



Ministry of the Environment

National Adaptation Plan

2018 Nov.

Ministry of the Environment, Japan

(1) Basic Direction of Climate Change Adaptation Policy in Japan

Objective

Prevention/reduction of Climate-related impacts



- Stabilization of people's life
- Sound development of society & economy
- Preservation of Natural environment

Society ensuring safety, security and sustainability

Role & Responsibility of each actor

National government

- To promote the various actors' adaptation in each subject

Local government

- To promote adaptation policies in local area

Business

- To introduce adaptation action in each business sector

Citizens

- To take adaptation action

The National Institute for Environmental Studies (NIES)

- To develop information infrastructure
- To provide technical support for local authorities

Period

Planning for next 5 years considering long-term perspective until the end of 21st century

Key strategies

1 Mainstreaming adaptation into government policies

2 Promotion of the Climate Change Adaptation based on scientific findings

3 Gathering information/knowledge from researchers and institutes and developing information infrastructure

4

Promotion of adaptation considering local background

5

Deepening understand of people and promoting adaptation action in each business sector

6

Contribution for capacity enhanced in the developing countries

7

Securing close relationship and collaboration among the relevant government agencies

Progress management

Climate Change Impact Assessment

- Submission to the Central Environment Council
- Assessment by 2020

Progress Management of NAP

- Follow-up every year by PDCA cycle

Development of Evaluation Method

- Grasp of effectiveness to bluish up the method

Climate Change Impact Assessment

Plan

Action

Do

Development of Evaluation Method

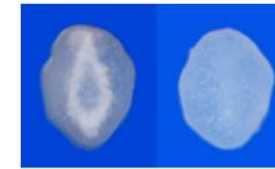
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(2) ①-1 Basic Directions for Measures in Each Sector (Agriculture, Forest/Forestry, Fisheries)

Source: Ministry of Agriculture, Forestry and Fisheries, Japan, etc.

Paddy Field Rice

- Reduction in rice quality due to high temperature
- The ratio of first-grade grains will decrease without introduction of high-temperature-tolerant cultivars



The section of white immature grain(Left) and normal grain(Right)



High-temperature-tolerant cultivars "Koi-no-Yokan" (Hiroshima pref.)

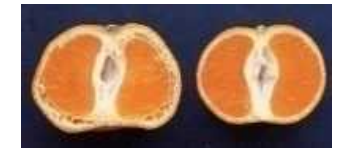
- Development of cultivars of agricultural crops and prevail which can adapt to global Warming
- Thoroughness of recommended watering & fertilization management

Fruit Trees

- Poor coloring of apples and grapes, peel puffing and sunburn of satsuma mandarin oranges, poor sprout emergence of Japanese pears
- Possible moving northward of suitable production area for the production of satsuma mandarin oranges and apples year by year due to climate change



Poor coloring of apples



peel puffing of satsuma mandarin oranges

- Introduction of superior colored varieties and yellow-green-colored varieties(e.g. apples, grapes, etc.)
- Switch to medium late ripening citrus fruits (such as blood orange) which are suitable for global warming instead of "Satsuma Mandarin Orange"



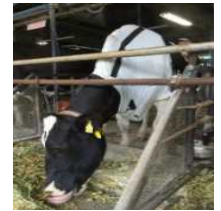
The fruits preferring the high-temperature (blood orange, Ehime pref.)

(2) ①-2 Basic Directions for Measures in Each Sector (Agriculture, Forest/Forestry, Fisheries)

Source: Ministry of Agriculture, Forestry and Fisheries, Japan, etc.

Livestock Farming

- Decrease in milk yields, milk constituent and reproductive performance of dairy cows due to high temperature
- Decrease in the rate of meat gain of beef cattle, pigs, and chickens
- Summer growth depression and insect damages of forage crops due to high temperature and low rainfall



Heat measures by development of livestock closing(Kyoto pref.)

