[TENTATIVE TRANSLATION]

As of November, 2020

Basic Plan on Water Cycle

June 2020

Introduction

1. Our relationship to the water cycle

(The water cycle)

Water is the source of life, and its endless cycle on the earth interacts with other elements of the natural environment, such as the atmosphere and the soil, to continually provide numerous blessings to diverse ecosystems, including humanity. In addition, the process of the water cycle has enriched people's lives and played important roles in industrial and cultural development.

(Water and Japan's geological and climatological features)

Located at the eastern tip of Monsoon Asia, one of the world's limited number of heavy-rainfall zones, Japan enjoys annual average precipitation of approximately 1,700 mm, or 1.6 times the global average. However, due to factors such as the fact that its land mass stretches approximately 3,000 km in both east-west and north-south directions and has a mountain ridge running down its center, Japan's precipitation is geographically and seasonally imbalanced, resulting in conditions under which it is not easy to use water resources in stability. In addition, since Japan's terrain is steeply sloped, rainfall quickly flows into rivers. This results in frequent floods. Since most of Japan's urban areas and farmland are located in alluvial plains formed by the actions of rivers, they are at risk of flooding. Under such conditions, people have strived to use water while mitigating damage through various measures suited to regional characteristics. Rainfall flows and moves downstream in the form of surface water or groundwater, and then it is used as consumer water, industrial water, agricultural water, water used in power generation, and for other purposes, while also being returned to the rivers or groundwater. In these ways, the land on which we live has been formed through a very close relationship with the water cycle.

(Water's benefits)

Water is essential to all life on earth, particularly to the social activities of humanity. Since ancient times, it has served as a fountain of people's livelihoods and supported social and cultural prosperity, providing substantial benefits to the public.

A look at the relationship between people and water in Japan shows that rice farming was introduced during the latter part of the Jomon Period (through the 10th century BC) and wet rice paddies built using irrigation canals first appeared during the Yayoi Period (third century BC - third century AD), marking the start of full-fledged wet-field farming in Japan. Until the middle ages, wet-field farming took place in areas where water could be used without large-scale civil-engineering works. Later, river improvement and irrigation technologies developed, and starting in the Edo Period (1603-1868), development of new rice fields was conducted proactive in areas that could not be developed before, such as the flood plains of major rivers, leading to the development of land infrastructure in which people's livelihoods were joined with the use of water.

Today, water's benefits serve as the foundations of our abundant lifestyles, supporting diverse local social and cultural activities in regions from the sources of rivers through their mouths to the sea.

(Water and the development of society)

Since ancient times, Japan has experienced efforts to build consensus on use of water through numerous conflicts and reconciliations related to use of agricultural water in river basins between upstream and downstream zones. Through the formation of this water-use order, a water cycle formed in which agricultural water, the leading portion of water use, could be used repeatedly within a river basin. In addition, actions were taken in rivers and river basins to mitigate the damage from repeated floods and droughts, in accordance with the economic and technological conditions of the time. The reflooding of the Tone River, which formed the basis for Tokyo's present prosperity, converted harms to benefits by protecting Edo from the river's flooding, developing new rice fields, and developing a transportation and shipping network, enabling urban land use.

Since the Meiji Period (1868-1912), river improvements have advanced together with Japan's modernization, and damage from flooding and mudslides has been reduced by a considerable degree. In addition, water-resource development to satisfy new demand for water as Japan's population increased quickly and concentrated in urban areas resulted in a state in which nearly all members of the public are supplied with waterworks. Furthermore, development of infrastructure such as waterworks and sewer systems has reduced cases of water-borne diseases such as cholera and typhoid.

During Japan's period of rapid social and economic growth in the postwar years, problems such as wide-ranging ground subsidence due to over pumping of groundwater in industrial zones and elsewhere and water pollution from industrial wastewater and other sources became severe. As a result of measures to protect groundwater such as laws and ordinances restricting pumping and conversion to use of river water led to a state in which wide-ranging and severe ground subsidence is rare. In addition, the spread of use of sewage treatment facilities such as those of sewer systems, agricultural community sewage treatment facilities, and Johkasou, the strengthening of regulations on business wastewater, and adoption of regulations on underground penetration improved water quality overall in rivers, lakes and marshes, groundwater, and other sources. In addition, hydroelectric power helped meet energy demand in the postwar recovery period and is considered an important source of green energy today, since it does not emit carbon dioxide in the generation process.

(The necessity of a sound water cycle)

Use of water in people's livelihoods until now has played a major role in the development of today's abundant society and culture. However, various factors such as concentration of population in urban areas, changes to industrial structures, and climate change accompanied by global warming have led to changes in the water cycle, resulting in various issues such as floods, droughts, and impacts on ecosystems.

In Japan, in order to protect the lives and property of members of the public from future water-related disasters (hereinafter, this refers to flooding, soil disasters, and drought), to pass along an abundant society to the future, and to realize further progress and development, it is vital to reaffirm the fact that water is an important shared asset of humanity, to enable sound cycling of water, and to enable the blessings thereof to be enjoyed in the future, through comprehensively promoting measures to maintain or recover a sound water cycle.

