

# Contents

- Toward Green Resilience
- Governance
- Strategy
  - Assessment of Dependencies and Impacts
  - Analysis of Risks and Opportunities
  - Key Initiatives
- Risk Management
- Metrics and Targets**
- Appendix—Detailed Analyses

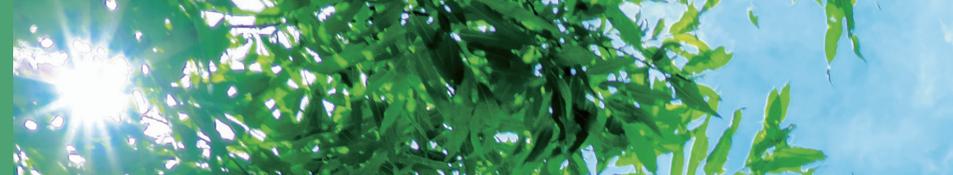
## Indicators and Targets of Our Initiatives

# Metrics and Targets

- 1** Metrics for Dependencies and Impacts ..... 47
- 2** Metrics for Risks and Opportunities ..... 47
- 3** Environmental Impact of Our Business Activities ..... 48
- 4** Metrics and Targets for Reduction of Environmental Impact of the Group' s Business Activities ..... 48
- 5** GHG Emissions of Underwriting Portfolio Companies ..... 48
- 6** Greenhouse Gas Emissions in Our Investment and Loan Portfolio Companies ..... 49
- 7** Weighted Average Carbon Intensity (WACI) in Our Investment and Loan Portfolio Companies ..... 49



# Metrics and Targets



## Contents

Toward Green Resilience

Governance

Strategy

Assessment of Dependencies and Impacts

Analysis of Risks and Opportunities

Key Initiatives

Risk Management

Metrics and Targets

Appendix—  
Detailed Analyses

## [1] Metrics for Dependencies and Impacts

The Group has defined six sectors – consumer staples, materials, consumer discretionary, industrials (transportation), industrials (including semiconductors used in manufacturing), and utilities – as having significant nature-related dependencies and impacts. The percentages of our underwriting portfolio companies\*1 and investment/loan portfolio companies\*2 in these sectors in FY2024 were 60.5% and 60.2%, respectively.

In addition, the exposure (investment and loan ratio) to businesses in sensitive locations of high importance from a biodiversity perspective was 1.29% for stocks, 1.34% for corporate bonds, and 0.76% for corporate loans (our top 500 investment/loan portfolio companies).

\*1 Corporate insurance policies for automobile insurance, fire insurance, casualty insurance (excluding construction insurance), cargo insurance, marine insurance, and aviation insurance

\*2 Listed shares, corporate bonds, and corporate loans

## [2] Metrics for Risks and Opportunities

### ■ Metrics for products/services that contribute to climate change responses / improvement of sustainability of natural capital

Annual average premium growth rate of 18% in years to 2025 in insurance products that contribute to “Symbiosis with global environment – Planetary Health” as KPI of our medium-term management plan in order to accelerate the provision of products and services covering risks related to climate change.

Item	Scope	Target	FY2024
Products and services which contribute to “Symbiosis with global environment – Planetary Health”	Group companies (Japan) + and other affiliates	18% of annual average revenue increase	20.6%

### ■ Metrics for products which help improve the resilience of society

We aim to increase the number of underwritten policies for products which help improve the resilience of society by an average of 20% per year until 2025.

Item	Scope	Target	FY2023	FY2024
Rate of increase in the number of underwritten policies for products which help improve the resilience of society	MS/AD	20% of annual average	17.6%	25.0%

### ■ Insurance premium income from products which contribute to decarbonization, circular economy and improvement of the resilience of society

Item	Scope	Unit	FY2024
Insurance premium income from products which contribute to decarbonization, circular economy and improvement of the resilience of society	MS/AD	JPY million	300,695 (6.4%)

### ■ Metrics for natural catastrophe risk levels in underwriting

Risk levels that occur once every 200 years.

### ■ Metrics for ESG thematic investing including climate change responses / improvement of sustainability of nature capital

Zero carbon transition requires technological innovation and capital investment toward a drastic reduction of greenhouse gas emissions. Factors such as growth of demand for funding and needs for new financial products and services will likely bring about opportunities for financial institutions. The Group is working on ESG thematic investing aimed at leading to solutions for various social issues on the premise of ensuring profitability.

#### Regarding ESG Thematic Investment

##### Balance trend of ESG thematic investing



#### Breakdown of Investment Balance

Example of Topics	(JPY billion)	
	End of March 2025	Outstanding balance of investment and loan
Investment in funds with ESG themes	234.0	
Support for initiatives designed to reduce GHG emissions		
Renewable/Next Generation energies (solar power, wind, hydrogen, etc.)	94.8	
Transition-/Sustainability-linked finance	37.8	
Green finance	165.9	
Support for global sustainable development		
Social sustainability (including supranational bonds)	214.2	
Impact investment* for regional revitalization and healthcare, and other investments	31.2	
<b>Total</b>	<b>777.7</b>	

Note: Of the investment amount commitment to the fund, only the amount already invested is included.

## Contents

Toward Green Resilience

Governance

Strategy

Assessment of Dependencies and Impacts

Analysis of Risks and Opportunities

Key Initiatives

Risk Management

Metrics and Targets

Appendix–  
Detailed Analyses

### ■ Metrics for investment in venture business including climate change responses/improvement of sustainability of nature capital

We are promoting cooperation and collaboration with innovation partners that contribute to resolving social issues, such as such as Jupiter Intelligence, a company which offers AI-based climate change risk assessment that responds to TCFD

Item	End of March 2025
Number of the Group climate/nature-related investments through MS&AD ventures (all cases)	8 (123)

## [3] Environmental Impact of Our Business Activities

### ■ Greenhouse gas emissions and energy consumption from our Group's business activities

### ■ Water consumption, waste emissions, etc. from our Group's business activities

→ESG data/materials: ISO26000 Core Subjects (Environment)

<https://www.ms-ad-hd.com/en/csr/data.html#012>



## [4] Metrics and Targets for Reduction of Environmental Impact of the Group's Business Activities

### ■ Targets

#### GHG emissions reduction targets

Target	FY2030 Target	FY2050 Target	Actual Result
Scope 1, 2 <sup>*1</sup>	-50% compared to basic fiscal year (FY2019)	Net zero	FY2024 - 40.0%
Categories 1, 3, 5, 6, 7 and 13	-50% compared to basic fiscal year (FY2019)		FY2024 - 26.9%
Underwriting portfolio/Investments/Loans portfolio companies	-37% compared to basic fiscal year (FY2019) (Key Japanese domestic corporate clients) In order to work with clients to reduce GHG emissions, we will deepen dialogue, identify issues for reduction, and propose solutions to resolve these issues.		FY2022 - 18.3%

\*1: Scope 1 refers to direct emissions from our Group, such as gasoline from company-owned vehicles. Scope 2 refers to indirect emissions from consumption of purchased electricity, etc.

\*2: Indirect emissions through the Group's business activities other than Scope 2. Category 1 refers to purchased products and services (covered by paper and mail). Category 3 refers to fuel and energy activities other than Scope 1 and Scope 2. Category 5 refers to waste from operations. Category 6 refers to business trips by employees. Category 7 refers to employee commuting. Category 13 refers to leased assets

\*3: GHG emissions of our major Japanese corporate clients (approx. 3,300) selected based on premium income (related to our underwriting and investment/loan portfolios)

#### Renewable energy usage rate

Target Year	Usage Rate	FY2024/2023 Actual
FY 2030	60%	-27.0%
FY 2050	100%	

## [5] GHG Emissions of Underwriting Portfolio Companies

Item	Scope	FY2022 Actual
Insurance Underwriting	Major domestic clients of Mitsui Sumitomo Insurance and Aioi Nissay Dowa Insurance <sup>*1</sup>	1153 thousand tons-CO <sub>2</sub>

\*1: Major Japanese corporate clients (approx. 3,300) selected based on premium income

## Contents

Toward Green Resilience

Governance

Strategy

Assessment of Dependencies and Impacts

Analysis of Risks and Opportunities

Key Initiatives

Risk Management

Metrics and Targets

Appendix–  
Detailed Analyses

## [6] Greenhouse Gas Emissions in Our Investment and Loan Portfolio Companies

The following table shows the carbon footprints (CO<sub>2</sub> equivalent of greenhouse gas emissions from business activities) of our investment and loan portfolio companies. Scope 1 and Scope 2 greenhouse gas emissions of our investment and loan portfolio companies are measured using Trucost's tool for calculating greenhouse gas emissions using a proprietary modeling approach, and PCAF estimates when there is not enough information disclosed by our investment and loan portfolio companies or publicly available. Assets subject to the analysis are domestic and foreign stocks of listed companies (covering approx. 99% on a market value basis), domestic and foreign bonds (covering approx. 99% on a book value basis), and domestic and foreign corporate loans (covering approx. 99% on a book value basis) out of the Group's investment and loan portfolio as at the end of March 2024. We are adopting PCAF standards for measuring greenhouse gas emissions in our investment and loan portfolio companies.

→ ESG data/materials: Underwriting and investment/loan portfolios

[https://www.ms-ad-hd.com/en/csr/data.html#underwriting\\_investment](https://www.ms-ad-hd.com/en/csr/data.html#underwriting_investment)

### GHGs emissions of our investment and loan portfolio companies (Scope 1 and Scope 2)

#### By asset

(Unit: kt-CO<sub>2</sub>e)

Asset	FY2022 <sup>*1</sup>	FY2023 <sup>*2</sup>	FY2024 <sup>*3</sup>
Stocks	2,302	2,111	2,111
Corporate Bonds	2,400	1,944	1,463
Corporate Loans	286	225	199

\*1: Calculated in FY2022 using portfolio as of end of March 2022. Stocks 99%, Corporate Bonds 67%, Corporate Loans 48%, totaling 98.4%.

\*2: Calculated in FY2023 using portfolio as of end of March 2023. Stocks 99%, Corporate Bonds 97%, Corporate Loans 95%, totaling 97.6%. GHG emissions from commercial real estate totaled 61,000 t-CO<sub>2</sub>e out of our investment and loan portfolio companies as at the end of March 2023.

\*3: Calculated in FY2024 using portfolio as of end of March 2024. Stocks 99.2%, Corporate Bonds 99.5%, Business loans 99.9%, totaling 99.3%. GHG emissions from commercial real estate totaled 67,000 t-CO<sub>2</sub>e out of our investment and loan portfolio companies as at the end of March 2024.

#### By industry (FY2024)

(Unit: kt-CO<sub>2</sub>e)

Industry*	Our Investment and Loan Portfolio Companies (Scope 1 and Scope 2)	Industry*	Our Investment and Loan Portfolio Companies (Scope 1 and Scope 2)
Energy	335	Finance	53
Materials	1,314	Information Technology	64
Industrials	729	Communication Services,	15
Consumer Discretionary	285	Utilities	736
Consumer Staples	213	Real Estate	17
Healthcare	13		
		<b>Total</b>	<b>3,773</b>

\* GIGS sector classification is adopted

## [7] Weighted Average Carbon Intensity (WACI) in Our Investment and Loan Portfolio Companies

Weighted average carbon intensity (WACI)\* is used as metrics of the carbon intensity of our investment/loan portfolio. Scope 1 and Scope 2 for our investment/loan portfolio companies are calculated through information disclosed by the companies, S&P Global Trucost analysis tool, and estimated value provided by PSAF. Subject assets are same as those of "[6] Greenhouse Gas Emissions in Our Investment and Loan Portfolio Companies" (stocks, corporate bonds and corporate loans).

\* An indicator which is a weighted average of "the ratio of GHG emissions vs. sales amount" in each of our investment/loan portfolio companies and "percentage of holding in the Group's investment/loan portfolio companies."

### Weighted average carbon intensity (WACI) in our investment and loan portfolio companies (Scope 1 and Scope 2)

(Unit: t-CO<sub>2</sub>e/US\$ million)

Asset	FY2022 <sup>*1</sup>	FY2023 <sup>*2</sup>	FY2024 <sup>*3</sup>
Stocks	114.5	100.1	99.6
Corporate Bonds	221.5	152.2	135.4
Corporate Loans	273.2	184.3	217.3

\*1: Calculated in FY2022 using portfolio as of end of March 2022. Stocks 99%, Corporate Bonds 67%, Corporate Loans 48%, totaling 98.4%

\*2: Calculated in FY2023 using portfolio as of end of March 2023. Stocks 99%, Corporate Bonds 97%, Corporate Loans 95%, totaling 97.6%

\*3: Calculated in FY2024 using portfolio as of end of March 2024. Stocks 99.2%, Corporate Bonds 99.5%, Business loans 99.9%, totaling 99.3%

### Relevant information disclosed

#### Strategy

→ Medium-to Long term Targets

<https://www.ms-ad-hd.com/en/csr/summary/kpi.html#link-list-4>

→ ESG integration and sustainability approach

<https://www.ms-ad-hd.com/en/csr/summary/esg.html>

#### Risk Management

→ ERM and Risk Management

[https://www.ms-ad-hd.com/en/group/value/risk\\_management/erm.html](https://www.ms-ad-hd.com/en/group/value/risk_management/erm.html)

#### Metrics and Targets

→ Targets and Results

<https://www.ms-ad-hd.com/en/csr/summary/kpi.html>

→ SG data/materials ISO26000 Core Subjects (Environment)

<https://www.ms-ad-hd.com/en/csr/data.html#012>

# Contents

Toward Green Resilience

Governance

Strategy

Assessment of Dependencies and Impacts

Analysis of Risks and Opportunities

Key Initiatives

Risk Management

Metrics and Targets

Appendix—  
Detailed Analyses

## 1 | TNFD General Requirements



### [1] The application of materiality

The Group evaluates the impact on stakeholder's evaluation and decision-making and the impact on the Group's business, and identifies our materialities. Based on the materialities identified, determining "Planetary Health (Symbiosis with the global environment)," "Resilience (Safe and secure society)," and "Well-being (Happiness of diverse people)" as priority issues, the Group has been working to resolve them.

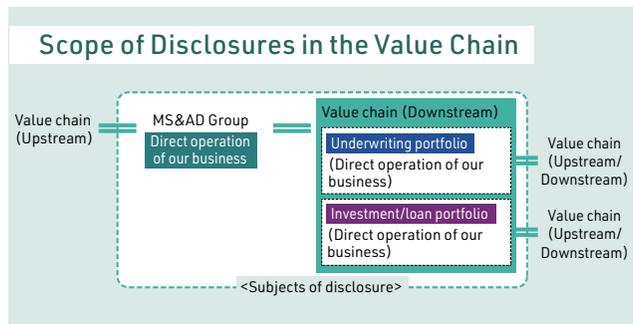
\* For the details, refer to "Identifying Materiality" in the Sustainability Report of the MS&AD Insurance Group.

