

# MAZDA GREEN PLAN 2020 MID-TERM ENVIRONMENTAL PLAN

## Mazda Green Plan 2020 Mid-Term Environmental Plan

Based on the "Philosophy and Policies" for environmental initiatives, being premised on "Mazda's Vision of a Future Society and Its Relationship with Vehicles", the plan is developed, centering on the following three main perspectives. **a**

### I. Themes to Be Resolved in the Future

Mazda considers the following as issues that both customers and society expect automakers to make positive contributions toward:

1. Energy- and Global-Warming-Related Issues  
Undertaking measures to reduce CO<sub>2</sub> emissions over the entire life cycle of a vehicle.
2. Promoting Resource Recycling  
Reducing waste from vehicles, the vehicle manufacturing and shipping processes, and disposal of end-of-life vehicles, as well as actively promoting the comprehensive recycling of resources.
3. Cleaner Emissions  
Reducing various emissions/waste (aside from CO<sub>2</sub>) from vehicles and manufacturing processes, especially emissions with highly adverse environmental impacts.
4. Environmental Management  
Develop environmental management throughout the entire Group and supply chain.

### II. Mazda's Initiatives (two categories)

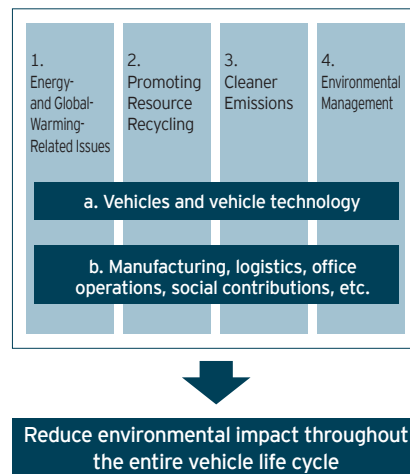
- a. Vehicles and vehicle technology  
Contributing to a reduced environmental impact through products and technology
- b. Manufacturing, Logistics, Office Operations, Social Contributions, etc.  
Contributing to a reduced environmental impact through all activities (excluding those related to products and technology)

### III. Consideration of the Entire Vehicle Life Cycle

Mazda is making efforts to reduce environmental impact throughout the entire product life cycle. Around 75% of CO<sub>2</sub> emissions occur over the period from customer use to disposal - an overwhelming percentage of overall emissions (see p. 58).

- Manufacturing and logistics (materials manufacturing, and vehicle manufacturing): accounts for around 25%
- Product use and disposal (use by customer, maintenance, disposal and recycling): accounts for around 75%

**a** Approach on the Mazda Green Plan 2020



## Mazda's Vision of a Future Society and its Relationship with Vehicles

### Around 2050: A sustainable society that aims for low-carbon, recycling-oriented, and coexisting in harmony with nature

The 2015 United Nations Climate Change Conference (COP 21) adopted the Paris Agreement, which aims to hold the future increase in the global average temperature to below 2°C and to pursue efforts to limit the temperature increase to 1.5°C compared to the status before industrial revolution. The world is seeing an acceleration of decarbonization in energy toward the realization of a low-carbon society.

This movement enables the combination of a sustainable society that values recycling in order to effectively use limited resources and one that also coexists in harmony with nature, as well as allowing for the stable continuation and progress of humankind. Specifically, they are: a society with greater use of renewable energy sources such as solar power, wind power and biofuels, as well as non-CO<sub>2</sub>-emitting hydrogen, and a shifting away from carbon energy; a society with improved resource behavior and a diffusion of activities based on the three Rs (reduce, reuse, recycle), enabling efficient and continued use of resources over their entire life cycle; and a society that allows the use of water sources, ecosystems and forests into the future as natural capital.

Regarding vehicles, demand the world over has diversified to include preferences based on regional needs, vehicle characteristics, fuel performance and characteristics, and other factors. This demand profile will only grow more complex in the future.

A multi-solution approach is needed to respond to these diverse demands. Mazda's expectation is that greatly improved internal combustion engines, alternative fuels such as natural gas and biofuels, and new types of vehicles that do not emit CO<sub>2</sub> by using energy sources such as electricity and hydrogen, and other such innovations, will provide those solutions. Going forward, Mazda believes it is necessary to push the limits of what is possible as the Company carefully plots the direction for its brand and technologies.

