

# Global environment



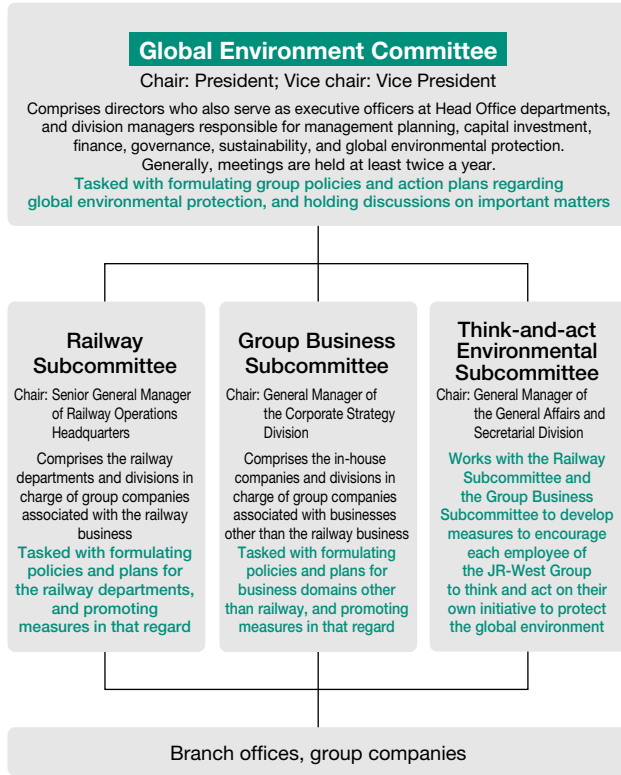
## JR-West Group's approach to protection of the global environment

As a corporate group that supports social infrastructure, the JR-West Group has a long-term vision under which it strives to help achieve safe, worry-free transportation that is kind to people and the planet, and a sustainable society. We continue to work towards sustainability through environmental conservation and other ways.

Speaking of the environment, the world has accelerated efforts to move to a decarbonized society in the face of global warming and climate change, and the pace at which it works to protect natural capital such as water and ecosystems. We consider combatting climate change a crucial management task in order to continue doing business. We will therefore avert climate-related risks, improve the railway's strength as an environmentally friendly mode of transport, and spread the word about how green railways are among customers and communities. These efforts will affect change towards a decarbonized society and create opportunities that we will take full advantage of by focusing our Group's business on contributing to a sustainable society.

### Systems for environmental protection

We consider protection of the global environment to be one of our key business challenges and have therefore established a Global Environment Committee. The committee is chaired by the president and comprises executive directors in charge of Head Office departments and general managers of the principal divisions. It deliberates and facilitates action on important matters, such as the Group's basic policy for global environmental protection and the setting of medium and long-term targets and plans. Important items deliberated by the Global Environment Committee are also reported to and discussed with the Sustainability Committee, Group Management Committee, and Board of Directors in order to share this information among senior management.



### Progress on medium-term environmental goals

In tandem with the JR-West Group Medium-Term Management Plan 2022, the JR-West Group set medium-term environmental goals for fiscal 2023. We succeeded in meeting all of the goals we set for fiscal 2023.

**Energy intensity (vs. FY2014)**  
FY2023 target: -3.0%  
FY2023 results: -5.0%

**Percentage of energy-efficient railcars**  
FY2023 target: 88.0%  
FY2023 results: 91.2%

**Station and onboard garbage recycling rate**  
FY2023 target: 96.0%  
FY2023 results: 99.7%

**Railway material recycling rate (facility construction)**  
FY2023 target: 97.0%  
FY2023 results: 97.9%

**Railway material recycling rate (rolling stock)**  
FY2023 target: 92.0%  
FY2023 results: 96.6%

**Promote environmentally friendly stations and office facilities**

## JR-West Group Basic Environmental Policy

The JR-West Group Basic Environmental Policy was created so that we could be a corporate group supporting social infrastructure that contributes to the realization of safe, worry-free transportation that is kind to people and the planet, and a sustainable society. As pillars of the policy, the JR-West Group and the respective JR-West in-house companies have set environmental goals in three areas—global warming prevention and climate change action; contributing to the creation of a circular economy; and living in harmony with nature—which they are all working together to achieve.



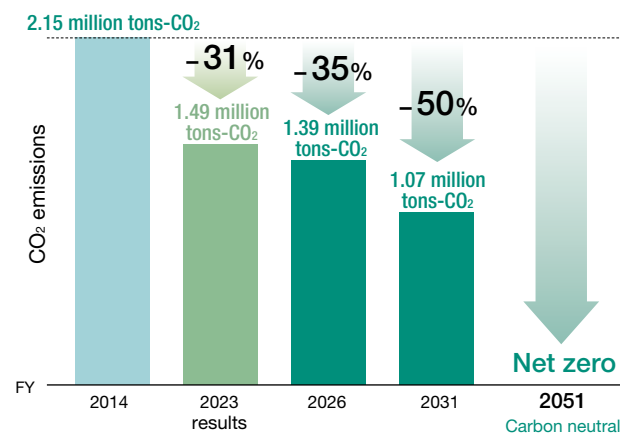
## Global warming prevention and climate change action

### JR-West Group Zero Carbon 2050 long-term environmental goals

Understanding that our businesses emit a large amount of CO<sub>2</sub> and responding to climate change—such as intensifying natural disasters, caused by global warming—are important management issues that must be addressed for the JR-West Group to continue doing business. In recognition of the need for the JR-West Group to be more active in addressing climate change, we have formulated the JR-West Group Zero Carbon 2050 long-term environmental goals. The goal for overall group CO<sub>2</sub> emissions (scope 1 and 2, consolidated) has been set at net zero by 2050. As an intermediate goal, we have set an emissions reduction of 35% by fiscal 2026 and 50% by fiscal 2031 (against fiscal 2014).