→ "Identifying Materiality" on MS&AD Corporate Website

<https://www.ms-ad-hd.com/en/csr/summary/businessmodel.html>

### [2] The scope of disclosures and location of nature-related issues

This report analyzes climate/ nature-related risks/opportunities for the Group's domestic and overseas activities (direct operation of our business, underwriting and investments/loans), and also provides a risk analysis of climate/ nature-related risks for each industry sector among our underwriting and investment/loan portfolio clients.



### [3] The location of nature-related issues

The Group analyzes regional nature-related risks associated with the direct operation of our business and downstream in the value chain (underwriting portfolio companies and investment/loan portfolio companies). It will continue research on analysis tools and databases to further expand the scope of our analyses.

### [4] Integration with other sustainability-related disclosures

As stated at the beginning, the Group is working on initiatives, taking an integrated approach to action on climate changes, enhancement of sustainability of natural capital, and preservation/recovery of bio-diversity. Following the framework recommended by the Task Force on Climate-related

Financial Disclosures (TCFD) and the Task Force on Nature-related Financial Disclosures (TNFD), we provide disclosures on both factors in an integrated manner. Initiatives related to sustainability other than climate/nature-related issues are disclosed in the MS&AD Sustainability Report.

\*For details, please refer to the following:

\*Section 10, "Identifying Materiality" in MS&AD Integrated Report (Annual Report).

→ "Identifying Materiality" in MS&AD Sustainability Report

<https://www.ms-ad-hd.com/en/csr/summary/businessmodel.html>

\*Section 13, "Identifying Materiality" in MS&AD Integrated Report (Annual Report).

[URL]

\* Access our Sustainability Report at the URL below:

<https://www.ms-ad-hd.com/en/csr.html>

The screenshot shows a report titled "マテリアリティの分析" (Materiality Analysis). It includes a flowchart with three steps: Step 1 (Identifying materiality), Step 2 (Assessing the impact of materiality), and Step 3 (Identifying the location of materiality). Below the flowchart is a detailed table with columns for "Materiality", "Impact", "Location", and "Status".

### [5] The time horizons considered

The time horizons for the disclosures in this report are as follows: Short-term: 2025 (End of the Medium-Term Management Plan); Medium-term: 2030 (Target year for the interim targets); Long-term: 2050

### [6] The engagement of Indigenous Peoples, Local Communities and affected stakeholders in the identification and assessment of the organization's nature-related issues

With regard to underwriting, we provide insurance to companies and individuals throughout Japan. Together with our insurance agencies, we actively engage with local stakeholders including municipalities and local businesses in various regions on climate/ nature-related risks, particularly in the context of adaptation to climate change for disaster prevention and mitigation. We are also promoting collective action toward a nature-positive transition by involving local stakeholders and research institutions, aiming to mitigate damage caused by natural disasters, recharge water resources, conserve biodiversity, and revitalize primary industries.

See page 37

We have just begun analyzing the regional climate/ nature-related risks associated with the direct operations and value chains of individual companies in our underwriting, investment and financing, and have not yet reached the level of precise assessment needed for effective engagement. We will continue to work hard to identify the issues.

We will continue to engage in dialogue with NPOs/NGOs about what risks may be associated with the local natural environment, although they are not specific local stakeholders, and will consider how risk assessment should be conducted. In addition, we are exchanging opinions with relevant organizations on the topics of greenhouse gas emissions and loss of biodiversity, which may pose significant risks to the local climate and environment.

# Contents

- Toward Green Resilience
- Governance
- Strategy
  - Assessment of Dependencies and Impacts
  - Analysis of Risks and Opportunities
  - Key Initiatives
- Risk Management
- Metrics and Targets
- Appendix– Detailed Analyses

## 2 | Mapping of TCFD/TNFD Disclosure Recommendations (4 Pillars and 14 Recommended Disclosures) to the Group's Analyses

### 1 Governance | Disclose the organization's governance of nature-related dependencies, impacts, risks and opportunities.

#### Recommended Disclosures

**A** Describe the board's oversight of nature-related dependencies, impacts, risks and opportunities.

**P.08** ▶ Supervisory Framework by the Board of Directors

**B** Describe management's role in assessing and managing nature-related dependencies, impacts, risks and opportunities.

**P.09** ▶ Role of Senior Management

**C** Describe the organization's human rights policies and engagement activities, and oversight by the board and management, with respect to Indigenous Peoples, Local Communities, affected and other stakeholders, in the organization's assessment of, and response to, nature-related dependencies, impacts, risks and opportunities.

**P.08** ▶ Supervisory Framework by the Board of Directors

**P.50** ▶ TNFD General Requirements

\*  Represents TNFD-specific recommended disclosure

## Contents

Toward Green Resilience

Governance

Strategy

Assessment of Dependencies and Impacts

Analysis of Risks and Opportunities

Key Initiatives

Risk Management

Metrics and Targets

Appendix–  
Detailed Analyses

## 2 Strategy

Disclose the effects of nature-related dependencies, impacts, risks and opportunities on the organization's business model, strategy and financial planning where such information is material.

### Recommended Disclosures

**A** Describe the nature-related dependencies, impacts, risks and opportunities the organization has identified over the short, medium and long term.

- P.11** ▶ Climate/Nature-related Dependencies/Impacts
- P.22** ▶ Physical Risk
- P.28** ▶ Transition Risk
- P.30** ▶ Climate/Nature-related Opportunities
- P.60** ▶ Risks and Opportunities in Six Industries

**B** Describe the effect nature-related dependencies, impacts, risks and opportunities have had on the organization's business model, value chain, strategy and financial planning, as well as any transition plans or analysis in place

- P.11** ▶ Climate/Nature-related Dependencies/Impacts
- P.15** ▶ Customer Dependencies and Impacts on Climate and Nature by Industry
- P.22** ▶ Physical Risk
- P.28** ▶ Transition Risk

**C** Describe the resilience of the organization's strategy to nature-related risks and opportunities, taking into consideration different scenarios.

- P.22** ▶ Physical Risk
- P.28** ▶ Transition Risk

**D** Disclose the locations of assets and/or activities in the organization's direct operations and, where possible, upstream and downstream value chain(s) that meet the criteria for priority locations.

- P.20** ▶ Interface with Sensitive Locations Identified Under the TNFD Framework

\*  Represents TNFD-specific recommended disclosure

# Contents

- Toward Green Resilience
- Governance
- Strategy
  - Assessment of Dependencies and Impacts
  - Analysis of Risks and Opportunities
  - Key Initiatives
- Risk Management
- Metrics and Targets
- Appendix– Detailed Analyses

## 3 Risk & Impact Management | Describe the processes used by the organization to identify, assess, prioritise and monitor nature-related dependencies, impacts, risks and opportunities.

### Recommended Disclosures

A<sub>i</sub>

Describe the organization's processes for identifying, assessing and prioritizing nature-related dependencies, impacts, risks and opportunities in its direct operations.

P.20 ▶ Interface with Sensitive Locations Identified Under the TNFD Framework

A<sub>ii</sub>

Describe the organization's processes for identifying, assessing and prioritizing nature-related dependencies, impacts, risks and opportunities in its upstream and downstream value chain(s).

P.43 ▶ Identification Process of Dependencies/Impacts on Nature and Risks

B

Describe the organization's processes for managing nature-related dependencies, impacts, risks and opportunities.

- P.43 ▶ Management of Natural Catastrophe Risks
- P.43 ▶ Litigation Risks in Underwriting
- P.44 ▶ As Responsible Institutional Investor
- P.44 ▶ Considering Sustainability in Business Activities

C

Describe how processes for identifying, assessing, prioritizing and monitoring nature-related risks are integrated into and inform the organization's overall risk management processes.

P.42 ▶ Risk Management

\*  Represents TNFD-specific recommended disclosure

# Contents

- Toward Green Resilience
- Governance
- Strategy
  - Assessment of Dependencies and Impacts
  - Analysis of Risks and Opportunities
  - Key Initiatives
- Risk Management
- Metrics and Targets
- Appendix—Detailed Analyses

## 4 Metrics & Targets

Disclose the metrics and targets used to assess and manage material nature-related dependencies, impacts, risks and opportunities.

### Recommended Disclosures

**A** Disclose the metrics used by the organization to assess and manage material nature-related risks and opportunities in line with its strategy and risk management process.

- P.47 ▶ Metrics for Risks and Opportunities

**B** Disclose the metrics used by the organization to assess and manage dependencies and impacts on nature.

- P.47 ▶ Metrics for Dependencies and Impacts

**C** Describe the targets and goals used by the organization to manage nature-related dependencies, impacts, risks and opportunities and its performance against these.

- P.48 ▶ Environmental Burden of Our Business Activities
- P.48 ▶ Metrics and Targets for Reduction of Environmental Burdens of the Group's Business Activities
- P.48 ▶ GHG Emissions from Underwriting
- P.49 ▶ Greenhouse Gas Emissions in Our Investment and Loan Portfolio Companies
- P.49 ▶ Weighted Average Carbon Intensity (WACI) in Our Investment and Loan Portfolio Companies

\* ■ Represents TNFD-specific recommended disclosure

## Contents

Toward Green Resilience

Governance

Strategy

Assessment of Dependencies and Impacts

Analysis of Risks and Opportunities

Key Initiatives

Risk Management

Metrics and Targets

Appendix—  
Detailed Analyses

&lt; 55 &gt;

Green Resilience Report 2025

## 3 | Detailed Analyses (Appendix)

**[P.18] LEAP Analysis of Marine Insurance**

In this section, we analyze nature-related issues in connection with marine insurance—one of the Group's core insurance businesses—and its primary coverage target, the shipping industry, which is closely interrelated with nature. This industry is important to the Group both as insurance underwriting and investment/loan portfolio companies. At the same time, it relies on ecosystem services provided by the ocean as a natural capital, while its operations and logistics activities exert multifaceted impacts on nature. We recognize that a deep understanding of the relationship between the shipping industry and nature is essential for sustainable growth together with the shipping industry.

**Dependencies and Impacts of the Shipping Industry on Nature**

To understand the shipping industry's dependencies and impacts on nature from direct operations, we primarily used the online tool ENCORE to assess materiality.

**[1] Major Impacts of the Shipping Industry**

The following activities were assessed as having significant impacts on nature:

**Vessel operations**

- **Use of marine areas:** Movement of ships, coastal ecosystem damage from grounding, and seabed disruption/destruction due to anchoring and dragging
- **Climate change:** GHG emissions
- **Disturbance:** Noise and light pollution from operations, collisions with large marine animals such as whales
- **Introduction of invasive species:** Spreading invasive species via ballast water and hull-fouling organisms
- **Air pollutants:** Emissions of air pollutants during operations
- **Harmful contamination of soil and water:** Release of toxic substances from cleaning agents and antifouling paints

**Maintenance and repair**

- **Harmful contamination of soil and water:** Use of antifouling paints

- **Disturbance:** Adverse effects on organisms and habitat fragmentation due to noise and odors

**[2] Major Dependencies of the Shipping Industry**

The assessment identified the following dependencies:

**While docked, loading/unloading, and entering ports**

- **Flood mitigation functions:** Coastal protection provided by mangroves, coral reefs, and other structures that mitigate storm surges and floods
- **Storm mitigation functions:** Reduction of impacts from wind, sand, and other storm events
- **Rainfall regulation functions:** Reduction of flood risk

**During navigation**

- **Global climate regulation functions:** Mitigation of changes in ocean currents and sea-level rise
- **Water purification functions:** Reduction of ship damage caused by chemical substances in the ocean
- **Water flow regulation functions:** Ensuring adequate water levels for transport in canals during dry seasons and stable water supply

**[3] Key Dependencies Relevant to Insurance**

Among the ecosystem services the shipping industry depends on, the following are considered relevant to insurance.

- **Insurance covering cargo:** Dependence on flood mitigation and storm mitigation functions during loading/unloading and temporary storage at ports
- **Insurance covering vessels:** Dependence on climate regulation functions that help prevent ship damage, human casualties, third-party damages, ship salvage in case of a sunken coastal vessel, and marine pollution such as oil spills in both international and coastal shipping

**Detailed Assessment of Impacts**

In conducting the detailed impact assessment, we first identified the species affected by each impact factor based on the results of literature surveys. We then overlaid data on the global distribution of relevant species, areas of high biodiversity importance such as protected areas (see table below), and global vessel traffic data to identify marine areas vulnerable to impacts.

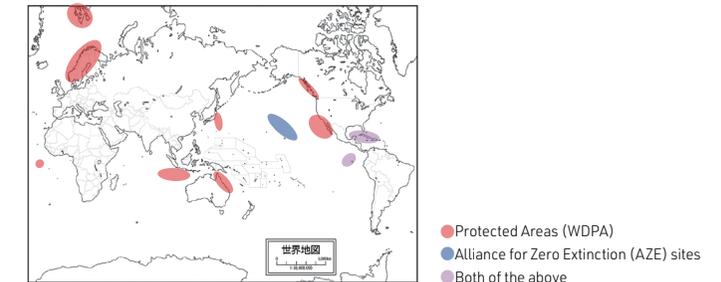
**Evaluation Indicators Used in the Analysis**

Theme	Category	Indicator	Data Source
Biodiversity Importance	Marine areas important from the perspective of protected areas and biodiversity	Protected Areas (WDPA)	• UNEP-WCMC and IUCN. (2021a). Protected Planet Report 2020.
		AZE sites	• IBAT • Alliance for Zero Extinction
		Ecologically or Biologically Significant Marine Areas (EBSAs)	• Convention on Biological Diversity
		MARPOL Convention Areas	• IMO
Importance of Ecosystem Service Provision	Species data	Important Marine Mammal Areas (IMMAs)	• IUCN MMPATF (2020)
		Distribution of mangroves, corals, algae, and seagrass	• IUCN, UNEP—WCMC
		Important areas for mammals, fish, birds, and reptiles	• Jenkins, C. N. & K. Van Houtan. (2016).
		Fisheries yield (commercial/non-commercial)	• Sea Around Us
		Economic value of coral reefs	• Spalding et al., 2018

The analysis revealed that the following marine areas are experiencing significant impacts:

**Areas Important from the Perspective of Protected Areas and Biodiversity**

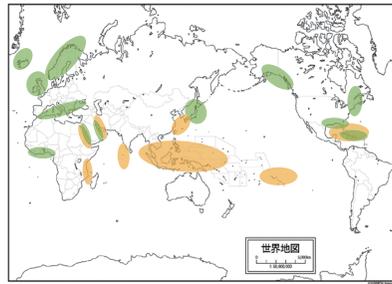
Colored areas indicate regions where shipping traffic exceeds a certain threshold and that are either subject to strict protection requirements or located near habitats of endangered species. In these areas, impacts from marine use, pollution, and the introduction of invasive species are considered significant.

