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Environmental Management

Policy and Basic Approach

The Nippon Kayaku Group's environmental initiatives play a part in the key sustainability issues of **KAYAKU Vision 2025** as a contribution to global environmental conservation, and the Group is implementing the targets laid out under its Responsible Care Policy as a key issue. In these activities, the Group complies with domestic and overseas environment-related laws, regulations, and agreements, etc., and anticipates environmental risks that will occur in product development, manufacturing processes, and business activities. These activities are a companywide initiative contributing to global environmental conservation, taking into account factors such as the reduction of environmental impact, prevention of pollution, energy conservation, climate change, resource conservation, and reduction of waste.

➤ [The Declaration on Environment, Health and Safety, and Quality](#)

Responsible Care in the Nippon Kayaku Group

All executives and employees of the Nippon Kayaku Group share the common recognition that safety is prioritized above all else, and comply with local laws and regulations both in Japan and overseas, working to prevent accidents and disasters relating to the environment and safety, in line with the Declaration on Environment, Health and Safety, and Quality.

The Nippon Kayaku Group Annual Responsible Care Policy is formulated each fiscal year based on policies that the Group believes should be continued from FY2019 onward, by reviewing targets that supplement key sustainability issues and efforts to achieve those targets, to ensure the environment, safety, and health of Nippon Kayaku itself and its domestic Group companies.

The Nippon Kayaku Group will continue to promote Responsible Care activities based on these policies.

Nippon Kayaku Group Annual Responsible Care Policy (Excerpt of policies related to the environment)

◆ Target

Serious environmental accidents / disasters: zero

◆ 1. Key issues in Responsible Care

- Companywide total Scope 1 + Scope 2 CO₂ emissions of 115,386t or less (Companywide CO₂ emission reduction rate: at least 12% compared with FY2019 levels)
- Zero emission rate: 1% or lower (Nippon Kayaku non-consolidated)

◆ 4. Activities to achieve environmental targets

- Enhancing external disclosure of climate-related information
- Strengthening of measures to reduce Scope 3 emissions (expanded requests for disclosure of emissions from raw materials, improved ton-kilometer calculation accuracy, revisions to waste generation volume calculation methods)
- Strengthened promotion of MFCA (expansion of applicable business sites)
- Proper operation of cloud-based environmental data aggregation system
- 3% annual reduction of Scope 1 + 2 CO₂ emissions at each business site
- Establishment of a method for calculating CO₂ emissions during product manufacturing
- Development of plastic waste reduction targets and implementation of measures

System

➤ [System for implementing Responsible Care](#)

Environmental Management System Certification Status

The Nippon Kayaku Group continues to acquire ISO14001 certification, the international standard for environmental management, and provides services by developing and manufacturing environmentally friendly products.

Nippon Kayaku began acquiring ISO14001 environmental management system certification in 1998, and all seven factories in Japan have obtained certification. Additionally, seven overseas group companies have obtained certification. The Group will continue considerations for acquiring ISO14001 certification for all Group companies, including those located overseas.

➤ [ISO14001 Certification](#)

Indicators

Key sustainability issues	Corresponding SDGs	Action plans	Indicators (KPI)	FY2025 Targets	FY2022 Results	FY2022 Topics for initiatives
Reducing Energy Consumption and Greenhouse Gas Emissions	 	<ul style="list-style-type: none"> Implement energy-saving and global warming countermeasures and achieve FY2030 environmental targets 	Greenhouse gas emissions (Scope 1+2)	(Targets to be achieved by FY2030) 88,324 tons or less (32.5% reduction or higher compared with FY2019) (Targets to be achieved by FY2022) 119,252 tons or less	108,107 tons	<ul style="list-style-type: none"> Introduction of MFCA and the solar power PPA model were promoted as a part of efforts to reduce greenhouse gas emissions Total waste produced declined by 3.3% compared with FY2021 The recycling of waste that was traditionally disposed of in landfill was further promoted, with the recycling rate improving to 85.0%, and the zero emission rate improving down to 0.8%. Development Status of Environmentally Friendly Products and Technologies [Safety Systems Business] Development of reduced weight cylinder type inflator / green propellant MGG [Polatechno Business] Improved production process, promoted reduced waste generation and emissions treatment energy through product design improvements [Functional materials] In the area of thermosetting resins for CFRP, we introduced customers to development products with potential for roll-out
			VOC emissions	(Non-consolidated) Disclose results	(Non-consolidated) 38.7 tons	
Reduction of Wastewater and Industrial Waste	 	<ul style="list-style-type: none"> Identify issues and clarify strategies for achieving carbon neutrality by FY2050 	COD emissions	(Non-consolidated) Disclose results	(Non-consolidated) 171.8 tons	<ul style="list-style-type: none"> Developed a thermosetting resin that uses bio-derived raw material [Color materials] Developed industrial ink jet (for coated paper, flexible packaging and textile printing) Released and expanded sales of heat-sensitive non-phenol developer Accelerated development of PLA (biodegradable) textile dye [Catalysts] Promoted joint development of catalyst for hydrogen production
Improving Efficiency of Water Resource Use	 		Total waste output	(Non-consolidated) Disclose results	(Non-consolidated) 27,621 tons	
			Recycling rate	(Non-consolidated) 80% or higher	(Non-consolidated) 85.0%	
			Zero emission rate	(Non-consolidated) 1% or less	(Non-consolidated) 0.8%	
			Goal setting in line with SBT and consideration and implementation of specific measures	Disclose progress	Earned A- CDP (climate change) score Implemented improvements to accuracy of Scope 3 emission calculations	
			Disclosure in Line with TCFD Recommendations	Disclose progress	Information Disclosed	
			Develop products and technologies with consideration for environmental issues	Disclose progress	Listed in Topics	

Medium-term Environmental Targets and Results

The Nippon Kayaku Group has established new medium-term environmental targets for FY2021 onward, and has started environmental conservation activities to achieve them.

In the newly established medium-term environmental targets, the scope of Scope 1+2 greenhouse gas emissions under "prevention of global warming" (32.5% reduction or higher by FY2030 compared with FY2019) has been expanded to include group companies (consolidated). Reducing emissions at a rate of around 3% every year to achieve this target, the target for FY2022 would be 119.2 thousand tons or less. Actual emissions for FY2022 were 108.1 thousand tons (a 17.4% reduction compared with FY2019), so we have achieved our target, and are steadily reducing emissions. In relation to this theme, in March 2022, the Nippon Kayaku Group endorsed the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD), and will continue to follow the TCFD recommendations by actively disclosing not only the state of reduction of greenhouse gas emissions, but also information on initiatives to build a sustainable, recycling-based society, such as information on risks and opportunities relating to climate change.

In the area of "reducing our chemical substance footprint," we reported both VOC emissions and COD emissions as actual results, without setting targets. VOC emissions increased slightly from the previous fiscal year, and COD emissions increased in line with changes in the items being produced.

