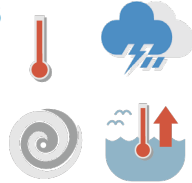


Electricity, water, gas, and heat supply

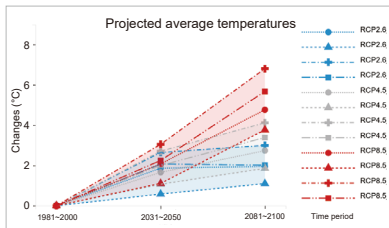
Major Factors of Impacts

Rising temperatures, increased frequency and intensity of extreme weather events, increased number of strong typhoons, and rising sea levels

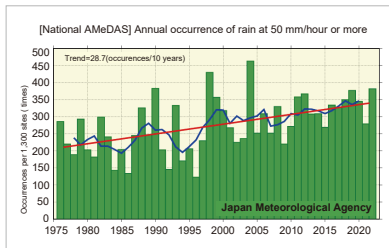


Current Situation and Future Projections

Increased short duration intense rains and frequency of droughts, and increased strong typhoons are causing direct damage to various infrastructures and public utilities. In the future, further increases in temperatures and heavy rainfall are predicted.



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)

Direct damage such as damage to infrastructure and public utilities disruptions will interfere with daily lives of citizens through power and water outages, etc.,

and also have a serious impact on manufacturing, distribution, sales, and other activities of various businesses. The effects of energy supply disruptions could also have a significant impact on primary industries such as agriculture, forestry, and fisheries.

Adaptation

Energy production facilities and transportation facilities should be strengthened in order to cope with effects of heavy rains, typhoons, droughts, etc. It is also necessary to formulate disaster prevention and mitigation plans based on future projections of climate change, and to establish appropriate and prompt emergency measures and restoration systems in the event of a disaster.

Category	Electricity	Water	Gas	Heat supply
Factor	Increased frequency and intensity of extreme weather events including heavy rains and typhoons, rising temperatures and sea levels			
Impacts	<ul style="list-style-type: none"> Shutdown of operations due to damage to facilities and equipment Increased disaster prevention and mitigation construction costs Increased maintenance and management construction costs Increased burden due to rising damage insurance premiums Increased employee health risks such as heat stroke Decreased productivity due to deteriorating working environment 			
	<ul style="list-style-type: none"> Damage to power distribution facilities, etc. due to fallen trees, flying debris, etc. Increased electricity demand for air-conditioning in summer 	<ul style="list-style-type: none"> Decreased water resources due to drought Deterioration of water quality due to rising water temperature, turbidity, storm surge, etc. 	<ul style="list-style-type: none"> Changes in summer and winter demand structure 	<ul style="list-style-type: none"> Changes in summer and winter demand structure
Adaptation measures	<ul style="list-style-type: none"> Formulate and implement BCP Prepare and utilize hazard maps Develop a system for sharing disaster information Strengthen facility resilience Water-tightening of critical facilities 			
	<ul style="list-style-type: none"> Promote distribution grid Promote shift to pole-free towns 	<ul style="list-style-type: none"> Construct a wide-area water pipe network Enhance water treatment functions 	<ul style="list-style-type: none"> Maintenance of systems to shut down supply Strengthen recovery system 	<ul style="list-style-type: none"> Promote heat supply projects to strengthen city districts
Adaptation business	<ul style="list-style-type: none"> Highly efficient heat pumps Wind power generators capable of handling strong winds 	<ul style="list-style-type: none"> High-performance turbid water treatment facility Water generators 	<ul style="list-style-type: none"> Gas cogeneration system 	<ul style="list-style-type: none"> Smart energy network system



Electricity, water, gas, and heat supply

Businesses that supply electricity, gas, heat, or water (excluding irrigation water), and businesses that treat sewage and rainwater