2. Positioning of this Plan and its subject period

(Positioning of this Plan)

It is important that water-cycle-related measures share the goal of maintenance or

recovery of a sound water cycle and be advanced through mutual coordination and adjustment among individual measures. In addition, many such measures need to be advanced through comprehensive government-wide coordination.

In light of these needs, in July 2014, the Basic Act on Water Cycle (Act No. 16 of 2014; "the Act" hereinafter) was enacted and the Headquarters for Water-Cycle Policy, chaired by the Prime Minister, was established. Also, in that same month, the first meeting of the Headquarters for Water-Cycle Policy was held, in which the decision was made to establish the Coordinating Committee.

To achieve the goals stipulated in Article 1 of the Act, this Plan serves as Japan's basic plan on water-cycle-related measures, established to comprehensively and systematically promote Japan's water-cycle-related measures pursuant to the provisions of Article 13 of the Act.

In addition, government-wide efforts are underway toward the maintenance or recovery of a sound water cycle through planning and coordination concerning the water cycle aside from this Plan as well.

(Period covered by this Plan)

The Cabinet decided on the Basic Plan on Water Cycle in July 2015, and necessary measures have been implemented until now based on that plan. Approximately five years have passed since that plan was formulated, and over that time, conditions related to the water cycle have changed. The decision has been made to modify the plan as necessary in consideration of this fact, and to reflect assessment of the effects of water-cycle-related measures.

This Plan has been formulated to cover the five-year period beginning in FY 2020, while keeping in mind prospects for roughly 10 years in the future and looking even further ahead.

This Plan will be reviewed roughly every five years and revised as necessary.

3. Ideal vision of the water cycle

(Maintenance or recovery of a sound water cycle)

The Act defines the "water cycle" as "the cycle of water through the process of

evaporation, precipitation, flowing, or filtration until reaching the sea or elsewhere, centered on water in river basins in the forms of surface water or groundwater." It defines a "sound water cycle" as "a water cycle in which the functions of water, in human activities and environmental preservation, are maintained appropriately." This means that in the maintenance or recovery of a sound water cycle, it is essential to maintain an appropriate balance between water's functions in human, industrial, and other activities and its functions in the natural environment.

In addition, to maintain or recover a sound water cycle into the future, it will be essential to respond in ways that take into consideration factors such as climate change accompanied by global warming, as well as factors such as low birth rates and the aging of the population, population decreases, depopulation, and future long-term changes in the industrial structure.

(Ideal goal)

Located in one of the world's leading heavy-rainfall zones, Japan uses water in forms such as consumer water, industrial water, and agricultural water, from various sources including surface water, such as rivers, lakes, and marshes, and groundwater. It is vital that the nation be able to enjoy water's abundant benefits with high quality and stability.

It is necessary to maintain and demonstrate sustainably the water-source recharge functions of the forests and farmland that cover the bulk of Japan's land mass, which temporarily store rainwater and purify it, in addition to other multifaceted functions such as erosion prevention, ecosystem preservation, and provision of venues for education and experiencing nature.

It is important that each region in a river basin preserve both of its water environment and ecosystems and be able to respond to critical droughts, through securing appropriate water volumes and quality in accordance with its terrain, geology, and other distinctive properties and the actual conditions of its water use.

In addition, recent years have seen increasingly frequent and severe cases of abnormal weather, due to climate change and other factors. As such, there is a need to minimize damage to the property of members of the public and to public facilities, while giving top priority to protecting people's lives, in the event of any type of water-related disaster.

Under such conditions, it is vital both that each and every member of the public

understand water's importance and that related parties in all regions, from river sources through their mouths to the sea, cooperate proactively in efforts to maintain or recover sound water cycles.

In order to pass along sound water cycles to future generations, it is important that members of the public, of all ages, have contact with familiar waterside spaces and water culture, understand how water benefits people's lives, and cooperate with diverse related parties in the river basin toward maintenance or recovery of a sound water cycle.

It is essential that water infrastructure (hereinafter, this refers in general to the facilities that enable use of water from storage through water use and drainage, including river management facilities, hydroelectric power facilities, agricultural water use facilities, industrial waterworks facilities, waterworks facilities, and sewer system facilities), which serves as the foundation to support people's lifestyles and industrial activities, be maintained, managed, and updated appropriately, while also having appropriate seismic performance and other features.

Japan has technologies and experience from its track record of overcoming marked water pollution and wide-ranging, severe ground subsidence in the past, as well as outstanding water-related systems, and these can be expected to contribute to solutions to the water issues faced by developing countries in Asia-Pacific region and around the world.

At the same time, it also is important to carry out research and technological development through industry-academy-government cooperation on science and technology related to the water cycle, such as behavioral analysis and elucidation of the facts concerning the water cycle, including groundwater, and predicting the impact of the risk of water-related disasters, and to put the results of such efforts to use in maintenance or recovery of a sound water cycle.

