

Creating "Social Value" —Environment—

Contribution to Global Environment Preservation



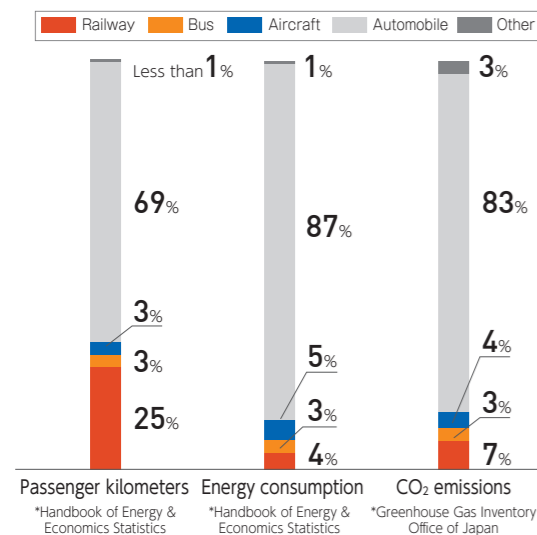
*Based on the Japanese government's policy to achieve carbon neutrality by 2050

Environmental superiority of railways

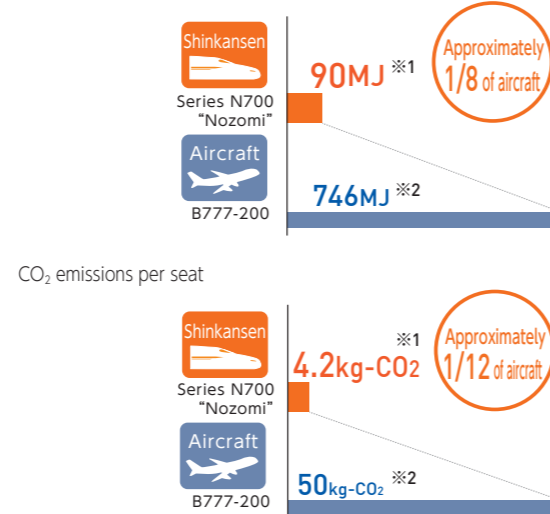
The problem of global warming is an issue that should be addressed on a global scale. As CO2 accounts for the largest emissions among greenhouse gases and is thus considered to have the largest impact on global warming, railways have the outstanding characteristic of being highly energy efficient compared to other transportation modes and having minimal adverse impact on the global environment. Railways account for only 7% of CO2 emissions despite undertaking 25% of Japan's overall passenger transport volume. Compared to an aircraft (B777-200), the Tokaido Shinkansen (Series N700 "Nozomi") consumes approximately one-eighth of the amount of energy per seat when traveling between Tokyo and Osaka and discharges about one-twelfth of the CO2 emissions, proving that the Tokaido Shinkansen has overwhelming environmental superiority. JR Central believes that having as many passengers as possible opt to use railway services, which have a smaller environmental impact than other modes of transport, will mitigate the load placed on the environment across the entire transportation sector and contribute to global environment preservation.

Comparison of the Tokaido Shinkansen and aircraft (between Tokyo and Osaka)
Energy consumption per seat
CO2 emissions per seat

Distribution of passenger transportation share, in terms of transportation volume, energy consumption, and CO2 emissions



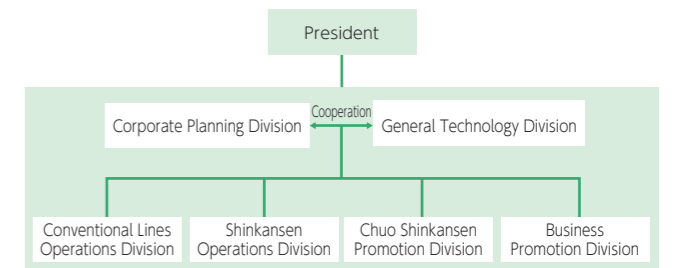
*The items in the breakdown may not add up to 100% due to rounding.
Source: Handbook of Energy & Economics Statistics (2020) for transportation volume and energy consumption. 2020 data from the National Institute for Environmental Studies, Greenhouse Gas Inventory Office of Japan for CO2 emissions.