To achieve these goals and move towards a decarbonized society, besides decreasing fossil fuels in the mix of energy that we purchase, we will utilize energy efficiency in order to decrease the overall amount of energy we use, and we will replace conventional energy forms with renewable energy.

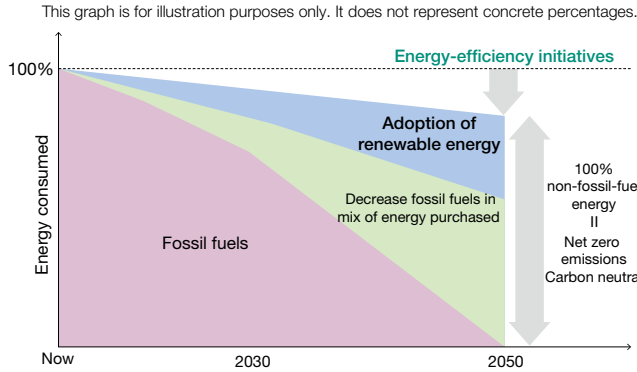
### JR-West Group CO<sub>2</sub> emissions reduction targets (Scope 1+2, consolidated)



### Scope 3 CO<sub>2</sub> emissions

	FY2022*1	FY2023
Non-consolidated	1.727 million tons-CO <sub>2</sub>	1.799 million tons-CO <sub>2</sub>
Group companies*2	1.194 million tons-CO <sub>2</sub>	1.345 million tons-CO <sub>2</sub>
Total	2.921 million tons-CO <sub>2</sub>	3.144 million tons-CO <sub>2</sub>

### Road map to carbon neutrality



- Scope 1: Total CO<sub>2</sub> directly emitted by the JR-West Group from combustion of fuels, such as diesel oil for diesel train operation, and kerosene and heavy oil for operational purposes (includes the CO<sub>2</sub> equivalent mass for leaked fluorocarbons)
- Scope 2: Total CO<sub>2</sub> emitted indirectly by the JR-West Group from the use of power and heat purchased from power companies and others
- Scope 3: Total CO<sub>2</sub> emitted from other companies in relation to the JR-West Group's business activities (indirect emissions other than Scope 1 and Scope 2)

\*1 Values differ from those released in the previous fiscal year due to changes in the boundaries of group companies and category 1 emission intensity, and the addition of a category in the calculations. (Refer to Non-financial Data on pages 91 and 92.)  
\*2 Scope of calculation for group companies: All consolidated subsidiaries and one group company with particularly large energy consumption (Osaka Energy Service Co., Ltd. [affiliate accounted for under the equity method]).



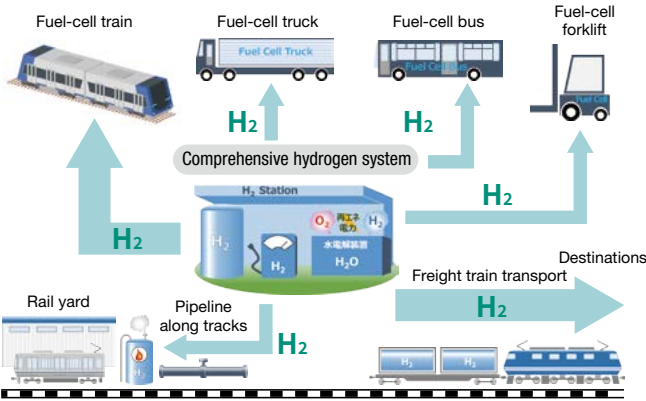
Global environment

Working with local communities and society to achieve decarbonization

Studying utilization of hydrogen

The JR-West Group is studying establishing a comprehensive hydrogen system within our train stations and other railway assets, and how to use this system as a base for supplying hydrogen to fuel-cell trains, buses, trucks, and cars, and as a means to transport the hydrogen. Through cooperation with local governments and businesses in utilizing hydrogen, we can realize a green, sustainable transportation network, and our group can provide a platform for hydrogen in the supply chain, allowing us to disseminate the use of hydrogen in different regions and contribute to the reduction of CO<sub>2</sub> emissions.

Hydrogen utilization plan



Utilizing renewable energy

Incorporating electricity from renewable energy into the Shinkansen, Osaka Loop Line, and JR Yumesaki Line

We are in the process of using more electricity from renewable energy to operate trains. For example, this renewable energy will be provided through an off-site corporate PPA (power purchase agreement) to the Shinkansen, a high-speed railway that transports between cities and is JR-West's key line, as well as the Osaka Loop Line and the JR Yumesaki Line, both of which will provide the main access to Expo 2025.

The percentage of renewable energy will be increased in stages, with a fiscal 2028 target of renewable energy accounting for 10% of the Shinkansen's operational power and 100% of the JR Loop Line's and JR Yumesaki Line's power.

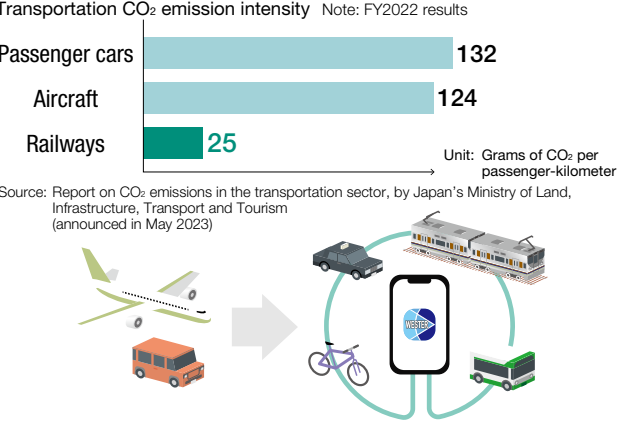
CO<sub>2</sub> reductions resulting from use of renewable energy

	CO <sub>2</sub> reduction (after renewable energy)	Procurement method
Shinkansen	Approx. 61,000 tons-CO <sub>2</sub> /year	PPA with the Chugoku Electric Power Co., Inc.
Osaka Loop Line, JR Yumesaki Line	Approx. 32,000 tons-CO <sub>2</sub> /year	PPA with the Kansai Electric Power Co., Inc.; non-fossil fuel certified electricity

Encouraging passenger modal shifts

To make Japan's transport sector decarbonized, it is essential to reduce carbon emissions in the various modes of transport, and at the same time shift to railways and other low-carbon transport mechanisms. With this in mind, we are striving to achieve a passenger modal shift by, for example, making trains and other public transportation more convenient through MaaS apps, and publicizing the environmental friendliness of trains as transport modes within and between cities.