**Important Marine Areas by Impact Factor (a)**

The orange areas represent marine zones where coral reefs are located, considered important due to impacts such as ship grounding. The green areas are marine zones with seagrass and seaweed, considered important due to the potential introduction of invasive species via hull fouling or ballast water.

# Contents

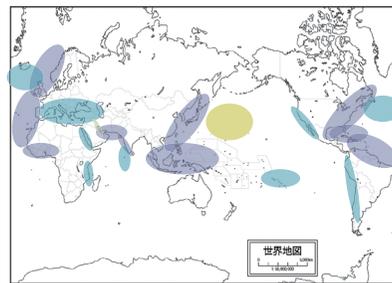
- Toward Green Resilience
- Governance
- Strategy
- Assessment of Dependencies and Impacts
- Analysis of Risks and Opportunities
- Key Initiatives
- Risk Management
- Metrics and Targets
- Appendix—Detailed Analyses



**Key Impact Factors**  
 ● Introduction of invasive species  
 ● Marine area use (grounding/ship stranding)

### Important Marine Areas by Impact Factor (b)

Marine areas with high shipping traffic that are considered significant from a pollution perspective were identified. Blue areas are those with coral reefs along with habitats for endangered fish and reptiles, where oil spills and container losses are considered major impacts. Yellow areas are those inhabited by endangered bird species, where light pollution and oil spills are considered major impacts. Purple areas are those inhabited by coral, fish, reptiles, and additionally endangered mammals, where collisions and similar impacts may be significant.



**Key Impact Factors**  
 ● Pollution (oil spills, container loss)  
 ● Pollution (light pollution, oil spills)  
 ● Pollution (collisions, oil spills, container loss)

Through this analysis, we were able to deepen our understanding of the relationship between the shipping industry and nature, as well as its implications for the insurance business. Correctly identifying dependencies and impacts on nature is not only essential for understanding the sustainability of the shipping industry, but also provides important insights for the Group's insurance underwriting and investment activities. Going forward, we will not only identify risks and opportunities based on this analysis but also further deepen our assessment along the value chain. In parallel, we will participate in discussions on the TNFD sector guidance to enhance understanding together with the industry.

## [P.19] LEAP Analysis of Renewable Energy Projects



### The Need for Renewable Energy Deployment and Environmental & Social Risk Assessment

As global decarbonization progresses in response to climate change, the adoption of renewable energy has become essential. In Japan, achieving carbon neutrality by 2050 requires a substantial increase in the share of electricity coming from renewable energy, including solar and wind power. However, the construction and operation of power plants can have diverse impacts on the natural environment and local communities. Rapid deployment of renewable energy therefore requires more advanced environmental and social risk assessments than in the past. While operators conduct legally mandated environmental assessments and implement measures to reduce environmental impacts, it remains challenging to fully cover potential risks, such as cumulative impacts or future risks. In response to this situation, as an insurance company, we investigate potential biodiversity and natural disaster risks that are difficult to address through environmental assessments and communicate these findings to client companies, thereby supporting the sustainable deployment of renewable energy.

### Purpose of LEAP Analysis for Onshore Wind Power

In fiscal 2023, the MS&AD Group added renewable energy projects to the scope of its environmental and social risk assessments. In fiscal 2024, we entered into a partnership agreement with the Nature Conservation Society of Japan (NACS-J). For onshore wind power, in particular, suitable locations are limited due to Japan's geography and wind conditions, making cumulative environmental impacts more likely. Therefore, to achieve more effective risk management and provide enhanced solutions to insurance portfolio companies and local communities, we conducted a LEAP analysis in accordance with the TNFD disclosure recommendations.

### Analysis and Results (L: Sensitive Locations, E: Dependencies & Impacts, A: Risks & Opportunities)

#### Locate: Assessment of Sensitive Locations

Based on the locations of onshore wind power projects, we assessed sensitive locations in accordance with TNFD guidelines, covering the four themes including biodiversity importance and ecosystem integrity (see page 19 for indicators and information used). As a result, all 6 projects examined were found to be either adjacent to protected areas or key biodiversity areas (KBA), or located in areas with high scores on the Biodiversity Intactness Index (BII), and were therefore classified as sensitive locations. These areas serve as habitats for rare raptors, migratory birds, and bat species, and present a range of potential risks, including

forest modification, impacts on wetlands, and landslide risks.

### Evaluate: Dependencies and Impacts Analysis

Dependencies and impacts of onshore wind power projects were analyzed using ENCORE\* (2024 edition) and the TNFD sector guidance. The results are summarized in Table 1. When it comes to dependencies, these projects have high reliance on natural ecosystem services, such as climate regulation, flood control, and soil retention. In terms of project impacts, they are manifested in changes to land and freshwater areas, noise and vibration, bird strikes (disturbance/collisions), introduction of invasive species, and effects on local communities' living environment and landscape.

\* An international online tool for companies and financial institutions to evaluate the dependencies, impacts, and materiality of their business activities on natural capital (ecosystem services).

### Major Impacts, Dependencies and Materiality of Onshore Wind Power Generation Projects

Very High VH High H Medium M Low L Very Low VL

Impact Driver	ENCORE Materiality Level	Dependencies & Impacts	Theme	Description of Impact
Use of Terrestrial Ecosystems Use of Freshwater Ecosystems	H	● ●	Land and Freshwater Area Modification/Occupation by Project Facilities	Land modification/occupation for wind farm and related infrastructure construction, habitat alteration for animals and plants (including fragmentation, degradation) Adverse effects on ecosystem services, including cultural services, caused by land modification or occupation
		● ●	Community Impacts Noise Generation	Habitat fragmentation caused by transmission lines, disruption of wildlife movement, and impacts on species' foraging or reproduction Facilitation of invasive species intrusion due to habitat conversion, ecosystem disturbance, and biodiversity loss Impacts on local communities and tourism due to wind turbine installation Impacts of operational noise from wind farms on marine ecosystems, fish, aquatic organisms, and bird reproduction
Pollution (Including Disturbance)	M	● ●	Disturbance & Collision	Collisions with turbine blades causing harm, especially to birds (raptors, migratory birds) and bats Disruption of birds' breeding or foraging behavior due to turbine construction Habitat destruction caused by poorly sited installations Bird mortality from collisions or electrocution from transmission lines Harm to animals due to vegetation management under transmission lines Effects on reproduction and individual survival of species from prolonged exposure to electromagnetic fields from transmission lines
		●	GHG Emissions	GHG emissions from transmission lines
Climate Change	VL	●	GHG Emissions	GHG emissions from transmission lines
Introduction of Invasive Species	N/A	●	Invasive Species Introduction	Potential introduction of invasive species (plants, etc.) due to construction activities Establishment opportunities for invasive plant communities due to vegetation removal for transmission lines Promotion of invasive species and disturbance of native ecosystems due to habitat conversion

# Contents

- Toward Green Resilience
- Governance
- Strategy
  - Assessment of Dependencies and Impacts
  - Analysis of Risks and Opportunities
  - Key Initiatives
- Risk Management
- Metrics and Targets
- Appendix—Detailed Analyses

Ecosystem Services	ENCORE Materiality Level	Nature of Dependency
Climate Regulation	VH	Transmission and distribution infrastructure depend on climate regulation to protect infrastructure from the impacts of unstable rainfall patterns and temperature fluctuations.
Soil and Sediment Retention	M	Infrastructure depends on ecosystem services of soil and sediment retention, provided by diverse vegetation and environmental assets.
Rainfall Pattern Regulation Storm Mitigation Flood Control	M~H	For stable operations, infrastructure depends on ecosystem services that regulate and mitigate extreme weather events, such as typhoons and floods.

### Assess: Risks and Opportunities

Three categories of risks were identified: physical, reputational, and regulatory. Physical risks include damage from typhoons and other extreme weather events, as well as increased landslide and flood risks caused by soil and vegetation loss. Reputational risks involve potential opposition from local residents and NGOs, leading to reputational damage. Finally, regulatory risks relate to the possible tightening of development restrictions. On the other hand, careful consideration of potential effects on the natural environment and local communities was found to create opportunities, such as improved reputation and reduced disaster risk.

Table 2: Risks and Opportunities Associated with Onshore Wind Power Generation

Category	Risks and Opportunities for the Operator	
Risks	Physical	Damage to facilities or operational stoppages due to typhoons or abnormal weather during construction or operation
		Increased risk of soil instability, landslides, or sediment disasters due to vegetation loss
		Facility damage or operational stoppages caused by intensified flooding from climate change and vegetation loss
	Policies & Regulations	Reduced power generation due to changes in wind patterns caused by climate change
Increased constraints on new development projects due to changes in nature-related regulations, such as limitations on areas available for development		
Opportunities	Reputation	Requests from authorities to halt projects because of adverse impacts on nature or local communities
		Opposition from local residents and criticism by NGOs due to noise, vibration, visual impacts, or impacts on nature and biodiversity
	Resilience	Enhanced reputation by conducting operations with consideration for nature
		Avoidance or mitigation of natural disaster risks through appropriate site selection and risk countermeasures

### Efforts by Developers, Limits of Environmental Assessment, and the Need to Address Cumulative Impacts

Developers have undertaken advanced measures, including environmental assessments, stakeholder engagement, and bird-strike mitigation (e.g., marking wind turbine blades, operational restrictions, and monitoring). However, current environmental assessment methods alone cannot fully capture cumulative impacts from multiple projects or the long-term increase in natural disaster risks arising from changes in ecosystem services (e.g., increased landslide risk due to vegetation alteration).

### Prepare: Direction for Response

For the impacts of onshore wind power, it is important to monitor whether appropriate impact and risk management measures are implemented during development, construction, and operations, in addition to measures such as those summarized in the table below. The Group communicates biodiversity and natural disaster risks identified through environmental and social risk assessments to its portfolio companies, and provides solutions—including measures to address nature-related risks and improve resilience—to support their operations. This is done in collaboration with the Nature Conservation Society of Japan (NACS-J) and through information provision. Moving forward, we will deepen collaboration with local communities and specialized institutions, advance joint monitoring of cumulative impacts and information sharing, and strengthen governance frameworks. Through insurance and risk solutions, we aim to contribute to the sustainable deployment of renewable energy while achieving both carbon neutrality and nature-positive outcomes, and enhancing long-term green resilience in society.

Table 3: Countermeasures/Response Directions by Onshore Wind Power Operators

Impact	Operator Countermeasures / Response Directions
General	Conduct post-construction surveys and environmental monitoring for significant potential impacts identified in environmental impact assessments, and consider additional measures as needed based on the results. Publicly disclose the results of post-surveys and monitoring to ensure transparency.
Cumulative Impacts with Other Projects	Share environmental impact assessment findings, post-survey, and monitoring results with other operators and conduct joint investigations as necessary to fully understand cumulative impacts.
Alteration, Fragmentation, or Movement of Animal and Plant Habitats	Define siting criteria to avoid ecologically important or sensitive areas, such as national parks, areas with a high degree of natural vegetation, and areas that are important or sensitive from a nature perspective, such as habitats for rare or endemic birds and organisms. Configure equipment placement within the development area to minimize impacts on animal and bird movement.
Noise & Vibration Infrasound Generation Wind Turbine Shadow / Shadow Flicker	Conduct surveys, predictions, and evaluations of noise, considering cumulative effects with other projects, and implement mitigation measures such as operational adjustments. Provide thorough and sufficient prior explanations to affected residents and promote stakeholder engagement.
Impacts on Birds & Bats	During site selection, avoid areas inhabited by or used by rare or endemic birds or bats, or areas along their migratory routes. Locate equipment within the development area to avoid the migratory routes of birds and bats (including height considerations). Place restrictions on facility operation during bird migration periods. Carry out monitoring and follow-up surveys for bird and bat strikes after operation begins, and if a significant impact is found, implement measures in accordance with the opinions of experts, such as painting eye marks on the blades to increase visibility to flying creatures. Determine in advance appropriate measures and response systems to minimize impacts of any bird or bat strikes (such as injured animal rehabilitation and cause analysis).
Introduction of Invasive Species	Implement measures to prevent the introduction of invasive species during the construction phase, such as washing vehicles before entering the site.
Impacts on Ecosystem Services Used by the Community	Consider the location, design, and color of facilities so that they harmonize with the surrounding landscape. During site selection, avoid areas that are important for the provision of ecosystem services, such as conservation forests and water source and recharge preservation forests.



## [P.21] Interface with Sensitive Locations and Key Watersheds



In this section, based on the TNFD's additional guidance for financial institutions,\* we examine the downstream value chain, which is important to us as a financial institution. We analyzed sensitive locations associated with both the Group's own operational sites and the investee companies within this value chain. Analyzing the extent to which a company operates in areas where significant nature-related issues exist or where biodiversity is particularly vulnerable is useful not only for enhancing corporate resilience to nature-related issues, but also for exploring initiatives toward nature-positive outcomes.

Note: Under the TNFD's disclosure Strategy D, organizations are advised to: "Disclose the locations of assets and/or activities in the organization's direct operations and, where possible, upstream and downstream value chain(s) that meet the criteria for priority locations." The analysis of sensitive locations corresponds to L4 ("Locate the interface with nature") in the LEAP approach recommended by the TNFD. L4 requires identifying areas in the value chain where medium to high dependencies and impacts exist, and confirming the interface with sensitive locations.

## [P.20] Assessment of TNFD Sensitive Locations for in our Top 500 Investment/Loan Portfolio Companies



In order to investigate interface with sensitive locations in the downstream value chain of the Group, MS&AD InterRisk Research & Consulting, one of the Group companies, conducted an analysis, using the location data of the direct operating bases of the 500 companies which are globally distributed companies. This assessment is based on four themes: "Importance of Biodiversity," "Integrity of Ecosystem," which looks at the degree of integrity of an ecosystem (integrity refers to a complete and intact state), "Importance of Ecosystem Service Provision," which looks at the attributes of stakeholders who depend on nature, and "Water-related Physical Risks," which looks at risks associated with water resources in the areas.

Going forward, we will focus on investigating points of contact with sensitive locations in the sectors that have significant contact points with these locations and each of our investment/loan portfolio companies, identify risks arising from such contacts, and provide support for nature-positive initiatives by our investment/loan portfolio companies.

