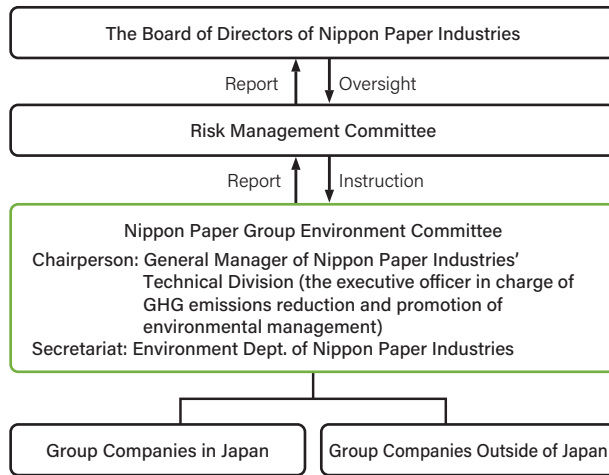


Environmental Management

1 Basic Policy

→P83 The Nippon Paper Group Environmental Charter

2 Promotion Structure

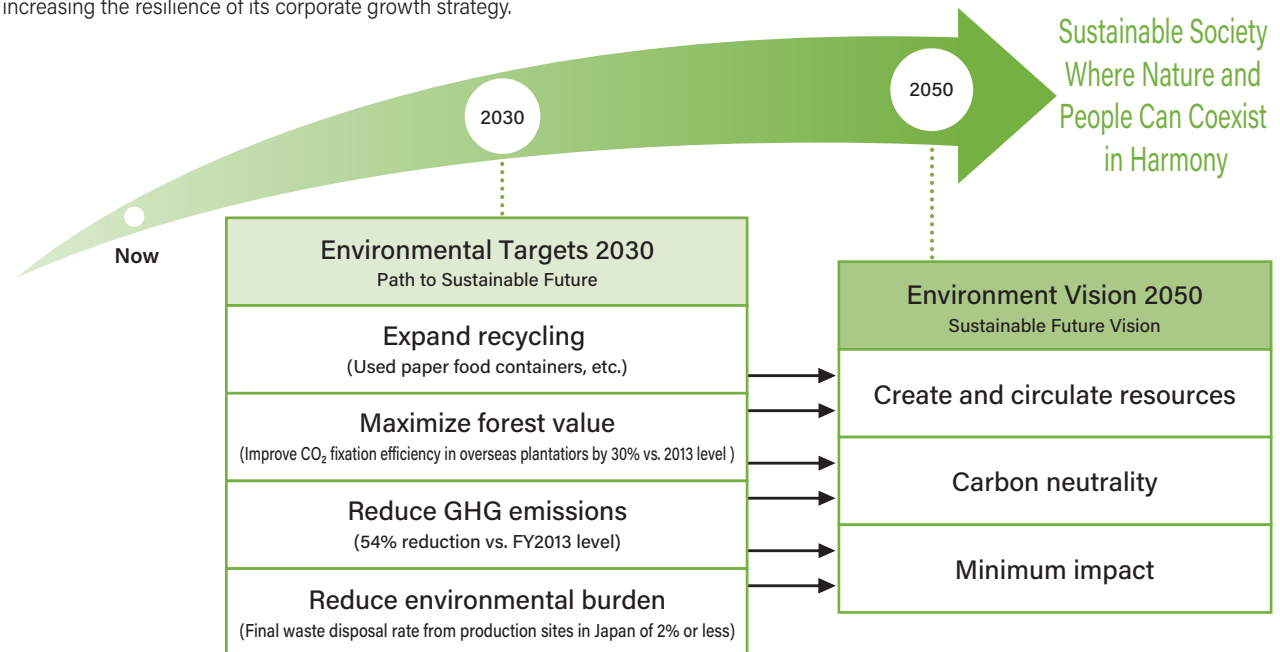


- Nippon Paper Group's management risks related to the environment are identified, and countermeasures are implemented by the Nippon Paper Group Environment Committee. The committee is chaired by the General Manager of the Nippon Paper Industries' Technical Division, who is the executive officer in charge of GHG emissions reduction and promotion of environmental management.
- Under the supervision of the Board of Directors, the Committee manages and evaluates the appropriate implementation of environmental targets based on the Nippon Paper Group Environmental Charter.
- The Committee includes all Group companies with major production sites.

- Once a year, the operational status and deliberations of the Committee are reported to the Board of Directors through the Risk Management Committee.
- In FY2022, the Committee reported to the Board of Directors through the Risk Management Committee on environmental law violations and risks related to the transition to a carbon neutral society.
- The Group holds the New Product Development Committee **→P52** and promotes the development of products derived from wood resources in line with growing environmental awareness.
- Based on information from the New Product Development Committee, the Management Executive Committee deliberates and decides on environmental management policies and measures, and incorporates them into business strategies to address environmental risks and seize business opportunities. In this way, the Group is increasing the resilience of its corporate growth strategy.

3 Nippon Paper Group Environmental Vision 2050, Nippon Paper Group Environmental Targets 2030

- The Group has set a vision for 2050 and the ideal state of the Group in 2050, and is working on the 2030 Environmental Targets formulated to achieve it.
- In the 2030 Environmental Targets, the Group will promote the reduction of greenhouse gas (GHG) emissions, the maximization of forest value, the expansion of recycling, and the reduction of environmental impact throughout the value chain in order to realize a sustainable society.
- The Group aims to achieve a sustainable society where people and nature coexist by providing products that have a low environmental impact throughout their life cycle.



Environmental Management

Nippon Paper Group Environmental Vision 2050 (Sustainable Future Vision)

1. Carbon Neutrality

Reduce greenhouse gas emissions to virtually zero.

- Minimize greenhouse gas emissions through the efficient use of energy and the use of renewable energy sources.
- Minimize greenhouse gas emissions in the value chain through collaboration with stakeholders.
- Become carbon neutral by offsetting residual emissions through CO₂ absorption and fixation in forests and CO₂ removal technologies.

2. Creation and Circulation of Resources

Create sustainable forests that preserve biodiversity and procure and supply resources.

- Maintain and expand forests with multifaceted value and maximize forest value.
- Procure and supply a variety of woody biomass resources that can be used as raw materials for various products.

Promote the utilization of woody biomass resources to contribute to better living in a circulation-oriented society.

- Provide a variety of materials and products made from woody biomass resources.
- Promote resource circulation and product recycling as a social infrastructure.

3. Minimum Impact

Minimize the environmental impact of the Group's business activities.

- Minimize the input and output of resources that impact the environment.
- Provide society with products and services that have a low environmental impact throughout their entire life cycle.

Environmental Management

Progress and Status of Initiatives in Nippon Paper Group Environmental Targets 2030 (FY2022)

1. Reduce greenhouse gas emissions

Reduce greenhouse gas emissions through fuel conversion and energy conservation measures.

Target	Progress and status of initiatives
<ul style="list-style-type: none"> ● Reduce direct greenhouse gas emissions by 54% from FY2013 levels. 	The Group reduced GHG emissions (Scope 1 and 2) by 30% compared with FY2013 levels.
<ul style="list-style-type: none"> ● Accelerate fuel conversion and increase the ratio of non-fossil energy use to at least 60%. 	The non-fossil energy ratio to energy used was 45%.
<ul style="list-style-type: none"> ● Improve total energy consumption per unit of production and distribution by 1% from the previous year. 	Total energy consumption per unit of production at Nippon Paper Industries: decreased by 1.4% in the paper business, increased by 2.1% in the paperboard business Total energy consumption per unit of distribution at Nippon Paper Industries: increased by 1.3%
<ul style="list-style-type: none"> ● Reduce greenhouse gas emissions from product transportation of the paper and paperboard business in Japan by 23% relative to FY2020 levels through modal shift and other measures.* 	Greenhouse gas emissions from product transportation of the paper and paperboard business in Japan decreased by 7% relative to FY2020 levels.
<ul style="list-style-type: none"> ● Collaborate with stakeholders to reduce indirect greenhouse gas emissions. 	The Group calculated Scope 3 emissions from major pulp and paper companies in Japan and is considering measures to reduce indirect GHG emissions.

* Applied to Nippon Paper Industries.

2. Promote the creation and circulating of resources

Promote the protection and cultivation of forest resources and biodiversity-conscious forest management.

Target	Progress and status of initiatives
<ul style="list-style-type: none"> ● Improve CO₂ fixation efficiency in overseas forest plantations by 30% compared to 2013 levels. 	The Group conducts research and development such as elite tree selection on an ongoing basis with the aim of improving CO ₂ fixation efficiency.
<ul style="list-style-type: none"> ● Obtain and maintain forest certification for all company forests in Japan and overseas. 	The Company and overseas plantation subsidiaries have obtained and maintained forest certification (FSC ^{*1} , PEFC, and SGEC) for all of the company-owned forests in Japan and overseas.
<ul style="list-style-type: none"> ● Ensure the traceability and sustainability of all woody biomass resources used. 	The Group has worked to confirm sustainability and enhance traceability by making use of forest certification systems, and through other efforts. The wood chips and pulp used for papermaking in FY2022 were all made from wood approved by FSC ^{*2} or PEFC (including controlled wood and controlled sources).
<ul style="list-style-type: none"> ● Promote the use of domestic forest resources. 	The use of domestic wood at all Nippon Paper Industries mills reached 35.1% in FY2022 (based on actual purchases).

*1 FSC® Logo License No. FSC® C001931 (AMCEL: Brazil)

*2 FSC® Logo License No. FSC® C001751 (Nippon Paper Industries)

Promote the circulation of resources.

Target	Progress and status of initiatives
<ul style="list-style-type: none"> ● Work to build a recycling system that promotes resource circulation. 	The Group classifies hard-to-use wastepaper discharged as industrial waste and business-related general waste into "industrial waste/general business-related waste exclusively for recycling purposes," and is entrusted the treatment of such waste. The Group is trying a scheme to recycle it as a used paper resource.
<ul style="list-style-type: none"> ● Utilize 12,000 t/year of unused recovered paper, which has been difficult to recycle, through the development of recovered paper utilization technology. 	The actual use of unused and hard-to-use wastepaper was 1,707 tons. (Breakdown: 1,617 tons of wastepaper for food and beverage containers, 90 tons of other hard-to-use wastepaper)

3. Reduce environmental impact

Reduce the environmental impact of manufacturing processes.

Target	Progress and status of initiatives
<ul style="list-style-type: none"> ● Reduce air pollutants by 15% and water pollutants by 15% compared to FY2018 levels. 	Reduction rate at production sites in Japan: SOx 31%, NOx 30%, dust 22%, COD/BOD 31%, and SS 8%
<ul style="list-style-type: none"> ● Reduce the final disposal of industrial waste at production sites in Japan to 2% or less. 	The final disposal of industrial waste at production sites in Japan was 1.6%.
<ul style="list-style-type: none"> ● Provide society with products and services that have minimal environmental impact throughout their entire life cycle. 	The Company expanding sales of cellulose products such as CNF and CMC as environmentally friendly products. In FY2022, adoption will expand significantly, mainly for food and cosmetics applications, and will be approximately four times as large as in FY2021.

Environmental Management

4 Strengthening Environmental Compliance

The Group is strengthening its environmental compliance from a preventive standpoint, using a two-pronged approach of establishing frameworks for preventing problems and ensuring that no problems are missed, and engaging in its business activities while giving priority to legal compliance.

Two-Pronged Approach

(1) Building Systems to Prevent Problems

- Building a workplace that emphasizes the importance of the environment (environmental compliance training)
- Strengthening the system for identifying applicable laws and regulations
- Implementing measures from both the facility and technology perspectives

(2) Establishing a Framework that Ensures All Problems are Covered

- Enhancement of environmental audits
- Enhancement of environmental management system
- Engaging in environmental communication and active information disclosure

1. Building a Workplace that Emphasizes the Importance of the Environment (Environmental Compliance Training)

To promote the creation of workplaces that emphasize the importance of the environment, the Group is working on systematic environmental training for employees.

- Encourage employees to obtain qualifications related to pollution prevention and to participate in external training to acquire specialized knowledge.
- Photo contest "Nippon Paper Group Eco Photo Award" (Environment Month every June)
- Environmental e-Learning
- Dissemination of environmental training materials and environmental information from each mill on in-house portal site (FY2022: Posted 11 environmental education materials)

Achievements in Environment-related Employee Education (FY2022)

Topic/Title	Participants	Number of participants	Number of sessions (frequency)
The Act on Promotion of Resource Circulation for Plastics, Reduction of plastic waste	Nippon Paper Group	7,379 persons	1 (once a year)

2. Strengthening the System for Identifying Applicable Laws and Regulations

To respond appropriately to revisions to environment-related laws and regulations, the Group uses a law search system and other means to share information on revisions of laws and their trends and has established a system to ensure compliance with laws and regulations.

3. Implementing Measures from Both the Facility and Technology Perspectives

- The Group extracts the risk of environmental accidents from two perspectives: the possibility of an accident and its impact on the environment, and introduces equipment and measurement equipment necessary for preventing accidents.
- Each Group company is engaged in continuous measures to prevent large-scale leaks of oil or chemical agents, including the installation of liquid containment barriers (oil fences, etc.) and measuring devices.

4. Enhancement of Environmental Audits

- The Group conducts regular environmental audits based on the "Environmental Management Policy Concerning Pollution Prevention," which is the action guideline for environmental management efforts issued by the Ministry of the Environment and the Ministry of Economy, Trade and Industry.
- Audits are double-checked by internal audits by each business site and audits by the department in charge of the environment at headquarters.
- In addition to document audits (confirmation of management records for wastewater and other waste materials) and on-site audits (confirmation of facilities such as chemical tanks), mutual audits are also conducted among Group companies in an effort to strengthen environmental audits.

5. Enhancement of Environmental Management System

- The Group thoroughly manages factory wastewater and exhaust gas daily through constant monitoring using measuring equipment and inspectors' measurements.
- The Group has introduced an environmental information management data system for all businesses with the aim of centrally managing environmental information. The Group plans to promote the sharing of environmental information from each site and the utilization of data.