- Dissemination of summer heat measures such as ventilation and misting in the livestock barn
- Development of technologies for productivity improvement and prevention of decline rate of weight gain (e.g. adequate nutrition management, etc.)
- Establishment of a cultivating system & variety improvement of forage crops adapted to high temperature and low rainfall

Agricultural Infrastructure

- Tendencies toward fluctuation of annual average precipitation and increase of sudden heavy rainfall
- Influences on the utilization of water resources, such as changes in rice cropping season and water management
- Possibility of increasing risk for farmland flooding due to intensity of torrential rainfall



Farmland flooding by torrential rainfall

- Enhancement of function for disaster prevention & reduction in rural areas by appropriate combination of integrated measures both for hard & soft infrastructures (e.g. drainage pumping stations/canals, risk assessment, hazard map formulation, etc.)

(2) ①-3 Basic Directions for Measures in Each Sector (Agriculture, Forest/Forestry, Fisheries)

Source: Ministry of Agriculture, Forestry and Fisheries, Japan, etc.

Forest/Forestry

- Occurrence of driftwood disaster caused by the hillside collapse exceeding the functions of forests to prevent mountain disasters
- Potential for increasing risk of the mountain disasters such as hillside collapse, debris flows caused by an increase in the frequency of occurrence of heavy rainfalls
- Potential for increasing unsuitable area for growing planted cedar forests in regions with low rainfall



Large mountain disaster by heavy rain

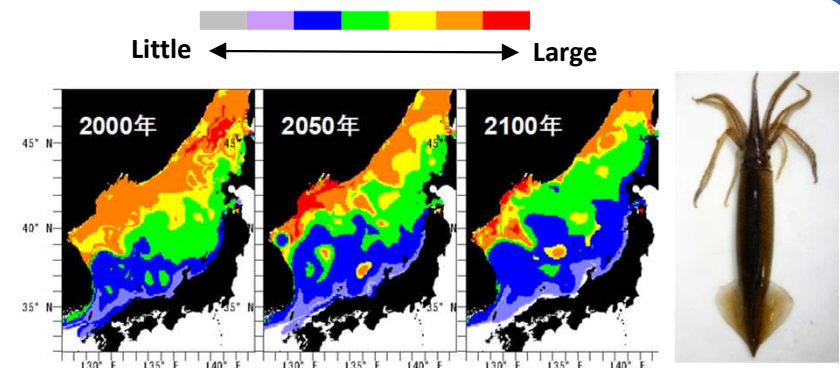


Dead cedars by dry air

- Prevention of mountain disasters by promoting implementation of forest conservation facilities and forest management works
- Research and studies on climate change impacts on forests and forestry industry

Fisheries

- Increase of yellowtails and Japanese Spanish mackerels and decrease of Japanese common squids in the Sea of Japan
- Possibility of increase of the southern species and decrease of the northern species
- As for cultured laver, decrease of annual crop yields in some regions due to delay in seeding
- Possibility of marine production decrease



Prediction of distribution of squid in the Sea of Japan(July)



- Marine environmental surveys in spawning sea areas and the major fishing grounds, and estimation and prediction of fisheries resources
- Development of high-water-temperature-tolerant breeds for aquaculture

(2) ②-1 Basic Directions for Measures in Each Sector (Natural Disasters, Coastal Areas)

Source: Ministry of Land, Infrastructure, Transport and Tourism, Japan

Flood·inland water

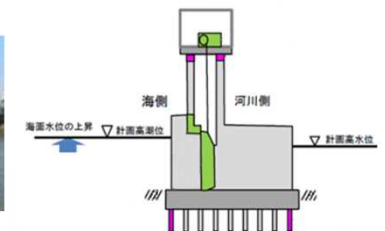
- 10-30% increase of risk for heavy rainfall events which might cause floods in major river basins in Japan by the end of this century compared to the present
 - Concern about the frequent occurrence of water disasters due to natural hazards exceeding the capacity of facilities and occurrence of extremely large scale water disasters which rarely occur but significantly exceeds the capacity of facilities
- **Stead improvement of facilities including levees, flood control structures and sewer systems**
 - **Reduction of inundation/ Restrain of flooding area expand in cooperation with Urban Development/Local Development**
 - **Improvement of institutional arrangements for Disaster Response through collaboration among All Stakeholders**