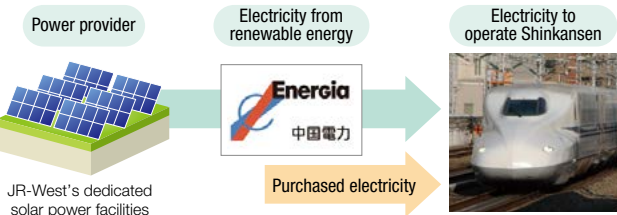
CO<sub>2</sub> emissions by mode of passenger transport



KPIs (key performance indicators)

Electricity from renewable energy as percentage of all power to operate trains		
FY2026	Shinkansen: 6%	Osaka Loop Line and JR Yumesaki Line total: 60%
FY2028	Shinkansen: 10%	Osaka Loop Line and JR Yumesaki Line total: 100%

Off-site corporate PPA for Shinkansen



Towards implementation of next-generation biodiesel

In fiscal 2023, JR-West began demonstration experiments as part of the Fiscal 2022 New Technology Development Challenges Program of the Ministry of Land, Infrastructure, Transport and Tourism's Railway Technology Development and Adoption Promotion System. We are participating through joint technological development of seven JR companies and the Railway Technical Research Institute. This initiative aims to develop technologies towards using biodiesel to power trains. With the goal of having biodiesel power 100% of the JR-West's diesel railcars, we will start trial operation on the San-in Line in fiscal 2024, continue with long-term trials in fiscal 2025, and implement biodiesel on public-use trains in fiscal 2026.

Diesel train and biofuel (artist's conception)



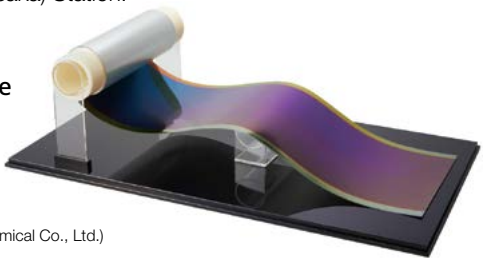
KPIs

Practical use of next-generation biodiesel in trains
FY2026: Implementation in diesel trains

Generating more energy on group sites and other land

For the Umekita area of Osaka Station, scheduled to be fully open in 2025, we plan to use regional heating and cooling systems, energy-efficient light such as LED and natural light, and have 100% of power used come from renewable energy. Besides these efforts towards decarbonization, we also plan to create energy jointly with Sekisui Chemical Co., Ltd. through the installation of that company's film-type perovskite solar cells in Umekita (Osaka) Station.

Film-type perovskite solar cell



(Photo: Sekisui Chemical Co., Ltd.)

Further energy savings

Saving energy is a crucial part of achieving carbon neutrality. Since train operation accounts for a large part of energy consumption, we are striving to reduce this by shifting to energy-efficient railcars. In the past several years, we have achieved dramatic energy savings with the introduction of such railcars as the 323 series (Osaka Loop Line, JR Yumesaki Line), 227 series (Wakayama Line, Manyo Mahoroba Line, Kinokuni Line), 271 series (Haruka express), and N700S Shinkansen (Sanyo Shinkansen). These trains incorporate SiC (silicon carbide) semiconductors, which achieve low power loss when turning on and off current in the VVVF inverter.

In addition, we are making station facilities more energy efficient by, for example, installing high-efficiency equipment, designing buildings to utilize natural light, and using dimmable lighting.

Energy-efficient 271 series (Haruka express)



Energy-efficient N700S Shinkansen



KPIs

Energy-saving railcars as a percentage of total rolling stock	
FY2026:	93%
FY2028:	95%



Global environment

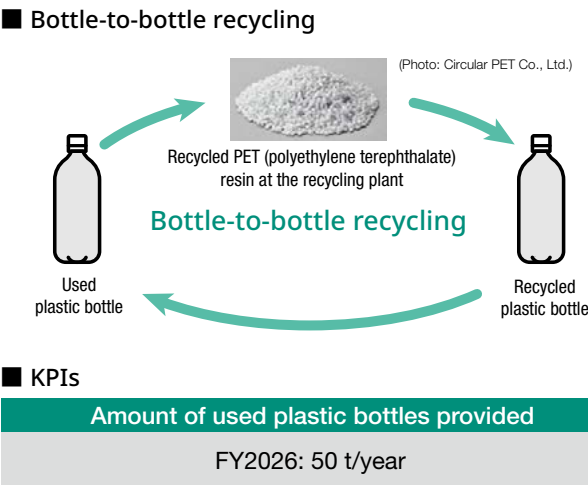
Contributing to the creation of a circular economy

Horizontal recycling of plastic bottles

To help build a circular economy, we are conducting horizontal recycling\* of plastic bottles. To this end, we have signed an agreement with Circular PET Co., Ltd., which plans to build a horizontal recycling plant in Tsuyama, Okayama Prefecture for used plastic bottles. JR-West will provide the plant with a continuous supply of used plastic bottles.

We will begin supplying these used plastic bottles from our Osaka-area operations starting in fiscal 2024. The amount will be gradually increased towards a goal of horizontally recycling at least 50 tons of used plastic bottles annually by fiscal 2026.

