

# Information and Communication

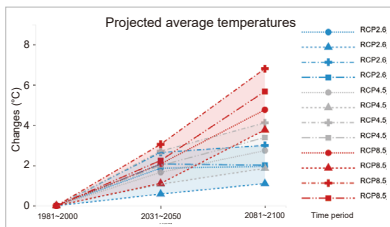
## Major Factors of Impacts

Rising temperatures and increased heavy rainfall

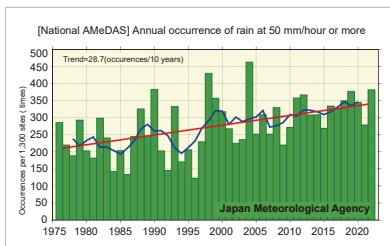


## Current Situation and Future Projections

Average temperature in Japan is increasing at a rate of 1.24°C/100 years. The amount and patterns of precipitation is changing, with heavy rains and rainless days are on the rise. Sea water temperatures are also expected to rise. It has been pointed out that the effects of overheating facilities due to rising temperatures, and the deterioration of radio wave quality due to heavy rainfall, may increase in the future.



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)

Meanwhile, an increase in demand for information to support all industries to adapt to climate change is anticipated.

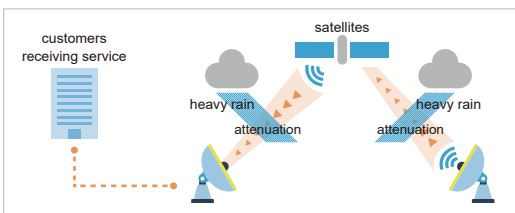


Image of effect of heavy rain on radio wave quality

## Adaptation

It is necessary to combine short-, medium-, and long-term adaptation measures based on situation of individual facilities and customer needs, along with time frame for facility renovations.

Factors	Rising temperatures and increased heavy rainfall		
Management resources	Core business	Adaptation business	
Impacts	<b>Malfunction or damage to facilities/equipment</b> <ul style="list-style-type: none"> <li>Rising temperatures cause facilities such as data centers, base stations, and their terminals to overheat, resulting in malfunctioning of heat-sensitive equipment</li> </ul>	<b>Impact on products and services</b> <ul style="list-style-type: none"> <li>Changes in precipitation, temperature, and other factors degrade radio wave quality and deteriorate quality of communication and broadcasting services.</li> </ul>	<b>Increased demand for information on adaptation for various industries</b> <ul style="list-style-type: none"> <li>Increased demand for information related to high temperatures and weather-related disasters</li> <li>Increased demand for information useful for adaptation businesses in various industries</li> </ul>
	Adaptation measures	<ul style="list-style-type: none"> <li>Observe and compare weather conditions to operating status of equipment and communication</li> <li>Improve heat resistance among facilities and terminals, install high-performance air conditioners</li> <li>Increase communication facilities</li> </ul>	<ul style="list-style-type: none"> <li>Adjust radio wave output and use modulation methods according to weather conditions</li> </ul>



# Information and Communication

The information and communications industry consists of telecommunication, broadcasting, and information services, and refers to establishments that provide services including the transmission of information, processing and provision of information, provision of Internet ancillary services, and the processing of information for the purpose of transmission.

