環境省
Ministry of the Environment

Climate Change Adaptation Plan

(Approved by the Cabinet of Japan on October 22, 2021)

October 2021

Ministry of the Environment, JAPAN

Outline of Climate Change Adaptation Plan (approved by the Cabinet on October 22, 2021)

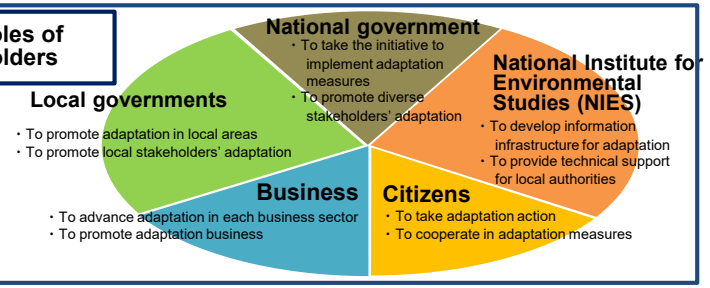
Objective

Achieving a safe and sustainable society by avoiding and minimizing negative impacts of climate change, securing citizen's life, socio-economic development and ecosystem, and building national resilience

Planning period

Approximately in five years

Basic roles of stakeholders



Basic strategies

Based on the 7 basic strategies, the relevant ministries and agencies jointly promote adaptation actions.

1. Mainstreaming adaptation in all policies
2. Promoting science-based adaptation
3. Developing information platform as a center of excellence
4. Localizing adaptation actions
5. Understanding of citizens and business
6. Assistance to developing countries
7. Cooperation among ministries

Progress management

Monitoring and evaluating the progress on adaptation while managing the progress by setting KPIs on sectoral/basic measures and setting indicators* from the perspective of making climate change adaptation firmly established and more widespread at national, local and citizen levels, based on a PDCA cycle

*E.g.(1) Rate of setting KPIs on sectoral measures (categories), (2) percentage of formulating local adaptation plans, (3) percentage of establishing local adaptation centers, and (4) degree of recognition of adaptation efforts.

Climate change impacts and adaptation measures (examples in each sector)

Agriculture, Forestry, and Fisheries

Impact Degraded rice quality under high temperature

Adaptation measure Introduction of high-temperature-resistant varieties

Natural Disasters

Impact Increased heavy rainfall events which might cause floods
Adaptation measure Promoting "River Basin Disaster Resilience and Sustainability by All" initiative

Impact Increase in the frequency of sediment disasters (debris flows, landslides, etc.)
Adaptation measures Installation of sediment control dams and other infrastructure

Water Environment, Water Resources

Impact Decline in groundwater levels during irrigation periods
Adaptation measures Promoting groundwater management and other measures

Natural Ecosystems

Impact Possible disappearance of suitable areas for the growth of coral reef

Adaptation measure Conservation of highly adaptable coral reef ecosystems

Human Health

Impact Increased risk of mortality due to heat illness

Adaptation measure Providing heat illness prevention information to the elderly

Impact Changes in the risks of various infectious disease outbreaks
Adaptation measure Collecting scientific knowledge on climate change impacts

Industrial / Economic Activities

Impact Impacts on national security

Adaptation measure Promoting policies to minimize impacts

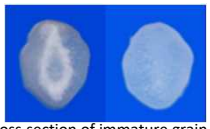
Basic Measures Related to Climate Change Adaptation

- Enhancement and utilization of scientific knowledge on climate change and other related issues
- Ensuring the system for collection, organization, analysis, and provision of information related to climate change, etc.
- Promotion of measures related to climate change adaptation with local governments
- Promotion of climate change adaptation by business operators, etc., and business activities contributing to climate change adaptation
- Securing international collaboration and promoting international cooperation related to climate change, etc.

Sectoral Measures Related to Climate Change Adaptation (1)
(Agriculture, Forest/Forestry, and Fisheries)

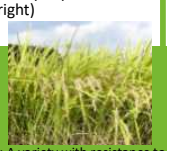
Paddy rice

- Deterioration in quality due to high temperatures.
- If the conversion to high temperature resistant varieties does not proceed, the percentage of the first-class rice may decrease nationwide.