\* Horizontal recycling is when a product is recycled to make the very same product. In this case, plastic bottles are recycled and this recycled material is used to make new plastic bottles, a process which is repeated over and over.



Reducing plastic use at JR-West Hotels

West Japan Railway Hotel Development, Ltd. handles JR-West's hotel business. Of the hotels it manages, five locations of the Granvia Hotel, four Hotel Vischio, the Nara Hotel, and the Umekoji Potel Kyoto are aggressively working to reduce plastic items identified in Japan's Plastic Resource Circulation Act. For example, the hotels are replacing 10 plastic items including cutlery and toiletries in guest rooms with items made of environmentally friendly materials.

An example is straws. The hotels are switching to straws made of Kaneka biodegradable polymer Green Planet™\*, a product whose raw material is used vegetable oil and other cooking oil from the Hotel Granvia Kyoto. Green Planet™ is broken down by microorganisms in the soil and ocean and its content return to nature. Plus, it works for users just as well as plastic.

Other plastic products, including packaging material, also use biomass and recycled plastic. The goal for fiscal 2026 is to reduce plastic use by approximately 70% (against fiscal 2020). In addition, the hotels are gradually replacing the plastic water bottles in guest rooms with paper-made water containers.

According to Chiaki Fukushima, assistant manager, Brand Strategy Department, Company Headquarters, West Japan Railway Hotel Development, "We have been trying numerous ways to reduce plastic while still ensuring convenience and

ease of use for our hotel guests. We will continue not only reducing plastic but also being environmentally friendly in every way possible."



Listing the type of material used on packages shows customers that we are environmentally friendly

Water bottle made of paper

■ KPIs

Reducing plastic product usage
FY2026 Use only plastic toiletries and other items made of 100% environmentally friendly materials
Use less than 10 t/year of single-use plastic items (70% reduction against FY2020)
Completely eliminate plastic bottles as guest room water containers

\* Kaneka biodegradable polymer Green Planet™ is produced by a microorganism fermentation process in which vegetable oils are used as a raw material. It is biodegradable in soil and seawater and eventually degrades into CO2 and water through the digestive process of microorganisms existing in the environment.

Living in harmony with nature

Using less water / Business operations that help protect biodiversity

We are taking numerous steps to live in harmony with nature, particularly by establishing KPIs with regards to protecting water, a key natural capital. For example, we use factory wastewater and rain water, instead of our industrial water supply, for washing railcars; and we place less impact on the environment by switching from organic solvent-based paints to water-based paints.

Group company West Japan Railway Techsia Co., Ltd. has developed an electrolytic wastewater treatment system that treats wastewater using electrolysis to reduce sludge content by more

than 90% while also reducing electricity needed for treatment. This system is used not only at JR-West rail yards but also by other companies, thus making a major contribution to proper wastewater treatment, energy savings, and reduction of waste.

Besides our water resource efforts, in civil engineering, we have improved the method for collecting the alkaline contaminated water generated when removing concrete, thus minimizing the volume entering waterways. We also neutralize the wastewater through pH adjustment to protect the rivers that are home to the ayumodoki, a protected fish species in Japan.



Washing a Shinkansen car using factory wastewater

J-TREAT electrolytic wastewater treatment system (Photo: West Japan Railway Techsia Co., Ltd.)

Ayumodoki (*Parabotia curtus*), a protected species of Japan (Source: Chugoku-Shikoku Regional Environment Office, Ministry of the Environment)

■ KPIs

Water used (Decrease per unit of consolidated net sales)
FY2026: 6.5 m³/million yen or less

Medium-Term Management Plan 2025 and Long-Term Vision 2032 KPIs

Category	Indicator	Result for base year or latest fiscal year	Target
Group wide	CO <sub>2</sub> emissions (consolidated; Scope 1+2; vs. FY2014)	FY2014: 2.15 million t-CO <sub>2</sub> FY2023: 1.49 million t-CO <sub>2</sub> (vs. FY2014: -31%)	FY2026: 1.39 million t-CO <sub>2</sub> (vs. FY2014: -35%) FY2031: 1.07 million t-CO <sub>2</sub> (vs. FY2014: -50%)
	Amount of used plastic bottles provided	—	FY2026: 50 t/year
	Water used (per unit of consolidated net sales)	FY2023: 6.1 m³/million yen	FY2026: 6.5 m³/million yen
Railway company	Energy-saving railcars as a percentage of total rolling stock	FY2023: 91.2%	FY2026: 93% FY2028: 95%
	Energy intensity reduction rate (vs. FY2014)	FY2023: -5.0%	FY2026: -5.5% FY2028: -6.5%
	Electricity from renewable energy as percentage of all power to operate trains*1	FY2023: JR Yumesaki Line 100%	FY2026: Shinkansen 6%; Osaka Loop Line and JR Yumesaki Line total 60% FY2028: Shinkansen 10%; Osaka Loop Line and JR Yumesaki Line total 100%
	Practical use of next-generation biodiesel in trains	—	FY2026: Implementation in diesel trains
	Station and onboard garbage recycling rate	FY2023: 99.7%	FY2026: 99%
	Facility construction material recycling rate	FY2023: 97.9%	FY2026: 97%
	Rolling stock material recycling rate	FY2023: 96.6%	FY2026: 95%
Goods sales and food services company	Electricity consumed in convenience store and gift shop business (annual electricity consumed per unit of store floor space)	FY2022: 564 kWh/m²	FY2026: 553 kWh/m²
Hotel company	Reducing plastic product usage	Use of single-use plastic items FY2020: 36 t/year	FY2026: Plastic toiletries and other items**2 made of 100% environmentally friendly materials Use less than 10 t/year of single-use plastic items (vs. FY2020: -70%) Completely eliminate plastic bottles as guest room water containers
Shopping center company	CO <sub>2</sub> emissions (annual emissions per total sales floor space)	FY2022: 0.0334 t-CO <sub>2</sub> /annual sales hours x 1,000 m²	FY2026: 0.0321 t-CO <sub>2</sub> /annual sales hours x 1,000 m²
Real estate company	CO <sub>2</sub> emissions from rental properties (vs. FY2014)	FY2014: 58,000 t-CO <sub>2</sub>	FY2026: 44,000 t-CO <sub>2</sub> (vs. FY2014: -24%)

\*1 For Shinkansen, renewable energy as a percentage of total electricity for operating JR-West's portion of the Sanyo Shinkansen and Hokuriku Shinkansen.  
\*2 Covers 10 plastic items (used in the hotel business) identified in Japan's Plastic Resource Circulation Act: cutlery such as spoons, and forks, and toiletries such as hair brushes.