※1 Calculation based on running performance (by JR Central) of Series N700 "Nozomi" (Tokyo - Shin-Osaka).
※2 Calculated by JR Central for B777-200 (Haneda - Itami/Kansai Airport) using ANA's "Annual Report 2011" for reference.

Promotion structure

JR Central promotes initiatives for global environment preservation through a structure headed by the President, under which the Corporate Planning Division and the General Technology Division, in charge of the management units and technology units respectively, cooperate to formulate policies for efforts to achieve carbon neutrality, resource recycling and biodiversity, as well as policies for technological development, and the Operations Divisions of the two railway businesses, the Chuo Shinkansen Promotion Division and the Business Promotion Division roll out the specific efforts.



Guidelines

Environmental Action Guidelines

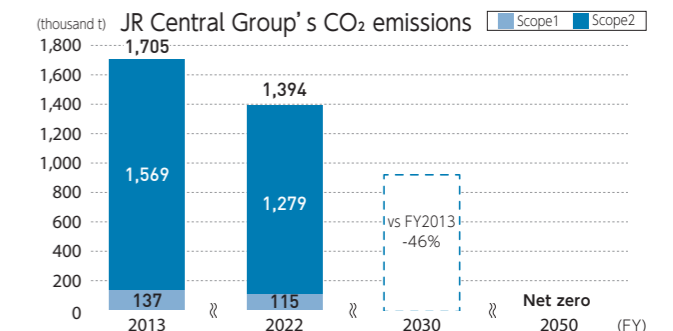
JR Central has established a set of Environmental Action Guidelines consisting of the following seven items as part of its engagement in global environment preservation.

- 1 Provide comfortable transportation services to promote further use of railways, which are superior in terms of global environment preservation
- 2 Promote technological development that contributes to global environment preservation
- 3 Use fuel and energy efficiently
- 4 Promote waste control and recycling
- 5 Appropriately manage chemical substances
- 6 Procure environmentally friendly goods and materials
- 7 Contribute to society and raise awareness for global environment preservation

Goals toward carbon neutrality

With global environmental conservation as a key management theme, we have been constantly enhancing the environmental superiority of railways, which are more energy efficient and have less environmental impact than other modes of transportation, by proactively adopting energy-saving rolling stock and equipment.

Additionally, we strive to further reduce CO2 emissions to achieve carbon neutrality in 2050. On the basis of the Japanese government's 2050 carbon-neutrality policy, JR Central and the JR Central Group aim to achieve net zero CO2 emissions in 2050 as well as reduce CO2 emissions in FY2030 by 46% from FY2013 levels.



Contribution to global environment preservation and the achievement of a decarbonized society

Of the 1.25 million tons of CO2 emitted by JR Central, approximately 95% is indirectly emitted through our use of electricity, while the remaining 5% is directly emitted through our use of fuels, etc. To address the 5% direct emissions from the use of fuels, we introduced the Series HC85 with reduced environmental impact and promote tests on biofuels. In addition, we have begun conducting simulated running tests combining railcar driving test equipment and hydrogen supply equipment for the development of hydrogen-powered railcars and will continue to conduct research on battery railcars. To address the indirect emissions from the use of

electricity, which account for the remaining 95% of the total, we will work to utilize renewable energy while making further energy-saving efforts, such as introducing additional energy-efficient rolling stock, including the N700S and Series 315, and replacing frequency converters for the Tokaido Shinkansen one by one with types with lower power loss, in addition to promoting decarbonization efforts across the entire power generation sector in Japan.

We also endorsed the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD)* in May 2021, based on which we are analyzing the risks and opportunities

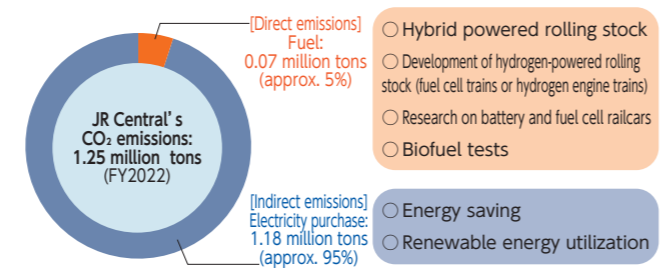
Contribution to Global Environment Preservation

related to climate change so that we can utilize them for stable business operations over the long term. We have so far disclosed qualitative information on the four elements specified by the TCFD as well as the results of a quantitative analysis on facility damage of the Tokaido Shinkansen due to flooding. In addition, we completed the analysis of revenue decreases of the Tokaido Shinkansen due mainly to suspension of service, which we disclosed recently. Going forward, we will continue to add depth to our risk analyses and consider strengthening our facilities to prepare against natural disasters.

