Keidanren
Policy & Action

Keidanren Carbon Neutrality Action Plan

－Vision toward Carbon Neutrality by 2050
and Fiscal 2023 Follow-up Results
(Performance in Fiscal 2022)－

［Final Version］

(Provisional Translation)

April 2, 2024

KEIDANREN

(Japan Business Federation)

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Introduction

Keidanren has run the PDCA cycle every fiscal year, promoting voluntary and proactive approaches by industries and companies, since it formulated the "Keidanren Voluntary Action Plan on the Environment" in June 1997, ahead of the adoption of the Kyoto Protocol in December 1997. In 2013, it expanded on the "Keidanren Voluntary Action Plan on the Environment" and formulated the "Keidanren's Commitment to a Low Carbon Society" (hereinafter "Commitment"), under the four pillars of which the Japanese business community has engaged in measures toward achieving a low carbon society (Figure A~D).

In October 2020, the Government announced its target to achieve carbon neutrality (CN) by 2050, followed by its announcement in April 2021 of its target to reduce greenhouse gas emissions by 46% in fiscal 2030. These ambitious goals can only be achieved through the fully committed efforts of both public and private sectors. It is necessary to let these efforts lead to Japan's economic growth, creating a virtuous cycle of economy and environment.

The Commitment laid emphasis on CO_2 emissions reductions toward 2030 with a view to contributing to Japan's mid-term reduction target under the Paris Agreement. Given increasing concerns and expectations in Japan and overseas regarding the achievement of CN by 2050, Keidanren decided to newly position the achievement of CN as its most important goal. Hence, it has renewed the Commitment as the "Keidanren Carbon Neutrality Action Plan" (hereinafter "CN Action Plan") and has invited members to formulate Visions toward achieving carbon neutrality.

The CN Action Plan continues to be included the Government's Plan for Global Warming Countermeasures as a pillar of industrial efforts. In the policy proposal "Towards Green Transformation (GX)[1]" published in May 2022, as well, Keidanren clearly states that it will continue to firmly implement the CN Action Plan and advance emission reductions through the maximum deployment of best available technologies (BAT) and the development of innovative technologies.

With the enactment of the GX Promotion Act and GX Decarbonization Power Supply Act, as well as the Cabinet Decision to adopt the Strategy for Promoting Transition to a Decarbonized, Growth-Oriented Economic Structure ("GX Promotion Strategy"), Japan is making firm progress towards achieving GX.

[1] Keidanren, "Towards Green Transformation (GX)" (May 2022)
https://www.keidanren.or.jp/en/policy/2022/043.html

By promoting the CN Action Plan, Keidanren is determined to maximize its efforts toward achieving carbon neutrality in 2050.

Figure A. Keidanren's efforts to combat climate change

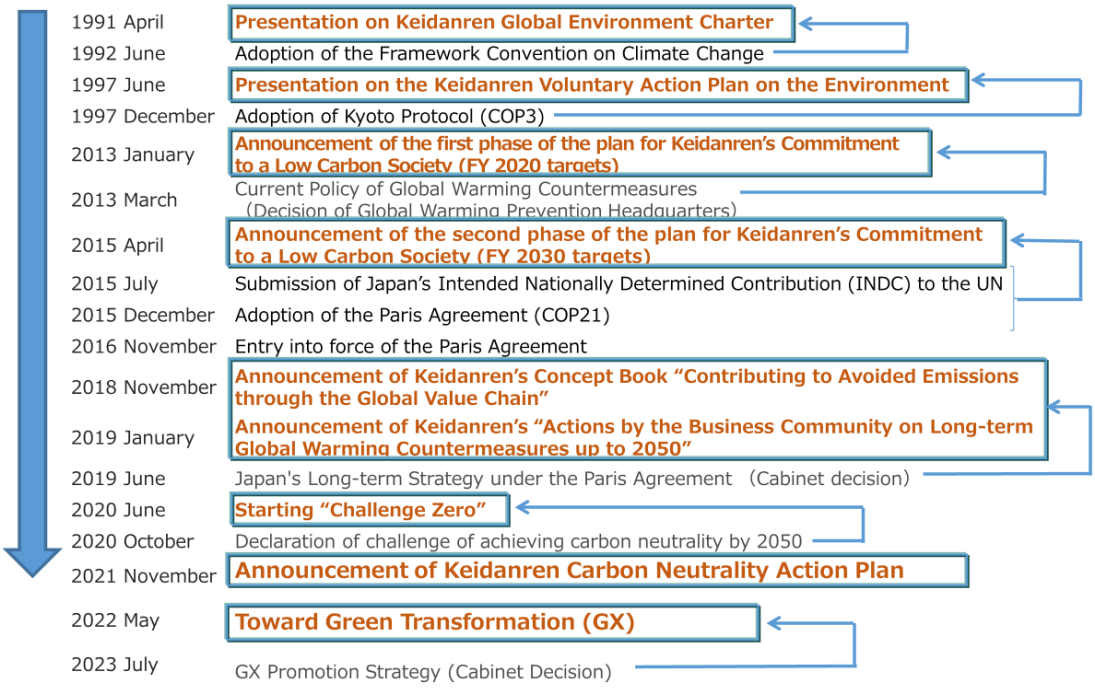
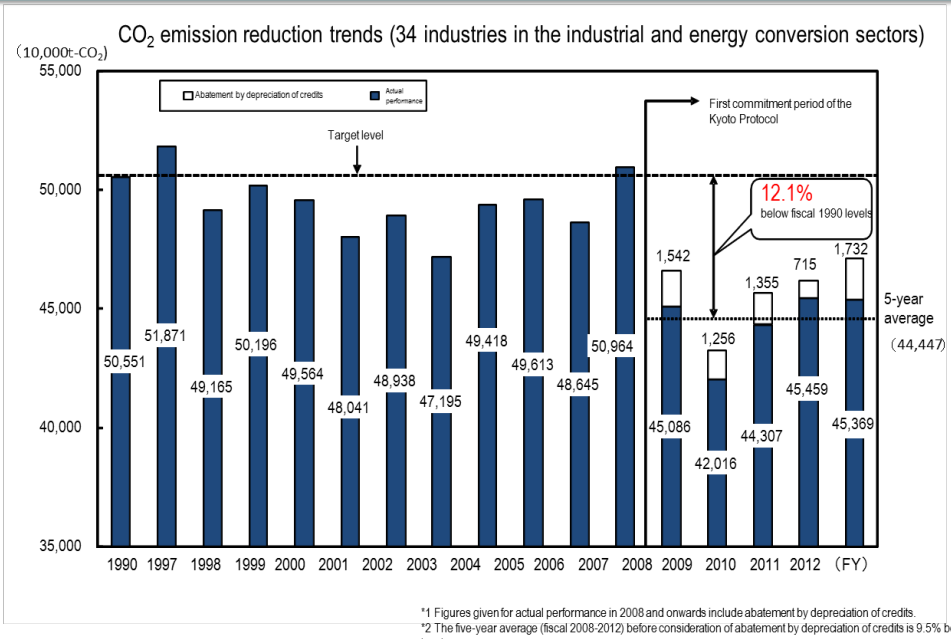


Figure B. Accomplishments of the Keidanren Voluntary Action Plan on the Environment (Section on Global Warming)

— First Commitment Period of the Kyoto Protocol (2008-2012) —

◆ As a result of efforts under the Voluntary Action Plan on the Environment, emissions were reduced by 12.1% (61.04 million t-CO_2) relative to fiscal 1990 during the first commitment period of the Kyoto Protocol (fiscal 2008-2012).



*1 Figures given for actual performance in 2008 and onwards include abatement by depreciation of credits.
*2 The five-year average (fiscal 2008-2012) before consideration of abatement by depreciation of credits is 9.5% below fiscal 1990 levels.

Figure C. Four pillars of the Keidanren Carbon Neutrality Action Plan

(1) Emission reductions from domestic business operations

Participating industries establish targets based on certain assumptions including maximum deployment of BAT and proactive efforts to save energy.

<Efforts to achieve targets>
1) Introducing energy-saving facilities, processes and equipment, etc.: High-efficiency production facilities (incl. power plants), lighting and air conditioning, etc.
2) Recovery and effective use of energy: waste heat recovery, etc.
3) Fuel conversion: utilization of renewable energy, etc.
4) Operational improvements of facilities and equipment: introduction of advanced control equipment

(2) Strengthened cooperation with other interested groups

Participating industries
1) Contribute to CO_2 emission reductions through the provision of low-carbon products and services; and
<Examples>
Improving the fuel economy of transportation equipment by utilizing lightweight and strong material (high tension strength steel, carbon fiber, etc.;) promoting energy conservation in the household sector through the diffusion of high-efficiency household appliances; achieving society-wide efficiency by using ICT services, etc.

2) Promote public campaigns to improve public awareness and knowledge of global warming.
<Examples>
Providing information on the environmental performance of a product; promoting eco-drive

(3) Promoting contribution at the international level

Participating industries
1) Contribute to CO_2 reductions at the global level by proactively transferring Japan's advanced technologies and know-how to developing countries; and
<Examples>
Emissions of approximately 0.65-1.02 billion t-CO_2 (estimate) will be potentially avoided globally in 2030 due to the deployment of high-efficiency power generation by Japanese companies

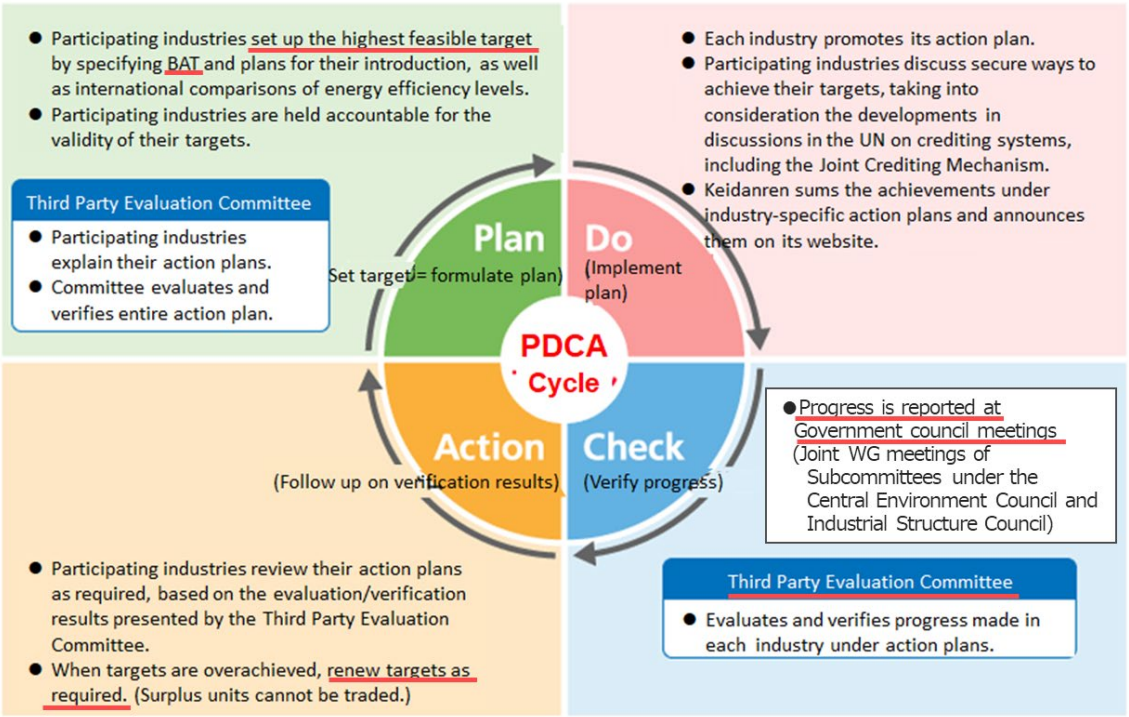
2) Engage in activities at international conferences, including cooperation towards the formulation of international standards and introduction of Japan's diverse global warming countermeasures.

(4) Innovative technology development toward CN by 2050

Participating industries engage in developing and commercializing innovative technology toward CN by 2050.

<Examples>
Industrial Sector
Hydrogen-based iron making, material use of CO_2, innovative cement production process, CCUS, power semiconductors, high-temperature superconductive cables, etc.
Energy Conversion Sector
Accommodating massive development of renewable energy, biofuels, hydrogen energy, methanation, etc.
Commercial Sector
ZEB・ZEH, energy-saving and high-speed signal processing, etc.
Transportation Sector
Fuel cell rolling stock, hydrogen-power aircrafts, etc.

Figure D. PDCA cycle



Part 1　Vision toward Carbon Neutrality by 2050 (Basic Policy, etc.)

1. Status of development of a Vision toward Carbon Neutrality (CN) by 2050 (basic policy, etc.)

Part 1 will report on the status of formulating a Vision toward CN by 2050 (basic policy, etc.).

As the world's concerns and expectations become increasingly focused on CN by 2050, the business community is also required to present its vision toward the achievement of CN by 2050 domestically and overseas. Given these circumstances, Keidanren has invited participating industries to formulate a Vision toward CN.

In the follow-up survey conducted this fiscal year, as well, all participating industries were asked about the progress made in formulating a Vision toward CN by 2050. Almost responding industries reported that they had either already formulated a Vision, were considering one, or intended to consider one. 1 industry responded that it had no plan to consider a Vision (Figure 1). Furthermore, the number of industries that have formulated a Vision increased from 40 industries to 45 industries. The CO_2 emissions from the 45 industries that have already formulated visions collectively amount to nearly 97 percent of total emissions from all participating industries (Figure 2).

Figure 1. Status of Vision formulation in 63 participating industries (number of industries)

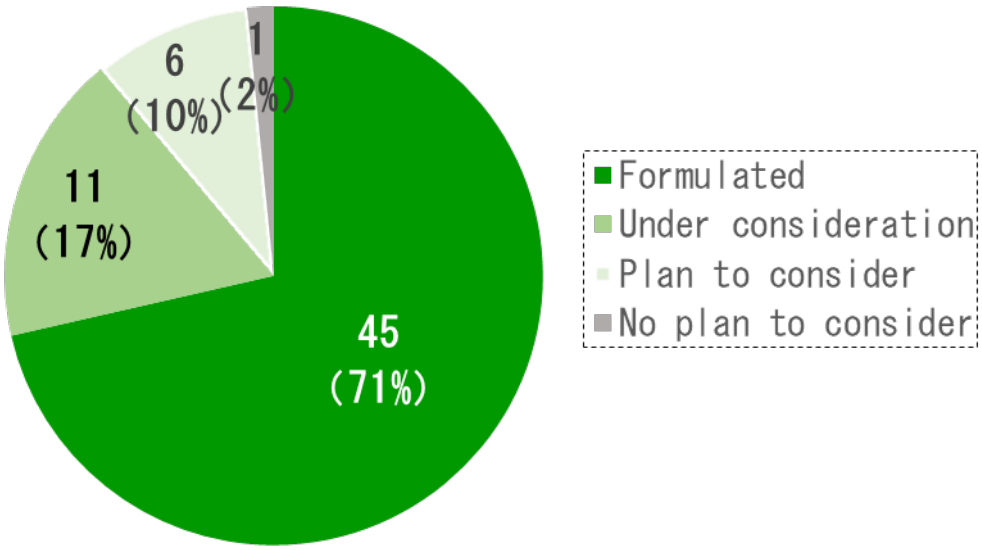
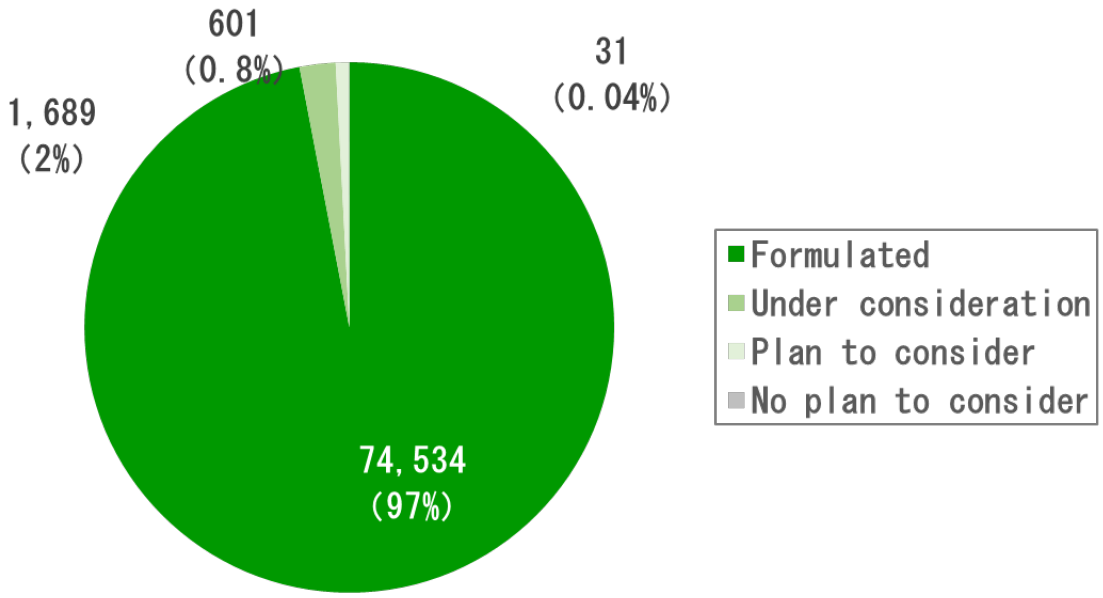


Figure 2. Status of Vision formulation (in terms of emissions, 10,000 t-CO_2)



* CO_2 emissions after electric power distribution are used for the industry, commercial and transportation sectors, and CO_2 emissions before electric power distribution are used for the energy conversion sector.

Table 1. Status of Vision development

Already formulated	Under consideration
The Japan Iron and Steel Federation	Japan Soft Drink Association
Japan Chemical Industry Association	Japan Dairy Industry Association
Japan Paper Association	The Japanese Electric Wire & Cable Makers' Association
Liaison Group of Japanese Electrical and Electronics Industries for Global Warming Prevention	The Shipbuilders' Association of Japan & The Cooperative Association of Japan Shipbuilders
◎ Japan Cement Association	Limestone Association of Japan
Japan Automobile Manufacturers Association/ Japan Auto-Bodies Industries Association	Flour Millers Association
★ **Japan Auto Parts Industries Association**	Telecommunications Carriers Association
Japan Mining Industry Association	Japan Department Stores Association
Japan Federation of Construction Contractors	Japan LP Gas Association
★ **Japan Lime Association**	Japan Federation of Coastal Shipping Associations
The Japan Rubber Manufacturers Association	Shikoku Railway Company
◎ The Federation of Pharmaceutical Manufacturers' Associations of Japan	**To be considered**
Japan Aluminium Association	Japan Federation of Housing Organizations
◎ Japan Federation of Printing Industries	The Japan Society of Industrial Machinery Manufacturers
◎ Flat Glass Manufacturers Association of Japan	Japan Chain Stores Association
◎ The Japan Bearing Industry Association	Japan Hotel Association
Japan Petroleum Development Association	Telecom Services Association
★ **Japan Copper and Brass Association**	Japan Internet Providers Association
◎ Brewers Association of Japan	**No plan to be considered**
◎ Japan Sanitary Equipment Industry Association	Japan Machine Tool Builders' Association
◎ Japan Industrial Vehicles Association	
◎ Japan Association of Rolling Stock Industries	
The Electric Power Council for a Low Carbon Society	
Petroleum Association of Japan	
The Japan Gas Association	
Japan Franchise Association	
◎ Japan Association of Refrigerated Warehouses	
Japanese Bankers Association	
The Life Insurance Association of Japan	
Japan Foreign Trade Council	
The General Insurance Association of Japan	
The Real Estate Companies Association of Japan	
Japan Building Owners and Managers Association	
Japan Securities Dealers Association	
★ **Japan Leasing Association**	
The Japanese Shipowners' Association	
◎ Japan Trucking Association	
The Scheduled Airlines Association of Japan	
◎ Association of Japanese Private Railways	**Classification**
East Japan Railway Company	Industrial sector
West Japan Railway Company	Energy conversion sector
Central Japan Railway Company	Commercial sector
★ **All Japan Railway Freight Forwarders Association**	Transportation sector

* ★ indicates industries that have newly adopted Visions.
◎ indicates industries that adopted in last fiscal year. Industries that have not disclosed their targets or performance in the past, namely, Kyushu Japan Railway Company, and Japan Freight Railway Company, are not listed.

2. Pathways and efforts toward carbon neutrality by 2050

Each industry presents the aiming pictures and future images, and the pathways and milestones to achieve CN by 2050 in their Visions (Attachment 1).

(1) Energy conversion sector

The electric power industry states that it will continue to implement measures that serve both purposes of "decarbonizing electric power" and "promoting electrification," such as maximizing the use of established technologies for decarbonizing power generation (nuclear power and renewable energy) and utilizing heat pumps, while also pursuing an energy mix that simultaneously achieves "S+3Es." At the same time it will work closely with the government to toward the practical application of innovative technologies (small module reactors, next-generation solar power, storage batteries, hydrogen- and ammonia-fired power generation, CCUS/carbon recycling) through "innovations," or solutions to advance electric power supply services.

The petroleum industry aims to achieve net zero CO_2 emissions (CN) and at the same time contribute to achieving society-wide CN through decarbonizing the products it supplies by accelerating efforts to decarbonize supply chains and products and actively engaging in the research and development and social implementation of innovative technologies that can utilize existing infrastructure (①CO_2-free hydrogen, ②synthetic fuels, ③CCS・CCU(carbon recycling), etc.).

Under the policy to achieve carbon neutralization of gas, the gas industry will promote thorough shift to natural gas and high-efficient use of natural gas (fuel conversion from oil and coal, further deployment of cogeneration and fuel cells, and efficiency improvements in equipment, etc.), decarbonization of gas (methanation and hydrogen utilization, etc.), and development of CCS/CCU-related technologies.

(2) Industrial sector

With a view to achieving carbon-neutrality to contribute to CN by 2050, the iron and steel industry will explore multiple pathways by employing every possible means including the drastic reduction of CO_2 emissions from blast furnace through "COURSE50 and ferro coke technologies plus CCUS", development of super-innovative technologies such as "hydrogen-based iron making", expanded use of scrap, using unharnessed waste heat of medium and low temperatures, and utilizing of biomass, etc.

Under the policy to allow the potential power of "chemistry" to emerge, thereby promoting and accelerating innovations that will resolve global issues and contributing to the growth of a sustainable society as a solution provider, the chemical industry will

engage in the carbon circulation of raw materials (material use of CO_2, utilization of biomass as a feedstock, and utilization of plastics waste, etc.) and in the conversion of processes (membrane separation processes) and structures to minimize energy use.

The paper manufacturing industry will accelerate further its energy efficiency efforts and fuel conversion in production activities, such as active introduction of the latest energy-efficient facilities and technologies, increase of the utilization ratio of renewable energies, and commercialization of innovative technologies (e.g. electrification of paper machine dryers and kilns, development of highly efficient pulp production methods). It will also engage in unique efforts for global warming issues; it will contribute to reducing CO_2 emissions from product life cycles by developing and utilizing environment-friendly materials derived from woody biomass, such as cellulose nanofiber, bioplastics, biochemicals, and to expanding afforestation as a source of CO_2 absorption (promoting forest tree breeding of fast-growing species with high environment adaptability).

Under the policy of contributing to resolve social issues related to climate change and energy constraints through various business fields from the three perspectives of "technology development," "co-creation", and "resilience.", the electrical and electronics industry will engage in innovating advanced energy conservation and carbon-free technologies (distributed power sources + next-generation battery storage, smart grids, CCUS, hydrogen production using water electrolysis, power semiconductors, rapid or wireless charging systems, etc.) and the social implementation of advanced data utilization solutions (autonomous driving systems, on-demand transportation systems, smart factories, on-demand manufacturing and logistics systems, accurate weather observation, and simulation technologies, etc.).

The cement industry will decarbonize the energy it uses by lowering the clinker/cement ratio to reduce emissions from the clinker production process which accounts for most of the CO_2 emissions from the production phase. It will also enhance the use of alternative waste, including biomass, and in the future co-fire hydrogen/ammonia.

The flat glass industry will accelerate the deployment of "Eco-glass S" and gas-filled multi-glazed glass, while also completing the development of CN technologies, including the combustions of non-fossil energies such as hydrogen and ammonia by 2035, and gradually introducing them at the timing of regular glass fusing kiln maintenance.

Among the industries that have newly formulated Visions, the copper and brass industry aims to achieve net zero CO_2 emissions while promoting the development of copper and brass products that contribute to the deployment of xEVs and hydrogen-related infrastructure, as well as to furthering energy savings in various equipment.

(3) Related to the transportation sector

The automobile industry will engage in deploying electric vehicles (HV, PHV, EV, FCV, etc.) and the achievement of a hydrogen economy (spreading FC-based mobility, etc.).

The maritime industry notes that efforts need to be made not only in ships but across the entire transportation chain, including new fuels and infrastructure to supply fuels. The industry will work on the shift to zero-emission vessels using alternative fuels such as carbon-recycled methane, ammonia, and hydrogen.

The aviation industry will engage in introducing new aircraft models, improving flight operations, and introducing and widely using sustainable aviation fuels (SAF).

East Japan Railway Company will promote the renewable energy power development and accelerate its deployment, achieve holistic energy management covering both supply and demand, introduce CCUS, deploy battery-powered rolling stock, develop fuel cell rolling stock, with a view to achieving net zero CO_2 emissions at every stage from energy production to consumption.

