[Image: Nippon Steel & Sumikin Pipeline & Engineering’s hydrogen station]

[Image: Fatigue test]
In order to realize a sustainable society, companies have to take effective initiatives to live in harmony with nature. Among eco-solutions that companies can adopt, the creation of hometown forests and sea forests has been hailed as a great success. This concept, introduced by Dr. Akira Miyawaki, is a forest creation method that effectively contributes to the conservation of biodiversity and CO₂ sequestration. The following text explains the concept and its implementation in Japan.

**“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 900 hectares (about the size of 190 Yankee Stadiums).

**Conserving biodiversity and sequestering CO₂**

Wild birds such as bunbuls and eagles gather and animals such as Ezo red fox and deer visit the forests we make and maintain at our steelworks 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.

**Iron protects and nurtures living creatures**

Iron is believed to account for one-third of the earth’s weight. It is iron that forms the earth’s core and creates a gigantic magnetic field. This magnetic field is a protective barrier against the solar wind and pushes away a continuous flow of charged particles in the solar wind, which is a protective barrier against the solar wind. We humans are powered by energy, which is created by receiving electrons via iron ions and gradually carry out oxidation-reduction reactions.

That is why we could say that iron protects and nurtures living creatures on the face of the earth.

**Iron in the Body**

An adult male of 70 kg weighs 4.5 g of iron in the body. About 3/4 of this amount, which is contained in hemoglobin, is in the red blood cells. Hemoglobin, which mainly contains iron, carries oxygen from the lungs to the rest of the body.

The second role is to efficiently transport electrons for producing energy. We humans are powered by energy, which is created by receiving electrons via iron ions and gradually carry out oxidation-reduction reactions.

**Geomagnetic field**

The geomagnetic field made of iron deflects harmful cosmic radiation and has thereby ensured that the surface of the earth is a safe environment for living creatures.

Source: EIA & NASA

**“Creation of Sea Forests”**

Implemented in 35 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 “Beverly Series,” iron supply units composed of steel slugs, humus, and soil and steel slag and has been promoting regeneration of seaweed beds by use of these units.

Some animal inhabitants of the Hometown Forests

<table>
<thead>
<tr>
<th>Area</th>
<th>Animal Inhabitants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nagasaki</td>
<td>Some animal inhabitants of the Hometown Forests</td>
</tr>
<tr>
<td>Fukuoka</td>
<td>Fukuoka (Kitakyushu, Kagoshima, Saiki, Kunisaki)</td>
</tr>
<tr>
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<td>Osaka (Nakasagamachi, Iwakuni, Saiki, Sabetsu)</td>
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**Some animal inhabitants of the Sea Forests**

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</thead>
<tbody>
<tr>
<td>Nagasaki</td>
<td>Nagasaki (Saiki, Sapporo, Mjiharu, Ito, Ishikawa, Shikoku)</td>
</tr>
<tr>
<td>Osaka</td>
<td>Osaka (Osaka Steel Works, Osaka, Yuraku, Osaka, Kobe, Osaka, Mie)</td>
</tr>
<tr>
<td>Kochi</td>
<td>Kochi (Kobe, Osaka, Kobe, Osaka, Mie)</td>
</tr>
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</tbody>
</table>

**Creating Hometown Forests and Creation of Sea Forests**

In order to realize a sustainable society, companies have to take effective initiatives to live in harmony with nature. Among eco-solutions that the Nippon Steel & Sumitomo Metal Corporation (NSSMC) Group provides, “Creation of Hometown Forests” and “Creation of Sea Forests” are two ongoing activities, which we believe are well representing our policy initiatives in this regard. Let us provide an update on both.
Innovative technical development

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.

The COURSE 50 Project (Technological Development and Innovative Steelmaking Process)

Since FY2008, 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 50 (COURSE 50) Project” which is aimed at developing 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 curtail CO2 emissions from blast furnaces as well as technology that uses hydrogen-unsaturated exhaust heat to separate and recover CO2 from blast furnace gas.

