

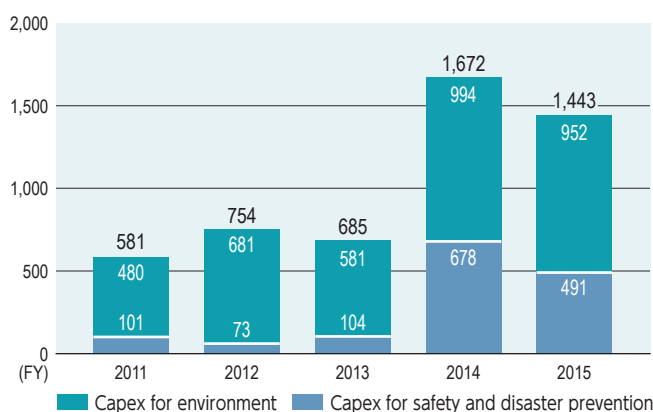
# Environment, Safety and Climate Change Strategy

## Capital Investment for the Environment and Safety and its Economic Effects

### Investment:

We have made active capital investments such as changing the feedstock for manufacturing ammonia at the Toyama Plant in our efforts to reduce GHG emissions. We also renovate aging facilities in a well-planned manner to ensure safety, disaster prevention and maintain safe operations.

Capex for environment and safety [million yen]



### Economic effects:

The measures we took for environmental protection, such as the reduction of steam at Toyama Plant and conversion of waste organic solvents into fuels at Onoda Plant, produced the following economic effects in FY2015.

Type of cost reduction	Amount [million yen]
Energy saving	173
Resource saving	49
Reuse and recycling	32

## Energy Consumption and Energy Consumption Rate

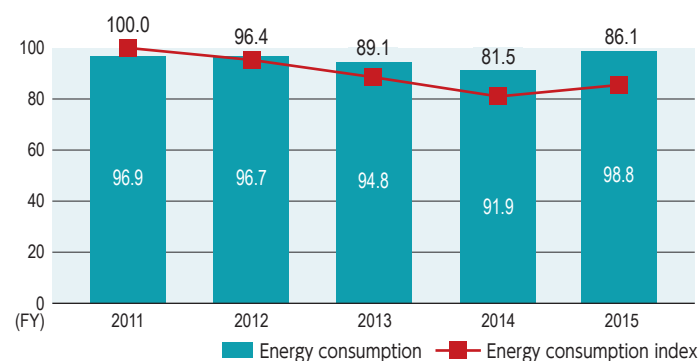
### Production and research:

In accordance with the Act on the Rational Use of Energy, we collect data on the amount of energy consumed at all of our business establishments and submit this data to the national government, along with data on our energy consumption rate. The amount of energy we consumed in FY2015 increased from the previous fiscal year by approximately a crude oil equivalent of 7,000 kiloliters. This is attributed to an increase in the production volume of products that consume a lot of energy. We have a product matrix that covers a wide range of products, from commodity chemicals to agrochemicals, pharmaceuticals and functional products for electronic materials. This makes it difficult to evaluate the energy consumption rate based on the simple quantity of production, which is why we calculate it based on sales. Our energy consumption rate had been improving over the last several years, but it increased by 4.6% year on year in FY2015. This is thought to have been the result of reducing the prices of our main products that we produce at our plants.

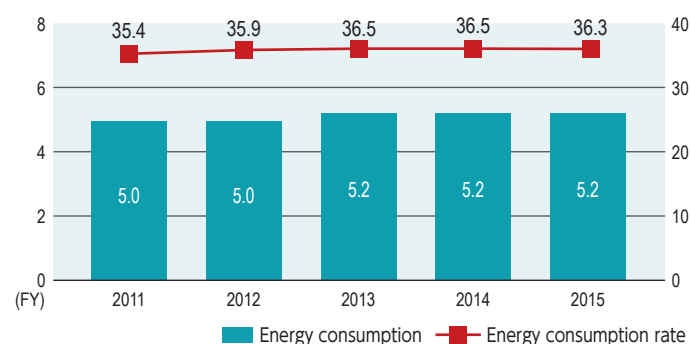
### Logistics:

As a cargo owner, we work together with Nissan Butsuryu Co., Ltd., a group company which handles our logistics operations, to promote the rational use of energy for transportation. In FY2015, our energy consumption rate improved from the previous fiscal year, while the amount of energy consumption in crude oil equivalent was almost unchanged from the previous fiscal year. We will continue striving to improve our energy consumption rate through measures such as promoting modal shifts, replacing vehicles with energy-saving and practicing eco-driving.