Among the industries that have newly formulated Visions, the freight forwarder industry aims to reduce CO_2 emissions from pickup and delivery trucks to the limit by proactively adopting streamlined operations and technological innovations and by promoting the introduction of low-carbon container pickup and delivery trucks.

Furthermore, the West Japan Railway Company, which disclosed the details of its efforts for the first time this fiscal year, will promote “contributing to achieving a decarbonized society through community collaboration,” as well as “environmental innovation in the railway sector using new technologies” and “further energy savings.”

(4) Commercial sector

Envisioning a society that has reached CN by 2050 with widely deployed “energy-savings and renewable energy-conscious buildings, such as ZEB and ZEH”, “buildings that use low-impact construction material,” and “cities that enable community-wide CO_2 reductions by combining renewable energy facilities, storage batteries and power interchange”, the real estate and office building industry will contribute through efforts to promote the conversion to ZEB and ZEH, ensure the traceability of construction materials, utilize HEMS and BEMS, and reuse buildings by renovating, in terms of individual buildings. In terms of entire communities, the industry will make efforts to promote the conversion to Zero Energy Towns (ZET) and to utilizes Community Energy Management Systems (CEMS).

The refrigerated warehouses industry will limit greenhouse emissions by the increased introduction of labor-saving devices and renewable energy, as well as shifting to fluorocarbon-free freezers through the promotion of replacements with energy efficient devices using green refrigerants.

Keidanren will continue to invite participating industries to formulate a Vision and engage in firm efforts to achieve it.

Part 2 Fiscal 2023 Follow-up Results Summary (Performance in Fiscal 2022) [Final Version]

Part 2 will report on the actual results of the emission reduction efforts undertaken by each industry in fiscal 2022 based on four pillars.

This Final Version will report on the follow-up results of all 63 participating industries. The reports submitted by individual industries can be found in the "Individual Sector Version" (only in Japanese).

Pillar 1: Emission reductions from domestic business operations

(1) Performance in CO_2 emissions

Participating industries have set up and announced individual targets to reduce CO_2 emissions from their business operations as commitments to society and are engaged in efforts to achieve their targets.

It should be noted that given the increasing importance of the electric power industry's follow-up on CO_2 emissions from its own business operations (electric power generation), since the fiscal 2017 follow-up, the follow-up report presents the outcome of efforts as CO_2 emissions before electric power distribution (direct emissions) for CO_2 emissions from the energy conversion sector including the electric power industry, and as emissions after electric power distribution (indirect emissions) for emissions from other sectors (industrial, commercial, transportation). Furthermore, the preliminary CO_2 emission factor[2] for electric power use (emission coefficient for electricity) was used to calculate total CO_2 emissions in fiscal 2022.

①All sectors

CO_2 emission trends[3]

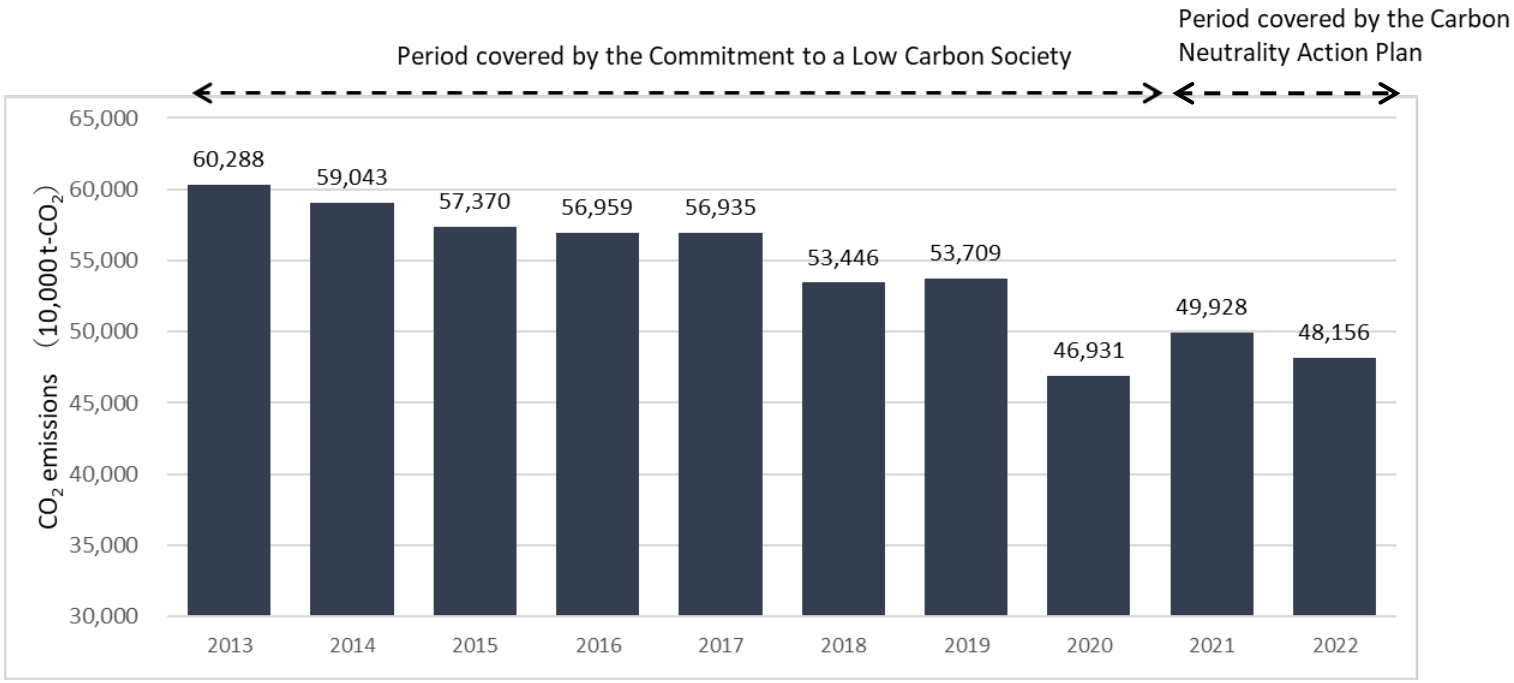
[2] Basic emission coefficient (emission coefficient for actual emissions): 4.35 t-CO_2/10,000 kWh, post-adjustment emission coefficient: 4.36 t-CO_2/10,000 kWh

[3] Participating industries in each sector are as follows. Attachment 2 should be referred to for emissions, etc. in each industry.
Industrial sector: manufacturing (iron and steel, chemical, pulp and paper, electrical and electronics, cement, automobiles, etc.), mining, construction
Energy conversion sector: sectors that convert primary energy, such as crude oil, coal and natural gas into electric power and petroleum products (electric power generation, coal and petroleum manufacturing, gas manufacturing)
Commercial sector: tertiary industries excluding transportation-related and energy conversion businesses (telecommunications, retail, finance, etc.)
Transportation sector: passenger transportation, freight transportation

In fiscal 2022, CO_2 emissions were reduced in all sectors relative to fiscal 2013 levels (emission levels for the baseline year for Japan's 2030 target for global warming countermeasures in the medium term) and the previous fiscal year (-3.5%). (Figure 3)

By sector, emissions were reduced in all sectors relative to fiscal 2013. Compared to the previous fiscal year, emissions were reduced in the industrial sector, while they increased in the energy conversion, commercial and transportation sectors. (Figure 4)

Figure 3. CO_2 emissions from all sector of reduction (final count)

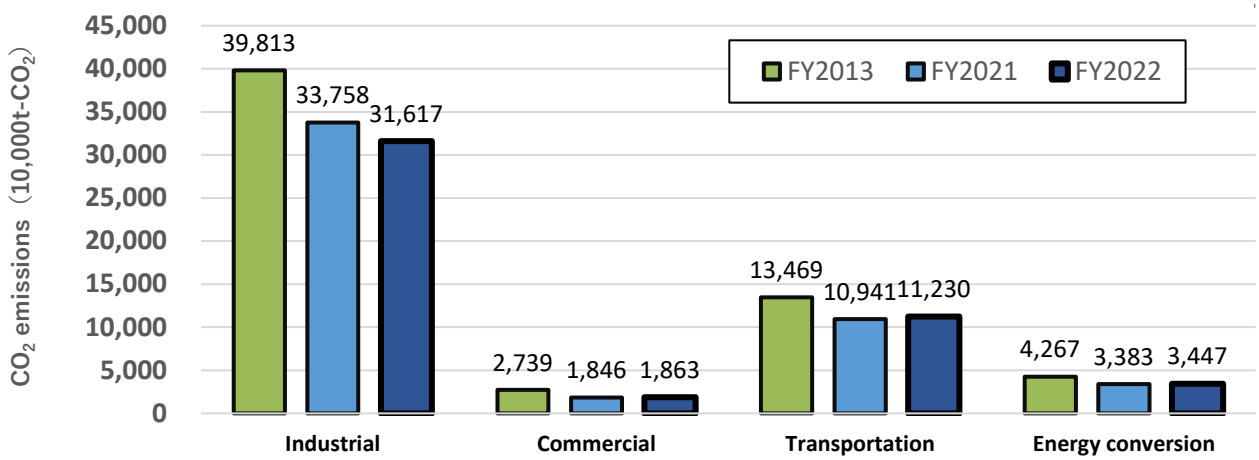


Notes:

- Fiscal 2013-2020 was covered by Keidanren's Commitment to a Low Carbon Society, succeeded by the Keidanren Carbon Neutrality Action Plan in fiscal 2021 and beyond.
- Some industries have not been included in the figure.

Figure 4. CO_2 emissions by sector and rate of reduction (final count)

Emissions after electric power distribution

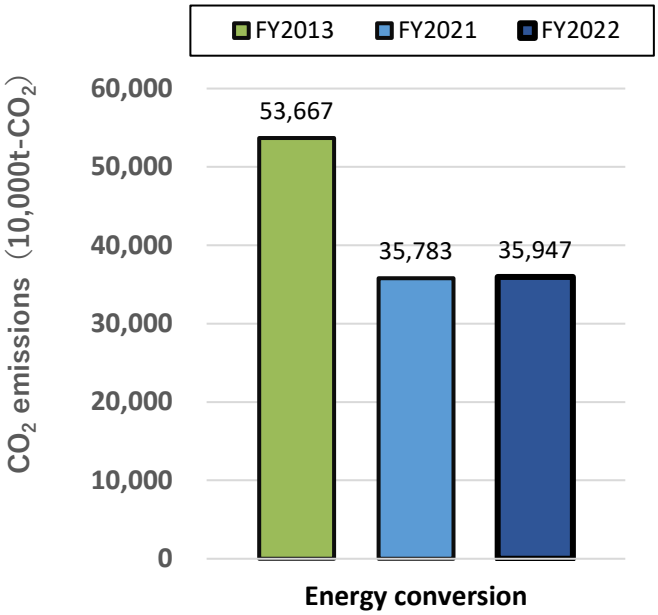


Sector	Target industries / participating ind.	Fiscal 2022 actual emissions	Relative to fiscal 2013	Relative to previous FY (fiscal 2021)
Industrial	31/31 industries	316.17 Mt-CO_2	-20.6%	-6.3%
Commercial	17/17 industries	18.63 Mt-CO_2	-32.0%	+0.9%
Transportation	12/12 industries	112.30 Mt-CO_2	-16.6%	+2.6%

NOTES:

- As emissions before electric power distribution are counted for the energy conversion sector, emissions after electric power distribution are provided for reference.
- Under the commercial sector, the Real Estate Companies Association of Japan has begun reporting CO_2 emissions from fiscal 2022 but this figure is not included in the total actual emissions for fiscal 2022 for the purpose of comparison with the previous fiscal year.

Emissions before electric power distribution



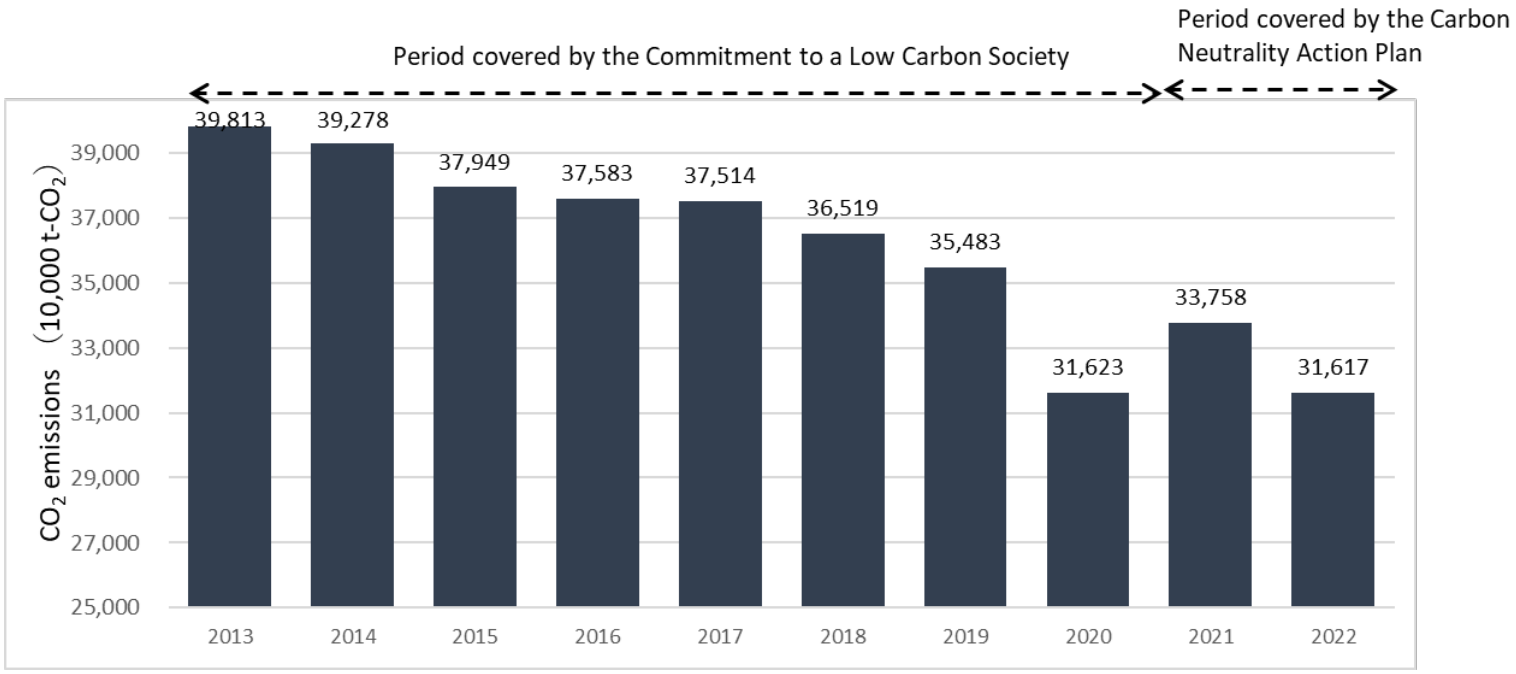
Sector	Target industries/ participating ind.	Fiscal 2022 CO_2 emissions	Relative to fiscal 2013	Relative to previous FY (fiscal 2021)
Energy conversion	3/3 industries	359.47 Mt-CO_2	-33.0%	+0.5%

②Industrial sector

CO_2 emission trends

In fiscal 2022, 316.17 million t-CO_2 (after electric power distribution) (20.6% below fiscal 2013 levels and 6.3% above previous fiscal year levels) were emitted from the 31 industries of the industrial sector. (Figure 5).

Figure 5. Emissions in the industrial sector
(after electric power distribution, final count)



NOTES:

- Fiscal 2013-2020 was covered by Keidanren's Commitment to a Low Carbon Society, succeeded by the Keidanren Carbon Neutrality Action Plan in fiscal 2021 and beyond.

Factor analysis[4]

An analysis of changes in CO_2 emissions in the industrial sector (Figure 6) revealed that compared to the previous fiscal year, CO_2 emissions due to "① change in economic activity", "② change in CO_2 emission factor" and "③ change in energy consumed per unit of economic activity" were reduced (①-6.1%;②-0.2%;③-0.1%).

Causes of the decrease in economic activity include surging energy and feedstock prices, prolonged supply and demand fluctuations due to the shortage of semiconductors and shrinking external demand. The decrease in the CO_2 emission factor can be attributed to a change in the energy structure resulting from the decline in economic activity, fuel conversion, and energy recovery. The decrease in energy consumed per unit of economic activity could be the result of continued energy conservation efforts in each industry,

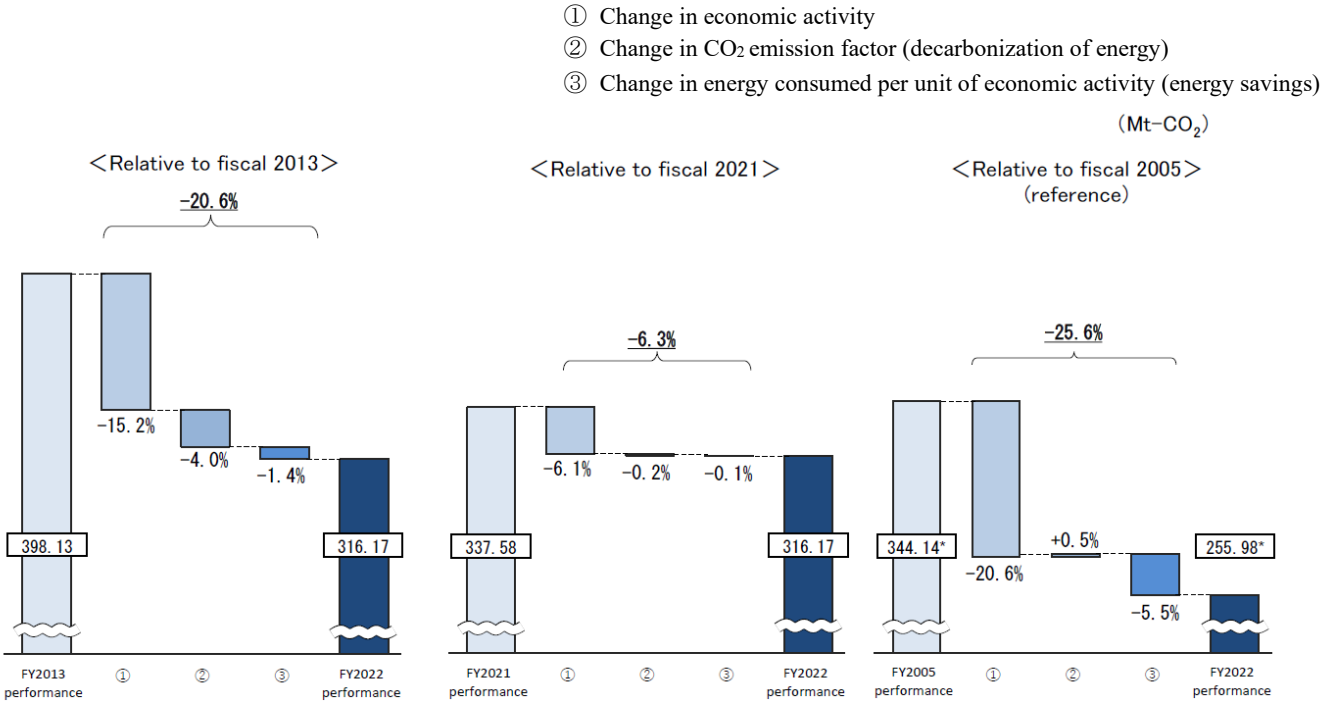
[4] In order to identify the factors that contributed to changes in CO_2 emissions, factors have been broken down to the following three factors in line with the Kaya Identity: "① change in economic activity," "② change in CO_2 emission factor (change in CO_2 emission factor for energy)," and "③ change in energy consumed per unit of economic activity (change attributable to energy savings)." For example, declines in values for ① would imply that CO_2 emissions were reduced due to less economic activity, declines in ② would imply that CO_2 emissions were reduced due to decarbonization of energy, and declines in ③ would imply that CO_2 emissions were reduced as a result of energy saving efforts.

despite worsening energy consumption intensity (in order to continue production activities, a given amount of energy use is required regardless of reduced production).

Relative to fiscal 2013, as a result of reductions due to "① change in economic activity" (-15.2%) accompanied by reductions due to "② change in CO_2 emission factor" and "③ change in energy consumed per unit of economic activity" (②-4.0%;③-1.4%), overall CO_2 emissions were reduced (-20.6%). Reductions due to "② change in CO_2 emission factor" can be attributed to advancements in the deployment of efficient onsite power generation and heat recovery technologies such as co-generation, in addition to the lower CO_2 emission factor of purchased electricity due to the restarting of nuclear power plants and increased deployment of renewable energy. Furthermore, emissions due to "③ change in energy consumed per unit of economic activity" decreased despite a large decrease in "① change in economic activity" which would reduce production efficiency as a result of continued energy saving efforts, including introducing high-efficiency equipment and eliminating or consolidating old equipment.

For reference, relative to fiscal 2005, emissions due to "② change in CO_2 emission factor" increased (+0.5%) due to the prolonged suspension of nuclear power plants after the Great East Japan Earthquake in 2011, while emissions due to "① change in economic activity"" and "③ change in energy consumed per unit of economic activity" decreased (①-20.6%; ③-5.5%). As a result, overall CO_2 emissions were reduced (-25.6%).

Figure 6. Factor analysis of change in CO_2 emissions (after electric power distribution, final count) in the industrial sector



NOTE: Figures have been rounded off; and therefore, the sum of ①, ② and ③ may differ from the rate of reduction relative to a fiscal year. Comparisons with fiscal 2005 levels have been calculated excluding data for the Japan Chemical Industry Association, Japan Federation of Housing Organizations, The Japan Rubber Manufacturers Association, Japan Machine Tool Builders' Association, Japan Copper and Brass Association, Brewers Association of Japan, and The Shipbuilders' Association of Japan.

Major efforts made in fiscal 2022

The industrial sector has continued to contribute to reducing CO_2 emissions by engaging in fuel conversion, recovering and utilizing energy, introducing high-efficiency equipment, and improving operational processes (Table 2).

In fiscal 2022, the iron and steel industry renewed thirteen coke ovens, in terms of the degradation of coke oven refractory bricks which have been a factor of increased CO_2 emissions, between fiscal 2013 and fiscal 2020, and three coke ovens are being renewed as of fiscal 2022.

In fiscal 2022, the chemical industry invested around 35 billion yen in equipment, reducing 470,000 t-CO_2. In other words, the industry has promoted CO_2 emission reductions by making capital investments of around 70,000 yen to reduce 1t of CO_2.

In terms of fuel conversion, industries continue to shift from heavy oil to natural gas, LPG, etc. In addition, many industries, including the iron and steel, chemical, paper manufacturing, cement, mining, limestone, rubber, aluminum, printing, glass, electric wire and cable, beer, and limestone mining industries, take measures in energy recovery

and use, recovering waste heat, byproducts and steam from production processes for heat use in power generation and air conditioning (see "Pillar 1 (5) ② for details).

As aforementioned, industries pointed out that as a result of many years of cumulative efforts to reduce emissions, there is limited room for significantly effective investment in energy savings. Furthermore, some industries have yet to complete updating aged or deteriorating equipment due to a shortage of labor and cost-related restrictions. In addition, with recent changes in the product mix from low-mix high-volume production to high-mix low-volume production, some industries have been seeing less CO_2 emission reductions resulting from improved production efficiency.