### Around 2020: A low-carbon society in which CO<sub>2</sub>-reducing technologies have become widespread

Around 2020, Mazda sees society on the way toward achieving a sustainable society while still maintaining the use of fossil fuels (oil based fuels, etc.) as its basic energy source. From energy security viewpoint, we expect the evolution of efficient fuel-use-technology for diverse fuels meeting with unique characteristics of each market/country, and the further introduction of low-carbon technology for several kinds of fuel/energy (electricity, gas, etc.) /materials/products covering all life-cycle processes (from production to consumption by users). Many products and services will be evaluated based on their environmental performance throughout their life cycle.

Regarding vehicles, highly efficient internal-combustion engines—such as gasoline and diesel engines, using liquid fuels (oil, biofuels, etc.), which account for most of the energy for mobility due to their high energy-preservation characteristics—will mainly be used as a base, and additional innovations that contribute to increased fuel economy, such as electric device technologies (idling-stop systems, regenerative braking, hybrid systems, plug-in hybrid systems), highly efficient transmissions, and reduced vehicle weight will also be implemented.

Moreover, technological innovations to support combustion technologies corresponding to diverse fuels and the use of natural gas or biofuels that emit less CO<sub>2</sub> are also expected. At the same time, electric vehicles will be introduced as an optimal form of mobility in regions where low-carbon energy can be supplied, such as power generation using renewable energy. On top of these trends, large-scale approaches such as reducing traffic congestion in urban areas will contribute toward the greater goal of realizing a low-carbon society.

## Life Cycle Assessment (LCA)

Mazda adopts LCA, a method for calculating and evaluating the environmental influence of products across its entire life cycle of vehicles through the purchasing of materials, manufacturing, use of products, recycling and final disposal, in order to actively reduce environmental impacts. The Company has confirmed the benefits of its clean-energy vehicles and newly introduced vehicles with internal combustion engines.

LCA is conducted for newly introduced vehicles in compliance with international standards (ISO 14040, ISO 14044), serving as objective and highly reliable proof that those new models have reduced environmental impact throughout their entire life cycles.

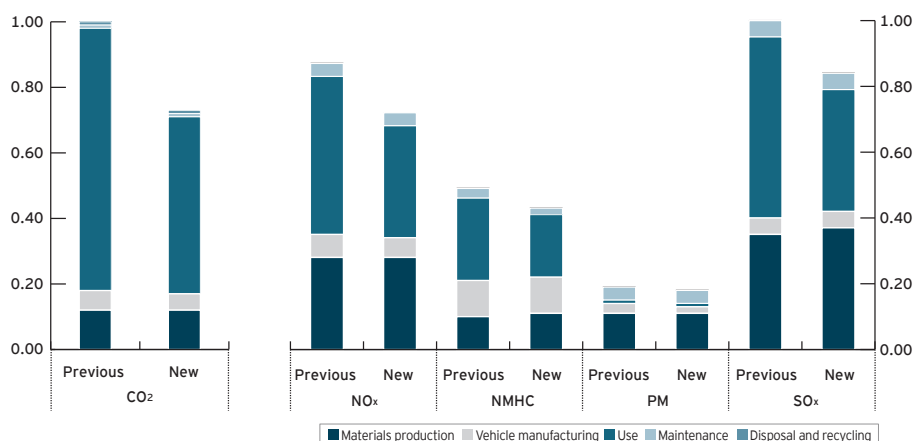
Mazda intends to steadily expand the implementation of LCA to new vehicles and confirm their environmental benefits.

### b Vehicles that Underwent LCA

Launch Year	Models
FY March 2010	Premacy (Mazda5 overseas), RX-8 Hydrogen RE
FY March 2011	Demio (Mazda2 overseas), Axela (Mazda3 overseas)
FY March 2012	CX-5*
FY March 2013	Atenza (Mazda6 overseas), Demio EV
FY March 2014	Axela (Mazda3 overseas)
FY March 2015	Demio (Mazda2 overseas), CX-3
FY March 2016	Roadster (MX-5 overseas)
FY March 2017	New CX-5

\* A model that underwent a review by a third-party organization and whose conformity with international standards (ISO 14040, ISO 14044) has been certified

LCA for the new CX-5 (Japanese model)



\* Calculated assuming a vehicle lifetime running distance of 110,000 km (13 years) and running under certain conditions.

\* Results of evaluations are shown as an index.

Figures for CO<sub>2</sub> refer to metric tons; all other figures refer to amounts in kilograms. Indices are shown separately. The CO<sub>2</sub> graph is based on an index of 1 for the CO<sub>2</sub> emission volume of the previous model, while all other graphs are based on an index of 1 for the SO<sub>x</sub> emission volume of the previous model.