Energy consumption (crude oil equivalent 1,000kl) and energy consumption index (FY2011 as a base of 100) in production and research



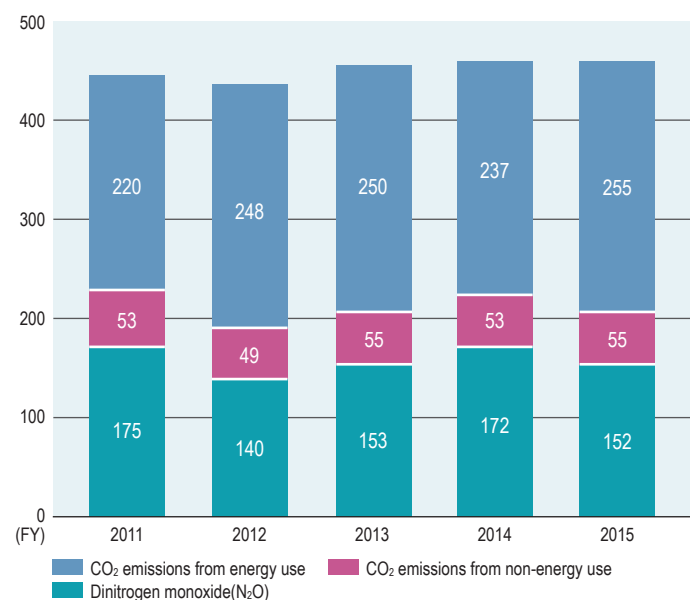
Energy consumption (left axis: crude oil equivalent 1,000kl) and energy consumption rate (right axis: kl/1 million ton kilo) in logistics



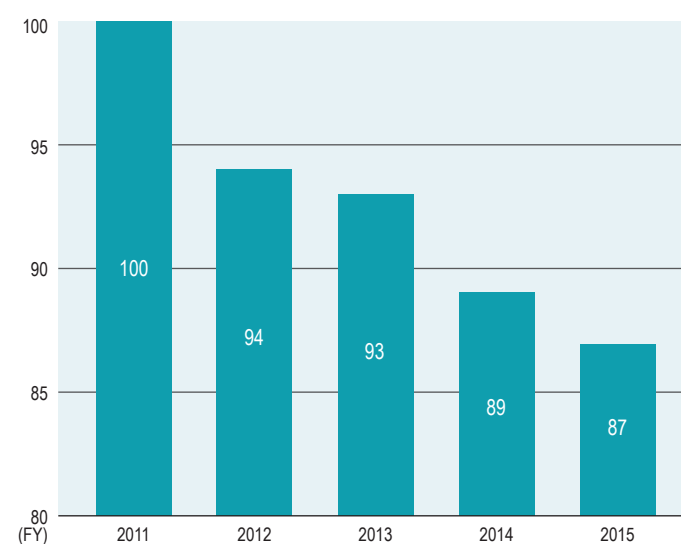
## Reduction of Greenhouse Gas Emissions

In accordance with the Act on Promotion of Global Warming Countermeasures, we collect data on the emissions of carbon dioxide (CO<sub>2</sub>) and other greenhouse gases from all of our business establishments, including our plants, laboratories, and head office, and report this data to the national government. In FY2015, our CO<sub>2</sub> emissions increased from the previous fiscal year, but there was a decline in dinitrogen monoxide (nitrous oxide, or N<sub>2</sub>O) emissions, and overall greenhouse gas emissions remained almost unchanged from the previous fiscal year. However, the GHG emission rate, which is calculated as the ratio between emissions and sales (emission/sales), fell steadily over the course of five years from FY2011 to FY2015. Compared to FY2011, the GHG emission rate was reduced by 13% in FY2015.