Table 2. Major efforts made in the industrial sector in fiscal 2022

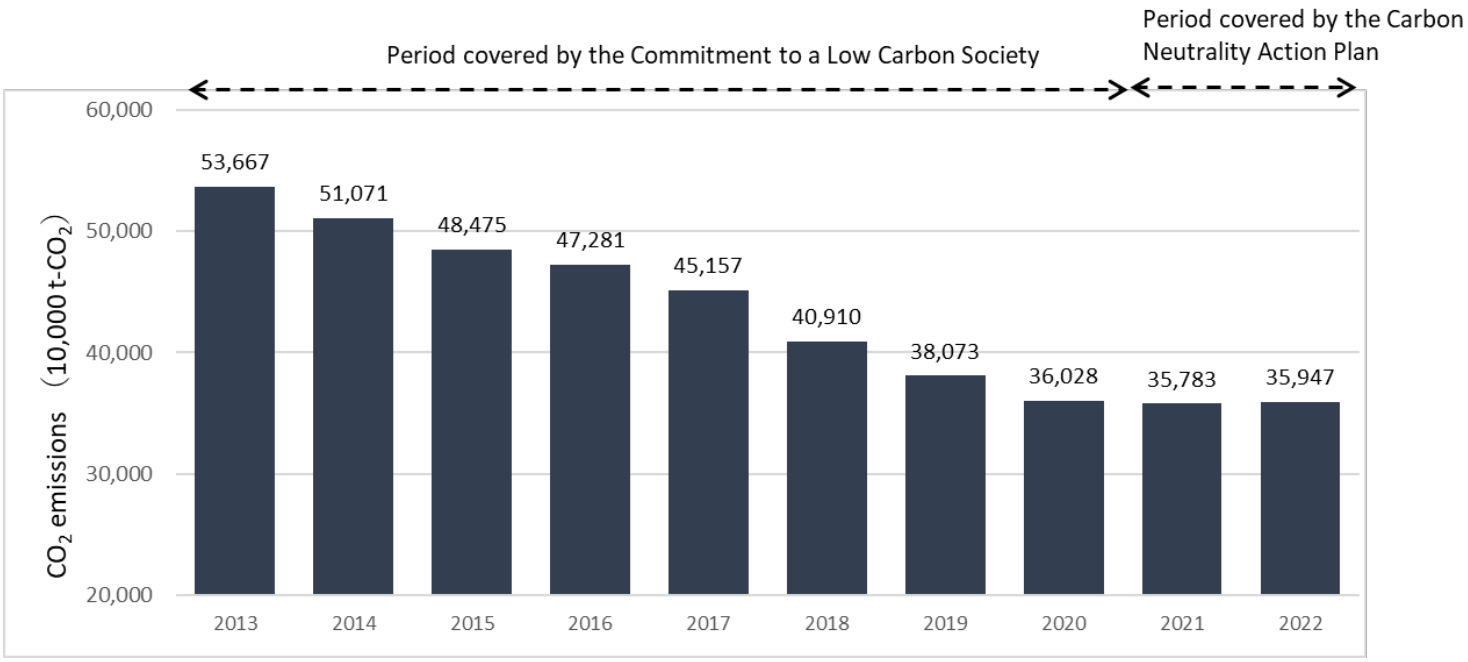
Improvement of efficiency of facilities	
・ Deployment of high-efficient equipment (heating furnaces, cracking furnaces, power generating facilities, HVAC (Heating, Ventilation, and Air Conditioning) equipment, transformers, pumps, compressors, motors, fans, freezers, etc.)	・ Application of inverter technologies to compressors ・ Renewal of coke ovens ・ Updating to high efficiency power generation facilities ・ Renewal to LED lighting
Improvement of operations and processes	
・ Optimization of operational conditions and methods ・ Changing baselines and settings (temperatures, frequency of ventilation, level of cleanliness, brightness, hours of operation, etc.)	・ Reducing feedstock as a result of recycling ・ Utilization of IoT to visualize the status of energy use
Fuel conversion / energy recovery	
・ Conversion from heavy oil and kerosene to city gas, propane gas, electric power, alternative fuels (wooden pellets, recycled oil, recycled fuels)	・ Regenerative burners ・ Waste heat recovery (enhanced thermal insulation of steam piping and hot water devices, reduction of heat carried away by products)

③Energy conversion sector

CO_2 emission trends

In fiscal 2022, the three participating industries of the energy conversion sector collectively emitted 359.45 million t-CO_2 (before electric power distribution) (33.0% below fiscal 2013 levels and 0.4% below previous fiscal year levels), thus continuing to follow a downward emission trend (Figure 7).

Figure 7. CO_2 emissions in the energy conversion sector (before electric power distribution, final count)



NOTES:

- Fiscal 2013-2020 was covered by Keidanren's Commitment to a Low Carbon Society, succeeded by the Keidanren Carbon Neutrality Action Plan in fiscal 2021 and beyond.
- Since the Electric Power Council for a Low Carbon Society was established in fiscal 2015, data for fiscal 2013 and 2014 are provided with reference to data from the Federation of Electric Power Companies of Japan and some new electric power businesses.

Factor analysis

An analysis of the causes that led to changes in CO_2 emissions (before electric power distribution) in fiscal 2022 (Figure 8) revealed that compared to the previous year, while CO_2 emissions due to "② change in CO_2 emission factor" decreased (-0.8%), emissions due to "③ change in energy consumed per unit of economic activity" both increased (+1.3%).

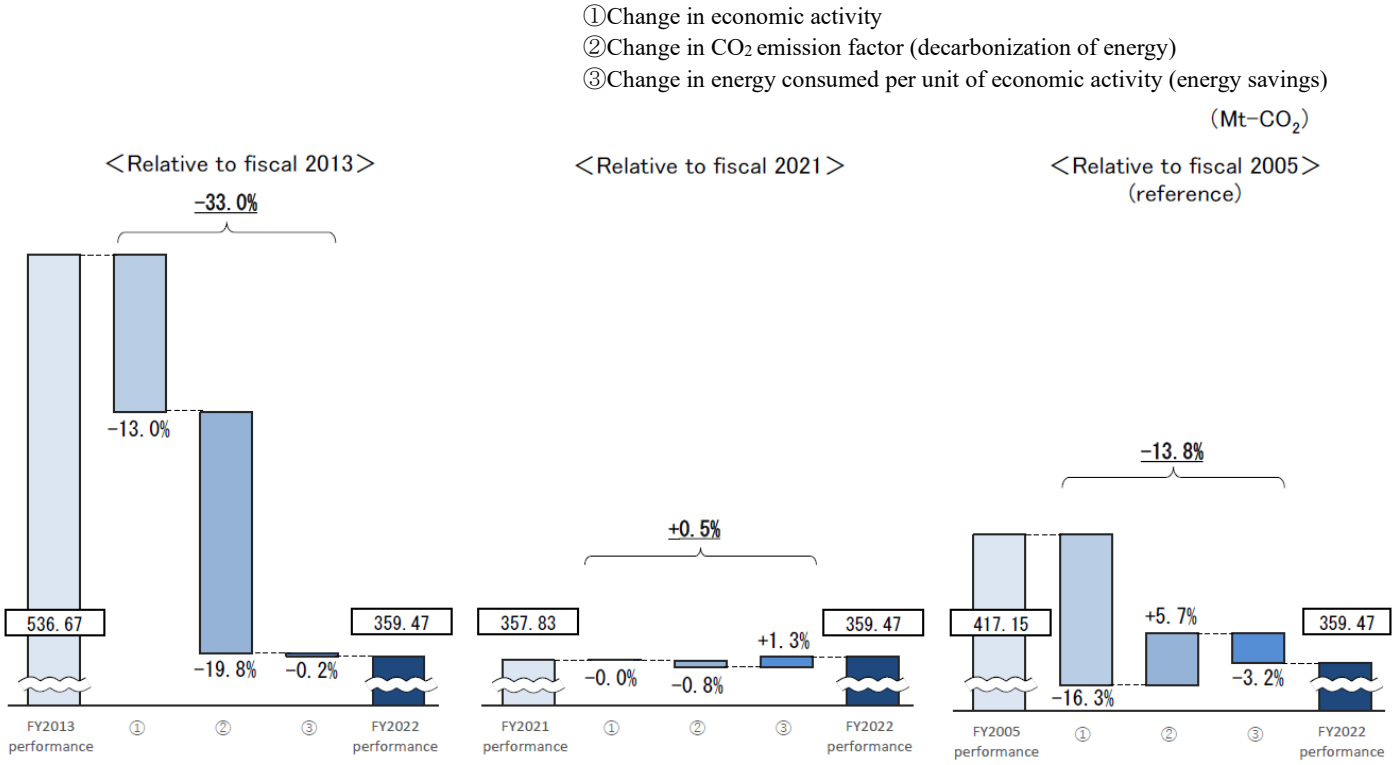
There was almost no change in emissions due to "① change in economic activity." These changes mainly owe to the fact that while the increased deployment of renewable

energy, the introduction of state-of-the-art high-efficiency thermal power generation facilities and improved heat efficiency of existing thermal power generation facilities contributed to reducing CO_2 emissions, nuclear power plants accounted for a smaller ratio of total power generation due to the implementation of periodic inspections.

Relative to fiscal 2013, not only emissions due to "① change in economic activity" and "② change in CO_2 emission factor" decreased (① -13.0%; ② -19.8%) but also emissions due to "③ change in energy consumed per unit of economic activity" decreased (-0.2%); and therefore, CO_2 emissions decreased by -33.0%. Emission reductions due to "② change in CO_2 emission factor" can be attributed to the restarting of nuclear power plants and the increased deployment of renewable energy.

For reference, relative to fiscal 2005, emissions due to "② change in CO_2 emission factor" increased (+5.7%) due to the prolonged suspension of nuclear power plants after the Great East Japan Earthquake in 2011, while emissions due to "① change in economic activity" and "③ change in energy consumed per unit of economic activity" decreased (① -16.3%; ③ -3.2%). As a result, overall CO_2 emissions were reduced (-13.8%).

Figure 8. Factor analysis of change in CO_2 emissions (before electric power distribution, final count) in the energy conversion sector



Note: Comparisons with fiscal 2005 and fiscal 2013 levels are provided for reference because of the discontinuity of the data before and including fiscal 2014 and beyond fiscal 2015.

Major efforts made in fiscal 2022.

The electric power industry promotes the utilization of nuclear power on the major premise of ensured safety, the development of hydro, geothermal, solar, wind, and biomass power generation, and the purchasing and deployment of renewable power under the FIT (feed-in-tariff) system. The industry is also engaged in reducing CO_2 emissions through continued efforts to improve the efficiency of thermal power generation, including LNG combined cycle power generation and ultra-supercritical coal-fired thermal power generation (Table 3).

The petroleum industry reduces CO_2 emissions by compiling a broad range of individual measures. These include further sophisticating the operation and management of refineries and utility plants, increasing mutual heat utilization among devices, installing more equipment to recover waste heat and other waste energy, and adopting highly efficient devices and catalysts. The industry also uses government support programs for the rational use of energy to promote energy conservation.

It has been difficult in recent years for the city gas industry to achieve substantial reductions as almost all business operators have finished renewing LNG production processes, etc. However, the industry promotes further CO_2 emission reductions by installing high-efficiency equipment when updating facilities and altering facility operations within a scope that does not affect the stable supply of city gas (reviewing pump operations, etc.).

Table 3. Major efforts made in the energy conversion sector in fiscal 2022

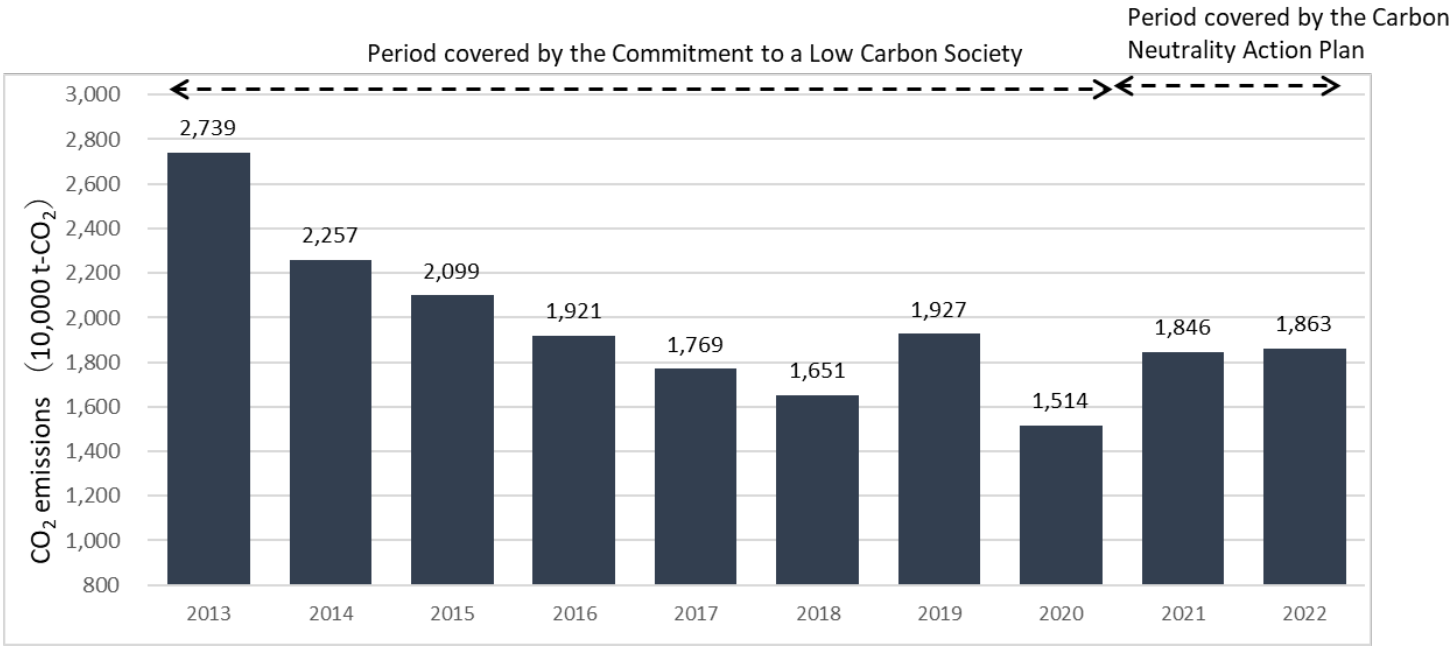
Introduction of high-efficiency facilities	
・ LNG combined cycle power generation ・ Ultra-supercritical coal-fired thermal power generation, etc. ・ Waste heat/waste energy recovery facilities	・ High-efficiency cogeneration equipment ・ Adoption of high-efficiency devices and catalysts
Creation of low carbon emission or zero emission energy	
・ Nuclear power on the major premise of ensured safety ・ Hydro, geothermal, solar, wind, and biomass power generation	・ Combined combustion of wood biomass at coal-powered thermal power generation plants ・ Addressing wind and solar output variability
Improvement of operations	
・ Further sophistication of control technologies and operation and management of refining and utility facilities at oil refineries ・ Mutual heat utilization among devices	・ Substantial improvements and advancements in processes
Provision of services	
・ Energy-saving consultation services ・ Support for energy saving activities using call centers ・ Electric power visualization services ・ Energy saving diagnosis through security check operations	・ Provision of virtual renewable energy choices using non-fossil certificates ・ Measures to promote deployment of renewable power ・ Provision of CO_2-free services ・ Environmental household account books

④Commercial sector

CO_2 emission trends

In fiscal 2022, the 17 participating industries of the commercial sector collectively emitted 18.63 million t-CO_2 (after electric power distribution) (32.0% below fiscal 2013 levels and 0.9% above previous fiscal year levels) (Figure 9).

Figure 9. CO_2 emissions in the commercial sector (after electric power distribution, final count)



NOTES:

- Fiscal 2013-2020 was covered by Keidanren's Commitment to a Low Carbon Society, succeeded by the Keidanren Carbon Neutrality Action Plan in fiscal 2021 and beyond.
- The Real Estate Companies Association of Japan has begun reporting CO_2 emissions from fiscal 2022 but is not included in the current graph this fiscal year for the purpose of comparison with the previous fiscal year.
- The Japan Building Owners and Managers Association has only reported emissions for 2013, 2019, 2021 and 2022.

Factor analysis

An analysis of CO_2 emissions (after electric power distribution) in the commercial sector in fiscal 2022 (Figure 10) has revealed that relative to the previous fiscal year, CO_2 emissions increased due to "① change in economic activity" and "② change in CO_2 emission factor" (① +6.6%; ② +0.6%), but decreased due to "③ change in energy consumed per unit of economic activity" (-6.3%); and therefore, total CO_2 emissions were increased (+0.9%). The main factors contributing to "① change in economic activity" were increased communications traffic due to increased time spent

at home amid COVID-19, in addition to a significant rise in information distributed across networks as a result of increased internet use and the widespread use of smartphones and tablets, as well as the emergence of diverse services and applications, such as the distribution of high-quality contents, including HD (high definition) images. Furthermore, the increase in emissions due to "② change in CO_2 emission factor" can be attributed to a slight increase in the CO_2 emissions factor for purchased electricity. In terms of factors contributing to decreases due to "③ change in energy consumed per unit of economic activity", industries reported that they were able to limit electric power use despite increased communications traffic through continued efforts to deploy telecommunications equipment with high energy saving performance, efficiently set up and operate data center facilities, etc., deploy high-efficiency HVAC equipment and LED lighting, and deploy energy management systems, such as BEMS (Building Energy Management System).

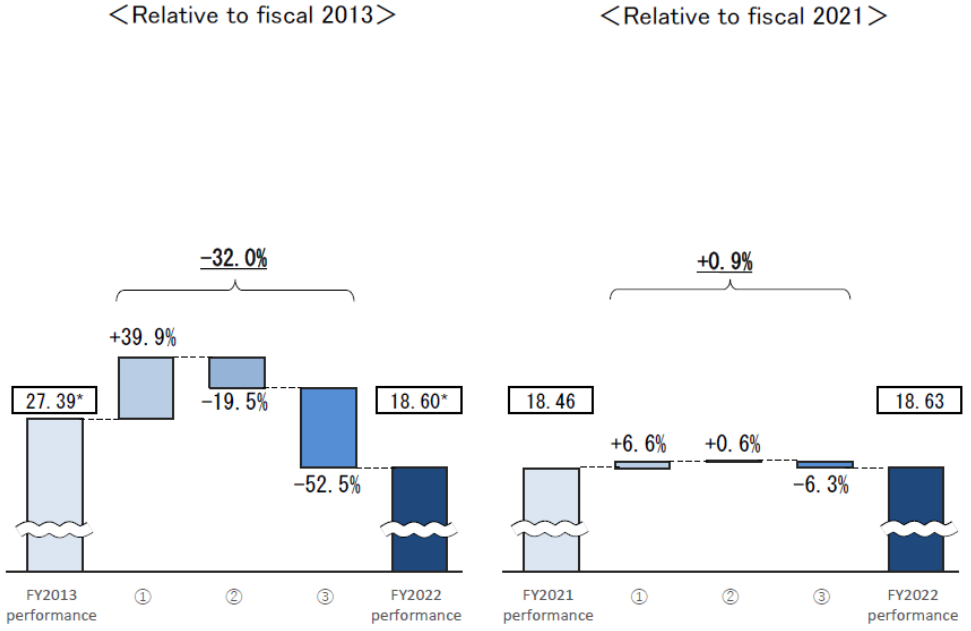
Relative to fiscal 2013, emissions due to "① change in economic activity" increased significantly (+39.9%), while emissions due to "② change in CO_2 emission factor" and "③ change in energy consumed per unit of economic activity" decreased (② -19.5%; ③ -52.5%), leading to reductions in CO_2" emissions. Compared to other sectors, emissions due to "② change in CO_2 emission factor" have dropped significantly because most of the CO_2 emissions in the commercial sector are attributable to electric power use, and are thus largely affected by improvements in the emission coefficient for electric power. The drastic decrease in emissions due to "③ change in energy consumed per unit of economic activity" are a result of efforts to reduce electric power use, including introducing telecommunications equipment with high energy saving performance, efficiently setting up and operating equipment, and implementing energy conservation measures especially in the telecommunications industry.

As indicated above, most of the CO_2 emissions in the commercial sector are attributable to electric power use, and are thus largely affected by the emission coefficient for electric power. The utilization of nuclear power plants on the premise that safety is secured, increased deployment of renewable energy, and the deployment of cutting-edge high-efficiency thermal power generation facilities are important in reducing CO_2 emissions in the commercial sector.

Figure 10. Factor analysis of change in CO_2 emissions (before electric power distribution, final count) in the commercial sector

①Change in economic activity
②Change in CO_2 emission factor (decarbonization of energy)
③Change in energy consumed per unit of economic activity (energy savings)

(Mt-CO_2)



NOTE: Figures have been rounded off; and therefore, the sum of ①, ② and ③ may differ from the rate of reduction relative to a fiscal year.

Major efforts made in fiscal 2022

The commercial sector has continued to reduce CO_2 emissions through introducing energy-saving and high-efficiency equipment and operational improvements. It has also promoted the introduction of renewable energy, such as solar and wind power, in the chain store, telecommunications, franchise chain, foreign trade, real estate, hotel, and telecommunication services industries (Table 4).

Operational improvements include the promotion of BEMS in the foreign trade industries. Such actions, along with working practice reform and the consolidation and reduction of office space promoted in many industries as a result of COVID-19, have contributed to reducing CO_2 emissions.

Particularly in the ICT (Information and Communication Technology) field, with the further utilization of big data, communications traffic has increased significantly. Under these circumstances, the telecommunications industry has taken measures to reduce electric power use, for example, introducing communication equipment (ICT devices, IP devices) with high energy-saving performance and the efficient construction and

operation of facilities (simplified network facilities, high-efficiency wireless base stations, energy- saving measures at data centers). As a result, energy consumption (electric power use) in fiscal 2022 has only slightly increased from the previous fiscal year.

Table 4. Major efforts made in the commercial sector in fiscal 2022

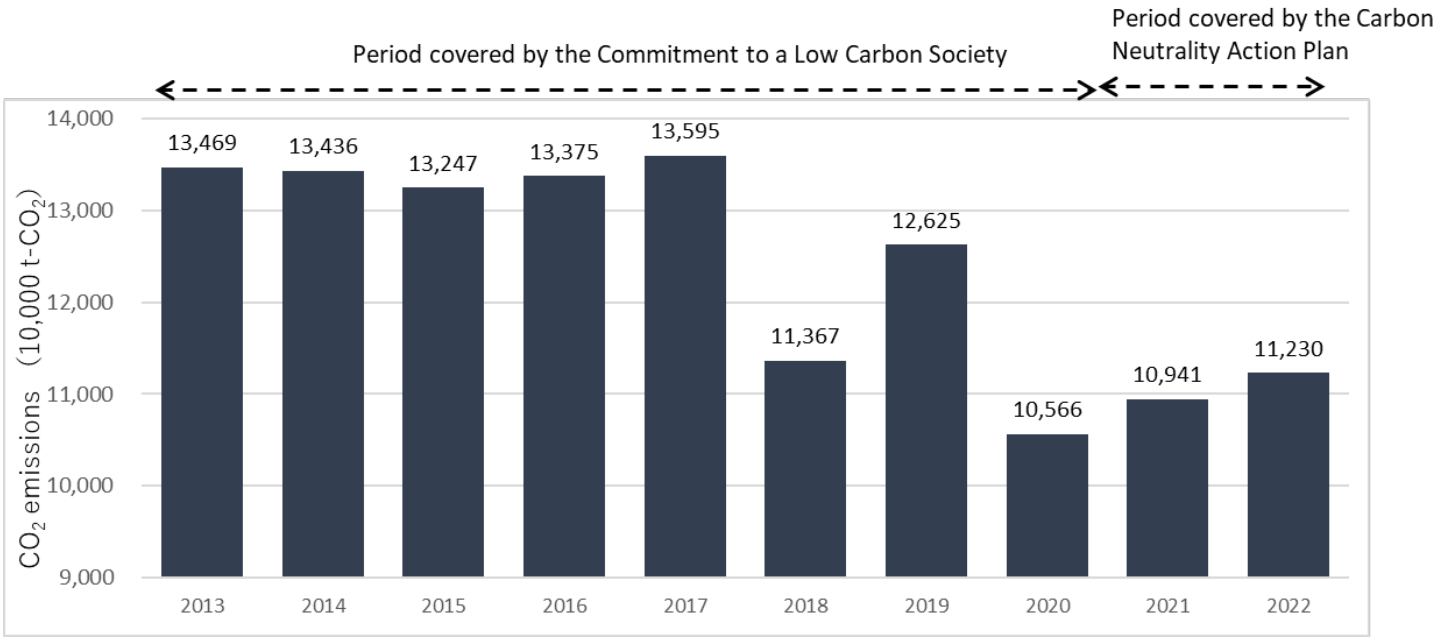
Introduction of energy-saving high-efficiency facilities	
・ High-efficiency wireless base station equipment ・ Connection of ICT devices and IP devices to DC power sources ・ High-efficiency HVAC systems ・ High energy efficiency power sources ・ High-efficiency transformers ・ Standardization of installing cutting-edge energy saving models at new stores ・ CO_2 refrigerant freezers ・ UPS renewals	・ LED lighting ・ Human-detecting sensors ・ Low emission vehicles ・ Enhanced heat insulation (exterior air barriers, high performance insulating window glass, sun-shielding films) ・ Tenant building renovation ・ Construction of business locations meeting ZEB Ready standards ・ Switching corporate cars and leased cars to PHV・EV・HV・FCV
Improvement of operations	
・ Energy-saving operation of lighting and HVAC equipment ・ BEMS (Building Energy Management System) ・ Visualization of energy management utilizing IoT ・ Peak shaving operations ・ Implementation of “Cool Biz” and “Warm Biz” campaigns	・ Consolidation of office space; relocation to energy efficient buildings ・ Acquisition and operation of environmental management system ・ Improved work management ・ Promotion of teleworking
Fuel conversion to renewable energy	
・ Solar and wind power generation	

⑤Transportation sector

CO_2 emission trends

In fiscal 2022, the 12 participating industries of the transportation sector collectively emitted 112.30 million t-CO_2 (after electric power distribution) (16.6% below fiscal 2013 levels and 2.6% above previous year levels), marking significant emission reductions relative to fiscal 2013, but increases compared to previous fiscal year levels. (Figure 11).

Figure 11. CO_2 emissions in the transportation sector (after electric power distribution, final count)



NOTES:

- Fiscal 2013-2020 was covered by Keidanren's Commitment to a Low Carbon Society, succeeded by the Keidanren Carbon Neutrality Action Plan in fiscal 2021 and beyond.
- Emissions from flights and shipping to and from overseas destinations are included for the Japanese Shipowners' Association and a part of the Scheduled Airlines Association of Japan
- In the overseas shipping industry, container ship operations were excluded from the fiscal 2019 follow up (performance in fiscal 2018); and therefore, emissions decreased in the transportation sector. However, container ship operations are covered again in the fiscal 2020 follow up (performance in fiscal 2019) and beyond.