Regarding iron ore hydrogen reduction technology, by FY2012, we comprehended hydrogen reduction characteristics at a laboratory bench level, participated property elucidation 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 Kimitsu Works. With regard to CO2 separation and recovery technologies, verification tests of CO2 separation and recovery from blast furnace gas were conducted at Kimitsu 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 (FY2013 to FY2017), which began in FY2013 as a project sponsored by NEDO (New Energy and Industrial Technology Development Organization) in preparation for commercialization in 2030, we are verifying technologies to reduce CO2 emissions from a blast furnace in a comprehensive manner. We are leading R&D efforts mainly in the research on a test blast furnace which aims for establishing reaction control technologies that maximize effects of hydrogen reduction, as well as in the additional verification tests that target advanced hydrogen amplification of the coke oven gas and in research on highly-efficient heat exchangers. (The test blast furnace is being constructed by incorporating individual element technologies that were acquired during the Phase 1 and is scheduled to start operation for the main test in FY2016 at the Kimitsu Works. The additional verification test is conducted in the Munron Works, via Hydrogen amplification technology to reduce CO2 emissions in the steelmaking process.)

Next-generation coke-making technology ("SCOPE 21")

Coke, which is carbonized coal, is indispensable in production of steel materials. As raw materials for coke, high-quality caking 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: coal pretreatment, carbonization (destructive distillation of coal 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 31%, further improving environmental conditions. We began operation of the first commercial model that fully embodies the innovative environmental technology "SCOPE 21" at our Oita Works in May 2008. Based on this experience, the second commercial model began operation at our Nagoya Works in June 2013. Both models have been operating smoothly up to the present.

R&D group of approximately 800 researchers

Total number of patents held

Approximately 25,000 patents issued in around 70 countries

The Environment Research Lab. in the Advanced Technology Research Laboratories is the only research division at NSSMC with the name “environmental.” It promotes research on fundamental technologies that support various endeavors to reduce the impact of steel works on the environment and also promotes the development of new products in the environmental and energy fields for engineering businesses and chemical businesses. The former supports steelmaking processes that are the most environmentally friendly in the world through fundamental research on highly-efficient waste water treatment technology, technology to measure air pollution substances, and technology to reduce the amount of these substances emitted; technology to make use of slag, a by-product of the steelmaking process, in fertilizer and other products, and technology to convert steel by-product gases to hydrogen and convert carbon dioxide to useful chemical products. The latter entails the development of products that will be key to the realization of an energy-saving society with reduced environmental impacts, such as catalyst materials that convert fuel gas to liquid fuel, electronic materials for fuel cells and lithium-ion batteries, and materials that selectively absorb oxygen. Chemistry-related researchers that specialize in fields such as biochemistry, organic chemistry, inorganic chemistry, catalytic chemistry, and electrochemistry are pursuing leading-edge research and development based on theories and principles.

VOICE

Hitoshi Dohnomae
General Manager of the Environment Research Laboratory, Advanced Technology Research Laboratories, Technical Research & Development Business

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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 environmental risks are promoted by combining internal and external audits and following the plan-do-check-act (PDCA) cycle.

Environmental management system

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

Annual environmental management cycle

In accordance with the international standard ISO 14001, NSSMC has built an environmental management system, with each steelworks or facility general manager serving as the responsible person. Each year, in addition to an internal audit of each steelworks or facility and a management review by its general manager, each steelworks or facility and factory is audited by the Head Office Environment Department.

For the group companies including those overseas, a direct interview is conducted by a member of the Head Office Internal Control/Audit Department to improve management levels. This is part of the corporate governance conducted by the Head Office Internal Control/Audit Department.

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 environmentally-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 17.3 billion yen in total for FY2014: 12.8 billion yen for investment in equipment for environmental measures and 4.5 billion yen for investment in energy-saving equipment. The aggregate amount accounted for approximately 6% of the total cost of equipment investment.

On the expenses side, environmental expenses were 89.9 billion yen in total and included 46.2 billion yen for atmospheric prevention costs and 11.8 billion yen for water contamination prevention costs. In addition, 9.2 billion yen was spent as environmental research and development costs.

As environmental measures, we invest in preventive measures for dust emissions, visual smoke emitted from steelworks chimneys, 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.

Among the environmental preservation costs, atmospheric prevention costs including measures to prevent 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, 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 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 further to preserve the environment and conserve energy.