GHG emissions [1,000 tons - CO<sub>2</sub>]



Index of the GHG emission rate (FY2011 as 100)



### TOPICS

## Initiatives for Preventing Climate Change

### 1. Toyama Plant: Switching from Naphtha to Natural Gas

In August 2016, the Toyama Plant switched from naphtha to natural gas as the feedstock used for ammonia. It will also consider switching to natural gas as the fuel for melamine furnaces and boilers.

Natural gas does not generate any sulfur oxide or soot dust when it is burned. The amount of CO<sub>2</sub> and NO<sub>x</sub> (nitrogen oxide) emitted by natural gas is 30% to 40% less than that of petroleum, thereby helping to protect the global environment and prevent climate change.

### 2. Onoda Plant: Reuse of Waste Organic Solvents

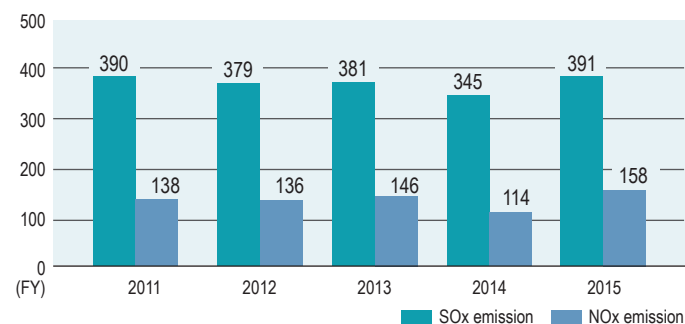
The Onoda Plant, which mainly produces organic fine chemicals, takes the waste organic solvents for column cleanup and the cleaning of pharmaceuticals and agrochemicals and uses them as boiler fuel. The waste organic solvents selected for reuse are those that pose no risk of generating toxic gases, such as SO<sub>x</sub> and NO<sub>x</sub>, and are free of chlorine. In the past, heavy oil was used as boiler fuel, and all waste organic solvents were incinerated by an industrial waste disposal operator. The reuse of solvents has not only reduced CO<sub>2</sub> emissions from the plant but also produced benefits in terms of cost.

We will continue to work patiently to tackle climate change.

## Control of Exhaust Gas

We control exhaust gas by observing the discharge standards stipulated in the Air Pollution Control Act and regulatory values based on agreements with local communities. We maintain the proper conditions in our desulfurization facilities and denitrification facilities in an effort to control the emissions of air pollutants such as sulfur oxide (SOx) and nitrogen oxide (NOx).

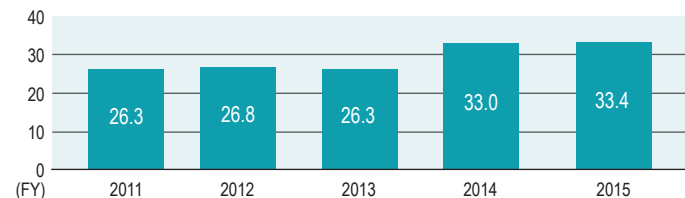
SOx emission / NOx emission [ton]



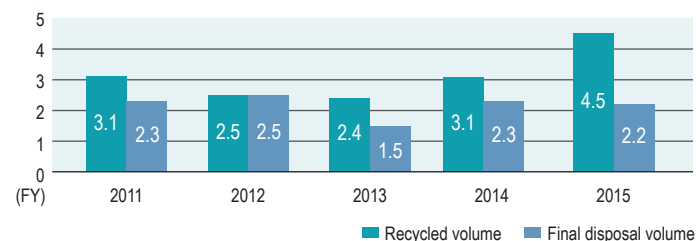
## Reduction of Waste

We thoroughly implement control measures to ensure the proper disposal of waste, while also striving to reduce industrial waste. Where we outsource waste treatment, we conduct on-site inspections of the waste disposer to confirm that our waste will be disposed properly, and check the travel distance of waste, destinations, and other details with their manifest. This approach enables us to monitor the entire process to the final disposal. Waste water discharged in the manufacturing process accounts for the majority of our industrial waste. We treat this waste internally by means of combustion. As for solid waste, we reuse sludge as feedstock for the base course material of roads and cement. We also promote the recycling of waste plastics in an effort to reduce the final disposal volume. The amount of waste generated began to rise in FY2014 due to an increase in the production volume of organic fine chemicals and flame retardants.