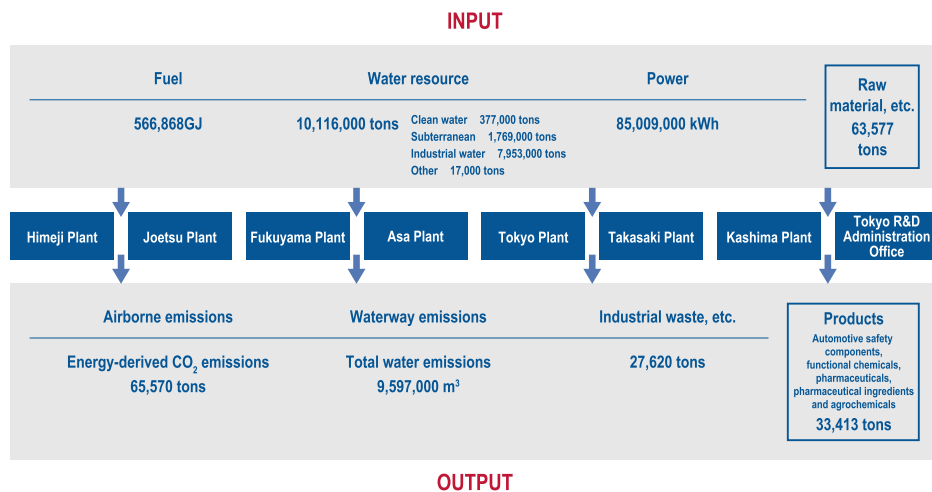
In the area of "reduction of waste," we reported total waste produced as actual results without setting a target. For recycling rate (excluding container reuse) we have set a target of 80% or higher, and a zero emission rate of 1% or less. Total waste produced in FY2022 was lower than the previous fiscal year, as a result of continued waste separation and reduction efforts at each plant and business site. With regard to recycling rate and zero emission rate, as a result of continued recycling efforts at each business site and ongoing efforts to reduce environmental impact, we were able to not only achieve our targets for recycling rate and zero emission rate, but also improve upon them.

◆ Progress in Results for Medium-term Environmental Targets

Category	Scope	Item	Target	FY2020*1	FY2021	FY2022
Prevention of global warming*2	Consolidated	Greenhouse gases & Scope 1 & 2*3 emissions	Target for FY2030: 88,300 tons or less (32.5% reduction or more compared to FY2019) (Reference: FY2022 results): 119,200 tons or less	117,800 tons (10.0% decrease)	112,200 tons (14.2% decrease)	108,100 tons (17.4% decrease)
		Reduction of chemical substance footprint	VOC*4 (volatile organic compound) emissions COD*5 emissions	(Report results) (Report results)	33.3 tons 122.6 tons	52.1 tons 124.2 tons
Reduction of waste	Non-consolidated	Total waste produced	(Report results)	25,153 tons	28,424 tons	27,621 tons
		Recycling rate (excluding container reuse)	80% or more	81.6%	82.3%	85.0%
		Zero-emissions rate*6	1% or less	1.6%	1.0%	0.8%

*1 Includes Joetsu Plant. Note that Joetsu Plant is outside the scope of the former medium-term environmental targets established for the period up to FY2020.
 *2 Medium-term environmental targets for the period up to FY2030: Reduced by 32.5% or more (88,300 tons or less) compared to FY2019 (130,800 tons)
 *3 Scope 1: Direct emissions of greenhouse gas by the business itself (emissions from the burning of fuel, manufacturing processes, etc.)
 Scope 2: Indirect emissions from the use of power, heat and steam provided by other companies.
 *4 Tally for volatile organic compounds (VOCs) includes not only the chemical substances that are required to be reported by government ordinance (PRTR law), but also the chemical substances designated by the Japan Chemical Industry Association.
 *5 Chemical oxygen demand (COD): This refers to the amount of oxygen needed to oxidize a substance under water, and is one of the major indexes for measuring water quality.

◆ FY2022 Material Flow in Business Activities (Relevant organization: Nippon Kayaku non-consolidated)



[Important Issues]

Reducing Energy Consumption and Greenhouse Gas Emissions

Policy and Basic Approach

In recent years, we have been faced with a rising sense of crisis about climate change as we witness abnormal weather conditions and devastations of the natural environment in various parts of the world. This has resulted in an acceleration of the global trend toward decarbonization as seen at COP27 (27th UN Climate Change Conference), with the Japanese government declaring a green growth strategy based on the Paris Agreement that seeks to achieve carbon neutrality by 2050. The Nippon Kayaku Group has also endorsed the Paris Agreement, and in addition to the FY2030 medium-term environmental targets adopted in 2020, the Group is working with the ultimate goal to achieve carbon neutrality by FY2050, with an eye to the future.

In order to make a significant reduction to our greenhouse gas emissions, the Nippon Kayaku Group will confront the issues of climate change not only by implementing comprehensive energy-saving efforts but also by installing power sources such as solar power that have low CO₂ emissions and by switching to power derived from recycled energy that has a low emissions coefficient. We also aim to achieve decarbonization throughout our value chain by providing products that contribute toward realizing a decarbonized society and by promoting supplier engagement to that end.

Information Disclosure Based on the TCFD Recommendations

Governance

The Sustainable Management Meeting, chaired by the president, deliberates, reviews and evaluates the business plan and other items related to the Nippon Kayaku Group's future responses to climate change. The results of such deliberations, reviews and evaluations are reported to the Board of Directors and, under this structure, are subject to being observed and supervised by the Board. Furthermore, the Environment, Safety, Quality Management Committee (chaired by Executive Director In Charge of Technology Unit) has been created as one of the specialized committees under the Sustainable Management Meeting to oversee the implementation of climate change initiatives. This committee delves deeper into issues related to climate change from a standpoint that extends across the entire Group.



Strategy

Nippon Kayaku has multiple businesses being deployed on a global scale, and is presented with various risks and opportunities depending on the business area. In order to identify the impact that climate change can have on each business, we evaluated the climate-related risks throughout the Group in accordance with the TCFD recommendations, and further considered the opportunities in each business area. In identifying the risks and opportunities related to climate change, the time period when the risks will emerge has been defined as follows.

	Period	Reason
Short-term	FY2022 to FY2025 (4 years)	Period falling within the Medium-term Business Plan KAYAKU Vision 2025 (KV25) that started in FY2022
Medium-term	Up to FY2030	In line with goals for FY2030 that are set in the Nippon Kayaku Group Environmental Targets of the Medium-term Business Plan
Long-term	Up to FY2050	In line with the year set as the goal for Japan's NDC target

◆ Climate-related Risks

Business risks related to climate change are based on the IPCC's Representative Concentration Pathway (RCP 2.6, 8.5) scenarios, IEA's Sustainable Development Scenario (SDS) and the Stated Policies Scenario (STEPS) for both the 2°C and 4°C scenarios.