Factor analysis

An analysis of the causes that led to changes in CO_2 emissions (after electric power distribution) in the transportation sector in fiscal 2022 (Figure 12) revealed that CO_2 emissions due to "① change in economic activity" and "③ change in energy consumed per unit of economic activity" increased (① +1.9%; ③ +0.8%), but there was almost no change in emissions due to "② change in CO_2 emission factor" on a

year over year basis. The increase due to "① change in economic activity" was caused by increased economic activity in the aviation and domestic shipping industry, with people and material flow returning after once being limited by COVID-19, despite decreased economic activity due to revisions in the train schedule and number of operating rolling stock in the railway industry. Emissions due to "③ change in energy consumed per unit of economic activity" increased because while the introduction and improvement of vessels, aircrafts, trucks, and rolling stock featuring high energy efficiency were continued and efficient operations leading to energy savings were sustained, shipping trends shifted towards shorter distances, smaller lots, and higher frequency and economic activity (transport volume) did not return to pre-COVID 19 levels and thus aggravated transport efficiency (shipowners and coastal shipping industries, etc.)

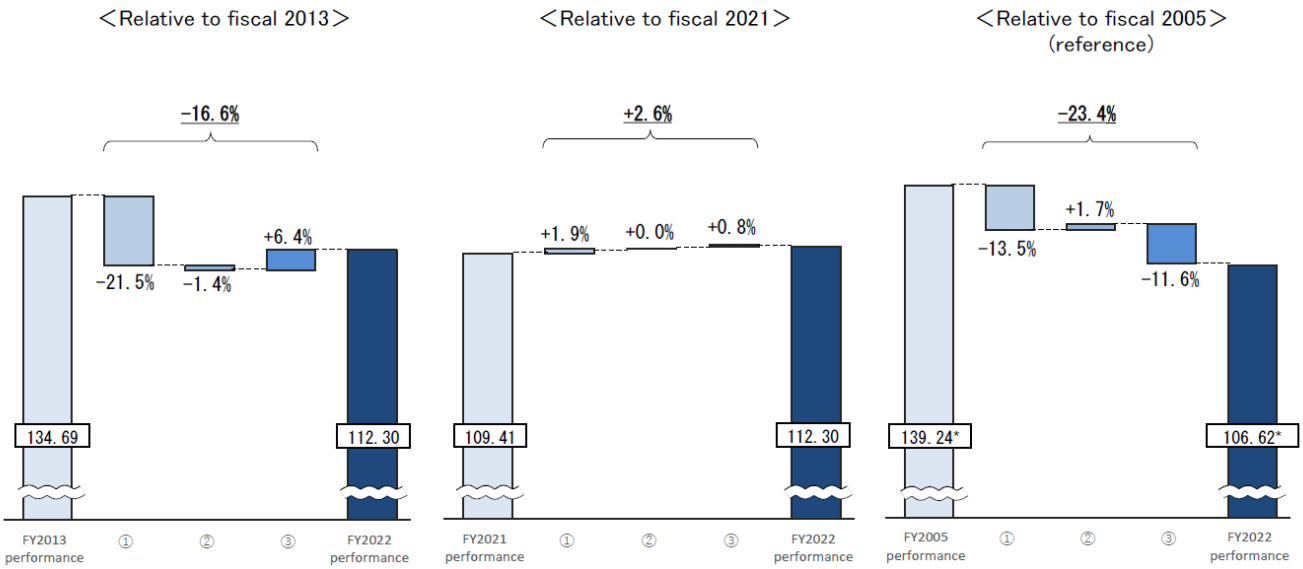
Relative to fiscal 2013, CO_2 emissions due to "① change in economic activity" and "② change in CO_2 emission factor" decreased (① -21.5%; ② -1.4%), while emissions due to "③ change in energy consumed per unit of economic activity" increased (+6.4%), amounting to an overall decrease in CO_2 emissions (-16.6%).

For reference, relative to fiscal 2005, CO_2 emissions increased due to "② change in CO_2 emission factor" increased (+1.7%) but CO_2 emissions decreased due to "① change in economic activity" and "③ change in energy consumed per unit of economic activity" decreased (① -13.5%; ③ -11.6%); and as a result, overall CO_2 emissions were reduced (-23.4%).

Figure 12. Factor analysis of change in CO_2 emissions (after electric power distribution, final count) in the transportation sector

①Change in economic activity
②Change in CO_2 emission factor (decarbonization of energy)
③Change in energy consumed per unit of economic activity (energy savings)

($Mt-CO_2$)



NOTE:

- Figures have been rounded off; and therefore, the sum of ①, ② and ③ may differ from the rate of reduction relative to a fiscal year.
- Figures for fiscal 2005 do not include data for the Association of Japanese Private Railways and the East Japan Railway Company.

Major efforts made in fiscal 2022

As a major measure taken by the transportation sector, each industry has made advancements in the introduction and operation of highly efficient vessels, trucks, aircrafts, and railways. (Table 5).

The overseas shipping industry is engaged in CO_2 emission reductions in terms of both facilities and operations, including the adoption of high-combustion efficiency engines and low frictional resistance design when building new vessels, utilizing weather routing services and navigation support systems, and conducting slow navigation. The domestic shipping industry also contributes to CO_2 emission reductions by making energy saving improvements to the vessel and equipment when scrapping and rebuilding older ships.

The trucking industry has reduced CO_2 emissions by offering subsidies for the adoption of environment-friendly vehicles, such as CNG and hybrid vehicles, and for the installation of devices, such as air heaters and battery powered air conditioning devices.

Given the gradual recovery of economic activity, which had decreased due to COVID-19, the aviation industry promoted the downsizing of aircrafts, retired old models and made improvements in flight operations.

The railway industry has introduced energy-efficient rolling stocks. It has also installed LED lights and high-efficiency large-scale HVAC systems on platforms, concourses and rolling stock centers.

Table 5. Major efforts made in the transportation sector in fiscal 2022

Introduction and operation of high-efficiency international and domestic vessels	
・ Low frictional resistance design, coating, and devices ・ High combustion efficiency engines ・ Effective use of waste heat ・ Cleansing vessels, coating, propeller polishing ・ Improvements in combustion efficiency of main engines ・ Turning off pumps not in use when in harbor	・ Utilization of weather routing and navigating systems ・ Slow navigation ・ Optimization of fuel oil and ballast water ・ Larger vessels
Introduction and operation of high-efficiency trucks	
・ CNG vehicles, hybrid vehicles	・ Devices to support efforts to refrain from vehicle idling
Introduction and operation of high-efficiency aircrafts	
・ Introduction of fuel-efficient aircraft	・ Improve flight operations
Introduction and operation of high efficiency rolling stock	
・ Energy-efficient rolling stock ・ High-efficiency HVAC facilities	・ Renewal of interior lighting, station platform and concourse lighting to LED

(2) Status of 2030 target revisions, probability of achieving 2030 target and rate of progress

Status of target revisions

A survey on the status of revisions of Phase II (fiscal 2030) targets (Table 6), 9 industries announce their plans to review their targets in the current follow up out of the 61 industries that have disclosed their targets and performance. Mainly industries that were close to achieving their Phase II targets have renewed their targets to more ambitious ones, indicating their intentions to contribute to achieving the Government's target to reduce emissions by 46% in fiscal 2030.

Probability of achieving 2030 target and rate of progress

A survey on the rate of progress made and the probability of successfully achieving targets revealed that 24 industries of the 63 participating industries find that they will be able to meet their targets.

In view of the progress made to date, 12 industries have already achieved their Phase II (fiscal 2030) targets in fiscal 2022. These industries have taken various measures, including pursuing higher efficiency in their operations through energy recovery, fuel conversion from heavy oil to LNG, etc., and shifting to renewable energy, in addition to deploying energy-saving facilities and high-efficiency.

One industry responded that they found it difficult to reach their target. The reason provided was the absence of established technologies to enable the achievement of carbon neutrality. The industry reported that it would make efforts to collect information on technologies and continue to make considerations toward promoting carbon neutrality.

Other opinions included expectations for the increased deployment of cost-competitive renewable energy in Japan and for Government support for efforts made toward carbon neutrality, given the current circumstances of surging energy prices and difficulties in securing natural gas as a result of the Russian invasion of Ukraine.

Industries that retained their original targets despite having overachieved them reported that they were paying close attention to the impacts of COVID-19 and carefully taking into account the possibility that CO_2 emission could have increased or decreased due to temporary variable factors.

Keidanren will call upon participating industries to make consistent efforts to review their targets as they engage in continued reduction efforts by maximizing the introduction of BAT and seek to further their efforts in technology development and deployment.

Table 6. Status of review of Phase II (fiscal 2030) targets and rate of progress in fiscal 2022

Industrial		The Japan Society of Industrial Machinery Manufacturers	214%	◎	Japan Federation of Construction Contractors	78%
	★	The Shipbuilders' Association of Japan & The Cooperative Association of Japan Shipbuilders	148%	◎	The Japan Iron and Steel Federation	76%
					Japan Federation of Printing Industries	72%
		Japan Association of Rolling Stock Industries	138%	◆	Japan Paper Association	63%
	★	Flat Glass Manufacturers Association of Japan	135%	★	The Japan Bearing Industry Association	62%
	◎◆	Japan Cement Association	69%	◆	Brewers Association of Japan	62%
		(top: intensity, bottom: absolute amount)	125%	◆	Japan Aluminium Association	60%
		Japan Soft Drink Association	112%	◎	Japan Petroleum Development Association	57%
	◆	Japan Lime Association	100%	◎◆	Japan Auto Parts Industries Association	57%
	◎	Limestone Association of Japan	91%	★	Japan Copper and Brass Association	47%
	◆	The Japanese Electric Wire & Cable Makers' Association	89%	★	Japan Chemical Industry Association	44%
	◎◆	Japan Dairy Industry Association	84%	◆	Japan Machine Tool Builders' Association	38%
	◆	Japan Sanitary Equipment Industry Association	84%	◆	Japan Industrial Vehicles Association	37%
	◆	Japan Mining Industry Association	82%	◆	The Federation of Pharmaceutical Manufacturers' Associations of Japan	36%
		Japan Automobile Manufacturers Association/ Japan Auto-Bodies Industries Association	81%	◎	Liaison Group of Japanese Electrical and Electronics Industries for Global Warming Prevention	5%
	◎	The Japan Rubber Manufacturers Association	81%		Japan Federation of Housing Organizations	–
		Flour Millers Association	80%			
Energy conversion	◆	The Electric Power Council for a Low Carbon Society	104%	◆	The Japan Gas Association	38%
	★	Petroleum Association of Japan	71%			
Commercial		Telecom Services Association	432%	★	Japan Leasing Association	70%
		Japan Foreign Trade Council	279%	★	The Real Estate Companies Association of Japan	44%
		Japan Hotel Association	120%		(top: absolute amount, bottom: intensity)	69%
	◎	Japan Department Stores Association	88%	★	Japan Building Owners and Managers Association	68%
		(top: intensity, bottom: absolute amount)	108%	◎	Japan Franchise Association	66%
		Telecommunications Carriers Association	100%	◆	Japan Securities Dealers Association	64%
	◆	Japanese Bankers Association	89%	◆	Japan Association of Refrigerated Warehouses	61%
	◆	Japan Chain Stores Association	88%	◆	Japan LP Gas Association	59%
	◎	The General Insurance Association of Japan	77%		Japan Internet Providers Association	–
	◆	The Life Insurance Association of Japan	71%			
Transportation		The Japanese Shipowners' Association	103%		Japan Federation of Coastal Shipping Associations	51%
		All Japan Railway Freight Forwarders Association	90%	◆	Central Japan Railway Company	51%
	◆	Association of Japanese Private Railways	79%		East Japan Railway Company	29%
	◎	West Japan Railway Company	61%		Japan Trucking Association	0%
	◆	Shikoku Railway Company	58%	◎	The Scheduled Airlines Association of Japan	-16%

◎: Industries that renewed their targets in the fiscal 2021 follow-up
◆: Industries that renewed their targets in the fiscal 2022 follow-up
★: Industries that renewed their targets in the fiscal 2023 follow-up

※ For industries that have renewed targets, the rate of progress against new targets are provided. Some industries plan to verify the appropriateness of their targets based on the achievement status of the fiscal 2022. Industries that have not disclosed their targets or performance in the past, namely, Kyushu Japan Railway Company, and Japan Freight Railway Company, are not listed.

※ Due to rounding, some industries underachieved their targets even though the rate of progress rate was 100%.

(3) Emissions reduction efforts made at corporate headquarters and other offices and in logistics

Many industries have reduced CO_2 emissions at corporate headquarters and other offices and in logistics.

They have also taken measures for energy conservation and decarbonization in their corporate headquarters and offices. These measures include deploying high-efficiency HVAC equipment, LED lighting, human-detecting sensors, thermal insulating glass, as well as continued meticulous efforts to turn off the lights when not in use, taking out certain lights, manage HVAC temperature settings, limit the number of elevators in operation, etc. Some industries developed their own electric power consumption targets for offices and continue to make efforts to be in line with the target. Some industries reported contributing to CO_2 emission reductions by implementing working practice reform, including promoting teleworking, improving operational efficiency, and converting to a paperless office, which led to less electric power consumption in the office and reduced waste incineration. There were also reports related to renewable energy, including installing solar and wind power generation facilities and purchasing green electric power certificates.

CO_2 emissions per floor area were reduced relative to fiscal 2013 levels in all 20 industries that reported in this index, with the exceptions of two industries for which fiscal 2013 data is not available. Sixteen industries achieved reductions by more than 30%. On a year-on-year basis, reductions were seen in 9 industries. Four industries achieved reductions by more than 10%.

On the other hand, it has been pointed out that increased emissions could be a result of increased energy consumption as more people work in the office with the recovery from COVID-19.

In the logistics area, various emission reduction measures are being taken not only in the transportation sector but also in other sectors. Industries reported introducing digital tachographs and energy-saving tires, promoting a modal shift, employing larger vehicles and vessels, streamlining logistics through joint delivery of products with other companies, direct delivery to clients, and promoting the deployment of natural gas vehicles and fuel cell vehicle.

CO_2 emissions per shipment were reduced relative to fiscal 2013 in only one industry out of the six industries that reported their performance. The dairy industry reported that some factors that led to increased CO_2 emissions per shipment relative to the previous fiscal year included a drop in efficiency due to an increase in shipments of products with low load efficiency due to increased demand related to cooking at home.

(4) Status of carbon credit utilization

A survey on the use of carbon credits revealed that two industries had utilized J-credits. Some industries responded that they would consider the advantages of acquiring and using credits in the future, or that they would consider their acquisition and use when it became difficult for them to achieve their fiscal 2030 targets.

(5) Status of deployment of renewable energy[5], energy recovery and utilization

① Renewable energy

Industries and companies are increasingly deploying renewable energy with a view to achieving CN (Table 7).

The Keidanren policy proposal "Towards Green Transformation (GX), " states we should aim for its "maximum introduction as a 'major power source' with 'low cost,' 'stable supply,' and 'responsible business discipline'" with the acknowledgement that "renewable energy is not only expected to be a main driver of achieving carbon neutrality in 2050 but also a power source that serves the strengthening of Japan's energy security which is currently dependent on fossil fuels.

In fiscal 2022, total renewable electric power at transmission and receiving end (including FIT-certified electric power sources) amounted to 158.2 billion kWh, accounting for approximately 20% of total electric power at transmission and receiving end. The breakdown is 44.5% hydropower, 40.3% solar power, 8.2% biomass, 4.2% wind power, 1.4% geothermal power, and 1.3% waste-to-energy. Around half of total renewable electric power at transmission and receiving end (including FIT-certified electric power sources) in fiscal 2022 was generated by the electric power industry.

Many industries other than the electric power industry are engaged in generating electric power from renewable energy, mainly solar power, hydropower, and biomass, but also including geothermal energy, for self-use.

The pulp and paper industry has continued its energy conversion efforts, shifting from fossil fuels to non-fossil fuels. Renewable energy, mainly comprising biomass, has decreased slightly in the overall energy mix (relative to fiscal 2013) the but the ratio of waste-derived fuels has increased.

[5] "Renewable energy" is defined in this section as: photovoltaic power, wind power, hydropower, geothermal power, solar heat, atmospheric heat and other heat and biomass found in nature (Source: Act on Sophisticated Methods of Energy Supply Structures and Ordinance (Cabinet Order 222 of 2009))

In the cement industry, some factories use woody biomass as an alternative to fossil fuels at their onsite power generation facilities, with an aim to improve their energy intensity.

Other industries also promote renewable power generation for self-consumption. The electrical and electronics, rubber, soft drink, dairy products, bearing, industrial vehicles, convenience store, telecommunications, foreign trade, real estate, and railway industries use mainly solar, and the aluminum industry uses hydropower in part. The industrial machinery industry generates power using solar PV at 27 business establishments and biomass at 1 location.

Furthermore, many industries, including those from the commercial sector, reported that they were promoting CO_2-free electric power purchases. The auto parts, printing, dairy, brewers, and convenience store industries reported that an increasing number of companies have introduced or are considering the introduction of PPAs[6].

It was reported that the petroleum industry is conducting research and development of technologies for CO_2-free hydrogen produced using renewable energy.

In order to turn renewables into a major electricity source, it is also important to take measures for the development and practical application of technologies.

The petroleum development industry reported the use of renewable energy at overseas offshore production facilities. The banking, life insurance, non-life insurance, and securities industries reported that they finance renewable energy businesses and projects in Japan and overseas. Participating industries promote the massive deployment of renewable energy and technology development for efficient energy use through various efforts.

② Energy recovery and utilization

Industries are also making efforts to reduce fuel consumption by recovering and utilizing waste heat and byproduct gases that are generated during manufacturing or fuel use (Table 7).

The iron and steel industry uses byproduct gases for power generation, utilizes steam, generates power using TRT (top-pressure recovery turbines), uses steam recovered by CDQ (coke dry quenching) for power generation, etc.

[6] PPA: Power Purchase Agreement (an agreement where solar power systems, etc. are installed on the rooftop of a business operator's building free of charge and the power generated is bought by consumers, such as the business operator)

The cement industry continues to make capital investments even amid COVID-19. Not only has increased use of waste-to-energy led to reduced energy intensity, but also contributing greatly to CO_2 emission reduction.

Furthermore, several industries reported using a cogeneration system and introducing binary cycle power generation utilizing heat recovered from steam.

Table 7. Examples of renewable energy and energy recovery and utilization

Renewable energy	
・ Development and deployment of hydro, geothermal, solar, wind, and biomass power generation ・ Biomass power generation (wood biomass, black liquor, wood refuse), geothermal power generation ・ Installation of solar power generation systems in factories, warehouses, offices etc. ・ ZEH, ZEB	・ Introduction of PPA-based projects (solar power) ・ Hydropower generation and wind power generation at corporate establishments ・ Purchasing renewable electric power ・ Promoting the massive deployment of renewable energy (various research and technology development, demonstration) ・ Development of technologies for efficient energy use
Energy recovery and utilization	
・ Power generation using waste heat, byproduct gases, recovered steam, etc. ・ Binary cycle power generation ・ Use of waste as an alternative energy source	・ Utilization of waste heat from boilers as a heat source for HVAC ・ Steam and hot water recovery from waste heat in a cogeneration system

(6) Coverage of current survey against total domestic emissions[7]

The coverage ratio of CO_2 emissions in fiscal 2022, calculated for each sector in the current follow-up survey against total domestic sectoral CO_2 emissions in fiscal 2021 (final figures) was 75% for the industrial sector, 83% for the energy conversion sector (before electric power distribution), 10% for the commercial sector, and 35% for the transportation sector. The industrial and energy conversion sectors have maintained a relatively high level of coverage.

In addition, with the Japan Leasing Association joining the CN Action Plan from fiscal 2022, there are 63 participating industries in total. Keidanren is determined to continue its efforts to increase the number of industries participating in the CN Action Plan with a view to further expanding its coverage.

[7] It should be noted that the figures in National Institute for Environmental Studies "Fiscal 2021 GHG Emissions Data of Japan (preliminary figures)," the source of total domestic emissions by sector in fiscal 2022 and those of the current survey have been derived using different calculation methods and boundaries due to their different purposes and backgrounds; and therefore, the coverage ratios should be used only for reference. Coverage for the transportation sector was calculated based on domestic CO_2 emissions excluding overseas departures and arrivals.

Pillar 2: Strengthening cooperation with other interested groups

In order to achieve society-wide CO_2 emission reductions, it is important that CO_2 emissions are reduced not only from individual corporate business operations but also through collaborative efforts with various actors, including consumers, customer companies, employees, local residents, central and local governments and educational institutions. Participating industries contribute to society-wide CO_2 emission reductions across the entire life cycle by developing and providing the products and services which contribute to CN. Moreover, various industries have come to supply renewable energy.

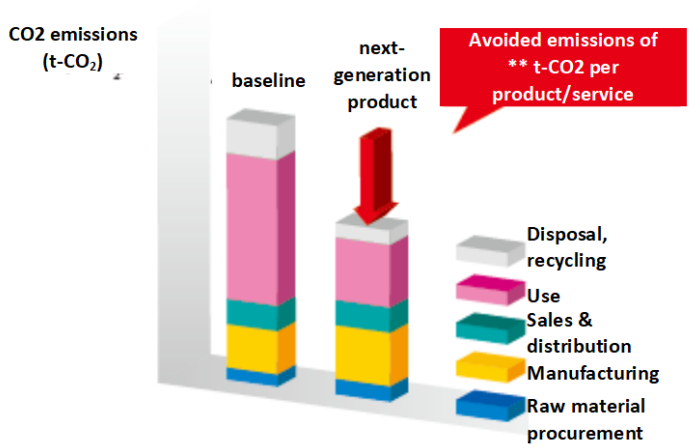
Furthermore, participating industries reach out to the residential sector, the users of products and services, and to public campaigns by providing information on environmental performance and burden, offering consulting services on energy saving, and promoting eco-drive campaigns in order to raise public awareness and knowledge of global warming prevention and fostering public campaigns.

(1) Efforts to reduce emissions through product and service life cycles

Focusing on CO_2 emissions from product and service life cycles, it is important to reduce total emissions, including not only those from product manufacturing and provision, but also those from procuring raw materials and distribution, using products and disposal and recycling.

For example, even if a high-performance energy efficient product emits more CO_2 than conventional products during manufacturing due to the increased complexity of the manufacturing process, substantial reductions of CO_2 emissions from the high-performance product itself can reduce overall CO_2 emissions in terms of the entire product life cycle. Furthermore, if the product can be recycled after use, we can reduce the input of new resources, and thus contribute to reducing CO_2 emissions (Figure 13).

Figure 13. Life cycle CO_2 emission reductions



Source: Compiled based on "Contributing to Avoided Emissions through the Global Value Chain - A new approach to climate change measures by private actors -." by Keidanren.

Such reductions are possible in services, as well as products. For example, the utilization of ICT service solutions allows people to work from home or remotely on the go, enabling flexible workstyles that are not constrained by time or location. This has contributed to society-wide emission reductions, including reduced use of electric power during work or reduced travels, in addition to increased work efficiency.

Participating industries have quantified their actual and expected emission reductions[8].

For example, the iron and steel industry has compiled calculations of CO_2 emissions avoided in the product use stage when conventional steel is replaced with high-function steel. Total avoided CO_2 emissions in Japan and overseas attributable to representative high-function steel[9] manufactured during fiscal 1990 through fiscal 2022 were calculated to be 34.79 million t-CO_2 in fiscal 2022.

The chemical industry calculates that when products manufactured in one year during 2030 are used to its end of life, avoided CO_2 emissions from solar power generation material and next-generation automobile material would be 45.45 million t-CO_2 and 20.25 million t-CO_2, respectively.

The automobile industry calculated its avoided CO_2 emissions in fiscal 2021 to be 7.89 million t-CO_2 due to fuel efficiency improvements and the deployment of next-generation vehicles (HV, PHV, EV, FCV, etc.). In association, the rubber industry reported that having published updated guidelines, it compared data from 2006 with that of 2020 to

[8] Focusing on emission reductions along entire value chains, Keidanren published "Contributing to Avoided Emissions through the Global Value Chain - A new approach to climate change measures by private actors -" to raise awareness of efforts made by industries and companies. https://www.keidanren.or.jp/en/policy/2018/102.html

[9] High tensile strength steel for automobiles, high tensile strength steel for ships, steel pipes for boilers, grain-oriented electrical steel sheets, stainless steel sheets

find that fuel efficient tires had contributed to avoided emissions amounting to 28.25 million t-CO_2.

In addition, the electrical and electronics industry introduced examples such as wind analysis technologies that support wind power generation, hybrid cloud solutions for smart factories, and services to connect home appliances to solar power generation. The East Japan Railway Company and West Japan Railway Company introduced efforts using MaaS.

The gas industry introduced solutions, including residential fuel cells as well as cogeneration, that enable the efficient use of energy by effectively using waste heat.

Furthermore, in many industries other than the electric power industry, more companies are engaged in selling renewable power under the FIT scheme, as well as generating renewable power (mainly solar, wind, and biomass) for self-consumption. In the leasing industry, there were 2,158 leasing contracts for renewable power generation equipment, amounting to a total of 422,000kW of installed capacity.

The chain store and department store industries are also engaged in calculating and announcing Scope 3 emissions with a view to reducing emissions across supply chains.

(2) Efforts leading to emission reductions in the residential sector

Achieving the fiscal 2030 target of reducing CO_2 emissions by more than 60% will, of course, require the wise use of the products and services on the part of users, but it is also important for citizens to reflect upon their consciousness, actions and decisions, and change their lifestyles.