4. Current conditions of the water cycle and related topics

(1) Main measures implemented until now

Until now, based on the Basic Plan on Water Cycle (July 10, 2015, Cabinet decision), related government agencies have cooperated to implement water-cycle-related measures steadily. Some main measures are shown below.

(Promoting cooperation across river basins etc.)

○ To carry out comprehensive and integrated river basin management, 44 river basin water cycle plans have been formulated by local public agencies and others through the end of March 2020.

○ To support the initiatives of local public groups and others in connection with comprehensive and integrated river basin management, in July 2018, the River Basin Management Guide was assembled, and in July 2018 and October 2019, outstanding case studies were collected in the River Basin Management Case Studies.

(Maintenance and improvement of storage and recharge functions)

○ To demonstrate in a comprehensive and advanced manner the multifaceted functions of forests, forestry improvement and preservation measures have been promoted.

○ To ensure safe flows of floodwater and rainwater in rivers and sewer systems, efforts were advanced to improve storage pipes used to store rainwater or filter it underground as well as rainwater storage and infiltration facilities.

(Promoting appropriate and effective water use etc.)

○ The Act on Partial Amendment of the Water Supply Act (Act No. 92 of 2018) was enacted in October 2019, resulting in enhancement of measures to strengthen the waterworks infrastructure, including wide-area coordination of waterworks, diverse public-private partnerships, and appropriate asset management by waterworks businesses and others.

○ To reconstruct a society with an awareness of water-disaster prevention, in which all of society is prepared for river flooding, progress has been made on disaster prevention and mitigation measures that combine intangibles, such as the January 2019 revisions to the Emergency Action Plan for Reconstruction of a Society with an Awareness of Water-disaster Prevention, with tangible measures, such as levee improvements and dredging of waterways.

○ To support the efforts of local public agencies and others regarding sustainable groundwater preservation and use, in August 2019, the Groundwater Management Guide was prepared, covering related expertise and notes.

○ To develop sustainable sewage treatment systems, systematic and efficient consumer wastewater measures have been implemented through appropriate division of responsibilities, with comprehensive consideration for the distinctive properties, economic potential, etc. of sewer systems, agricultural community sewage treatment facilities, and Johkasou.

○ Efforts have been advanced in areas such as preservation and rehabilitation of waterside spaces, through means including preservation and recovery of ecosystem networks in rural areas and preservation and rehabilitation of forests, rural areas, rivers, and seas. In addition, efforts also have been made to pass along and rehabilitate the diverse local communities and regional cultures in river basins.

(Promoting education concerning a sound water cycle etc.)

○ Education has been conducted on water cycles in forests, rivers, and other environments through means including school education, tours, and hands-on experiences on site.

○ To promote and raise awareness of the water cycle and publicize related information, events have been held in conjunction with Water Day (August 1) and Water Week (August 1-7), together with other measures including awards and commutation of information related to the water cycle.

(Measures to promote autonomous activities by private organizations and others)

○ Community activities to manage preservation of forests, farmland, canals, etc. have been supported.

○ To promote water-cycle-related activities by the private sector and others, opportunities have been provided for water-related public-private partnerships.

(Conducting research necessary to formulate and implement water cycle policies)

○ To ascertain current conditions and facts regarding the water cycle in river basins, surveys have been conducted concerning water volumes, water quality, water usage, groundwater levels, and other matters in public waters.

○ To consider responses to climate change, research has been conducted to improve the precision of meteorological data and predict global warming and its impacts.

(Promotion of science and technology)

○ Research and development and other activities have been conducted in areas such as technologies for analysis of water quality, groundwater, ground subsidence, etc.; impact assessment; methods of analyzing water environmental risks; and satellites to observe climate change.

(Securing international collaboration and promoting international cooperation)

○ Together with communication of Japan's water-cycle-related experience and knowledge intentionally through international conferences and other venues, the importance of public investment in water and disaster prevention has been stressed.

○ The Act on Promotion of Participation by Japanese Businesses in Social Capital Projects Overseas (Act No. 40 of 2018) was enacted in August 2018, encouraging public-private partnerships to promote overseas expansion of infrastructure systems utilizing Japan's experiences, knowledge, and technologies.

(Water-cycle-related human-resources development)

○ Training was provided for staff of local public agencies and others, to develop human resources related to the water cycle.

○ To contribute to achievement of the Sustainable Development Goals (SDGs), adopted by the United Nations in September 2015, measures have been implemented to train human resources involved in water resources in developing countries, through means such as dispatch of experts and acceptance of trainees.

(2) Main future issues

While water-cycle-related measures have been implemented steadily until now based on the Basic Plan on Water Cycle (July 10, 2015, Cabinet decision), numerous issues remain in connection with the maintenance or recovery of a sound water cycle. These include the issues listed below.