◆ Risks in Transitioning to a Decarbonized Economy for the 2°C Scenario

Category	Major risks	Period of risk emergence	Financial impact	Major countermeasures
Policies & regulations	Increased operation costs from tighter emissions regulations	Short to long term	Medium	<ul style="list-style-type: none"> Implement dispersed power for each site, such as solar power and high-efficiency cogeneration power generators Reduce material loss by utilizing MFCA and implement comprehensive energy-saving activities
	Rising price of electricity, LNG, etc.	Short to long term	Medium	
	Increased raw material costs from tighter emissions regulations	Short to long term	Medium	<ul style="list-style-type: none"> Encourage suppliers to reduce emissions through engagement activities
Market & reputation	Increased costs from disclosure of environmental information and LCA calculations, etc.	Medium to long term	Small	<ul style="list-style-type: none"> Rationalize the emissions calculation method at each site and systemize the LCA calculations

◆ Physical Risks from the 4°C Scenario

Category	Major risks	Period of risk emergence	Financial impact	Major countermeasures
Acute & chronic physical risks	Increased costs from flood damage caused by typhoons, heavy rain events, high tides, etc.	Short to long term	Medium	<ul style="list-style-type: none"> When building new plants, account for the possibility of flooding when considering the geographical situation and the configuration and placement of equipment
	Impact on operations due to water shortage	Medium to long term	Small	<ul style="list-style-type: none"> Strengthen efforts to save water used during production, and consider reusing and recycling water
	Reduced labor productivity due to increased temperatures	Medium to long term	Small	<ul style="list-style-type: none"> Enhance the work environment such as by improving air-conditioning, and promote the automation of high-temperature work processes

◆ Opportunities in Each Business Area in Transitioning to a Decarbonized Economy for the 2°C Scenarios

Business area	Business environment		Opportunity	Period of opportunity creation	Financial impact*
Safety Systems	Tightened regulations against greenhouse gas emissions in various countries & regions	<ul style="list-style-type: none"> Demand for methods of mobility and transportation with relatively low emissions is expanding globally. Sales of internal combustion engine vehicles are greatly restricted by region. 	<ul style="list-style-type: none"> The compact-size, lightweight characteristics, and shape of automotive safety components are diversifying with the introduction of EVs and autonomous driving. Demand for safety components for unmanned aerial vehicles such as drones is expanding. 	Short to long term	Large
Polatechno			<ul style="list-style-type: none"> Demand for safety display device materials such as sensors and HUDs is expanding with the introduction of EVs and autonomous driving. Demand for polarizing plates that contribute to low power consumption of display devices is also expanding. 	Short to long term	Medium
Functional Materials		<ul style="list-style-type: none"> Advances in social changes, such as growth of smart cities Heightened demand for increased energy efficiency of electronics products Increased demand for storage batteries able to handle large output fluctuations in response to expanding use of recyclable energy 	<ul style="list-style-type: none"> Increase in semiconductor materials from growth of smart cities and DX Expansion of functional materials that help reduce energy consumption of display devices Expansion of low-emission materials due to the increased shift in raw materials toward biomass feedstock Expansion of resin materials that help make mobility frames more lightweight 	Short to long term	Large
Color Materials		<ul style="list-style-type: none"> Global expansion of demand for mobility/transport methods that have relatively low emissions 	<ul style="list-style-type: none"> Expansion of ink for digital on-demand that enables low-carbon printing Expansion of dimming glass/film that controls incident sunlight 	Short to long term	Large
Catalysts			<ul style="list-style-type: none"> Growth of catalyst for producing green energy, such as hydrogen Growth of catalyst for promoting the use of biomass-derived raw materials 	Medium to long term	Large
Pharmaceuticals			<ul style="list-style-type: none"> Studying items within the entire range of business activities that will become opportunities 	Short to medium term	Small
Agrochemicals		<ul style="list-style-type: none"> Direct impact is limited 	<ul style="list-style-type: none"> A certain level of temperature increase is expected even for the 2°C scenario, thus expanding the use of biostimulants that help maintain and improve agricultural productivity Expanded use of existing agrochemicals to deal with new problems with pests 	Medium to long term	Small

* Financial impact: Large = 2 billion yen or more; Medium = 0.5 to 2 billion yen; Small = 0 to 0.5 billion yen

Risk Management

The Nippon Kayaku Group identifies the reducing energy consumption and greenhouse gas emissions as a key sustainability issue related to climate change.

The M-CFT Mitigation of Climate Change Team was created to coincide with the start of the KV25 under a governance system comprised of the Board of Directors, the Sustainable Management Meeting and the Environment, Safety, Quality Management Committee. This response team serves a central role in identifying and evaluating climate change risks, while also executing other specific measures such as actively implementing energy-saving efforts and pushing forward with environmental investments.

Metrics and Targets

As a metric against the risk of climate change, the Nippon Kayaku Group has established the target of reducing greenhouse gas emissions (Scope 1 and 2) for the entire Group by 32.5% in FY2030 compared to FY2019. In order to achieve this target, we are starting by aiming to reduce greenhouse gas emissions by 3% every year during the KV25 period. We are also conducting advanced studies on making a shift to green energy such as hydrogen and ammonia in order to achieve carbon neutrality for Scope 1 and 2 by FY2050.

Also, in order to enable us to include Scope 3 in establishing future targets on reducing emissions, we have been working on enhancing the accuracy of our Scope 3 calculation methods in anticipation of being able to individually determine the amount of emissions for each product (carbon footprint). Our calculation results for Scope 1, 2 and 3 have been examined by a third party since FY2022. In order to reduce Scope 3 emissions, we will work together with our business partners in reinforcing efforts to reduce environmental impacts throughout the entire supply chain.

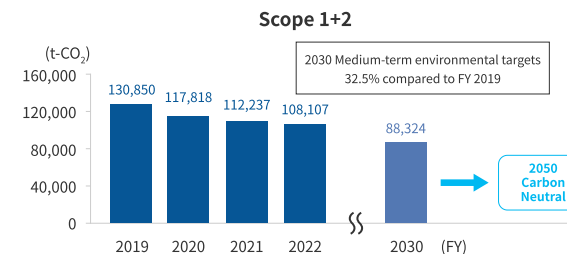
◆ Reduction in the Amount of Greenhouse Gas Emissions

In the Paris Agreement adopted at COP21, held in 2015, each country pledged to pursue CO₂ emission reduction targets at the national level, with the aim of limiting the increase in global average temperatures to "below 2°C," and working towards a level of "below 1.5°C" above pre-industrial levels. The Nippon Kayaku Group has also adopted medium-term environmental targets, specifically of reducing the amount of CO₂ emitted from energy sources by at least 32.5% or more by FY2030, compared with FY2019, as a standalone target for Nippon Kayaku (non-consolidated) in FY2020, and expanded the scope to the entire Nippon Kayaku Group in FY2021.

In addition to energy saving and optimization of production processes, the Nippon Kayaku Group is also working to introduce power sources with low CO₂ emissions, such as solar power, and switch to low-emission-factor electric power derived from renewable energy. Our Scope 1 and 2 emissions, which are used as metrics in our FY2030 medium-term environmental targets, have been diminishing every year as shown below.

Scope 1: Direct emissions of greenhouse gas generated from a source owned or managed by the business operator themselves (emissions from fuel usage, manufacturing processes, etc.)

Scope 2: Indirect emissions of greenhouse gas from the use of power, heat or steam supplied by another business (emissions from purchased power, etc.)



◆ Disclosure of Data on CO₂ Emissions (Scope 3) throughout the Supply Chain

In recent years, there has been an increasing tendency for companies to keep tabs on, manage and disclose information on indirectly emitted CO₂ throughout the supply chain. At the Nippon Kayaku Group, we are not only aggregating and managing Scope 1 and Scope 2 emissions as before, but are also calculating Scope 3 emissions within the supply chain.

Since FY2017, Nippon Kayaku has been calculating Scope 3 emissions on a non-consolidated basis, but from FY2019, this has been expanded to include both domestic and overseas Group companies. The Nippon Kayaku Group will continue to calculate and manage our data based on the General Guidelines on Supply Chain GHG Emission Accounting issued by the Ministry of the Environment, in order to systematically implement initiatives to reduce CO₂ emissions throughout the supply chain.