Cross section of immature grain with white portion (left) and normal grain (right)

- **Development and dissemination of high temperature resistant varieties.**
- **Thoroughly implement basic techniques such as fertilizer and water management.**



Hiroshima Prefecture: A variety with resistance to high-temperature "Koi-no-yokan"

Livestock and forage crops

- During the summer, milk production, milk composition, and reproductive performance of dairy cattle decline, and the body mass index of beef cattle, pigs, and poultry deteriorates.
- Dry matter yields of forage crops are increasing year by year in some areas.

Kyoto Prefecture: Development of clothing for livestock using cool touch materials for humans

- **Promotion of measures against heat, such as watering and ventilation in barns**
- **Development of productivity-enhancing technologies such as appropriate nutritional management**
- **Construction of cultivation system for forage crops, development and dissemination of cultivation management technology**

Forestry

- Occurrence of woody debris flow accompanying hillside collapses triggered by external forces that exceed forests' ability to stabilize slopes.
- Possible increased risks of mountain disasters such as hillside collapses and debris flow due to more frequent heavy rainfall.
- Possible increase in growth problems of Japanese cedar planted forests in areas with already lower precipitation.

Large-scale mountain disaster caused by heavy rain

Withering cedar trees due to drought

- **Prevention of mountain disasters including through erosion control facility deployment and forest management.**
- **Research and study on climate change impacts on forests and forestry**

Fruit tree

- Poor skin color of apple and grape, peel puffing and sunburn of satsuma mandarin, and flowering disorder of Japanese pear.
- There is a possibility that the suitable areas for apple and satsuma mandarin cultivation will shift year by year.

Poor skin color of apple

Peel puffing of satsuma mandarin

- **Introduction of superior-colored cultivars or yellow-green cultivars for apple and grape.**
- **convert to medium-late maturing citrus ('Shiranuhi', etc.), which prefer warmer climates to satsuma mandarin.**

'Shiranuhi' have been developed by National Agriculture and Food Research Organization (NARO)

Agricultural production base

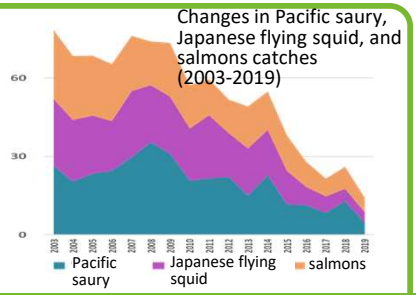
- In addition to the frequent occurrence of short duration heavy rainfall, drought due to low rainfall also occurred.
- A change in the timing of rice planting and an increase in water management labor.
- The risk of waterlogging damage to farmland may increase.

waterlogging damage to farmland caused by torrential rain

- **Efficient use of agricultural water and maintaining and improving of disaster prevention and mitigation functions in rural areas through appropriate combination of hard and soft measures.**

Fisheries

- Decline in catches of Pacific saury, Japanese flying squid and salmons.
- Mass death of scallop and oyster
- Decreased harvest of cultured laver due to shorter cultivation period.
- Changes in the distribution area and body size of migratory fish stocks, and possible impact on fish farming areas due to the rising water temperatures in summer.



- **Comprehend the impact of marine environmental changes on fishery resources and improve the precision of stock assessment**
- **Improvement of aquaculture breeds tolerant to higher water temperatures and technology for monitoring harmful algal blooms over wider areas**

《Examples of KPIs》

【Agriculture (paddy rice)】Percentage of area planted with high temperature resistant varieties (staple food rice)

【Forestry (timber production (plantation forests, etc.))】Percentage of prefectures where the pine weevil damage rate in pine forests to be conserved is kept at "slight damage" of less than 1%.