Storm surges·High waves

- Increase of coastal erosion due to long-term sea-level rise
 - Storm surges and stronger waves as a result of increase of typhoon strength due to climate change
 - Risk for damage to coastal protection facilities and breakwaters in harbors and fishing ports due to increase in wave height and storm surges
- **Improvement of facilities for more robust structures and coastal disaster prevention forests**
 - **Monitoring for weather and marine change / Impact assessment using simulations of projections for inundation due to storm surges and high waves**
 - **Development of technologies for levees, measures against coastal erosion and so on**

To design of facilities to avoid rework in expectation of the frequency of occurrence of heavy rainfalls in the future

To adopt structural type which have easily enhancement of facilities such as Supposing wide range to precipitation amount in the design stage, enhancement of base in advance



Ex: Water lock gate of Nikkoukawariver (Aichi Pref.)

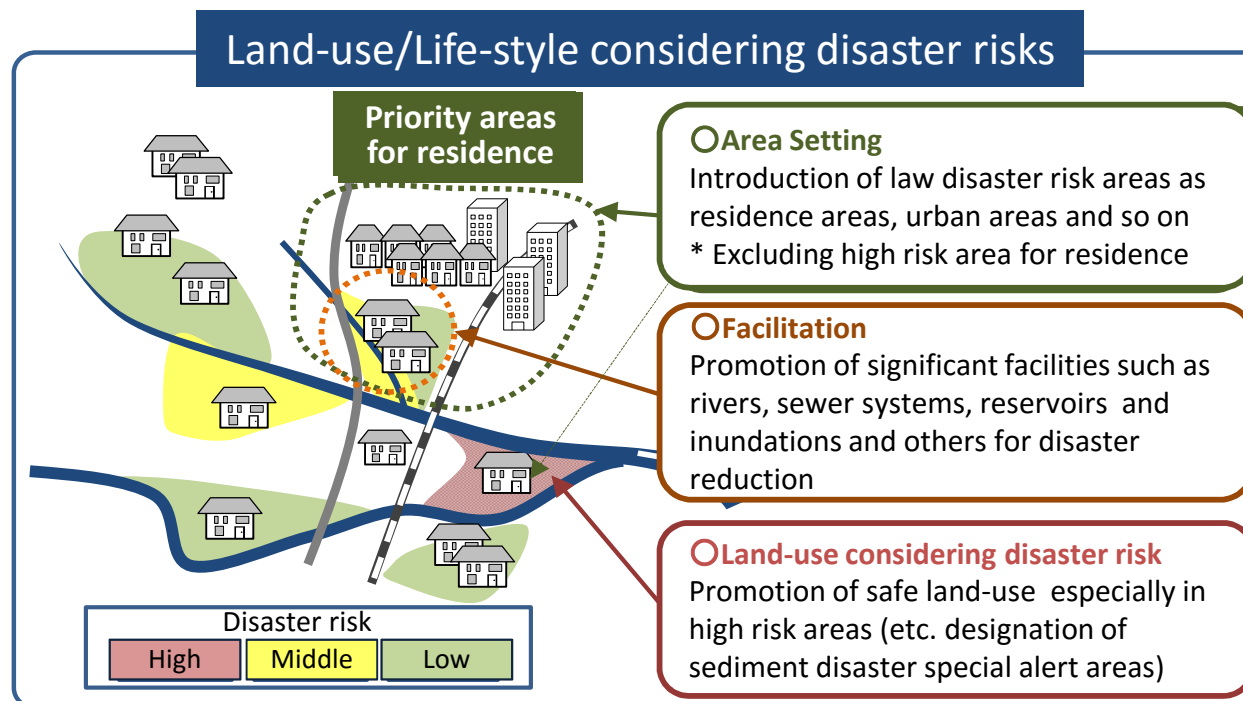
(2) ②-2 Basic Directions for Measures in Each Sector (Natural Disasters, Coastal Areas)

Source: Ministry of Land, Infrastructure, Transport and Tourism, Japan

Debris flows, Landslide, etc.