Scope 3: Indirect emissions other than Scope 2 (emissions from raw material procurement, employee commuting, business travel, waste processing consignment, product usage, disposal, etc.)

Category	Emissions (thousand ton-CO ₂ /year)			
	FY2019	FY2020	FY2021	FY2022
1 Purchased products and services	243.6	237.3	294.5	275
2 Capital goods	42.7	42.9	26.8	29.6
3 Fuel- and energy-related activities not included in Scope 1 or 2	22.4	21.2	22.3	21
4 Transportation and distribution (upstream)	19.0	17.6	22.3	19.7
5 Waste generated in operations	26.5	28.8	31.8	16.2
6 Business travel	0.8	0.8	0.8	0.8
7 Employee commuting	2.5	2.4	2.4	2.4
8 Leased assets (upstream)	Included in Scope 1 or Scope 2			
9 Transportation and distribution (downstream)	1.0	1.0	1.6	1.5
10/11 Processing/usage of sold products	-	-	-	-
12 End-of-life treatment of sold products	15.4	23.2	26.4	23
13 Leased assets (downstream)	0.4	0.4	0.4	0.4
14/15 Franchise/investments	-	-	-	-
Total of Scope 3	374.3	375.6	429.3	389.6
Scope 1	36.2	35.3	37.5	35.5
Scope 2	94.7	82.5	74.7	72.6
Total of Scope 1+2+3	505.2	493.4	541.5	497.7

Calculation method: As a rule, the amount of CO₂ emitted is calculated based on the General Guidelines on Supply Chain GHG Emission Accounting issued by the Ministry of the Environment and the Ministry of Economy, Trade and Industry, and the emission coefficient listed by the IDEA Research Laboratory at the National Institute of Advanced Industrial Science and Technology's Research Institute of Science for Safety and Sustainability.

[> Environmental Management](#)

[> Environmental data](#)

Initiatives

The Nippon Kayaku Group is actively pursuing energy and resource efficiency measures in the manufacturing processes at each of our production facilities, in order to achieve our medium-term environmental targets of reducing greenhouse gas emissions (Scope 1+2) for the FY2030 by 32.5% compared to the FY2019 levels and carbon neutrality by FY2050. To accomplish this goal, we are implementing Material Flow Cost Accounting (MFCA) and solar power generation initiatives.

Material Flow Cost Accounting (MFCA)

MFCA is a methodology aimed at continuously reducing environmental impact resulting from production activities by identifying and clarifying energy and material losses during the manufacturing process. Nippon Kayaku is working to cost savings and reduce environmental impact, including waste generation and CO₂ emissions in the manufacturing processes, through the implementation of MFCA.

At our Fukuyama factory, which specializes in the production of pigments for consumer inkjet printers, the effectiveness of recovering solvents from waste solvents through distillation was confirmed as a result of laboratory studies and practical testing based on MFCA results since the latter half of 2018, and it led to a shift in our processes to reuse recovered solvents in manufacturing. As a result, we not only reduced the amount of waste sent for external incineration and solvent purchases but also achieved significant environmental impact reductions and cost savings.

We have expanded the use of MFCA to other manufacturing facilities, introducing it at the Tokyo factory and Atsusa factory in 2019, the Kashima factory in 2020, and the Joetsu factory in 2021, in order to commit to further promoting environmental impact reduction and manufacturing cost reduction. Our ultimate goal is to extend MFCA implementation to the entire group.



Distillation Recovery Facility

Solar Power Generation

Nippon Kayaku is working to significantly reduce greenhouse gas emissions by introducing solar power generation as a means of introducing power sources with low CO₂ emissions and switching to electricity with a low emission coefficient derived from renewable energy sources.

In March 2023, we introduced the on-site service of the solar power generation PPA model to the Fukushima Plant.

The solar power generation PPA model is a model in which Nippon Kayaku leases its premises and roof to a third party to install solar power generation equipment and purchases the generated power for a long period of time, and it enable us to use power generated from renewable energy sources and to reduce electricity costs. We expect to reduce greenhouse gas emissions by 731 t-CO₂ per year by using electricity generated by the solar power generation system installed at the Fukuyama Plant.

Nippon Kayaku will promote the installation of company-owned solar power generation equipment at our manufacturing sites other than the Fukuyama Plant, in addition to the solar PPA model.



Contribution to Greenhouse Gas Emission Reduction

Initiatives	Unit	FY2022
MFCA	t-CO ₂	60.2
Solar power generation	t-CO ₂	-

Prevention of Air Pollution

Policy and Basic Approach

The Nippon Kayaku Group complies with the laws and regulations of each country and region with regard to air pollutants such as NOx, SOx, soot and dust, and volatile organic compounds (VOCs) emitted from its plants and development bases. We take measures against pollution by managing emissions, setting stricter standards than those required by laws and regulations to prevent air pollution in the areas around our plants and development bases.

System

> [System for implementing Responsible Care](#)

Indicators

Indicator	Scope	Unit	FY2018	FY2019	FY2020	FY2021	FY2022
Volatile organic compounds (VOCs)	Non-consolidated	tons	25.6	28.6	33.3	52.1	38.7
Dichloromethane	Non-consolidated	tons	3.9	4.9	4.0	3.6	3.2
Formaldehyde	Non-consolidated	tons	0.16	0.04	0.04	0.15	0.13
NOx*1	Non-consolidated	tons	8.2	9.1	7.5	7.7	8.3
SOx*2	Non-consolidated	tons	1.4	1.3	1.0	0.7	0.9
Dust*3	Non-consolidated	tons	0.6	0.9	0.5	0.5	0.4

*1 NOx (nitrogen oxide): NOx is produced when burned chemical substances react to nitrogen in the air and when fuels and chemical substances that contain nitrogen compounds such as coal are burned. Not only is it a major cause of air pollution including photochemical smog and acid rain, but NOx also has a harmful effect on the human respiratory system.

*2 SOx (sulfur oxide): SOx is emitted when fossil fuels that contain sulfur are burned. SOx reacts with moisture in the atmosphere to form sulfuric acid and sulfurous acid, which are causes of air pollution and acid rain.

*3 Dust: Dust mainly refers to fine particles (soot) found in dust smoke produced when burning fossil fuels. In addition to being a major cause of air pollution, dust can cause humans to contract pneumoconiosis or other harmful health conditions when breathed in in high concentrations.

> [Environmental Management](#)

Initiatives

Reducing Emissions of Volatile Organic Compounds (VOCs) and Hazardous Air Pollutants

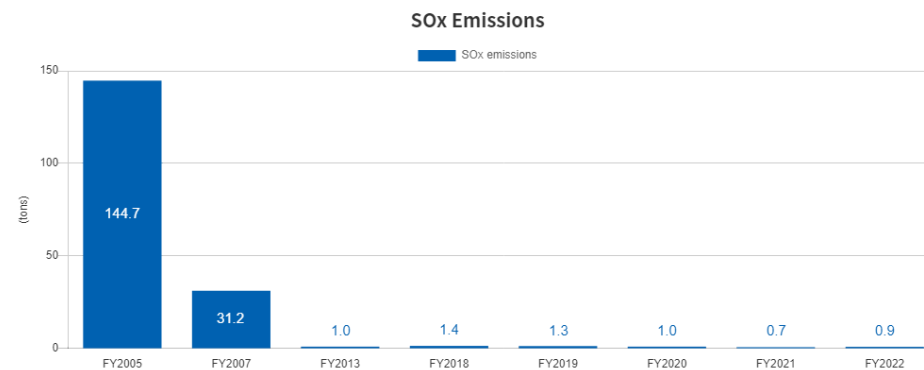
Nippon Kayaku is working to reduce VOC emissions in a wide range of areas by aggregating data not only on VOCs stipulated under Japan's Air Pollution Control Act, but also chemical substances designated by the Japan Chemical Industry Association. We are also working to reduce emissions of harmful air pollutants such as dichloromethane and formaldehyde, which are two of the 12 substances that we manage voluntarily. The following are examples of our main initiatives.