For this reason, it is essential that efforts to maintain or recover a sound water cycle be promoted across multiple government agencies, in cooperation with local public agencies and the private sector, and in a comprehensive and integrated manner.

(River basin coordination)

While efforts to achieve comprehensive and integrated management of river basins are being implemented fully in some regions where there is a high level of interest in the water cycle, regional imbalances are apparent from a nationwide perspective. Other issues include the difficulty of understanding the current state of the water cycle and the effects of initiatives and the fact that local public agencies and others do not necessarily have adequate knowledge of the water cycle.

(Maintenance and improvement of storage and recharge functions)

A shortage of labor in forests, farmlands, and other areas that contribute to the maintenance or recovery of a sound water cycle, centered on regions affected by depopulation, low birth rates, and the aging of the population, could make it difficult to maintain and demonstrate their multifaceted functions in areas such as water source recharge. In addition, decreased underground filtration of rainwater due to urbanization and other factors could lead to depletion of spring water and decreases in rivers' normal water flows, resulting in problems such as water quality degradation, and increased flows during flooding.

(Aging of water infrastructure)

Japan's water infrastructure was developed rapidly beginning in the decade after World War II, and particularly in the subsequent period of rapid economic growth and later. It played an important role in the nation's postwar recovery and development. However, many facilities have aged, leading to increasing risk of long-term cessation of their functioning in the event of a large-scale disaster such as an earthquake.

(Climate change and water-related disasters)

In recent years, Japan has experienced a succession of severe water and soil disasters, such as the September 2015 torrential downpours in the Kanto and Tohoku regions, the July 2017 torrential downpours in northern Kyushu, the July 2018 torrential downpours, and the 2019 east Japan typhoon (Typhoon Hagibis). These have resulted in severe damage including considerable loss of life and property. In addition, incidents such as

water and soil disasters are becoming increasingly frequent and severe due to factors including the effects of climate change accompanied by global warming. Examples include increasing frequencies of short-term heavy rainfall and strong downpours. Droughts too continue to lead to measures such as restrictions on water pumping, on an almost yearly basis, and in the future, climate change is expected to lead to increased damage from droughts due to increased numbers of days with no precipitation and decreased snow accumulation. As a result, there are concerns about increasingly frequent, long-term, and severe damage due to droughts.

(Sustainable groundwater preservation and use)

In addition to its diverse uses such as drinking water, groundwater also serves roles in preservation of biodiversity and as a tourism resource. At the same time, over pumping of groundwater in some regions has resulted in ground subsidence, salination, groundwater pollution, and other harm. In addition, in general, groundwater has a highly regional nature, and in many regions, the actual state of its behavior is unclear.

(Water environment)

With regard to water quality, many lakes and marshes or closed coastal seas continue to fail to meet environmental quality standards, and issues such as groundwater pollution from business sites and surface sources, and those related to ecosystem preservation continue to be left.

(Promotion of science and technology)

To ascertain the actual facts of various issues related to the water cycle, such as aging of water infrastructure, increasing risks of water-related disasters due to climate change accompanied by global warming and other factors, changes in physical cycles related to the water cycle, and groundwater conditions, there is a need for analysis, elucidation, and technological development while utilizing monitoring and observation data from satellites and other sources.

(Ecosystems, waterside spaces, and water culture)

In addition to the shrinking of local communities due to factors such as population

decreases and regional economic contraction in river basins, dramatic changes in natural and social conditions, and their impacts, are making it difficult to preserve and rehabilitate the waterside spaces where creatures live, grow, and multiply, to maintain sound water sources, and to pass along diverse water culture.

(Awareness raising, publicity, education)

Opportunities to come into contact with water in everyday living have decreased, and particularly among the younger generation, knowledge of the water cycle and understanding and awareness of water are in a decreasing trend. For this reason, there is a need to deepen understanding of the water cycle among region residents, the private sector, and others, and to make autonomous efforts toward maintenance or recovery of a sound water cycle.

(Securing international collaboration and promoting international cooperation)

For many people around the world, continual use of safe drinking water and sanitary facilities such as toilets remains difficult. One target of SDGs Goal 6 (Water and Sanitation) is to "Ensure availability and sustainable management of water and sanitation for all" by 2030. In addition, issues such as food shortages and rural poverty are related to inadequate water-management organizations and technologies in rural communities. Furthermore, it is expected that demand for water infrastructure development will swell in the future, centered on emerging countries in Asia. Under such conditions, the water issues faced by the world are growing and changing, and they could affect the entire world, including Japan.

(Human-resources development)

There is a concern that as Japan undergoes changes in its population and other aspects of its social structure in the future, it will be difficult to secure appropriate management levels due to a shortage of human resources in areas such as water infrastructure operation, maintenance, upgrading, research, and technological development.

5. Main details of priority initiatives under this Plan

In light of factors such as the state of implementation of water-cycle-related measures until now, remaining issues, and changes in social and other conditions, efforts in the following areas will be priorities over the coming five years or so.