【Fishery (Migratory fish stocks (Ecology of fish, etc.)】Number of fish species assessed based on MSY (Maximum Sustainable Yields)

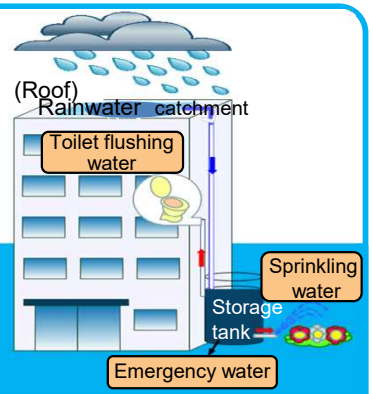
Sectoral Measures Related to Climate Change Adaptation (2)
(Water Environment, Water Resources, and Natural Ecosystems)

Water Environment, Water Resources

Water Supply

- Droughts in various areas in Japan due to absence or lack of rain for a prolonged period of time, resulting in water supply restriction
- Possibility of more severe droughts, affecting many areas such as waterworks, agricultural, and industrial water
- Possibility of constant intrusion of highly concentrated saltwater in downstream areas due to sea-level rise

Yagisawa dam in drought
(2016, Gunma Prefecture)
Source: "Water Cycle Policy (FY2017)"



To use rainwater in storage tanks as water for toilets and for sprinkling

- **Assessment of drought risks and information sharing among actors**
- **Improving functions of existing facilities and preparing drought measures such as the use of rainwater and reclaimed water**
- **Promoting formulation of action plans against droughts and further encouraging groundwater management**
- **Promotion of efficient securing and usage of agricultural water**

Examples of KPIs: Number of published action plans against drought

Natural Ecosystems

Note: Promoting initiatives considering that land, freshwater, coastal, and marine ecosystems are closely interconnected and that climate change-induced changes will affect entire ecosystems

Terrestrial Ecosystems

- Changes and shifts in distribution of vegetation, plant community types, and species composition due to higher temperature and earlier melting of snow
- Expansion of the distribution of *sika* deer and wild boars across Japan
- Projections of changes or reductions in suitable habitats for plant species, vegetation, and animals (such as ptarmigans) in alpine and subalpine zones

Ptarmigans live only in alpine zones such as the Northern Alps and their habitat is projected to be reduced.
Source: The website of the Ministry of the Environment

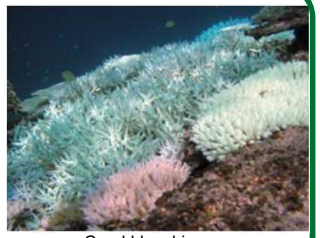
- **Monitoring and evaluation with a focus on significant zones such as alpine zones**
- **Promoting the creation of forest ecological networks integrated with valley forests**

Examples of KPIs: [Impact of Wildlife] Number of developed category 2 specified wildlife control plans (*sika* deer) with numerical targets

Coastal Ecosystems

- Increased frequency of subtropical coral bleaching due to a rise in seawater temperature
- Progressing transition from low-temperature to high-temperature species in conjunction with rising seawater temperature
- Projections of disappearance of sea areas suitable for the growth of tropical and subtropical reef-building coral in Japanese coastal waters due to an increase in seawater temperature and ocean acidification

(Projections assuming a global average temperature increase of 4°C by the second half of the 21st century)



Coral bleaching
Source: Ministry of the Environment

- **Monitoring and evaluation with a focus on coral reefs and other areas**
- **Restoring healthy ecosystems that are highly adaptable to climate change and conserving biodiversity to promote the creation of ecological networks**

Examples of KPIs: [Coastal Ecosystems (Subtropical Zone)] Number of initiatives conducive to conserving coral reef ecosystems reported by the government ministries and agencies, as well as local governments

Sectoral Measures Related to Climate Change Adaptation (3) (Natural Disasters)

Rivers

- The number of points where water levels exceeded the level of flood risk are increasing.
- Heavy rains that can cause floods will increase significantly by the end of this century compared to the present in major river basins in Japan.
- Damage caused by flood is expected to increase due to temperature rise.