- Installing exhaust gas treatment equipment
- Installing gas absorption equipment
- Installing regenerative (thermal storage) combustion equipment
- Improving work methods and reviewing alternatives to chemical substances used
- Leakage prevention measures

Reducing Emissions of SOx (Sulfur Oxides), NOx (Nitrogen Oxides), Soot and Dust

To date, Nippon Kayaku has engaged in the following kinds of measures, and manages SOx, NOx, and soot and dust emissions at lower levels than regulatory values.

- Fuel conversion from C heavy oil to A heavy oil, LPG, and natural gas
- Introducing low-NOx boilers and compact once-through boilers
- Installing NOx denitration equipment
- Installing dust collectors



[Important Issues] Reduction of Wastewater and Industrial Waste

Policy and Basic Approach

The Nippon Kayaku Group uses and discharges large amounts of water in its business activities. Recognizing water as a key issue at all of its sites, the Nippon Kayaku Group pays attention to appropriate use of water and environmental conservation in surrounding areas, and manages wastewater by setting voluntary management standards that are stricter than the values stipulated by laws and regulations, and by prefectural and municipal ordinances.

With regard to waste, we must work toward achieving a recycling-oriented society with a low environmental impact by pushing forward with our efforts to make efficient use of and recycle different materials throughout the various life cycle stages, from production to consumption and up to final disposal. In view of this, Nippon Kayaku Group has set recycling rate and zero emission rate as key performance indicators (KPIs) in **KAYAKU Vision 2025 (KV25)**. In addition to reducing waste, we are also working to effectively use waste generated in business activities as further resources. Furthermore, in April 2022, the Act on Promotion of Resource Circulation for Plastics came into effect. The situation regarding plastics waste reduction is changing, and becoming increasingly severe. Against the backdrop of problems such as climate change and plastic waste, the movement to promote plastic resource recycling is becoming more active in Japan. The Nippon Kayaku Group also uses plastic and disposes of it as waste, but works with the 3Rs in mind: reducing the plastic we emit (Reduce), reusing it (Reuse), and recycling it as a resource (Recycle).

System

> [System for implementing Responsible Care](#)

Audits

The Nippon Kayaku Group conducts audits at each business site and Group company through central environmental safety and health audit, to ensure that wastewater and waste are being managed appropriately. In our central environmental safety and health audit, we check wastewater and waste management for deficiencies and problems under laws, regulations, and ordinances, and check wastewater treatment plants and waste storage sites to identify any problems with the state of management.

> [Responsible Care Audits](#)

Indicators

> [Environmental Management](#)

Initiatives

Compliance with Environmental Regulations

The Nippon Kayaku Group installs wastewater treatment facilities at each plant according to the composition of wastewater discharged in manufacturing processes, and sets voluntary management values that are stricter than the emission standards of laws and local government ordinances, to ensure that standard values are not exceeded. In FY2022, there were no violations of laws or ordinances relating to wastewater, such as the Water Pollution Prevention Act, and laws and regulations relating to waste discharge, such as the Act on Waste Management and Public Cleansing.

> [Number of environmental violations](#)

Wastewater

◆ Reduction of PRTR Substances

In FY2022, Nippon Kayaku announced that it handles 75 types of chemical substances requiring submission of notices under the PRTR Act (the Act on the Assessment of Releases of Specified Chemical Substances in the Environment and the Promotion of Management Improvement). To reduce our impact on the external environment, we are implementing various measures such as installing processing equipment and converting raw materials.

Indicator	Scope	Unit	FY2018	FY2019	FY2020	FY2021	FY2022
Emissions of PRTR substances	Atmosphere	Non-consolidated tons	17.1	18.9	16.8	25.2	38.7
	Water bodies	Non-consolidated tons	11.4	13.3	9.1	14.7	51.4
	Soil	Non-consolidated tons	0	0	0	0	0
	Total*	Non-consolidated tons	28.5	32.2	25.9	39.9	90.1

* The total sum may be incongruent due to rounding.

◆ Water Environment Protection

The Nippon Kayaku Group sets voluntary management standards that are stricter than the values stipulated by laws and regulations, and by prefectural and municipal ordinances where each production base is located, and confirms that standard values are met when discharging wastewater. Nippon Kayaku also handles colorant-related products such as dyes and inkjet inks. Fukuyama Plant and Tokyo Plant—which manufacture these colorant material products—decolorize colored wastewater generated in the manufacturing process before discharge.

Indicator	Scope	Unit	FY2018	FY2019	FY2020	FY2021	FY2022
COD	Non-consolidated	tons	155.3	168.7	150.6	153.6	171.8
Total phosphorus emissions	Non-consolidated	tons	1.6	10.6	3.2	11.2	7.1
Total nitrogen emissions	Non-consolidated	tons	93.2	74.8	83.2	73.5	114.0
SS*	Non-consolidated	tons	45.3	46.0	48.4	49.9	47.5

* SS: Suspended solids (SS refers to particulate-like substances of 2 mm or less in diameter found floating or suspended in water. These include metal particles, animal and plant plankton and their carcasses, and organic and metal sediments originating from sewage and factory effluents, among others. The increase in SS causes a decline in water transparency, and affects underwater photosynthesis by preventing light penetration.)

◆ Initiatives at Each Business Site

Joetsu Plant

Training on Wastewater

Joetsu Plant, which produces polarizers, uses around 20,000m³ of water every month in production processes.

The wastewater discharged as part of production contains various chemical substances, and the amount of industrial waste is reduced by processing wastewater using water treatment equipment and reusing it as process water. After monitoring the quality of wastewater discharged into rivers using analyzers, the plant set even stricter voluntary management standard values than those stipulated by ordinances, and only wastewater meeting those standards is discharged into rivers.

At the plant, employees of the Facilities, Environment and Safety Department serve as instructors, providing training to employees who work on and supervise how wastewater used for production is treated and discharged into rivers, as well as on wastewater treatment facilities and drainage methods. Going forward, we will continue to conduct regular training to deepen employee understanding and reduce environmental impact.



Industrial Waste

◆ Response to the Act on Promotion of Resource Circulation for Plastics

As the situation surrounding plastics continues to change and grow increasingly severe, the Act on Promotion of Resource Circulation for Plastics was enforced in Japan in April 2022.

Nippon Kayaku falls under the category of a large-volume emitter under the Act. In order to contribute to the realization of a sustainable society, Nippon Kayaku keeps in mind the 3Rs (Reduce, Reuse, and Recycle), and will continue to systematically set targets and reduce waste plastic.

