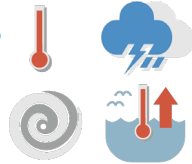


Manufacturing

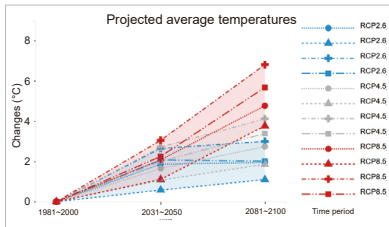
Major Factors of Impacts

Changes in precipitation amounts and patterns, increases in temperature, increases in sea level, and increases in sea temperature

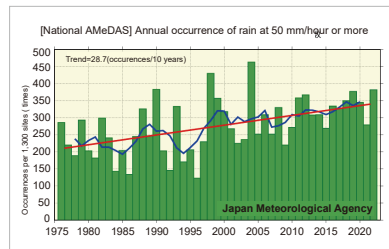


Current Situation and Future Projections

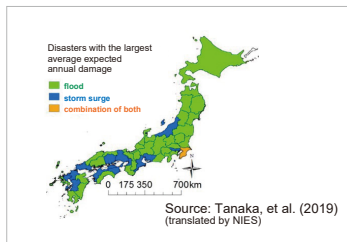
Average temperatures in Japan are increasing at a rate of 1.24°C /100 years. Heavy rainfall is also on the increase, rainfall amounts and patterns are changing, indicating that heavy rains and large typhoons are expected to increase further. Sea water temperatures are also expected to rise. Heavy rainfall events that could potentially cause flooding are projected to increase toward the end of the century in major river basins.



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)



Types of disasters that cause the greatest damage**
 **Note that this figure only shows type of disasters that cause the largest amount of damage between flood, storm surge, and combination of both, but other disasters are also projected to occur.

Adaptation

Promote measures against weather-related disasters (torrential rains, typhoons, floods, etc.) and measures against quality deterioration and changes in demand due to drought and temperature changes. Combine soft and hard measures to mitigate risks based on accurate risk assessment.

Factors

Changes in precipitation patterns, increased weather-related disasters, rising temperatures

Management resources

Core business

Markets/Customers

Adaptation business

Increased disaster risk

- Increased risk of damage to facilities and employees
- Interruption with commuting and working



Increased drought risk

- Increased risk of water resources (securing sufficient amount of water for production)



Increased health risks of employees

- Increased risk of heat stroke, etc.
- Increased risk of mosquito-borne infectious diseases



Decreased quality Increased cost

- Decreased quality and production efficiency due to temperature changes in manufacturing process and shorter periods of production



Market changes

- Impact on local industries rooted in the region's unique climate



- Changes in needs due to temperature changes

Development of new products

- Impact on local industries rooted in the region's unique climate



- Increased demand for new products

Impacts

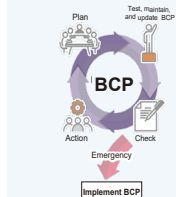
Impacts on the supply chain

- Increased risks in raw material procurement due to lower yields and quality of raw materials, etc.
- Supply chain disruptions, including damage to suppliers
- Interruption of logistics network

Adaptation measures

Formulate and implement BCP

Response to disasters



Support producers



Manage work environment



Control room temperature at factories



Survey market needs and respond to changes

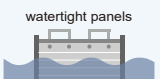


Develop products to support adaptation

Development of new local specialties



Development of adaptation-related products



Optimal placement of facilities



Reuse water in manufacturing process



Relocate manufacturing facilities





Manufacturing

Manufacturing is classified as establishments that manufacture new products by making physical or chemical changes to organic or inorganic substances and wholesale these products.

Factors	Changes in precipitation patterns, increased weather-related disasters, rising temperatures					
Management resources	Core business				Markets/Customers	Adaptation business
Impacts	Increased disaster risk	Increased drought risk	Increased health risks of employees	Decreased quality/Increased cost	Market changes	Development of new products

- Increased disaster risk**
 - Increased risk of damage to factories and storage facilities, and increased restoration costs (especially flood risk)
 - Increased risk of damage to employees, interruption with commuting and working
 - Increased risk of secondary disasters due to damage to facilities that store waste, chemicals, etc.
- Increased drought risk**
 - Increased risk of water resources (securing sufficient amount and quality of water for production)
 - Increased energy costs, such as an increase in purchased electricity due to a decline in the operating rate of in-house hydroelectric power generation plants
- Increased health risks of employees**
 - Increased risk of heat stroke, etc.
 - Increased risk of mosquito-borne infectious diseases
- Decreased quality/Increased cost**
 - Decrease in product quality and increase in production costs due to temperature changes in manufacturing process and lower quality of raw materials
 - Deterioration in production efficiency due to shorter production periods available
 - Increased weed control costs due to increased weed growth caused by higher CO2 concentration
- Market changes**
 - Impact on local industries rooted in the region's unique climate
 - Changes in needs due to temperature changes
 - Decreased sales due to damage to sales outlets and customers, and spread of infectious diseases
- Development of new products**
 - Impact on local industries rooted in the region's unique climate
 - Increased demand for new products
 - Decrease in sales from clients and customers being the victim of disasters