Waste volume [1,000 tons]



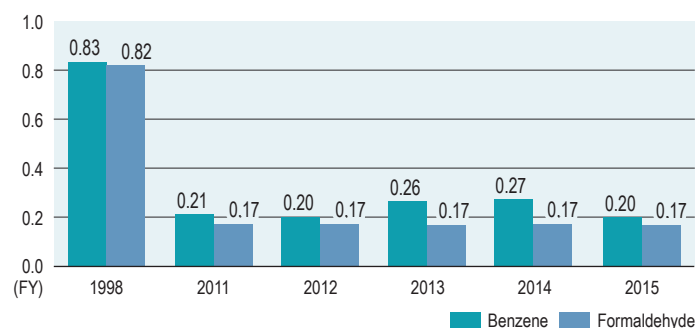
Recycled volume / Final disposal volume [1,000 tons]



## Reduction of Emissions of VOCs

We regularly take initiatives to reduce emissions of volatile organic compounds (VOCs), which cause the formation of photochemical oxidants. We have not emitted any 1,2-Dichloroethane into the atmosphere since 2006 due to the introduction of VOC eliminators and other initiatives. Our emissions of other VOCs (benzene and formaldehyde) have also remained at around 25% of the level of 2006 and earlier.

Emissions of organic air pollutants [ton]



## Reduction of Emissions of PRTR Substances

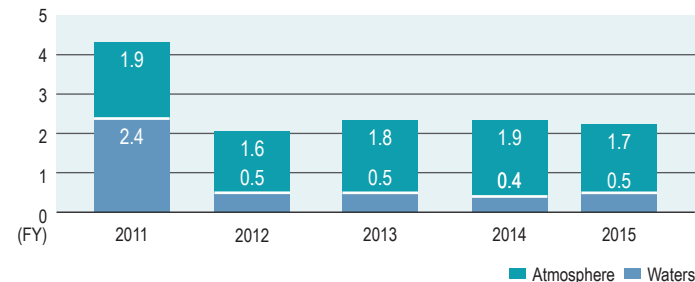
In FY2015, we emitted 62 chemical substances whose emissions are must be registered in accordance with the Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof (PRTR law). The main substances emitted were formaldehyde and n-hexane. Formaldehyde is used as a reaction solvent, while n-hexane is found in naphtha, which is used as a fuel or feedstock.

Emissions of PRTR substances [ton]

Substance	Emissions				
	FY2011	FY2012	FY2013	FY2014	FY2015
Formaldehyde	2.4	0.5	0.5	0.4	0.5
N-hexane	1.2	1.2	1.4	1.4	1.3
Others	0.7	0.3	0.4	0.5	0.4
Total	4.3	2.1	2.3	2.3	2.2

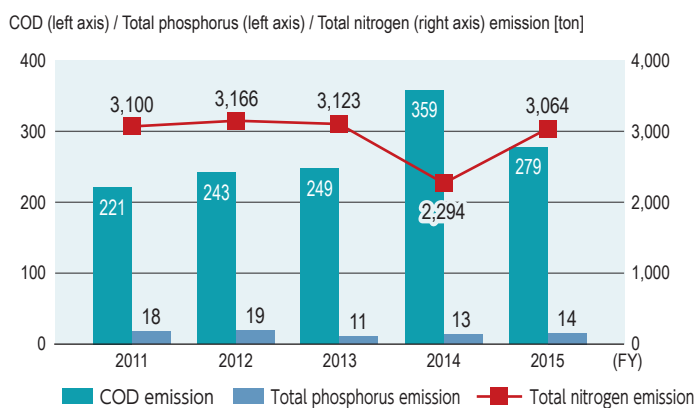
We emit a total of 2.2 tons of these substances, including 1.7 tons to the atmosphere and 0.5 tons to the waters. Total emissions remained almost unchanged from the previous fiscal year, but we have continued to take steps to control them. We did not emit these substances into the soil.