Furthermore, we will cooperate with external companies and organizations to contribute to the preservation of the global environment and achievement of a decarbonized

society by further enhancing the environmental superiority of railways through new technologies and initiatives that contribute to the reduction of environment impact.

Initiatives to reduce CO₂ emissions

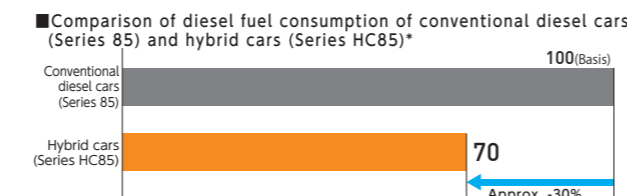


*Refer to pages 23-24 for information on the TCFD.

Initiatives to reduce direct CO₂ emissions

Hybrid powered rolling stock

We developed the new, hybrid-powered limited express Series HC85 as a successor to the Series 85 diesel railcars used for our limited express trains "Hida" and "Nanki" and completed its introduction process in July 2023. The Series HC85 achieves an approximately 30% reduction in diesel fuel consumption and CO₂ emissions and an approximately 40% reduction in NO_x emissions in comparison to the Series 85 diesel railcars by making use of the power stored in the batteries when accelerating and stopping.

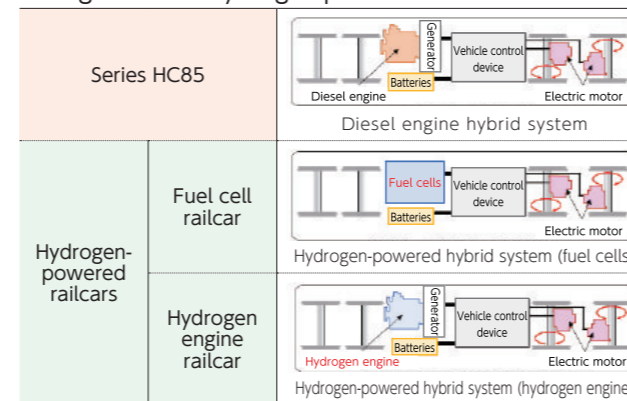


*Based on a simulated run from Nagoya to Toyama at the maximum speed of 120 km/h

Development of hydrogen-powered rail cars and research on battery railcars

We have been working to develop hydrogen-powered railcars as a way of reducing CO₂ emissions from diesel railcars to net zero. We aim to use, as a power source, fuel cells or hydrogen engines, which use hydrogen as fuel, instead of diesel engines that use light oil as fuel, aiming to introduce a hydrogen-powered hybrid system that runs on electricity obtained from this and electricity from batteries. In order to test the performance of railcars powered by fuel cells or hydrogen engines and their suitability for our long-distance, nonelectrified routes with many mountainous areas, we began simulated running tests that combine railcar driving test equipment and hydrogen supply equipment in November 2023. We have also been conducting research on battery railcars, which are equipped with a large running battery and can run on sections where there are no overhead wires.

Configuration of hydrogen-powered railcars



*Vehicle control device: A device that controls the operation of the electric motor by appropriately combining the output of fuel cells or a hydrogen engine and charging and discharging of batteries.

Biofuel tests

With regard to biofuels, we are conducting demonstration tests with the Railway Technical Research Institute and other JR companies for the introduction of biofuel under the "demonstration and evaluation of next-generation biodiesel fuel for railway

vehicles," a technological development project of the Railway Technology Development and Promotion Framework by the Ministry of Land, Infrastructure, Transport and Tourism. JR Central is in charge of testing the performance of diesel engines alone.