Environment-related* Fines and Penalties

Environment-related fines and penalties (FY2022)	0 Yen
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* Decrees and regulations regarding the environment of water intake, wastewater, air, and waste

Environmental Management

6. Engaging in Environmental Communication and Active Information Disclosure

- The Group has also established the Nippon Paper Group Risk Communication Guidelines and is implementing initiatives based on the guidelines.
 - Risk communication for local residents and local governments held at each mill/office (in principle, held at least once a year)
 - Preliminary briefing session on the environmental impact of construction and operation when introducing large equipment, etc.
- The Group tries to listen to the opinions of all, including accepting opinions and questions on its website, establishing complaints and inquiries desks at mills, and utilizing an environmental monitor system to request information from local residents.
- When a complaint is received, the Group moves swiftly to determine possible causes, and implement emergency and permanent solutions.
- The Group also explains to the person who lodged the complaint what happened and what was done to resolve the situation, so that they can be satisfied that the Group has responded appropriately.

Environment-related Complaints in Japan (FY2022)

Complaints	Noise/ Vibration	Odor	Dust and mist dispersal	Smoke	Other	Total
Number	4	3	1	0	0	8

5 Acquisition of Major Environmental Certifications and Awards

Acquisition of ISO 14001 Certification* (as of March 31, 2023)

Company name	Mills/Operating division/Production subsidiaries
Nippon Paper Industries	Asahikawa Mill, Siraoi Mill, Akita Mill, Ishinomaki Mill, Iwanuma Mill, Nakoso Mill, Ashikaga Mill, Soka Mill, Fuji Mill, Gotsu Mill, Otake Mill, Iwakuni Mill, Yatsushiro Mill, Higashimatsuyama Mill
Nippon Paper Crecia	Tokyo Mill, Kaisei Mill, Koyo Mill, Kyoto Mill
Crecia-Kasuga	Shin-Fuji Mill
Nippon Paper Papylia	Harada Mill, Suita Mill, Kochi Mill
NP Trading	Headquarters, Sapporo Branch Office, Chubu Branch Office, Kansai Branch Office, Chugoku Branch Office, Kyushu Branch Office, Shizuoka Sales Office
Daishowa Uniboard	Headquarters, Miyagi Mill
N&E	Headquarters Mill
Nippon Paper Ishinomaki Technology	Headquarters
Opal	Opal Kiwi Packaging Auckland, Opal Kiwi Packaging Christchurch, Opal Kiwi Packaging Hastings, Opal Australian Paper Maryvale Mill
Jujo Thermal	Kauttua
Siam Nippon Industrial Paper	Siam Nippon Industrial Paper
Nippon Paper Liquid Package Product	Egawa Mill, Miki Mill, Ishioka Mill

* Sites that have obtained certification for some manufacturing are also listed.

- Nippon Paper Industries has obtained ISO 14001 certification for 100% of its production locations.

The Status of Eco-Action 21 Acquisition (as of March 31, 2023)

Company name	Mills/Operating division/Production subsidiaries
Akita Jujo Chemicals	Headquarters Mill

External Awards for Environmental Conservation Activities (FY2022)

Recipient	Award
GAC	Sainokuni Saitama Small and Medium Enterprise CO ₂ Reduction Grand Prize "Outstanding performance award"
Nippon Paper Industries Nakoso Mill	Fukushima Minpo Fukushima industry award "Special Prize"

Response to Climate Change

1 Basic Policy

 **→P83** The Nippon Paper Group Environmental Charter

2 Achieving Carbon Neutrality in 2050

- The Nippon Paper Group's greenhouse gas (GHG) reduction is based on three pillars: fuel conversion, energy conservation in production and logistics processes, and absorption and fixation of CO₂ through optimal management of company-owned forests.
- One of the basic policies of the 2030VISION is "Respond to rapid changes in the social landscape, such as GHG reduction and environmental issues," so the Group is working on reducing GHG emissions and implementing a green strategies to achieve carbon neutrality in 2050.
- In May 2023, the Group revised its original plan for the GHG emissions reduction target for FY2030 and decided to reduce GHG emissions (Scope 1 and 2) by 54% compared to FY2013.
- To accelerate GHG emissions reduction, the Company introduced internal carbon pricing in FY2021. However, this operation has been temporarily suspended since FY2022, due to the soaring price of coal and other fuels.
- In the long term, the Group aims to achieve carbon neutrality in 2050 through a multifaceted approach, including introducing carbon-free fuels and CCUS.
- In 2021, the Japan Paper Association, of which the Company is a member, set up the "Countermeasures against Global Warming aiming at Net Zero GHG emission from the Paper Industry – Long-Term Version 2050" and is working to realize the construction of a carbon neutral industry through the proactive introduction of a range of measures aimed at reducing CO₂ emissions.
- The Company is actively working on various measures to realize the "Countermeasures against Global Warming, aiming at Net Zero GHG emission from Paper Industry – Long-Term vision 2050" advocated by the Japan Paper Association.

Nippon Paper Group's GHG Reduction Initiatives



The Nippon Paper Group's FY2030 Targets

Reduce GHG emissions (Scope 1 and 2) by 54%* compared with FY2013

- Reduce fossil fuel use by maximizing the use of existing infrastructure

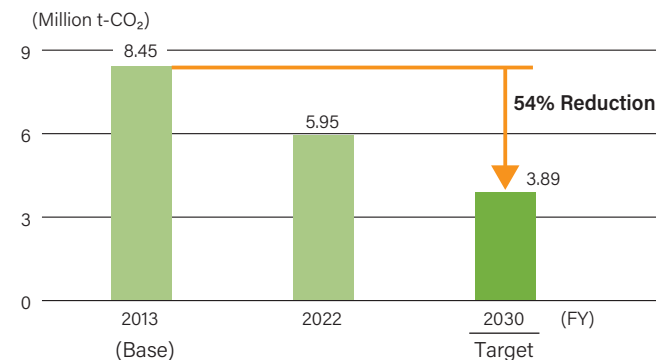
Pursuit of a green strategies

- Maximize forest value (30% improvement in CO₂ fixation efficiency at overseas plantations, compared to 2013)
- Respond to demands to eliminate and reduce plastic (increase products that replace plastic with paper)

* Targeting GHG emitted during product manufacturing

Carbon neutrality in 2050

GHG Emissions (Scope 1 and 2)



Response to Climate Change

GHG Emissions (Scope3, FY2022)

Coverage: Nippon Paper Industries, Nippon Paper Crecia, Nippon Paper Papylia

	Category	Emissions (thousand t-CO ₂)
1	Purchased goods and services	2,621
2	Capital goods	183
3	Fuel- and energy-related activities (not included in scope 1 or scope 2)	2,207
4	Upstream transportation and distribution	719
5	Waste generated in operations	111
6	Business travel	2
7	Employee commuting	8
8	Upstream leased assets	Not applicable
9	Downstream transportation and distribution	322
10	Processing of sold products	328
11	Use of sold products	0
12	End-of-life treatment of sold products	426
13	Downstream leased assets	Not applicable
14	Franchises	Not applicable
15	Investments	Not applicable
	Others (upstream)	Not applicable
	Others (downstream)	Not applicable
	Total	6,925

Coverage: Nippon Paper Industries, Nippon Paper Crecia, Nippon Paper Papylia

Target business: Paper and Paperboard Business, Dairy-Life Products Business, Energy Business
Category11: It is assumed that paper and paperboard products, which are our main products, do not use energy during product use.

CASE STUDY

Commissioned by NEDO for CCUS R&D and Demonstration-related Projects (Nippon Paper Industries)

In collaboration with Takuma Co., Ltd., a boiler manufacturer, the Company was entrusted with a project entitled "Research, Development and Demonstration Project for CCUS/Investigation Project related to CCUS Technology/Technology Investigation Project related to CO₂ separation & capture and intensive transportation & Utilization for large-scale CO₂ Emission Source/Investigation into Energy-Saving CO₂ Separation & Capture at Biomass Power Plants," commissioned by the New Energy and Industrial Technology Development Organization (NEDO) from 2021 to 2022. Using the biomass power generation facility of Yufutsu Energy LLC as a model, the Company examined energy-saving CO₂ separation and capture technology and integration technology, and investigated issues related to commercialization.

3 Fuel Conversion

- The Group uses black liquor (produced as a byproduct of the production of pulp) and construction waste materials as woody biomass fuels.
- The amount of woody biomass energy for the Group in FY2022 is equivalent to 3.2%*¹ of Japan's total non-fossil energy supply (excluding nuclear and hydroelectric power).
- In addition to woody biomass fuel, the Company actively uses waste fuels such as used tires and RPF*². Its non-fossil energy utilization rate in FY2022 was 45%.
- In its Energy Business, the Company uses wood pellets procured appropriately in Japan and overseas with the aim of expanding its supplies of renewable energy.
- In 2022, the Nippon Paper Crecia Kaisei Mill introduced a solar power generation facility through PPA (Power Purchase Agreement).

*¹ Estimated by the Company based on domestic primary energy supply data (finalized data for FY2021) published by the Agency for Natural Resources and Energy

*² RPF: Refused derived paper and plastics densified fuel. This is a high-grade solid fuel made mainly from those paper and plastic industrial waste materials which are difficult to recycle. (From the website of Japan RPF Industry Association)

CASE STUDY

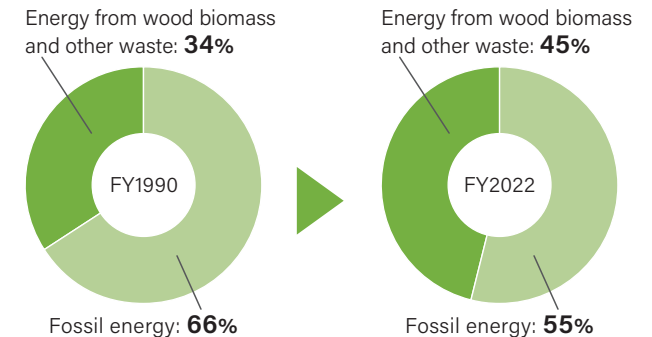
Initiatives in the Energy Business

Together with Sojitz Corporation, the Company has established the Yufutsu Energy Center LLC, a power generation company. In February 2023, the Company started operations at the Yufutsu Biomass Power Plant, one of Japan's most extensive power generation facilities that exclusively burn biomass.

As fuel, the plant uses wood chips, palm kernel shells (PKS), and unused wood, such as forest residue leftovers from Hokkaido.

In addition, Nippon Paper Ishinomaki Energy Center is carrying out renovation work for high biomass co-firing to increase the biomass ratio from 26% to 42% (scheduled for completion in November 2023).

Ratio of Fossil Energy Usage (calorie conversion)



CASE STUDY

Use of Torrefaction Technology and Woody Biomass Fuels (Nippon Paper Industries)

The Company has established a torrefaction technology to manufacture new woody biomass fuel as an alternative to coal for thermal power stations. Torrefaction is a technology that carbonizes woody biomass at a relatively low temperature. This has been developed for the production of fuels which remain relatively high in calories, are easy to crush, and have developed a water resistance that makes them suitable for outdoor storage. The fuel produced by the torrefaction technology can be used in the existing thermal power generating equipment, and contributes to the reduction of GHG emissions.

In-house Production of Solid Fuel from Waste (Nippon Paper Industries)

At its Otake Mill, paper sludge*¹ and waste paper residue*² generated in the production process of containerboards are solidified within the plant and used as energy to run the mill. In-house waste fuel production not only leads to a reduction in the amount of coal used, but also contributes to a reduction in the amount of final waste disposal due to waste recycling. Furthermore, since April 2019, the mill has been accepting plastic waste from Otake City as raw material.

*¹ A sludge produced in the manufacture of paper. It contains mainly cellulose fibers and minerals drained during the paper dewatering / drying process.

*² Foreign matter produced when processing wastepaper

Response to Climate Change

4 Energy Conservation in Production and Logistics Processes

1. Promotion of Energy Conservation in Production Process

- The Group is working hard to conserve energy in Japan and overseas by introducing high-efficiency equipment and reviewing its production processes.
- As for effective initiatives, the Group is expanding them to the mills of Group companies in Japan and overseas in an effort to increase their effectiveness.

<Examples of energy saving in production process>

- Reduction of steam by recovering heat from recycled water in pulp machines (at the Company Shiraoui Mill)
- Reduction of power consumption by introducing high-efficiency rotors to the screens that remove foreign matter from the pulp (at the Company Yoshinaga Mill)
- Utilization of a co-generation system (Use of steam with high temperature and pressure obtained in combustion at a boiler in power generation and production processes)

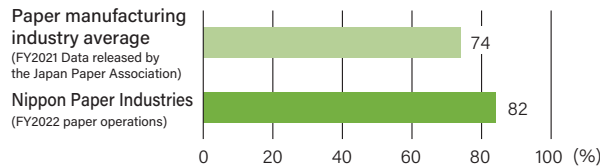
2. Promotion of Energy Conservation in Logistics Processes

From the perspectives of "improving loading efficiency" and "shortening transport distances," the Group is working on green logistics that will lead to a reduction in GHG emissions.

<Promoting energy-saving in logistics processes>

- Promoting a modal shift (Long-distance transportation by loading a large amount of goods at one time on railroads and coastal vessels)
- Pursuing direct delivery and joint delivery (Direct delivery without going through the warehouse in cooperation with the distributor)
- Trial operation of fuel cell forklifts (at the Company's Iwakuni Mill)

Comparison of Modal Shift Rates



Green Management Certifications*¹ (as of April 14, 2023)

Company	Number of offices with Green Management certification* ²
NIPPON PAPER LOGISTICS	5
Nanko Logistics Support	1
Hotoku	1
NP Unyu Kanto	3
NP Unyu Fuji	1
NP Unyu Kansai	1
NP Unyu Iwakuni	2

*¹ A system in which the Foundation for Promoting Personal Mobility and Ecological Transportation acts as a certification body and certifies and registers businesses that are making efforts above a certain level based on the Green Management Promotion Manual.