Impacts on the supply chain

- Increased risk in raw material procurement due to lower yields and quality of raw materials, etc.
- Supply chain disruptions, including damage to suppliers
- Interruption of logistics network

Types of adaptation measures	Soft	Hard	Soft	Hard	Soft / Hard	Soft	Hard	Soft	Hard
Adaptation measures	<ul style="list-style-type: none"> Formulate and implement BCP (formulate manuals to respond to disasters, implement disaster drills, etc.) Assess risk of each manufacturing site Planned closures Strengthen supply chain Take out damage insurance Analyze impact using hazard maps Monitor rainfall /river level 	<ul style="list-style-type: none"> Optimal placement of facilities Relocate manufacturing facilities Locate critical facilities (e.g., power receiving and transforming equipment) on upper floors Prepare for outages of public utilities including electricity (e.g., radio and satellite phone communication networks, uninterruptible power supplies (UPS)) Install watertight panels and watertight doors Reinforce, replace, or take other measures in accordance with regular inspections of the structure Construct outer levees Raise ground level 	<ul style="list-style-type: none"> Assess drought risk for each manufacturing site Prepare manuals for water conservation in case of drought Strengthen supply chain Risk assessment 	<ul style="list-style-type: none"> Reuse water in manufacturing process, install equipment to reduce amount of water required in manufacturing process Install water reservoirs sufficient for several weeks of operation Relocate manufacturing sites 	<ul style="list-style-type: none"> [Soft measures] Manage work environment Improve working style and work management [Hard measures] Control room temperature at factories Install high-efficiency air conditioning Optimal allocation of facilities Reduce work load through introduction of technology 	<ul style="list-style-type: none"> Support producers Technical guidance Risk assessment Monitoring Improve manufacture methods 	<ul style="list-style-type: none"> 1)Control room temperature at factories and install necessary equipment 2)Select and relocate sites based on risk assessment 	<ul style="list-style-type: none"> Survey market needs and respond to changes Impact assessment 	<ul style="list-style-type: none"> Develop new local specialties Develop products related to countermeasures against floods and landslides Develop adaptation support materials for agriculture Develop equipment related to securing water resources Develop products to prevent forest fire Develop products related to measures against heat stroke, heat-related illnesses, and heat islands Develop products related to countermeasures against infectious diseases

Effect	Low ~ Medium	Low ~ High	Low ~ Medium	Low ~ Medium	Low ~ High	Low	1)Medium 2)High	Low ~ Medium	-
Cost	Low ~ Medium	Low ~ High	Low ~ Medium	Low ~ Medium	Low ~ High	Low	1)Low ~ Medium 2)Medium ~ High	Low ~ Medium	-
Time span	Short ~ Medium	Short ~ Long	Short ~ Medium	Short ~ Medium	Short ~ Long	Short	1)Short 2)Medium ~ Long	Short ~ Medium	-

How to proceed with adaptation measures

[Current approach] Promote initiatives against weather-related disasters (torrential rains, typhoons, floods, etc.) and initiatives against quality deterioration and changes in demand due to drought and temperature changes.

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

[References]Ministry of the Environment (2020) "Climate Change Impact Assessment Report Details" <https://www.env.go.jp/press/files/jp/115262.pdf>, Ministry of the Environment (2022) "Climate Change Adaptation Guide for Private Sector - Preparing for Climate Risks and Surviving" https://adaptation-platform.nies.go.jp/private_sector/guide/index.html, Japan Meteorological Agency "[National AMeDAS] Annual occurrence of rain at 50 mm/hour or more" https://www.data.jma.go.jp/cpdinfo/extreme/extreme_p.html, Japan Meteorological Agency (2020) "Climate Change Monitoring Report 2019" https://www.data.jma.go.jp/cpdinfo/monitor/2019/pdf/ccmr2019_all.pdf, National Institute for Environmental Studies "H08 Water Risk Tool" https://h08.nies.go.jp/h08/viewer_j.html, National Institute for Environmental Studies "Climate Change Observation and Prediction Data" Climate Change Adaptation Information Platform (A-PLAT) <https://adaptation-platform.nies.go.jp/map/index.html>, Tanaka, Yukako et al. (2019) "Assessment on the Risk of Flood and Storm Surge with Flood Control Facilities" https://doi.org/10.2208/jscejhe.75.2_109