Initiatives to reduce indirect CO₂ emissions

Energy-saving - Introduction of energy-conserving rolling stock -

We are actively developing and introducing energy-conserving rolling stock in an effort to further reduce the Tokaido Shinkansen's energy consumption. We have been

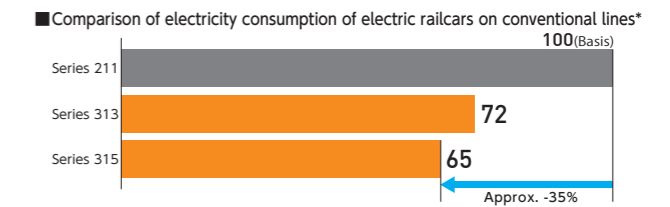
introducing the N700S since FY2020 to replace Series N700, with a plan to introduce 59 trainsets by FY2026.

The N700S consumes 7% less electricity than the N700A

type*¹ thanks to its silicon carbide semiconductor drive system, lighter car body, reduced running resistance, and other features. As a result, the unit energy consumption*² as of the end of FY2022 decreased by approximately 32% from what it was in FY1990.

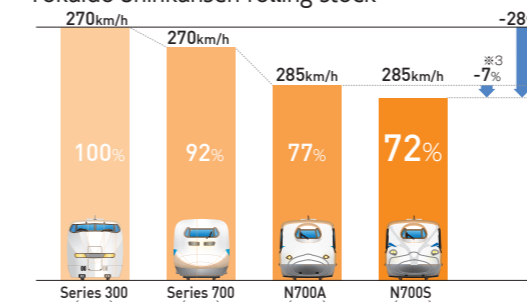
JR Central has also been striving to reduce the energy consumption of rolling stock on conventional lines. We have been introducing the new type commuter train Series 315 since FY2021 to replace Series 211, with a plan to introduce 352 cars by FY2025. With further improvements made in energy efficiency through the use of silicon carbide for the power converter, the Series 315 consumes approximately 35% less electricity than the Series 211.

*¹ Generic name of N700A and the Series N700 (enhanced version)
*² JR Central defines unit energy consumption as the amount of energy consumed when running one car for one kilometer, as total rolling stock kilometers is the value that is the most relevant to its business activities.



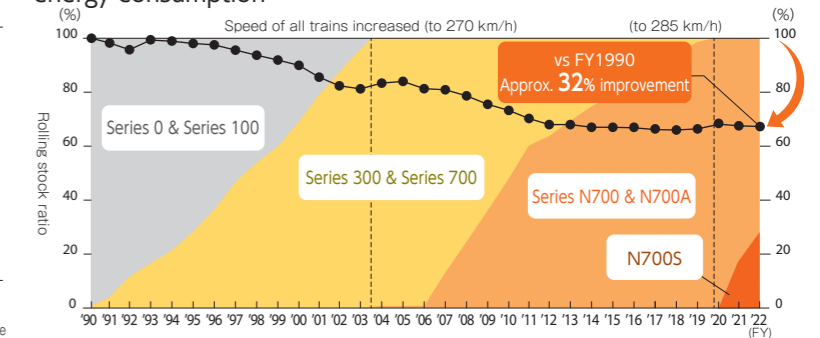
*Based on a simulated run from Toyohashi to Ogaki and from Nagoya to Nakatsugawa at the maximum speed of 120 km/h (rapid operation)

Comparison of electricity consumption by type of Tokaido Shinkansen rolling stock



Notes: 1. Based on a simulated run from Tokyo to Shin-Osaka at the maximum speed listed above
2. Figures in parentheses represent the year in which the series was introduced.
3. Includes the effect of optimization of air conditioning control method

Trend of the ratio of Tokaido Shinkansen rolling stock and unit energy consumption



Energy-saving - Facility improvement -

On the Tokaido Shinkansen, frequency converters are installed in sections east of the Fuji River to convert the 50Hz electricity received from the power company into the 60Hz electricity required for the Shinkansen to run. In the period from FY2021 to FY2027, two units of conventional, rotating-type frequency converters at Nishi-Sagami were replaced with stationary-type units with less power loss. In addition, the development of technology to suppress instantaneous large

currents caused by ground faults in overhead wires and to avoid overloads caused by train schedule disruptions, etc. has made it possible to make all frequency converters stationary. We plan to replace the two Tsunashima units with stationary types by the end of 2037. These replacements are expected to reduce electricity consumption by approximately 80 million kWh per year.