*² Awarded the "Green Management Certification Permanent Award" for all business sites that have been certified and registered continuously for 10 years from the first year of registration.

Eco Rail Mark Certifications*(as of March 31, 2023)

Company	Certification type
Nippon Paper Industries	Eco Rail Mark for companies
	Eco Rail Mark for products (paper, white paperboard)

* The certification, established by the Ministry of Land, Infrastructure, Transport and Tourism, applies to companies (and the products of companies) which use more than given percentage of rail freight transportation, which generates lower unit CO₂ emissions.

CASE STUDY

Efforts in Round-Trip Transportation between Akita Prefecture and the Tokyo Metropolitan Area (Nippon Paper Industries)

Since 2022, the Company has started round-trip transportation between Akita Prefecture and the Tokyo metropolitan area in collaboration with DOWA Ecosystem Co., Ltd. (DOWA) and Japan Freight Railway Company. In the past, containerboards produced at its Akita Mill were mostly transported by truck due to product height restrictions. By using large containers owned by DOWA, it has become possible to switch part of the product transport to freight rail transport. This contributes to reducing the burden of truck logistics, diversifying risks and improving stability through double-track transportation modes, and reducing GHG emissions.

Response to Climate Change

3. Absorption and Fixation of CO₂ through Appropriate Management of Company-owned Forests

- The Group is in compliance with the Clean Development Mechanism (CDM) of the Kyoto Protocol and considers that the forests absorb CO₂ while growing and the CO₂ is deemed emitted to the atmosphere when trees are harvested.
- The forests owned by the Group in Japan and overseas are harvested and replanted based on the business plan for the purpose of using resources.
- Part of the amount of CO₂ absorbed through proper forest management and continuous thinning has been certified as "J-Credits*" after inspection.
- The net amount of CO₂ absorbed by forests in company-owned forests in Japan and overseas (absorption amount minus logging amount) was about 780,000 tonnes-CO₂ from 2020 to 2022, and the total fixation amount was about 31 million tonnes-CO₂ as of the end of 2022.
- The Group estimates that the amount of sequestered CO₂ in forests in environmental protection area established in plantation projects overseas is approximately 10 million tonnes-CO₂.

* A system in which the government certifies as "credits" the amount of CO₂ emissions reduced through the introduction of energy-saving equipment, the use of renewable energy, and the absorption of CO₂ through appropriate forest management.

J-Credit Sales Performance

Company	Credit name	FY2019	FY2020	FY2021	FY2022
Nippon Paper Industries	Fuji/Kitayama company-owned forest thinning promotion project	1 case	—	2 cases	2 cases
Nippon Paper Lumber	Gunma/Sudagai company-owned forest thinning promotion project	2 cases	1 case	2 cases	3 cases

CASE STUDY

Acquisition of J-Credits (Nippon Paper Industries)

In September 2022, the Company newly acquired J-Credit certification for Kazaki Company-owned forest (Fuji City, Shizuoka Prefecture). This project was the first case in Japan to obtain J-Credit certification using aircraft and drones, which became possible with the revision of the system in August 2021.

Response to Climate Change

Response to TCFD

The Nippon Paper Group endorsed the Task Force on Climate-related Financial Disclosures (TCFD) in April 2021 with the aim of disclosing appropriate information on its response to climate change issues.

Governance

The Group has positioned responding to climate change issues as an issue for management and is working on mitigation and adaptation measures centered on reducing greenhouse gas (GHG) emissions.

The Company's Board of Directors positions the response to climate change issues as vital for realizing the Group Mission. It receives reports on the progress of the various projects related to GHG emission reduction, identified risks and opportunities, scenario analysis results, and other key data points from the director in charge of GHG emission reduction and environmental management (at least twice a year) and the Risk Management Committee (once a year). The Board also supervises the execution of these operations.

Risk Management

The assessment of and response to climate change-related risks are integrated into the Group's [risk management system](#) → PoB and managed by the Risk Management Committee. At the same time, risks reported in reports by the director in charge of GHG emissions reduction and promotion of environmental management (at least twice a year) are arranged in order of priority and evaluated, and then prompt decisions are made by the Board of Directors. Regarding risk assessment, the Climate Change Strategy Working Group sets multiple temperature rise scenarios, analyzes and evaluates them in order to identify essential risk.

Indicators and Targets

Indicators	Targets			
	FY	2030	2022 (Implementation Results)	2050
GHG Emissions Reduction Rate	54% Reduction* (compared with FY2013)	30% Reduction 5.95 million t-CO ₂	Carbon neutrality	
Non-fossil energy use ratio	60% or more	45%	—	

* Scope 1 and 2 related to manufacturing, excluding the energy business field

- Amount of investment to address climate-related risk: ¥52.0 billion (by FY2030)
- Internal carbon price: Introduced in FY2021, but temporarily ceased being used in FY2022 due to a surge in the price of fuels such as coal

Strategy and Scenario Analysis

The Group drew up a vision of society against the backdrop of growing awareness of ESG issues. Using two scenarios (1.5°C scenario and 4.0°C scenario), the Company conducted qualitative and quantitative assessments of the impacts of climate change risks and opportunities as of 2030 and 2050 on its financial plans, and reported the results to the Board of Directors

Scenario Analysis Methods

(1) Establishing an Image of Society 1.5°C scenario (RCP 2.6)

All kinds of policies will be introduced to keep temperature rise below 1.5°C, and at the same time, society as a whole will take action to limit temperature rise. As a result, temperatures will rise slowly, and therefore, by 2030, there will be little change from the current situation in terms of severe disasters, temperature rises, and precipitation patterns. In markets, production and consumption activities giving priority to environment conservation such as an expansion in ethical consumption, will increase.

4°C scenario (RCP 8.5)

No policies will be introduced to control temperature rise. While some stakeholders will take actions to limit temperature rise from the perspective of promoting ESG management, regardless of whether policies are introduced or not and regardless of what society as a whole is doing, society generally

will not take actions to limit temperature rise. As a result, temperatures will rise more rapidly than in the 1.5°C scenario, and the frequency of severe disasters will increase, temperatures will rise, and precipitation patterns will be more changeable in 2030 than in the current situation.

(2) Evaluation Items

Risk: likelihood of occurrence, timing of occurrence, timing of impact, financial impact

Opportunity: likelihood of occurrence, timing of occurrence, timing of impact, financial impact, market growth

Summary of Analysis Results

The Group is considering scenario analyses and other information to formulate a transition plan toward carbon neutrality in 2050.

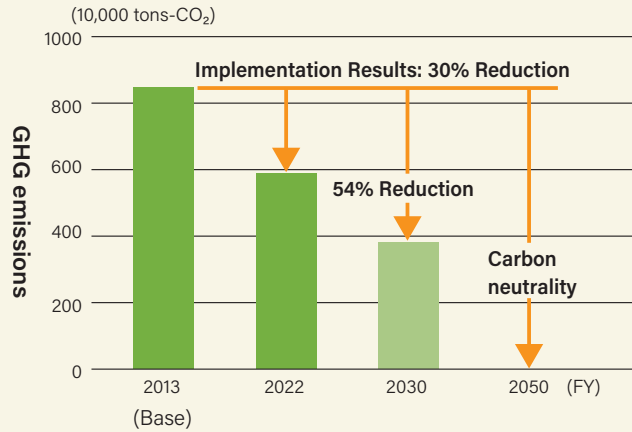
As the pulp and paper industry is energy-intensive, transitional factors such as the introduction of policies and changes in market needs pose significant risks. At the same time, physical elements such as an increase in severe disasters also pose substantial risks. In response, the Company focuses on reducing GHG emissions, establishing diversified production sites, and implementing a green strategy. Particularly for cutting GHG emissions, for which the transition risk factors were evaluated to be changing faster (e.g., the introduction of policies and changes in market needs, and their impact may be large), the Group considered additional measures to reduce coal consumption in conjunction with reorganization of production structure, and in May 2023, the Group raised its reduction target for FY2030 from 45% to 54%.

Going forward, the Group aims to ensure strategic resilience by using scenario analysis and other means to achieve the GHG reduction targets quickly.

Risks posed by climate change are a critical management issue for the Group. On the other hand, however, there are many opportunities for the Company to leverage its strengths to enter and grow in markets that are being created and expanded by introducing policies and changes in market needs. Also, in response to adaptation to climate change, the Group plans to utilize multiple production sites and work to reduce risks such as production stoppages through a meticulous business continuity system. At the same time, the development and sale of eco-friendly and adaptable products that are needed by society will provide opportunities for growth in markets that are expected to expand.

Response to Climate Change

Nippon Paper Group Plan for Shift to Carbon Neutrality



Period	Short-term	Mid-term	Long-term
Target	54% reduction compared with FY2013 (Scope 1 and 2)*		Carbon neutrality in 2050
Priority measures	Continuation and reinforcement of energy-saving measures Improve the basic unit by 1% or more compared to the previous fiscal year		
	Conversion to non-fossil fuels Non-fossil energy ratio of 60% by FY2030		
	Improved production efficiency Reorganization of production structure		Introduction of carbon-free fuels and CCUS
	Maximizing forest absorption of CO ₂ Sustainable forest management and utilizing breeding/propagation technology		

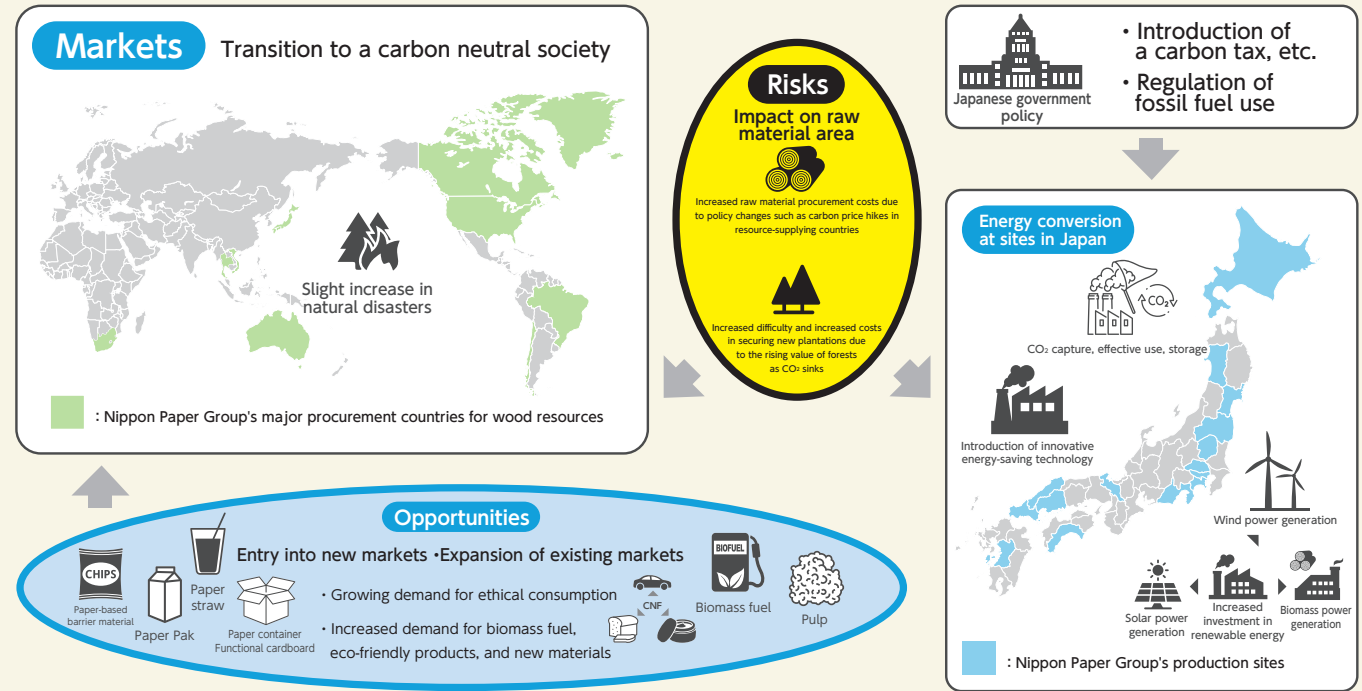
* Emissions related to manufacturing, excluding the energy business field

[1.5°C scenario]

2030

Costs such as a carbon tax will increase.

On the other hand, new business opportunities such as biofuels, environmentally friendly products, and new materials will emerge.



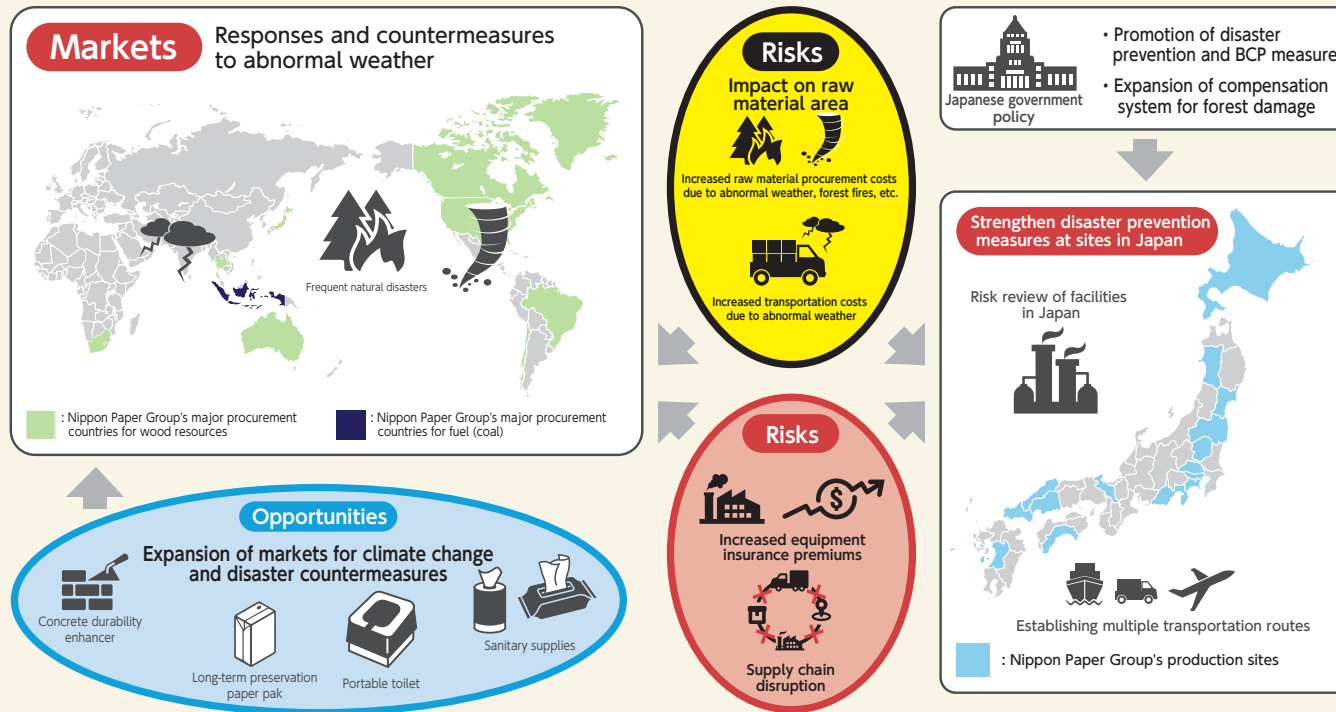
Response to Climate Change

[4°C scenario]

2030

Increased physical risk.