Back

Category		Electricity	Water	Gas	Heat supply	
Factor		Increased frequency and intensity of extreme weather events including heavy rains and typhoons, rising temperatures and sea levels				
Impacts	Common	<ul style="list-style-type: none"> Shutdown of operations due to damage to facilities and equipment Increased disaster prevention and mitigation construction costs Increased maintenance and management construction costs Increased burden due to rising non-life insurance premiums Increased employee health risks such as heat stroke Decreased productivity due to deteriorating working environment 				
	Category	<p>Natural disasters</p> <ul style="list-style-type: none"> Interruption of power supply due to damage to power facilities Damage to power distribution facilities, etc. due to fallen trees, flying debris, etc. Deterioration and corrosion of transmission and substation equipment due to salt damage from typhoons and snow Increased/decreased ice and snow on power lines and power towers due to extreme temperature drops, etc. <p>Rising temperatures</p> <ul style="list-style-type: none"> Increased electricity demand for air-conditioning in summer, fluctuations in peak electricity demand in summer and winter <p>Thermal and nuclear power generation> Damage to water intake and port facilities due to waves and storm surge, reduced power output due to rising seawater temperatures used as cooling water, and difficulty in securing cooling water due to drought</p> <p>Hydroelectric power generation> Impact on power output due to breaks in headrace and hydraulic pipes caused by slope failures, flooding of facilities and burial of spillways, changes in drought and snowmelt runoff timing, and accelerated sedimentation caused by flooding and slope failures</p> <p>Solar power generation> Flooding of power generation facilities, blown panels and collapsed structures due to typhoons and tornadoes</p> <p>Wind power generation> Decreased wind power generation resources due to changes in wind conditions; damage to power generation facilities by strong winds and storm surges due to strong winds and storm surges</p>	<p>Natural disasters</p> <ul style="list-style-type: none"> Discontinuation of water supply due to damage to water supply facilities Water intake restrictions and water cutoffs due to flooding Rupture of water pipe bridges, etc. due to rising rivers <p>Water shortage</p> <ul style="list-style-type: none"> Frequent droughts due to scarce rainfall, reduction of water resources due to drought <p>Water quality deterioration</p> <ul style="list-style-type: none"> Water intake restrictions and water shutoffs due to deteriorating water quality Deterioration of water quality due to increased amount of fine suspended sediment Deterioration of water quality due to rising water temperature, turbidity, storm surge, etc. Increased salinity due to saltwater run-up 	<p>Natural disasters</p> <ul style="list-style-type: none"> Discontinuation of gas supply due to damage to gas facilities Delayed or stagnant LNG transportation Damage to pipelines and other facilities due to heavy rain or typhoons Damage to bridge attached pipes due to rising rivers Procurement hampered by weather-related disasters at procurement sites <p>Rising temperatures</p> <ul style="list-style-type: none"> Changes in demand structure, such as increased demand for air conditioning in summer and decreased demand for heat in winter 	<p>Natural disasters</p> <ul style="list-style-type: none"> Discontinuation of heat supply due to damage to heat supply facilities Damage to pipelines and other facilities due to heavy rain or typhoons Outage of supply due to power outage <p>Rising temperatures</p> <ul style="list-style-type: none"> Changes in demand structure, such as increased demand for air conditioning in summer and decreased demand for heat in winter 	
	Soft	<p>Common</p> <ul style="list-style-type: none"> Formulate and implement BCP Prepare and utilize hazard maps Develop a system for sharing disaster information Develop disaster coordination plan Obtain weather information at early stage and prepare disaster countermeasures manual Prepare plans and countermeasures during and after the occurrence of damage Conduct disaster drills regularly <p>Natural disasters</p> <ul style="list-style-type: none"> Prompt initial response through rapid collection and dissemination of information Secure alternative supply and fuel until restoration Review technical standards (wind and snow resistance) for power towers and transmission poles Advanced technologies for supply and demand operation and system stabilization <p>Quick recovery by strengthening cooperation among related parties at the time of damage</p> <ul style="list-style-type: none"> Assessing suitability of sites for power plants and transmission/distribution routes <p>Hydroelectric power generation> dam operation based on rainfall and runoff forecasts using weather models</p>	<p>Natural disasters</p> <ul style="list-style-type: none"> Enhance water level and turbidity monitoring <p>Water shortage</p> <ul style="list-style-type: none"> Prepare drought response manuals, plans, and drought response timelines Prepare emergency water supply measures for water reduction/outage and systems for restoration <p>Water quality deterioration</p> <ul style="list-style-type: none"> Improve water quality observation and monitoring systems for lakes and dams Reduction of nutrient loading, selective water intake at dams 	<p>Natural disasters</p> <ul style="list-style-type: none"> Develop systems to shut down supply Strengthen recovery systems Construct disaster prevention blocks that can be remotely operated to shut down supplies Conduct disaster drills in cooperation with local communities and municipalities <p>General/Common</p> <ul style="list-style-type: none"> Ensure safety of raw materials and fuel by diversifying procurement sources 	<p>Natural disasters</p> <ul style="list-style-type: none"> Strengthen surveillance and communication systems <p>General/Common</p> <ul style="list-style-type: none"> Ensure safety of raw materials and fuel by diversifying procurement sources 	