(1) Water-cycle innovation through river basin management － Further deployment of river basin management and improvements in its quality －

Comprehensive and integrated management of a river basin is considered to refer not to the management of the entire river basin by a single party but to coordinated activities by various actors, including administrators and other public agencies, experts, businesses, groups, and residents related to the river basin, to maintain or improve people's livelihoods and water volumes, water quality, and natural environment engaged with water in sound and good conditions, in forests, rivers, farmland, urban areas, lakes and marshes, coastal areas, and elsewhere. This is referred to herein as "river basin management." The scope of the river basin subject to river basin management is that described in Part 2: 1(1).

River basin management initiatives are expected to generate a wide range of results, including focusing a sense of solidarity in the river basin, efficient implementation of solutions to issues in the river basin, and stimulating the region through raising the river basin's brand power.

To deploy high-quality river basin management initiatives nationwide, through means such as further formulation of river basin water cycle plans for river basins across Japan and enhancing their content, it is important that the actors in river basin management of local public agencies and other parties related to the river basin understand and share the goals, effects, issues, and other aspects of initiatives and fully ascertain the natural and social conditions of the river basin as a whole, to implement measures suited to related issues effectively and efficiently.

For this reason, support to local public agencies and others will be enhanced through means such as provision of technological advice and know-how concerning river basin management. In addition, efforts will be advanced in areas such as research to elucidate the actual conditions of the water cycle, including groundwater, and establishment of

evaluation indicators and methods to make matters such as the soundness of the water cycle in the river basin and the effect of river basin management efforts visible. In doing so, research will be advanced with the cooperation of experts and others.

Through these efforts, river basin management will be deployed nationwide and its quality will be improved, and water cycle innovation by river basin management will be advanced.

(2) Realization of a safe and sound society through sound water cycle initiatives －Responding to risks of climate change, large-scale natural disasters, etc.－

In light of its distinctive geological, terrain, and meteorological properties, Japan is subject to frequent water-related disasters, earthquakes, and other natural disasters. In particular, there are concerns that in recent years, factors such as the impact of climate change accompanied by global warming are making water-related disasters more frequent and more severe and leading to increased water-related disaster risk. Under such circumstances, it is increasingly important to prevent or minimize damage to human life, property, and important water infrastructure as a result of large-scale natural disasters and other causes and to develop national, regional, and economic societies that are resilient against water-related disasters, earthquakes, and other disasters.

For this reason, to be ready for large-scale water-related disasters, earthquakes, etc., effective disaster prevention and mitigation and national resilience measures will be promoted with appropriate combination of tangible and intangible measures for important water infrastructure, through a government-wide integrated approach suited to factors such as the risk of disaster and regional conditions. In addition, in anticipation of critical droughts in excess of current water supply levels, efforts will be conducted that include research on evaluation of drought risk, stable supply of water from a risk-management approach, and drought adaptation measures. Furthermore, strategic efforts will be promoted to maintain, manage, and update water infrastructure, and improve its seismic performance, using measures such as wide-area coordination and public-private partnerships, in accordance with the natural and social conditions of individual regions. In measures such as risk evaluation, it is important that studies be based on scientific knowledge such as monitoring and observation data from satellites and other sources and forecasts of climate change.

In addition, through advancing river basin management efforts, sustainable initiatives will be promoted comprehensively in areas such as sustained demonstration of the storage and recharge functions of forests, rivers, farmland, urban areas, etc., to help prevent floods and global warming, and sustainable preservation and use of groundwater.

These initiatives will contribute to accelerated realization of a safe and sound society.

(3) Passing on an abundant society to future generations through a sound water cycle － Awareness raising, publicity, education, and international contributions regarding a sound water cycle －

The land of Japan has been formed through a very close relationship with the water cycle, from which it benefits greatly, and has been the scene of the development of a rich society and unique culture over the nation's long history. In order to pass along to future generations the sound water cycle that has developed in Japan through this process, it is important that the diverse actors involved in a river basin cooperate to create and maintain opportunities for members of the public, young to old, to have contact with water, in order to foster understanding and awareness concerning the water cycle. In addition, it also is important that the public and private sectors join together in international deployment of Japan's water-cycle-related experiences, knowledge, and technologies, as well as harmonization among individual governments, international institutions, etc. and international cooperation, to achieve Goal 6 and Goal 13 (Climate Change) ("Take urgent action to combat climate change and its impacts") of the SDGs while raising awareness of the importance of the water cycle, in addition to contributing to solutions to water challenges worldwide, including improving water management in rural communities.

For this reason, coordination will be achieved on an industry-academy-government-residents basis, adding local residents to the industry-academy-government axis, to strategically promote and raise awareness of, publicize, educate on, and develop human resources related to sound water cycles, in addition to deepening understanding of and interest in sound water cycles among members of the public broadly, through efforts such as raising awareness of Water Day and Water Week.