Renewable energy utilization

Of our facilities, the SCMAGLEV and Railway Park and the Hamamatsu Workshop have installed solar power generation systems. The systems generate power of approximately 450,000 kW per year each at the respective facilities. In addition, since FY2022, we have been working to achieve net zero CO₂ emissions of electric railcars on the Taketoyo Line by purchasing and using FIT non-fossil fuel energy certificates*¹ worth approximately 2 million kWh, the annual electricity volume used for the operation of electric railcars on this line, from Electric Power Development Co., Ltd.

In 2024, we plan to begin the work to install a solar power generation system that uses the Tokaido Shinkansen's trackside slopes. The maximum output of 2.7MW is planned, using trackside slopes suitable for solar power generation along the Tokaido Shinkansen (Shin-Yokohama - Nagoya). The power

*¹ The FIT non-fossil fuel energy certificate is a certificate of the non-fossil fuel energy value of the renewable electricity purchased under the FIT (Feed-in Tariff) system.
*² This plan is subject to change depending on the environment along railway lines, geological conditions, etc.

output, of approximately 2.7 million kWh annually, equivalent to the power requirement of approximately 650 ordinary households, will be used mainly at nearby Shinkansen stations*².



Solar power generation using the Shinkansen trackside slope (trial installation)

➤ Contribution to Global Environment Preservation

➤ Initiatives on resource recycling

JR Central strives to recycle resources, promoting "three Rs" (reduce, reuse and recycle) initiatives, including

reducing waste discharge from construction work, utilizing rainwater, reusing uniforms, and recycling train tickets.

Recycled aluminum from Tokaido Shinkansen rolling stock

Recycled aluminum made by removing impurities from scrapped Tokaido Shinkansen train cars is molded and processed for intended purposes and reused in a variety of products. The N700S car uses recycled aluminum for interior parts. As we have ensured reliability and quality as a car body material, by establishing an aluminum sorting process, we will use recycled aluminum in parts of the car body that require strength in the future. In addition, we provide recycled aluminum as an interior construction material for the Shin-

Yoko Gateway Spot waiting room at Sagami Railway and Tokyu Railways Shin-Yokohama Station and jointly developed a metal baseball bat for children with Mizuno Corporation. Another plan is to use it for the Iida Line Shimoji Station building, which is scheduled to be rebuilt in the second half of FY2023. Recycled aluminum from Tokaido Shinkansen rolling stock can reduce CO₂ emissions from the production process by 97% compared to newly manufacturing regular aluminum, reducing environmental impact.



Manufacturing process and usage examples (metal bats and station building) of Recycled aluminum from Tokaido Shinkansen rolling stock
*Images in ② and ④ courtesy of SUS Corporation, and image of bats, of Mizuno Corporation

Tokaido Shinkansen upcycling

We process fabric from Tokaido Shinkansen seats and uniforms that had previously been discarded and use it in an "upcycling" project to recycle it into new products. In addition to recycling the fabric from seats removed in vehicle inspection and maintenance work into products such as slippers, we recycle old customer-service uniforms replaced with new ones into products such as mini shoulder bags.



Moquette slippers

Mini shoulder bag

Reuse of lead-acid batteries for level crossings

On conventional lines, we annually replace a certain number of lead-acid batteries installed in level crossing facilities as a backup power supply in case of power outages. We began in June 2023 to test a process for recycling and reusing used lead-acid batteries at some level crossing facilities, using Rent Corporation's lead-acid battery recycling technology. If the required performance and durability are confirmed through

the tests, we plan to gradually introduce recycled lead-acid batteries, which will contribute to not only the reduction of waste but also the reduction of CO₂ emissions. We note that CO₂ emissions from recycling lead-acid batteries can be reduced to levels more than 90% lower than CO₂ emissions from manufacturing them.