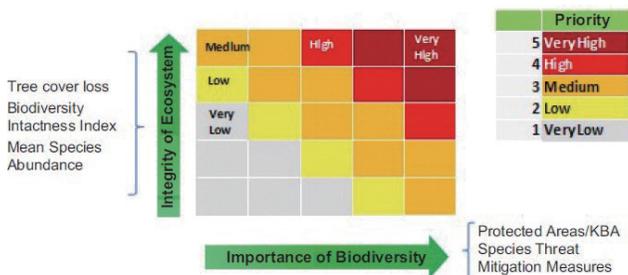
### [1] Percentage of Sites Operating in Sensitive Locations by Sector and Assessment Theme "Importance of Biodiversity" x "Integrity of Ecosystem"

In order to analyze the "Importance of Biodiversity," we rated the direct operation sites of our investment/loan portfolio companies on a 5-point scale from 5 (Very High) to 1 (Very Low) in descending order of the number of operations in areas such as KBAs (Key Biodiversity Areas), protected areas, areas with a high presence of endangered species, areas that have significant socioeconomic functions for many businesses. In order to analyze the "Integrity of Ecosystem,"

**Contents**

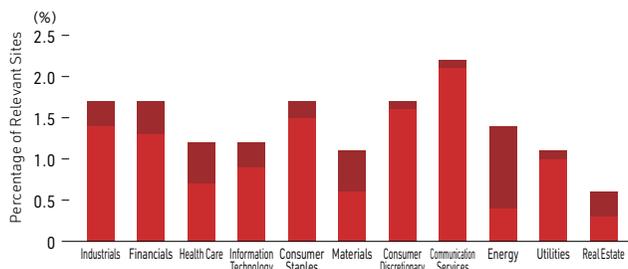
- Toward Green Resilience
- Governance
- Strategy
  - Assessment of Dependencies and Impacts
  - Analysis of Risks and Opportunities
  - Key Initiatives
- Risk Management
- Metrics and Targets
- Appendix—Detailed Analyses

We also rated areas where deforestation is occurring, biodiversity is deteriorating, and species are being lost on the same 5-point scale. The results of these two analyses are then placed in a matrix as shown in the figure below, and areas with 4 (High) or higher in both two ratings are designated as sensitive locations. We calculated the percentage of operation sites in sensitive locations by company, and the average percentage of companies was computed by industry.



For a given company, when averaging the percentage of sites operating in sensitive locations in terms of "Importance of Biodiversity" and "Integrity of Ecosystem" by industry, the percentage is small, with even the highest industries barely exceeding 2%. However, we found that the industries such as "communication services," "consumer discretionary," "consumer staples," "industrials" and "financials" lean toward higher percentages.

### "Importance of Biodiversity" x "Integrity of Ecosystem" Assessment

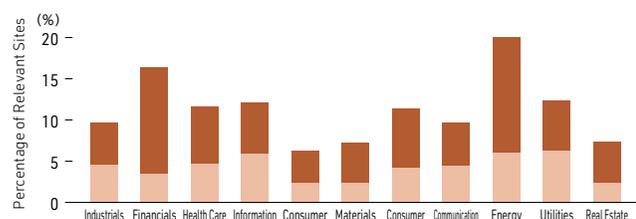


### Importance of ecosystem service provision

Local residents and businesses are in some way dependent on the ecosystem services in the location, but indigenous peoples, in particular, often lead self-sufficient lives closely tied to the local natural environment, making the importance of ecosystem service provision significantly greater for them compared to the general local people and businesses. Accordingly, for this theme (importance of ecosystem service provision), in order to analyze by industry the negative impacts on local stakeholders related to nature, we incorporated both the percentage of operating sites located within 500 meters of indigenous territories and ecosystem service indicators reflecting the benefits that nature provides.

The result shows that the sectors with high percentages were the energy sector, which involves extensive land use and heavy dependence on natural resources, and the finance sector, which operates globally.

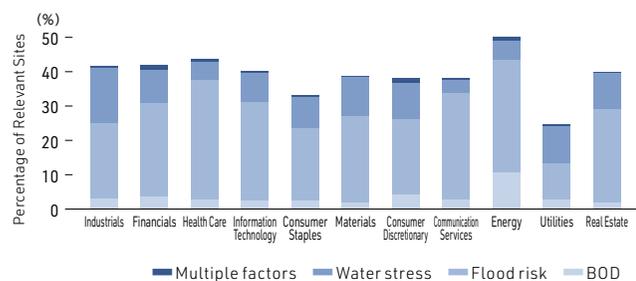
### Assessment of the Importance of Ecosystem Service Provision



### Water-related physical risks

For this theme, water-related physical risks are analyzed using three indicators (water stress, flood risk, and BOD-water pollution index). Bases rated 4 or 5 out of 5 for each of the three indicators, or bases rated 4 or 5 for multiple risks (combined factors), are designated as sensitive locations. The water-related physical risk exceeded 20% for all industries, indicating that it is a high priority.

### Assessment of Water-related Physical Risks



Regarding water stress, we focused on seven industries with particularly high dependence on water resources. Sites with a score of 4 or higher were examined by watershed boundaries, and the results showed that they were concentrated in

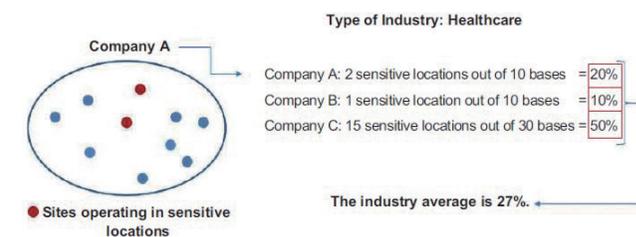
the United States (California and Florida) and China (Shanghai). Approximately half of the sites in all 3 watersheds belong to the consumer goods and services sector, indicating that these watersheds require careful attention to the risk of water resource depletion.

Regarding flood risk, we closely examined the distribution of sites scoring 4 or higher within Japanese watersheds. The largest concentrations of sites with high flood inundation risk were found in watersheds spanning Tokyo, Kanagawa, and Shizuoka; Osaka, Wakayama, and Nara; and the San'in (northern Chugoku) region. In these watersheds, sites in the capital goods and services sector accounted for approximately 40%, representing the largest share. In these watersheds, special attention is needed for flood inundation risk. Through support such as disaster prevention and mitigation measures and the provision of insurance coverage, we aim to contribute to enhancing disaster resilience.

### [2] Summary of overall indicators

For each of the above themes, the following table provides a summary of the sector-averaged figures for the percentage of companies operating in sensitive locations.

GICS Sector	Importance of Biodiversity	Integrity of Ecosystem	Importance x Integrity	Importance of Ecosystem Service Provision	Water-related Physical Risk
Industrials	4.4%	8.0%	1.7%	9.7%	41.5%
Financials	6.4%	13.7%	1.6%	16.4%	41.8%
Health Care	5.7%	12.4%	1.2%	11.7%	43.8%
Information Technology	4.8%	9.6%	1.1%	12.1%	40.4%
Consumer Staples	7.3%	8.0%	1.7%	6.3%	33.1%
Materials	6.0%	8.1%	1.0%	7.2%	38.7%
Consumer Discretionary	7.2%	9.9%	1.8%	11.4%	38.1%
Communication Services	8.9%	12.4%	2.2%	9.6%	38.0%
Energy	4.1%	21.5%	1.4%	20.1%	50.1%
Utilities	4.9%	10.8%	1.2%	12.2%	24.7%
Real Estate	2.1%	6.3%	0.6%	7.3%	39.9%



# Contents

- Toward Green Resilience
- Governance
- Strategy
  - Assessment of Dependencies and Impacts
  - Analysis of Risks and Opportunities
  - Key Initiatives
- Risk Management
- Metrics and Targets
- Appendix—Detailed Analyses

## Evaluation Indicator

	Theme	Name of Indicator	Data Source
Evaluation Indicator	Importance of Biodiversity	Protected Areas/KBA (Key Biodiversity Area)	IBAT
		Species Threat Abatement and Restoration Matrix (STAR_t)	IBAT
	Integrity of Ecosystem	Tree cover loss	Global Forest Watch
		Mean Species Abundance	GLOBIO
	Importance of Ecosystem Service Provision	Biodiversity Intactness Index	Natural History Museum
		Indigenous and Community Lands	Land Mark
		Contribution of nature to people (Biodiversity Intactness Index)	Chaplin-Kramer et al. (2023)
	Water-related Physical Risk	Water Stress (Baseline Water Stress)	WRI (Aqueduct)
		Flood Risk	Flood Risk Finder
		BOD Index (water pollution)	World Bank Group Data Catalog

### [P.27] Analysis of Physical Risks in the Investments and Loans Portfolio

#### Analysis of Physical Risks in Investments and Loans Portfolio

As an institutional investor, the Group makes investments and loans to many companies, and we believe that an increase in water disaster damage at key locations of our investment/loan portfolio companies due to climate change could lead to a deterioration in investment returns. To this end, we analyze the physical risks of the assets of our major investment/loan portfolio companies to identify climate change risks associated with fund management. We also analyze the relationship between the business locations of our investment and loan portfolio companies and sensitive locations.

[See page 27](#) ▶

#### Scenario Analysis: Evaluation of Physical Risks for Our Top 500 Investment/Loan Portfolio Companies

The Group has a strong relationship with climate change risks through transactions with customers, and here we quantitatively evaluated the physical risk under climate change scenarios for our investment and loan (stock, corporate bonds, and corporate loans) portfolio.

An increase in physical risks such as floods and wind disasters due to climate change may affect the sales and assets of our investment/loan portfolio companies. Therefore, we selected our top 500 investment/loan portfolio companies and analyzed the impact of flood and wind disaster risk\* due to climate change on both sales impact and asset impact for stocks, corporate bonds, and corporate loans (for details of the analysis, see "Analysis Models, Methods, etc." on the right).

\* In addition to the risks of floods and wind damage, we also analyze the impact on sales by taking into account heat risks (i.e. decreased labor productivity and increased cooling costs due to abnormally high temperatures and heat waves).

## Analysis Models, Methods, etc.

### Model used

Jupiter intelligence<sup>1</sup> Climate Score Global (CSG) model

### Scope

Direct operation sites of Top 500 companies in our investment/loan portfolio (stocks, corporate bonds, corporate loans) (Total 108,600 assets)

### Target hazards

Floods (river flooding/storm surge), wind, extreme heat, wildfires

### Evaluation metrics

Weighted average of <annual average loss/annual sales> for each portfolio company in terms of the Group's share of stocks, corporate bonds, and corporate loans<sup>2</sup>

### Time horizons

2020, 2030, 2040, 2050, 2075, 2100

### Scenarios

SSP1-2.6: (less than 2°C scenario)<sup>3</sup>

SSP5-8.5: (more than 4°C scenario)<sup>4</sup>

<sup>1</sup> U.S. climate-tech startups with which the Group has partnership

<sup>2</sup> Weighted averages follow the Partnership for Carbon Accounting Financials (PCAF) methodology

<sup>3</sup> Scenarios that limit global average temperature increase to less than 2°C above pre-industrial levels under sustainable development

<sup>4</sup> Scenario in which global average temperature increase exceeds 4°C above pre-industrial levels under fossil fuel-dependent development

### Analytical Methods for Evaluation Matrix

**[STEP1]** Calculate damage to each site using a model

**[STEP2]** In order to calculate the impact on profitability, calculate the damage to sales and asset at each time horizon: 2020, 2030, 2040, 2050, 2075 and 2100

**a. Sales damage due to business suspension: Calculate the loss at each site using the following formula:**

Expected annual loss ratio due to flood, wind or other damage at each site [(%) ] x [sales amount per location].

Then, aggregate the results of each company to calculate the amount of sales damage

**b. Property damage due to flood, wind or other damage: Calculate [annual average loss due to flood, wind or other damage] for each site.**

**[STEP3]** Divide sales loss and asset loss in each company by gross sales amount to calculate the percentage of total amount of annual sales damaged in each company. Aggregate by company and calculate the amount of asset damage.

**[STEP4]** Calculate weighted averages for each attribute (stocks, corporate bonds and corporate loans) based on PCAF methodology. Calculate the percentage of portfolio damage for each attribute, and calculate the sales impact and asset impact for each of a. and b.

**[STEP5]** Carry out the procedures STEP 1 through STEP 5 at each time horizon using two scenarios, SSP1-2.6 and SSP5-8.5, and compare the results to identify the increase in percentages of portfolio damage caused by the impacts of climate change.

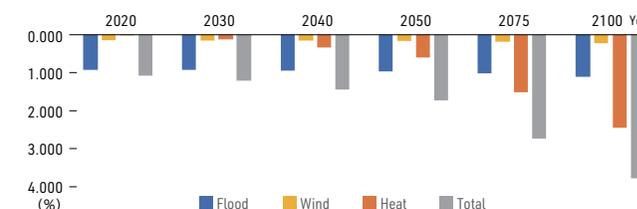
## Analysis results

The results of the analysis reveal that in the higher than 4°C scenario for stocks, which is considered to have the greatest impact on the Group, projected impacts on sales damage and asset damage by 2050 are each approximately 2% (total damage for floods, windstorms, extreme heat, etc.). However, the overall impact on the investment and loan portfolio as a whole is considered to be limited in terms of the sales of the investment and loan portfolio companies.

Currently, the impact on sales is primarily driven by flood risk, but heat-related risk is expected to increase year by year and surpass flood risk after 2050. Under the higher than 4°C scenario, extreme heat would likely become the main risk. In response, we will strengthen support for corporate measures to cope with heat, including training on heatstroke prevention, preparation of response systems for heat-related incidents, and provision of compensation.

