Mitigation and Adaptation to Climate Change

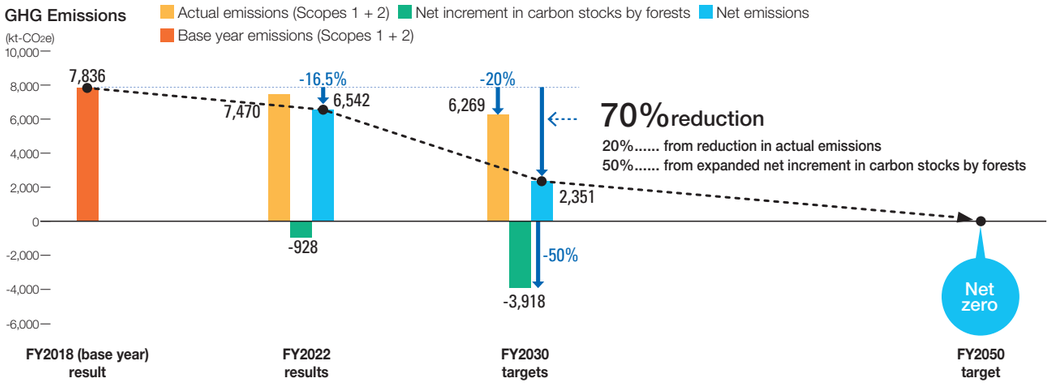
Basic Approach

The Oji Group established Environmental Charter in 1997 with the basic philosophy of rolling out its corporate activities in harmony with the environment from a wide global perspective and contributing to the realization of a truly affluent, sustainable society. As our vision toward mitigating climate change based on the Charter, in 2020 we formulated our Environmental Vision 2050 centered around the goal of net-zero carbon, and we also set a milestone target to achieve that goal in our Environmental Action Program 2030 of reducing our greenhouse gas (GHG) emissions by at least 70% compared to FY2018 levels. To achieve the target, we focus on reducing actual emissions by reducing coal consumption and other emission sources, and increasing the net increment in carbon stocks by forests.

GHG Emissions Reduction Target and Emissions Results

Our goal is to reduce net emissions (actual emissions minus net increment in carbon stocks) by at least 70% compared to the FY2018 levels by FY2030. Of this, 20% is to be achieved by reducing actual emissions (total of Scope 1 and Scope 2), and 50% is to be achieved by increasing the net increment in carbon stocks by forests.

In FY2022, the net GHG emissions were reduced by 16.5% compared to the FY2018 levels, to 6,542 kt-CO_2e.



Roadmap for GHG Emissions Reduction toward FY2030

	Category	Sub-category	GHG reduction (kt-CO_2e)	GHG reduction rate	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Reduction in actual emissions	Improve energy efficiency	Maintain energy conservation	200	2.6%	Reduce energy consumption intensity by 1.0% or more per year, averaged over five years									
					Reduced by 3.8% on average between FY2018 and 2022									
	Increase the percentage of renewable energy use	Reduce coal consumption	1,007	12.9%	● Shut down 1 boiler ○ To shut down 1 boiler								To shut down 6 boilers	
					Technical research and test for changing the fuel composition					Studies and decisions on facility			Implementation	
		Install private solar power systems, etc.	360	4.5%	Installation planning					Investment decisions			Installation	
					Install solar power systems on factory roofs and idle land									
Subtotal			**1,567**	**20.0%**		Reduction of 366 kt-CO_2e (4.7%)								
Expansion of net increment in carbon stocks by forests	Invest in forest conservation and plantation	Expand forest plantations	3,918	50.0%	Overseas production forests 256,000 ha	279,000 ha								400,000 ha
					Search for sites, land surveys					Assessment of business feasibility			Consideration of acquisition, decision	
		Plant fast-growing trees			KTH to be a consolidated subsidiary									
					Continue forest tree breeding (breed improvement) and elite trees' plantation									
					Net increment in carbon stocks by forests: 928 kt-CO_2e (11.8%)									
Total			**5,485**	**70.0%**										

Participation in the GX League

Oji Holdings joined the GX League which began full-scale activities in May 2023. The League is a forum for companies endeavoring for carbon neutrality to discuss and carry out a transformation of the entire socio-economic systems (green transformation) in cooperation with the Japanese Government, universities, and financial institutions.