Breakdown of emissions of PRTR substances [ton]



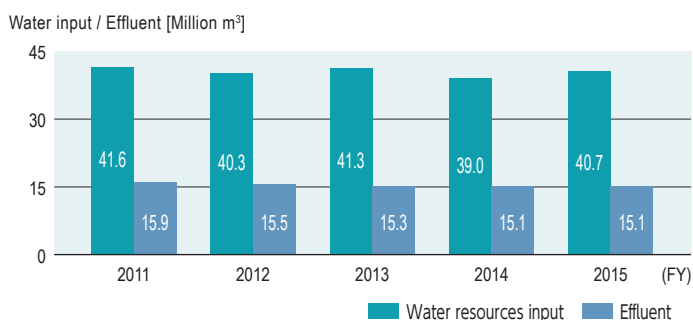
## Control of Waste Water

Our plants observe the discharge standards stipulated in the Water Pollution Control Act and regulatory values based on agreements with local communities. We monitor the chemical oxygen demand (COD) in waste water and the total nitrogen and total phosphorous concentration. There was an increase in the amount of COD discharged in the previous fiscal year due to the malfunction of water discharge facilities. However, improvements to the facilities helped return the amount to normal levels in FY2015. On the other hand, while there was a decrease in the amount of total nitrogen discharged in the previous fiscal year due to the shutdown of the ammonia plant, the level returned to normal in FY2015.



## Efficient Use of Water Resources

At Nissan Chemical plants, we carry out exhaustive water-saving activities by observing environmental laws and regulations and cooperating with local organizations. These activities ensure that our operations do not place a burden on natural water circulation. We also clean waste water before returning it to nature to prevent negatively affecting the environment. The Toyama Plant is located in the city of Toyama at the base of Mount Tate, beneath which there is an abundance of groundwater. We have been promoting the rational use of groundwater as a member of the groundwater water use council in Toyama area, a local council that works to protect the local natural environment and promote the sound development of local communities. Prohibiting the use of groundwater for melting snow and the circulation of water in a cooling tower are some of the measures we employ for the rational use of groundwater. The Onoda Plant is located in Sanyo-Onoda City facing the Seto Inland Sea (Suonada). We have been taking measures to maintain the quality of waste water discharged from the plant in line with the Act on Special Measures concerning Conservation of the Environment of the Seto Inland Sea. We also assist local measures to address the potential shortage of industrial water.



## Biodiversity

At Nissan Chemical, we are fully aware of the fact that biodiversity serves as an important foundation for sustainable society in the future. As a member of international society, we intend to promote activities that contribute to biodiversity by sharing roles and responsibilities with all the people and working together with them. For this purpose, we have established the Nissan Chemical Biodiversity Action Guidelines.

In addition, in October 2015 we participated in the Japan Business and Biodiversity Partnership to promote our initiatives for biodiversity.



### Nissan Chemical Biodiversity Action Guidelines

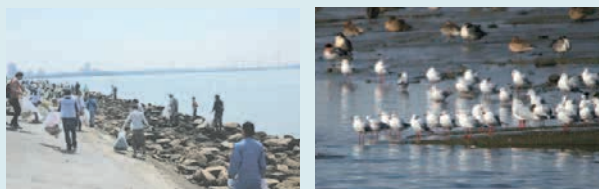
Our corporate philosophy is to “contribute to society in harmony with the environment, based on our excellent technologies, products, and services.” We at the Nissan Chemical Group engage in business activities that take into account biodiversity and help protect the global environment.

- 1) We will understand, analyze, and evaluate the impact of our products on biodiversity throughout their lifecycle and strive to reduce the impact. We will work to preserve biodiversity and ensure the sustainable use of biological resources.
- 2) We will strive to raise each employee's awareness of biodiversity through responsible care activities.
- 3) We will continue to carry out social contribution activities that help preserve biodiversity and earn us the high esteem and trust of society.
- 4) We will disclose the results of these initiatives to deepen the level of communication with society.