In addition, together with further accelerating international harmonization and international cooperation through communication of information and exchange of opinions in venues such as international conferences on water issues, development

cooperation, and utilization of Japan's technologies, human resources, standards, etc., Japan will take leadership in contributing to solutions to global water challenges and achievement of the SDGs by promoting overseas expansion of water-related business through public-private partnership.

By maintaining or recovering a sound water cycle through these initiatives, an enriched society will be passed along to future generations.

6. Structure of this Plan

Part 1 of this Plan first reviews current conditions and issues and then, based on factors such as changes in socioeconomic conditions, establishes basic policies for initiatives to be promoted through centralized and comprehensive means and measures to be implemented in the future from a long-term perspective, in line with the five fundamental principles stipulated in Article 3 of the Act.

Part 2 specifically describes the measures to be implemented by the Japanese government comprehensively and systematically, in accordance with the basic policies described in Part 1. The table below summarizes the relationship between the main details of priority efforts under this Plan (Introduction: 5) and measures to be taken by the government with regard to the water cycle (Part 2).

Relationship between the main details of priority efforts under this Plan and water-cycle-related measures

Main details of priority initiatives under this Plan		Part 2. Water-cycle-related measures to be taken comprehensively and systematically by the Japanese government	
(1)	Water-cycle innovation through river basin management － Further deployment of river basin management and improvements in its quality －	1	Promoting cooperation across river basins etc. - Framework of comprehensive and integrated river basin management -
		5	Measures to promote autonomous activities by private organizations and others
		6	Conducting research necessary to formulate and implement water cycle policies
		7	Promotion of science and technology
(2)	Realization of a safe and sound society through sound water cycle initiatives － Responding to risks of climate change, large-scale natural disasters, etc.－	2	Maintenance and improvement of storage and recharge functions
		3(1)	Securing stable water supplies and drainage etc.
		3(2)	Responding to disasters
		3(3)	Securing and promoting use of groundwater sustainably
		3(4)	Strategic maintenance, management, and updating of water infrastructure
		3(5)	Efficient and effective use of water
		3(10)	Responding to global warming
(3)	Passing on an abundant society to future generations through a sound water cycle － Awareness raising, publicity, education, and international contributions regarding a sound water cycle －	3(6)	Water environment
		3(7)	Water cycle and ecosystems
		3(8)	Water environment preservation, rehabilitation, and creation
		3(9)	Passing along, rehabilitation, and creation of water culture
		4	Promoting education concerning a sound water cycle etc.
		8	Securing international collaboration and promoting international cooperation
		9	Water-cycle-related human-resources development

Furthermore, Part 3 describes matters necessary for the comprehensive and systematic promotion of measures, such as their effective implementation, the duties of related parties, coordination and cooperation among them, and publication of measures.

Section 1 Basic policies on measures related to the water cycle

Although measures related to the water cycle each have their own individual objectives and targets, in many cases they are closely related in terms of the content of efforts and related parties. For this reason, the related parties advancing measures need to implement measures with a greater degree of coordination, through mutual sharing of a vision for the future reflecting the distinctive properties of each river basin or region, with a shared understanding of information and issues in various fields related to the water cycle.

In addition, based on the view that it is essential to reaffirm the fact that water is a shared asset of humanity and to realize a sound water cycle and the enjoyment of its benefits into the future, the Headquarters for Water-Cycle Policy promotes measures under this Plan and comprehensively coordinates measures taken by related administrative agencies based on this Plan, in order to promote water-cycle-related measures centrally and comprehensively. Also, in deploying measures, individual government agencies strive to cooperate toward efficient and effective implementation of measures across individual fields, to maintain and recover a sound water cycle.

Additionally, in the process of promoting the measures in this Plan, if steps such as revision of systems are necessary, then they shall be considered promptly and the necessary measures taken.

Furthermore, information will be committed on world-leading water-cycle-related measures proactively and strategically.

The basic policies of water-cycle-related measures are described below.

1. Comprehensive and integrated river basin management

(Promoting cooperation across river basins etc.)

The water-cycle-related issues faced by a river basin may vary widely in accordance with its terrain, climate, and other national conditions. These may include securing appropriate water volumes and water quality for the region, preservation and recharge of

water sources, preservation and use of groundwater, preservation of ecosystems, disaster countermeasures, and crisis management in response to disasters or droughts. In addition, since between urban and rural areas, regional distinctive properties and distinctive features vary with conditions such as population, industrial structure, economic society, and natural environment, the water cycle should reflect the regional actual conditions.

Also, as described under 5(1) in the Introduction, it must be noted that it is important that comprehensive and integrated river basin management be conducted through cooperation among diverse actors related to the river basin, such as administrators and other public agencies, experts, businesses, groups, and residents, in order to protect the lives and property of members of the public from water-related disasters and enable the enjoyment of water's blessings in people's livelihoods.

