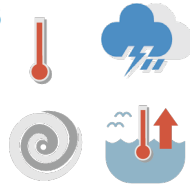


Transportation and postal services

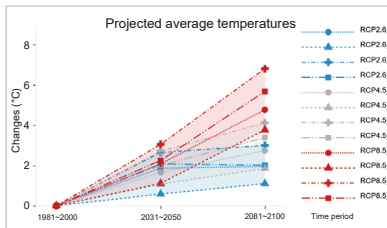
Major Factors of Impacts

Rising average temperatures, increased number of summer days, increased heavy rainfall and large typhoons, increased heavy snowfall, rising sea levels and storm surges

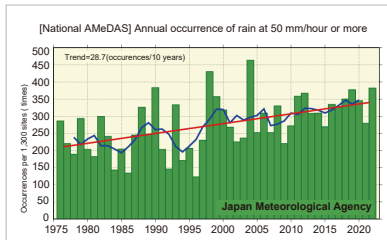


Current Situation and Future Projections

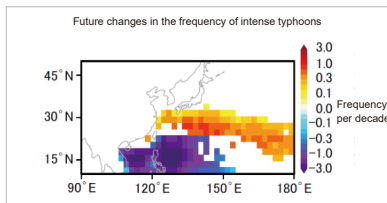
Average temperatures in Japan are increasing at a rate of 1.24°C/100 years. Heavy rainfall is also on the increase, and with changes in the amount and patterns of rainfall, heavy rains and large typhoons are expected to increase further. Sea water temperatures are also expected to rise.



Projected average temperatures (annual average temperature projections based on emission scenarios and climate models (difference from standard period)) Source: A-PLAT



Changes in the annual occurrence of precipitation of 50 mm/hour or more in Japan Source: Japan Meteorological Agency website (translated by NIES)



Future changes in the frequency of intense tropical cyclones (typhoons). The frequency is increasing in the red region (RCP 8.5 scenario, end of the 21st century). Sources: Yoshida et al. (2017), Meteorological Research Institute, Japan Meteorological Agency (2017)

Studies using RCP8.5 project increase in strong winds and strong tropical cyclones through the second half of the 21st century, although trends differ by regions.

Adaptation

Accurately identify impacts of climate change through monitoring and climate projections. Limit increased disaster risks by strategically and adaptively promoting optimal combination of hard and soft adaptation measures.

Factors	Rising temperatures, increased heavy rainfall, typhoons, and heavy snowfall, rising sea levels and storm surges			
	Core business	Market/Consumers	Adaptation business	
Management resources	Impact on buildings and facilities <ul style="list-style-type: none"> Damage to buildings and facilities Increased restoration and disaster prevention costs 	Direct impact on sales/increased operating costs <ul style="list-style-type: none"> Decreased revenues due to poorer transportation services Delays or accidents in operation or flight operations Passengers and crew affected by disasters Damage to products during transport Suspension, delay, or stranding of business due to transportation network disruption Increased fuel costs due to diverted navigation and marine casualties 	Changes in demand <ul style="list-style-type: none"> Decreased sales as customers refrain from going out Decreased revenues due to damage caused by disaster to clients and customers 	Development of new services <ul style="list-style-type: none"> Increased usage due to reduced snowfall Growing need for transportation method other than land transportation to avoid impact of heavy snowfall
Impacts	Secure alternative network	Use weather services	Determine operation feasibility based on rain gauge observations, etc.	Assess needs
	Adaptation measures	Regular inspection	Preliminary drills	Promote installation of highly efficient air conditioning
Impacts				Respond to changing needs



Transportation and postal services

Transportation and postal services include establishments engaged in the transportation of passengers and cargo by rail, motor vehicles, ships, aircraft, or other means of transportation; establishments engaged in warehousing and services associated with transportation; and establishments that serve postal or letter services.