- Increase of frequency for sediment-related disasters associated with increases in the number of heavy rainfall events and their intensity in short term
- Increase of sediment-related disasters which hit too fast to evacuate due to sudden local torrential rainfall events
- Increase of deep-seated slope failure associated with record heavy rainfall from typhoons and other storms

- Improvement of facilities and equipment focusing in the areas which are most effective to protect human life
- Support for hazard mapping and action planning for disasters prevention
- Strengthening national land monitoring systems by the use of satellites

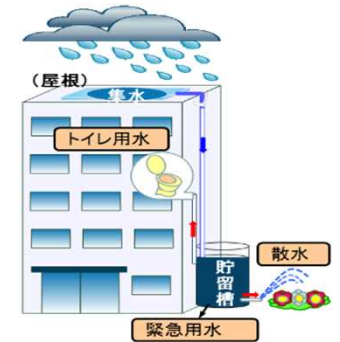


Water supply (Surface water)

- Declining trends in the number of days with precipitation per year, and droughts occurred with requiring water withdrawal restrictions every year
- Possibility of droughts becoming more frequent, lasting longer, being more severe, and causing more drought damage
- Impacts to utilization of water resources, including changes in rice cropping season and water management. as measures to address deterioration of paddy field rice quality due to high temperature



“Yagisawa dam” in drought (2016, Gunma Pref.)



To use of rainwater and reclaimed waste water

- **Assessment of drought risks for existing facilities and preparation for risk information sharing in collaboration with among actors**
- **Promotion of formulation for action plans against drought**
- **Usage of rainwater and reclaimed waste water, and assessment of actual situation of groundwater during drought**

(2) ④ Basic Directions for Measures in Each Sector Natural Ecosystems

Source: Ministry of the Environment, Japan

Alpine / Subalpine zone

- Degeneration and shifts in distribution of vegetation and wild animals due to higher temperature and earlier snowmelt
- Possibility of change or shrink of suitable habitat for the Japanese stone pine in alpine and subalpine zones by the end of the 21st century
- Possibility of disappearance of alpine plants due to earlier snowmelt in the future



Grouse live in only alpine such as Northern Alps and project shrink of the habitat.

- **Monitoring with focusing on significant zones such as alpine zone**
- **Securing migratory pathways for wildlife**

Subtropics

- Appearance of coral bleaching due to increase of seawater temperature
- Moving northward of coral reefs in south of the Boso Peninsula, and along north and west coasts in Kyushu
- Possibility of half reduction of suitable areas for the growth of reef-building coral by 2030, and disappearance by 2040, due to an increase in seawater temperature and ocean acidification.
(under the A2 scenario (2090–2099) of 2.0°C to 5.4°C)



Coral reef whitening

- **Monitoring of coral reefs for conservation and restoration of ecosystem network around coral areas**

(2) ⑤ Basic Directions for Measures in Each Sector (Human Health)

Source: NIES, National Institute of Infectious Diseases, Japan

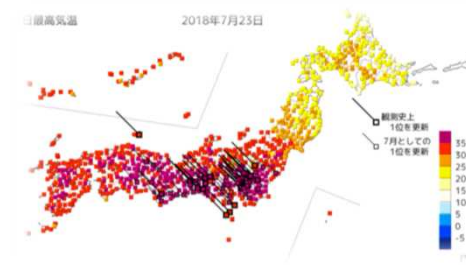
Risk of death, Heat Illness

- Increase of excess mortality* due to high temperature which has already been observed globally