On the other hand, business opportunities for climate change and disaster response products will expand.



Response to Climate Change

■ Details of the Analysis Results

Climate Change-Related Risks

Risks as of 2030

Factors	Impact on the Company	Financial impact		
		1.5°C scenario	4°C scenario	
Transition factors	Policy introduction (e.g., carbon tax, changes in energy mix)	Carbon tax*1 and energy procurement costs will increase.	High*2	Low*2
		Capital investment costs for fuel conversion and energy conservation will increase.	High	Low
		Raw material procurement costs will increase.	High	Low
		Increased acquisition cost of plantation project sites.	Medium	Low
	Changes in market needs	Increased procurement costs for certified wood chips.	Medium	Medium
		Development costs and capital investment costs for reducing environmental impact will increase.	Medium	Low to Medium
Physical factors	Increase in the number of severe disasters (frequent typhoons and heavy rains)	Stoppage of raw material procurement, production, product transportation, etc., resulting in reduced production volume and delayed or halted deliveries of products.	Medium to High	High
		Procurement, manufacturing, and logistics costs will increase.		
		Increase in turbidity of rivers, etc., from which water is taken, resulting in production stoppage and delay or stoppage of deliveries of products.		
	Increase in temperature and change in precipitation patterns	Losses in the company's plantation assets.	Medium	High
		Raw materials will become difficult to procure and procurement costs will increase.		
		Costs for search for alternative materials and technology development will increase.		
		Sales volume decreases or sales price declines due to difficulty in maintaining quality.		

*1 Carbon tax is set based on the IEA's NZE (Net Zero Emission) scenario.

*2 Carbon price impact small: less than 10 billion yen, medium: 10 billion yen or more and less than 50 billion yen, large: 50 billion yen or more (Qualitative evaluation except for *2)

1. Transition Factors

1-1. Risks Mainly Due to the Introduction of Policy

<Hikes in carbon and fuel prices due to introduction of carbon tax, etc.>

Under the 1.5°C scenario, carbon prices will increase mainly due to the introduction of policies such as carbon taxes, emissions trading schemes, and bans on the use of coal-fired power generation. At the same time, it is expected that fossil fuel prices will rise, and fuel procurement costs will increase. Since the pulp and paper industry is energy-intensive, financial plans are at risk of being significantly affected by the introduction of these policies.

Under the 4°C scenario, carbon prices will not increase and fossil fuel prices are not expected to rise significantly because no policies will be introduced, but changes in supply and demand for fossil fuel will occur and fuel prices will fluctuate. This is already part of the Company's normal risk management and the risk of being affected is considered small.

In response to the risk of higher fossil fuel prices expected in the 1.5°C scenario, in which all kinds of policies are introduced, the Group will make maximum use of its Nippon Paper Lumber biomass procurement network, which has among the best timber procurement performance in Japan, reducing this risk by accelerating the shift to non-fossil fuels.

Regarding the rise in carbon prices due to the introduction of emissions trading schemes and carbon taxes, the Group will mitigate risk of an impact on financial plans related to carbon price hikes at an early stage by taking speedier actions to reduce GHG emissions. Concerning measures to reduce GHG emissions, the Group continues to implement energy-saving measures at its paper and paperboard mills to reduce coal consumption with an index of 1% or more improvement in energy consumption per unit of production each year. Simultaneously, the Group works on converting to recycled fuels, such as biomass and waste fuels, and maximizes the use of black liquor*, carbon neutral energy.

The Group will mitigate the risk of an impact on financial plans related to carbon price hikes at an early stage by considering reorganization of production structure, reducing GHG emissions in an integrated manner, and achieving low-carbon consumption early through steps such as controlling output of coal boilers and stopping them.

The Group believes that there is a high possibility of carbon price hikes triggered by future introduction of emissions trading schemes and other such systems. Therefore, the Group will also work to mitigate risks by participating in the Ministry of Economy,

Trade and Industry's GX League and getting actively involved in the formation of systems, rules, and other resources so that these can contribute to corporate growth.

* Black liquor is comprised mainly of a wood component, lignin, and created as a by-product during the course of pulp manufacturing.

<Changes in energy composition>

In the 1.5°C scenario, there is a risk that the demand for biomass fuels will increase due to policies to promote the introduction of renewable energy, causing fuel prices to rise and procurement costs to increase. At the same time, under the current FIT system, there is a risk that the procurement cost of wood chips for paper production will also increase due to competition with biomass fuels.

In the 1.5°C scenario, there is a risk that the demand for biomass fuels will increase due to policies to promote the introduction of renewable energy, causing fuel prices to rise and procurement costs to increase. At the same time, under the current FIT system, there is a risk that the procurement cost of wood chips for paper production will also increase due to competition with biomass fuels.

In response to the procurement risks associated with the increased demand for biomass fuel due to the introduction of various policies, the Company believes that it can procure biomass fuels stably and at a relatively attractive price by making maximum use of its Nippon Paper Lumber biomass procurement network, which has among the best wood procurement performance in Japan.

With regard to wood chips for papermaking, the Company will reduce risks by securing raw materials and stabilizing purchase prices by strengthening relationships of trust based on our long track record with existing suppliers and developing and adopting inexpensive local resources.

<Impact on raw material procurement>

Since the Company imports most of the raw materials necessary for its manufacturing from overseas, it may be affected by the policy trends of resource-supplying countries. Under the 1.5°C scenario, carbon prices are expected to be raised due to stricter policies in resource-supplying countries, and there is a risk that raw material procurement costs will increase.

The Company collects information on policies in resource-supplying countries and strives to predict the occurrence of risks, while at the same time trying to reduce risks by diversifying supply sources.

Response to Climate Change

<Expansion of the carbon credit market>

In the 1.5°C scenario in which the world aims to become carbon neutrality (net zero CO₂), the market is expected to expand due to increased demand for carbon credits. Along with this, the demand for credits from forest absorption is expected to increase, leading to increased forest investment for credit creation and a subsequent rise in the price of land suitable for planting trees, so there is a risk that the cost of acquiring plantations for its plantation business will increase. Some regions are already witnessing this trend.

On the other hand, under the 4°C scenario, some stakeholders may secure plantation land from the perspective of promoting ESG management, regardless of whether policies are introduced or not, and regardless of the movements of society as a whole, but the risk of such actions on the Company's plantation business is considered small.

Expansion of the plantation business requires a large area of suitable land for plantation, so rising land prices may pose a risk to the Company. However, the Company can reduce this risk by utilizing its strengths, such as its proprietary technology for breeding and propagating highly efficient CO₂-fixing trees and operating plantation businesses in cooperation with third parties.

1-2. Risks Arising Primarily from Changes in Market Needs

<Rapid increase in demand for environmentally friendly products>

Under the 1.5°C scenario, demand for environmentally friendly products is expected to increase, and there is a risk that technology development costs, capital investment costs, etc. will increase in response to this demand while products and services with high environmental burden will no longer be selected in the market. In the future, the market is expected to favor products and services derived from renewable raw materials, due to expectations of being environment friendly. Therefore, the Company believes that by accurately identifying and forecasting customer needs and further promoting the "paperization" that it is already working on, the Company will be able to promote the replacement of materials with renewable biomass materials, reduce risks associated with changes in market needs, and at the same time seize this as an opportunity to expand its business. The Company will further accelerate reduction of GHG emitted over the course of product manufacturing. At the same time, by taking advantage of the fact that its production sites are dispersed throughout Japan, the Company will offer products that contribute to the reduction of GHG emissions throughout the supply chain by shortening the transportation distance to delivery destinations and reducing GHG

emissions during transportation through the use of multiple production sites.

In addition, as part of changes in market needs, under the 1.5°C scenario, the demand for certified paper based on the forest certification system, which indicates that the paper is made from forest resources that have been properly managed, will increase more than ever due to the heightened awareness of the whole society about the proper management and use of forests, which will increase the procurement cost of certified wood chips that are a limited resource.

To reduce this risk, the Company will maintain and continue good relationships with certified timber suppliers, and at the same time, it will secure certified timber in a stable and efficient manner by acquiring certification in new plantation areas and by supporting suppliers in expanding certified resources.

2. Physical Factors

2-1. Risks Mainly Caused by an Increase in Severe Disasters

<Damage to production sites and distribution networks>

Under the 4°C scenario, severe disasters such as typhoons and torrential rains are expected to become more frequent, and the probability of damage to production sites and distribution networks is expected to increase, so the risk of a decrease in production volume due to temporary production stoppages and delays or stoppages in deliveries will become greater. In addition, in the event that the power supply is interrupted due to damage to power lines or other essential services, there is a risk that production sites that do not have their own power generation facilities will be forced to temporarily suspend production.

Although the Company cannot control the occurrence of natural disasters, it is working to reduce risks by establishing elaborate systems to ensure business continuation, such as backup systems for production and inventory controls. The Company is also trying to reduce risks by promoting measures to adapt to climate change, such as bulking up equipment installation sites and installing in-house power generation equipment for use in times of disaster.

<Deterioration of water intake quality>

The Company's main business, pulp and paper, uses water in its manufacturing process. If the water quality (turbidity) of the rivers, etc. from which water is taken deteriorates due to typhoons or heavy rains, product quality cannot be maintained, and there is a risk that production will be suspended until the water quality improves. This event is already occurring,

but is expected to become more frequent under the 4°C scenario.

Natural disasters are unavoidable, but the Company is taking measures to ensure that operations can continue as long as possible by strengthening its water intake purification facilities and methods, and at the same time, working to reduce risks by developing a detailed system for business continuity in case production is suspended.

2-2. Risks Mainly Caused by Rising Temperatures and Changes in Rainfall Patterns

<Forest fire occurrence>

As temperature rises, under the 4°C scenario, forest fires are expected to occur more frequently around the world. Since the Company's business model is based on forest resources, fires in the forests of its wood chip suppliers or in its own forests could pose a major risk in terms of stable procurement of raw materials and procurement costs. In addition, in the event that the Company's own forests are damaged by fire, there is a risk that the value of the Company's own forests will decline, and revenue from the Company's plantation business will decrease.

In order to reduce these risks, the Company is strengthening its fire prevention and extinguishing systems in its own forests, and at the same time, it is trying to reduce these risks by dispersing its own forests and suppliers in multiple countries and regions.

<Deterioration in plant growth>

The growth of plants is greatly affected by temperature and rainfall. Since the Company uses plant-derived raw materials such as wood chips, various types of pulp, starch, etc., there is a risk that procurement of raw materials will become difficult and procurement costs will rise in the 4°C scenario where plant growth is expected to decline due to rising temperatures and changes in rainfall patterns. In the event that the Company has difficulty in procuring raw materials, it would be hard to maintain the quality and function of its products, which may be a risk that its sales volume and price decrease. However, the Company is working to reduce these risks by diversifying its raw material supply sources and continuing to search for alternative materials.