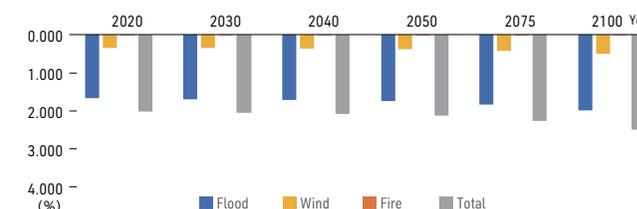
### Stocks / Sales

Disaster Type	2020	2030	2040	2050	2075	2100
Flood	0.927%	0.928%	0.949%	0.965%	1.021%	1.107%
Wind	0.150%	0.156%	0.161%	0.167%	0.190%	0.228%
Heat	0.002%	0.124%	0.339%	0.601%	1.521%	2.449%
Total	1.079%	1.207%	1.449%	1.733%	2.731%	3.784%



### Stocks / Assets

Disaster Type	2020	2030	2040	2050	2075	2100
Flood	1.676%	1.692%	1.713%	1.740%	1.840%	1.994%
Wind	0.341%	0.352%	0.362%	0.375%	0.419%	0.497%
Fire	0.010%	0.010%	0.010%	0.010%	0.012%	0.013%
Total	2.027%	2.054%	2.085%	2.126%	2.271%	2.504%



# Contents

- Toward Green Resilience
- Governance
- Strategy
  - Assessment of Dependencies and Impacts
  - Analysis of Risks and Opportunities
  - Key Initiatives
- Risk Management
- Metrics and Targets
- Appendix—Detailed Analyses

## 4 | Risks and Opportunities in Six Industries

	Companies in the automotive/parts industry	The Group
	Risk: <span style="color: red;">◆</span> Upstream <span style="color: red;">■</span> The company itself <span style="color: red;">◇</span> Downstream Opportunity: <span style="color: blue;">◆</span> Upstream <span style="color: blue;">■</span> The company itself <span style="color: blue;">◇</span> Downstream	Risk: <span style="color: red;">●</span> Underwriting <span style="color: red;">○</span> Investment/Loan <span style="color: red;">◉</span> Consulting service Opportunity: <span style="color: blue;">●</span> Underwriting <span style="color: blue;">○</span> Investment/Loan <span style="color: blue;">◉</span> Consulting service
Physical Risk	<ul style="list-style-type: none"> <li><span style="color: red;">◆</span> Supply chain disruptions such as damage to suppliers and manufacturing contractors and suspension of logistics functions due to natural disasters</li> <li><span style="color: red;">◆</span> Increase in costs of materials caused by reduced yields and quality deterioration of natural rubber and other raw materials due to temperature rise, drought, and ecosystem deterioration</li> <li><span style="color: red;">■</span> Losses and decreased sales incurred by damage to facilities and equipment production suspension due to natural disasters</li> <li><span style="color: red;">■</span> Increase in energy costs and employee health risks, and decrease in productivity associated with deterioration of quality, factory operation rate and cooling efficiency of air conditioning equipment due to extreme temperature rise</li> <li><span style="color: red;">◇</span> Loss of customers due to damage, shutdown of operations and disruption of store operations caused by natural disasters and delays in taking countermeasures for business partners and delivery destinations</li> <li><span style="color: blue;">■</span> Gaining customer trust and increasing orders by strengthening BCP response to large-scale disasters caused by extreme weather</li> <li><span style="color: blue;">■</span> Increase profits through added value by enhancing the durability of products that can withstand rising temperatures, precipitation, and changes in weather patterns</li> </ul>	<ul style="list-style-type: none"> <li><span style="color: red;">●</span> Increase in claims settlement due to natural disasters</li> <li><span style="color: red;">●</span> Decline in premium income due to poor business performance</li> <li><span style="color: red;">○</span> Decrease in asset value or deterioration of business performance in our investment/loan portfolio companies due to damage from natural disasters</li> <li><span style="color: blue;">◉</span> Support for developing business continuity plans in preparation for natural disasters, extreme temperature rises, water shortages, etc.</li> <li><span style="color: blue;">◉</span> Increase in revenue by providing services related to adaptation measures, disaster prevention and mitigation, and environmental preservation.</li> </ul>
Transition Risk	<ul style="list-style-type: none"> <li><span style="color: red;">◆</span> Increase in nature-related due diligence in procurement of mineral resources, etc. and procurement costs of sustainable raw materials</li> <li><span style="color: red;">■</span> Increase in costs due to introduction of carbon tax</li> <li><span style="color: red;">■</span> Decrease in demand for conventional internal combustion engine vehicles due to increased environmental awareness among consumers</li> <li><span style="color: red;">■</span> Increase in the cost of responding to stricter environmental regulations such as exhaust gas regulations, EV battery recycling, fuel efficiency standards, GHG emissions, and water resources and waste management, and an increase in the burden of capital investment for energy conservation and renewable energy</li> <li><span style="color: red;">■</span> Loss of revenue due reputational damage caused by air pollution, water pollution, plastic pollution, and emissions associated with business operations</li> <li><span style="color: red;">■</span> Decline in reputation and sales from stakeholders and investors due to delays in responding to climate change measures and ESG information disclosure</li> <li><span style="color: blue;">■</span> Increase in sales due to increased demand for EVs and FCVs</li> <li><span style="color: blue;">■</span> Gain in market share through successful introduction of technologies with lower environmental impact, such as use of renewable energy and reduction of water and plastic use</li> <li><span style="color: blue;">■</span> Increase in sales through cost reduction and value appeal by using recycled materials and reusing resources</li> <li><span style="color: blue;">◇</span> Reduction of transportation costs and GHG emissions by improving logistics efficiency (shared transportation, modal shift)</li> </ul>	<ul style="list-style-type: none"> <li><span style="color: red;">●</span> Decline in premium income due to business downturn in the relevant companies and markets</li> <li><span style="color: red;">●</span> Decrease in insurance premiums due to stricter underwriting standards and conditions as a result of tightening of environmental regulations</li> <li><span style="color: red;">○</span> Decline in investment returns due to business turnaround in companies and markets that are not adequately addressing climate and natural issues</li> <li><span style="color: red;">○</span> Reputational damage due to involvement in businesses that lead to global warming and destruction of nature</li> <li><span style="color: blue;">●</span> Increase in sales by providing insurance products that support new technologies such as EVs and FCVs, value chain probability, and introduction of new business models such as recycling</li> <li><span style="color: blue;">○</span> Business leap forward in the relevant companies and markets that have made progress in addressing climate- and nature-related issues</li> <li><span style="color: blue;">○</span> Increased revenue from intermediaries such as credits to offset GHG emissions</li> <li><span style="color: blue;">○</span> Development and provision of new services that mitigate negative impacts on the natural environment related to raw material procurement, etc.</li> <li><span style="color: blue;">○</span> Increase in revenue by providing services related to information disclosure and business strategy based on climate- and nature-related risks</li> </ul>

	Companies in the transportation industry	The Group
	Risk: <span style="color: red;">◆</span> Upstream <span style="color: red;">■</span> The company itself <span style="color: red;">◇</span> Downstream Opportunity: <span style="color: blue;">◆</span> Upstream <span style="color: blue;">■</span> The company itself <span style="color: blue;">◇</span> Downstream	Risk: <span style="color: red;">●</span> Underwriting <span style="color: red;">○</span> Investment/Loan <span style="color: red;">◉</span> Consulting service Opportunity: <span style="color: blue;">●</span> Underwriting <span style="color: blue;">○</span> Investment/Loan <span style="color: blue;">◉</span> Consulting service
Physical Risk	<ul style="list-style-type: none"> <li><span style="color: red;">◆</span> Serious impact on transportation infrastructure and flight schedules and increased risk of accidents due to natural disasters</li> <li><span style="color: red;">◆</span> Impact on operations due to changes in turbulence frequency due to climate changes and changes in wind and ocean current patterns</li> <li><span style="color: red;">◆</span> Decrease in labor productivity under harsh working conditions due to temperature rises, and increase in labor costs due to shortage of workers</li> <li><span style="color: red;">■</span> Increase in energy costs associated with deterioration of the durability of vehicles and infrastructure, increase in maintenance costs and decrease in cooling efficiency of air-conditioning equipment due to extreme temperature rises</li> <li><span style="color: red;">■</span> Increase in transportation costs due to depletion of fossil fuels and other natural resources</li> <li><span style="color: red;">■</span> Increased risk of accidents due to collisions with large creatures such as whales, deer and bears</li> <li><span style="color: red;">◇</span> Damage to business partners or suspension of operations due to natural disasters, increase in costs of alternative logistics, and loss of business opportunities</li> <li><span style="color: red;">◇</span> Decrease in the number of passengers due to damage to natural tourism resources</li> <li><span style="color: blue;">■</span> Increase in revenue through services that respond to increase in transportation demand through rapid response in the event of disasters</li> </ul>	<ul style="list-style-type: none"> <li><span style="color: red;">●</span> Increase in claims settlement due to natural disasters</li> <li><span style="color: red;">●</span> Decline in premium income due to poor business performance</li> <li><span style="color: red;">○</span> Decrease in asset value or deterioration of business performance in our investment/loan portfolio companies due to damage from natural disasters</li> <li><span style="color: blue;">◉</span> Increase in revenue by providing services related to adaptation measures, disaster prevention and mitigation, and environmental preservation</li> </ul>
Transition Risk	<ul style="list-style-type: none"> <li><span style="color: red;">■</span> Increased operational and technology development costs due to stricter regulations on emissions, fuel efficiency standards, and ecosystem protection</li> <li><span style="color: red;">■</span> Decreased demand for traditional transportation methods due to rising environmental awareness among consumers and businesses</li> <li><span style="color: red;">■</span> Increased costs associated with the introduction of carbon taxes, credit purchases, and the shift to sustainable biomass and SAF (Sustainable Aviation Fuel) fuels</li> <li><span style="color: red;">■</span> Loss of market share due to the failure to implement environmentally friendly technologies such as renewable energy usage and GHG emissions reduction</li> <li><span style="color: red;">■</span> Reputation damage due to air pollution, water contamination, and waste generation associated with business operations</li> <li><span style="color: red;">■</span> Fines, compensation costs, and expenses for pollution removal and habitat restoration, as well as reputation damage, resulting from transportation accidents</li> <li><span style="color: red;">■</span> Decline in stakeholder and investor evaluations and sales due to delays in addressing climate change measures and ESG information disclosures</li> <li><span style="color: blue;">■</span> Increased sales through the development and introduction of decarbonized transportation methods utilizing energy sources such as EVs and FCVs</li> <li><span style="color: blue;">■</span> Cost reduction and creation of new market opportunities through the provision of environmentally and nature-conscious transportation services and joint transport</li> <li><span style="color: blue;">■</span> Cost reduction and increased sales through the use of recycled materials and the promotion of resource re-use, emphasizing value</li> <li><span style="color: blue;">◇</span> Reduction in transportation costs and GHG emissions through logistics efficiency improvements (joint transport, modal shift)</li> </ul>	<ul style="list-style-type: none"> <li><span style="color: red;">●</span> Decrease in insurance premium income due to the business downturn of the company or market</li> <li><span style="color: red;">●</span> Reduction in insurance premium income due to stricter underwriting standards and conditions following the enhancement of environmental regulations</li> <li><span style="color: red;">○</span> Decline in investment returns due to the business downturn of companies or markets that inadequately address climate and natural challenges</li> <li><span style="color: red;">○</span> Reputation damage due to involvement in businesses contributing to global warming and environmental destruction</li> <li><span style="color: blue;">●</span> Increased demand for new types of coverage due to support for business transformations, such as new energy sources and transportation methods</li> <li><span style="color: blue;">○</span> Significant business advancements for companies or markets that have adequately addressed climate and natural challenges</li> <li><span style="color: blue;">○</span> Increase in income through the intermediaries of credits that offset GHG emissions</li> <li><span style="color: blue;">○</span> Development and provision of new services that mitigate negative impacts on the natural environment</li> <li><span style="color: blue;">○</span> Increase in income through the provision of services related to information disclosure and business strategies that consider climate/ nature-related risks</li> </ul>

# Contents

- Toward Green Resilience
- Governance
- Strategy
  - Assessment of Dependencies and Impacts
  - Analysis of Risks and Opportunities
  - Key Initiatives
- Risk Management
- Metrics and Targets
- Appendix—Detailed Analyses

	Companies in the food/beverage industry	The Group
	Risk: <span style="color: red;">◆</span> Upstream <span style="color: red;">■</span> The company itself <span style="color: red;">◇</span> Downstream Opportunity: <span style="color: blue;">◆</span> Upstream <span style="color: blue;">■</span> The company itself <span style="color: blue;">◇</span> Downstream	Risk: <span style="color: red;">●</span> Underwriting <span style="color: red;">○</span> Investment/Loan <span style="color: red;">◉</span> Consulting service Opportunity: <span style="color: blue;">●</span> Underwriting <span style="color: blue;">○</span> Investment/Loan <span style="color: blue;">◉</span> Consulting service
Physical Risk	<ul style="list-style-type: none"> <li><span style="color: red;">◆</span> Damage to raw material production areas (farmland/aquaculture farms) due to natural disasters, instability in raw material procurement, and suspension of logistics functions</li> <li><span style="color: red;">◆</span> Reduced yield and quality of raw materials, depletion of natural resources; increased costs for maintaining quality, changing procurement regions, and developing alternative raw materials due to heatwaves, droughts, water shortages, and the degradation of ecosystems such as water quality and soil.</li> <li><span style="color: red;">◆</span> <span style="color: red;">■</span> Decrease in labor productivity under harsh working conditions due to temperature rises and increase in labor costs due to shortage of workers</li> <li><span style="color: red;">■</span> Incurrence of recovery costs due to damage to factories, production stoppages, and disruption of logistics due to extreme weather and natural disasters</li> <li><span style="color: red;">■</span> Increase in energy costs due to deterioration of cooling efficiency of air conditioning equipment due to extreme temperature changes</li> <li><span style="color: red;">■</span> Increase in costs to respond to landslides and flood disasters due to sea level rise and extremely severe weather disasters</li> <li><span style="color: red;">◇</span> Damage to business partners or suspension of operations due to natural disasters, increase in costs of alternative logistics, and loss of business opportunities</li> </ul>	<ul style="list-style-type: none"> <li><span style="color: red;">●</span> Increase in claims settlement due to natural disasters</li> <li><span style="color: red;">●</span> Decline in premium income due to poor business performance</li> <li><span style="color: red;">○</span> Decrease in asset value or deterioration of business performance in our investment/loan portfolio companies due to damage from natural disasters</li> <li><span style="color: blue;">○</span> Increase in revenue by providing services related to adaptation measures, disaster prevention and mitigation, and environmental preservation.</li> </ul>
Transition Risk	<ul style="list-style-type: none"> <li><span style="color: red;">◆</span> Relocation of production area/procurement area and burden of relocation costs associated with the expansion of natural conservation areas, stricter regulations on land use, the use of pesticides and fertilizers, etc., and instability in raw material procurement</li> <li><span style="color: red;">◆</span> Increase in procurement costs due to enhanced traceability, expectations for sustainable raw materials for regenerative agriculture, etc., and competition with raw materials for biofuels, etc.</li> <li><span style="color: red;">■</span> Increase in cost of responding to stricter environmental regulations, including GHG emissions, water management, waste management, air pollution, soil contamination and increase in burden of capital investment for energy conservation and renewable energy</li> <li><span style="color: red;">■</span> Decrease in sales associated with brand image deterioration and suspension of handling at retail stores due to inability to respond to growing consumer awareness on climate-related and environmental issues.</li> <li><span style="color: red;">■</span> Loss of market share due to failure to introduce technologies with lower environmental impact, such as renewable energy use, reduced GHG emissions, reduced water use, and environmentally friendly packaging</li> <li><span style="color: red;">■</span> Increase in energy costs due to introduction of carbon tax</li> <li><span style="color: red;">■</span> Decline in evaluation from stakeholders and investors, decline in corporate value and stock prices, and increase in response costs due to delays in responding to climate change measures, biodiversity considerations, and ESG information disclosure</li> <li><span style="color: red;">■</span> Loss of revenue brought about by reputational damage due to air pollution, water pollution, plastic pollution, and emissions associated with business operations</li> <li><span style="color: blue;">◆</span> Increase in profits by establishing sustainable production methods for raw materials, improving added value through environmental conservation in production areas, and stabilizing procurement costs</li> <li><span style="color: blue;">■</span> Ensuring stable yields by developing raw materials and varieties in response to climate change (raw materials resistant to extreme heat, pest-resistant varieties), improvement of water use efficiency, and switching to land use with reduced environmental impacts</li> <li><span style="color: blue;">■</span> Increase in development and sales of new products in response to increased demand and changes in consumer preferences due to climate change (products to prevent heat stroke and infectious diseases)</li> <li><span style="color: blue;">■</span> Reduction of transportation costs and GHG emissions by improving logistics efficiency (shared transportation, modal shift)</li> <li><span style="color: blue;">■</span> Gain of market share due to success in introduction of renewable energy use, reduced GHG emissions, reduced water use, and technologies for raw materials and packages with lower environmental impacts</li> </ul>	<ul style="list-style-type: none"> <li><span style="color: red;">●</span> Decline in premium income due to business downturn in the relevant companies and markets</li> <li><span style="color: red;">●</span> Decrease in insurance premiums due to stricter underwriting standards and conditions as a result of tightening of environmental regulations</li> <li><span style="color: red;">●</span> <span style="color: red;">○</span> Loss of reputation due to involvement in businesses that lead to global warming and destruction of nature</li> <li><span style="color: red;">○</span> Decline in investment returns due to business turnaround in companies and markets that are not adequately addressing climate and natural issues</li> <li><span style="color: blue;">●</span> Development of new insurance products that address climate change risks and environmental risks</li> <li><span style="color: blue;">○</span> Business leap forward in the relevant companies and markets that have made progress in addressing climate- and nature-related issues</li> <li><span style="color: blue;">○</span> Increased revenue from intermediaries such as credits to offset GHG emissions</li> <li><span style="color: blue;">○</span> Development and provision of new services that mitigate negative impacts on the natural environment related to raw material procurement, etc.</li> <li><span style="color: blue;">○</span> Increase in revenue by providing services related to information disclosure and business strategy that take climate- and nature-related risks into consideration</li> </ul>