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Factors	Rising temperatures and increased heavy rainfall				
Management resources	Core Business		Adaptation Business		
Impacts	Malfunction or damage to facilities/equipment	Impact on products and services		Increased demand for information on adaptation for various industries	
	<ul style="list-style-type: none"> <li>Rising temperatures cause facilities such as data centers, base stations, and their terminals to overheat, resulting in malfunctioning of heat-sensitive equipment</li> <li>Increased power costs for high temperature countermeasures</li> <li>Damage to base stations, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Changes in precipitation, temperature, and other factors degrade radio wave quality and deteriorate quality of communication and broadcasting services</li> <li>Discontinuation of products and services due to supply chain disruptions</li> </ul>	<ul style="list-style-type: none"> <li>Increased demand for information related to high temperatures and weather-related disasters</li> <li>Increased demand for information useful for adaptation businesses in various industries</li> </ul>		
Adaptation measures	Soft Measures	Hard Measures	Soft Measures	Hard Measures	Soft Measures
	<p>Observe and compare weather conditions to operating status of equipment and communication: constantly observe weather conditions inside and outside of the facility, including temperature, precipitation, and humidity; and continuously compare and analyze them to operating condition of equipment.</p>	<ol style="list-style-type: none"> <li>1) Improve heat resistance among facilities and terminals: improve insulation of facilities by constructing rooftops, walls, floors, etc., and adopt heat-resistant terminals</li> <li>2) Install high-performance air conditioning: install air conditioning that can handle extreme heat, durable and economical, starting where equipment vulnerable to heat and critical equipment are located</li> <li>3) Optimal placement of relocatable telecommunication facilities (operations, servers, etc.): relocate telecommunication facilities to locations with more favorable climate conditions</li> </ol>	<ol style="list-style-type: none"> <li>1) Observe and compare weather conditions and communication conditions: constant observation and analysis of surrounding weather conditions against communication conditions</li> <li>2) Adjust radio wave output and use modulation methods according to weather conditions: when signal levels drop due to heavy rain, etc., increase the output or switch to modulation methods with low transmission error rates (this requires government support)</li> <li>3) Strengthen supply chains</li> </ol>	<p>Expansion of telecommunication facilities: based on observation results and climate change projections, expand coverage area and guarantee the quality by building more radio towers</p>	<ol style="list-style-type: none"> <li>1) Provide disaster alert bulletins: prompt provision of disaster information from the Japan Meteorological Agency, local governments, etc. via cell phone applications and e-mails</li> <li>2) Provide climate change impact monitoring systems: develop and provide climate change impact monitoring systems for disasters, etc. by combining big data such as population dynamics, vehicle location data, weather and satellite data, etc. according to the purpose</li> <li>3) Develop useful information for adaptation business: develop and provide information that can be used for adaptive business in various industries by utilizing weather observation and forecast data along with data from various industries (information on sales forecast for specific products according to weather conditions, yield forecast for agricultural products, etc.)</li> </ol>
Effect	Low	1) ~ 2)Medium 3)High	1)Low 2)Medium 3)High	High	High
Cost	Low	1)Medium 2)Low 3)High	1)Low 2)Medium 3)High	High	Medium
Time span	Short	1) ~ 2)Short 3)Long	1)Short 2) ~ 3)Medium	Long	1)Short 2) ~ 3)Medium
Notes	-	-	-	-	Precautions should be taken to ensure that the Meteorological Service Act is not violated.

## How to proceed with adaptation measures

**[Current approach]** For many businesses in Information and Communication industry, transmission of electronic information and stable operation of facilities and equipment required for that transmission are fundamental to their business, so in many cases, these facilities and equipment are maintained with a high level of safety, taking weather conditions such as temperature and precipitation into consideration. However, few cases have been reported of facilities and equipment being built taking into account the effects of climate change. Since maintenance to cope with effects of climate change is costly and time-consuming, it must be based on reliable evidence, but such information specific to ICT industry has not yet been fully developed.

**[Climate change-aware approach]** In Information and Communication industry, temperature-sensitive precision equipment and radio waves affected by precipitation are important elements, but effects of overheating facilities due to rising temperatures and reduced radio wave quality due to heavy rainfall may increase in the future. Therefore, while monitoring impact of daily weather conditions on individual facilities, it is necessary to examine possible impacts of future climate change. It is also important to implement both hard and soft measures based on these considerations. In particular, when updating hard measures that will be in service for a long period of time, it is very important to design them so that they will adapt to the effects of climate change until the end of their service period. As adaptation businesses in various industries become more active, demand for information that is useful for these businesses is also expected to increase, and development of commercial information that highlights the company's strengths will help diversify and expand its business.

[References] AEA group (2010) "Adapting the ICT Sector to the Impacts of Climate Change -Final Report" [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/183486/infrastructure-aea-full.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/183486/infrastructure-aea-full.pdf), Fu G, Horrocks L, Winne S. (2016) "Exploring the impacts of Climate Change on the UK's ICT Infrastructure" Infrastructure Asset Management, 2016,3(1), 42-52 [https://eprints.ncl.ac.uk/file\\_store/production/213790/228F678D-C7F8-4B18-850F-19A838600D73.pdf](https://eprints.ncl.ac.uk/file_store/production/213790/228F678D-C7F8-4B18-850F-19A838600D73.pdf), Ministry of the Environment (2019) "Climate Change Adaptation Guide for Private Sector (Reference Materials)" [https://adaptation-platform.nies.go.jp/private\\_sector/guide/pdf/minkan\\_tekiou\\_guide\\_sankoshiyou.pdf](https://adaptation-platform.nies.go.jp/private_sector/guide/pdf/minkan_tekiou_guide_sankoshiyou.pdf), Japan Meteorological Agency (2020) "Climate Change Monitoring Report 2019" [https://www.data.jma.go.jp/cpdinfo/monitor/2019/pdf/ccmr2019\\_all.pdf](https://www.data.jma.go.jp/cpdinfo/monitor/2019/pdf/ccmr2019_all.pdf), 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](https://www.data.jma.go.jp/cpdinfo/extreme/extreme_p.html), Ministry of Internal Affairs and Communications "Study Items for Advanced Fixed Wireless Systems" [https://www.soumu.go.jp/main\\_content/000279368.pdf](https://www.soumu.go.jp/main_content/000279368.pdf), NEC Corporation (2014) "Climate Change' Measures Supported by ICT: Toward Adaptation to Climate Change"