NO<sub>x</sub>: Nitrogen Oxides  
 NMHC: Non Methane Hydrocarbon  
 PM: Particulate Matter  
 SO<sub>x</sub>: Sulfur Oxides

## Approaches and Targets in Each Area for 2020

To execute the Mazda Green Plan 2020, three committees set the following approaches and targets to promote each effort.

### Products and technologies: Product Environment Committee

Mazda provides all customers who purchase Mazda vehicles with driving pleasure as well as outstanding environmental and safety performance.

### Manufacturing, logistics, and office operations: Business Site Environment Committee

Mazda contributes toward realizing a low-carbon society through achieving even greater gains in operating efficiency by introducing low-CO<sub>2</sub>-emission production technologies and unwavering actions for constant improvement in the entire Mazda Group in Japan.

### Social contributions (environmental area): Social Contribution Committee

Based on the three pillars of Mazda's social contribution activities regarding the environment and safety performance, human resources development and community contributions, and a group-wide, global perspective, Mazda commits to disclosure and raising public awareness of environmental issues through its main business as an automobile maker. The Company also focuses on collaboration with regional communities, including volunteer activities.

**Targets and Actions in the Mazda Green Plan 2020 Mid-Term Environmental Plan** (Self-assessment key ○:Accomplished, △:Nearly accomplished, ×: Not accomplished)