Waste Plastic Output

Indicator	Scope	Unit	FY2020	FY2021	FY2022
Waste plastic output	Non-consolidated	tons	954	888	886
Recycling rate	Non-consolidated	%	80.2	80.8	81.8

◆ Initiatives at Each Business Site

Fukuyama Plant

Zero Emissions through Effective Use of Waste

Nippon Kayaku is reducing the amount of waste it generates, and is engaged in consideration for utilizing generated waste as resources. Many types of waste are generated in the production activities of Fukuyama Plant, but sludge generated in wastewater treatment by microorganisms accounts for a large percentage of them. This sludge is difficult to dispose of because it contains moisture. In the past, it was disposed of in landfills under appropriate management. As a result of considering whether this sludge can be used as a resource with the aim of reducing environmental impact, it was found that it can be recycled as a fuel (so-called reduced fuel) used by waste incineration companies to adjust calorific value, and it is now being used by such waste incineration companies for this purpose. The ash generated when used for incineration is further effectively used as a raw material for cement and roadbed materials. Fukuyama Plant is also considering the use of industrial waste, and has not only achieved a zero landfill disposal rate but also a recycling rate of 100%.

Going forward, we will continue working to maintain a zero emission rate (the ratio of landfill disposal to total waste produced) of 1% or less, as set forth in our Sustainability Action Plan, and a recycling rate of at least 80% or higher.

Kayaku Safety Systems de Mexico

Industrial Waste Management

Kayaku Safety Systems de Mexico has been making untiring efforts to recycle solid waste, such as wood, cardboard, non-ferrous metals, aluminum and plastics, by separating them into appropriate categories and finding external suppliers that can re-use them. These different types of waste are stored for a period of two to three months at designated sites and are picked up by government-certified suppliers on a regular basis. Of the waste that is collected, those types that can be recycled are transported to recycling companies. There, wood is made into wood pallets, cardboard is recycled into new cardboard, and plastics, aluminum and ferrous metals are used to produce new raw materials.

This program extends to non-production areas such as break areas, where organic and non-organic waste such as plastic bottles are separated to undergo proper treatment for recycling.

Since the end of 2021, we have improved our waste separation management. In the past, there was no established separation method, and resources that could otherwise be used effectively were included in waste and disposed of. In view of this, we established reuse and disposal standards for each type of waste, and separated waste based on these standards. This not only makes sorting decisions easier for workers, increasing efficiency and accuracy, but also increases the amount of metal, wood, and plastic we recycle. Plastic materials that were previously considered waste have also been reviewed, and as a result, more materials can now be reused. The specific results for last fiscal year are shown below.

- Metal reused increased from 1 ton to 3 tons
- Wood waste reduced from 10 tons to 4 tons
- Plastic reuse increased from 50 tons to 73 tons

As part of our plan for this fiscal year, we aim to reuse packaging materials.



◆ Waste Data

Total waste produced in FY2022 was 27,621 tons, down approximately 3.3% from 28,568 tons in the previous year. Additionally, as a result of continuing to promote the recycling of waste that had been disposed of by landfill or incineration at each business site and continuing to implement initiatives to reduce environmental impact, the amount of landfill disposal was reduced to 233 tons, a decrease of about 22% from the previous fiscal year, and the zero emission rate fell by 0.2 percentage points to 0.8% from 1.0% in the previous year.

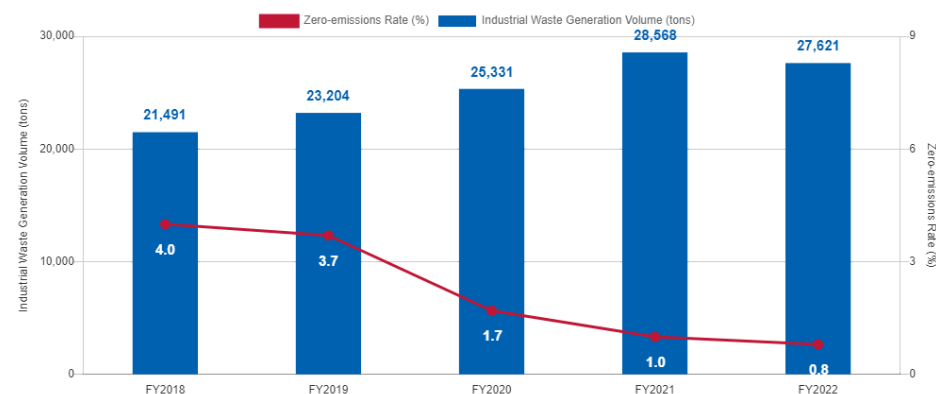
Going forward, we will continue to reduce waste generated by business activities and make effective use of generated waste, reduce waste sent to landfill, which has a major impact on the global environment, and continue efforts throughout the Group to protect the global environment and create a sustainable society.

Indicator	Scope	Unit	FY2018	FY2019	FY2020	FY2021	FY2022
Volume of non-hazardous waste generated	Non-consolidated	tons	16,626	17,973	19,406	22,065	21,190
	Volume of general waste generated	Non-consolidated	768	717	648	679	647
	Volume of industrial waste generated	Non-consolidated	15,858	17,256	18,758	21,387	20,543
Volume of hazardous waste generated (designated industrial waste subject to specific management)	Non-consolidated	tons	4,865	5,231	5,925	6,503	6,431
	Designated industrial waste	Non-consolidated	733	131	221	146	182
Total^{*1}	Non-consolidated	tons	21,491	23,204	25,331	28,568	27,621
Types of waste	Sludge	Non-consolidated	2,171	2,206	1,979	2,307	2,338
	Waste oil	Non-consolidated	5,176	5,296	5,762	6,386	5,848
	Waste acid	Non-consolidated	425	617	2,243	2,185	1,524
	Waste alkali	Non-consolidated	12,105	13,399	13,377	15,784	16,064
	Waste plastic	Non-consolidated	557	642	954	888	886
	Other	Non-consolidated	1,057	1,044	1,015	1,019	961
Amount recycled	Non-consolidated	tons	17,493	19,584	20,449	23,290	23,963
Landfill amount	Non-consolidated	tons	870	847	404	298	233
Recycling rate ^{*2}	Non-consolidated	%	81.4	84.4	81.3	82.3	85.0
Zero-emissions rate	Non-consolidated	%	4.0	3.7	1.7	1.0	0.8

*1 The total sum may be incongruent due to rounding.

*2 Includes solvent recovery and reuse.

Trend in the Volume of Industrial Waste Generated and in the Zero-emissions Rate



Costs Relating to Pollution, Waste or Resource Use

> [Environmental Accounting](#)

[Important Issues] Improving Efficiency of Water Resource Use

Policy and Basic Approach

Water risks can be largely divided into physical risks caused by drought, flooding and water contamination, and regulatory risks resulting from toughened water quality standards, changes in water and sewer prices, and switching to clean water due to the suspension of industrial water supply, among others. Water is a limited and precious resource, and its conservation is considered an important theme throughout the world.

The Nippon Kayaku Group produces a variety of chemical products, and water is essential for the continuation of its business activities. We are constantly aware of the importance of our water resources, and are mindful of using water carefully without being wasteful.