Back

Factors	Rising temperatures, increased heavy rainfall, typhoons, and heavy snowfall, rising sea levels and storm surges			
Management resources	Core business		Market/Consumers	Adaptation business
Impacts	Impact on buildings and facilities	Direct impact on sales/increased operating costs	Changes in demand	Development of new services

- Damage (buckling, etc.) to tracks due to high temperatures
- Weather-related disasters causing equipment malfunctions or collapses and impacting supply chain
- Damage from flooding (especially low-rise infrastructure, tunnels, underground facilities)
- Increased risk of damage from wind, flood, storm surge, etc. (especially underground facilities)
- Increased costs to restore damaged facilities and terminals
- Increased costs for disaster prevention and mitigation construction
- Decreased property values in areas with high disaster risk

- Decreased revenues due to poorer transportation services
- Delays or accidents in operation or flight operations
- Passengers and crew affected by disasters
- Damage to products during transport (caused by weather-related disasters)
- Suspension, delay, or stranding of business due to transportation network disruption (caused by weather-related disasters)
- Increased fuel costs (in navigation and cargo operations) due to diverted navigation and marine casualties
- Increased electricity costs for frozen and refrigerated warehouses and air conditioning costs due to rising temperatures
- Increased number of days of service suspended due to poor weather conditions

- Decreased sales as customers refrain from going out
- Short-term decrease in demand due to cancellations of flights caused by extreme weather conditions, etc.
- Decreased revenues due to damage caused by disaster to retailers and customers
- Risk of passengers being affected by disasters

- Increased usage due to reduced snowfall
- Growing need to build transportation methods other than landtransportation to avoid impact of heavy snowfall

Types of adaptation measures	Soft	Hard	Soft	Hard	Soft	Hard
	<ul style="list-style-type: none"> • Secure alternative network • Cooperate with other companies in same industry (e.g., substitute transport) • Regular inspection • Analyze and assess disaster risks • Improve planning and design of infrastructure • Consider relocation of electrical facilities and equipment to higher locations • Vehicle evacuation and planned suspension 	<ul style="list-style-type: none"> • Waterproofing measures by installing watertight panels, watertight walls, sandbags, etc. • Secure spare parts for common use among various locations • Relocate facilities with high disaster risk • Reinforce structures and take countermeasures based on regular inspections of structures 	<ul style="list-style-type: none"> • Secure alternative network • Cooperate with other companies in same industry (e.g., substitute transport) • Use weather services (identify and avoid flooded areas, identify routes) • Avoid stormy weather through analysis system • Determine operation feasibility based on rain gauge observations, etc. • Planned suspension of operations • Conduct and prepare preliminary drills (stock emergency food, portable toilets, carry tire chains, review countermeasure manuals) • Check river and sea level status using river monitoring cameras, etc. 	<ul style="list-style-type: none"> • Install highly efficient air conditioning • Improve insulation of facilities • Waterproofing measures by installing watertight panels, watertight walls, sandbags, etc. • Reinforce structures and take countermeasures based on regular inspections of structures 	<ul style="list-style-type: none"> • Assess needs and respond to changing needs • Impact assessment • Planned suspension of operations 	<ul style="list-style-type: none"> • Accelerate Modal Shift

Effect	Low ~ Medium	Low ~ Medium	Low ~ High	Low ~ High	Low ~ Medium	-
Cost	Low ~ Medium	Low ~ Medium	Low ~ High	Low ~ High	Low ~ Medium	-
Time span	Short ~ Medium	Short ~ Medium	Short ~ Long	Short ~ Long	Short ~ Medium	-

How to proceed with adaptation measures

[Current approach] Accurately identify impacts of climate change through monitoring and climate projections, etc. Limit increased disaster risk by strategically and adaptively promoting the optimal combination of hard and soft adaptation measures.

[Climate Change-aware approach] Risk assessment should be conducted for each impact of concern, and a combination of soft and hard measures should be taken to mitigate risk based on results of the assessment.

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