## TOPICS

### Clean-up Activities

The Nagoya Plant participates in clean-up activities organized by groups such as the Fujimae-Higata wo Mamoru Kai, an NPO engaged in activities for protecting Fujimae-Higata tidal flat. A tidal flat plays an important role as an ecosystem for food chains of living organisms and natural purification. The clean-up activities aim to maintain the tidal flat as an asset. Fujimae-Higata, a tidal flat in Nagoya Port, is one of the largest stopovers for migratory birds in Japan and a wetland registered under the Ramsar Convention.



## TOPICS

### Nissan Bio-park Nishi-hongo

The development of the Nissan Bio-park Nishi-hongo, which is operated by the Toyama Plant and received the RC Grand Prix Award from the Japan Chemical Industry

Association in 2014, began about 10 years ago on a plot of approximately two hectares of land. It has turf areas, a wetland, a pond, and a creek. Firefly larvae were released in the park as part of the Hotaru Koi

Project, an initiative which aims to nurture Japanese fireflies.

The pond is used for breeding Japanese rice fish, an endangered species. It also serves as a balancing reservoir in the event of flooding. Tulips, sunflowers, Japanese cherry trees, Japanese beech trees, and other plants are planted in the park, which also has tables for cherry-blossom viewing. The Bio-park Support Team, which is made up of former employees of Nissan Chemical, is working together with a group that manages the adjacent flower field to achieve the main objective of the Nissan Biopark Nishi-hongo, which is to "create spaces with biodiversity, mainly waterfront and community-based forests, to provide places where employees of the plant and local residents can relax."



### Interview: Manager of Environment and Safety Section, Toyama Plant

At the Nissan Biopark Nishi-hongo of the Toyama Plant, former employees of Nissan Chemical who are qualified as naturalists, or nature guides certified by the prefectural government of Toyama, serve as guides for visitors to the park.

The ground and square are open to the local residents, and families visit the park to view the cherry blossoms when they are in bloom. We hope to see the plant continue to coexist in harmony with local residents through these activities.



Manager of environment and safety section,  
Toyama Plant **Isao Hinata**

## Promotion of Development and Sales of Environmentally-Friendly Products and Green Products

At Nissan Chemical, we have been working on the development of environmentally-friendly products that diminish the effects of climate change and the environmental impact.

### Compact agrochemical products

We provide lightweight, compact agrochemical products that contain high concentrations of active ingredients, such as granulated wettable powder. This enables us to make a number of contributions, such as reducing CO<sub>2</sub> emissions from packaging materials, waste, manufacturing, and transportation.

### AdBlue®, a high-grade urea solution

AdBlue® is a high-grade urea solution that is used for the urea SCR system, a technology for purifying exhaust gas. AdBlue® helps reduce the environmental impact. When it is sprayed on exhaust gas from a diesel vehicle, nitrogen oxide (NO<sub>x</sub>) is decomposed into nitrogen and water, which are harmless. Demand for AdBlue® has been increasing year by year due to the tightening of regulations on automobile exhaust gas. This trend is expected to continue, so we have established bases for supplying this product in the Kanto, Hokkaido, Hokuriku, Tokai, and Kyushu areas.

### ECOPROMOTE®, nucleating agents for inducing the crystallization speed of PLA.

The ECOPROMOTE® is a series of additives for polylactic acid (PLA), a bioplastic derived from plants such as corn. While PLA is the leading biodegradable plastic in terms of practical application, its uses have been limited because it is plagued by problems with molding processability and heat resistance. The ECOPROMOTE® has a function for promoting the crystallization growth of PLA, exhibits superior heat resistance, and can be molded quickly. Therefore, it is used widely for materials that need to be durable, such as electronic equipment materials and those of printers.



Composite printer

### Nucleating agent for electroless plating

We promoted the application development of HYPERTech®, a functional coating material that contains hyperbranched nano-particles. As a result, we have developed nucleating agents for electroless plating that allows for a more than 90% reduction of the amount of metal used for wiring the touch panels of smartphones, tablet PCs, and other devices. Metal wires are created by making a metal film covering the entire substrate in a vacuum vessel, and then removing unwanted parts with acid. More than 90% of the metal is removed in this process.

HYPERTech® makes it possible to draw wiring patterns, with the metal adhering to only the drawn lines. This in turn helps to minimize the area covered with metal plating.



Touch panel