Hard	<p>Common</p> <ul style="list-style-type: none"> Strengthen facility resilience (countermeasures against flood, wind, salt, snow, and landslide disasters, etc.) Water-tightening of critical facilities (e.g., installation of tide doors, watertight doors, etc.) Raise height of sites and adopt silt construction Locate critical facilities (e.g., power receiving and transforming equipment) on upper floors <p>Natural disasters</p> <ul style="list-style-type: none"> Promote distribution grid Promote shift to pole-free towns Make power networks stronger and smarter Implement planned and secured logging <p>Improve power generation efficiency and reduce transmission and distribution losses</p> <ul style="list-style-type: none"> Strengthen resilience of electricity supply (e.g., promote introduction of household solar power generation) Waterproof covering of cables and implement waterproofing measures for connections Implement measures to prevent snow from settling on power transmission lines and power towers <p>General/Common</p> <ul style="list-style-type: none"> Common to any power generation Introduce EMS and smart meters Hydroelectric power generation Control sediment runoff by preserving forests and mountain areas Improve dam functionality (raising dam, removal of accumulated sediment, etc.) 	<p>Natural disasters</p> <ul style="list-style-type: none"> Construct a wide-area water pipe network Prompt repair of water pipes, regular replacement, and improvement of materials Introduce water intake pumps that prevent sediment from entering <p>Water shortage</p> <ul style="list-style-type: none"> Functional improvement of lakes and dams (e.g., raise structures, remove accumulated sediment, etc.) Use rainwater and recycled water <p>Water quality deterioration</p> <ul style="list-style-type: none"> Construct a wide-area water pipe network Enhance (optimize) water treatment functions Establish wetlands and green areas that contribute to nutrient retention and water purification <p>General/Common</p> <ul style="list-style-type: none"> Introduce smart meters 	<p>Natural disasters</p> <ul style="list-style-type: none"> Establish a wide-area gas supply network Prepare disaster countermeasures at LNG terminals Reinforce lifeline construction that is resistant to water-related disasters Strengthen resilience of facilities such as governor stations (facility that reduce the pressure of city gas) Expand use of distributed energy systems such as energy networks and gas cogeneration systems <p>General/Common</p> <ul style="list-style-type: none"> Introduce smart meters 	<p>Natural disasters</p> <ul style="list-style-type: none"> Strengthen resilience of heat supply piping Reinforce culverts to prevent flooding Improve power system reliability through multiplexing of power systems, installation of emergency generators, cogeneration systems, etc. <p>General/Common</p> <ul style="list-style-type: none"> Promote heat supply projects to strengthen city districts 		
Adaptation	<ul style="list-style-type: none"> Highly efficient heat pumps Wind power generators capable of handling strong winds EV + battery storage system High-performance turbid water treatment facility Water generators Gas cogeneration system Heat stroke prevention system using gas leak alarms Smart energy network system 					
Cost	Soft : Low ~ Medium Hard : Medium ~ High		Soft : Low ~ Medium Hard : Medium ~ High		Soft : Low ~ Medium Hard : Medium ~ High	
Time span	Soft : Short ~ Medium Hard : Medium ~ Long		Soft : Short ~ Medium Hard : Medium ~ Long		Soft : Short ~ Medium Hard : Medium ~ Long	

How to proceed with adaptation measures

[Current approach] Efforts are being made to strengthen resilience of various energy production and transportation facilities against increasingly severe weather disasters such as torrential rains, typhoons, and floods, and to improve deteriorating business environment due to rising temperatures.

[Climate change-aware approach] As climate change progresses in the future, degree and frequency of impacts will further increase. It is necessary to clarify expected impacts in the future and promote measures to reduce and avoid damage in advance. This includes planning and designing climate-resilient facilities and equipment, strengthening coordination of transportation networks, etc. It is also necessary to develop disaster countermeasure manuals and plans based on hazard maps, and to establish appropriate and prompt emergency measures and recovery systems in the event of a disaster.

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