* An indicator showing increase of total mortality from illness, whether directly or indirectly

- Double increase of heat illness patients transported by ambulance in the major prefectures excluding Shikoku region by the middle of 21st century*

* Resource: NIES (RCP8.5 scenario projects increase 2.6 - 4.8°C (average 3.7°C) by the end of 21st century (2081-2100) compared to current (1986-2005))



Daily maximum temperature (23rd July 2018)
(Source: Japan Meteorological Agency)

- Provision of meteorological information & cautionary alerts, and raising public awareness for appropriate prevention and treatment.
- Information dissemination regarding status of outbreaks of heat illness

Infection

- Expansion of habitat of mosquitoes* that cause vectors of infectious diseases such as dengue fever throughout rural northern parts of the Tohoku region

* *Aedes (Stegomyia) albopictus*

- Possibility of risk increase of vector-borne diseases



Aedes albopictus

- Collection of scientific findings about aspects such as the correlation between temperature increase and occurrence of infectious diseases
- Development of measures including ongoing fixed-point observation, targeting sources of larvae, extermination of adult insects

Industrial and Economic Activity

Source: Ministry of Land, Infrastructure, Transport and Tourism, Japan, etc.

Other Impacts (e.g., Overseas impact)

- Changes in import prices of energy
- Direct and physical impacts on manufacturing plants operating overseas
- Impacts of the spread of infectious diseases via migrants and incoming travel, associated with an increase of disease carriers overseas



Flood in Rojana Industrial Park (Thailand, Oct.~Nov. 2011)

- **Research and survey of impact on economic and social state in Japan by the overseas impact of climate change**

Life of Citizenry, Urban Life

Water Supply, Transportation and others

- Impacts in underground inundation, power outages and subway systems due to record torrential rainfall
 - Impacts in water supply infrastructure due to drought, flood and water quality deterioration
 - Impacts on cut slopes due to heavy rainfall and typhoons
- * It's difficult to clarify whether these impacts are due to climate change though

Measures against inundation at the underground stations



Water stop



Tide gate

- **Promotion of equipment and facilities upgrade to be resistant against natural disasters**
- **Improvements of traffic facilities* to secure safety and smooth traffic for disaster**

* e.g. traffic control centers, traffic monitoring cameras, etc.

(3) Basic Policies for Promotion of Adaptation

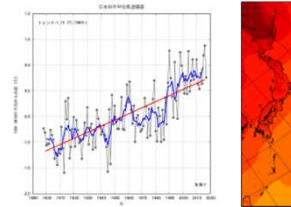


統合的気候モデル高度化研究プログラム
Integrated Research Program for Advancing Climate Models (TOUGOU)