Global environment

Climate change-related risks and opportunities, and scenario analysis (information disclosure based on TCFD recommendations)

Basic approach

Realizing that environmental protection is an important management task, we have formulated the JR-West Group Basic Environmental Policy under which we pursue increasingly deeper initiatives from a long-run perspective.

Climate change is a particularly crucial issue, and our group understands that our business as a whole emits a large amount of CO<sub>2</sub> and recognizes that addressing climate change is an important issue for management if we are to continue doing business into the future. We are working to understand the risks and opportunities that climate change brings.

Governance

The JR-West Group will contribute to the creation of a sustainable society, and we will pursue initiatives to protect the environment and allow us to grow sustainably in the long term. And to serve as the driving force behind these initiatives, we have established the Global Environment Committee, which is chaired by the president and comprises executive directors in charge of Head Office departments and general managers of the principal divisions. This committee generally meets twice annually to deliberate on the Group's basic policy for global environmental protection and on the setting of medium- and long-term environmental targets and plans. It also monitors the progress of concrete initiatives aimed at achieving the plans and targets.

Items on the Global Environment Committee agenda are reported to and discussed by the Sustainability Committee, Group Management Committee, and Board of Directors as necessary.

Strategy

Based on the impacts of climate change and socioeconomic scenarios in light of the situations presented by the IPCC (Intergovernmental Panel on Climate Change), the JR-West Group has analyzed the risks and opportunities that climate change represents to the railway business.

We are aware of such risks as the heightened costs accompanying the introduction of carbon pricing, and increased damage brought on by more frequent typhoons and floods. Conversely, the superior environmental characteristics of railway have been recognized, and it was found that the increased convenience offered by the spread of MaaS and other similar services also provides opportunities to increase railway use.

The details of the analysis is shown on pages 60 to 62. The analysis was conducted using a 1.5°C increase scenario (RCP\*1 1.9) and a 2°C increase scenario (RCP 2.6) in which society aggressively addresses climate change to prevent temperature rise; and a 4°C increase scenario (RCP 8.5) in which measures are insufficient to prevent a temperature rise. Note that the qualitative analysis is based on a 1.5°C increase scenario and a 2°C increase scenario.

The JR-West Group has formulated the JR-West Group Zero Carbon 2050

Risk management

The JR-West Group will update the content of its analysis based on information such as changes in the business environment and the publication and update of a range of forecasts issued by public institutions in relation to the risks and opportunities associated with climate change, along with measures to address them. We will also periodically deliberate on and monitor the content of the analysis and the state of initiatives aimed at achieving long-term environmental

Indices and goals

The JR-West Group has formulated the JR-West Group Zero Carbon 2050 long-term environmental goals and has set the objective of achieving net-zero CO<sub>2</sub> emissions for the entire Group by 2050. We have set interim goals of reducing emissions by 35% by fiscal 2026 and 50% by fiscal 2031 (both against fiscal 2014 levels).

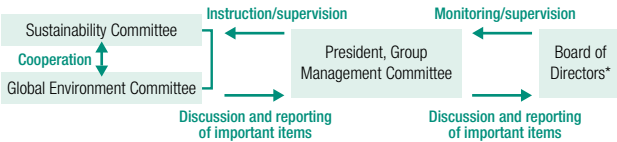
Additionally, the JR-West Group supports the recommendations of the TCFD (Task Force on Climate-related Financial Disclosures). We will proceed with appropriate disclosure and analysis of information on risks and opportunities related to climate change.

These risks and opportunities, and the analysis thereof, focus on those areas comprising our core businesses: railways, sales of goods and food services, hotels, shopping centers, and real estate.

Global Environment Committee members and organization chart

Chair: President Vice chair: Vice president

Members: Directors who also serve as executive officers at Head Office departments, and division managers and in-house company heads responsible for management planning, capital investment, finance, governance, sustainability, global environmental protection, BCP, and information disclosure



\* Examples of matters referred to the Board of Directors for discussion:  
Setting of long-term environmental goals, climate change-related risk and opportunity analysis, content of information disclosures based on TCFD recommendations

long-term environmental goals and has set the objective of achieving net-zero CO<sub>2</sub> emissions\*2 for the entire Group by 2050. We have set interim goals of reducing emissions by 35% by fiscal 2026 and 50% by fiscal 2031 (both against fiscal 2014 levels).

Towards these goals, as environmental protection initiatives under our Long-Term Vision and Medium-Term Management Plan 2025, we are further improving energy savings by, for example, introducing energy-efficient railcars, adopting power made from renewable energy, and implementing next-generation biodiesel. We are also striving to achieve a passenger modal shift by, for example, making trains and other public transportation more convenient through MaaS apps and publicizing the environmental friendliness of trains as transport modes within and between cities. It is all part of collaborative efforts with regions and communities to achieve a decarbonized society.

Going forward, the JR-West Group will take appropriate measures to address the risks and opportunities it has identified.

\*1 RCP: Representative concentration pathways  
\*2 Scope 1 and Scope 2 emissions (consolidated)

targets in meetings of the Global Environment Committee.