Sustainability initiatives at hotels

JR Tokai Hotels Co., Ltd. is striving to reduce the amount of plastic products it provides, such as by providing paper straws and take-out tableware made from alternative materials. In addition, Hotel Associa Takayama Resort has registered as Takayama City's "Hida Takayama SDGs Partner" and is contributing to the reduction of food

waste by developing Hamburg steak that uses scraps of Hida beef and menu items that incorporate locally sourced ingredients.



Tableware made from alternative materials

Sustainable public procurement

JR Central implements a green procurement policy, prioritizing the procurement of environmentally friendly materials. To this end, we established the JR Central Green

Procurement Guidelines to enhance coordination with our suppliers and work with them to contribute towards global environment preservation.

URL https://company.jr-central.co.jp/company/material_procurement/_pdf/green_guide_line.pdf

➤ Conservation of biodiversity and coexistence with local communities

In order to reduce the impact of our business activities on ecosystems and contribute to local communities, we are working to conserve biodiversity in cooperation with external companies and organizations.

For example, in order to promote the conservation of the natural environment of the Southern Alps, we engage in the following initiatives to support local residents' efforts to conserve alpine plants and improve forests.

Conservation of alpine flora

In Japan's Southern Alps, there has been the issue of loss of flower fields due to deer depredation and sediment discharge, among others. In Nagano Prefecture, the Southern Alps Counter-Depredation Association has been implementing measures to protect alpine flora by installing deer-proof fencing and capturing Japanese deer, among other measures. JR Central entered into a Biodiversity Partnership Agreement

with the Southern Alps Counter-Depredation Association and Nagano Prefecture in March 2022 to provide partial support for the expenses necessary for alpine plant conservation activities conducted by the Association, which has contributed to the expansion of the protected area. In addition, our employees take part in the work to install deer-proof fences.

Forest maintenance

In the areas centered around the Southern Alps UNESCO Eco Park, JR Central is supporting the efforts of the local communities to maintain forests. In January 2023, we newly entered into a Forest Maintenance Agreement with the municipality of Hayakawacho and the Hayakawacho Forest Owner's Cooperative in Yamanashi Prefecture and in June 2023, a Forest Foster Parent Agreement with the Kamiina Forest Association, etc. in Ina, Nagano Prefecture.

We currently engage in support activities in four locations, including Fujikawacho, Yamanashi Prefecture, and Ooshikamura, Nagano Prefecture where we signed similar agreements in 2022. We aim to continue the effort to "protect, utilize and nurture" the natural environment of the Southern Alps as a whole, together with the people in the local communities involved.

➤ Initiatives on compliance with laws and regulations

As part of our efforts to preserve the global environment, we annually conduct compliance surveys of all workplaces to ensure compliance with various environmental laws and regulations and appropriately manage chemical substances,

etc. Furthermore, we conduct internal audits to confirm the compliance status of each workplace and provide feedback on the results in an effort to ensure thorough compliance.

Contribution to Global Environment Preservation

Management of chemical substances

Based on the PRTR system* under the Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof (Pollutant Release and Transfer Register Law), we report the amount of emissions and transfer of relevant substances and manage those substances appropriately.

Furthermore, while we had been using oil-based paint containing volatile organic compounds (VOC) for full body painting of trains on the Shinkansen and conventional lines, we introduced the country's first water-based paint coating

* A system whereby business operators identify the amount of chemical substances that may be harmful to human health or the ecosystem that are released from their business sites into the environment (air, water and soil) and are transferred outside of business sites as part of waste and report it to the national government. The government then tabulates and discloses the amounts released and transferred based on such reported data and estimates.

robot for the Shinkansen in our Hamamatsu Workshop in 2017, enabling environmentally friendly water-based painting. We also introduced the country's first water-based paint coating robot for the front of trains on conventional lines in the Nagoya Workshop in 2020, enabling water-based painting of some bodies.



Train body painting

Measures against pollution

As measures against water contamination and air pollution, we strive to prevent pollution by installing devices to treat waste water left after washing vehicles and burners that reduce the generation of NOx and conducting regular measurement. In addition, as measures against soil contamination, we submit a report to the

relevant organizations should any substances exceeding the standard value set be detected in soil surveys conducted at the time of landform changes or land sale, and we will take appropriate measures as instructed by laws and regulations and the administrative authorities.