Response to Climate Change

Opportunities for Business Expansion

Opportunities as of 2030

	Factors	The Company's opportunities	The Company's strength	Market growth		
				1.5°C scenario	4°C scenario	
Transition factors	Policy introduction (e.g., carbon tax, changes in energy mix)	Renewable energy will be introduced.	Demand for power generation facility locations will increase.	<ul style="list-style-type: none"> Company-owned forests and land in Japan, etc. Biomass fuel production technology Fuel procurement network Utilization of existing boilers 	Expansion	Stable
			Demand for biomass fuels will increase.			
			Waste-derived fuels such as refuse derived paper and plastics densified fuel (RPF) and waste tire-derived fuel will be utilized more often.			
		Next-generation vehicles are becoming increasingly popular.	Storage batteries will spread and demand for raw materials for storage batteries will increase.	<ul style="list-style-type: none"> CMC Technology and Production Facilities CNF Technology and Production Facilities 	Significant expansion	Expansion
			Demand for CNF will increase due to the need to reduce the weight of automobiles.			
		Carbon credit market will be activated.	Demand for forest absorption credits will increase.	<ul style="list-style-type: none"> Company-owned forests in Japan Forest management technology Breeding and propagation technology 	Significant expansion	Stable
		Resources will become more difficult to obtain due to stricter policies in resource-providing countries.	Demand for domestic lumber will increase.	<ul style="list-style-type: none"> Company-owned forests and in Japan seedling businesses Recycled paper procurement network Collaboration with Stakeholders Unused recovered paper recycling technology 	Expansion	Stable
			Demand for recycled paper will increase.			
	Carbon recycling is advancing (utilization of carbon resources).	Increasing demand for carbon fixation and utilization by forests	<ul style="list-style-type: none"> Breeding technology for high-efficiency CO₂-fixation trees Company-owned forests in Japan 	Expansion	Stable	
		Growing demand for chemical raw materials using wood-derived CO ₂	<ul style="list-style-type: none"> Biomass-derived CO₂ supply infrastructure (recovery boilers) Chemical CO₂ fixation and utilization technology 	Significant expansion	Stable	
	Transition to a decentralized society	Increasing local production and local consumption of energy	Small scale fuel demand will increase.	<ul style="list-style-type: none"> Fuel procurement network 	Expansion	Stable
		Decentralization of product consumption	Increased opportunities to sell products with reduced CO ₂ emissions during distribution while handling shipments from each production site	<ul style="list-style-type: none"> Multiple production sites 	Expansion	Stable
Changes in market needs	Demand for environmentally friendly products will increase.	Demand for biomass materials will increase as the need for paperizing increases due to decarbonization.	<ul style="list-style-type: none"> Woody biomass materials development technologies (CNFs, paper-based packaging materials, liquid containers, functional corrugated cardboard, biocomposites, etc.) Technologies to extract and utilize lignin Technology for recycling unused wastepaper 	Significant expansion	Expansion	
		Demand for lignin products will increase.				
		Demand for paper made from sustainably sourced forest materials will increase.	<ul style="list-style-type: none"> Track record of procuring certified forest materials Relationship of trust with excellent suppliers Sustainable forest management 	Expansion	Expansion	
		Demand for products that reduce GHG emissions from livestock farming will increase.	<ul style="list-style-type: none"> Cellulose material utilization technology 	Expansion	Stable	
		Demand for halogen-free resins with low environmental burden will increase.	<ul style="list-style-type: none"> Increased demand for functional coating resin "AUOREN[®]" 	Expansion	Expansion	
		The decarbonization trend is intensifying in the aviation industry, increasing demand for sustainable aviation fuel (SAF).	<ul style="list-style-type: none"> Pulp and cellulose manufacturing technology 	Expansion	Expansion	
Physical factors	A rise in demand for stable product supply	Growing demand for purchasing from suppliers with established flexible BCP systems	<ul style="list-style-type: none"> Multiple production sites 	Expansion	Significant expansion	
		Overseas raw material suppliers and distribution networks are damaged.	Demand for domestic lumber will increase.	<ul style="list-style-type: none"> Domestic Company-owned forests and seedling Businesses Recycled paper procurement network Fuel procurement network Collaboration with stakeholders Unused recovered paper recycling technology 	Expansion	Significant expansion
	Demand for recycled paper will increase.					
	Domestic demand for waste-derived fuels and biomass fuels will increase.					
	Increasing need to strengthen buildings	Demand for concrete admixtures and other materials will increase.	<ul style="list-style-type: none"> Admixture for concrete (fly ash) technology 	Expansion	Expansion	
Demand for long-term food storage will increase.	Increasing demand for aseptic paper cartons for long-term storage of contents	<ul style="list-style-type: none"> Total system supplier (processing from base paper, sales and maintenance technology of filling machines) 	Expansion	Expansion		
Increase in temperature and change in precipitation patterns	Decreases in the amount of plant growth	Demand for environmental stress tolerant trees will increase.	<ul style="list-style-type: none"> Breeding and propagation technology 	Expansion	Expansion	

Response to Climate Change

1. Transition Factors

1-1. Opportunities Associated with the Introduction of the Policy

<Increase in demand for renewable energy>

In the 1.5°C scenario, policies are expected to promote the introduction of renewable energy, which will increase the demand for locations to install solar, wind, and small hydroelectric power generation facilities, as well as the demand for biomass fuels.

The Company owns its forests and land in Japan, and it has an opportunity to expand its business of supplying renewable energy in cooperation with power generation companies. Increasing demand for biomass fuels will provide an opportunity to expand the biomass fuel sales business by making maximum use of the procurement network of Nippon Paper Lumber, one of the largest wood collection and sales companies in Japan.

In the 1.5°C scenario, where a rapid increase in demand for renewable energy is expected, the Company believes that it has the tangible and intangible assets, such as biomass boilers and facilities and technologies that use black liquor, a carbon-free fuel, to meet this demand, and can quickly respond to this market expansion and capture business opportunities.

<Dissemination and expansion of next-generation vehicles>

Since the transportation sector accounts for about 20% of Japan's CO₂ emissions, it is predicted that next generation vehicles such as electric vehicles will become more popular in the future.

In March 2021, the New Industry Creation Hatchery Center (NICHe) at Tohoku University announced that it had discovered that CNF*1s have a powerful energy storage effect, and that it had succeeded in developing the world's first dry, lightweight supercapacitor by using the Company's TEMPO-oxidized CNF to create an uneven surface with a controlled CNF surface shape. In addition to enabling high-voltage charging in a shorter period of time than conventional lithium-ion batteries, CNF-based energy storage is a technology that is expected to solve the problem of increasing energy storage capacity, which is currently an issue for electric vehicle batteries, and could make a significant contribution to the spread of electric vehicles, etc. The global supercapacitors market was valued at approximately USD 5.02 billion in 2021, and is expected to grow at a rate of 23.9% per annum from 2022 to 2030, reaching USD 22.5 billion in 2030. *2 With the spread of next-generation vehicles, the need to reduce vehicle

weight is expected to increase further. The size of the fiber-reinforced plastics market, including automotive components, was USD228.4 billion in 2019 and is expected to reach USD295.6 billion by 2027. *2 Currently, glass (glass fiber) and carbon (polymer-reinforced carbon fiber) are the most commonly used fibers for reinforcing materials, but with the spread of electric vehicles and other vehicles, there is a growing need for lightweight materials to further improve fuel efficiency. The specific gravity (weight per unit volume) of CNF is lower than that of other fibers, making it a highly effective lightweight fiber. In addition, CNF is a carbon neutral, plant-derived material with multifaceted value in environmental conservation, as it has less performance degradation due to material recycling than glass fiber reinforced resin.

The global CNF market size is estimated to be about 6 billion yen in 2023. As it is gradually being adopted for composite reinforcement materials for automobile parts and other materials, the market size is expected to expand to about 7.5 billion yen in 2025 (150 tonnes in 2022 to 270 tonnes projected for 2025) *3.

The diffusion of next-generation vehicles is a highly feasible event in both scenarios, with or without the introduction of policies, but in the 1.5°C scenario, the diffusion will be rapid due to policy support. The Company believes that it has the technological superiority and technological development capability to respond to this rapid spread, and that it can promptly respond to the rapid market expansion and grow the Company's business.

*1 Cellulose Nano Fiber

*2 Report by Report Ocean (U.S.) dated December 17, 2020

*3 Source: Yano Research Institute, https://www.yanoresearch.com/en/press-release/show/press_id/3237

<Expansion of the carbon credit market>

In the 1.5°C scenario where the world is aiming for carbon neutrality (net zero CO₂), the carbon credit market is expected to expand due to increased demand, and the demand for forest absorption credits is expected to increase accordingly.

The Company owns approximately 90,000 hectares of its forests in Japan and operates tree plantation projects in various overseas countries. In addition to forest management technology cultivated through the management of Company-owned forests in Japan and overseas plantation projects, the creation

of carbon credits by utilizing the Company's unique breeding and propagation technology that enables highly efficient CO₂ fixation is expected to enable the Company to enter the expanding market and capture business opportunities. The Company is committed to making contribution to formulation of rules regarding how forest absorption credits should be shaped and utilized from a forest owner's perspective, through such initiatives as the GX League Basic Concept advocated by the Ministry of Economy, Trade and Industry.

<Strengthen the policies of resource-providing countries>

Since the Company imports most of the raw materials necessary for its manufacturing from overseas, it may be affected by the policy trends of resource-supplying countries. In the 1.5°C scenario, there is a risk that raw material procurement costs will increase if resource-providing countries tighten their policies and raise carbon prices. On the other hand, the Company owns forests in Japan and utilizes such resources, and at the same time, it operates a seedling business that contributes to creation of new resources. The Company has also established diversified procurement networks in Japan for resources such as fuels and recovered paper. Accordingly, the Company is able to make a shift to utilization of domestic resources. In addition, the Company has already become one of the top-ranked companies in Japan in terms of the domestic timber utilization rate.

The Company is working with stakeholders to create a closed-loop recycling system for recovered paper, and at the same time, it is leveraging its strengths to make efficient and stable use of diverse resources, such as utilizing technologies to make use of paper that is difficult to recycle, such as used paper containers for food and beverage applications.

In October 2022, the Company began operating recycling facilities for food and beverage paper containers at its Fuji Mill to build a used paper recycling business. In addition, the Company is working with Hamamatsu City to recycle used paper containers and building a scheme for sorting and collecting paper cups and paper cartons. By 2030, It aims to stably collect and use unused wastepaper (12,000 tonnes per year), such as used paper containers.

Under the 1.5°C scenario, the Company expects the impact of the policies of resource-providing countries to occur within five years, but the Company believes it can maintain and expand its business by taking advantage of its access to domestic resources.

Response to Climate Change

<Promotion of carbon recycling>

In the 1.5°C scenario, carbon recycling, which is the process of capturing and reusing CO₂ from the atmosphere, is expected to progress rapidly, along with the reduction of GHG emissions through the reduction of fossil fuel use.

In its overseas plantation business, the Company continues the cycle of planting, nurturing, harvesting (wood chip production), and then replanting, by which, every year, the forests absorb and fix CO₂ in the atmosphere and use it as a wood resource.

As an example, the annual production volume of wood chips by AMCEL (Brazil), the Group's plantation company, is equivalent to approximately 1.5 million tonnes of forest CO₂ absorption. By positioning its overseas plantation business as a carbon recycling business and promoting the use of its proprietary breeding and propagation technologies that enable highly efficient CO₂ fixation, the Company can improve its CO₂ absorption and fixation capacity and contribute to the recycling of carbon resources, not just in the Company's own forests.

The Company aims to improve the CO₂ fixation efficiency in overseas tree plantation projects by 30% by FY2030, as compared with FY2013. The Company intends to secure future resources for the Company by contributing to improvement of productivity of forests across the globe and an increase in CO₂ fixation through provision of our breeding and propagation technologies and plantation technologies to other companies. The Company entered into a strategic partnership agreement concerning a plantation project in Indonesia with Marubeni Corporation in 2022, and commenced provision of technological support. In addition, the Company aims to secure about 0.1 million hectares of new plantation resources mainly in Asia. Since CO₂ derived from biomass obtained from sustainable forests is considered carbon neutral, carbon negativity (negative emissions) can be achieved by separating and recovering the CO₂ generated from the combustion of biomass fuels and storing it underground or recycling it. In the future, with the practical application of technologies for CO₂ separation, underground storage, and recycling, the Company can expect to achieve carbon negativity using CO₂ generated from biomass boilers and black liquor-fueled recovery boilers operating in Japan.

1-2. Opportunities Associated with Transition to a Decentralized Society

Under the 1.5°C scenario, the transition from a metropolitan-intensive society to a decentralized society is expected to proceed. As a result, local production and local consumption of energy will increase, and small-scale demand for fuel will likely increase. This trend has already begun, but it is expected to accelerate under the 1.5°C scenario. In response, the Company will have the opportunity to expand its biomass fuel sales business by making full use of the biomass procurement network of Nippon Paper Lumber, which is one of the largest wood collection and sales networks in Japan. In addition, with the shift to a decentralized society, the places of consumption of products are also expected to become more dispersed.

In the 4°C scenario, regardless of the temperature rise, there will be a shift to decentralization, but at a slower rate than in the 1.5°C scenario, in part due to the impact of increased risk of infectious diseases. In both scenarios, the Company believes that it can maintain and expand its business by taking advantage of the fact that its mills are dispersed throughout Japan and by responding to the decentralization.

1-3. Opportunities Arising from Changes in Market Needs

<Increase in demand for biomass materials>

The Company has built a business model based on carbon neutral forest resources, which enables it to provide products that meet the needs of customers who prefer environmentally friendly products. There is an ongoing movement to switch from plastic to paper packaging as a means of solving the problem of ocean plastic. In the 1.5°C scenario, this trend will be further accelerated in combination with climate change issues, and the demand for the use of biomass materials in various products other than packaging materials is considered to increase.

As part of the Company's strategy to meet the increasing demand for biomass materials, it is promoting "paperization" under the slogan, "Let paper do what it can do." In addition to developing and marketing "SHIELDPLUS®", a paper packaging material with unprecedentedly excellent barrier properties against oxygen and water vapor, the Company has also developed and started marketing products such as "waterproof liner", a multifunctional base paper for corrugated board that is a sustainable alternative to Styrofoam boxes, "SPOPS®", a replaceable paper container,

and "School POP®", which enables drinking without using straws. Moreover, biomass composites, which are made of "KC FLOCK®", powdered cellulose created by finely grinding pulp, and plastic, are under consideration for various applications as a material with low environmental burden, as the Company can reduce the use of plastic while improving the strength by using biomass composites. It believes that, by providing powdered cellulose suitable for composite material, it can respond to changing market needs and capture and expand business opportunities.

<Increased demand for products derived from sustainable forests>

The Company confirms the legality and sustainability of all woody raw materials it procures and ensures traceability through its supplier questionnaires, site visits and audits. At the same time, all of its woody raw materials are FM (Forest Management) materials under the forest certification system and have been risk assessed and managed.

In addition to utilizing the forest certification system, the Company has adopted a due diligence system to confirm the legality and sustainability of its woody raw materials, and it has established a system that enables it to promptly respond to inquiries from customers regarding raw material procurement. In addition, in order to supply certified forest paper, for which demand has been increasing in recent years, the Company will establish a system to secure certified forest materials in cooperation with suppliers.

The Company's sustainable procurement of forest resources is based on trusting relationships with its suppliers that it has built over the years, and the Company ensures certainty through its due diligence system and forest resource creation in procurement activities.