Content discussed by the Global Environment Committee is reported to and discussed by the Sustainability Committee, Group Management Committee, and Board of Directors as necessary, sharing and managing matters such as climate change-related risks as important issues for management.

We believe that this is a level that will result in Japan meeting the goals that it has set for CO<sub>2</sub> reduction and lead to the achievement of the targeted temperature increase of 1.5°C or less, or less than 2°C higher than that of the time of the industrial revolution—the goal of the Paris Agreement.

Qualitative analysis of risks and opportunities

Risks recognized

\* Sales of goods and food services; SC: shopping centers

Type	Risk to the company	Impact	Major businesses that will be impacted					Measures
			Railways	Sales/food*	Hotels	SC*	Real estate	
Risks associated with the transition to a decarbonized society (transition risks)	Heightened costs accompanying the introduction of carbon pricing	Large	○	○	○	○	○	<ul style="list-style-type: none"><li>Promote energy-efficient rolling stock, energy-saving equipment, and energy-saving driving</li><li>Use alternative fuels, switch electricity to renewable sources</li><li>Transition to low-carbon equipment and facilities through the use of internal carbon pricing</li><li>Install energy-efficient equipment (high-efficiency air conditioners, LED lighting, water-saving equipment, etc.)</li><li>Decrease the amount of electricity purchased from retail electricity providers by incorporating solar power from on-site PPAs and other means</li><li>Reduce basic contract fees by managing demand values through cooperation with tenants</li></ul>
	Increased green investment brought on by emissions controls	Large	○	○	○	○	○	<ul style="list-style-type: none"><li>Respond to growing green investment through the issuance of green bonds</li><li>Control development costs through open innovation and joint development with other companies</li><li>Use subsidy systems from the government and other organizations</li></ul>
	Increased development costs to support next-generation technology		○		○	○	○	<ul style="list-style-type: none"><li>Investment activities that take environmental values into account using internal carbon pricing</li></ul>
	Failed investment due to errors in assessing environmental values		○		○	○	○	<ul style="list-style-type: none"><li>Use alternative fuels</li><li>Study sustainable modes of transportation that are environmentally appropriate for the region</li></ul>
	Increased costs for procuring fossil fuels		○	○	○	○	○	<ul style="list-style-type: none"><li>Control the cost of purchasing materials by updating equipment and reviewing facilities</li></ul>
	Increase in material prices due to suppliers passing on environmental costs through their pricing	Large	○	○	○	○	○	
	Increase in electricity shortages caused by disturbances in the supply-demand balance associated with the electrification of society and the expanded use of renewable energy		○	○	○	○	○	<ul style="list-style-type: none"><li>Promote energy-efficient rolling stock, energy-saving equipment, and energy-saving driving</li><li>Establish in-house systems and methods to respond to power shortage warnings</li></ul>
	Increase in construction costs with the dissemination of ZEH and ZEB					○	○	<ul style="list-style-type: none"><li>Use subsidy systems from the government and other organizations (ZEH support project of the Sustainable Open Innovation Initiative, etc.)</li></ul>
	Growth of ethical consumption in society		○	○	○	○	○	<ul style="list-style-type: none"><li>Achieve smart, green transport by using MaaS in urban areas and intercity transportation</li><li>Consider sustainable transport systems that are environmentally appropriate for the region, in consultation with the region concerned</li></ul>
	Decline in the environmental preeminence of railways due to the electrification of automobiles	Large	○	○		○		<ul style="list-style-type: none"><li>Expand EV parking spaces so EVs can coexist with public transportation</li><li>Adopt environmentally friendly product planning, construction planning, and equipment specifications (use solar power systems, make rooftop gardens, make wooden apartment buildings fire-proof)</li><li>Use environmentally friendly sales promotion tools in model homes (use posters and banners made of green materials, buy environmentally friendly equipment, switch to digital pamphlets, etc.)</li></ul>
Risks associated with the physical impact of climate change (physical risks)	Negative effect on material procurement due to reduced ESG rating	Large	○	○	○	○	○	<ul style="list-style-type: none"><li>Disclose information on the status of TCFD analysis and the JR-West Group Zero Carbon 2050 long-term environmental goals</li><li>Conduct research on the development of social infrastructure through the Kyoto University Disaster Risk Management Engineering course (JR-West), and hold regular lectures for citizens, both funded by the company</li></ul>
	More criticism from stakeholders due to delays in initiatives and insufficient information disclosure	Large	○	○	○	○	○	<ul style="list-style-type: none"><li>Acquire more environmental certifications, such as DBJ (Development Bank of Japan) Green Building Certification, and publicize these</li><li>Create environmentally friendly standard specifications</li><li>Incorporate new technologies in collaboration with installation contractors</li></ul>
	Loss of consumer confidence due to increased suspensions of train operations		○	○		○		<ul style="list-style-type: none"><li>Publish information on JR-West safety initiatives, including planned suspensions of operations</li><li>Provide information to customers in a timely and appropriate manner when train operations are suspended</li></ul>