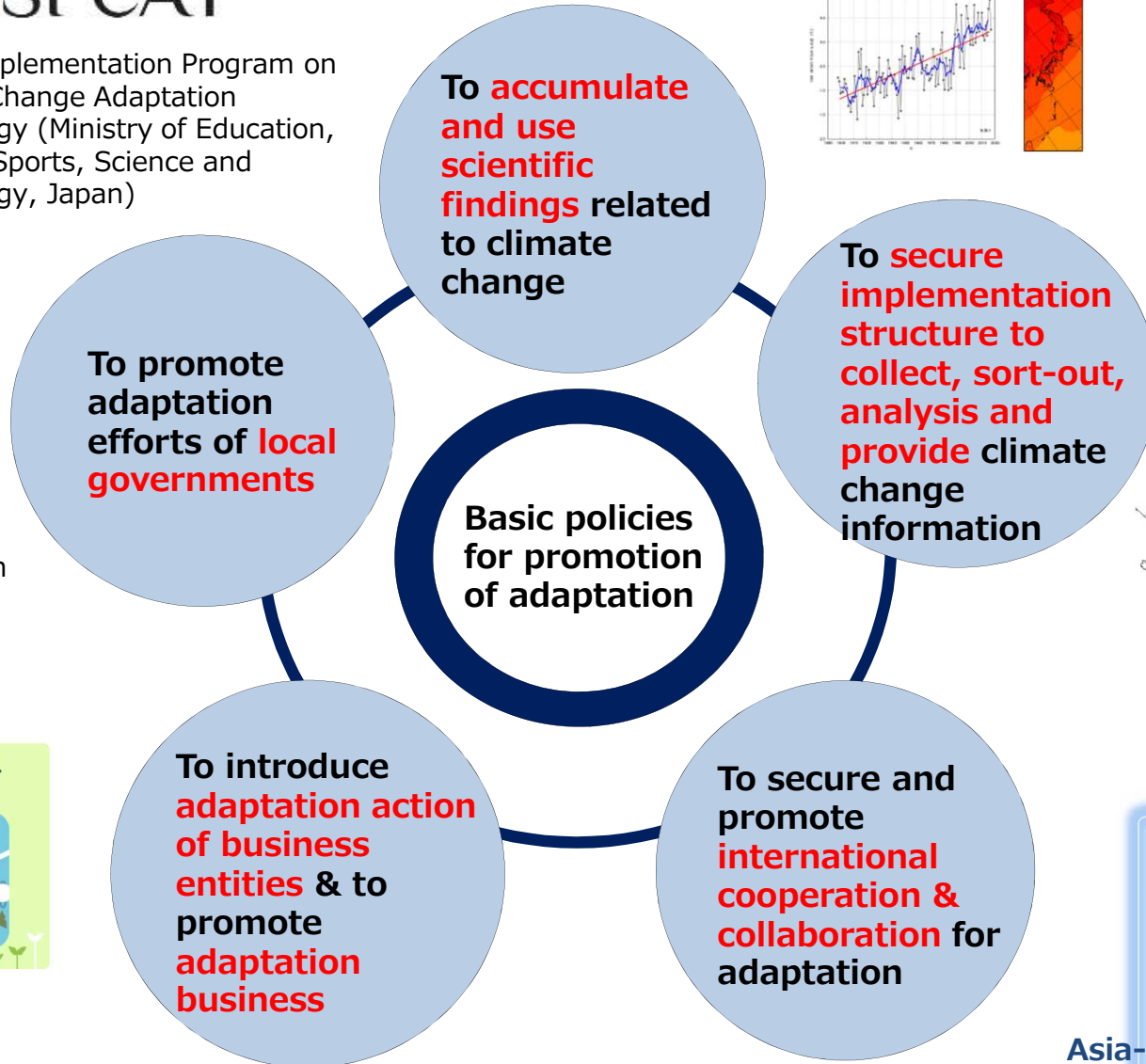
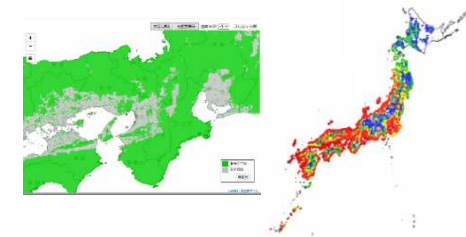


Social Implementation Program on Climate Change Adaptation Technology (Ministry of Education, Culture, Sports, Science and Technology, Japan)

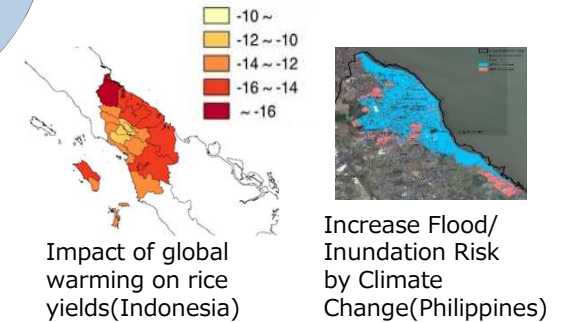
Monitoring and Projection of Climate Change (Japan Meteorological Agency)