Cooperation with external entities

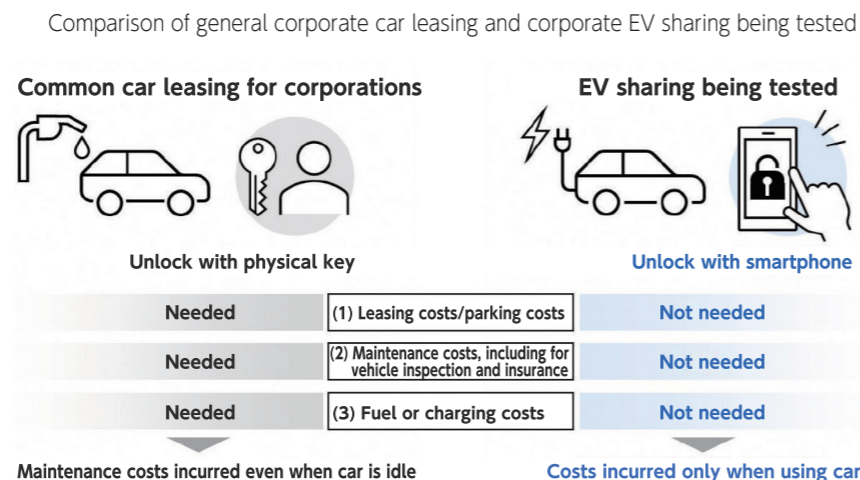
Environmental Partnership Organizing Club (EPOC)

EPOC is a group that was established in 2000 mainly by the industry sector in the Chubu region, with the aim of building a sustainable economy and society by leveraging the environmental achievements of companies. (Please see EPOC's website for more details.)

We joined EPOC in FY2002 and are currently involved in the operation of the organization as a core company. We will continue to contribute to global environment preservation through EPOC in cooperation with member companies, among others.

Joint project to test "EV sharing for corporations" at Toyohashi Station

Since July 2023, JR Central has been working with ENEOS Corporation on a project to test an EV sharing service for companies at a parking lot in front of Toyohashi Station.



In this testing project, we are verifying a business model that reduces vehicle ownership costs and reduces global environmental impact through reduction in CO2 emissions by replacing corporate vehicles used in business activities with EV sharing. We are inviting local businesses that support our purpose to participate, contributing to each company's efforts to reduce their environmental impact, and working to strengthen collaboration with the local community.

We will look into the possibility of expanding the joint project of testing an EV sharing service.

Environment-related data

Activity status and environmental accounting for FY2022

The investments, costs, and their principal effect involved in environment preservation activities during FY2022 are estimated as listed below.

Environmental accounting

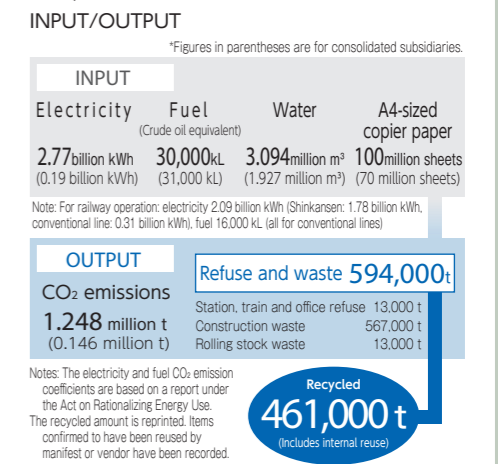
Category	Main Initiatives	Environment preservation cost (100 million yen) #1		Notes
		Investment	Expenses	
Global environment preservation cost	<ul style="list-style-type: none"> Introduction of energy-conserving rolling stock Improved energy-efficiency at stations and office buildings 	1048.1	6.0	<ul style="list-style-type: none"> Percentage of energy-conserving rolling stock: 100% (Shinkansen electric railcars, 100% conventional line electric railcars and diesel railcars) New production of Shinkansen N700S rolling stock New production of conventional-line Series 315 and Series HC65 rolling stock
Research and development cost	<ul style="list-style-type: none"> Development of energy-conserving rolling stock Development related to environment preservation along railway lines 	0.0	116.8	<ul style="list-style-type: none"> Energy consumption by N700S: -28% (vs Series 300)* *Comparison between Series 300 (traveling at 270 km/h) and the N700S (traveling at 285 km/h)
Resource recycling cost	<ul style="list-style-type: none"> Proper disposal and recycling of station and train refuse Proper disposal and recycling of items generated from workshops and construction work 	0.3	73.7	<ul style="list-style-type: none"> Recycle rate of Shinkansen rolling stock: Approximately 90% Recycle rate of uniforms: Basically 100%
Environment conservation cost	<ul style="list-style-type: none"> Countermeasures against noise and vibration along railway lines Proper management of environmentally hazardous substances 	82.0	54.7	<ul style="list-style-type: none"> Protection of the environment along railway lines by modifying noise-blocking walls and increasing their height, shaving rail surfaces, etc.
Total#2		1130.4	251.5	