Moreover, in 2022, the Group's "Philosophy and Basic Policy Concerning Raw Materials Procurement" was revised and its contents were strengthened. Under the policy, the Wood Resource Procurement Guidelines were newly established, and the Group will respond to customer requests by further increasing the reliability of the wood resources the Group uses.

To maximize wood resources, the Company produces a variety of products such as industrial dispersants and lead-acid battery additives, made from lignin in addition to pulp.

The Company is committed to continuing to provide environmentally friendly products using sustainable wood resources as raw materials.

Response to Climate Change

<Increase in products that reduce greenhouse gas emissions>

The amount of greenhouse gases generated during the conversion of cattle excrement into fertilizer accounts for about 30% of the total emissions from the agriculture, forestry, and fisheries sectors in Japan, and research is being conducted to reduce these emissions.

Using the Company's proprietary technology to extract only cellulose fiber, which is easily digestible by cattle, from wood chips, it is developing livestock feed with superior fiber content and nutritional value.

Feeding cows with easily digestible feed is expected to reduce the water content of excrement and reduce GHG emissions generated when compost is made. Reducing GHG emissions in the livestock industry has become a global issue. In the 1.5°C scenario, there is a possibility that efforts to achieve this will accelerate, and the market for feed with a reduction effect may expand.

The Company believes that it can capture this business opportunity by utilizing the technologies it has accumulated in the pulp and paper business.

<Increased demand for sustainable aircraft fuel (SAF)>

The Company aims to start manufacturing bioethanol derived from domestic wood with an annual production capacity of tens of thousands of kiloliters by FY2027.

Considering the utilization of domestic wood and its contribution to a carbon neutral society, the bioethanol to be manufactured is assumed to be mainly used as raw material for domestic SAF*1. At the same time, the Company will also consider carbon recycling initiatives that contribute to a carbon neutral society, such as CCU*2 using wood-derived CO₂ generated as a secondary product in bioethanol production and the effective use of residues from the fermentation process.

Utilizing its paper pulp manufacturing technology cultivated over the years, the Company plans to quickly establish a mass manufacturing technology and supply system for "wood-derived bioethanol" in units of 10,000 kiloliters, thereby accelerating its entry into the biochemicals market and contributing to the building

of a carbon neutral society.

*1 SAF: Sustainable Aviation Fuel. Sustainable aircraft fuel. This sustainable aviation fuel significantly reduces CO₂ emissions in its lifecycle, from production and collection to manufacturing and combustion, compared to conventional fuels, and can be utilized as is with existing infrastructure.

*2 CCU: Carbon dioxide Capture and Utilization. This refers to the separation and recovery of CO₂ and its effective use as a resource in crop production and chemical product manufacturing.

2. Physical Factors

2-1. Opportunities Due to the Increase in the Number of Severe Disasters

<Increase in demand for stable supply of products>

Severe weather disasters, such as typhoons and torrential rains, are expected to cause damage to production sites and distribution networks, further intensifying the demand from customers to maintain a stable supply of products.

In response, the Company is working to formulate a detailed system for business continuity. It is developing a system that will allow it to manufacture products at multiple plants. Since severe disasters are expected to become more frequent in the 4°C scenario, the Company believes that it can take advantage of the fact that its factories are dispersed throughout Japan to accelerate the transition to a more flexible production structure and further strengthen its system for business continuity.

Also, in the event that its overseas raw material suppliers are damaged and opportunities for domestic timber, recovered paper and domestic non-fossil fuel use expand significantly, the Company can take advantage of its strong timber, recovered paper and fuel procurement network as well as its efforts to secure recovered paper raw materials in collaboration with its customers. Furthermore, it believes that it can also maintain and expand its business by utilizing its unused recovered paper recycling technology and making extensive use of domestic resources.

<Increase in demand for long-term storage food containers>

The market for containers for long-term storage is expected to grow, as local governments and households are becoming

increasingly concerned about the importance of storing emergency food supplies to prepare for severe disasters that are expected to occur not only in a 4°C scenario but also in a 1.5°C scenario.

The Company sells "FUJIPAK," which enable room-temperature distribution and long-term storage of beverages and tofu. In addition, the "non-aluminum FUJIPAK," which does not use aluminum foil and can be distributed at room temperature, is attracting attention as an environmentally friendly container because it improves recyclability and reduces greenhouse gas emissions. The Company has developed a new container, NSATOM®, which enables it to fill a wider variety of contents in addition to its long-term storage function. Since paper containers that can be stored for a long time are expected to contribute to de-PE(polyethylene) and food loss prevention, it will continue to develop new containers that meet the needs of the market and strengthen the Company's stable supply system.

2-2. Rising Temperatures and Changing Precipitation Patterns

<Increasing demand for environmental stress tolerant plants>

Since plants cannot move on their own, and environmental changes such as rising temperatures can cause stress and inhibit growth, efforts have been made for some time to develop plants resistant to high temperatures, salt damage, and drought.

Under the 4°C scenario, the demand for environmental stress tolerant plants may increase because the appropriate areas for plant growth are expected to change and decrease due to climate change.

The Company has been developing tree breeding and propagation technologies for many years and has developed a number of proprietary technologies for these. Because tree breeding takes time, it will be difficult to expand the business rapidly in 2030, but the Company will work to expand its business quickly after 2030, when the value of forests will further increase toward carbon neutrality.

Promotion of Resource Circulation

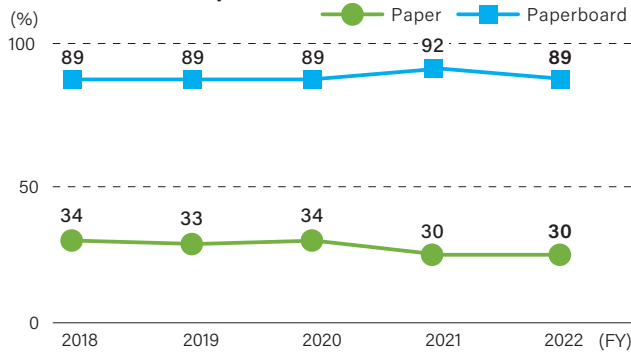
1 Basic Policy

📖 → P83 **The Nippon Paper Group Environmental Charter**

2 Initiatives for Using Wastepaper

The Nippon Paper Group considers wastepaper as important raw material and is working on the recycling of unused wastepaper.

Trend of Used Paper Utilization Rate (in Japan*)



* From FY2021, Crecia-Kasuga is also included in the scope

CASE STUDY

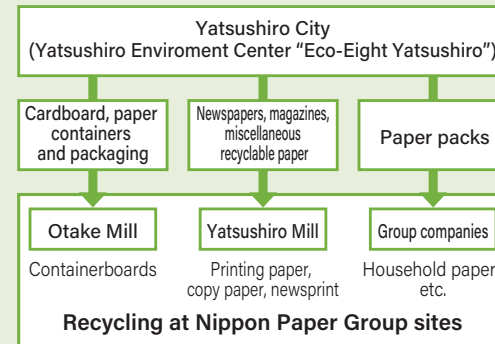
Collaborative Business for Recycling Used Food Paper Containers (Nippon Paper Industries)

Nippon Paper Industries has been conducting tests of self-collection of paper containers for ice cream and other foods with the support of Hamamatsu City since April 2021. This project, being carried out together with Hamamatsu Green Wave Co., Ltd., and NPO Ecolife Hamamatsu, uses collection boxes installed at Ecohama, a facility in Hamamatsu City to raise environmental awareness, and other locations where used paper containers are collected and brought to one of the Company's mills to be utilized as raw material for paper. This will contribute to raising general consumers' awareness of recycling, reducing the volume of incinerated rubbish, and fixing carbon by prolonging use of woody resources.

CASE STUDY

Circular Use of Wastepaper in Collaboration with Local Governments

The Company's Yatsushiro Mill, in collaboration with Yatsushiro City, has built a system to recycle used paper generated in Yatsushiro City. Various types of used paper (newspapers, magazines, miscellaneous recyclable paper, cardboard, paper packs, paper containers, and packaging) collected by Yatsushiro City are accepted by the Yatsushiro Mill and other plants of the Group, recycled using facilities and technologies such as recovered paper pulp production facilities, and used as raw materials for making paper.



Closed Loop Initiatives (Nippon Paper Industries)

The Company has established a "closed loop" scheme in which it directly purchases wastepaper from its customers in order to make long-term, stable use of collected waste newspaper and catalog paper as a raw material. In April 2023, the Company signed a new contract with DINOS CORPORATION Co., Ltd., regarding the sale and recycling of used paper, for the purpose of domestic circulation of resources by building a "closed loop" of catalog waste paper, and started operations.

Collection and Recycling of Paper Cups (Nippon Paper Industries)

Since 2019, the Company has been working to collect used paper cups at its headquarters and recycle them as raw materials for cardboard at its Ashikaga Mill. In FY2022, the Company collected 150,000 paper cups.

Collection and Recycling of Paper Cups Used in In-flight Services (Nippon Paper Industries)

Since December 2022, the Company has started recycling paper cups and other items in collaboration with Japan Airlines Co., Ltd. (JAL). The JAL Group properly sorts and collects the paper cups used in in-flight services. At the same time, the Group builds a unique route for its transportation, accumulation, and packaging, which has enabled the separate collection and recycling of used paper cups. Currently, this paper is recycled as cardboard and toilet roll paper, but in the future, the Company aims to realize horizontal recycling from paper cups back to paper cups.

Paper Carton Recycling "PakUpcycle®"

The Company has conducted various initiatives with a catch phrase of "PakUpcycle®," coined by the Company by combining "Pak" (beverage paper pack) and "Upcycle" (to reuse unnecessary items through processing to add value as a product).

<Paper-Pak Carton Collection and Recycling>

The Company has installed Paper-Pak collection boxes at Group company sites and is working to increase employee awareness of paper packs recycling. In addition, the Company has positioned the collection of paper packs as an activity that enables society as a whole to make effective use of resources, and is working with collection companies to strengthen the efforts to promote recycling at various facilities and schools. In 2017, the Company commenced collection activities using a proprietary method, primarily in Nerima City, Tokyo. The collected paper packs are used as raw material for household paper products. (Results for FY2022: 3.7 tonnes)

<Recycling of Beverage Paper Packs with Aluminum>

The Company is working on the development of mixture of polyethylene and aluminum (hereinafter PolyAl) jointly with RIPRO Corporation, Japan and HAGIHARA INDUSTRIES INC. to material-recycle* the mixture, processed as waste in the recycling process of the beverage paper packs with aluminum. Boundary piles made from PolyAl are used by several forest cooperatives.

* Recycling method in which waste is recycled as raw material for a new product

Reduction of Environmental Burden

1 Basic Policy

📖 →P83 The Nippon Paper Group Environmental Charter

2 Effective Management of Water Resources

- Nippon Paper Group uses water necessary for production activities from tap water, industrial water, groundwater, and rivers.
- For the sustainable use of water resources, the Group is working hard to reduce water consumption and the amount of water pollutants in its wastewater.
- In FY2022, the Group has received no information from the government or local residents that the mills of Group companies were impacting the environment due to their water intake.
- The Group conducts assessments in order to identify water risks, such as the frequency of water supply and flooding, and formulate appropriate countermeasures for each major production site in Japan and overseas.
- In the primary evaluation conducted in FY2022, in order to grasp the water issues in the regions where each site is located, water stress levels were evaluated using the WWF "Water Risk Filter"*; a water risk assessment tool for each basin, both in Japan and overseas at 55 sites.
- The evaluation results were "very low" at 2 sites, "low" at 52 sites, "medium" at 1 site, "high" and "very high" at 0 sites. Going forward, the Group will continue to assess water risks and build a production structure that responds to the risks of droughts and water disasters.

* Water Risk Filter: A tool for evaluating water risks developed by the World Wide Fund for Nature (WWF)

1. Reducing the Amount of Water Used

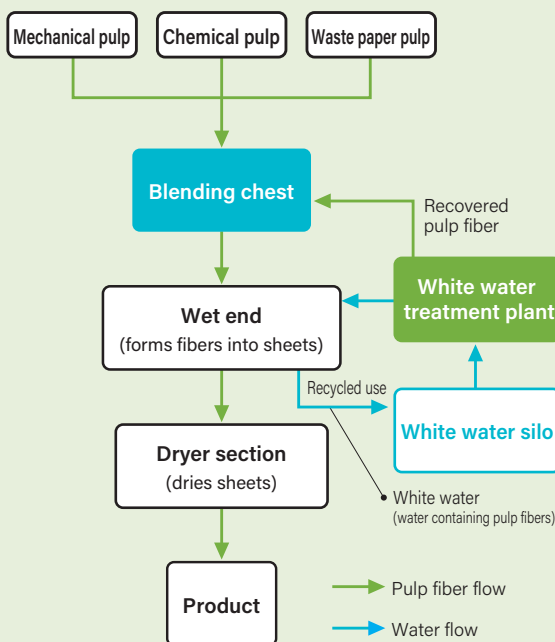
- The Group actively reuses water in production processes to reduce the amount of water used.
- The reuse of water in the production process leads to energy saving of equipment by reducing the amount of inflow water.

CASE STUDY

White Water Recycling

At the Group's paper mills, they collect water containing fine pulp fibers generated in the wet part called white water. The collected white water is separated into pulp fibers and reused water by the treatment equipment, the pulp fibers are returned to the preparation facility, and the reused water is returned to the wet part for recycling, in an effort to reduce water consumption.

White Water Circulation Flow Diagram



CASE STUDY

Recycling of Water Using Jet Nozzles (Nippon Paper Industries)

As the amount of recycled water in the manufacturing process increases, hydrogen sulfide is generated due to fouling within the system caused by closed processes and the rotting of accumulated fine pulp. In order to achieve both water saving and better operability, submersible jet nozzles that utilize the eductor* effect have been installed in Nippon Paper Industries' mills at Ashikaga, Soka, Gotsu, and Yatsushiro. The powerful liquid flow removes dirt and deposits from the bottom of the pit, thereby cleaning the system. In the future, the Company plans to expand this method to other mills in Japan.