・Reviewing flood control plans reflecting the impacts of climate change

・Promoting "River Basin Disaster Resilience and Sustainability by All" Initiative that integrate structural and non-structural measures in cooperation among all stakeholders

・Promoting the use of green infrastructure in "River Basin Disaster Resilience and Sustainability by All" Initiative

Coastal Areas (Storm surges/High waves)

- The sea level around Japan was increasing according to the analysis result of tidal observation records.
- Potential increase of risks of high waves is expected as a result of changes of tropical cyclone intensity and tracks.
- Sea-level rise raises the possibility of coastal erosion.

・Impact assessment based on meteorological and oceanographic monitoring, projections for storm surges and high waves and other methods

・Development of embankments with robust structures, parapet walls, and tsunami seawalls

・Promote the development and conservation of coastal disaster-prevention forests

Examples of KPIs:
[Rivers (Floods)] Number of river improvement plans reflecting the future impacts of climate change
[Mountain areas (Debris flows, landslides, and other disasters)] Number of newly announced sediment disaster prone areas based on the hazard maps for sediment disasters

Mountain Areas (Sediment Disasters)

- Assuming that recent distinctive rainfall conditions were due to climate change, changes in the form of sediment disasters have already occurred, and the disasters will become more severe in the future.
- If rainfalls become more severe, debris flows, and sediment-laden flood is expected to occur more frequently.

・Development of facilities focusing on the protection of “human life and livelihood”
・Support for hazard mapping, etc.
・Implementation of countermeasure projects based on the “Plan against Sediment-laden Flood”

Figure and photo source: Ministry of Land, Infrastructure, Transport and Tourism

Image of "River Basin Disaster Resilience and Sustainability by All" Initiative

Sectoral Measures Related to Climate Change Adaptation (4)
(Human Health, Industrial/Economic Activities, Life of Citizenry, and Urban Life)

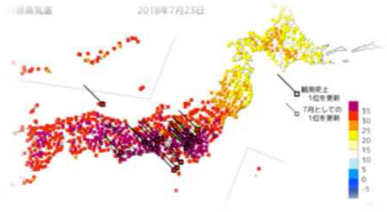
Human Health

Heat Stress

・Observed increase in excess mortality* due to increased temperatures

*An indicator showing an increase in the total mortality from illness, whether directly or indirectly

・Projections of an increase in death from cardiovascular diseases due to temperature increase and increasing death of elderly people due to heat stress by 2030-2050



Daily maximum temperature (July 23, 2018)

・Provision and cautionary alerts based on meteorological information and Wet Bulb Globe Temperature (WBGT), as well as raising public awareness for appropriate prevention and treatment

・Information dissemination regarding occurrence of heat illness

Infectious Diseases

・Expansion of the habitat of mosquitoes that transmit dengue fever to Aomori Prefecture (northern part of Japan)

・Concerns about a domestic infection chain due to changes in the habitat and population density of mosquitoes carrying infectious diseases

Asian tiger mosquito (*Aedes (Stegomyia) albopictus*) (Photo provided by the Department of Medical Entomology, the National Institute of Infectious Diseases)

・Collection of scientific findings about aspects such as the correlation between temperature increase and changes in the risk of infectious disease outbreaks

・Ongoing fixed-point observation, measures targeting sources of larvae, extermination of adult insects, and understanding of trends in the occurrence of infectious diseases

Examples of KPIs: [Heat Stress (Heat Stroke, etc.)] Number of deaths due to heat illness per year and the progress of raising public awareness for heat illness

Industrial/Economic Activities

Industrial and Economic Activities (Construction industry), Other Impacts (Overseas impacts)

・The construction industry has the highest number of deaths and injuries due to heat illness in the workplace.

・Reports on the impacts of climate change on international relations and security in Europe, the United States, and other countries predict weakened international support, increased burdens, and intensified conflicts over resource management.