	Companies in the materials industry (petrochemical)	The Group
	Risk: <span style="color: red;">◆</span> Upstream <span style="color: red;">■</span> The company itself <span style="color: red;">◇</span> Downstream Opportunity: <span style="color: blue;">◆</span> Upstream <span style="color: blue;">■</span> The company itself <span style="color: blue;">◇</span> Downstream	Risk: <span style="color: red;">●</span> Underwriting <span style="color: red;">○</span> Investment/Loan <span style="color: red;">◉</span> Consulting service Opportunity: <span style="color: blue;">●</span> Underwriting <span style="color: blue;">○</span> Investment/Loan <span style="color: blue;">◉</span> Consulting service
Physical Risk	<ul style="list-style-type: none"> <li><span style="color: red;">◆</span> Decrease in yield and quality of raw materials and increase in quality maintenance costs, due to deterioration of ecosystem such as heat, drought, water shortages, and deterioration of water quality</li> <li><span style="color: red;">◆</span> <span style="color: red;">■</span> Decrease in labor productivity under harsh working conditions due to temperature rises and increase in labor costs due to shortage of workers</li> <li><span style="color: red;">◆</span> <span style="color: red;">■</span> Increase in costs due to supply chain disruptions, instability in raw material procurement, and suspension of logistics functions, caused by natural disasters</li> <li><span style="color: red;">■</span> Increase in energy costs due to deterioration of cooling efficiency of air conditioning equipment caused by extreme temperature changes</li> <li><span style="color: red;">■</span> Incurrence of costs associated with damage to factories, production stoppages, and disruption of logistics due to extreme weather s and natural disasters such as drought</li> <li><span style="color: red;">◇</span> Decrease in sales due to damage, shutdown of operations due to extreme weather or natural disasters in business partners and delivery destinations</li> </ul>	<ul style="list-style-type: none"> <li><span style="color: red;">●</span> Increase in claims settlement due to natural disasters</li> <li><span style="color: red;">●</span> Decline in premium income due to poor business performance</li> <li><span style="color: red;">○</span> Decrease in asset value or deterioration of business performance in our investment/loan portfolio companies due to damage from natural disasters</li> <li><span style="color: blue;">○</span> Increase in revenue by providing services related to adaptation measures, disaster prevention and mitigation, and environmental preservation.</li> </ul>
Transition Risk	<ul style="list-style-type: none"> <li><span style="color: red;">◆</span> Increase in nature-related due diligence in procurement of mineral resources, etc. and procurement costs of sustainable raw materials</li> <li><span style="color: red;">◆</span> <span style="color: red;">■</span> Loss of revenue brought about by damage to reputation due to environmental destruction in raw materials procurement and air pollution, water pollution, waste pollution and plastic pollution associated with business operations</li> <li><span style="color: red;">◆</span> <span style="color: red;">■</span> Incurrence of fines, damages, pollution removal and habitat restoration costs, etc. due to environmental accidents, and loss of reputation</li> <li><span style="color: red;">■</span> Increase in cost of responding to stricter environmental regulations, including GHG emissions, water management, waste management, air pollution, soil contamination and increase in burden of capital investment for energy conservation and renewable energy</li> <li><span style="color: red;">■</span> Loss of revenue as a result of demand restraint for virgin materials due to the acceleration of the circular economy</li> <li><span style="color: red;">■</span> Customer loss due to brand image deterioration caused by inability to respond to growing consumer awareness on climate- and nature-related issues</li> <li><span style="color: red;">■</span> Loss of market share due to failure to introduce technologies with lower environmental impact, such as renewable energy use, reduced GHG emissions, reduced water use, and environmentally friendly packaging</li> <li><span style="color: red;">■</span> Increase in energy costs due to introduction of carbon tax</li> <li><span style="color: red;">■</span> Decline in evaluation from stakeholders and investors, decline in corporate value and stock prices, and increase in response costs due to delays in responding to climate change measures, biodiversity considerations, and ESG information disclosure</li> <li><span style="color: blue;">◆</span> Enhancement of added value and stabilization of procurement costs by switching to raw materials with less environmental impact, such as utilization of sustainable biomass materials and recycled materials</li> <li><span style="color: blue;">■</span> Market expansion for products resistant to environmental changes such as rising temperatures and droughts</li> <li><span style="color: blue;">■</span> Capturing of new markets by focusing on waste reduction and products with low environmental impact</li> <li><span style="color: blue;">■</span> Loss of customers due to damage, shutdown of operations at business partners and delivery destinations caused by extreme weather or natural disasters</li> <li><span style="color: blue;">■</span> <span style="color: blue;">◇</span> Creation of new markets through product design that responds to the circular economy and the establishment of recycling systems and systems for resource recycling</li> <li><span style="color: blue;">◇</span> Reduction of transportation costs and GHG emissions by improving logistics efficiency (shared transportation, modal shift)</li> </ul>	<ul style="list-style-type: none"> <li><span style="color: red;">●</span> Decline in premium income due to business downturn in the relevant companies and markets</li> <li><span style="color: red;">●</span> Decrease in insurance premiums due to stricter underwriting standards and conditions as a result of tightening of environmental regulations</li> <li><span style="color: red;">●</span> <span style="color: red;">○</span> Loss of reputation due to involvement in businesses that lead to global warming and destruction of nature</li> <li><span style="color: red;">○</span> Decline in investment returns due to business turnaround in companies and markets that are not adequately addressing climate and natural issues</li> <li><span style="color: blue;">●</span> Development of new insurance products that address climate change risks and environmental risks</li> <li><span style="color: blue;">●</span> Developing new insurance products that address risks associated with new schemes to reduce environmental impacts, such as promoting sustainable raw material procurement and recycling, and coverage for losses related to shared delivery, etc.</li> <li><span style="color: blue;">○</span> Business leap forward in the relevant companies and markets that have made progress in addressing climate- and nature-related issues</li> <li><span style="color: blue;">○</span> Increased revenue from intermediaries such as credits to offset GHG emissions</li> <li><span style="color: blue;">○</span> Development and provision of new services that mitigate negative impacts on the natural environment related to raw material procurement, etc.</li> <li><span style="color: blue;">○</span> Increase in revenue by providing services related to information disclosure and business strategy that take climate- and nature-related risks into consideration</li> </ul>

# Contents

- Toward Green Resilience
- Governance
- Strategy
  - Assessment of Dependencies and Impacts
  - Analysis of Risks and Opportunities
  - Key Initiatives
- Risk Management
- Metrics and Targets
- Appendix—Detailed Analyses

	Companies in the technology/Hardware industry (Electronic Equipment, Devices & Components/Semiconductors)	The Group
	Risk: ◆ Upstream ■ The company itself ◇ Downstream Opportunity: ◆ Upstream ■ The company itself ◇ Downstream	Risk: ● Underwriting ○ Investment/Loan ● Consulting service Opportunity: ● Underwriting ○ Investment/Loan ● Consulting service
<b>Physical Risk</b>	<ul style="list-style-type: none"> <li>◆ Decrease in yield and quality of raw materials and increase in quality maintenance costs due to ecosystem deterioration such as heat, drought, water shortages and deterioration of water quality</li> <li>◆ Increase in nature-related due diligence in procurement of mineral resources, etc. and procurement costs of sustainable raw materials</li> <li>◆ ■ Decrease in labor productivity under harsh working conditions due to temperature rises and increase in labor costs due to shortage of workers</li> <li>◆ ◇ Increase in costs due to supply chain disruptions, instability in raw material procurement, and suspension of logistics functions, caused by natural disasters</li> <li>■ Recovery costs incurred as a result of business suspension due to damage to factories and decrease in sales due to extreme weather and natural disasters</li> <li>■ Disruption of production and services and increase in costs due to depletion of water resources</li> <li>■ Increase in energy costs due to deterioration of cooling efficiency of air conditioning equipment due to extreme temperature changes</li> <li>◇ Loss of customers due to damage, shutdown of operations at business partners and delivery destinations caused by extreme weather or natural disasters</li> <li>◇ Loss of customers due to disruption or delayed response associated with damage or shutdown of operations at business partners and delivery destinations caused by extreme weather or natural disasters</li> </ul>	<ul style="list-style-type: none"> <li>● Increase in claims settlement due to natural disasters</li> <li>● Decline in premium income due to poor business performance</li> <li>○ Decrease in asset value or deterioration of business performance in our investment/loan portfolio companies due to damage from natural disasters</li> <li>● Increase in revenue by providing services related to adaptation measures, disaster prevention and mitigation, and environmental preservation.</li> </ul>
<b>Transition Risk</b>	<ul style="list-style-type: none"> <li>◆ Burden of cost of moving and relocating procurement areas for minerals, etc. due to expansion of nature conservation areas, and instability of raw material procurement</li> <li>◆ ■ Loss of revenue caused by reputational damage due to environmental destruction during raw materials procurement and air pollution, water pollution and waste pollution associated with business operations</li> <li>◆ ■ Increase in cost due to restrictions on available land resulting from the expansion of nature conservation areas and stricter regulations on land development</li> <li>■ Increase in cost of responding to stricter environmental regulations, including GHG emissions, water management, waste management, air pollution, soil contamination throughout the product value chain, and an increase in the burden of capital investment for energy conservation and renewable energy</li> <li>■ Decrease in sales associated with brand image deterioration and suspension of handling at retail stores due to inability to respond to growing consumer awareness on climate-related and environmental issues.</li> <li>■ Loss of market share due to failure to introduce technologies with lower environmental impact, such as renewable energy use, reduced GHG emissions, reduced water use, and packaging with less environmental impact, including the establishment of recycling technologies</li> <li>■ Increase in energy costs due to introduction of carbon tax</li> <li>■ Decline in evaluation from stakeholders and investors, decline in corporate value and stock prices, and increase in response costs due to delays in responding to climate change measures, and ESG information disclosure</li> <li>■ Loss of revenue brought about by damage to reputation due to air pollution, water pollution, plastic pollution and emissions associated with business operations</li> <li>■ Increase in opportunities to create and offer climate change-related products and services in response to changes in technology and markets</li> <li>■ Development of new markets through the design and construction of zero-energy buildings and green infrastructure</li> <li>■ Reduction of transportation costs and GHG emissions by improving logistics efficiency (shared transportation, modal shift)</li> <li>■ Gain of market share through successful introduction of technologies with lower environmental impact such as use of renewable energy, reduction of GHG emissions, reduction of water use, and environmentally friendly packaging</li> </ul>	<ul style="list-style-type: none"> <li>● Decline in premium income due to business downturn in the relevant companies and markets</li> <li>● ○ Loss of reputation due to involvement in businesses that lead to global warming and destruction of nature</li> <li>○ Decline in investment returns due to business turnaround in companies and markets that are not adequately addressing climate and natural issues</li> <li>● Developing new insurance products that address risks associated with new schemes to reduce environmental impacts, such as promoting sustainable raw material procurement and recycling, and coverage for losses related to shared delivery, etc.</li> <li>○ Business leap forward in the relevant companies and markets that have made progress in addressing climate- and nature-related issues</li> <li>● Increased revenue from intermediaries such as credits to offset GHG emissions</li> <li>● Development and provision of services to mitigate negative impacts on the natural environment related to raw material procurement, water use, etc.</li> <li>● Increase in revenue by providing services related to information disclosure and business strategy that take climate- and nature-related risks into consideration</li> </ul>