Environmental preservation costs

<table>
<thead>
<tr>
<th>Item</th>
<th>Definition</th>
<th>2014/2016</th>
<th>Billion yen</th>
</tr>
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<tbody>
<tr>
<td>Pollution Prevention Costs</td>
<td>Cost of measures against pollution</td>
<td>11.6</td>
<td>46.1</td>
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<tr>
<td></td>
<td>Cost of collection of recycling, maintenance costs, sewer gas dilution and emissions</td>
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<tr>
<td></td>
<td>Treatment costs (steam, material costs, and labor)</td>
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<tr>
<td></td>
<td>Total</td>
<td>11.6</td>
<td>46.1</td>
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<tr>
<td>Global Warming Prevention Costs</td>
<td>Costs of reducing energy consumption</td>
<td>4.5</td>
<td>3.3</td>
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<td></td>
<td>Maintenance costs for internal power consumption</td>
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<td></td>
<td>Energy efficiency improvement for internal power consumption</td>
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<tr>
<td></td>
<td>Total</td>
<td>4.5</td>
<td>3.3</td>
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<tr>
<td>Costs of Recycling Resources</td>
<td>Cost of recycling</td>
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<td></td>
<td>Treatment of general waste from business activities</td>
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<td></td>
<td>Expenses incurred in the treatment of general waste from business activities</td>
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<tr>
<td></td>
<td>Total</td>
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<tr>
<td>Environmental Management Activity Cost</td>
<td>Environmental preservation costs</td>
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<td></td>
<td>Expenses required for creation of green areas</td>
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<td></td>
<td>Expenses incurred in the treatment of general waste from business activities</td>
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<td></td>
<td>Total</td>
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<tr>
<td>Research and Development Costs</td>
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<td></td>
<td>Development costs (including personnel costs) required for environmental measures</td>
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<td>Total</td>
<td>4.8</td>
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<td>Social Activity Costs</td>
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<tr>
<td></td>
<td>Expenses required for creating green areas</td>
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<tr>
<td></td>
<td>Expenses incurred in the treatment of general waste</td>
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<tr>
<td></td>
<td>Total</td>
<td>3.7</td>
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<tr>
<td>Other Environmental Costs</td>
<td>Other costs</td>
<td>5.2</td>
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<td></td>
<td>Expenses for energy-saving measures</td>
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<td></td>
<td>Total</td>
<td>5.2</td>
<td>5.2</td>
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<tr>
<td>Total</td>
<td>Environmental preservation cost</td>
<td>17.3</td>
<td>26.9</td>
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</table>

Reference: Net income (consolidated basis) 254.2
Corporate Governance

In line with its Corporate Philosophy, Nippon Steel & Sumitomo Metal Corporation (NSSMC) aims to build a dynamic NSSMC Group. To that end, we have adopted a “Company with Audit and Supervisory Board”. Corporate governance system and have introduced an executive office system to ensure the proper execution of business activities and clarify responsibilities for the results of each business unit.

The Board of Directors adequately and swiftly makes decision regarding the Company’s important business activities and oversees the execution of duties by Directors, while the Audit and Supervisory Board Members oversees the execution of duties by Directors from the position of maintaining integrity, objectivity, and independence. By doing this, we seek to ensure management’s efficiency, soundness, and transparency, and enhance corporate governance with the ultimate aim of achieving sustainable improvement in corporate value and being trusted by society.

Corporate Governance structure and internal control system

General Meeting of Shareholders

Directors, Executive Officers, and General Managers in Charge

Corporate Policy Committee

Government Companies

Representative Director and Chairman - General Manager of CSR and Audit

Companywide Committees

Corporate Governance structure

Decision-oriented discussions.

Established as deliberative body to hash out designated themes before the

Corporate Policy Committee

Eligible employees include Nippon Steel & Sumitomo Metal Corporation employees, their family members, and suppliers who have been approved by the Corporate Policy Committee.

Investigation and responses

Requests for advice or report

Employees

Compliance education

We continue to prioritize the improvement of integrity and reliability in our actions. This is the first principle we have stated in the Corporate Philosophy. Through messages from top management, periodic legal training programs, and other activities, we make certain that all employees fully understand NSSMC’s basic policy on corporate governance.

We have prepared original written materials for our employees to conduct fair and appropriate business. We also conduct educational programs and a learning program for each rank of employees to cultivate their strong awareness on compliance.

Internal controls and risk management system

The scope of internal controls and the risk management systems are regularly confirmed through the Audit and Supervisory Board Committee, chaired by the Executive Vice President in charge of Corporate Governance.

Each division and Group company is required to take measures and share information about risk management among NSSMC and its Group companies through regular meetings and other means.

Risk Management List

Grievance Management List

Compliance Management List

Corporate Policy Committee

1 Eligible employees include Nippon Steel & Sumitomo Metal Corporation employees, their family members, and suppliers who have been approved by the Corporate Policy Committee.
Social Report

Nippon Steel & Sumitomo Metal Group and its stakeholders

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.

Collaboration with an NPO, “Mori wa Umi no Koibito”

Since 1989, Mr. Shigetada Hatakeyama, a fisherman cultivating oysters and scallops in Kesennuma City, Miyagi Prefecture, and the leader 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”), 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 2015, approximately 1,500 students and others, including employees of our Group, joined their tree-planting festival.