System

> [System for implementing Responsible Care](#)

Indicators

> [Environmental Management](#)

Initiatives

Compliance with Environmental Regulations

The Group has concluded various agreements with the local governments and local communities where its business sites are located. We comply with various agreements concerning the environment, pursue initiatives to reduce our environmental impact, and contribute to safety and security in local communities. There were no violations of laws and regulations relating to water quality or water volume in FY2022.

> [Number of environmental violations](#)

Usage of Water Resources

Water Usage by Water Intake Source

Indicator	Scope	Unit	FY2018	FY2019	FY2020	FY2021	FY2022
Municipal water	Consolidated	1,000 m ³	813	706	763	805	754
Industrial water	Consolidated	1,000 m ³	6,815	7,758	7,897	8,138	8,003
Groundwater (well water)	Consolidated	1,000 m ³	1,733	2,388	1,918	1,947	1,819
Other (reservoirs, rainwater storage)	Consolidated	1,000 m ³	0	0	0	68	81
Total water usage	Consolidated	1,000 m³	9,361	10,852	10,578	10,958	10,657

Wastewater Discharge by Outlet

Indicator	Scope	Unit	FY2018	FY2019	FY2020	FY2021	FY2022
Sea area	Consolidated	1,000 m ³	7,081	7,374	7,014	7,142	6,726
River	Consolidated	1,000 m ³	1,985	2,682	2,400	2,410	2,351
Sewerage networks	Consolidated	1,000 m ³	995	928	974	987	910
Total wastewater discharge	Consolidated	1,000 m³	10,061	10,984	10,388	10,539	9,987

Identifying Water-stressed Areas

The Nippon Kayaku Group is working to identify and understand risks relating to water use and link them to more effective initiatives in response to water risks. Using the water risk evaluation tool Aqeduct developed by the World Resources Institute (WRI), we have conducted a survey on the state of water stress in the countries where Nippon Kayaku's plants are located.

Results of Survey on Water Stress at Nippon Kayaku's Manufacturing and, Research and Development Bases (FY2022)^{*1}

Region / country	Unit	Water usage by water stress level					
		High	High to medium	Medium	Medium to low	Low	
Asia	Japan	1,000 m ³ (number of sites)	0	0	2,715 (6)	7,403 (4)	0
	China	1,000 m ³ (number of sites)	0	13 (1)	0	0	320 (3)
	Malaysia	1,000 m ³ (number of sites)	0	0	0	0	56 (1)
Europe	Czech Republic	1,000 m ³ (number of sites)	0	0	0	13 (1)	0
	Netherlands	1,000 m ³ (number of sites)	0	0	0	0	3 (1)
	UK	1,000 m ³ (number of sites)	0	1 (1)	0	0	0
North and Central America	USA	1,000 m ³ (number of sites)	0	0	7 (1)	111 (1)	0
	Mexico	1,000 m ³ (number of sites)	15 (1)	0	0	0	0
Total^{*2}	1,000 m³ (number of sites)	15 (1)	14 (2)	2,722 (7)	7,527 (6)	379 (5)	

*1 We conduct surveys using Aqeduct Water Risk Atlas.

*2 Totals may not match due to rounding.

◆ Initiatives at Each Business Site

Fukuyama Plant

Initiatives to Reduce Water Usage

The Fukuyama Plant treats wastewater resulting from the colorant manufacturing process within the plant, and then releases the treated water into the Seto Inland Sea. The Fukuyama Plant has been manufacturing colorants for inkjet printers since 2000, and has been working on improving the method for treating wastewater resulting from the manufacturing process. As part of such efforts, numerous studies have been performed on implementing individualized treatment in accordance with the brand and revising the manufacturing process to reduce the environmental impact.

Through these efforts, the plant managed to reduce the contracted volume of industrial water from 24,000 m³ per day to 23,000 m³ per day in 2015, and further down to 22,000 m³ per day in FY2018. At present, the plant is implementing even better wastewater treatment techniques, and is succeeding in continuing operations while maintaining the same contracted volume of industrial water, despite the increase in production volume. Moreover, in addition to industrial water, the plant is also working to reduce the use of public water, which is also used during the manufacturing and equipment cleaning processes.

Kayaku Safety Systems Europe

Implementation of Equipment for the Effective Use of Rainwater

Kayaku Safety Systems Europe (KSE) introduced a water storage tank system in 2017 to utilize rainwater more effectively as part of its capital investment activities to promote environmental protection. By FY2020, an equivalent of 750.5 m³ of tanks had been installed. Rainwater, in addition to water discharged from air-conditioning that is used to control the humidity within the plant, is used for non-drinking purposes, which helps to not only increase the efficiency of water usage but also contributes toward reducing costs.



Due to the impact of climate change, the current drop in the amount of precipitation in the Czech Republic poses a significant concern, making the recycling of water extremely important. Since FY2020, the annual water storage at KSE amounts to more than the amount of drinking water used by all of KSE's employees and their families (approximately 4,000 people) for the year. KSE is continuing to promote this project in order to contribute toward the realization of a sustainable society.

Indicator	Unit	FY2019	FY2020	FY2021	FY2022
Water storage capacity (scheduled)	m ³	-	4,877	5,040	5,040
Water storage capacity (actual)	m ³	4,433	6,177	7,234	6,802
Economic effects	Ten thousand yen	282	361	411	335

Biodiversity

Policy and Basic Approach

We at the Nippon Kayaku Group recognize that biodiversity is an essential foundation for achieving a sustainable society. Environmental pollution and deforestation are major factors in the loss of biodiversity. Therefore, under the Responsible Care Policy, the Nippon Kayaku Group engages in its business activities with constant consideration for environmental impact and reducing environmental risks, including effective use of resources, climate change initiatives, prevention of water pollution and air pollution, etc.

System

> [System for implementing Responsible Care](#)

Initiatives

Water-related Initiatives

> [\[Important Issues\] Reduction of Wastewater and Industrial Waste](#)

> [\[Important Issues\] Improving Efficiency of Water Resource Use](#)

◆ Initiatives at Each Business Site

Takasaki Plant

Plant Operations in Harmony with the Natural Environment

The Takasaki Plant was formerly an army gunpowder manufacturing plant for the Tokyo Second Army Arsenal in Iwahana. The plant was purchased in April 1946 and used to manufacture black-colored gunpowder. It later switched to manufacturing pharmaceuticals in August 1971. The plant has been aiming to be in “harmony with nature” from the time it began operations, and was certified under ISO 14001 in January 2001.

Surrounded by a rich natural environment that includes the Gunma-no-Mori forest and Karasu river, the plant operates under the slogan of “Takasaki Plant continues to protect life and the environment.” Under this banner, the plant’s environmental policy states that each and every person shall act with full awareness of the fact that they are working in an industry that is vital to human life, promote environmental protection activities and strive to operate the plant in a way that is in harmony with its rich natural environment.

The factory is located on an expansive site that extends over an area of 560,000 m². Of this, 110,000 m² that is registered as a green zone under the Factory Location Act was formerly used for gunpowder storage. But as it has not been used since the factory switched to making pharmaceuticals, the area has been left in a virtually natural state. Believed to have reverted to its earlier ecosystem, it now serves as one of the Takasaki city district’s most valuable natural habitats.

The site is surrounded by Class A rivers on three sides: to the east, south and north. They are the Karasu river (a Class A river that is part of the Tone river system), the Ino river (a Class A river that branches off from the Karasu river) and the Kasu river (a Class A river that branches off from the Hirose river, which is also part the Tone river system). The northern side of the site adjoins the Gunma-no-Mori prefectural city park. We will continue to protect this valuable naturally forested area that is home to various wildlife including raccoon dogs and kingfishers.