	Increased damage to facilities due to the increasing frequency of typhoons and floods	Large	○	○	○	○	○	<b>Initiatives mainly in the railway business</b> <b>Measures to prevent flooding of railway facilities</b> <ul style="list-style-type: none"><li>Implement both facilities-based and operations-based measures to prevent flooding and relocate rolling stock at important facilities such as general depots, rolling stock holding facilities, signal equipment facilities, and control centers</li></ul> <b>Weather disaster response system</b> <ul style="list-style-type: none"><li>Introduce a weather disaster response system on major railway lines in the Kansai area to prepare for worsening weather disasters and minimize the risk of human error</li><li>Deploy radar rainfall monitoring systems on all conventional railway lines to improve safety in the event of localized heavy rainfall</li></ul> <b>Reinforcement measures of slopes on railway lines</b> <ul style="list-style-type: none"><li>Reinforce sloping areas and establish drainage systems to improve safety and shorten times when operation is restricted, primarily in the Kyoto/Osaka/Kobe area</li><li>Create slope disaster charts and utilize sensing technologies to understand slope deformation and enhance detection precision</li></ul> <b>Strengthening of railway track equipment</b> <ul style="list-style-type: none"><li>Improve train operations' safety and durability by replacing old wooden sleeper sections with concrete ones</li></ul> <b>Planned suspensions of operations</b> <ul style="list-style-type: none"><li>Implement planned suspensions of operations, including relocation of rolling stock, as necessary when large typhoons approach or make landfall</li><li>Appropriately provide information regarding planned suspension and resumption of operations</li></ul> <b>Emergency response training</b> <b>Initiatives in each business</b> <ul style="list-style-type: none"><li>Create a crisis management manual</li><li>Ensure safe operation of business through proper shutdowns, and early or delayed openings or closings of stores</li><li>Have BCP measures (supplies, BCP back-up power source, etc.) in place in new office buildings</li><li>Install emergency equipment (water and flood gates, etc.), have back-up power, install cubicles on higher building floors</li><li>Collaborate with local government to offer usage of buildings with floors and cubicles that don't flood, and elevated water tanks, for use as regional evacuation shelters (e.g., Machiya Building, Yokohama Portside Building)</li><li>Use hazard maps to minimize risks and boost market competitiveness (e.g., do not put apartments on the first floor of buildings in areas in danger of flooding)</li></ul>
	More suspension of train operations and stoppage of business due to damage to facilities	Large	○	○	○	○	○	<ul style="list-style-type: none"><li>Taking BCP into account, install emergency power generators at control centers in order to maintain function during power blackouts</li><li>Establish in-house systems and methods to respond to power shortage warnings</li><li>Deploy the N700S to the Tokaido and Sanyo Shinkansen lines (Its onboard battery-based self-propulsion system will allow us to help customers in the event of extended blackouts)</li></ul>
	Increased impact on trains and stoppage of business due to power blackouts	Large	○	○	○	○	○	<ul style="list-style-type: none"><li>Ensure that there are multiple channels in the supply chain for important items that have a significant effect on business operations and that a certain amount of inventory is maintained</li></ul>
	Material shortages due to disruptions in supplier logistics		○	○	○	○	○	<ul style="list-style-type: none"><li>Pursue initiatives to mitigate damage to railway facilities (stated above)</li></ul>
	Increased damage insurance		○					<ul style="list-style-type: none"><li>Green rooftops and building walls, adopt heat-insulating materials</li><li>Improve air conditioning efficiency by introducing regional heating and cooling systems</li><li>Reduce energy consumption by installing high-efficiency air conditioners</li></ul>
	Increased air conditioning costs due to rising temperatures		○	○	○	○	○	<ul style="list-style-type: none"><li>Expand measures to prevent damage from animals (install fences to keep deer from entering, develop sound equipment for repelling animals, improve vehicle obstruction guards, etc.)</li></ul>
	Increased damage from animals due to the expanding range of wildlife caused by decreased snowfall		○					<ul style="list-style-type: none"><li>Step up food hygiene</li></ul>
Working environment	Increase in the risk of food poisoning due to rising temperatures			○	○	○		
	Increase in labor accidents such as heat stroke due to rising temperatures		○	○			○	<b>Measures to prevent heat stroke</b> <ul style="list-style-type: none"><li>Prepare equipment to counter heatstroke, such as air-conditioned clothing, use the WBGT index, work in the morning and evening hours</li><li>Equip crew compartments on railcars with air conditioners</li></ul> <b>Reconstruction of railway systems</b> <ul style="list-style-type: none"><li>Reduce workload along railway lines through onboard and sensor-networked ground inspections, surveying with MMS technology, and the mechanization and automation of construction work</li><li>Reduce workload along railway lines through the integration of functions into vehicles and the simplification of ground facilities</li></ul>
	Increased cost of measures to prevent heat stroke		○				○	