Internship programs

227 students

We have been offering internship opportunities at steelworks and research centers to students to help them learn about our business and gain some work experience.

Community-based educational support

Providing education on the environment and manufacturing

NSSMC hosts a number of programs in its steelworks nationwide and nearby elementary and junior high schools, such as “ Tataco ironmaking” demonstrations, workshops, and lectures in classrooms.

NSSMC Group

Contribute to society through materializing a sustainable corporate activities

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

We participate in person-to-person exchanges and collaborate with young people and their teachers with regard to our “product manufactur- ing” and environmental initiatives.

We work jointly with various organizations and NGOs in Japan and attend environment- al activities.

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.

We carry out environmental protection activities which match the needs and char- acteristics of local communities, and engage in environmental activities with various stakeholders in our local communities.

We pursue various personnel poli- cies, based on fair treatment of per- sonnel, to ensure that our employees work consistently with pride, enthu- siasm and validity.

We are implementing various health and safety measures so that employees of our company, group companies, and business partners can do their jobs in safe and secure workplaces.

Diverse communication activities

Participation in Eco-Products 2014

In December 2014, NSSMC exhibited products and technologies at Eco-Products 2014, the largest ecological exhibition in Japan, which was held at Tokyo Big Sight (Tokyo International Exhibition Center). Our presentations showed how we addressed environmental and energy issues through our focus on three ecos, and attracted the attention of many visitors.

Environmental conservation in local communities

Environmental conservation agreements

Each of our steelworks in Japan has concluded an environmental conservation agreement (anti-pollution agreement) and an agreement for the greening of plant sites with their local municipality. We work hard to fully comply with these agreements, in order to ensure environmental conservation in the local communities.

Awards from external organizations.

NSSMC’s technological advances and response to needs of our customers have been highly evaluated, and we have received various awards from many organizations. NSSMC’s “Creation of Innovative Forests” received the Good Life Award Judging Committee’s Special Award in March 2015.

Mecenat

Kioi Hall

The Nippon Steel & Sumitomo Metal Arts Foundation operates the Kioi Hall (in Chiyoda-ku, Tokyo), where it holds classical concerts by Kioi Sinfonietta Tokyo. The foundation also helps popularize traditional Japanese music by using the Kioi Hall’s small hall exclusive for Japanese music performance, a rare type of hall even in Japan.
Third-party opinion

Yuko Sakita
Journalist and environmental counsellor

Overall report
I have read the Sustainability Report of Nippon Steel & Sumitomo Metal Corporation (NSSMC) published three years after the merger.

Owing to the advance of global industrialization, the need for the development of community infrastructure is high in each country and steel demand is growing. This is an industry that consumes a large amount of energy, and as a business operator with a large environmental impact that includes CO2, NSSMC aims to contribute to the reduction of CO2 emissions worldwide through world-leading energy efficiency technologies and high-quality steel materials. I highly commend the accuracy of NSSMC’s point of view as “the world-leading steelmaker with comprehensive strengths,” as outlined in the Message from Top Management.

This report communicates corporate activities related to the environment and society to various stakeholders, and making use of it is important for citizens, society and investors as well as operating communities and employees. It initially presents negative information as well and illustrates in an easily understandable way overall business activities by categorizing them into “the three ecos (eco process, eco products and eco solution) + innovative technology development” as the value chain.

In addition, I believe it was carefully prepared with the aim of disseminating information and providing communication. For example, it not only quantifies the energy efficiency and CO2 emissions volumes of overall operations but also the lifetime environmental impact of products based on UCA.

Environmental report
In the case of the “eco process,” which endeavors to reduce environmental impacts in the process of manufacturing, the power self-sufficiency rate is 84%, the rate of use of waste heat in steam generation is 87%, the rate of use of by-product gases is 100%, the rate of use of by-product gases is 100%, the rate of use of waste heat in steam generation is 87%, the rate of use of by-product gases is 100%, the rate of use of waste heat in steam generation is 87%, the rate of use of by-product gases is 100%, the rate of use of waste heat in steam generation is 87%, the rate of use of by-product gases is 100%, the rate of use of waste heat in steam generation is 87%, the rate of use of by-product gases is 100%, the rate of use of waste heat in steam generation is 87%, the rate of use of by-product gases is 100%, the rate of use of waste heat in steam generation is 87%, the rate of use of by-product gases is 100%, the rate of use of waste heat in steam generation is 87%, the rate of use of 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