Category	Item	Targets and actions by 2020	FY March 2017		Self-assessment	FY March 2018	
			Targets and actions	Results		Targets and actions	
<b>1. Energy- and Global-Warming-Related Issues</b>							
a. Vehicles and vehicle technology	①Respond to fuel economy standards in each country/region.	Introduce technology to raise fuel economy, to respond fully to the fuel economy standards of each country/region.	Each country/region: Fully achieve fuel economy/greenhouse gas standards.	Achieved fuel economy/greenhouse gas standards in Japan, U.S., Europe and China.	○	Each country/region: Fully achieve fuel economy/greenhouse gas standards.	
			<ul style="list-style-type: none"> <li>• Achieve the fuel economy target for 2020.</li> </ul>	<ul style="list-style-type: none"> <li>• Introduced SKYACTIV TECHNOLOGY into the new CX-5.</li> <li>• As of the end of FY March 2017, the Company has raised the average fuel economy of Mazda vehicles sold worldwide by 26% compared with 2008 levels. (Plan: 30%) (This is the result of the Company's achievement of both raising global fuel economy and satisfying customer needs. On the estimated model mix basis at the time of the establishment of the plan, the Company almost accomplished the plan of an increase of 30% compared with 2008 levels. However, the model mix has changed due to higher demand for crossover models than estimated.)</li> </ul>	△	<ul style="list-style-type: none"> <li>• Achieve the fuel economy target for 2020.</li> <li>• Promote SKYACTIV TECHNOLOGY steadily.</li> <li>• Promote development and implementation of technologies based on the Building-Block Strategy.</li> </ul>	
	②Improve fuel economy using SKYACTIV TECHNOLOGY.	Raise the average fuel economy of the Mazda vehicles sold worldwide by 30% by 2015 and by 50% by 2020 compared with 2008 levels.	<ul style="list-style-type: none"> <li>• Promote SKYACTIV TECHNOLOGY steadily.</li> <li>• Promote development and implementation of technologies based on the Building-Block Strategy.</li> </ul>	Continue the sales of vehicles with hybrid system.	Continued the sales of Axela Hybrid	○	Continue the sales of vehicles with hybrid system.
			Promote the development of electric motor drive technologies.	Continue to promote the development of electric motor drive technologies based on the analysis results of Demio EV's traveling data.	Continued to solve problems, such as driving range, with reference to Demio EV's traveling data and customer feedback.	○	Continue to promote the development of electric motor drive technologies based on the results of analysis of Demio EV's traveling data.
			Advance the development and introduction of hydrogen rotary engine vehicles.	Clarify technical issues and investigate resolutions to address them, by conducting periodic inspection, etc. of Hydrogen RE vehicles and vehicles with the Hydrogen RE range extender system.	Conducted market follow-up (periodic inspection, etc.) of Hydrogen RE vehicles and vehicles with the Hydrogen RE range extender system (Completed).	○	-
③Promote development of next generation vehicles using biofuels, electrical power, hydrogen, etc.	Promote development of technologies supporting alternative fuels such as biofuels, synthetic fuels, and hydrogen.	-	-	-	○	Promote development of technologies supporting alternative fuels such as biofuels, synthetic fuels, and hydrogen.	
		④Reduce CO <sub>2</sub> emissions from factories and offices.* <sup>1</sup>	Reduce CO <sub>2</sub> emissions from all Mazda Group factories and offices in Japan by 28% or more compared with 1990 levels.	Reduce CO <sub>2</sub> emissions from all Mazda Group factories and offices in Japan by 43% compared with 1990 levels.	Reduced CO <sub>2</sub> emissions from all Mazda Group factories and offices in Japan by 44% compared with 1990 levels.	○	Reduce CO <sub>2</sub> emissions from all Mazda Group factories and offices in Japan by 43% compared with 1990 levels* <sup>2</sup> .
b. Manufacturing, logistics, office operations, social contributions, etc.	⑤Reduce CO <sub>2</sub> emissions from logistics.	Reduce CO <sub>2</sub> emissions from all Mazda Group logistics operations in Japan by 50% compared with 1990 levels.	Reduce CO <sub>2</sub> emissions from all Mazda Group logistics operations in Japan by 52% compared with 1990 levels.	Reduced CO <sub>2</sub> emissions from all Mazda Group logistics operations in Japan by 58% compared with 1990 levels.	○	Reduce CO <sub>2</sub> emissions from all Mazda Group logistics operations in Japan by 60% compared with 1990 levels.	
	<p>*1 For CO<sub>2</sub> emissions calculations, the CO<sub>2</sub> coefficient based on the standard (Keidanren's Commitment to a Low Carbon Society) of the Japan Business Federation (Nippon Keidanren) are used. (For the calculations of FY March 2017 and after, the coefficient of FY March 2016 is used.)</p> <p>*2 The target for FY March 2018 has been set with consideration given to the increase in production volume and the reduction of the basic emissions unit.</p>						
<b>2. Promoting Resource Recycling</b>							
a. Vehicles and vehicle technology	⑥Promote vehicle recycling.	Promote the use of bioplastics.	Promote development of plastic parts, etc. that are easy to disassemble and recycle.	For the new CX-5, improved disassembly/recycling efficiency, thermal recyclability, appropriate disposal measures (easy fluid extraction, etc.), and expanded use of recycled materials.	○	Promote development of plastic parts, etc., that are easy to disassemble and recycle.	
			Develop and implement bioplastics, and expand adoption.	<ul style="list-style-type: none"> <li>•CX-9 (interior &amp; exterior parts);</li> <li>•Axela/Mazda3 (interior parts);</li> <li>•Demio/Mazda2 (interior parts);</li> <li>•Roadster RF/MX-5 RF (interior &amp; exterior parts);</li> <li>and</li> <li>•New CX-5 (interior &amp; exterior parts)</li> </ul>	○	Develop and implement bioplastics, and expand adoption.	
	Promote bumper-recycling technology.	<ul style="list-style-type: none"> <li>•Promote collection and recycling of damaged bumpers.</li> <li>•Promote the development of technology for bumper-to-bumper recycling of ELVs.</li> </ul>	<ul style="list-style-type: none"> <li>•Continued to promote collection and recycling of damaged bumpers. (Collected bumpers: around 61,800)</li> <li>•Promoted the development of technology for bumper-to-bumper recycling of ELVs. (Completed)</li> </ul>	○	Promote the collection and recycling of damaged bumpers.		
b. Manufacturing, logistics, office operations, social contributions, etc.	⑦Reduce waste volumes, promote recycling.	Reduce direct landfill waste to zero across the entire Mazda Group in Japan.	Reduce direct landfill waste across the entire Mazda Group in Japan to 1% of total or less.	Reduced direct landfill waste across the entire Mazda Group in Japan to 0.5% of total.	○	Reduce direct landfill waste across the entire Mazda Group in Japan to 0.5% of total or less.	
	⑧Reduce packaging volume used.	Reduce volume of packaging and wrapping across the entire Mazda Group in Japan by 45% compared with 1990 levels.	Reduce volume of packaging and wrapping across the entire Mazda Group in Japan by 56% compared with 1990 levels.	Reduced volume of packaging and wrapping across the entire Mazda Group in Japan by 58% compared with 1990 levels.	○	Reduce volume of packaging and wrapping across the entire Mazda Group in Japan by 59% compared with 1990 levels.	
		<ul style="list-style-type: none"> <li>•Reduce volume of water used across the entire Mazda Group in Japan.</li> <li>•Reduce volume of tap water used by 47% compared with 1990 levels*<sup>3</sup>.</li> </ul>	<ul style="list-style-type: none"> <li>•Reduce volume of water used across the entire Mazda Group in Japan.</li> <li>•Reduce volume of tap water used by 41% compared with 1990 levels*<sup>3</sup>.</li> </ul>	<ul style="list-style-type: none"> <li>•Reduce volume of water used across the entire Mazda Group in Japan.</li> <li>•Reduced volume of tap water used by 46% compared with 1990 levels.</li> </ul>	○	<ul style="list-style-type: none"> <li>•Reduce volume of water used across the entire Mazda Group in Japan.</li> <li>•Reduce volume of tap water used by 47% compared with 1990 levels</li> </ul>	
⑨Reduce volume of water used and promote effective use of water.	<ul style="list-style-type: none"> <li>•Reduce volume of water used across the entire Mazda Group in Japan.</li> <li>•Reduce volume of tap water used by 47% compared with 1990 levels*<sup>3</sup>.</li> </ul>	<ul style="list-style-type: none"> <li>•Reduce volume of water used across the entire Mazda Group in Japan.</li> <li>•Reduce volume of tap water used by 41% compared with 1990 levels*<sup>3</sup>.</li> </ul>	<ul style="list-style-type: none"> <li>•Reduce volume of water used across the entire Mazda Group in Japan.</li> <li>•Reduced volume of tap water used by 46% compared with 1990 levels.</li> </ul>	○	<ul style="list-style-type: none"> <li>•Reduce volume of water used across the entire Mazda Group in Japan.</li> <li>•Reduce volume of tap water used by 47% compared with 1990 levels</li> </ul>		
<p>*3 The targets for FY March 2021 and 2017 regarding the use of tap water contained the volume of the tap water to be used by facilities that are not covered in the plan. Accordingly, the targets have been revised based on the appropriate coverage of the plan.</p>							