	Companies in the electricity/gas industry	The Group
	Risk: ◆ Upstream ■ The company itself ◇ Downstream Opportunity: ◆ Upstream ■ The company itself ◇ Downstream	Risk: ● Underwriting ○ Investment/Loan ● Consulting service Opportunity: ● Underwriting ○ Investment/Loan ● Consulting service
<b>Physical Risk</b>	<ul style="list-style-type: none"> <li>◆ Unstable procurement of raw materials due to poor harvest of biomass fuels, etc. due to extreme weather conditions</li> <li>◆ ■ Supply chain disruptions, instability in raw material procurement, and suspension of logistics functions caused by natural disasters</li> <li>◆ ■ Decreased hydroelectric power sales and increased cooling costs due to water shortage</li> <li>◆ ■ Decrease in labor productivity under harsh working conditions due to temperature rises and increase in labor costs due to shortage of workers</li> <li>■ Increase in costs in the event of extensive damage to power plants, substation and transmission equipment, etc. due to extreme weather or natural disasters, resulting in long-term shutdowns or large-scale power outages, etc.</li> <li>■ Increase in costs to deal with the destruction of the natural environment due to the construction of power plants and gas extraction facilities, fragmentation of ecosystems due to the construction of power lines and pipelines, and changes in river ecosystems due to hydroelectric dams</li> </ul>	<ul style="list-style-type: none"> <li>● Increase in claims settlement due to natural disasters</li> <li>● Decline in premium income due to poor business performance</li> <li>○ Decrease in asset value or deterioration of business performance in our investment/loan portfolio companies due to damage from natural disasters</li> <li>● Increase in revenue by providing services related to adaptation measures, disaster prevention and mitigation, and environmental preservation.</li> </ul>
<b>Transition Risk</b>	<ul style="list-style-type: none"> <li>■ Increase in costs in response to stricter environmental regulations, such as GHG emissions, water management, waste management, air pollution, and soil contamination</li> <li>■ Incurrence of costs due to the cancellation or reduction of business plans due to opposition movements by indigenous peoples, local communities, NGOs, etc., or orders by authorities from the perspective of nature conservation, or litigation results</li> <li>■ Loss of customers due to a decline in brand image caused by the impacts on biodiversity and ecosystem services in the construction and operation of power plants and emergence of risks to the region (e.g., bird strikes, slope disasters caused by deforestation, etc.)</li> <li>■ Increase in costs of procuring sustainable biomass fuels due to land competition and increased demand</li> <li>■ Loss of market share due to failure to introduce technologies with low environmental impact, such as reducing GHG emissions and water usage</li> <li>■ Increase in energy costs due to introduction of carbon tax</li> <li>■ Decrease in value of existing assets due to energy transition</li> <li>■ Decline in evaluation from stakeholders and investors, decline in corporate value and stock prices, and increase in response costs due to delays in responding to climate change measures, biodiversity considerations, and ESG information disclosure</li> <li>■ Loss of revenue brought about by loss of reputation caused by air pollution, water pollution and waste pollution associated with business operations</li> <li>■ Increased opportunities to create and provide climate change-related products and services in response to changes in decarbonization and energy technologies and markets that coexist with the natural environment</li> <li>■ Gain of market share through successful introduction of technologies with lower environmental impact such as use of renewable energy, reduction of GHG emissions, reduction of water use, and environmentally friendly packaging</li> </ul>	<ul style="list-style-type: none"> <li>● Decline in premium income due to business downturn in the relevant companies and markets</li> <li>● Decrease in insurance premiums due to stricter underwriting standards and conditions as a result of tightening of environmental regulations</li> <li>● ○ Loss of reputation due to involvement in businesses that lead to global warming and destruction of nature</li> <li>○ Decline in investment returns due to business turnaround in companies and markets that are not adequately addressing climate and natural issues</li> <li>● Development of new insurance products that address climate change risks and environmental risks</li> <li>○ Development of new insurance products that address climate change risks and environmental risks</li> <li>● Increased revenue from intermediaries such as credits to offset GHG emissions</li> <li>● Development and provision of services to mitigate impacts on the natural environment at business locations such as power plants</li> <li>● Development and provision of services to mitigate impacts on the natural environment at business locations such as power plants</li> </ul>

**Contents**

- Toward Green Resilience
- Governance
- Strategy
  - Assessment of Dependencies and Impacts
  - Analysis of Risks and Opportunities
  - Key Initiatives
- Risk Management
- Metrics and Targets
- Appendix—Detailed Analyses

# 5 | LEAP Analysis of Green Infrastructure Published in Fiscal Year 2024

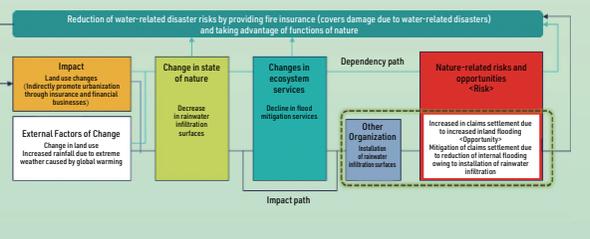
**Column**

## ~LEAP Approach: to reduce economic losses from flood-related disasters through the introduction of green infrastructure\*1~

As analyzed in the Chapter "Climate/Nature-Related Risks and Opportunities," we recognize that, for non-life insurers, "Prevention of floods/storms" rooted in nature is an important ecosystem service that enables damage mitigation. As short-term heavy rains increase due to global warming, urbanization leads to an increase in paved surfaces as a change in land use, a key impact defined by the TNFD, and the loss of rainwater infiltration function by soil is considered to be a factor that increases the flood disaster risk for non-life insurers.

Therefore, in order to promote measures to reduce the risk of water-related disasters through green infrastructure\*1 that exhibits flood prevention functions rooted in nature, we have organized risks and opportunities associated with changes in land use (increasing paved surfaces/installation of rainwater infiltration surfaces), using the chart of "dependencies and impacts on nature, and relationship between risks and opportunities" outlined in the TNFD' LEAP approach. We conducted a quantitative evaluation in accordance with the procedures of the approach, and confirmed a reduction in the amount of flood-related damage.

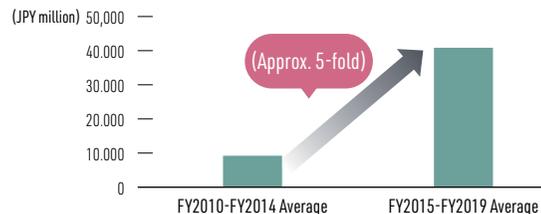
\*1: An approach to utilize diverse functions of the natural environment for infrastructure development



### ■ Scoping

Domestic fire insurance, which accounts for a large percentage of the Group's premium income, has seen a rapid increase in the number of claims settlement due to water-related disasters in recent

Claims settlement due to water-related disasters(5-year average, Residential properties)



Source: General Insurance Rating Organization of Japan

On the other hand, in terms of rainfall conditions in Japan, the frequency of heavy rainfall (50 mm or more of rainfall per hour) increased by approximately 1.5 times between 2014-2023 and 1976-1985<sup>\*2</sup>, and the occurrence of water-related disasters increased proportionally. In recent years, the amount of damage caused by inland flooding in urban areas, etc. accounts for about 40% of all water-related disasters, and in Tokyo, it has reached approx. 70%<sup>\*3</sup>. In addition, it is believed that inland flooding has increased as the increase in paved surfaces due to urbanization is preventing rainwater from penetrating into the ground, and rainwater that exceeds the treatment capacity of drainage facilities flows into rivers and sewers all at once. Therefore, identifying "land use change" due to increased impermeable surfaces as a key impact, we decided to analyze the mitigation of flood damage by introducing green infrastructure that temporarily stores and infiltrates rainfall and suppresses runoff.

\*2 Japan Meteorological Agency website, "Past Changes in Heavy Rainfall and Extreme Heat Days (Extreme Phenomena).

\*3 Ministry of Land, Infrastructure, Transport and Tourism, "Recent Rainfall and Inland Water Damage, and Current Status of Sewerage System Development".

### ■ Locate

Because the Group provides domestic fire insurance coverage without significant regional bias, the regions analyzed in this case focused on the high risk of damage due to water-related disasters, rather than on sales by region. In recent years, northwestern Kyushu has already experienced severe flooding, and is regarded as one of the regions where rainfall will increase the most (rainfall increases by 1.4 times in a 4°C rise scenario)<sup>\*4</sup> according to survey results by the Ministry of Land, Infrastructure, Transport and Tourism (hereinafter "MLIT"). Accordingly, we decided to conduct LEAP analysis on specific areas that meet the following conditions in northwestern Kyushu.

- Regions with damage caused by inland flooding in recent years
- Small and medium-sized river basins in cities to verify damage caused by inland flooding.

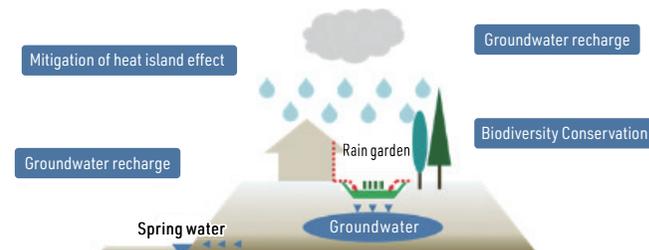
### • Basins with significant land use alteration in recent years

\*4 MLIT's "Ideal Flood Control Plan Based on Climate Change" Recommendation (revised April 2021) "Concept for setting rainfall change multipliers for each regional classification"

### ■ Evaluate

Effective measures to control inland flooding include drainage to outside waterways through the construction of pumping stations, drainage through underground discharge channels, as well as storage and infiltration of rainwater at various locations. For rainwater storage and infiltration, there are infiltration systems such as rainwater infiltration basins and rainwater tanks, but recently green infrastructure such as "rain gardens" that utilize natural functions have been attracting attention. These approaches to storage and infiltration is in line with the concept of "River Basin Disaster Resilience and Sustainability by ALL," promoted by MLIT, which calls for flood control in entire river basins, not just river areas.

In addition to mitigating flood damage, "rain gardens" are expected to provide a variety of ecosystem services to the region, such as enhancing biodiversity, conserving water basins, and mitigating the heat island effect. However, until now, the accumulated effects of "rain gardens" in basins have not been quantitatively evaluated. In order to clarify the effect of "rain garden" development on reducing the amount of damage caused by flood-related disasters, we carried out a quantitative analysis using the RRI model at actual locations.



### ■ Assess

Target	Details
Public//Commercial facilities, Residences	<ul style="list-style-type: none"> <li>● Collect rainwater from the roof into a rain garden (20 cm deep) with a base area of 1/5 of the roof area.</li> <li>● Permeation capacity from base layer: 100 mm/hr</li> </ul>
Parks	<ul style="list-style-type: none"> <li>● Storage facility with the same area of the base as the park (20 cm deep)</li> <li>● No infiltration from the park is expected.</li> </ul>

### Target area/basin

Small- to medium-sized river in a core city in northwestern Kyushu, which has been subject to continuous flood damage in recent years. The river basin is (7.8km<sup>2</sup>)

# Contents

- Toward Green Resilience
- Governance
- Strategy
- Assessment of Dependencies and Impacts
- Analysis of Risks and Opportunities
- Key Initiatives
- Risk Management
- Metrics and Targets
- Appendix—Detailed Analyses

## Infiltration/storage case setting

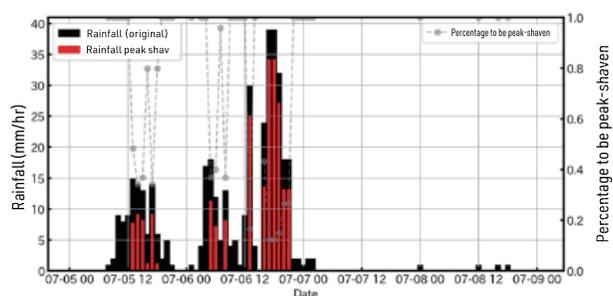
### Target rainfall

- Actual rainfall amount during heavy rains in July 2018
- Rainfall amount in 2050 based on SSP1-2.6 and SSP5-8.5 scenarios

### Analysis method

- (i) The effect of installing a rain garden is reflected in the simulation by subtracting "the amount of rainfall stored and infiltrated into the rain garden" from the actual rainfall amount.
- (ii) To calculate the inundation depth, time series of rainfall peak shaven (red bar graph) is fed into the RRI model

### Rainfall time series before vs. after peak shaving at representative AMeDAS points in the city concerned

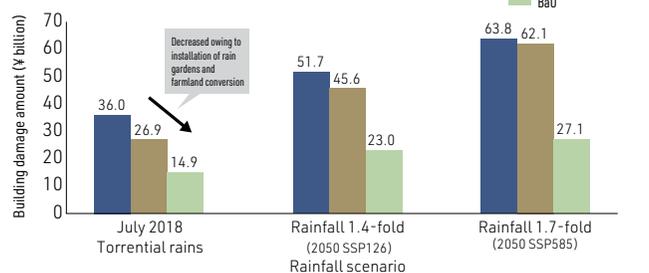


The difference between actual rainfall (black) and rainfall after peak shaving (red) is the storage and infiltration effect of the rain garden.

### Analysis results

- In the case of the torrential rainfall in July 2008, the amount of damage was reduced by JPY910 million by converting land to farmland, and by JPY2.11 billion by installing rain gardens.
- In both rainfall scenarios, the rain garden installation measure reduces the amount of damage the BaU.

### Experiments by rainfall scenario: building damage amount



Regarding the amount of building damage, we calculated asset values by multiplying the total floor area (3D urban model data) by the house asset table value per unit area for 2018, and then applied the house damage function from the Manual for Economic Evaluation of Flood Control Investment (2020) of the MLIT

These calculation results are based on a partial modification of the Rainfall Runoff Inundation (RRI) model program of the Public Works Research Institute.

### Preparation (to be continued)

We found that the installation of "rain gardens" has a certain effect on mitigating flood damage. This time, we conducted an analysis based on the assumption of 100% introduction, but in the future we would like to further refine our analysis by examining the effect of reducing the risk of flood-related disasters based on the percentage of systems installed, as well as the locations where the systems can be installed to achieve higher effects.

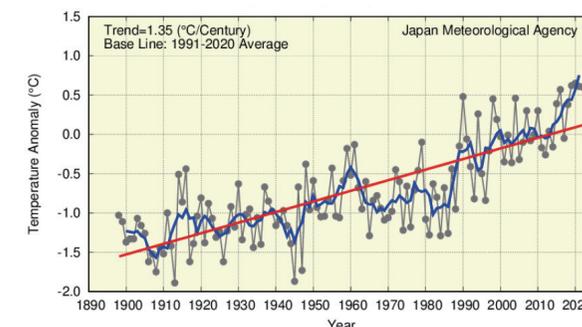
On the other hand, the installation of rain gardens cannot be expected to have any significant disaster prevention effects without the cooperation of not only public spaces managed by local governments, but also homes, businesses, and various stakeholders within the basins. Incentive mechanisms and collaboration with local governments, research institutes, and NPOs are required to determine the details such as onto whom the burden should be placed for installing equipment that can provide disaster prevention effects. Along with research on green infrastructure such as "rain gardens," the Group is promoting in various regions to create models of collective action that will encourage safe and secure community development and the transition to nature-positive local communities.