Flood in Rojana Industrial Park (Thailand, October–November 2011)
Source: Basic knowledge on flood control, the Ministry of Land, Infrastructure, Transport and Tourism

・Measures to address heat illness in the workplace in the manufacturing and construction industries

・Implementing surveys of impacts on the economic and social state in Japan from the overseas impact of climate change

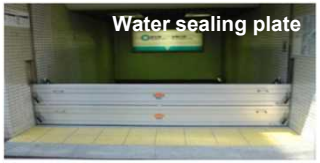
Examples of KPIs: [Construction Industry] Dissemination of "Combat Heatstroke at Work"

Lives of the Citizenry, Urban Life

Infrastructure, Critical Services, etc.

・Impacts of meteorological events such as heavy rains, tropical cyclones, and droughts on infrastructure and critical services have recently been observed in many places in Japan.

・There are reports of disrupted transportation networks due to heavy rains and resulting isolated areas, and damaged and halted critical services such as electricity, gas, and water supply.



Measures against inundation at subway stations

・Social implementation of green infrastructure through cross-sectoral and public-private cooperation

・Preparation of crisis management manuals for water supply infrastructure and improvement of systems to enable timely and appropriate emergency response measures and repairs

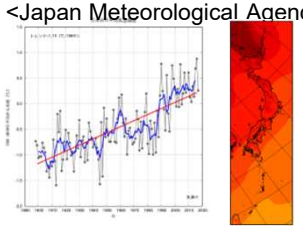
Examples of KPIs: [Urban Infrastructure, Critical Services (Water Supply, Transportation, and Others)] Preparation of crisis management manuals (water supply), Maintenance rate of disaster-resilient equipment (aids to navigation)

Basic Measures Related to Climate Change Adaptation

Data Integration and Analysis System (DIAS)
Integrated Research Program for Advancing Climate Models (TOUGOU)
<Ministry of Education, Culture, Sports, Science and Technology>

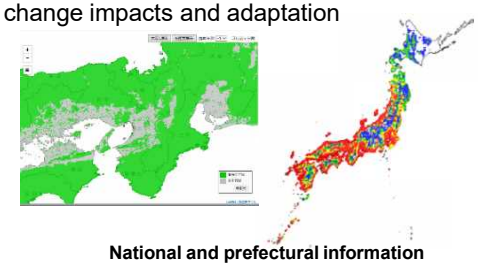
Regional Councils on Climate Change Adaptation
<Ministry of the Environment>

Monitoring and Projection of Climate Change
<Japan Meteorological Agency>



A-PLAT
Climate Change Adaptation Information Platform

Information platforms on climate change impacts and adaptation

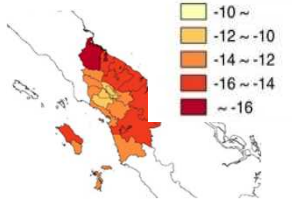


National and prefectural information
<National Institute for Environmental Studies>

Basic measures to promote adaptation

- **Enhancing and utilizing scientific knowledge on climate change**
- **Ensuring implementation structure to collect, sort-out, analysis and provide climate change information**
- **Securing and facilitating international collaboration and cooperation for climate change**
- **Promoting adaptation actions of business entities and adaptation business**
- **Promoting adaptation measures of local governments**

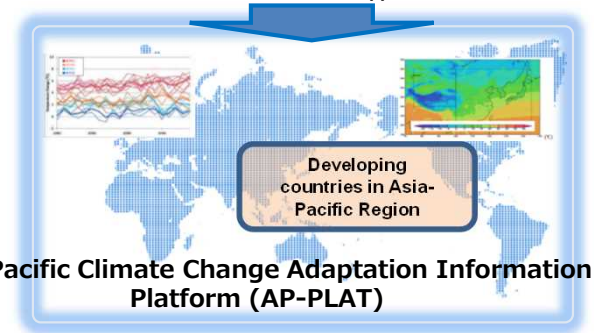
Projection of rice yield percentage (%)



Rice yield projection in Indonesia

Blue: Projected inundation areas in 2014
Red: Projected inundation areas based on the land-use planning in 2025