For this reason, local public agencies, the Japanese government, and other parties will work to establish river basin water cycle councils with membership including, depending on the actual conditions of the region, of local public agencies, local branch offices of national government agencies, experts, stakeholders (businesses, groups, residents involved in irrigation, water recharge, and the water environment in the river basin, from upstream forests to downstream coastal areas). In addition, to deploy river basin management initiatives nationwide, it is important to share information on the state of the water cycle across a broad area, issues and measures, and experience and knowledge obtained from efforts conducted across Japan. For this reason, the Japanese government will promote efforts to develop an environment to enable collecting and sharing of a wide range of information related to the water cycle.

The river basin water cycle council will formulate the river basin water cycle plan and strive to promote measures for the maintenance or recovery of a sound water cycle, flexibly and in stages.

Specifically, to advance water-cycle-related measures in which the region plays an active role, through coordination and cooperation among individual actors, water cycle issues in the region and a vision for the future, as well as basic sources and measures for realizing solutions to these, will be shared among related parties in the river basin while referring to existing efforts, and the river basin's water cycle will be managed in a comprehensive and integrated manner for the entire river basin.

In doing so, since the state of water functions related to people's livelihoods and

environmental preservation may vary greatly by region, it is preferable that targets for maintenance or recovery of a sound water cycle be set in understandable ways corresponding to individual goals, reflecting various existing indicators and the actual conditions of the region.

In some regions, related parties already have established workshops and other bodies to address individual issues. The relationship between these existing bodies and the river basin water cycle council is described in Part 2: 1(2).

2. Proactively promoting initiatives to maintain or recover a sound water cycle

(Maintenance and improvement of storage and recharge functions)

Through the processes of evaporation into the atmosphere, precipitation to the earth, and flowing downhill or being filtered underground, eventually reaching the sea or other bodies of water, the water cycle is centered on surface water or groundwater in river basins. To maintain or recover a sound water cycle, it is essential to maintain and improve the water storage and recharge functions of forests, rivers, farmland, urban areas, etc.

However, forests and farmland suffer from labor shortages, centered on regions where depopulation of rural communities and aging of owners and managers are advancing, leading to concerns about increasing difficulty of maintaining and demonstrating water source recharge functions. In addition, decreased underground filtration of rainwater could lead to depletion of spring water and decreases in rivers' normal water flows, resulting in problems such as water quality degradation, and increased flows during flooding. Furthermore, although ground subsidence due to over pumping of groundwater has leveled off in recent years, there still remain numerous regions in which subsidence is proceeding, and groundwater levels have not yet recovered in some regions.

For this reason, efforts will be advanced to maintain and improve water storage and recharge functions and to provide information about the background and effects of such efforts, while paying close attention to the effects on groundwater volumes and quality.

(Promoting education concerning a sound water cycle etc.)

Water is a valuable resource shared by the public, with a highly public nature; it is deeply related to people's lives in various ways; and factors such as water volumes and water quality greatly impact people's livelihoods. For these and other reasons, it is important that members of the public learn about the importance of water from childhood, learn to think and act in ways that involve use of water with care, understand the deep ties between water and regional history, atmosphere, and culture, and learn the importance of maintenance or recovery of a sound water cycle.

It also is important to note that ties between the water used in everyday living and the water cycle can be difficult to identify, and to create an environment for efforts related to maintenance or recovery of a sound water cycle in which not only children but all members of the public understand and appreciate water's importance and the vital nature of maintenance or recovery of a sound water cycle.

While water is cyclical, since the cycle is uneven over time and between regions, there are quantitative and qualitative restrictions to its use as a resource. There is a need to foster anew an understanding that our water use has been supported by the repeated, unceasing efforts and plans of our ancestors, even before modern times, and unceasing efforts to develop, maintain, and manage infrastructure such as water infrastructure and forests. In addition, it is important to encourage people to take an interest in the water cycle by fostering throughout society an atmosphere and culture in which many people, from young to old but especially among the younger generation, feel involved in efforts related to the water cycle, including sympathy and gratitude for water's benefits and people in water reservoir areas as well as understanding of the harm that the water cycle can cause, such as floods and drought. In addition, to pass along a sound water cycle to future generations, there are needs to create opportunities for contact with nearby water and learning about water, and to foster awareness of water.

Furthermore, to deepen the understanding and interest of members of the public concerning the importance of a sound water cycle in a broad sense, the Act designates August 1 as Water Day, and the government designates the week starting on this date as Water Week. It is important to systematically advance events suited to the goals of this day and week through cooperation among diverse actors nationwide.

In light of the above factors, in order to enable individual members of the public to

think about what they should do in order to continue enjoying water's benefits and act accordingly, with an understanding and appreciation of the importance of the water cycle, while recognizing that water benefits people's livelihoods, and it also can harm them as a result of water-related disasters and similar situations, and to promote an understanding of the connectedness of the water cycle to fields such as weather, forests, rivers, agriculture, urban areas, waterworks, sewer systems, the environment, groundwater, rainwater management, living creatures, and chemistry, measures will be taken to raise awareness of, publicize, educate on, and provide information about the water cycle, as well as encouraging autonomous action by members of the public in connection with maintenance or recovery of a sound water cycle, through industry-academy-government-resident cooperation.