[Approach to environment preservation cost] #1. Fractions below 10 million yen are omitted. #2. Totals do not add up due to rounding.

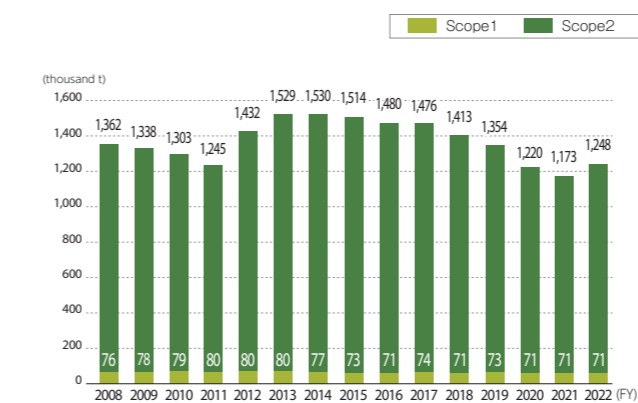
- Compilation is applicable only to JR Central.
- The applicable period is April 1, 2022 to March 31, 2023.
- "Environmental Accounting Guidelines 2005," a publication of the Ministry of the Environment, was consulted with regard to aspects of style.
- Depreciation is not included in the calculations for expenditures.
- In the event of multiple-purpose expenditures, the full amount with greater environment preservation effect is included in the calculation.

Environmental load in business activities

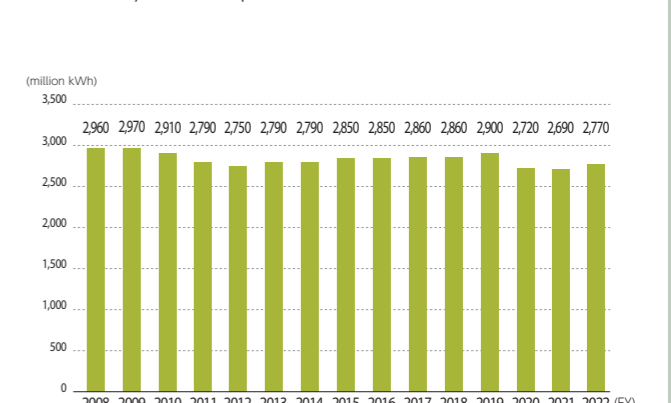
The main resources and energy consumed as well as waste generated in JR Central's business activities during the year FY2022 are as shown below.



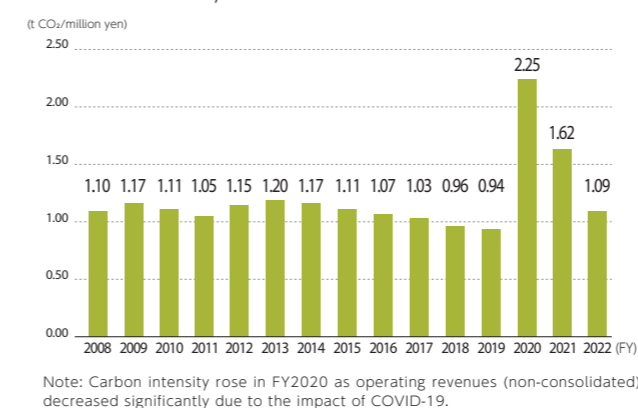
CO₂ emissions



Electricity consumption



Carbon intensity



Amount of water used