(Self-assessment key ○:Accomplished, △:Nearly accomplished, ×:Not accomplished)

Category	Item	Targets and actions by 2020	FY March 2017		Self-assessment	FY March 2018
			Targets and actions	Results		Targets and actions
<b>3. Cleaner Emissions</b>						
a. Vehicles and vehicle technology	⑩Ensure cleaner vehicle exhaust gas emissions.	Introduce and promote low emission vehicles to improve air quality in each country and region.	Promote the introduction of low emission vehicles that meet the needs of each country and region.	Japan: 97% (vehicle number ratio) of passenger vehicles met the SU-LEV(★★★★) standard. United States: Introduced low-emission vehicles that meet Tier3/LEV2,3 regulations in all product lines. Europe: All product lines met the Euro 6 standards. China: Developed vehicles that meet Euro 5 standards or equivalent levels. Other: Introduced low-emission vehicles that meet the needs of each country and region.	○	Promote the introduction of low emission vehicles that meet the needs of each country and region.
	⑪Reduce inclusion of substances of environmental burden in products.	Reduce VOCs in vehicle interiors.	Pass Ministry of Health, Labour and Welfare (MHLW) guidelines for the indoor aerial concentration in all new vehicles.	Passed Ministry of Health, Labour and Welfare (MHLW) guidelines for the indoor aerial concentration with the new CX-5.	○	Pass Ministry of Health, Labour and Welfare (MHLW) guidelines for the indoor aerial concentration in all new vehicles.
		Promote development and adoption of car air-conditioning systems using new refrigerants with low environmental impact.	Promote development and adoption of car air-conditioning systems using new refrigerants with low environmental impact.	Developed a car air-conditioning system using a refrigerant with low environmental impact and promoted its adoption to new model vehicles.	○	Promote development and adoption of car air-conditioning systems using new refrigerants with low environmental impact.
b. Manufacturing, logistics, office operations, social contributions, etc.	⑫Reduce waste volumes of PRTR substances.	Reduce waste volumes of PRTR substances across the entire Mazda Group in Japan.	Reduce waste volumes of PRTR substances across the entire Mazda Group in Japan.	Reduced waste volumes of PRTR substances across the entire Mazda Group in Japan by 2.5% compared with FY March 2016 levels.	○	Reduce waste volumes of PRTR substances across the entire Mazda Group in Japan.
	⑬Reduce volumes of VOC waste emissions.	Reduce volumes of VOC waste emissions to an average 23 g/m <sup>2</sup> or less across all Mazda lines.	Reduce volumes of VOC waste emissions to an average 22.0 g/m <sup>2</sup> or less across all Mazda lines.	Reduced volumes of VOC waste emissions to an average 22.0 g/m <sup>2</sup> across all Mazda lines.	○	Reduce volumes of VOC waste emissions to an average 22.0 g/m <sup>2</sup> or less across all Mazda lines.