Participating industries engage in public relations and educational activities to encourage wise use of low-carbon and energy-saving products and transformations in lifestyles, as well as raise awareness among employees and their families by promoting the use of environmental household account books and “eco-driving,” and collaborate with communities, local governments and educational institutions through hosting environmental learning events. Furthermore, some industries reported that they participated in the “COOL CHOICE” campaign (Table 8).

Table 8. Examples of efforts leading to emission reductions in the residential sector

Promotion among employees and their families	
・ Implementation of environmental household account books ・ Introduction of e-learning, hosting in-house seminars ・ "Jisa Biz (staggered working hours)" and off-peak commuting	・ Air conditioning temperature control, turning off unnecessary lights ・ In-house "eco-point" program ・ Eco-drive
Collaboration with local communities and governments and educational institutions	
・ Supporting local elementary, junior high and high schools in environmental education	・ Participation in local government-led "eco-challenge" activities
Participation in public campaigns	
・ Participation in "COOL CHOICE," "Lights Down Campaign," "Fun to Share," "Eco-action 21," "Decokatsu" ・ Implementation of "Cool Biz" and "Warm Biz" campaigns	・ Promotion of intermodal transportation (park & ride) ・ Purchasing environment-friendly products (green procurement) ・ Greening and environmental conservation activities at factories and business establishments

(3) Fostering and conserving forest sinks

Dealing with global warming also calls for measures to foster and conserve forest sinks. In the fiscal 2022 follow-up, industries reported on their involvement in forest and Satoyama (village forest) conservation activities and tree-planting activities in areas close to business locations and on private land.

The paper manufacturing industry reported that under its target of planting trees across at total of 65,000 ha in Japan and overseas by fiscal 2030, it has implemented 18 projects in 7 countries, namely Brazil, New Zealand, Indonesia, Chile, Australia, Vietnam, and South America. In addition to these activities, from the standpoint of being a buyer of products, the industry engages in efforts that contribute to the proper use of forest sinks by formulating green procurement standards and purchasing products that comply with the Act on Promoting Green Procurement or products that have acquired environmental labeling (Eco-mark, etc.).

The dairy, Industrial machinery, life insurance, foreign trade, general insurance, and hotel industries have also adopted raw materials certified under various certification schemes, including those of FSC, PEFC, the Rainforest Alliance, and RSPO. In this way, more industries are engaged in conserving and fostering forest sinks through their business activities.

Pillar 3: Promoting contribution at the international level

It is undisputable that global warming countermeasures call for domestic greenhouse gas emission reductions. At the same time, climate change is a global issue. Given increased CO_2 emissions expected because of increased energy use especially in emerging and developing economies, the Japanese business community needs to promote emission reductions on a global scale. Since product and service value chains are spread across the world, it is important to take emission reduction measures that consider global value chains from upstream (raw material procurement) to downstream (use, disposal and recycling)[10].

In the fiscal 2022 follow-up, industries reported that they were contributing to emission reductions on a global scale by reducing CO_2 emissions through the introduction of low carbon energy-saving products such as electric vehicles, and by providing and transferring excellent technologies through promoting low carbon energy-saving electric power generation projects that utilize technologies and knowhow fostered in domestic business operations, electric power generation from renewable energy, and energy recovery (Table 9).

For example, the iron and steel industry estimated their reduced CO2 emissions in fiscal 2022 to be 77.67 million t-CO2 as a result of coke dry quenching, blast furnace top pressure recovery turbine, and byproduct gas-fired dedicated gas turbine combined cycle power generation.

The aluminum industry calculated avoided CO_2 emissions as a result of promoting recycling in fiscal 2022 to be 13.69 million t-CO_2.

The gas industry calculated avoided CO_2 emissions from overseas LNG and power generation businesses undertaken by city gas business operators to be 14.60 million t-CO_2. Furthermore, avoided CO_2 emissions from overseas sales of gas tankless water heaters, such as Eco−JOES, by gas equipment manufacturers were calculated to amount to 13.50 million t-CO_2.

Mostly in the electric power and gas industries and in the foreign trade industry, there were many reports of companies taking part in electric power generation projects using renewable energy in various parts of the world. The foreign trade industry has drawn upon their know-how in turnkey contracts for electric power infrastructure construction projects and providing services such as maintenance and inspection to engage in the IPP (Independent Power Producer) business worldwide; and in recent years it is focused on

[10] The Government's Long-term Strategy also includes the approach of avoided emissions through the global value chain (GVC).

renewable power generation projects. As a result of these efforts, avoided CO_2 emissions in fiscal 2022 were calculated to be 12.49 million t-CO_2. There is increased activity to financially support such efforts; and therefore, in the banking industry, an increasing number of banks are offering loans or project finance for renewable energy projects yearly.

The industrial machinery industry reported various projects, including an energy efficient desalination project in Saudi Arabia, a binary power generation project at a geothermal power plant in the Philippines, waste-to-energy projects in Bangladesh and Vietnam. These projects utilized NEDO funds, JCM and subsidies provided by public interest incorporated foundations.

The sanitary equipment industry reported a case where a company participated in the green building material program under the Ministry of Economy, Trade, and Industry and introduced Japanese water-saving toilet standards to ASEAN economies.

Furthermore, the petroleum development, petroleum, trade and shipowners industries reported examples of developing or considering projects related to hydrogen and ammonia, which are gaining increased attention as clean fuels.

Some of these efforts include quantifying avoided CO_2 emissions, as done in estimating reductions under "Pillar 2: Strengthening cooperation with other interested groups." Reductions are expected to increase across the entire global value chain as companies visualize the advantages of their products and services by quantifying avoided emissions, thus accelerating the transfer of low-carbon energy-saving technologies.

Some issues, including determining a baseline for calculation and how to calculate reductions overlapping among industries when a target product covers several industries or companies, have been identified. With an aim to solve these issues and to improve the transparency of the basis for calculation and approach taken, the Ministry of Economics, Trade and Industry published the "Guidelines for Quantifying GHG emission reductions of goods or services through Global Value Chain" to be referred to when explaining calculations to other parties.

Furthermore, participating industries are proactively involved in international scheme design, including efforts for international standardization. The printing industry, in partnership with paper manufacturing industry, has led discussions on the international standardization of evaluation methods for paper recycling and deinking. Paper recycling involves a deinking process that could be internationally standardized in a versatile manner, thus advancing paper recycling at a global level and contributing to energy conservation. Such efforts lead to a global understanding of quantifying avoided emissions and the proper evaluation of the efforts made by the Japanese business community.

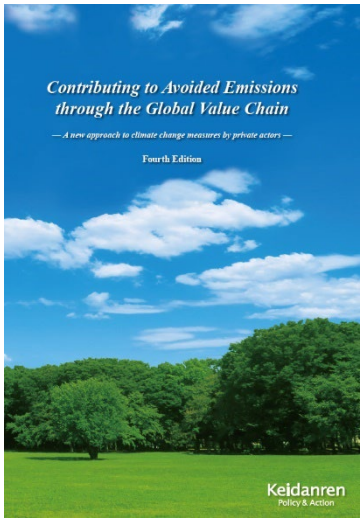
Keidanren has revised the concept book "Contributing to Avoided Emissions through the Global Value Chain -A new approach to climate change measures by private actors-" (published in fiscal 2018) to encourage emission reductions across the global value chain. Three cases were updated in the follow-up study for fiscal 2022 (Figure 14). While this is not equivalent to the PDCA cycle under the Action Plan, it serves to promote the deployment of low carbon energy-saving technologies by sharing concepts and case studies with various stakeholders.

Table 9. Examples of overseas contribution to avoided emissions

Avoiding emissions through overseas transfer of Japanese technologies and knowhow
・CDQ (coke dry quenching), TRT (top-pressure recovery turbine) power generation, GTCC*1 exclusively fired using by-product gas (The Japan Iron and Steel Federation)
・Desalination technologies using reverse osmosis membranes (Japan Chemical Industry Association)
・Hydropower generation at corporate mines (Japan Mining Industry Association)
・Aluminum recycling (Japan Aluminium Association)
・Electric power generation technologies utilizing waste heat (Flat Glass Manufacturers Association of Japan)
・CO_2 recovery from coal-fired thermal power plants and EOR (Japan Petroleum Development Association)
・Ocean water desalination systems, waste-to-energy plant using municipal solid wastes, power generation utilizing used tires (The Japan Society of Industrial Machinery Manufacturers)
・Solar, wind, geothermal, and hydro power generation projects (Electric Power Council for a Low Carbon Society)
・LNG projects, solar and wind power generation projects, gas engine CGS, gas tankless water heaters, Enefarm, GHP (The Japan Gas Association)
・IPP (independent power producer) business using renewable energy (Japan Foreign Trade Council)
・Lending and project financing for renewable energy development projects (Japanese Bankers Association)
Avoiding emissions through overseas diffusion of Japan's advanced low-carbon products and services
・Polyethylene terephthalate from biomass, aircraft lightweight materials, next-generation vehicles materials (Japan Chemical Industry Association)
・Lightweight paper (Japan Paper Association)
・High efficiency thermal power generation and renewable power generation technologies, IT products, solutions (Liaison Group of Japanese Electrical and Electronics Industries for Global Warming Prevention)
・Next-generation vehicles (Japan Automobile Manufacturers Association)
・Energy-saving ships (The Shipbuilders' Association of Japan & The Cooperative Association of Japan Shipbuilders)

- Water-saving toilets (Japan Sanitary Equipment Industry Association)
- Leasing transactions for low-carbon equipment (Japan Leasing Association)
- Permanent magnet synchronous motors (PMSM) for railway vehicles (Japan Association of Rolling Stock Industries)

Figure 14. Concept book: "Contributing to Avoided Emissions through the Global Value Chain - A new approach to climate change measures by private actors –"



Full text can be found on the Keidanren website:
http://www.keidanren.or.jp/en/policy/vape/gvc2018.pdf

Pillar 4: Development of innovative technologies toward carbon neutrality by 2050

In order to significantly reduce CO_2 emissions with a view to achieve CN by 2050, it is indispensable to create completely new innovations that are not an extension of conventional efforts. This will require research and development and social implementation in the medium- to long-term, which will call for alignment and strong government support. Furthermore, not all industries will leapfrog to achieve CN in 2050; and therefore, transition technologies also need to be introduced to maximize our efforts to reduce emissions.

In the fiscal 2022 follow-up, participating industries reported that they were formulating roadmaps toward CN by 2050 and promoting efforts to develop and commercialize innovative technologies (including transition technologies) that would achieve significant CO_2 reduction (Tables 10 and 11).

Under the "Hydrogen Utilization in Iron and Steelmaking Processes", the iron and steel industry is engaged in technology development based on a roadmap to develop hydrogen reduction technologies such as Hydrogen Reduction Technologies Utilizing Hydrogen From Within Steelworks and Direct Hydrogen Reduction Technologies, etc. from 2030 through 2050. In fiscal 2022, the industry completed the design and fabrication of the facilities for the demonstration test and the basic design of the experimental furnace.

Furthermore, with a view to commercialization in 2030 or beyond, the chemical industry is developing plastic feedstock production processes using CO_2; the cement industry is developing an innovative cement production process; the petroleum development industry is engaged in carbon capture and storage (CCS); the petroleum industry is developing Sustainable Aviation Fuels (SAF), hydrogen an ammonia supply chains, liquid fuels manufactured from carbon dioxide, and processes to recycle waste plastics into petrochemical feedstock; the gas industry is engaged in methanation, which is a process that combines CO_2-free hydrogen and carbon dioxide to make e-methane; and the aviation industry is engaged in efforts related to SAF. In the energy conversion sector, the electric power industry is promoting the ammonia co-firing, single fuel firing (ammonia), and the hydrogen co-firing at thermal power plants. As examples of utilizing digital transformation (DX), the printing industry reported the test launch of a DX platform to link production among member companies.

In 2020, Keidanren launched the “Challenge Zero” initiative to strongly communicate in Japan and overseas and encourage challenging efforts made by companies and organizations to innovate (Figure 15). Keidanren seeks to strongly promote “Challenge Zero” in collaboration with the Government to initiate a “game change” where actors race to achieve innovation while also attracting ESG investment and seeking partnerships within and across industries as well as among industry, academia, and government.

Table 10. Examples of innovative technologies (feedstock, manufacturing, products and services) and the timing of deployment

Timing of deployment	Innovative technologies and services (industry)
Deployment started	・Cellulose nanofiber (Japan Paper Association) ・Net Zero Energy House; ZEH (The Real Estate Companies Association of Japan) ・Capture and Fuel recycling of CO2 in Lime kiln exhaust gas (Japan Lime Association) ・Green chemistry, extended-release tablets, continuous production, Manufacturing classification system (The Federation of Pharmaceutical Manufacturers' Associations of Japan) ・Closed-loop (horizontal) recycling systems (Japan Aluminium Association) ・Methanation technologies, FC forklift (Japan Industrial Vehicles Association) ・Fuel cell hybrid railway cars (Japan Association of Rolling Stock Industries) ・Smart energy networks, low-cost hydrogen production devices (The Japan Gas Association) ・Conversion of fuel (diesel) for diesel cars (West Japan Railway Company) ・Introduction of the new HC85 series limited express train cars on conventional lines (Central Japan Railway Company)
2022 and beyond	・Manufacturing bioethanol for sustainable aviation fuels (SAF) (Japan Paper Association) ・Ammonia/Hydrogen Combustion Technology, Glass cullet recycling technologies, Flue gas waste heat utilizing technologies (Flat Glass Manufacturers Association of Japan) ・CCS, Hydrogen, Ammonia (Japan Petroleum Development Association) ・Sophisticated shipbuilding processes utilizing IoT (The Shipbuilders' Association of Japan & The Cooperative Association of Japan Shipbuilders) ・Solar power generation, storage batteries, fuel cell-based EMS, hydrogen burners for paint drying furnaces（Japan Industrial Vehicles Association） ・Manufacturing sustainable aviation fuels (SAF) (Petroleum Association of Japan) ・— (Telecommunications Carriers Association) ・Visualization of CO_2 reduction achieved through safe driving（The General Insurance Association of Japan） ・Development synthetic technologies for producing green (Japan LP Gas Association) ・Sustainable Aviation Fuels (SAF) (The Scheduled Airlines Association of Japan) ・Development of fuel cell hybrid railway cars, use of renewable energy in railway operation (installation of solar power systems at stations) (East Japan Railway Company)
2030 and beyond	・"Hydrogen Utilization in Iron and Steelmaking Processes", ferro coke (The Japan Iron and Steel Federation) ・Manufacturing processes for organosilicon functional chemical products, precision manufacturing processes for functional chemical products, plastic feedstock production technologies using CO_2, etc., (Japan Chemical Industry Association) ・Innovative cement production process (Japan Cement Association) ・Heat storage equipment that harnesses the cumulative chemical heat of lime to recover and reuse high-temperature waste heat from factories (Japan Lime Association) ・Innovative heat exchange/heat control technologies, advance resource circulations system for aluminum materials (Japan Aluminium Association)

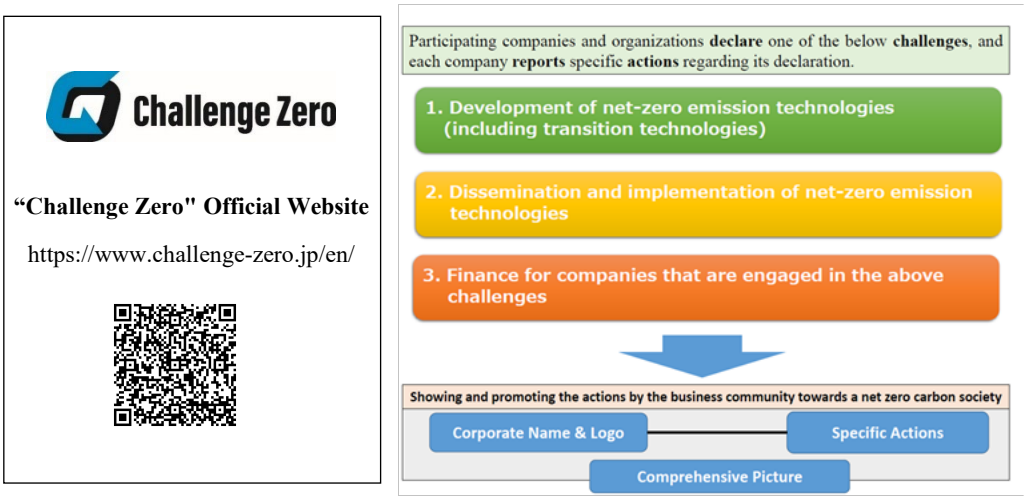
	・ Fuel conversion (Hydrogen) (Flat Glass Manufacturers Association of Japan) ・ Decarbonization of fuel powering large heavy machinery (Lime Association of Japan) ・ Development of fuels to improve internal combustion engine efficiency, technology for CO2-free hydrogen production, carbon and plastic waste recycling technologies, and advancements in CCUS (Carbon Capture, Utilization, and Storage) technology (Petroleum Association of Japan) ・ Production of e-methane by methanation (The Japan Gas Association) ・ Intercooler-based multi-phased direct LPG synthesis technology, R&D for LPG synthesis technology through carbon recycling, technology development of new catalysts for carbon recycling-based LPG synthesis, R&D for manufacturing processes and social implementation models (Japan LP Gas Association) ・ Hydrogen co-fired power generation (East Japan Railway Company)

Table 11. Example of roadmaps for developing and deploying innovative technologies (feedstock, manufacturing, products and services)

<table>
<tr><th>Industry</th><th>Innovative technologies (feedstock, manufacturing, products and services)</th><th>2022</th><th>2025</th><th>2030</th><th>2050</th></tr>
<tr><td rowspan="2">The Japan Iron and Steel Federation</td><td>Development of Hydrogen Reduction Technologies Utilizing Hydrogen From Within Steelworks</td><td></td><td></td><td>Implementation</td><td></td></tr>
<tr><td>Development of Low-carbon Technologies Using External Hydrogen and CO2 Contained in Blast Furnace Exhaust Gas, development of direct hydrogen reduction technologies</td><td></td><td></td><td>Technology demonstration</td><td>Implementation</td></tr>
<tr><td>Japan Chemical Industry Association</td><td>Plastic feedstock production processes using CO_2</td><td></td><td colspan="2">R&D, commercialization</td><td>Business phase</td></tr>
<tr><td>Japan Paper Association</td><td>Manufacturing bioethanol for sustainable aviation fuels (SAF)</td><td></td><td>Start production
facility operation</td><td>Increase
production</td><td></td></tr>
<tr><td>Japan Cement Association</td><td>Energy efficient cement</td><td>Preliminary considerations</td><td colspan="2">Confirm manufacturing conditions, product adaptability, economic rationality</td><td></td></tr>
<tr><td>The Japan Rubber Manufacturer Association</td><td>Hydrogen utilization technologies</td><td>Domestic: demonstration</td><td>Domestic: Continue studies - commercialization</td><td>Domestic; commercialization – deployment
Overseas: studies – commercialization</td><td>Domestic: deployment
Overseas: deployment</td></tr>
<tr><td>The Federation of Pharmaceutical Manufacturers' Associations of Japan</td><td>Green chemistry technologies</td><td colspan="4">Sophistication</td></tr>
<tr><td>Japan Aluminium Association</td><td>Advanced resource circulation system for aluminum materials</td><td colspan="2">R&D</td><td>Commercialization</td><td></td></tr>
<tr><td>Flat Glass Manufacturers Association of Japan)</td><td>Cullet-recycling technologies</td><td colspan="2">Gradual deployment</td><td></td><td></td></tr>
</table>

The Japanese Electric Wire & Cable Makers' Association	High-temperature superconductive cables		Technology development		
Japan Petroleum Development Association	CCS	Demonstration	Demonstration	Commercialization	
The Shipbuilders' Association of Japan & The Cooperative Association of Japan Shipbuilders	Sophisticated shipbuilding processes utilizing IoT		Commercialization	Deployment	
Japan Industrial Vehicles Association	Methanation	Start demonstrations	Deployment in other industries		
Japan Association of Rolling Stock Industries	Use of the next-generation biodiesel fuel in rolling stock engines	Test operation			
Electric Power Council for a Low Carbon Society	Ammonia co-firing	Demonstration		Operations; increase co-firing ratio	Single fuel firing
	Hydrogen co-firing	Demonstration			Operations; increase co-firing ratio
Petroleum Association of Japan	Technology development of synthetic fuels (e-fuel)	R&D	Demonstration in pilot plant	Studies on commercial plant, capital investment	Commercialization
The Japan Gas Association	Production of e-methane by methanation	R&D, demonstration		Commercialization	Business expansion
Telecommunications Carriers Association	Optoelectronic integration technologies for ultra-low energy consumption and high-speed signal processing technology		Commercialization of Board connection devices	Commercialization of Chip-to-chip devices	
Japan LP Gas Association	Development of green LPG synthesis technologies			Pilot study completed	
East Japan Railway Company	Development of fuel cell hybrid railway cars	Demonstration	Demonstration	Introduction	Increased deployment
West Japan Railway Company	Conversion of fuel (diesel)for diesel cars	Studies, demonstration	Commercialization		
Central Japan Railway Company	HC85 series for new limited express train cars on conventional lines	Deployment			

Figure 15. “Challenge Zero” (Challenge Net Zero Carbon Innovation)



Controlling non-CO_2 greenhouse gas emissions

Global warming countermeasures involve emission reductions of not only CO_2, but also of other greenhouse gases[11].

HCFCs and HFCs, which bear high warming potential and thus impose a large impact on global warming, are used as refrigerants in freezers and HVAC equipment. The production and consumption of HCFCs have been controlled globally based on the Montreal Protocol on Substances that Deplete the Ozone Layer (hereinafter, "Montreal Protocol"), the amendment (Kigali Amendment) to which came into effect in January 2019, obligating signatory nations to reduce production and consumption volumes of HFCs. In accordance with the Amendment, domestic production and consumption of HFCs will be reduced in phases; and therefore, the development of green refrigerants, including refrigerants with low GWP (Global Warming Potential) and fluorocarbon-free refrigerants is essential.

Participating industries are endeavoring to improve the recovery rate of existing refrigerants upon disposal, as well as to develop technologies to reduce emissions and put new technologies into practical use (Table 12).

Based on the Fluorocarbon Emission Control Law enacted in April 2020, many industries are taking measures to prevent leakage during inspections and implement scheduled updates of the equipment. Dairy products industry, industrial machinery industry, beer industry, shipbuilders' industry, limestone industry, sanitary equipment industry, convenience store industry, and hotel industry, reported efforts to install fluorocarbon-free refrigerators and freezers in their factories and stores. The soft drink industry reported that it was shifting to non-fluorocarbon vending machines and the gas industry reported that it was promoting the deployment of gas absorption cold/hot water heaters that do not use any fluorocarbons. The cement and lime manufacturing industries reported that they were engaged in the destruction and decomposition treatment of fluorocarbons. The refrigerated warehousing industry, which deals with many cooling facilities hosted a workshop on the treatment of fluorocarbon refrigerants with the acknowledgement of the Ministry of the Environment and the Ministry of Economy, Trade, and Industry to foster more people with knowledge of the Fluorocarbon Emission Control Law.

Regarding gases other than fluorocarbons, the electric power and petroleum industries reported efforts to reduce nitrogen oxide (N_2O) emissions and the electrical and printing,

[11] Methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), and fluorinated gases (HCFC, HFC, PFC, etc.)

rolling stock, and electric power industries reported measures taken to reduce sulfur hexafluoride (SF_6) emissions.

The Antarctic ozone layer is projected to recover to 1980 values (before the appearance of the ozone hole) by around 2066 as a result of global fluorocarbon emission controls. Regulations on substances that deplete the ozone layer have positive impacts on global warming countermeasures. Keidanren will continue to call for emission controls on greenhouse gases other than CO_2 and fluorocarbons.

Table 12. Major efforts to reduce non-CO_2 greenhouse gas emissions

- Shifting to non-fluorocarbon vending machines (Japan Soft Drink Association)
- Replacement of fluorinated refrigerants used in refrigerators and freezers with fluorocarbon-free refrigerants (Japan Dairy Industry Association, The Japan Society of Industrial Machinery Manufacturers, Japan Sanitary Equipment Industry Association, Japan Franchise Association, Japan Hotel Association)
- Introduction of freezers using HFOs （hydrofluoroolefins) with low global warming potential (Japan Dairy Industry Association, Brewers Association of Japan)
- In the HVAC area, deployment and promotion of gas absorption cold/hot water heaters that use no fluorocarbons (The Japan Gas Association)
- Organization of a workshop on the treatment of fluorocarbon refrigerants (Japan Association of Refrigerated Warehouses)
- Greenhouse gas emission reductions achieved by destroying fluorinated gases (Japan Cement Association)
- Decomposition treatment of fluorocarbons in lime kilns (Lime Manufacture Association)
- Prevention of leakage upon the installation, inspection, and repair of equipment, recovery and reuse (Japan Federation of Housing Organizations, Japan Federation of Printing Industries, Japan Dairy Industry Association, The Japan Society of Industrial Machinery Manufacturers, The Shipbuilders' Association of Japan & The Cooperative Association of Japan Shipbuilders, Limestone Association of Japan, Japan Sanitary Equipment Industry Association, Japan Association of Rolling Stock Industries, The Electric Power Council for a Low Carbon Society, Japan Association of Refrigerated Warehouses, The Real Estate Companies Association of Japan, Japan Hotel Association, West Japan Railway Company)
- Reductions in nitrogen oxide (N_2O) emissions due to improved power generation efficiency and combustion efficiency (The Electric Power Council for a Low Carbon Society, Petroleum Association of Japan)
- Emission reduction and recycling of sulfur fluorides (SF_6), leakage prevention and improved recovery rates Japan Federation of Printing Industries, Japan Association of Rolling Stock Industries, The Electric Power Council for a Low Carbon Society)

Conclusion

Japan is committed internationally to achieving carbon neutrality and reducing greenhouse gas emissions by 46% in 2050. These challenging targets require the promotion of "green transformation (GX)," which is a socio-economy-wide transformation. GX lies at the core of Japan's growth strategy and must lead Japan toward sustainable growth through increased investment.