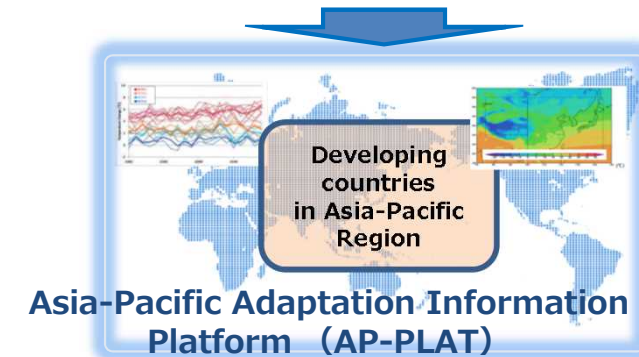
Climate Change Adaptation Platform (A-PLAT)



Regional Adaptation Consortium (Ministry of the Environment, Japan)



Climate Risk Management and Adaptation Business





Climate Change Adaptation Act (June 2018)

1. Comprehensive Adaptation Programme

- Set up clear roles of national and local governments, private sectors, and citizens to promote climate change adaptation efforts.
- National government shall formulate **National Adaptation Plan (NAP)** to promote adaptation in all sectors. The national government should develop methodologies for monitoring and evaluation (M & E) of the progress of adaptation efforts.
- MOE shall implement **climate change impact assessments, every 5 years**. The NAP needs to be revised accordingly.

Promotion of effective adaptation measures in various fields through reliable scientific information

Agriculture, Forestry, Fisheries

Human Health

Water Environment and Resources

Industries and Economic Activity

Natural Ecosystems

Life of Citizens

Natural Disasters

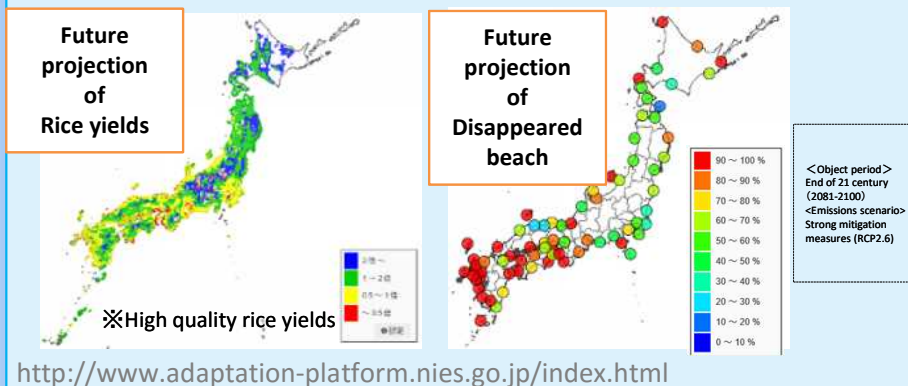
Based on scientific findings of future impact projections ...

- Develop agricultural products with high-temperature-resistant varieties
- Set up fishing grounds based on the changes of fish distribution.
- Maintain embarkment and flood control facility.
- Develop flood risk maps.
- Promote heat illness prevention measures.

2. Information Platform

- The National Institute for Environmental Studies (**NIES**) operates Climate Change Adaptation Platform (**A-PLAT**) as center of excellence.

Example of the main contents of A-PLAT



3. Adaptation in Local Areas

- Local governments (Prefectures and municipalities) are asked to formulate **Local Climate Change Adaptation Plans**.
- Prefectures and municipalities should assign **Climate Change Adaptation Center** as a local climate change data collection and provision center.
- Local stakeholders can organize **Regional Councils** to promote adaptation measures locally in a cooperative manner.

4. International Actions and Business

- Promote International cooperation.
- Promote adaptation business.