Reducing Actual Emissions

We are working to improve energy efficiency and increase the percentage of renewable energy use to reduce GHG emissions through our business activities. In FY2022, the actual GHG emissions were reduced by 4.7% compared to the FY2018 levels, to 7,470 kt-CO_2e.

Improve Energy Efficiency

We are working to improve our energy efficiency with a target reduction in energy consumption intensity of at least 1% per year, averaged over five years. Our mills and plants regularly hold energy conservation meetings, attended by personnel from energy management and manufacturing divisions to discuss facility renovations and change of operation methods.

In FY2022, our domestic business companies made energy conservation investments of 1.6 billion yen, thereby reducing energy consumption corresponding to approximately 1% of the total energy consumption across the Group (crude oil conversion 47 thousand kL). Energy consumption intensity was reduced by 3.8% per year on the average between FY2018 and FY2022.

Increase the Percentage of Renewable Energy Use

The Oji Group has increased the percentage of renewable energy use by utilizing black liquor (byproduct from its global pulp production operations), wood residue, and bark as fuels. Aiming to further improve energy efficiency, we are working to reduce coal consumption while introducing solar power generation systems.

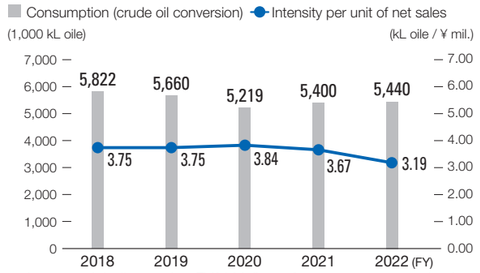
In FY2022, the percentage of renewable energy use was 54.7%.

Reduce Coal Consumption

Of the 16 boilers in Japan that were burning coal as of FY2018, we will disuse eight coal-only-fired boilers by FY2030 which do not include backup boilers, and switch to gas fuels in a transition phase toward decarbonization. We shut down a coal boiler at Oji Materia Nayoro Mill in FY2021 as part of restructuring of production systems, and also shut down a coal boiler at Oji F-Tex Ebetsu Mill in FY2023. We are also considering reducing coal consumption by changing the composition of fuels at coal co-fired boilers. With the investment of about 100 billion yen, we expect to reduce GHG emissions by about 1,000 kt-CO_2e.

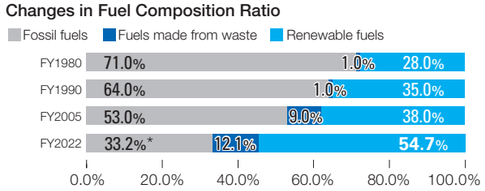
As achieving net-zero carbon emissions will require further reduction of the use of fossil fuels including gas, in the future, we will also consider using hydrogen, ammonia, and synthetic methane (e-methane) as fuels.

Energy Consumption★ and Intensity



★ A star mark indicates that FY2022 figure for energy consumption has been assured by KPMG AZSA Sustainability Co., Ltd.
For the calculation method, see page 111.

Changes in Fuel Composition Ratio



*Breakdown: Coal 11.4%, gas 8.7%, oil 7.3%, and purchased energy 5.8%

Installation of Solar Power Systems

We have been installing solar power systems on factory roofs and idle land. A new warehouse built in August 2022 at Oji Nepia Edogawa Factory uses electricity generated from solar power. At Oji Container Tochigi Plant, a solar power generation facility scheduled to start operation in September 2023 will supply all of the power used by the plant during the daytime.

Solar power generation facility at Tochigi Plant, Oji Container

Topics Efforts for a Shift to Black Pellets Fuel

At the boiler #6 of Oji Paper Tomakomai Mill, where waste-derived fuels (RPF, waste tires, sludge, etc.) and coal are co-fired, a demonstration test for a shift from coal to black pellets to reduce CO_2 emissions is underway.