Future flood projections in the Philippines



Asia-Pacific Climate Change Adaptation Information Platform (AP-PLAT)

Climate Risk Management

Reducing impacts of climate change in own business operations

Adaptation Business

Providing products and services to help others promote adaptation, considering adaptation as a business opportunity

Examples of KPIs:

- **Percentage of the basic plans and white papers, approved by the Cabinet in Japan, that indicates responses to climate change adaptation**
- **Number of initiatives/projects and amount of budget that related climate change projections, impact projections, and assessment studies**
- **Percentage of administrative plans formulated by prefectures and ordinance-designated cities (e.g. a comprehensive plan, a local disaster management plan) that have a perspective of climate change adaptation in its description on disaster risk reduction.**
- **Number of access to the website of the Climate Change Adaptation Information Platform (A-PLAT)**
- **Number of information dissemination by the Asia-Pacific Climate Change Adaptation Information Platform (AP-PLAT)**

(Reference) Outline of the Climate Change Adaptation Act

(Act No. 50 of 2018)
Promulgated on June 13, 2018
Enforced on December 1, 2018

1. Integrated Promotion of Adaptation

- Set out clear roles for national and local governments, private sectors, and citizens to promote climate change adaptation.
- The national government shall formulate the **Climate Change Adaptation Plan** to promote adaptation in sectors such as agriculture and DRR. It should develop methodologies to monitor and evaluate the progress of adaptation. (The plan approved by the Cabinet was upgraded to a statutory plan to further enhance the description.)
- MOE shall implements **climate change impact assessments**, almost every five years. The Climate Change Adaptation Plan needs to be revised accordingly.

Promote effective adaptation measures in various sectors based on reliable detailed information

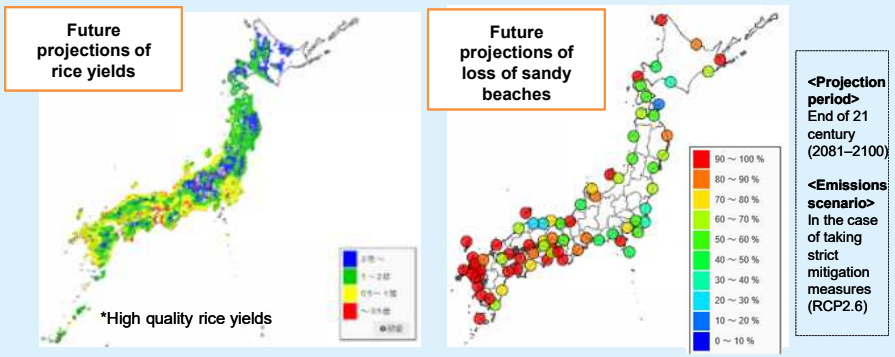
- Agriculture, Forestry, and Fisheries
- Water Environment, Water Resources
- Natural Ecosystems
- Natural Disasters
- Human Health
- Industrial / Economic Activities
- Life of Citizenry

On the basis of scientific knowledge of future impact projections,
- Develop and popularize heat-tolerant varieties of agricultural crops
- Set up fishing grounds based on the changes in fish distribution
- Maintain tangible infrastructure such as embankments and flood control facilities steadily
- Support for hazard mapping
- Promote heat illness prevention measures

2. Development of Information Platforms

- The **National Institute for Environmental Studies (NIES)** is **positioned as the core of the information platforms** for adaptation.

Key information from the Climate Change Adaptation Information Platform (from NIES website)



http://www.adaptation-platform.nies.go.jp/index.html

3. Enhancement of Local Adaptation

- Local governments (prefectures and municipalities) shall endeavor to formulate **Local Climate Change Adaptation Plans**.
- Prefectures and municipalities should establish systems to collect and provide information on adaptation (**Local Climate Change Adaptation Centers**).
- Organizing **Regional Councils on Climate Change Adaptation**, national and local governments and other entities promote adaptation measures locally.

4. International Development of Adaptation and Other Issues

- Promote international cooperation
- Promote initiatives by business entities and adaptation business