As an environmental facility, we have both the green zone and a “creek” within the plant site. This creek is a part of a facility that was used for hydraulic power generation during the time when the plant was used to manufacture gunpowder. Relics from the foreign-made hydraulic power generator that was used during the war are also being carefully preserved and managed.

The creek exists in a naturally forested area that is removed from the nearby residential districts. Close to the rivers and a safe place for animals, it serves as an oasis for migrating birds that stop by every year to gain nourishment from the surrounding forests and rivers. The annual arrival and northerly departure of these migrating birds is a seasonal event that is greatly looked forward to by our employees.

To protect the environment at the Takasaki Plant, in addition to our efforts toward achieving carbon neutrality we are also implementing measures to protect the surrounding area by managing emissions of our treated industrial wastewater. These emissions are being managed in the following manner.

The creek that flows through has a dam built on it that divides it into two sections. The first section temporarily pools industrial wastewater that has been detoxified by the activated sludge process. In the second section, the water quality is measured on a daily basis, and the dam is opened to release the water from the creek into the river after it has been confirmed by means of actual measurements that there are no abnormalities. In this way, we are taking every precaution to prevent environmental pollution.



Transitioning to Forest-certified Products

Nippon Kayaku has switched to forest-certified paper for all of its copy paper. We also continue to use forest-certified paper for all groupwide media such as internal newsletters, company brochures, and explanatory leaflets on sustainable management published by head office. We are also gradually shifting to forest-certified products for packaging materials where possible.

Going forward, we will continue working to minimize the impact of the Nippon Kayaku Group's business activities on the environment as much as possible, focusing primarily on environmental initiatives that employees can be aware of as familiar to them.

Environmental Accounting

Environmental Accounting

Nippon Kayaku calculates and discloses costs relating to environmental conservation in its business activities to effectively implement environmental conservation initiatives. Environmental accounting is calculated for the period from April 2022 through March 2023, and investment amounts are based on actual investment results for equipment relating to environmental conservation during the target period, with reference to the Environmental Accounting Guidelines (2005 version) issued by the Japanese Ministry of the Environment, and the Environmental Accounting Guidelines for Chemical Companies published by the Japan Chemical Industry Association (JCIA). Expenses are calculated based on the results of equipment maintenance costs, personnel costs, and depreciation costs, etc., relating to environmental conservation.

◆ Environmental Accounting

FY2022 Environmental Conservation Costs

Category		Scope	Unit	Investments	Expenses	Details
I. Business area costs		Non-consolidated	Million yen	530	1,551	Environmental conservation costs to limit environmental impact in the businesses area due to production and service activities
Breakdown	① Pollution prevention costs	Non-consolidated	Million yen	(288)	(333)	Investments and expenses relating to the prevention of air pollution, water pollution, underground seepage into groundwater, noise, and vibration
	② Global environmental conservation costs	Non-consolidated	Million yen	(237)	(64)	Capital investments and maintenance / management costs relating to energy conservation and measures to combat global warming
	③ Resource recycling costs	Non-consolidated	Million yen	(5)	(806)	Expenses relating to resource conservation, recycling, and appropriate treatment and disposal of industrial waste, etc.
	④ Other	Non-consolidated	Million yen	(0)	(349)	Pollution load levies, etc.
II. Upstream and downstream costs		Non-consolidated	Million yen	0	67	Costs of suppressing environmental impacts upstream or downstream from production and service activities
III. Administration costs		Non-consolidated	Million yen	3	268	ISO14001 renewal and maintenance audit costs, environmental impact monitoring, information disclosure, education and training, greening, etc.
IV. R&D costs		Non-consolidated	Million yen	0	158	Expenses relating to R&D and product development for environmentally friendly themes
V. Social activity costs		Non-consolidated	Million yen	0	10	Factory tours, community activity subsidies, organization membership fees, etc.
VI. Environmental damage handling costs		Non-consolidated	Million yen	0	0	Natural restoration costs, etc.
Total		Non-consolidated	Million yen	533	2,054	

◆ Economic Effects from Environmental Protection Measures

Economic Effects of Environmental Conservation Measures FY2022

Targets of evaluation of effects		Scope	Unit	Effective amount	Main contents
Inside business areas effects	Pollution control effect	Non-consolidated	Million yen	0.4	Installation of sludge level interface sensors, collection of scattered dust by dust collectors, etc.
	Global environmental conservation effects	Non-consolidated	Million yen	97.4	Adoption of energy-saving equipment (LED lighting, high-efficiency pumps, etc.), replacement of steam piping, replacement of substation equipment, replacement of compressors, optimization of air conditioner operating conditions, utilization of exhaust heat, outdoor unit sprinkling, roof sprinkling, heat shield films, etc.
	Resource recycling effects	Non-consolidated	Million yen	69.5	Recovery and reuse of solvents, in-house treatment of waste solvents, external sales of waste such as scrap metal and waste plastics as recycled resources
Upstream / downstream effects		Non-consolidated	Million yen	38.3	Cleaning and reuse of SUS drums and poly drums, etc.
Other		Non-consolidated	Million yen	0.0	Tree-planting activities
Total		Non-consolidated	Million yen	205.5	

Investments Related to the Environment and to Health and Safety

Nippon Kayaku makes well-planned and continual investments in projects related to the environment and safety and health. In FY2022, the total of environment related capital investments was 533.0 million yen, and the total of health and safety-related capital investments was 430.7 million yen.

Environment-related Capital Investments

Category	Scope	Unit	FY2018	FY2019	FY2020	FY2021	FY2022
Air pollution prevention equipment	Non-consolidated	Million yen	85.9	40.2	20.9	37.1	68.1
Water pollution prevention equipment	Non-consolidated	Million yen	40.6	70.5	109.7	266.9	206.7
Underground seepage prevention equipment	Non-consolidated	Million yen	52.0	13.4	5.5	4.9	7.2
Noise and vibration prevention equipment	Non-consolidated	Million yen	4.3	2.4	17.2	6.0	6.0
Industrial waste processing equipment	Non-consolidated	Million yen	3.9	30.9	106.6	111.2	5.1
Plant greening	Non-consolidated	Million yen	0.0	1.0	1.8	0.5	3.3
Energy conservation and global warming prevention equipment	Non-consolidated	Million yen	102.9	40.3	172.6	244.6	236.6
Total	Non-consolidated	Million yen	289.6	198.7	434.3	671.3	533.0

Safety- & Health-related Capital Investments

Category	Scope	Unit	FY2018	FY2019	FY2020	FY2021	FY2022
Equipment aging measures	Non-consolidated	Million yen	327.9	469.0	292.9	490.9	245.0
Safety and work environment measures	Non-consolidated	Million yen	164.8	165.3	171.4	171.4	86.6
Explosion, fire and leakage measures	Non-consolidated	Million yen	12.8	39.4	9.2	14.1	60.6
Earthquake and other natural disasters measures	Non-consolidated	Million yen	11.0	2.6	51.4	4.4	6.5
Other	Non-consolidated	Million yen	34.9	4.0	4.5	6.4	32.0
Total	Non-consolidated	Million yen	551.4	680.3	529.4	687.1	430.7