Three tests were conducted in FY2022 to collect basic data on the fuel such as transportability and combustibility. Now we will draw up a plan for a long-run test in view of stable regular operation, to identify issues and consider whether boiler retrofitting is needed.

Black pellets (biomass-fuel wood pellets that are semi-carbonized)

Topics

Renewable Energy Power Generation Business

We sell electricity generated by biomass, hydropower, and solar power, indirectly contributing to the reduction of GHG emissions by electricity consumers. In FY2022, we sold 1,103 GWh of electricity through the feed-in tariff (FIT) system for renewable energy under which electric utilities purchase electricity from renewable energy at a fixed price. This is equivalent to a reduction of 480 kt-CO_2e in electricity consumer emissions*.

* Calculated by multiplying the amount of electricity sold by the national average emission factor used to calculate emissions from electricity use under the Mandatory Greenhouse Gas Accounting and Reporting System.

Reducing Emissions from Wood Chip Carriers

Most of the wood chips used as raw material for paper are transported by ship from overseas plantations. With international efforts underway to reduce GHG emissions from ships, Oji Group's chip carriers now navigate at lower speeds to reduce GHG emissions by increasing fuel efficiency. In addition, newer vessels built in recent years generate lower GHG emissions than conventional types, contributing to GHG emissions reduction.

Woodchip carrier GT SELENE (built in 2022)

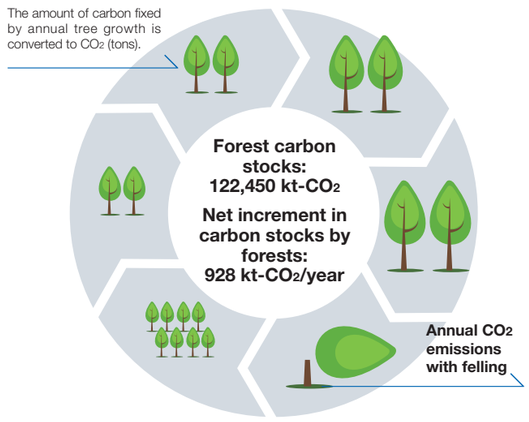
Expansion of Net Increment in Carbon Stocks by Forests

The Oji Group owns a total of 603,000 ha of forests (comprising 455,000 ha of production forests and 148,000 ha of conservation forests) in Japan and overseas and practices sustainable forest management taking into consideration the environment, society, and economy. The actual carbon stocks of these forests reached 122,450 kt-CO_2 at the end of FY2022, and the annual average net increment in carbon stocks by forests between FY2018 and FY2022 was 928 kt-CO_2*1. The amount of O_2 released during the same period averaged 675 kt per year*2. To achieve our Environmental Action Program 2030, we aim to increase the net increment in carbon stocks by forests to 4,000 kt-CO_2 by expanding plantations and planting fast-growing trees.

*1 The figures of carbon stocks and net increment in carbon stocks exclude those by CENIBRA's forests planted by third parties and forests less than two years after plantation.
*2 Calculation assuming that the same amount of O_2 as CO_2 absorbed (in moles) is released.
Source: National Institute for Environmental Studies
https://www.nies.go.jp/kanko/news/25/25-3/25-3-04.html (Japanese only)

The net increment in carbon stocks by forests is calculated by the gain-loss method (except for CENIBRA). CENIBRA calculates the figure by the stock difference method which is more accurate. CENIBRA has obtained assurance for the net increment in carbon stocks by forests in FY2021 and FY2022 from a third party organization.

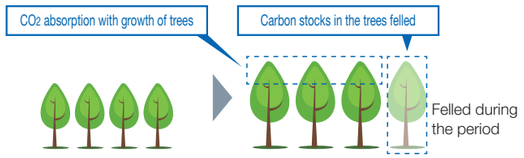
Annual CO_2 absorption with growth



Forest carbon stocks : The CO_2 stocks in Oji Forests as of end of FY2022.
Net increment in carbon stocks by forests : The amount of CO_2 absorbed by the trees in Oji Forests minus the amount of CO_2 stored in the trees felled which are subtracted as emissions. Annual average between FY2018 and FY2022.