In the current follow-up survey, the number of industries that have formulated Visions toward achieving CN in 2050 increased to 45 industries from 40 industries, last fiscal year when Keidanren first called upon industries to compile Visions. This indicates the determination of the business community to maximize its efforts towards achieving CN in 2050.

Furthermore, emissions from domestic business operations were reduced by 20.1% relative to fiscal 2013 and 3.5% from the previous fiscal year. This was a result of decreased emissions due to decreased economic activity in the industry sector, as well as continued efforts by participating industries to improve the efficiency and operation of equipment.

Participating industries will need to continue to reduce emissions by the maximum deployment of best available technologies and to take measure toward the development and social implementation of innovative technologies.

With strict annual follow-ups conducted by Keidanren's Third Party Evaluation Committee and a Government Council, the CN Action Plan is governed by a framework that ensures the reliability and transparency of the Plan; and therefore, it effectively functions as a social system.

Under the CN Action Plan, Keidanren will accelerate its proactive approaches not only to reduce emissions from domestic business operations but also to collaborate with various actors to achieve carbon neutrality on a global scale across the global value chain.

〔Attachment 1〕

Vision of industries toward carbon neutrality by 2050 (basic policy, etc.)

(*: Japanese Document)

1. Industrial sector

The Japan Iron and Steel Federation
"Basic Policy of the Japan steel industry on 2050 Carbon Neutrality aimed by the Japanese government" (February. 2021)

Japan Chemical Industry Association
"Chemical Industry's Stance on Carbon Neutrality" (May 2021)

Japan Paper Association
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Industry-specific trends in each sector (*1)

1. Industrial Sector

10,000t-CO_2; 10,000kl crude oil equivalent; fiscal year

Industry	(*2) （☆: target adopted by the industry）	Notes	1990	2005	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Relative to FY2005	Relative to FY2013	Relative to previous FY
The Japan Iron and Steel Federation	CO2 emissions (actual emissions) ☆		20,213	18,835	19,446	19,195	18,429	18,281	18,132	17,735	17,273	14,591	16,302	15,027	-20.2%	-22.7%	-7.8%
	CO2 emissions (post-adjustment)		20,231	18,847	19,429	19,170	18,399	18,259	18,119	17,727	17,257	14,584	16,297	15,023	-20.3%	-22.7%	-7.8%
	CO2 emission intensity index (actual emissions)	Base year: FY2013	1.08	0.97	1.00	1.01	1.02	1.00	1.00	1.00	1.02	1.02	0.99	1.00	3.3%	0.4%	1.2%
	CO2 emission intensity index (post-adjustment)		1.08	0.97	1.00	1.00	1.02	1.00	1.00	1.00	1.02	1.02	0.99	1.00	3.2%	0.4%	1.2%
	Energy consumption		6,371	5,902	5,927	5,848	5,629	5,611	5,563	5,473	5,325	4,534	5,053	4,683	-20.6%	-21.0%	-7.3%
	Energy consumption intensity index	Base year: FY2013	1.11	1.00	1.00	1.00	1.02	1.01	1.01	1.01	1.03	1.04	1.01	1.03	2.7%	2.6%	1.7%
	Production activity index		0.97	1.00	1.00	0.98	0.93	0.94	0.93	0.91	0.87	0.73	0.85	0.77	-22.8%	-23.0%	-8.9%
Japan Chemical Industry Association	CO2 emissions (actual emissions) ☆				6,365	6,268	6,161	5,998	6,051	5,842	5,767	5,513	5,733	5,465		-14.1%	-4.7%
	CO2 emissions (post-adjustment)				6,365	6,266	6,152	5,992	6,049	5,848	5,770	5,518	5,741	5,468		-14.1%	-4.8%
	CO2 emission intensity index (actual emissions)	Base year: FY2013			1.00	1.02	0.97	0.94	0.89	0.85	0.87	0.94	0.93	0.93		-7.4%	-0.7%
	CO2 emission intensity index (post-adjustment)				1.00	1.02	0.97	0.93	0.89	0.86	0.87	0.94	0.93	0.93		-7.3%	-0.8%
	Energy consumption				2,571	2,543	2,532	2,485	2,540	2,492	2,476	2,371	2,479	2,366		-7.9%	-4.6%
	Energy consumption intensity index	Base year: FY2013			1.00	1.02	0.99	0.96	0.93	0.90	0.92	1.00	1.00	0.99		-0.7%	-0.6%
	Production activity index				1.00	0.97	1.00	1.01	1.06	1.07	1.04	0.92	0.97	0.93		-7.3%	-4.0%
Japan Paper Association	CO2 emissions (actual emissions) ☆		2,582	2,519	1,883	1,816	1,795	1,781	1,786	1,751	1,661	1,564	1,583	1,434	-43.1%	-23.8%	-9.4%
	CO2 emissions (post-adjustment)		2,582	2,519	1,883	1,816	1,793	1,780	1,786	1,752	1,661	1,565	1,584	1,434	-43.1%	-23.8%	-9.5%
	CO2 emission intensity index (actual emissions)	Base year: FY2013	1.32	1.16	1.00	0.97	0.97	0.95	0.95	0.94	0.93	0.97	0.92	0.86	-25.6%	-13.9%	-6.4%
	CO2 emission intensity index (post-adjustment)		1.32	1.16	1.00	0.97	0.97	0.95	0.95	0.94	0.93	0.97	0.92	0.86	-25.6%	-13.8%	-6.5%
	Energy consumption		967	899	634	614	604	600	604	599	570	535	548	514	-42.8%	-19.0%	-6.3%
	Energy consumption intensity index	Base year: FY2013	1.47	1.23	1.00	0.98	0.97	0.96	0.96	0.95	0.95	0.98	0.95	0.92	-25.3%	-8.3%	-3.2%
	Production activity index		1.04	1.16	1.00	0.99	0.99	0.99	1.00	0.99	0.95	0.86	0.91	0.88	-23.5%	-11.6%	-3.2%
Liaison Group of Japanese Electrical and Electronics Industries for Global Warming Prevention *3	CO2 emissions (actual emissions)		1,111	1,813	1,297	1,336	1,350	1,405	1,444	1,335	1,297	1,176	1,226	1,246	-31.3%	-3.9%	1.6%
	CO2 emissions (post-adjustment)		1,111	1,813	1,297	1,334	1,344	1,400	1,441	1,340	1,299	1,180	1,234	1,248	-31.1%	-3.7%	1.2%
	Energy consumption		645	994	571	601	625	666	708	691	695	634	672	680	-31.6%	19.1%	1.1%
	Energy consumption intensity target index ☆	Base year: FY2020	1.80	1.18	1.00	0.95	0.98	0.95	0.98	0.96	1.01	1.00	0.93	0.94	-20.4%	-5.4%	0.7%
	Production activity index		0.56	1.33	0.90	0.99	1.01	1.11	1.14	1.13	1.08	1.00	1.13	1.14	-14.1%	26.0%	0.4%
Japan Cement Association	CO2 emissions (actual emissions) ☆		2,762	2,185	1,806	1,775	1,718	1,696	1,732	1,685	1,614	1,551	1,528	1,396	-36.1%	-22.7%	-8.7%
	CO2 emissions (post-adjustment)		2,762	2,185	1,806	1,774	1,718	1,696	1,732	1,686	1,614	1,552	1,529	1,396	-36.1%	-22.7%	-8.7%
	CO2 emission intensity index (actual emissions)	Base year: FY2013	1.02	1.02	1.00	1.00	1.00	0.99	0.99	0.97	0.96	0.96	0.95	0.94	-8.0%	-6.3%	-1.1%
	CO2 emission intensity index (post-adjustment)		1.02	1.02	1.00	1.00	1.00	0.99	0.99	0.97	0.96	0.96	0.95	0.94	-8.0%	-6.3%	-1.1%
	Energy consumption		874	656	541	532	515	510	522	512	491	472	467	428	-34.7%	-20.8%	-8.2%
	Energy consumption intensity index ☆	Base year: FY2013	1.08	1.02	1.00	1.00	1.00	0.99	1.00	0.98	0.97	0.97	0.97	0.96	-5.9%	-4.0%	-0.6%
	Production activity index		1.50	1.19	1.00	0.98	0.95	0.95	0.97	0.97	0.93	0.90	0.89	0.82	-30.6%	-17.5%	-7.6%
Japan Automobile Manufacturers Association, Inc. / Japan Auto-Body Industries Association, Inc.	CO2 emissions (actual emissions) ☆		990	801	738	716	666	671	661	623	582	522	518	517	-35.5%	-30.0%	-0.2%
	CO2 emissions (post-adjustment)		990	801	738	715	663	669	661	624	583	523	520	518	-35.4%	-29.9%	-0.5%
	CO2 emission intensity index (actual emissions)	Base year: FY2013	1.44	1.08	1.00	0.95	0.85	0.86	0.81	0.75	0.72	0.76	0.75	0.63	-42.3%	-37.4%	-16.8%
	CO2 emission intensity index (post-adjustment)		1.44	1.08	1.00	0.94	0.85	0.86	0.81	0.76	0.72	0.76	0.76	0.63	-42.2%	-37.3%	-17.0%
	Energy consumption		496	398	329	324	308	317	321	314	300	271	273	271	-31.8%	-17.7%	-0.5%
	Energy consumption intensity index	Base year: FY2013	1.61	1.21	1.00	0.96	0.89	0.91	0.88	0.85	0.83	0.88	0.89	0.74	-39.0%	-26.3%	-17.0%
	Production activity index		0.93	1.00	1.00	1.03	1.06	1.06	1.11	1.12	1.10	0.93	0.93	1.12	11.8%	11.8%	19.9%
Japan Auto Parts Industries Association	CO2 emissions (actual emissions) ☆		764	745	771	745	689	700	700	648	618	569	568	569	-23.6%	-26.2%	0.2%
	CO2 emissions (post-adjustment)		764	745	771	744	686	698	699	650	619	571	570	570	-23.5%	-26.1%	-0.1%
	CO2 emission intensity index (actual emissions)	Base year: FY2013		0.86	1.00	0.93	0.92	0.90	0.84	0.78	0.78	0.80	0.76	0.80	-7.4%	-20.5%	4.9%
	CO2 emission intensity index (post-adjustment)			0.86	1.00	0.93	0.91	0.90	0.84	0.79	0.78	0.80	0.76	0.80	-7.2%	-20.3%	4.5%
	Energy consumption		401	384	337	334	316	329	338	329	323	300	303	297	-22.6%	-11.8%	-1.9%
	Energy consumption intensity index	Base year: FY2013	1.72	1.33	1.00	1.02	0.99	1.02	1.00	0.97	0.99	1.07	0.96	0.87	-34.2%	-12.7%	-9.4%
	Production activity index		0.69	0.86	1.00	0.98	0.94	0.96	1.00	1.01	0.96	0.83	0.93	1.01	17.7%	1.1%	8.3%
Japan Mining Industry Association	CO2 emissions (actual emissions) ☆		411	396	449	441	405	369	362	340	330	320	313	309	-22.0%	-31.2%	-1.3%
	CO2 emissions (post-adjustment)		411	396	449	441	404	368	361	341	331	321	314	309	-21.9%	-31.2%	-1.6%
	CO2 emission intensity index (actual emissions)	Base year: FY2013	1.07	0.90	1.00	0.95	0.91	0.84	0.83	0.77	0.76	0.74	0.74	0.71	-21.0%	-29.1%	-3.8%
	CO2 emission intensity index (post-adjustment)		1.07	0.90	1.00	0.95	0.91	0.84	0.83	0.77	0.76	0.74	0.74	0.71	-20.9%	-29.0%	-4.0%
	Energy consumption		170	161	163	163	154	144	144	142	141	137	136	134	-16.8%	-17.6%	-1.2%
	Energy consumption intensity index	Base year: FY2013	1.21	1.01	1.00	0.97	0.95	0.91	0.91	0.88	0.89	0.87	0.88	0.85	-15.7%	-15.1%	-3.7%
	Production activity index		0.86	0.98	1.00	1.03	0.99	0.98	0.97	0.99	0.97	0.97	0.95	0.97	-1.3%	-3.0%	2.6%
Japan Federation of Construction Contractors	CO2 emissions (actual emissions)		248.83	532.14	410.81	437.77	431.26	420.72	412.21	429.14	444.57	393.89	354.64	296.95	-44.2%	-27.7%	-16.3%
	CO2 emissions (post-adjustment)		249	532	411	438	431	420	412	430	445	394	355	297	-44.2%	-27.7%	-16.3%
	CO2 emission intensity index (actual emissions)		1.00	3.32	3.12	3.14	3.10	3.05	3.04	3.02	2.96	2.81	2.59	2.30	-30.8%	-26.3%	-11.3%
	CO2 emission intensity index (post-adjustment) ☆		1.00	3.32	3.12	3.13	3.10	3.05	3.04	3.03	2.96	2.82	2.59	2.30	-30.8%	-26.3%	-11.4%
	Energy consumption		160	229	159	170	168	166	164	174	183	162	146	121	-47.0%	-23.5%	-16.6%
	Energy consumption intensity index		1.00	2.22	1.87	1.89	1.89	1.88	1.88	1.91	1.90	1.80	1.65	1.46	-34.3%	-22.0%	-11.7%
	Production activity index		1.00	0.64	0.53	0.56	0.56	0.55	0.55	0.57	0.60	0.56	0.55	0.52	-19.4%	-1.9%	-5.6%
Japan Federation of Housing Organizations	CO2 emissions (actual emissions)		538		260	240	239	242	228	211	206	198	209	204		-21.6%	-2.5%
	CO2 emissions (post-adjustment)		538		260	240	239	242	228	211	206	198	209	204		-21.6%	-2.5%
	CO2 emission intensity index (actual emissions)		1.00		0.74	0.81	0.79	0.77	0.75	0.69	0.70	0.75	0.73	0.74		-0.2%	1.0%
	CO2 emission intensity index (post-adjustment)		1.00		0.74	0.81	0.79	0.77	0.75	0.69	0.70	0.75	0.73	0.74		-0.2%	1.0%
	Production activity index		1.00	0.79	0.65	0.55	0.56	0.59	0.56	0.57	0.54	0.49	0.53	0.51	-35.6%	-21.4%	-3.5%

Industry	(*2) （☆:target adopted by the industry)	Notes	1990	2005	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Relative to FY2005	Relative to FY2013	Relative to previous FY
Japan Lime Association	CO2 emissions (actual emissions) ☆		357	308	246	246	223	225	227	223	210	176	189	175	-43.1%	-29.0%	-7.2%
	CO2 emissions (post-adjustment)		357	308	246	246	223	225	227	223	210	176	189	175	-43.1%	-28.9%	-7.2%
	CO2 emission intensity index (actual emissions)	Base year: FY2013	1.28	1.11	1.00	1.00	0.97	0.95	0.94	0.92	0.92	0.90	0.87	0.87	-21.7%	-13.1%	0.0%
	CO2 emission intensity index (post-adjustment)		1.28	1.11	1.00	1.00	0.97	0.95	0.94	0.92	0.92	0.90	0.87	0.87	-21.6%	-13.0%	-0.1%
	Energy consumption		123	106	84	84	76	78	80	80	75	64	69	65	-38.2%	-22.6%	-5.5%
	Energy consumption intensity index	Base year: FY2013	1.30	1.11	1.00	1.00	0.97	0.96	0.97	0.96	0.96	0.95	0.93	0.95	-14.8%	-5.2%	1.9%
	Production activity index		1.13	1.13	1.00	1.00	0.93	0.96	0.98	0.99	0.93	0.79	0.88	0.82	-27.4%	-18.3%	-7.2%
The Japan Rubber Manufacturers Association*4	CO2 emissions (actual emissions) ☆				214	209	195	187	178	164	148	146	145	134		-37.3%	-7.4%
	CO2 emissions (post-adjustment)				222	216	204	196	190	182	169	158	171	169		-23.8%	-1.0%
	CO2 emission intensity index (actual emissions)	Base year: FY2013			1.00	9.63	1.00	1.00	0.91	0.82	0.76	0.90	0.77	0.71		-28.5%	-6.7%
	CO2 emission intensity index (post-adjustment)				1.00	0.99	1.00	0.98	0.93	0.88	0.83	0.94	0.87	0.87		-13.1%	-0.2%
	Energy consumption				99	97	94	92	90	90	87	81	89	88		-11.0%	-1.1%
	Energy consumption intensity index	Base year: FY2013			1.00	1.00	1.04	1.03	1.00	0.98	0.96	1.08	1.02	1.01		1.5%	-0.3%
	Production activity index				1.00	0.98	0.92	0.90	0.91	0.93	0.91	0.76	0.88	0.88		-12.3%	-0.8%
The Federation of Pharmaceutical Manufacturers' Associations of Japan	CO2 emissions (actual emissions) ☆		161	236	261	252	247	248	239	222	216	215	216	218	-7.5%	-16.5%	1.0%
	CO2 emissions (post-adjustment)		161	236	261	252	246	247	238	223	216	216	217	218	-7.4%	-16.4%	0.7%
	CO2 emission intensity index (actual emissions)	Base year: FY2013	1.29	1.18	1.00	1.03	0.98	0.97	0.93	0.88	0.86	0.87	0.78	0.75	-36.3%	-24.9%	-3.6%
	CO2 emission intensity index (post-adjustment)		1.29	1.18	1.00	1.03	0.98	0.97	0.93	0.89	0.86	0.87	0.78	0.75	-36.2%	-24.8%	-3.8%
	Energy consumption		77	114	116	114	115	117	116	112	111	111	113	114	0.4%	-1.9%	1.3%
	Energy consumption intensity index	Base year: FY2013	1.37	1.28	1.00	1.04	1.02	1.03	1.01	1.00	0.99	1.01	0.91	0.88	-30.8%	-11.7%	-3.3%
	Production activity index		0.48	0.77	1.00	0.94	0.96	0.98	0.98	0.96	0.96	0.95	1.06	1.11	45.1%	11.2%	4.7%
Japan Aluminum Association	CO2 emissions (actual emissions)		156	168	146	149	145	145	142	134	126	117	122	119	-29.5%	-18.9%	-2.7%
	CO2 emissions (post-adjustment) ☆		156	168	146	149	144	145	142	134	126	117	122	119	-29.4%	-18.8%	-2.9%
	CO2 emission intensity index (actual emissions)	Base year: FY2013	0.99	0.95	1.00	0.94	0.92	0.93	0.92	0.92	0.92	0.91	0.87	0.91	-4.2%	-8.6%	4.6%
	CO2 emission intensity index (post-adjustment)		0.99	0.95	1.00	0.94	0.92	0.93	0.92	0.92	0.92	0.92	0.88	0.91	-4.1%	-8.5%	4.4%
	Energy consumption		77	81	66	68	67	69	69	67	64	60	63	61	-25.0%	-8.0%	-3.3%
	Energy consumption intensity index	Base year: FY2013	1.09	1.02	1.00	0.95	0.95	0.98	0.98	1.02	1.04	1.04	1.00	1.04	1.9%	3.7%	4.0%
	Production activity index		1.08	1.21	1.00	1.08	1.07	1.07	1.06	0.99	0.94	0.88	0.95	0.89	-26.4%	-11.3%	-7.0%
Japan Federation of Printing Industries	CO2 emissions (actual emissions) ☆			137	144	137	136	132	119	109	100	94	90	87	-36.6%	-39.7%	-3.4%
	CO2 emissions (post-adjustment)			137	144	137	136	132	119	109	101	94	90	87	-36.5%	-39.6%	-3.7%
	CO2 emission intensity index (actual emissions)	Base year: FY2013		1.00	1.00	0.96	0.90	0.89	0.82	0.72	0.66	0.65	0.61	0.57	-43.4%	-43.5%	-6.9%
	CO2 emission intensity index (post-adjustment)			1.00	1.00	0.96	0.90	0.89	0.81	0.72	0.67	0.65	0.61	0.57	-43.3%	-43.4%	-7.2%
	Energy consumption			74	64	62	64	63	59	56	53	50	48	46	-37.3%	-27.4%	-3.8%
	Energy consumption intensity index	Base year: FY2013		1.21	1.00	0.98	0.94	0.95	0.90	0.83	0.79	0.77	0.73	0.68	-43.9%	-31.9%	-7.3%
	Production activity index			0.95	1.00	1.00	1.05	1.03	1.02	1.05	1.05	1.01	1.03	1.07	11.9%	6.6%	3.7%
Flat Glass Manufacturers Association of Japan	CO2 emissions (actual emissions) ☆		181	134	117	110	106	106	109	110	111	94	92	76	-43.3%	-34.9%	-16.8%
	CO2 emissions (post-adjustment)		181	134	117	110	106	106	109	110	111	94	92	76	-43.3%	-34.9%	-16.9%
	CO2 emission intensity index (actual emissions)	Base year: FY2013	1.07	1.10	1.00	1.00	0.94	0.96	0.95	0.94	0.98	1.11	1.00	0.93	-15.5%	-7.2%	-7.6%
	CO2 emission intensity index (post-adjustment)		1.07	1.10	1.00	1.00	0.94	0.96	0.95	0.94	0.98	1.11	1.01	0.93	-15.5%	-7.1%	-7.6%
	Energy consumption		73	52	44	42	42	42	44	45	45	37	37	31	-40.5%	-29.5%	-15.4%
	Energy consumption intensity index	Base year: FY2013	1.14	1.14	1.00	1.01	0.97	1.01	1.01	1.01	1.05	1.16	1.07	1.01	-11.4%	0.6%	-6.0%
	Production activity index		1.44	1.04	1.00	0.94	0.97	0.94	0.98	1.00	0.97	0.73	0.78	0.70	-32.9%	-29.9%	-10.0%
Japan Soft Drink Association	CO2 emissions (actual emissions)		47	103	122	116	115	114	111	118	116	109	113	113	10.1%	-7.5%	-0.3%
	CO2 emissions (post-adjustment)		47	103	122	116	115	114	111	118	116	109	114	113	10.2%	-7.4%	-0.5%
	CO2 emission intensity index (actual emissions) ☆	Base year: FY2012	0.97	1.09	0.96	0.91	0.88	0.85	0.80	0.82	0.76	0.79	0.77	0.75	-31.6%	-22.0%	-2.7%
	CO2 emission intensity index (post-adjustment)		1.03	1.17	1.02	0.97	0.93	0.90	0.85	0.87	0.81	0.85	0.82	0.80	-31.6%	-21.9%	-2.9%
	Energy consumption		21	48	57	54	55	55	55	60	60	57	59	59	22.7%	4.7%	-0.3%
	Energy consumption intensity index	Base year: FY2012	0.93	1.11	0.96	0.92	0.91	0.89	0.85	0.90	0.85	0.89	0.87	0.85	-23.8%	-11.7%	-2.7%
	Production activity index		0.42	0.80	1.09	1.08	1.13	1.15	1.19	1.23	1.30	1.18	1.26	1.29	61.0%	18.6%	2.5%
Japan Dairy Industry Association	CO2 emissions (actual emissions)		86	112	120	116	116	112	104	98	96	94	126	125	11.8%	4.8%	-0.4%
	CO2 emissions (post-adjustment)		86	112	120	115	116	112	104	98	96	94	126	125	11.9%	4.9%	-0.6%
	CO2 emission intensity index (actual emissions) ☆	Base year: FY2013	0.84	1.06	1.00	0.97	0.90	0.87	0.81	0.77	0.76	0.77	0.69	0.68	-35.7%	-31.8%	-1.5%
	CO2 emission intensity index (post-adjustment)		0.84	1.06	1.00	0.97	0.90	0.87	0.81	0.78	0.76	0.77	0.69	0.68	-35.7%	-31.8%	-1.7%
	Energy consumption		41	51	52	51	53	52	49	48	48	47	64	64	23.8%	22.4%	-1.0%
	Energy consumption intensity index	Base year: FY2013	0.92	1.12	1.00	0.99	0.94	0.92	0.88	0.87	0.87	0.89	0.81	0.80	-28.9%	-20.5%	-2.0%
	Production activity index		0.85	0.88	1.00	1.00	1.07	1.07	1.07	1.05	1.05	1.03	1.52	1.54	74.0%	53.8%	1.1%
The Japanese Electric Wire & Cable Makers' Association	CO2 emissions (actual emissions) ☆		109	91	96	92	88	86	83	78	72	66	67	64	-29.9%	-33.3%	-3.8%
	CO2 emissions (post-adjustment)		109	91	96	91	88	85	82	79	72	66	67	64	-29.8%	-33.2%	-4.2%
(metal (copper/aluminnum) c	CO2 emission intensity index (actual emissions)		0.77	0.82	1.00	0.95	0.94	0.93	0.88	0.80	0.72	0.76	0.75	0.76	-7.6%	-24.2%	0.8%
(metal (copper/aluminnum) c	CO2 emission intensity index (post-adjustment)	Base year: FY2013	0.77	0.82	1.00	0.95	0.93	0.93	0.88	0.80	0.73	0.76	0.76	0.76	-7.4%	-24.0%	0.4%
(optical fiber cable)	CO2 emission intensity index (actual emissions)		3.62	0.96	1.00	0.88	0.80	0.76	0.70	0.72	0.79	0.69	0.65	0.58	-39.8%	-42.0%	-11.5%
(optical fiber cable)	CO2 emission intensity index (post-adjustment)		3.62	0.96	1.00	0.88	0.80	0.75	0.70	0.72	0.79	0.70	0.66	0.58	-39.6%	-41.9%	-11.9%
	Energy consumption		64	50	42	41	40	40	40	40	38	35	36	35	-30.8%	-16.6%	-4.4%
(metal (copper/aluminnum) c	Energy consumption intensity index		1.04	1.03	1.00	0.97	0.98	1.01	0.98	0.94	0.89	0.94	0.94	0.94	-8.7%	-5.6%	0.2%
(optical fiber cable)	Energy consumption intensity index	Base year: FY2013	5.37	1.28	1.00	0.90	0.85	0.83	0.80	0.87	0.99	0.88	0.84	0.74	-42.0%	-26.0%	-12.0%
(metal (copper/aluminnum) c	Production activity index		1.70	1.24	1.00	1.01	0.98	0.95	0.97	1.01	1.02	0.88	0.90	0.86	-30.8%	-14.1%	-4.9%
(optical fiber cable)	Production activity index		0.04	0.60	1.00	1.04	1.16	1.20	1.24	1.24	0.99	1.09	1.17	1.29	114.3%	29.4%	10.6%
The Japan Bearing Industrial Association	CO2 emissions (actual emissions) ☆			73	85	84	79	78	79	74	68	59	66	65	-11.2%	-23.3%	-2.0%
	CO2 emissions (post-adjustment)			73	85	84	79	78	78	74	68	60	67	65	-11.0%	-23.1%	-2.3%
	CO2 emission intensity index (actual emissions)	Base year: FY2013		0.86	1.00	0.93	0.92	0.90	0.84	0.78	0.78	0.80	0.76	0.80	-7.4%	-20.5%	4.9%
	CO2 emission intensity index (post-adjustment)			0.86	1.00	0.93	0.91	0.90	0.84	0.79	0.78	0.80	0.76	0.80	-7.2%	-20.3%	4.5%
	Energy consumption			40	37	37	36	37	38	38	36	32	36	35	-12.2%	-5.0%	-2.3%
	Energy consumption intensity index	Base year: FY2013		1.08	1.00	0.95	0.96	0.98	0.94	0.92	0.95	0.98	0.94	0.98	-8.5%	-1.5%	4.5%
	Production activity index			1.01	1.00	1.07	1.02	1.02	1.11	1.12	1.02	0.88	1.03	0.97	-4.1%	-3.5%	-6.5%