* Sucking up the liquid inside the pit and discharging it with supplied water using pressure difference

2. Wastewater Management

- The Group discharges wastewater after reducing the amount of organic substances in the wastewater after reducing them to the standard values stipulated by laws and regulations and the values agreed upon with local governments.
- The Group is working toward reducing water pollutants by 15% compared to FY2018 by FY2030.
- Wastewater from the mills is purified using activated sludge treatment equipment before being discharged into the sea or rivers.
- Wastewater from the mills is thoroughly controlled through constant monitoring using measuring equipment and daily water quality inspections by inspectors.
- The Group has introduced an environmental information management data system for all businesses. In addition to water information (intake volume, wastewater volume, amount of pollutants), the Group will centrally manage a range of environmental information as a database and plan to promote sharing and data utilization at each site.

Reduction of Environmental Burden

3. Initiatives in Collaboration with Other Companies

The Group is working with other companies to implement initiatives for the sustainable use of water resources.

CASE STUDY

Participation in the JOKI Programme (Jujo Thermal Ltd.)

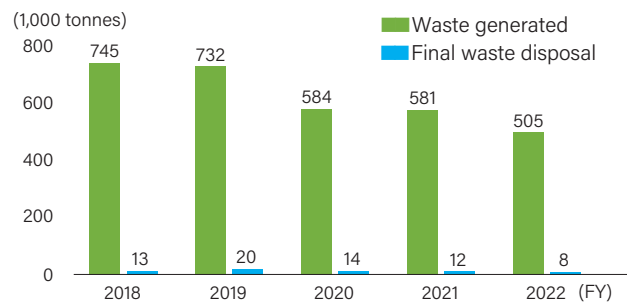
Jujo Thermal (Finland) participates in the JOKI programme, which aims to strengthen the protection of water resources in operating areas and improve water quality.

3 Waste Reduction

1. Waste Recycling

The Group is advancing initiatives such as revising production processes and making effective use of boiler ash as civil engineering material in order to reduce the amount of industrial waste sent to landfill and other forms of final disposal.

Waste Generated and Final Waste Disposal (in Japan*)



* From FY2021, Crecia-Kasuga is also included in the scope

CASE STUDY

Circular Use of Quicklime (Nippon Paper Industries)

At its papermaking mills, the Group uses quicklime to recover chemicals used in the pulp manufacturing processes and to manufacture fillers that impart functionality to paper. Quicklime waste is generated in this process. The Group has so far disposed of this material as an industrial waste. However, the Company's Ishinomaki and Iwanuma mills have started collaborating with a supplier that can recycle quicklime waste. Under this collaboration, the Ishinomaki and Iwanuma mills are working to reuse quicklime waste as a resource.

Processing Coal Fly Ash from a Boiler into a Construction Material (Nippon Paper Industries)

The Ishinomaki Mill operates a coal boiler to privately generate electricity on site. In the process, combustion ash is generated in its coal boiler. The Company processes the combustion ash through heat modification, and sells the material as CfFA® (Carbon-free Fly Ash) concrete admixture. Mixing CfFA® into concrete has the effect of making it more durable and longer lasting. CfFA® has so far been adopted in earthquake recovery construction (bridges and seawalls, etc.) in the Tohoku region of Japan.

Effective use of local waste (Nippon Paper Industries)

At the Company's Nakoso Mill, waste generated in neighboring areas is actively used as fuel. This waste includes shiitake mushroom beds and rubber chips from artificial turf. The use of waste as fuel allows the Nakoso Mill to reduce its use of fossil fuels. The local production and consumption of fuel has not only contributed to reducing GHG emissions from the Nakoso Mill, but it has also helped to reduce waste generated in local areas. In 2022, the Company won the 7th Fukushima Industrial Award Special Prize sponsored by Fukushima-Minpo.

Recycling of Paper Pallets

The Group is contributing to the effective use of renewable resources by collecting and reusing pallets through the Pallet Recycle Co., Ltd.

2. Response to the Plastic Resource Circulation Act

The Group is working on the control of generation and discharging of waste plastic and its recycling pursuant to the Plastic Resource Circulation Act, established in April 2022.

<Control of generation and discharging>

- Changing plastic products used in business activities to simple packaging and returnable containers
- The Group encourages waste paper suppliers to reduce plastic contamination in waste paper through the Japan Paper Association

<Recycling>

- Use of hard-to-recycle waste paper-derived plastics as a heat source
- Conversion of waste, including locally generated waste plastic, into solid fuel → P27

4 Controlling Chemical Substances

- The Group examines the chemical substances it uses in its production processes in accordance with its Chemical Substance Management Guidelines. The Group implements risk management by monitoring how much of these substances is used and how much is released into the environment. The Group also takes corrective actions as necessary.
- At risk communication → P25 sessions held at each mill and business office, the Company discloses to local stakeholders the management status of chemical substances subject to the PRTR system and the amounts released and transferred.

Reduction of Environmental Burden

Amounts of Substances Subject to the PRTR Law Released and Transferred*1 (FY2022)

Chemical Substance	Amount Released	Amount Transferred	Total released and transferred
Zinc water-soluble compounds	300	0	300
Acrylamide	12	0	12
Acrylic acid and its water-soluble salts	14	0	14
Acrylonitrile	1.0	0	1.0
Ethylbenzene	0.1	0	0.1
Ethylene glycol monoethyl ether	270	4,600	4,870
Xylene	252	0	252
Glutaraldehyde	20	1.7	22
Chloroform	36,306	27,844	64,150
Cyclohexylamine	740	0	740
Dichloromethane (synonym: Methylene chloride)	10,000	100	10,100
N,N-Dimethylacetamide	24	220	244
N,N-Dimethylformamide	49	300	349
Mercury and its compounds	18	0	18
Selenium and its compounds	0.4	0	0.4
Dioxins*2	1,254	11,014	12,267
O,O-Dimethyl O-(3-methyl-4-nitrophenyl) phosphorothioate (synonym: Fenitrothion or MEP)	2.6	0	2.6
Toluene	28,103	50,878	78,981
Naphthalene	0.4	0	0.4

Chemical Substance	Amount Released	Amount Transferred	Total released and transferred
Carbon disulfide	5,184	0	5,184
Arsenic and its inorganic compounds	0.4	0	0.4
Trimethylbenzene	175	0	175
Hydrogen fluoride and its water-soluble salts	19,317	0	19,317
Hexane	0.2	0	0.2
Benzene	0.04	0	0.04
Boron compounds	21,112	0	21,112
Polychlorinated biphenyls (synonym: PCBs)	0	4,671	4,671
Poly(oxyethylene) alkyl ether (limited to those the alkyl group is C=12-15 and mixture thereof)	6.5	0	6.5
Formaldehyde	1,240	66	1,306
Manganese and its compounds	5,045	0	5,045
Methacrylic acid	2.0	0	2.0
Methyl methacrylate	21	0	21
Methylnaphthalene	856	0	856
(1-Hydroxyethane-1,1-diyl)diphosphonic acid and its potassium salt and sodium salt	0	1,560	1,560
Total*3 Unit : kg	129,073	90,240	219,314

*1 A summary of the volumes Group companies reported in accordance with the PRTR Law.

*2 Dioxins unit : mg-TEQ

*3 Dioxins are not included in total data.

Reduction of Environmental Burden

5 Prevention of Soil and Air Pollution

- The raw materials and chemicals used by the Group's mills contain almost no heavy metals, trichloroethylene or other soil contaminants.
- In FY2022, following on from FY2021, there were no cases of soil contamination within the Group.
- The Group has introduced equipment and technology to reduce atmospheric pollutants, such as sulfur oxides (SOx) and nitrogen oxides (NOx) generated in the manufacturing process, to below the standard values stipulated by laws and regulations and agreed with local governments.
- Contaminants in the air are reduced with NOx removal equipment, desulfurization equipment, a dust collector, etc.

6 Preventing Noise and Vibration

The Group is engaged in efforts utilizing IoT technologies to prevent the occurrence of noise and vibrations. → P51

Preservation of Biodiversity

1 Basic Policy

 [→P83](#) **The Nippon Paper Group Environmental Charter**

 [→P83](#) **Basic Policy on the Preservation of Biodiversity**

2 Preserving Biodiversity in the Value Chain

● Nippon Paper Group strives to reduce the impact on biodiversity throughout the entire value chain, from raw material procurement to paper manufacturing processes, wastewater treatment, and GHG emissions control.

● The Group sustainably procures wood resources, which are the raw materials for the Group's products, from properly managed forests.

3 Preserving Biodiversity in Forest Management

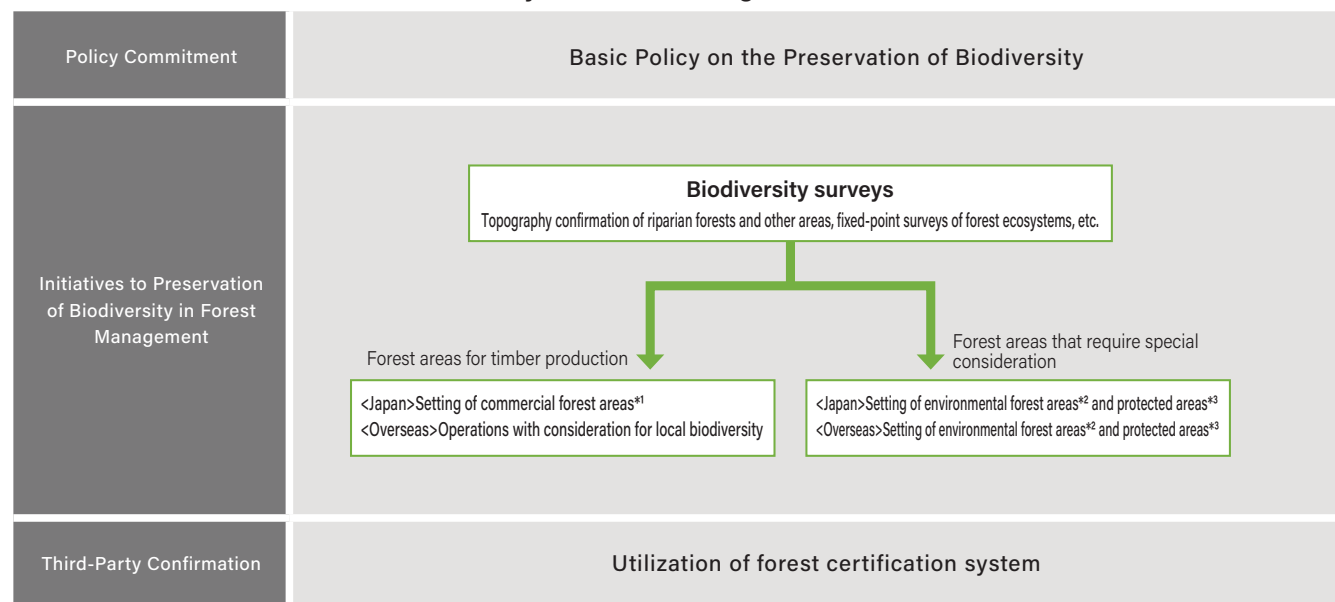
1. Initiatives to Preserve Biodiversity in Forest Management

- The Group manages sustainable forests in the company-owned forests in Japan and overseas.
- The Group conducts biodiversity surveys based on its Basic Policy on the Preservation of Biodiversity in the company-owned forests in Japan and overseas.
- In existing projects, the Group confirms topographical information that should be considered, such as waterfront forests, and conducts fixed-point surveys of forest ecosystems.
- Based on the results of biodiversity surveys, in areas that require special attention, the Group has established environmental forests, protected areas, and protected forests where logging is not performed.
- In managed forests where lumber is produced, the Group appropriately manages the forests by considering the location and timing of logging and implementing operations that consider local biodiversity.

2. Third-Party Confirmation

- By utilizing the forest certification system, the Group can have third-party confirmation that its forest management is being implemented, considering biodiversity.
- Nippon Paper Industries and overseas plantation company have obtained forest certification for all company-owned forests in Japan and overseas.

Initiatives to Preservation of Biodiversity in Forest Management



*1 Forest areas that are operated for the sustainable production of timber

*2 Forest areas that are not cultivated or logged for the production of timber

*3 Forest areas where logging and other operations are restricted to preserve biodiversity

Preservation of Biodiversity

CASE STUDY

Participation in the 30by30 Alliance for Biodiversity* (Nippon Paper Industries)

The Company participated in the "30by30 Alliance for Biodiversity" launched by the Ministry of the Environment. In FY2022, the Company provided information on the Ho-oh company-owned forest (Yamanashi Prefecture) as a trial and verification example of the screening process for a "site in harmony with nature," for which the Ministry of the Environment will start certification in FY2023. In the future, the Company will consider expanding the target area.

* A coalition of volunteer companies, local governments, and organizations, launched by the Ministry of the Environment to achieve the international goal of preserving 30% or more of land and sea areas as natural environment areas by 2030

Preserving Blakiston's Fish Owl* Habitat While Pursuing Business Activities Collaborating with the Wild Bird Society of Japan (Nippon Paper Industries)

The Company carries out initiatives to conduct business activities while protecting Blakiston's fish owl habitat with the Wild Bird Society of Japan.

* Blakiston's fish owl was identified as a national protected species in 1971, and placed on the Red List of critically endangered species by Japan's Ministry of the Environment

Collaborating with the Wild Bird Society of Japan

Year	Activities
2010	Entered into an agreement on the protection of wild birds with which forestland owned by the Company in Eastern Hokkaido was identified as a sanctuary.
2015	Set a new standard for the compatibility of business activities with the preservation of Blakiston's fish owl habitat in company-owned forests in Eastern Hokkaido. Won Biodiversity Action Award of the Ministry of the Environment.
2020	Installation of artificial nest boxes to support Blakiston's fish owl breeding
2021	Won Hokkaido Biodiversity Conservation Awards of the Hokkaido Government.
2022	Introducing the initiatives at the Nippon Paper Group sustainability lectures → P02

Conducting Biodiversity Surveys on Overseas Company-owned Land (AMCEL)

AMCEL (Brazil) has about 170,000 hectares as protected areas of approximately 300,000 hectares of company-owned land. The protected areas are a habitat for many wildlife species and they also include forests with high conservation value where rare and endangered species live. AMCEL conducts biodiversity surveys on the company-owned land.