Global environment

Opportunities recognized

Type	Opportunities for the company	Impact	Major businesses that will be impacted					Seizing opportunities
			Railways	Sales/ Food*	Hotels	SC*	Real estate	
Resource efficiency	Reductions in CO <sub>2</sub> emissions and energy consumption by updating rolling stock and equipment to energy-efficient ones		○	○	○	○	○	● Accelerate the installation of high-efficiency equipment such as devices that utilize regenerative power, by using new subsidy programs and energy-saving facilities ● Install energy-efficient equipment when upgrading (high-efficiency air conditioners, LED lighting, water-saving equipment)
	Equipment updates making effective use of government support systems such as tax incentives		○	○	○	○	○	● Use ZEH subsidy systems and other support from the Ministry of Land, Infrastructure, Transport and Tourism, Ministry of Economy, Trade and Industry, and Ministry of the Environment
Energy sources	Wider use of fuels with net-zero CO <sub>2</sub> emissions, fuel cells, and storage batteries through technological progress and reductions in pricing	Large	○	○	○	○	○	● Study new energy sources (next-generation biodiesel, carbon-free next-generation rolling stock, fuel-cell co-generation systems, etc.) ● Reduce the cost of installing storage batteries by utilizing national and local government grants
Products and services	In areas where the characteristics of railway can be put to good use, railways are acknowledged as being environmentally superior, with use increasing due to policy-based promotion of public transport and greater environmental awareness of customers (modal shift)	Large	○	○	○	○		● Increase usage of trains and the JR-West Group's many other services by publicizing trains' environmental advantages and the Group's green initiatives ● Enhance secondary transport services linked with railway (park and ride, electric bicycle sharing services, etc.)
	Increased use due to the greater convenience of public transport associated with the proliferation of MaaS, and due to a growth in non-resident population	Large	○	○	○	○	○	● Enhance services using digital technology ● Enhance MaaS (Kansai MaaS, WESTER MaaS app, etc.) ● Create synergy by offering public transport users the courtesy services of other JR-West Group businesses
	Increasing the use of public transport and spreading the sharing economy		○				○	● Upgrade equipment and systems for bike sharing and other parts of the sharing economy
	Spread of sustainable modes of transportation that are environmentally appropriate for the region	Large	○					● Cooperate with regional communities using demand-based transportation to make regional public transport more convenient ● Promote BRT development projects using self-driving and convoy driving technologies
	Spread of sustainable modes of housing that are environmentally appropriate for the region						○	● Develop environmentally friendly housing (architectural planning, equipment specs, sales methods*) * e.g., save on building materials by reusing a model home for multiple properties; use VR to give prospective buyers virtual tour of housing units
Market	Reduction of electricity procurement costs through expansion of renewable energy		○	○	○	○	○	● Study participation in renewable energy business ● Expand renewable energy use by installing solar power equipment through on-site PPAs that utilize building rooftops and idle land
	Wider use of electricity with net-zero CO <sub>2</sub> emissions through technological progress and reductions in pricing Acquisition of real estate that has low environmental impact and meets rental needs						○	● Use 100% renewable energy for new lease properties ● Encourage customers and others to carry out ESG investing by acquiring environmental certifications such as the DBJ Green Building Certification
	Securing of revenue in the electricity supply and demand market using JR-West equipment		○				○	● Study participation in VPP (virtual power plant) business
Resilience	Ensuring of reliability through successful BCP measures in the event of weather disasters so as to reduce suspensions of train operations and stoppage of business		○	○	○	○	○	● Pursue measures to mitigate damage to railway facilities (see previous page) and disclose related information ● Gain customers by developing real estate resistant to natural disasters ● Have BCP measures (supplies, BCP back-up power source, etc.) in place in new office buildings ● Install emergency equipment (water and flood gates, etc.)
	Maintaining railway forests helps reduce CO <sub>2</sub> emissions and prevent disasters		○					● Ongoing forest conservation activities through Club J-WEST Forest ● Study the effective use of railway forests

\* Sales of goods and food services; SC: shopping centers

Assumptions for quantitative impact of risks and other concerns

For risks and other concerns extracted through qualitative analysis, we have made quantitative impact assumptions for those items that we expect to have a significant impact and for which objective future forecast data corresponding to the scenarios used in the analysis are available. In addition, we have estimated the trend in transportation revenues based on estimated population and GDP data derived from socioeconomic scenarios. Our assumptions are based on society in 2030 or 2050. The transition risks are calculated based on a 1.5°C/2°C scenario in which society acts

proactively to address climate change. The physical risks and impacts on transportation revenues are calculated based on 1.5°C/2°C and 4°C scenarios. (The results of the estimated impacts are shown in the chart on page 62.) In particular, the physical risks and impacts on transportation revenues are greater in the 4°C scenario than in the 1.5°C/2°C scenario. Based on these factors, we will take measures to address the risks and promote initiatives to realize a decarbonized society, so as to help curb climate change.

Presuppositions for assumed transition risk and physical risk impact

Transition risks	Item	Source of forecast data used for trial calculation	Assumed impact in 2030	
			4°C scenario	1.5°C/2°C scenario
Transition risks	Heightened costs accompanying the introduction of carbon pricing	IEA "World Energy Outlook 2021"	—	US\$ 140/t-CO <sub>2</sub> (2030, NZE scenario, developed countries) Exchange rate: US\$ 1 = ¥130
	High material prices due to suppliers passing on environmental costs	Kiyoshi Fujikawa (author) "Load of Carbon Tax by Region and Income Group," others	—	About 2% higher than the current level
Physical risks	Item	Source of forecast data used for trial calculation	Assumed impact in 2050	
			4°C scenario	1.5°C/2°C scenario
Physical risks	Greater damage to facilities due to increase in natural disasters	Technical Study Group on Flood Control Planning in Light of Climate Change "Recommendations for Flood Control Planning in Light of Climate Change" (revised April 2021); Ministry of Land, Infrastructure, Transport and Tourism	Approx. four times more frequent than current levels	Approx. two times more frequent than current levels
	Reduced revenue owing to increased operational suspensions due to natural disasters			

Quantitative impact assumptions (financial impact) for transition risks and physical risks

Transition risks	Item	Assumed impact in 2030	
		4°C scenario	1.5°C/2°C scenario
Transition risks	Heightened costs accompanying the introduction of carbon pricing	—	+20 billion yen/year
	High material prices due to suppliers passing on environmental costs	—	+2 billion yen/year
Physical risks	Item	Assumed impact in 2050	
		4°C scenario	1.5°C/2°C scenario
Physical risks	Greater damage to facilities due to increase in natural disasters	10 billion yen/year	3 billion yen/year
	Reduced revenue owing to increased operational suspensions due to natural disasters	4.5 billion yen/year	1.5 billion yen/year

Trial calculation of changes in rail transportation revenue

Based on population and GDP data derived from socioeconomic scenarios, which are used in cross-disciplinary climate change research, we have estimated the changes in rail transportation revenue up to 2050. The population data is derived from "Japanese SSP Population Estimates by City, Town, and Village," published by the National Institute for Environmental Studies. GDP data is derived from "Global Dataset of Gridded Population and GDP Scenarios," published by IIASA (International Institute for Applied Systems Analysis). Based on projected demographic and domestic

GDP changes in our business areas, we have estimated the changes that will occur from fiscal 2024 onward, which is the period following the revised JR-West Group Medium-Term Management Plan. (For the data referenced here, the 1.5°C/2°C scenario = SSP1 and the 4°C scenario = SSP3.) The future forecasts in our trial calculation are based on demographic and GDP estimates only and do not take into account individual factors that may affect revenues, such as future sales measures.