Industry	(*2) (☆: target adopted by the industry)	Notes	1990	2005	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Relative to FY2005	Relative to FY2013	Relative to previous FY
The Japan Society of Industrial Machinery Manufacturers	CO2 emissions (actual emissions) ☆				57	57	55	54	53	49	47	45	44	45		-21.4%	1.3%
	CO2 emissions (post-adjustment)				57	57	54	53	52	49	47	45	45	45		-21.2%	0.9%
	Energy consumption				25	26	25	25	25	25	25	24	24	24		-3.4%	0.7%
	Production activity index	Base year: FY2013			1.00	1.06	1.15	1.05	1.10	1.16	1.13	1.10	1.17	1.22		22.5%	4.4%
Japan Petroleum Development Association *5	CO2 emissions (actual emissions) ☆		13	17	23	19	19	20	19	18	17	18	18	19	12.9%	-14.5%	8.9%
	CO2 emissions (post-adjustment)		13	17	23	19	19	19	19	18	17	18	18	17	-2.6%	-26.3%	-6.4%
	CO2 emission intensity index (actual emissions)	Base year: FY2013	0.89	0.69	1.00	0.91	0.94	0.94	0.88	0.92	0.94	1.08	1.11	1.34	95.7%	34.4%	21.1%
	CO2 emission intensity index (post-adjustment)		0.89	0.69	1.00	0.91	0.94	0.93	0.88	0.92	0.94	1.08	1.11	1.16	68.7%	15.8%	4.1%
	Energy consumption		6	9	11	9	9	10	10	9	9	9	9	10	13.7%	-8.7%	6.0%
	Energy consumption intensity index	Base year: FY2013	0.92	0.73	1.00	0.93	0.97	0.97	0.93	0.99	1.04	1.19	1.22	1.44	97.1%	43.5%	17.8%
	Production activity index		0.63	1.10	1.00	0.93	0.91	0.93	0.96	0.85	0.80	0.73	0.71	0.64	-42.3%	-36.4%	-10.0%
Japan Copper and Brass Association	CO2 emissions (actual emissions) ☆				67	68	82	64	64	60	55	51	58	56		-15.7%	-2.7%
	CO2 emissions (post-adjustment)				67	68	82	64	64	60	55	51	58	56		-15.6%	-3.0%
	CO2 emission intensity index (actual emissions)	Base year: FY2013			1.00	0.99	1.28	0.94	0.90	0.85	0.86	0.90	0.85	0.89		-10.5%	4.7%
	CO2 emission intensity index (post-adjustment)				1.00	0.99	1.28	0.94	0.90	0.85	0.86	0.90	0.86	0.90		-10.4%	4.4%
	Energy consumption				29	30	36	30	31	30	29	27	31	30		1.2%	-3.2%
	Energy consumption intensity index	Base year: FY2013			1.00	1.01	1.26	1.00	0.99	0.98	1.01	1.07	1.03	1.07		7.4%	4.2%
	Production activity index				1.00	1.02	0.96	1.02	1.06	1.05	0.96	0.85	1.01	0.94		-5.8%	-7.1%
Brewers Association of Japan	CO2 emissions (actual emissions) ☆				57	55	53	51	50	47	46	41	39	41		-28.8%	3.3%
	CO2 emissions (post-adjustment)				57	55	53	51	50	47	46	41	39	41		-28.7%	3.2%
	CO2 emission intensity index (actual emissions)	Base year: FY2013			1.00	0.97	0.94	0.92	0.91	0.87	0.87	0.86	0.86	0.87		-13.0%	1.4%
	CO2 emission intensity index (post-adjustment)				1.00	0.97	0.94	0.92	0.91	0.87	0.87	0.86	0.86	0.87		-12.9%	1.3%
	Energy consumption				27	26	26	25	25	24	24	21	20	21		-22.4%	3.2%
	Energy consumption intensity index				1.00	0.98	0.96	0.95	0.95	0.93	0.94	0.93	0.94	0.95		-5.2%	1.3%
	Production activity index				1.00	0.99	1.00	0.98	0.96	0.95	0.92	0.83	0.80	0.82		-18.1%	1.9%
The Shipbuilders' Association of Japan and the Cooperative Association of Japan Shipbuilders	CO2 emissions (actual emissions) ☆				65	69	69	71	65	59	53	53	42	38		-41.6%	-9.7%
	CO2 emissions (post-adjustment)				65	69	69	70	65	60	54	54	42	38		-41.5%	-10.1%
	CO2 emission intensity index (post-adjustment)	Base year: FY2013			1.00	1.09	1.08	1.19	1.10	0.88	0.72	0.90	0.83	0.77		-22.7%	-7.1%
	CO2 emission intensity index (post-adjustment)				1.00	1.09	1.08	1.18	1.10	0.88	0.72	0.91	0.84	0.77		-22.6%	-7.5%
	Energy consumption				28	30	31	32	31	30	28	28	22	20		-26.9%	-10.4%
	Energy consumption intensity index				1.00	1.11	1.13	1.28	1.24	1.03	0.89	1.12	1.05	0.97		-3.2%	-7.8%
	Production activity index				1.00	0.98	0.99	0.91	0.91	1.04	1.14	0.91	0.78	0.76		-24.4%	-2.8%
Limestone Association of Japan	CO2 emissions (actual emissions) ☆			25	28	28	27	27	26	26	26	24	25	24	-4.3%	-15.6%	-2.8%
	CO2 emissions (post-adjustment)			25	28	28	27	27	26	26	26	24	25	24	-4.2%	-15.5%	-3.0%
	CO2 emission intensity index (actual emissions)	Base year: FY2010		0.98	1.19	1.19	1.19	1.19	1.15	1.11	1.13	1.14	1.11	1.13	16.3%	-5.0%	2.3%
	CO2 emission intensity index (post-adjustment)			1.06	1.30	1.30	1.30	1.29	1.25	1.21	1.23	1.25	1.21	1.23	16.4%	-4.9%	2.1%
	Energy consumption			12	12	12	12	11	12	12	12	11	12	11	-8.1%	-3.7%	-3.3%
	Energy consumption intensity index	Base year: FY2010		0.95	0.98	0.99	1.01	1.03	1.02	1.02	1.05	1.06	1.04	1.06	11.7%	8.4%	1.7%
	Production activity index			1.20	1.11	1.10	1.07	1.05	1.07	1.09	1.06	1.00	1.04	0.99	-17.7%	-11.2%	-5.0%
Japan Machine Tool Builders' Association	CO2 emissions (actual emissions) ☆		25	27	36	37	36	33	34	33	29	26	29	31	14.5%	-14.5%	8.5%
	CO2 emissions (post-adjustment)		25	27	36	37	35	33	34	33	29	26	29	31	14.8%	-14.4%	8.1%
	CO2 emission intensity index (actual emissions)	Base year: FY2013	0.76	0.64	1.00	0.86	0.79	0.80	0.71	0.61	0.66	0.79	0.73	0.63	-1.8%	-37.4%	-14.0%
	CO2 emission intensity index (post-adjustment)		0.76	0.64	1.00	0.86	0.79	0.80	0.71	0.61	0.66	0.79	0.73	0.63	-1.6%	-37.3%	-14.3%
	Energy consumption		15	15	15	16	16	15	16	17	15	14	16	17	14.0%	8.2%	7.9%
	Energy consumption intensity index	Base year: FY2013	1.04	0.81	1.00	0.88	0.84	0.87	0.80	0.73	0.81	0.99	0.93	0.79	-2.3%	-20.7%	-14.4%
	Production activity index		0.91	1.17	1.00	1.19	1.23	1.15	1.31	1.47	1.23	0.89	1.08	1.37	16.7%	36.5%	26.1%
Japan Sanitary Equipment Industry Association	CO2 emissions (actual emissions) ☆		50	36	26	23	20	20	20	20	20	18	18	17	-53.3%	-33.7%	-6.2%
	CO2 emissions (post-adjustment)		50	36	26	23	20	20	20	20	20	18	18	17	-53.2%	-33.6%	-6.4%
	CO2 emission intensity index (actual emissions)	Base year: FY2013	2.35	1.62	1.00	0.92	0.81	0.76	0.78	0.76	0.74	0.72	0.64	0.57	-64.7%	-42.8%	-10.7%
	CO2 emission intensity index (post-adjustment)		2.35	1.62	1.00	0.92	0.80	0.76	0.78	0.77	0.74	0.72	0.64	0.57	-64.6%	-42.8%	-10.9%
	Energy consumption		23	17	12	11	9	9	10	10	10	10	10	9	-47.7%	-22.6%	-6.5%
	Energy consumption intensity index	Base year: FY2013	2.44	1.69	1.00	0.94	0.84	0.81	0.85	0.86	0.85	0.83	0.75	0.67	-60.5%	-33.3%	-11.0%
	Production activity index		0.82	0.88	1.00	0.98	0.97	1.00	0.98	1.03	1.04	0.99	1.10	1.16	32.3%	16.0%	5.0%
Flour Millers Association	CO2 emissions (actual emissions)		19	23	30	30	29	28	27	24	23	23	22	22	-6.7%	-28.3%	-1.0%
	CO2 emissions (post-adjustment)		19	23	30	30	29	28	27	24	23	23	22	22	-6.5%	-28.2%	-1.4%
	CO2 emission intensity index (actual emissions) ☆	Base year: FY2013	0.72	0.77	1.00	0.99	0.93	0.90	0.87	0.79	0.76	0.76	0.75	0.74	-3.3%	-25.7%	-0.3%
	CO2 emission intensity index (post-adjustment)		0.72	0.77	1.00	0.99	0.93	0.89	0.86	0.79	0.76	0.76	0.75	0.74	-3.1%	-25.6%	-0.7%
	Energy consumption		12	13	13	13	13	13	13	12	12	12	12	12	-9.8%	-7.9%	-1.2%
	Energy consumption intensity index	Base year: FY2013	1.05	1.02	1.00	1.01	0.98	0.97	0.97	0.95	0.95	0.95	0.96	0.95	-6.5%	-4.6%	-0.5%
	Production activity index		0.86	1.00	1.00	1.00	1.01	1.01	1.01	1.00	1.00	0.98	0.97	0.97	-3.5%	-3.5%	-0.7%
Japan Industrial Vehicles Association	CO2 emissions (actual emissions) ☆		7	7	5	5	4	4	4	4	4	4	4	4	-41.2%	-14.2%	2.1%
	CO2 emissions (post-adjustment)		7	7	5	5	4	4	4	4	4	4	4	4	-41.1%	-14.1%	1.8%
	CO2 emission intensity index (actual emissions)	Base year: FY2013	0.94	1.11	1.00	0.95	0.89	0.90	0.84	0.74	0.76	0.79	0.75	0.77	-30.7%	-23.4%	1.5%
	CO2 emission intensity index (post-adjustment)		0.94	1.11	1.00	0.94	0.88	0.89	0.84	0.75	0.76	0.80	0.76	0.77	-30.6%	-23.2%	1.2%
	Energy consumption		3	4	2	2	2	2	2	2	2	2	2	2	-39.4%	3.6%	2.0%
	Energy consumption intensity index	Base year: FY2013	1.11	1.29	1.00	0.96	0.92	0.96	0.92	0.86	0.90	0.95	0.91	0.93	-28.5%	-7.4%	1.5%
	Production activity index		1.46	1.32	1.00	1.04	1.04	1.00	1.05	1.11	1.01	0.96	1.11	1.12	-15.2%	11.9%	0.6%

Industry	(*2) (☆:target adopted by the industry)	Notes	1990	2005	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Relative to FY2005	Relative to FY2013	Relative to previous FY
Japan Association of Rolling Stock Industries	CO2 emissions (actual emissions) ☆		5	4	4	4	3	3	4	3	3	3	3	3	-29.9%	-28.8%	-7.9%
	CO2 emissions (post-adjustment)		5	4	4	4	3	3	4	3	3	3	3	3	-29.8%	-28.7%	-8.2%
	CO2 emission intensity index (actual emissions)		1.00	0.56	0.50	0.51	0.44	0.49	0.45	0.33	0.33	0.32	0.36	0.37	-33.9%	-27.0%	1.9%
	CO2 emission intensity index (post-adjustment)		1.00	0.56	0.50	0.51	0.44	0.49	0.45	0.33	0.33	0.32	0.36	0.37	-33.7%	-26.9%	1.5%
	Energy consumption		3	2	2	2	2	2	2	2	2	2	2	1	-31.1%	-12.7%	-8.1%
	Energy consumption intensity index		1.00	0.55	0.40	0.41	0.36	0.41	0.40	0.31	0.32	0.30	0.35	0.36	-35.0%	-10.5%	1.7%
	Production activity index		1.00	1.43	1.56	1.53	1.69	1.50	1.68	2.04	1.98	1.99	1.68	1.52	6.0%	-2.5%	-9.6%
Emissions from industrial proces	CO2 emissions		6,027	5,086	4,431	4,395	4,207	4,204	4,239	4,229	4,086	3,739	3,871	3,643	-28.4%	-17.8%	-5.9%
Revisions *4	CO2 emissions (actual emissions)				9	7	9	10	12	17	21	12	26	35			36.1%
	CO2 emissions (post-adjustment)																
Total *7	CO2 emissions (actual emissions)		36,861	34,414	39,813	39,278	37,949	37,583	37,514	36,519	35,483	31,623	33,758	31,617	-20.2%	-15.2%	-6.3%
	CO2 emissions (post-adjustment)		36,880	34,426	39,796	39,243	37,890	37,541	37,490	36,530	35,477	31,635	33,782	31,622	-20.2%	-15.2%	-6.4%
	Energy consumption		10,622	10,310	12,067	11,956	11,674	11,647	11,718	11,532	11,288	10,151	10,850	10,252	-20.6%	-10.1%	-5.5%

*1 Due to the rounding off, totals may differ from the sum of individual items.
*2 Intensity indices have been calculated by having each industry set a base year, the figure for which is used as 1. Unless otherwise specified in remarks (BAU baseline etc.), the base year is fiscal 1990.
*3 The Liaison Group of Japanese Electrical and Electronics Industries for Global Warming Prevention has implemented the Commitment to Low Carbon Society as a new scheme independent of the conventional Voluntary Action Plan on the Environment. Therefore, data for participating industries under Keidanren's commitment to a Low Carbon Society are available for only the years following the base year (fiscal 2012). The figures provided for fiscal 1990 and fiscal 2005 have been derived from the Voluntary Action Plan on the Environment as reference.
*4 Figures for the Japan Rubber Manufacturers Association have been caclulated using the coefficient for thermal power generation and coefficents for each fiscal year of electric power companies actually used by each company have been used to calculate actual emissions at fiscal 2013 (base year) and after fiscal 2020. The difference between a simple suminclusing relevant industries and the total is provided as "Revisions".
*5 Emissions from industrial processes include CO_2 emissions of dissipated gas from mining facilities of the Japan Petroleum Development Association.
*6 Emissions from industrial processes refer to CO_2 emissions from manufacturing processes that are not energy-oriented.
*7 The rate of change from fiscal 2005 to fiscal 2021 is calculated except for industries with no data for fiscal 2005.

Calculation method
Period covered: April 1, 2022 – March 31, 2023
Scope of calculation: Participating industries under the Keidanren Commitment to a Low Carbon Society and Commitment to a Low Carbon Society (62 industries)
CO_2 emissions: Σ〔(annual consumption of fuel oil, gas, heat) × energy-specific calorific coefficient [*1] × energy-specific carbon emission coefficient [*1] × CO_2 conversion factor [*2]〕+(annual electric power consumption within industry-specific boundaries) × CO_2 conversion factor [3]

*1 Source: Agency for Natural Resources and Energy "General Energy Statistics" However, the standard state of gases was redefined in "General Energy Statistics fiscal 2013 preliminary figures" (published on November 14, 2014); and therefore, the old calorific figures are used for natural gas and city gas, in order to maintain the continuity of the data and scheme. For some fuels, industries use coefficients calculated using their own data.
*2 Source: "National Greenhouse Gas Inventory Repoort of JAPAN, 2023".
*3 Source: National Institute for Environmental Studies, Japan, "Japan's greenhouse gas emission report." For some fuels, industries use coefficients calculated using their own data.
*4 Source: Electric Power Council for a Low Carbon Society.

The CO_2 emission factor for electric power use (emission coefficient for electricity) used to calculate total CO_2 emissions in fiscal 2021 is a preliminary value . (*)
Basic emission coefficient (emission coefficient for actual emissions): 4.35 t-CO_2/10,000kWh; post-adjustment emission coefficient: 4.36 t-CO_2/10,000kWh

Amount of production activity: Each industry arbitrarily sets the unit of production activity amount.

2. Energy Conversion Sector

10,000t-CO_2; 10,000kl crude oil equivalent; fiscal year

Industry	(*1) （☆：target adopted by the industry）	Notes	1990	2005	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Relative to FY2005	Relative to FY2013	Relative to previous
The Electric Power Council for a Low Carbon Society *2	CO2 emissions (actual emissions)		27,500	37,300	49,400	47,000	44,400	43,200	41,100	37,000	34,400	32,800	32,400	32,500	-12.9%	-34.2%	0.3%
	CO2 emissions (post-adjustment)		27,500	37,300	49,300	46,900	44,100	43,000	41,100	37,200	34,500	32,900	32,600	32,700	-12.3%	-33.7%	0.3%
	CO2 emission intensity index (actual emissions) ☆	Base year: FY2013	0.74	0.74	1.00	0.97	0.94	0.91	0.87	0.81	0.78	0.77	0.76	0.76	2.7%	-23.5%	0.5%
	CO2 emission intensity index (post-adjustment)		0.74	0.75	1.00	0.97	0.94	0.91	0.88	0.82	0.78	0.78	0.77	0.77	3.4%	-22.9%	0.5%
	Energy consumption intensity index	Base year: FY2013	1.09	1.04	1.00	0.98	0.99	0.98	0.98	0.97	0.98	0.97	0.98	1.00	-4.0%	-0.5%	1.4%
	Production activity index		0.76	1.01	1.00	0.98	0.96	0.96	0.95	0.92	0.89	0.86	0.86	0.86	-15.2%	-14.0%	-0.2%
Petroleum Association of Japan	CO2 emissions (actual emissions) ☆		3,110	4,154	4,033	3,824	3,834	3,845	3,809	3,682	3,446	3,039	3,174	3,232	-22.2%	-19.9%	1.8%
	CO2 emissions (post-adjustment)		3,110	4,154	4,033	3,823	3,833	3,844	3,808	3,682	3,446	3,039	3,174	3,232	-22.2%	-19.8%	1.8%
	CO2 emission intensity index (actual emissions)	Base year: FY2013	1.17	0.99	1.00	0.99	0.97	0.97	0.97	0.98	0.96	1.04	1.01	1.01	2.4%	1.1%	0.0%
	CO2 emission intensity index (post-adjustment)		1.17	0.99	1.00	0.99	0.97	0.97	0.97	0.98	0.96	1.04	1.01	1.01	2.4%	1.1%	0.0%
	Energy consumption		1,287	1,713	1,651	1,563	1,573	1,589	1,569	1,503	1,428	1,247	1,302	1,330	-22.4%	-19.4%	2.1%
	Energy consumption intensity index	Base year: FY2013	1.18	1.00	1.00	0.99	0.98	0.98	0.97	0.98	0.98	1.04	1.01	1.02	2.1%	1.7%	0.3%
	Production activity index		0.66	1.04	1.00	0.96	0.98	0.98	0.98	0.93	0.89	0.72	0.78	0.79	-24.0%	-20.7%	1.8%
The Japan Gas Association *3	CO2 emissions (actual emissions)		135	47	46	48	45	46	45	42	40	40	40	40	-15.8%	-13.3%	-0.9%
	CO2 emissions (post-adjustment)		135	47	46	48	44	46	45	43	40	40	40	39	-17.8%	-15.3%	-3.6%
	CO2 emission intensity index (actual emissions) ☆	Base year: FY2013	7.64	1.27	1.00	1.02	0.98	0.95	0.95	0.94	0.91	0.94	0.93	0.95	-25.4%	-5.1%	1.9%
	CO2 emission intensity index (post-adjustment)		7.64	1.27	1.00	1.02	0.97	0.95	0.95	0.94	0.92	0.94	0.93	0.93	-27.2%	-7.3%	-0.9%
	Energy consumption		67	25	21	22	21	22	22	22	22	22	22	22	-11.7%	4.7%	-0.9%
	Energy consumption intensity index	Base year: FY2013	8.32	1.46	1.00	1.04	1.01	1.00	1.03	1.07	1.09	1.13	1.12	1.15	-21.8%	14.5%	1.9%
	Production activity index		0.39	0.81	1.00	1.02	1.00	1.06	1.05	0.99	0.95	0.93	0.94	0.91	12.9%	-8.6%	-2.8%
Emissions from industrial processes *4	CO2 emissions		0	214	189	200	196	190	203	185	188	150	169	175	-18.3%	-7.3%	3.3%
	Energy consumption																
Total（Emissions before electric power distribution）	CO2 emissions (actual emissions)		30,745	41,715	53,667	51,071	48,475	47,281	45,157	40,910	38,073	36,028	35,783	35,947	-13.8%	-33.0%	0.5%
	CO2 emissions (post-adjustment)		30,745	41,715	53,567	50,971	48,174	47,080	45,157	41,110	38,174	36,129	35,984	36,146	-13.4%	-32.5%	0.5%
	Energy consumption		16,322	20,731	19,740	18,919	18,665	18,624	18,383	17,672	17,262	16,350	16,605	16,818	-18.9%	-14.8%	1.3%

*1 Intensity indices have been calculated by having each industry set a base year, the figure for which is used as 1. Unless otherwise specified in remarks, the base year is fiscal 1990.
*2 Because the Electric Power Council for a Low Carbon Society was established in fiscal 2015, the data for fiscal 1990 and fiscal 2005 represent only the Federation of Electric Power Companies, and the data for fiscal 2013 - 2014 include the Federation of Electric
Power Companies and PPS.
*3 The data for the Japan Gas Association in and before 2012 are based on industrial boundaries defined under the Voluntary Action Plan on the Environment. The calculated CO_2 emissions differ from the figures dervied using the marignal adjustment method
(cogeneration) that the Japan Gas Association has adopted as target indices.
*4 Emissions from industrial processes refer to CO_2 emissions from manufacturing processes that are not energy-oriented.