**4. Environmental Management**

a. Vehicles and vehicle technology	⑭Promote life cycle assessment (LCA).	Expand the implementation of LCA (in Japan).	Steadily implement LCA in new vehicles.	Implemented LCA in the new CX-5.	○	Steadily implement LCA in new vehicles.
	⑮Promote an integrated approach to traffic systems.	Improve driving technique and promote activities to raise awareness.	Promote steady introduction and further progress of i-DM.	Introduced i-DM in the new CX-5 as a standard feature.	○	Promote steady introduction and further progress of i-DM.
b. Manufacturing, logistics, office operations, social contributions, etc.	⑯Reduce the environmental risk of the Mazda Group in Japan.	Promote environmental protection activities among Mazda Suppliers.	Expand promotion of the Mazda Green Purchasing Guidelines and revise if necessary. •Support 100% establishment of EMS among major suppliers.	Cascaded the Guidelines to all suppliers, and requested compliance. •Supported 100% establishment of EMS among major suppliers.	○	Expand promotion of the Mazda Green Purchasing Guidelines and revise if necessary. •Support 100% establishment of EMS among major suppliers.
		Promote the establishment and introduction of environmental management systems (EMS).	Promote introduction of EcoAction 21 at all Mazda Group dealerships in Japan. Continue proper operation of the EMS introduced into all auto parts sales companies across Japan.	Promote introduction of EcoAction 21 at all Mazda Group dealerships in Japan by encouraging shops to obtain certification. Visited auto parts sales companies to inspect their EMS operation and provide instructions, thereby ensuring that EMS is firmly established at the sales companies.	○	Promote introduction of EcoAction 21 in all Mazda Group dealerships in Japan, and encourage shops to obtain certification. Review the activities carried out at auto parts sales companies and the support necessary from Mazda, in order to ramp up EMS at the sales companies.
	⑰Promote activities to raise awareness of environmental issues.	•Actively disseminate environmental information to improve environmental awareness among Mazda and Mazda Group company employees. •Actively disseminate environmental information to improve environmental awareness among Mazda customers.	Continuously raise awareness inside and outside of the Group regarding environmental issues that society faces and measures throughout the entire life cycle of vehicles to reduce environmental impact.	•Continuously promoted education for employees in Mazda and its Group companies, implementing "cool-biz" and "light-down" campaigns and other activities to raise biodiversity awareness. •Continuously raised the environmental awareness by holding environmental events and dispatching instructors for environmental education.	○	•Continuously raise awareness inside and outside of the Group regarding environmental issues that society faces and measures throughout the entire life cycle of vehicles to reduce environmental impacts. •Improve environmental awareness among Mazda customers and actively disseminate environmental information.
	⑱Promote environmental protection activities in partnership with regional communities.	Promote environmental protection activities in regional communities by taking part in environmental volunteer activities (including regional cleanups and efforts to preserve biodiversity) and dispatching instructors to regional events and schools to offer environmental education.	Promote activities to deepen understanding of biodiversity and forest preservation. Dispatch instructors for environmental education to regional communities and continuously participate in regional cleanups based on their needs.	•Promoted environmental activities based on the needs of regional communities (around 30 activities in Japan and abroad). •Major activities: Forest preservation activities, support for protection of endemic species, regional cleanups, carbon offset, etc.	○	Continuously raise awareness of environmental issues and deepen understanding of biodiversity based on the needs of regional communities, preserve forests, and participate in regional cleanups.
	⑲Inform the public about the Mazda Group's environmental protection activities.	Disseminate information about the Mazda Group's environmental protection activities worldwide by hosting and actively participating in environmental events.	Continuously disseminate information at a wide variety of environmental events (including motor shows held in Japan and abroad).	Disseminated information by holding/participating in environmental exhibitions and events, such as Eco-Pro 2016.	○	Continuously disclose information on the Mazda Group's environmental protection activities.