Biodiversity Preservation Initiatives of AMCEL

Activities	Description
Regular water inspections	Installation of equipment for monitoring the quality and level of water in the plantation area, and performance of regular water inspections
Wild animal and plant habitat research in company-owned forest	AMCEL conducts habitat research and monitoring of wild animals and fish in plantation areas in a joint effort with multiple research institutions and ecologists.
Monitoring of vegetation in protected areas	AMCEL conducts continuous monitoring research of vegetation in protected areas

Supporting the Activities of the Association for the Protection of Shirane-aoi*

To protect the Shirane-aoi, the Association for the Protection of Shirane-aoi (Japanese wood poppy) was established in 2000 by Gunma Prefectural Oze High School and Katashina-mura, Tone-gun, Gunma Prefecture. Nippon Paper Development, which manages the Saganuma company-owned forest, has provided operational support since the association's establishment and has opened a portion of the company-owned forest to the public. Since 2002, Group employees have participated in these activities as volunteers.

* Plants of the Ranunculaceae (buttercup) family designated as an endangered species in Gunma Prefecture

Eradicating Invasive Plant Species from Iriomote Island ~Cooperation with the Iriomote Island Ecotourism Association~ (Nippon Paper Industries)

Based on the agreement concluded in 2017 with the Okinawa Forest Office of the Kyushu Forestry Department of the Forestry Agency, in about 9 hectares of national forest on Iriomote Island, the Company has eradicated Bay Biscayne creeping oxeye*, an alien species that has invaded Iriomote Island, and investigated the invasion status of exotic plants in collaboration with the NPO Iriomote Island Ecotourism Association. In March 2022, the agreement was updated to continue the activities for another 5 years.

* A plant in the Asteraceae (sunflower) family which originated from the Americas, but was introduced throughout Okinawa for greenifying slopes and embankments, etc. It has strong propagating capabilities, and there are concerns over its impact on local ecosystems.

Mutual Cooperation in Forest Management with Coca-Cola Bottlers Japan

The Company, Nippon Paper Group company Marunuma Kogen Resort and Coca-Cola Bottlers Japan Inc. (hereinafter CCBJ) cooperate for the conservation and protection of forest and water resources. They are collaborating on initiatives to keep "Healthy forest" that nurtures "rich water." The water source area of CCBJ's Saitama Mill and Iwatsuki Mill are located in part of Saganuma company-owned forest in Katashina Village, Gunma Prefecture (1,746 ha), and the Group promotes the activities of forest conservation and maintenance.

Other Environment-related Data

1 Environmental Accounting (Domestic)

- Calculation standards are based on the Environmental Accounting Guidelines 2005
- Scope of organizations covered
 - Consolidated: Nippon Paper Industries; Nippon Paper Crecia; Crecia Kasuga; Nippon Paper Papyrus; GAC; Nippon Seitai; Nippon Paper Ishinomaki Energy Center; Yufutsu Energy Center; N&E; Daishowa Uniboard; Nippon Paper Development; Nippon Dynawave Packaging; Opal; Jujo Thermal; Siam Nippon Industrial Paper; Amapá Forestal e Celulose
 - Non-consolidated: Mishimakako; Osakakako; Kochikako; Nippon Paper Liquid Package Product; Akita Jujo Chemicals
 - Affiliated company: Fukuda Paper MFG

Environmental Conservation Costs (FY2022)

(Millions of Yen)

Categories	Main contents	Investment	Cost
(1) Business area costs	—		
1. Pollution prevention costs	Measures against air pollution, water pollution, noise and vibration	2,967	14,054
2. Global environmental conservation costs	Company-owned forest in Japan nursery care, overseas plantation business, energy-saving investment	3,893	700
3. Resources circulation costs	Efficient use of resources, cost of waste management	985	8,372
(2) Upstream/downstream cost	Expenses related to collection, recycling, and disposal of pallets and packing materials	—	3,478
(3) Administration cost	Costs for employee training, maintaining ISO 14001, analysis of air and water quality, and management of various conferences	—	301
(4) R&D cost	Product development that contributes to environmental conservation, such as promoting the use of recovered paper, and reduction of environmental impact at the manufacturing stage	—	2,620
(5) Social activity costs	Social contribution activities, group support, corporate action report	—	22
(6) Environmental remediation costs	Pollution Health Compensation Levy	—	406
Total		7,845	29,953

Environmental Benefits of Environmental Conservation (FY2022) (Millions of Yen)

Effect	Amount
Income from company-owned forests in Japan	661
Reduced expenses from energy saved	2,510
Reduced disposal expenses through the effective use of waste	3,633
Gain on sales from the recycled waste	510
Reduced expenses through the recycling of shipping material	1,387
Total	8,701

Environmental conservation impacts (FY2022)

Categories	Environmental Impact Indicators	Results	YoY Change	
Effects related to resources introduced to business activities	Plantation projects overseas	Overseas plantation areas	72kha	No change
	Energy-saving measures	Fuel reduction (Heavy oil equivalent)	40,715kl	UP 5,139kl
Effects related to environmental impact and waste from business activities	Greenhouse gas emissions		4.87Mt	Down 0.71Mt
	Air pollutant emissions	NOx emissions (NO equivalent)	5,852t	Down 955t
		SOx emissions (SO ₂ equivalent)	2,031t	Down 331t
		Soot and dust emissions	870t	Down 30t
	Effluent		741Mt	Down 58Mt
	Water contaminant emissions	COD/BOD emissions	35,888t	Down 1,745t
		SS emissions	18,190t	UP 148t
Final waste disposal		8kt	Down 4.1kt	
Effects related to goods and services produced from business activities	Product recycling	Recycled paper utilization rate (paper)	30%	No change
		Recycled paper utilization rate (paperboard)	89%	Down 3%
	Shipping material recycling	Pallet recovery rate	40%	Down 2%

Other Environment-related Data

2 Balance of Materials

Balance of Materials for All Businesses (Principal Materials) (3 years)

Input		Unit	FY2020*1	FY2021*1	FY2022*1
Energy Input	Purchased electricity	GWh	1,934	2,425	1,931
	Oil	Thousand kl	578	434	178
	Coal	Thousand t	2,039	2,287	1,192
	Gas	Thousand t	299	302	399
	Other fossil fuels	Thousand t	23	27	19
	Non-fossil fuels*2	Thousand t	5,347	5,919	5,268
	(Of which Black liquor)	Thousand t	3,985	4,307	3,995
Chemical substances subject to the PRTR Law*3	Amount handled	t	11,568	11,094	10,840
Water intake (water consumption)	Total amount of water intake (water consumption)	Million t	880	953	899
	River water	Million t	710	615	660
	Industrial water	Million t	140	291	190
	Well water	Million t	29	46	48
	Public water supply	Million t	1	1	2
	Rainwater	Million t	0	0	0
	Seawater, sea, ocean	Million t	0	0	0
Raw Material	External waste water	Million t	0	0	0
	Woodchips	Thousand BDt	5,446	4,699	4,735
	Logs	Thousand BDt	702	857	707
	Pulp	Thousand Adt	446	492	575
	Recycled paper(Pulp)	Thousand Adt	3,202	2,802	2,831
	Base Paper	Thousand Adt	123	122	136
Others	Thousand Adt	—	384	77	

*1 Covered: FY2020 https://www.nipponpapergroup.com/english/csr/npg_esgdb2021_e_contents.pdf
FY2021 https://www.nipponpapergroup.com/english/csr/npg_esgdb2022_e_contents.pdf
FY2022 https://www.nipponpapergroup.com/english/csr/npg_esgdb2023_e_contents.pdf

*2 Biomass fuels (including black liquor) and waste fuels

*3 Japan only. Dioxins are not included in total data.

*4 Coverage: Nippon Paper Industries, Nippon Paper Crecia, Nippon Paper Papylia

*5 Only in Japan, Aggregated by specially controlled industrial waste

*6 Nippon Paper Lumber, Daishowa Uniboard

[Units]GWh = Gigawatt hours, BDt = Bone-dry tonnes, Adt = Air-dry tonnes Note: t indicates Tonnes(also called Metric Tons)

Output		Unit	FY2020*1	FY2021*1	FY2022*1
Gas Emissions	GHG emissions(Scope 1 and 2)	Million t-CO ₂	6.90	6.79	5.95
	(Scope 1)	Million t-CO ₂	6.26	5.83	4.86
	(Scope 2)	Million t-CO ₂	0.64	0.96	1.09
	Emissions by type of greenhouse gas (Scope 1)				
	CO ₂	Million t-CO ₂	5.79	5.38	5.52
	CH ₄	Million t-CO ₂	0.03	0.03	0.03
	NO ₂	Million t-CO ₂	0.44	0.43	0.40
	SOx emissions	Thousand t	2.83	3.02	3.41
	NOx emissions	Thousand t	9.39	8.99	8.15
	Soot and dust	Thousand t	1.10	1.23	1.11
Chemical substances subject to the PRTR Law*3	Amount released	t	150	143	131
	Amount transferred	t	94	106	89
VOCs (volatile organic compounds)*4	Emissions	t	49	51	97
Waste Water	Waste water total	Million t	843	890	859
	Public water	Million t	835	877	849
	Sewerage	Million t	8	13	10
	COD/BOD	Thousand t	53	50	48
	BOD	Thousand t	—	43	9
	COD	Thousand t	—	7	39
	SS	Thousand t	24	25	25
	Nitrogen	Thousand t	1.3	1.3	1.2
	Phosphorous	Thousand t	0.2	0.2	0.2
	Total Waste Generated	Thousand BDt	760	848	743
Waste	Final disposal subtotal	Thousand BDt	72	102	102
	Recycled subtotal	Thousand BDt	688	746	585
	Hazardous waste generation*5	BDt	1,541	1,610	4,484
Products manufactured	Paper, Household Paper	Million t	3.29	3.64	3.31
	Paperboard	Million t	1.88	1.90	1.85
	Pulp	Thousand t	221	156	180
	Paper container	Thousand t	92	95	83
	Chemical products	Thousand t	93	62	90
	Building materials+others*6	Thousand t	80	197	214
Electricity	Electricity	GWh	2,384	2,199	2,241

Other Environment-related Data

Balance of Materials in the Pulp and Paper Businesses in Japan (Principal Materials) (3 years)

		Unit	FY2020*1	FY2021*1	FY2022*1
Input					
Energy Input	Purchased electricity	GWh	804	985	765
	Oil	Thousand kl	147	137	173
	Coal	Thousand t	1,619	1,521	1,166
	Gas	Thousand t	101	140	137
	Other fossil fuels	Thousand t	23	27	19
	Non-fossil fuels*2	Thousand t	3,582	3,823	3,804
	(Of which Black liquor)	Thousand t	2,561	2,803	2,737
Chemical substances subject to the PRTR Law*3	Amount handled	t	341	482	490
Water intake (water consumption)	Amount of water intake	Million t	757	756	709
	Water intensity	t/product-t	168	158	158
Raw Material	Woodchips	Thousand BDt	3,344	3,453	3,745
	Logs	Thousand BDt	23	20	14
	Pulp	Thousand Adt	350	393	480
	Recycled paper(Pulp)	Thousand Adt	2,658	2,693	2,324
	Base Paper	Thousand Adt	—	0.4	98
	Others	Thousand Adt	—	0.3	16

*1 Coverage : FY2020 Nippon Paper Industries, Nippon Paper Crecia, Nippon Paper Papylia
 FY2021 Nippon Paper Industries, Nippon Paper Crecia, Nippon Paper Papylia, Crecia-Kasuga, Fukuda Paper MFG
 FY2022 Nippon Paper Industries, Nippon Paper Crecia, Nippon Paper Papylia, Crecia-Kasuga, Fukuda Paper MFG

*2 Biomass fuels (including black liquor) and waste fuels

*3 Japan only. Dioxins are not included in total data. Excludes chemical business

[Units]GWh = Gigawatt hours, BDt = Bone-dry tonnes, Adt = Air-dry tonnes Note: t indicates Tonnes(also called Metric Tons)

		Unit	FY2020*1	FY2021*1	FY2022*1
Output					
Gas Emissions	GHG emissions (Scope 1 and 2)	Million t-CO ₂	5.49	5.51	4.80
	(Scope 1)	Million t-CO ₂	5.17	5.04	4.24
	(Scope 2)	Million t-CO ₂	0.31	0.47	0.56
	GHG emissions intensity during production	t-CO ₂ / product-t	1.24	1.15	1.07
	Emissions by type of greenhouse gas (Scope 1)				
	CO ₂	Million t-CO ₂	—	—	4.38
	CH ₄	Million t-CO ₂	—	—	0.03
	NO ₂	Million t-CO ₂	—	—	0.39
	SOx emissions	Thousand t	1.7	2.1	2.3
	NOx emissions	Thousand t	7.0	6.5	5.8
Chemical substances subject to the PRTR Law*3	Amount released	t	104	97	90
	Amount transferred	t	6	15	90
VOCs (volatile organic compounds)	Emissions	t	49	51	60
Waste Water	Waste water total	Million t	731	729	671
	Public water	Million t	—	—	669
	Sewerage	Million t	—	—	2
	COD/BOD	Thousand t	36	38	28
	SS	Thousand t	16	18	15
	Nitrogen	Thousand t	1.2	1.3	1.1
	Phosphorous	Thousand t	0.1	0.2	0.1
Waste	Total Waste Generated	Thousand BDt	553	582	494
	Final disposal subtotal	Thousand BDt	13	12	8
	Recycled subtotal	Thousand BDt	541	570	484
Products manufactured	Paper, Household Paper	Million t	2.9	3.1	2.8
	Paperboard	Million t	1.6	1.6	1.5
	Pulp	Thousand t	11	17	158