3. Commercial Sector

10,000t-CO_2; 10,000kl crude oil equivalent; fiscal year

Industry	(*1) (☆: target adopted by the industry)	Notes	1990	2005	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Relative to FY2013	Relative to previous FY
Japan Chain Stores Association	CO2 emissions (actual emissions)			774	540	496	395	284	220	209	206	200	190	188	-65.2%	-0.9%
	CO2 emissions (post-adjustment)			774	540	495	393	283	220	209	206	201	191	188	-65.1%	-1.4%
	Energy consumption			454	233	219	181	134	108	109	111	109	105	103	-55.7%	-1.6%
Telecommunications Carriers Association	CO2 emissions (actual emissions)				571	566	555	522	502	479	462	468	489	496	-13.0%	1.5%
	CO2 emissions (post-adjustment)				571	565	552	520	501	481	463	470	492	497	-12.8%	1.1%
	Energy consumption				246	251	254	247	247	251	252	257	274	276	12.0%	0.8%
	Energy consumption intensity index ☆	Base year: FY2013			1.00	0.77	0.53	0.35	0.30	0.25	0.21	0.15	0.13	0.10	-89.9%	-22.2%
	Production activity index				1.00	1.33	1.97	2.86	3.30	4.12	4.77	7.14	8.56	11.09	1009.0%	29.5%
Japan Franchise Association	CO2 emissions (actual emissions)				438	459	451	449	431	400	375	358	354	353	-19.3%	-0.1%
	CO2 emissions (post-adjustment)				438	458	449	447	430	401	376	360	356	354	-19.1%	-0.6%
	Energy consumption				189	203	207	212	212	210	205	197	198	196	3.9%	-0.8%
Japan Department Store Association	CO2 emissions (actual emissions)	Base year: FY2013	106	201	190	172	160	152	134	119	114	87	89	93	-51.1%	4.6%
	CO2 emissions (post-adjustment) ☆		106	201	190	172	159	152	134	119	114	88	89	88	-53.8%	-1.7%
	CO2 emission intensity index (actual emissions)			0.86	1.00	0.93	0.92	0.90	0.84	0.78	0.78	0.80	0.76	0.80	-20.5%	4.9%
	CO2 emission intensity index (post-adjustment)			0.86	1.00	0.93	0.91	0.90	0.84	0.79	0.78	0.80	0.76	0.80	-20.3%	4.5%
	Energy consumption		64	113	83	77	74	72	65	61	61	47	48	50	-39.9%	3.8%
	Energy consumption intensity index ☆	Base year: FY2013	1.38	1.20	1.00	0.94	0.89	0.88	0.85	0.82	0.82	0.76	0.75	0.77	-23.4%	1.5%
	Production activity index		0.56	1.13	1.00	0.99	1.00	0.98	0.92	0.89	0.89	0.74	0.77	0.78	-21.5%	2.2%
Japan Association of Refrigerated Warehouses	CO2 emissions (actual emissions)		62	83	106	103	98	96	90	85	82	83	83	83	-22.0%	-0.5%
	CO2 emissions (post-adjustment)		62	83	106	103	98	95	90	86	83	83	84	83	-21.9%	-1.0%
	CO2 emission intensity index (actual emissions)	Base year: FY2013	0.83	0.83	1.00	0.96	0.91	0.88	0.83	0.76	0.74	0.71	0.71	0.69	-31.0%	-2.4%
	CO2 emission intensity index (post-adjustment)		0.83	0.83	1.00	0.95	0.90	0.88	0.83	0.77	0.74	0.72	0.71	0.69	-30.8%	-2.8%
	Energy consumption		40	48	46	46	45	45	45	45	45	46	47	46	0.4%	-1.2%
	Energy consumption intensity index ☆	Base year: FY2013	1.24	1.13	1.00	0.98	0.97	0.96	0.95	0.93	0.94	0.91	0.92	0.89	-11.1%	-3.1%
	Production activity index		0.70	0.94	1.00	1.02	1.02	1.02	1.02	1.05	1.05	1.10	1.11	1.13	12.9%	1.9%
Japanese Bankers Association	CO2 emissions (actual emissions)				139	134	127	120	112	100	91	89	82	78	-43.7%	-4.9%
	CO2 emissions (post-adjustment)				139	134	126	119	112	100	92	89	83	79	-43.6%	-5.4%
	Energy consumption				60	59	58	57	55	52	50	49	46	44	-27.5%	-5.6%
	Electric power consumption intensity (power consumption / total floor area) ☆	Base year: FY2013			1.00	0.98	0.96	0.94	0.92	0.87	0.84	0.83	0.80	0.78	-22.3%	-2.6%
The Life Insurance Association of Japan	CO2 emissions (actual emissions)				111	102	96	85	80	72	67	63	62	60	-45.6%	-2.7%
	CO2 emissions (post-adjustment)				111	102	96	85	80	73	67	63	62	60	-45.5%	-3.1%
	Energy consumption				48	45	44	40	39	38	36	34	35	33	-30.8%	-3.3%
	Production activity index	Base year: FY2013			1.00	0.98	0.97	0.96	0.95	0.94	0.93	0.92	0.91	0.92	-7.9%	1.2%
Japan Foreign Trade Council, Inc.	CO2 emissions (actual emissions)			5	5	5	4	4	4	3	3	3	3	2	-58.3%	-23.0%
	CO2 emissions (post-adjustment)			5	5	5	4	4	4	3	3	3	3	2	-58.2%	-23.4%
	Energy consumption			3	2	2	2	2	2	2	2	2	2	1	-47.1%	-23.6%
	Electric power consumption intensity (power consumption poer unit floor area in entire company) ☆	Base year: FY2013			1.00	0.97	0.94	0.90	0.89	0.87	0.87	0.74	0.77	0.56	-43.8%	-27.5%
The General Insurance Association of Japan	CO2 emissions (actual emissions)				29	27	25	24	21	20	18	18	16	16	-42.8%	-0.3%
	CO2 emissions (post-adjustment)				29	27	25	24	21	20	18	18	17	16	-42.7%	-0.7%
	CO2 emissions from electric power consumption per unit flo				59	59	55	54	50	47	40	39	36	36	-39.3%	-0.3%
	CO2 emissions from electric power consumption per unit flo ☆				59	59	55	53	50	47	40	39	36	36	-39.2%	-0.8%
	Energy consumption				12	12	11	11	11	10	10	10	9	9	-28.4%	-2.1%
	Production activity index	Base year: FY2013			1.00	0.96	0.94	0.92	0.88	0.87	0.94	0.93	0.93	0.88	-11.9%	-5.6%
Japan LP Gas Association	CO2 emissions (actual emissions)		2	3	3	3	3	3	3	2	2	2	2	2	-23.8%	1.0%
	CO2 emissions (post-adjustment)		2	3	3	3	3	3	3	2	2	2	2	2	-23.6%	0.5%
	CO2 emission intensity index (actual emissions)	Base year: FY2010	1.08	1.03	1.48	1.40	1.45	1.36	1.35	1.18	1.13	1.13	1.12	1.15	-22.2%	2.5%
	CO2 emission intensity index (post-adjustment)		1.26	1.21	1.73	1.64	1.69	1.59	1.58	1.39	1.32	1.33	1.32	1.35	-22.0%	2.0%
	Energy consumption ☆		2	2	1	1	1	1	1	1	1	1	1	1	-0.6%	0.3%
	Energy consumption intensity index	Base year: FY2010	1.17	1.02	1.08	1.04	1.12	1.08	1.12	1.06	1.05	1.06	1.07	1.09	1.4%	1.8%
	Production activity index		0.96	1.12	0.88	0.89	0.82	0.86	0.84	0.88	0.88	0.88	0.88	0.86	-2.0%	-1.4%
Japan Building Owners and Managers Association	CO2 emissions (actual emissions)				410						349		332	340	-17.0%	2.3%
	CO2 emissions (post-adjustment)				410						350		334	341	-16.9%	2.0%
	CO2 emissions (industry specification)				410						348		318	289		
	CO2 emission intensity index (actual emissions)				1.00						0.73		0.65	0.67	-33.5%	1.9%
	CO2 emission intensity index (post-adjustment)				1.00						0.73		0.66	0.67	-33.4%	1.5%
	CO2 emission intensity index (industry specification)				1.00						0.72		0.62	0.56		
	Energy consumption				180						185		179	183	1.7%	2.0%
	Energy consumption intensity index	Base year: FY2013			1.00						0.88		0.80	0.82	-18.5%	1.6%
Japan Securities Dealers Association	CO2 emissions (actual emissions)				19	18	17	16	15	13	12	11	11	12	-40.7%	7.7%
	CO2 emissions (post-adjustment)				19	18	17	16	15	14	12	11	11	12	-40.5%	7.2%
	Energy consumption				8	8	8	8	7	7	7	6	6	6	-23.6%	7.0%
	Electric power consumption per unit floor area ☆	[kWh/㎡]			107	102	95	90	84	78	72	68	67	72	-32.9%	7.4%
Japan Hotel Association	CO2 emissions (actual emissions)				70	68	66	65	63	61	57	43	47	52	-25.7%	10.9%
	CO2 emissions (post-adjustment)				70	68	66	64	63	61	57	44	47	52	-25.6%	10.6%
	Energy consumption				31	31	31	30	31	30	29	22	24	27	-13.6%	10.1%
	Energy consumption intensity index ☆	Base year: FY2013			0.91	0.90	0.88	0.88	0.88	0.88	0.86	0.73	0.77	0.80	-12.1%	3.6%
	Production activity index				1.02	1.03	1.03	1.03	1.04	1.04	1.02	0.92	0.94	1.00	-1.7%	6.2%
Telecom Services Association	CO2 emissions (actual emissions)				102	96	90	90	81	77	78	80	79	81	-20.7%	2.5%
	CO2 emissions (post-adjustment)				102	96	89	89	81	77	78	81	80	81	-20.5%	2.0%
	Energy consumption				44	43	41	42	40	40	42	44	44	45	2.2%	1.7%
	Energy consumption intensity index ☆	Base year: FY2013			1.00	0.97	0.94	0.96	0.91	0.90	0.91	0.93	0.90	0.90	-10.1%	-0.6%
	Production activity index				1.00	0.99	1.00	1.00	1.00	1.01	1.05	1.08	1.11	1.14	13.6%	2.3%
Japan Internet Providers Association	CO2 emissions (actual emissions)						6	5	8	5	5	5	3	3		-8.2%
	CO2 emissions (post-adjustment)						6	5	8	5	5	5	3	3		-8.7%
	CO2 emission intensity index (actual emissions)						1.00	0.80	1.06	0.66	1.00	0.53	0.30	0.27		-10.8%
	CO2 emission intensity index (post-adjustment)						1.00	0.80	1.06	0.66	1.01	0.53	0.31	0.27		-11.2%
	Energy consumption						3	3	4	3	3	3	2	2		-8.9%
	Energy consumption intensity index ☆	Base year: FY2015					1.00	0.83	1.14	0.75	1.19	0.63	0.37	0.33		-11.4%
	Production activity index						1.00	1.14	1.27	1.43	0.91	1.59	1.71	1.76		2.8%
Japan Leasing Association	CO2 emissions (actual emissions) ☆			1.0	0.9	1.8	1.7	1.6	1.5	1.4	1.4	1.4	0.8	0.7	-19.7%	-3.5%
	CO2 emissions (post-adjustment)			1.0	0.9	1.8	1.7	1.6	1.5	1.4	1.4	1.4	0.8	0.7	-19.5%	-3.9%
	CO2 emission intensity index (actual emissions)	Base year: FY2013		0.97	1.00	1.05	0.97	0.88	0.84	0.78	0.75	0.74	0.55	0.52	-48.0%	-5.8%
	CO2 emission intensity index (post-adjustment)			0.97	1.00	1.05	0.96	0.88	0.84	0.78	0.75	0.75	0.56	0.52	-47.9%	-6.2%
	Energy consumption			0.6	0.4	0.8	0.8	0.8	0.8	0.7	0.8	0.7	0.4	0.4	3.4%	-4.1%
	Energy consumption intensity index	Base year: FY2013		1.32	1.00	1.08	1.03	0.96	0.96	0.94	0.94	0.95	0.72	0.67	-33.0%	-6.4%
	Production activity index			1.11	1.00	1.84	1.94	2.03	2.02	1.97	2.03	1.99	1.51	1.54	54.4%	2.5%
Revisions	CO2 emissions (actual emissions)															
	CO2 emissions (post-adjustment)															
	Energy consumption															
Total *1	CO2 emissions (actual emissions)		171	1,072	2,739	2,257	2,099	1,921	1,769	1,651	1,927	1,514	1,846	1,863	-32.0%	0.9%
	CO2 emissions (post-adjustment)		171	1,072	2,739	2,254	2,088	1,914	1,766	1,657	1,931	1,521	1,858	1,862	-32.0%	0.2%
	Energy consumption		106	621	1,185	998	961	905	868	860	1,039	828	1,020	1,023	-13.7%	0.3%

*1 Intensity indices have been calculated by having each industry set a base year, the figure for which is used as 1. Unless otherwise specified in remarks, the base year is fiscal 1990.
*2 The rate of change from fiscal 2013 to fiscal 2021 is calculated except for industries with no data for fiscal 2013.

4. Transportation Sector

10,000t-CO_2; 10,000kl crude oil equivalent; fiscal year

Industry	(*1) (☆: target adopted by the industry)	Note	1990	2005	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Relative to FY2005	Relative to FY2013	Relative to previous FY
The Japanese Shipowners' Association	CO2 emissions (actual emissions)		3,856	5,574	5,539	5,417	5,215	5,258	5,402	3,266	4,563	4,024	3,710	3,685	-33.9%	-33.5%	-0.7%
	CO2 emissions (post-adjustment)		3,856	5,574	5,539	5,417	5,215	5,258	5,402	3,266	4,563	4,024	3,710	3,685	-33.9%	-33.5%	-0.7%
	CO2 emission intensity index (actual emissions)		1.00	0.88	0.62	0.57	0.59	0.61	0.61	0.63	0.69	0.65	0.62	0.69	-21.0%	12.5%	11.1%
	CO2 emission intensity index (post-adjustment) ☆		1.00	0.88	0.62	0.57	0.59	0.61	0.61	0.63	0.69	0.65	0.62	0.69	-21.0%	12.5%	11.1%
	Energy consumption		1,393	2,012	1,931	1,889	1,821	1,836	1,887	1,140	1,594	1,405	1,296	1,287	-36.0%	-33.3%	-0.7%
	Energy consumption intensity index		1.00	0.88	0.59	0.55	0.57	0.59	0.59	0.61	0.67	0.63	0.60	0.67	-23.6%	12.7%	11.1%
	Production activity index		1.00	1.65	2.33	2.48	2.28	2.22	2.31	1.34	1.71	1.61	1.54	1.38	-16.3%	-40.9%	-10.6%
Japan Trucking Association	CO2 emissions (actual emissions)			4,720	4,079	4,100	4,091	4,068	4,087	4,104	4,044	3,874	4,114	4,000	-15.3%	-1.9%	-2.8%
	CO2 emissions (post-adjustment)			4,720	4,079	4,100	4,091	4,068	4,087	4,104	4,044	3,874	4,114	4,000	-15.3%	-1.9%	-2.8%
	CO2 emission intensity index (actual emissions)	Base year: 2005		1.00	0.91	0.93	0.96	0.93	0.93	0.93	0.90	1.03	1.04	1.00	-0.1%	9.6%	-4.1%
	CO2 emission intensity index (post-adjustment) ☆			1.00	0.91	0.93	0.96	0.93	0.93	0.93	0.90	1.03	1.04	1.00	-0.1%	9.6%	-4.1%
	Energy consumption			1,776	1,527	1,534	1,531	1,523	1,530	1,536	1,514	1,450	1,540	1,497	-15.7%	-1.9%	-2.8%
	Energy consumption intensity index	Base year: 2005		1.00	0.91	0.93	0.96	0.93	0.92	0.93	0.89	1.02	1.04	0.99	-0.6%	9.6%	-4.1%
	Production activity index			1.00	0.95	0.93	0.90	0.93	0.93	0.93	0.95	0.80	0.84	0.85	-15.2%	-10.5%	1.4%
The Scheduled Airlines Association of Japan	CO2 emissions (actual emissions)		1,718	2,667	2,152	2,248	2,320	2,438	2,536	2,487	2,539	1,260	1,703	2,112	-20.8%	-1.9%	24.0%
	CO2 emissions (post-adjustment)		1,718	2,667	2,152	2,248	2,320	2,438	2,536	2,487	2,539	1,260	1,703	2,112	-20.8%	-1.9%	24.0%
	CO2 emission intensity index (actual emissions)	Base year: 2013	1.19	1.13	1.00	0.94	0.94	0.92	0.89	0.92	0.92	1.06	1.03	0.96	-15.3%	-4.1%	-7.4%
	CO2 emission intensity index (post-adjustment) ☆		1.19	1.13	1.00	0.94	0.94	0.92	0.89	0.92	0.92	1.06	1.03	0.96	-15.3%	-4.1%	-7.4%
	Energy consumption		660	1,026	814	850	878	922	959	941	961	477	644	799	-22.1%	-1.9%	24.0%
	Energy consumption intensity index	Base year: 2013	1.21	1.15	1.00	0.94	0.94	0.92	0.89	0.92	0.92	1.06	1.03	0.96	-16.6%	-4.1%	-7.4%
	Production activity index		0.67	1.10	1.00	1.11	1.15	1.23	1.33	1.26	1.28	0.55	0.76	1.02	-6.5%	2.4%	33.9%
Japan Federation of Coastal Shipping Associations	CO2 emissions (actual emissions)		858	789	722	726	704	713	703	707	700	666	700	713	-9.7%	-1.3%	1.8%
	CO2 emissions (post-adjustment) ☆		858	789	722	726	704	713	703	707	700	666	700	713	-9.7%	-1.3%	1.8%
	CO2 emission intensity index (actual emissions)	Base year: FY2013	1.00	1.04	1.09	1.11	1.09	1.11	1.09	1.10	1.15	1.21	1.21	1.22	17.3%	11.9%	1.2%
	CO2 emission intensity index (post-adjustment)		1.00	1.04	1.09	1.11	1.09	1.11	1.09	1.10	1.15	1.21	1.21	1.22	17.3%	11.9%	1.2%
	Energy consumption		314	288	255	256	249	252	248	250	248	236	248	253	-12.1%	-0.7%	1.9%
	Energy consumption intensity index	Base year: FY2013	1.00	1.04	1.06	1.07	1.05	1.07	1.05	1.07	1.11	1.17	1.17	1.19	14.2%	12.6%	1.4%
	Production activity index		1.00	0.88	0.77	0.76	0.75	0.75	0.75	0.75	0.71	0.64	0.67	0.68	-23.0%	-11.8%	0.5%
The Association of Japanese Private Railways	CO2 emissions (actual emissions) ☆				260	250	242	234	224	207	196	188	181	179		-31.2%	-1.1%
	CO2 emissions (post-adjustment)				260	250	241	233	224	207	197	189	182	179		-31.0%	-1.5%
	Energy consumption				112	111	111	110	110	108	107	104	101	99		-11.4%	-1.8%
	Energy consumption intensity index	Base year: FY2013			1.00	0.98	0.98	0.98	0.97	0.95	0.94	0.91	0.90	0.91		-8.9%	1.1%
	Production activity index				1.00	1.00	1.01	1.01	1.01	1.01	1.02	1.02	1.00	0.97		-2.7%	-2.9%
East Japan Railway Company	CO2 emissions (actual emissions)	Base year: FY2013			234	224	216	220	215	209	201	196	186	187		-20.1%	0.5%
	CO2 emissions (post-adjustment)				215	223	216	218	212	206	199	194	183	184		-14.4%	0.5%
	Energy consumption ☆	100 million MJ			517	511	508	502	506	495	480	473	465	463		-10.4%	-0.4%
	Energy consumption intensity index	(Shinkansen)			2.49	2.51	2.45	2.44	2.44	2.41	2.39	2.31	2.34	2.42		-2.8%	3.4%
	Production activity index	(Shinkansen)			1.00	1.04	1.12	1.13	1.15	1.18	1.16	1.13	1.07	1.02		2.0%	-4.7%
	Energy consumption intensity index	(Conventional Lines)			1.59	1.55	1.50	1.49	1.50	1.50	1.49	1.47	1.48	1.49		-6.3%	0.7%
	Production activity index	(Conventional Lines)			1.00	1.00	1.01	1.00	1.00	1.00	1.00	0.99	0.98	0.97		-3.0%	-1.0%
West Japan Railway Company	CO2 emissions (actual emissions)			151	185	182	177	172	165	149	145	137	132	134	-11.3%	-27.8%	1.4%
	CO2 emissions (post-adjustment) ☆			151	185	181	176	171	164	150	146	137	133	134	-11.1%	-27.6%	0.9%
	CO2 emission intensity index (actual emissions)	Base year: FY2013		0.87	1.00	0.97	0.93	0.90	0.86	0.78	0.75	0.74	0.74	0.74	-15.0%	-26.2%	-0.5%
	CO2 emission intensity index (post-adjustment)			0.87	1.00	0.97	0.93	0.90	0.86	0.79	0.75	0.75	0.75	0.74	-14.8%	-26.0%	-1.0%
	Energy consumption			86	79	80	80	80	80	77	78	74	72	73	-15.0%	-8.2%	0.7%
	Energy consumption intensity index	Base year: FY2013		1.15	1.00	1.00	0.99	0.98	0.97	0.94	0.94	0.94	0.95	0.94	-18.6%	-6.1%	-1.1%
	Production activity index			0.94	1.00	1.01	1.03	1.03	1.04	1.03	1.05	0.99	0.96	0.98	4.3%	-2.2%	1.9%
Shikoku Railway Company	CO2 emissions (actual emissions) ☆		9	8	8	8	8	8	7	7	7	7	6	7	-17.8%	-14.1%	7.3%
	CO2 emissions (post-adjustment)		9	8	8	8	8	8	7	7	7	7	6	7	-17.7%	-14.0%	7.1%
	CO2 emission intensity index (actual emissions)	Base year: FY2013	1.18	0.93	1.00	0.98	0.96	0.95	0.92	0.89	0.87	0.85	0.83	0.91	-2.0%	-9.3%	8.6%
	CO2 emission intensity index (post-adjustment)		1.18	0.93	1.00	0.98	0.96	0.95	0.92	0.89	0.87	0.85	0.84	0.91	-1.9%	-9.2%	8.4%
	Energy consumption		4	4	3	3	3	3	3	3	3	3	3	3	-18.6%	-5.3%	6.5%
	Energy consumption intensity index	Base year: FY2013	1.22	1.03	1.00	0.99	0.98	0.99	0.98	0.96	0.96	0.94	0.93	1.00	-3.0%	0.0%	7.8%
	Production activity index		1.00	1.13	1.00	0.99	1.00	1.01	1.01	0.97	0.99	0.97	0.96	0.95	-16.1%	-5.3%	-1.2%
Central Japan Railway Company	CO2 emissions (actual emissions) ☆				168	163	161	156	150	140	136	127	124	128		-23.6%	3.7%
	CO2 emissions (post-adjustment)				168	163	160	156	150	140	136	128	124	128		-23.4%	3.2%
	CO2 emission intensity index (actual emissions)	Base year: FY2013			1.00	0.96	0.92	0.87	0.83	0.77	0.74	0.75	0.75	0.73		-26.7%	-1.9%
	CO2 emission intensity index (post-adjustment)				1.00	0.95	0.91	0.87	0.83	0.77	0.74	0.76	0.75	0.73		-26.5%	-2.3%
	Energy consumption				72	72	73	73	73	72	73	69	68	70		-2.9%	3.1%
	Energy consumption intensity index	Base year: FY2013			1.00	0.98	0.97	0.95	0.94	0.92	0.92	0.95	0.96	0.93		-6.8%	-2.5%
	Production activity index				1.00	1.02	1.05	1.07	1.07	1.09	1.10	1.00	0.99	1.04		4.2%	5.7%
All Japan Freight Forwarders Association	CO2 emissions (actual emissions) ☆	Base year: FY2009		14	13	13	13	12	12	12	12	11	11	11	-22.8%	-15.9%	-0.6%
	CO2 emissions (post-adjustment)			14	13	13	13	12	12	12	12	11	11	11	-22.8%	-15.9%	-0.6%
	Energy consumption			5	5	5	5	5	5	5	5	4	4	4	-23.2%	-15.9%	-0.6%
	Production activity index			1.13	1.06	1.06	1.09	1.08	1.10	1.00	1.02	0.93	0.91	0.90	-20.3%	-14.8%	-0.9%
Revisions *2	CO2 emissions (actual emissions)				109	105	102	96	93	79	81	77	74	74		-32.1%	-0.1%
Total *3	CO2 emissions (actual emissions)		6,442	13,924	13,469	13,436	13,247	13,375	13,595	11,367	12,625	10,566	10,941	11,230	-19.3%	-16.6%	2.6%
	CO2 emissions (post-adjustment)		6,442	13,924	13,450	13,434	13,244	13,370	13,590	11,366	12,625	10,566	10,941	11,228	-19.4%	-16.5%	2.6%
	Energy consumption		2,372	5,197	5,362	5,357	5,304	5,350	5,445	4,666	5,103	4,334	4,481	4,588	-11.7%	-14.4%	2.4%

*1 Intensity indices have been calculated by having each industry set a base year, the figure for which is used as 1. Unless otherwise specified in remarks, the base year is fiscal 1990.
*2 The total value of closed participant companies (West Japan Railway Company, Kyushu Railway Company, Japan Freight Railway Company) lists it in Revisions.
*3 The rate of change from fiscal 2005 to fiscal 2021 is calculated except for industries with no data for fiscal 2005.