## 6 | Analysis of Climate/ Nature-related Risks and the Non-life Insurance Industry Published in Fiscal Year 2024

Changes in risks related to future climate change and biodiversity loss will have a significant impact on the non-life insurance industry. For example, as climate change progresses, disasters such as heat waves, droughts, and forest fires caused by global warming will become more frequent and increase in magnitude. Furthermore, the risk of heavy rainfall and flooding will increase as precipitation patterns are affected, and the risk of flooding of coastal areas will increase as sea levels rise due to melting glaciers and thermal expansion of ocean waters. In Japan, the annual average temperature is expected to rise and the number of extremely hot days and torrential rains are expected to increase. The above-men-

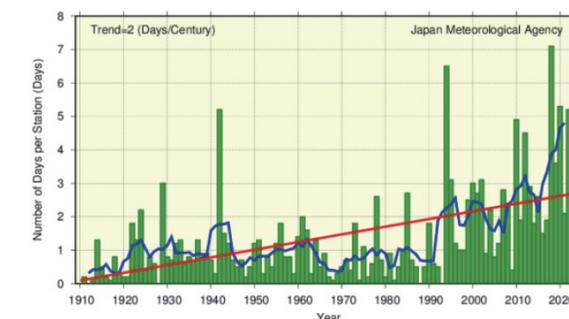
tioned risks are expected to materialize and supply chain disruptions are expected to affect corporate activities.

### Secular changes in annual average temperature in Japan



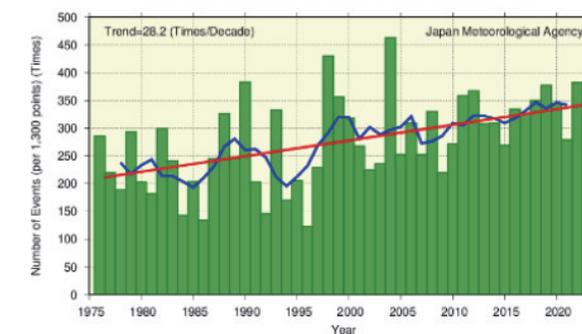
(Source: Japan Meteorological Agency, Climate Change Monitoring Report 2023, p.51)

### Secular changes in the annual number of extremely hot days (daily maximum temperature of 35°C or higher) in Japan



(Source: Japan Meteorological Agency, Climate Change Monitoring Report 2023, p.52)

### Changes in the Number of Short-Duration Intense Rainfall Events in Japan



(Source: Japan Meteorological Agency, Climate Change Monitoring Report 2023, p.60)

# Contents

- Toward Green Resilience
- Governance
- Strategy
- Assessment of Dependencies and Impacts
- Analysis of Risks and Opportunities
- Key Initiatives
- Risk Management
- Metrics and Targets
- Appendix—Detailed Analyses

As climate change becomes more severe, the number of endangered species has increased from about 1,500 to more than 7,000 over the past 10 years, raising concerns about the loss of biodiversity. When biodiversity is lost, the ecosystem services that nature provides, such as soil stability, will decrease, which increases the risk of floods and landslides and decreases water purification ecosystem services. This is expected to have an impact on many corporate activities, including agriculture and industry, such as water resource depletion and water quality deterioration.

**(i) Examples of impacts on non-life insurance industry**

The increasing frequency and magnitude of these natural disasters will result in increased claims settlement and may affect the profitability of non-life insurance companies, as the reinsurance market, which the companies use to diversify risk, is also exposed to similar risks, and this could result in higher reinsurance premiums paid by non-life insurance companies.

**(ii) Existence of uncertainties in risk assessment**

While the above-mentioned risks have been identified through various scientific validations, the prediction models used to estimate these risks also contain uncertainties. This section describes the Group's perception of these uncertainties.

**a. Uncertainties in climate prediction models**

The Coupled Model Intercomparison Project (CMIP), an international project that aims to advance scientific understanding of climate change by comparing and evaluating multiple climate projection models and integrating their results, also provides data for climate projection and scenario analysis in the IPCC assessment report. Its climate prediction models contain the following uncertainties:

<b>a. Structural Uncertainty of the Model</b>	Because each model uses different parameters, results may vary among models. In particular, greenhouse and parasol effects of the clouds associated with global warming differ from model to model, and this is the biggest factor* in the uncertainty of climate change predictions.
<b>b. Uncertainty of external forcing</b>	Uncertainty also exists regarding future changes in external forcing, such as solar radiation, volcanic activity, and anthropogenic GHG emissions.
<b>c. Uncertainty of internal variability</b>	In the climate system there is natural internal variability (such as El Niño events), which can affect model predictions.
<b>d. Uncertainty of data</b>	Uncertainty exists in the accuracy of the observed data used to validate models and set initial conditions. The JMA report on changes in the frequency of short-duration intense rainfall events in Japan mentioned above also suggests that future data accumulation is needed to reliably capture these long-term changing trends, due to the low frequency of extreme heavy rainfall events and the relatively short observation time of AMeDAS.
<b>e. Uncertainty of scale</b>	The model is grid-based, which limits its spatial resolution, limiting its ability to predict regional climate change in detail.

\*Zelinka et al., Causes of Higher Climate Sensitivity in CMIP6 Models,

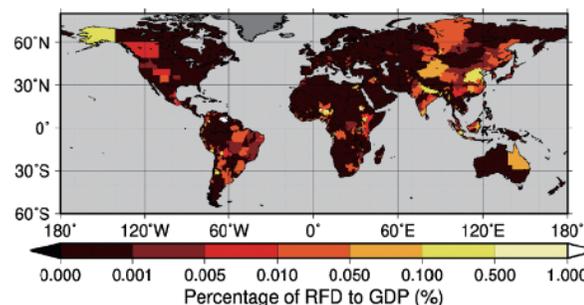
As such, we recognize that there are multiple uncertainties in the climate models provided in the IPCC assessment reports, and that even in the analysis results for the scenario in which global warming progresses the most (RCP8.5/SSP5-8.5) the impact could be higher than expected.

**b. Uncertainty regarding the damage amount after taking flood control measures**

Floods are a natural disaster that has a particularly significant impact on the Group's portfolios. Even after implementing adaptation measures (measures to prevent floods), depending on climate change and socioeconomic development conditions, "limits of adaptation," may occur in which flood damage will increase beyond the current damage amount. This is due to the significant flood damage that occurs during the construction of structures to protect against floods, and it has become clear that it is important to make a decision to implement adaptation measures as early as possible and to secure funding for this purpose.

Taking these points into consideration, the Group has developed the "Endorsement covering emergency evacuation of vehicles in the event of disasters," and other products, that cover the costs incurred to avoid damage in the event of a natural disaster.

**Increase in the amount of flood damage over current damage amount when adaptation measures are implemented**



(Source: Tanoue et al., Residual flood damage under intensive adaptation, (Tanoue, M., Taguchi, R., Alifu, H. et al. Residual flood damage under intensive adaptation. Nat. Clim. Chang. 11, 823–826 (2021). <https://doi.org/10.1038/s41558-021-01158-8>)

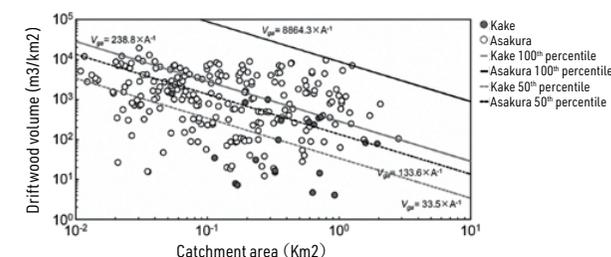
**c. Uncertainty regarding the damage amount caused by landslides,**

Diverse ecosystems provide us with ecosystem services such as flood mitigation and soil and sediment retention. If there is a future loss of biodiversity, however, there is a risk that these services will not be available and damage will occur. For example, forests have the function of preventing landslide disasters by suppressing the occurrence of surface landslides during rainfall. This function increases or decreases as the forest matures or degrades. In addition, compared to young forests, although mature forests are able to prevent landslides from larger-scale heavy rains, in mature forests the driftwood volume in the event of

a landslide may be greater.

In Japan, forests cover 67% of the land area, of which approximately 40% are man-made forests in a mature state, and as mentioned above, heavy rainfall is expected to increase due to climate change. As a result, although the amount of damage caused by landslides is expected to increase in the future, the magnitude of the risk may not have been anticipated.

**Increases in driftwood volumes in forests with different maturity**



(Source: Sato et al., Evaluation of influences of forest cover change on landslides by comparing rainfall-induced landslides in Japanese artificial forests with different ages)

Figure. Comparison of driftwood volume in Kake and Asakura disasters The Asakura (city in Fukuoka) disaster (solid black line in the figure), the damage is 30-fold larger than that at Kake. Similarly, comparing the 50th percentile lines of the Kake (city in Hiroshima) disaster (gray dotted line) and of the Asakura disaster (black dotted line), the damage at Asakura is four-fold larger than that at Kake.

Believing in the importance of river basin flood control, including forest maintenance that takes these conditions into consideration, the Group has been promoting "Green Resilience" initiatives such as the "Green River Basin Flood Control Initiative" in the Kuma River basin and the "Initiative for realizing water positivity in Kumamoto," which contribute to preventing and mitigating landslide disasters

**Image of River Basin Disaster Resilience and Sustainability by All**



see page 37

**Contents**

- Toward Green Resilience
- Governance
- Strategy
  - Assessment of Dependencies and Impacts
  - Analysis of Risks and Opportunities
  - Key Initiatives
- Risk Management
- Metrics and Targets
- Appendix—Detailed Analyses

# 7 | Appendix: Terms Related to Heat Map

## Dependency Heat Map: ecosystem services

Term	Explanation
<b>Animal energy</b>	Labor provided by domesticated animals such as cattle, horses, donkeys, goats, and elephants, used in agriculture, etc.
<b>Bioremediation</b>	Natural processes whereby organisms such as microorganisms, plants, algae, and some animals decompose, reduce, and detoxify pollutants.
<b>Mass flow rate mitigation</b>	Sediment transport and storage functions in rivers, lakes, oceans, etc. through buffering and attenuating mass flows
<b>Climate adjustment</b>	Function of nature to moderate the climate. Global climate adjustment is achieved through long-term storage of carbon dioxide in soil, plant biomass, and oceans. At the regional level, ocean currents and winds adjust climate. At the regional and micro levels, vegetation adjusts temperature, humidity, and wind speed.
<b>Dilution by the atmosphere and ecosystem</b>	The function of nature, such as fresh and ocean water and the atmosphere, to dilute gaseous, liquid, and solid wastes produced by human activities.
<b>Suppression of infectious diseases</b>	Disease control functions in plants, animals, and humans
<b>Textiles and other materials</b>	Fibers, etc. collected from plants, algae, and animals that are used directly or processed for various purposes. In addition to wood and further unprocessed fibers, this includes production materials such as cellulose, cotton, and dyes, as well as plant, animal, and algae materials for use in production of feed and fertilizers.
<b>Filtration</b>	Filtration, sequestration, storage, and accumulation of pollutants by various organisms, including algae, animals, microorganisms, vascular plants, and non-vascular plants.
<b>Prevention of floods/storms</b>	Flood and storm suppression functions provided by the sheltering, buffering, and damping effects of natural and planted vegetation.
<b>Genetic materials</b>	DNA derived from all living organisms, including plants, animals, and algae.
<b>Underground water</b>	Water stored underground in aquifers composed of permeable rock, soil, and sand. Water contributing to groundwater sources is derived from rainfall, snowmelt, and water flow from natural freshwater sources.

Term	Explanation
<b>Habitat maintenance</b>	Function to maintain habitats that contribute significantly to reproduction of individual members of a particular species. These include places where larvae occur in high numbers, where they are protected from predators, and where they grow faster than in other places.
<b>Stabilization/Erosion prevention</b>	Large-scale stabilization and erosion control functions performed by vegetation that protect and stabilize terrestrial, coastal, and marine ecosystems, coastal wetlands, and sand dunes. Slope vegetation helps prevent avalanches and landslides, while mangroves, seagrasses, and macroalgae help prevent beach and sediment erosion.
<b>Mitigation of sensory impacts</b>	Functions that reduce impacts on human health and the environment, such as noise and light pollution reduction provided by plants.
<b>Pest control</b>	Pest control and invasive alien species management functions provided by the introduction and maintenance of predators against insect pests and invasive alien species, landscaping to reduce pest invasion, and natural toxins against pests.
<b>Pollinators</b>	Pollinator functions provided primarily by three elements: animals, water, and wind. The majority of plants self-propagate, depending on pollinators such as insects, and the pollen-carrying functions of water flow and wind.
<b>Soil quality</b>	Soil quality, such as fertility and soil structure, maintained by processes such as weathering, nitrogen fixation, nitrification, and mineralization
<b>Surface water</b>	Water flowing over the surface of the ground, such as river water
<b>Ventilation</b>	Ventilation function of nature and planting, which is essential for improving indoor air quality. Without this, accumulation of volatile organic compounds (VOCs), airborne bacteria, and mold could pose the risk of long-term health damage to building occupants.
<b>Water cycle</b>	Circulation of water that flows through the Earth's atmosphere, land, and oceans. The hydrologic cycle is involved in [replenishment] [recharging] of groundwater sources (aquifers) and maintenance of surface water flow.
<b>Water quality</b>	Quality of water provided by maintaining the chemical states of fresh and salt water, such as rivers, streams, lakes, and groundwater sources, and ensuring a favorable living environment for biota.

## Impact Heat Map: Impact drivers

Term	Explanation
<b>Utilization of terrestrial ecosystems</b>	Modification of terrestrial ecosystems associated with development of agricultural land, commercial forests, and mines
<b>Utilization of freshwater ecosystem</b>	Impacts on freshwater ecosystems such as wetlands, ponds, lakes, streams, rivers, and peatlands through modifications associated with the construction of bridges, dams, seawalls, etc.
<b>Utilization of marine ecosystem</b>	Modification of marine ecosystems associated with aquaculture and mining development
<b>Use of water</b>	Impacts from groundwater and surface water use
<b>Utilization of other resources</b>	Mining minerals and capturing wild fish, wild mammals, etc.
<b>GHG emissions</b>	Emissions of greenhouse gases such as carbon dioxide (CO2) and methane (CH4)
<b>Air pollution</b>	Air pollution due to substances other than GHG
<b>Water pollution</b>	Impacts of discharging of pollutants into bodies of water
<b>Soil contamination</b>	Contamination of soil by wastes, etc.
<b>Wastes</b>	Impacts of various types of waste emissions
<b>Disturbance</b>	Effects of high-intensity or prolonged noise or light pollution
<b>Introduction of alien species</b>	Biological changes and interference due to introduction of alien species.