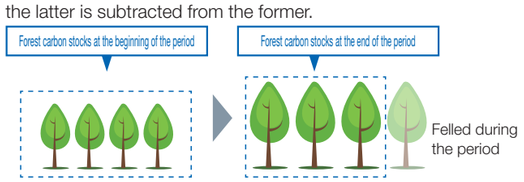
Gain-loss Method

The amount of CO_2 absorbed with growth of trees and the amount of carbon stocks by the trees felled during the period are calculated and the latter is subtracted from the former.



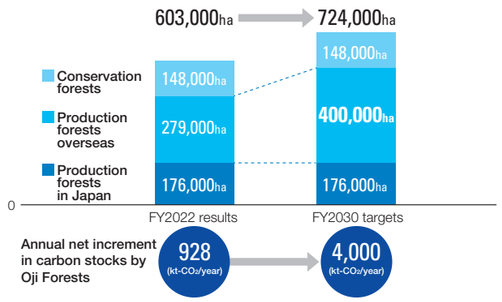
Stock Difference Method

The forest carbon stocks at the end of a period and the forest carbon stocks at the beginning of the period are calculated and the latter is subtracted from the former.



Expand Forest Plantations

With KTH in Indonesia becoming a consolidated subsidiary in FY2022, the net increment in carbon stocks by Oji Forests has increased. We are considering acquiring more sites for forest plantation primarily in South America, Oceania, and Southeast Asia, where we have been operating our forest plantation business. Our target is to expand the area of our overseas production forests to 400,000 ha by FY2030, at an estimated acquisition cost of about 100 billion yen.



Plant Fast-growing Trees

In our overseas forest plantation business, we plant fast-growing trees, including hardwoods such as eucalyptus and acacia as well as softwoods such as radiata pine. We harvest and replant trees in a shorter cycle than general forestry practices, for example, in a 6-to-10-year cycle for eucalyptus and acacia and in an approximately 30-year cycle for radiata pine.

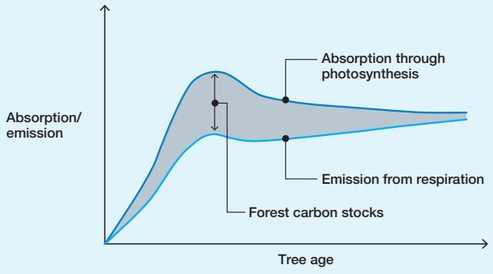
In addition, CENIBRA, Brazil, has long been breeding forest trees. More than 10 types of high-quality varieties with high growth rate and pulp productivity were selected from among more than 20 thousand trees obtained through artificial pollination efforts. KTH, Indonesia, also continues to breed forest trees. Planting high-quality tree species developed by each business increases the growth rate of forest trees, facilitating carbon absorption and fixation.


Artificial pollination of eucalyptus


Tree nursery, CENIBRA

Topics **Challenges for Japanese Forestry and Action to Mitigate Climate Changes**

About two-thirds of Japan's land area is covered by forests, of which plantations account for about 40%. Most of these plantations were planted in the years after World War II to the period of rapid economic growth. Now that half of these trees are over 50 years old and are ready to be fully utilized (time to harvest).



Because respiration relative to carbon absorption is greater in a mature forest than in a young forest in the growing phase, the net carbon absorption capacity decreases as a plantation matures. For this reason, felling and replanting trees in plantations is considered desirable not only for circular resource use, but also for mitigating climate change. However, the rate of carbon fixation (approximately equal to carbon dioxide absorption) by forests has been declining due to the gradual decrease of young forests in the growing phase, as the circular use of forests has been impeded by such problems as declining number of forestry workers, the underdeveloped forest road networks, and slow progress of replanting and cultivation due to falling timber prices.

In Oji Forests in Japan, we intend to fell and replant approximately 400 to 500 ha of plantations every year. We will continue to work to overcome challenges for forestry in cooperation with the government, local communities, and other companies to help the circular use of plantations to increase carbon absorption.