In particular, to raise awareness of the water cycle, including recognition of Water Day and Water Week, publicity and awareness-raising activities will be carried out through proactive and strategic support for regional efforts and communication of information internationally. In addition, through means such as preparation of educational tools and programs, efforts will be made to encourage understanding and appreciation of the water cycle among members of the public of all generations, young to old.

(Carrying out research as necessary to formulate and implement water cycle measures and promotion of science and technology)

It is important that research and studies concerning the water cycle be promoted from an overall perspective, through coordination by related government agencies and cross-functional sharing of information across fields, while based on research conducted in individual fields.

Current water-cycle-related issues include the aging of water infrastructure, increasing risks of water-related disasters due to factors such as climate change accompanied by global warming, changes in physical cycles related to the water cycle, and the need to ascertain the actual conditions of groundwater.

It is important to promote research and development on technologies needed to address these issues: water infrastructure maintenance, management, and upgrading technologies to contribute to river improvement and stable water supplies; monitoring and observation by satellites etc., clarification of mechanisms such as climate change

accompanied by global warming, and prediction and assessment of its impacts; and technologies for quantitatively ascertaining groundwater behavior, including water volumes and water quality. Also important is research on subjects such as evaluation methods to visualize the soundness of the water cycle in a river basin and the effects of river basin management initiatives on the regional environment and people's activities. Also, as advanced technologies such as IoT, robotics, and AI are being incorporated into various industrial and social activities, there is a need to advance research related to maintenance or recovery of a sound water cycle while keeping in mind the realization of "Society 5.0," as a new society balancing economic growth with resolution of social issues.

Furthermore, to stimulate science and technology related to the water cycle and promote their implementation in society, there is a need to promote publication and sharing of research results in easy-to-use formats and encourage their effective use, as well as developing systems for the smooth and swift spread of newly developed technologies, at fair prices, both domestically and internationally.

To implement these measures under conditions of limited budgets and systems, it is important to consider their priorities and to implement research that is feasible and truly necessary, as well as developing low-priced technologies. In addition, in order to put research data to maximum use, another important issue is that of how to collect and share data from individual institutes and provide them in formats that are easy to use in accordance with the places using them and users' needs.

In light of the above factors, measures will be taken to formulate policies related to maintenance or recovery of a sound water cycle and, in order to implement them from an overall perspective, to ascertain the necessary data, implement necessary research including observations, collect and share the results thereof, and promote research as well as science and technology.

(Water-cycle-related human-resources development)

While Japan's water-cycle-related water management, supply, and treatment services have accumulated numerous advanced technologies, these can be maintained, continued, and upgraded only by accumulation of experience and handing them down to future generations.

Human-resources development is fundamental to all aspects of promoting measures to maintain or recover a sound water cycle. However, amid structural changes to society in areas such as the scale of population, there are concerns about shortages of human resources and concentration of workload in connection with water infrastructure operation, maintenance, management, and upgrading, as well as research and technological development. In addition, under such circumstances, the qualifications and capabilities demanded from those employed in water-cycle-related activities are growing increasingly advanced and diverse, in connection with technological advances and integration. It is important to train in each generation, including the young and middle-aged generations, science and technology researchers and practitioners to put such technologies and information to full use, with an eye toward comprehensive initiatives conducted for individual river basins from a medium- to long-term perspective to maintain or recover a sound water cycle.

In addition, to operate the water infrastructure properly and maintain, manage, and upgrade it accordingly, it is essential to systematize standards based on a certain level of technical knowledge and train human resources able to carry out these tasks properly. For this reason, there is a need both to study centralization of knowledge related to water infrastructure operation, maintenance, management, and upgrading and to enhance qualification systems and implement appropriate training and other activities.

Furthermore, it also is important to broaden the base of efforts to maintain or recover a sound water cycle, to achieve industry-academy-government-resident cooperation for broad human-resources development related to the water cycle, and to encourage the participation of specialized human resources with knowledge and expertise concerning water-cycle-related initiatives in addition to new participation by members of the public interested in the water cycle.

Since human-resources development is an issue common to all fields, proactive human-resources development initiatives will be advanced from a more broad-ranging point of view, to encourage human-resources cycles and exchanges across the boundaries separating the sectors of industry, academy, government, and residents, and across international boundaries.

(Measures to promote autonomous activities by private organizations and others)

An important role also is played in maintenance or recovery of a sound water cycle by businesses, members of the public, or private-sector organizations made up of these actors, who understand their own relations to the water cycle and engage in social activities on their own. It is hoped that private-sector organizations with roots in their communities will expand their activities related to the water cycle and deploy their own unique efforts above and beyond existing frameworks of administrators and others. There also is a movement toward such actors proactively taking on themselves roles traditionally played by administrators. To promote such activities of private-sector organizations, it is important to consider the forms to be taken by cooperation and division of responsibilities with private-sector organizations and to develop cooperative systems.

In doing so, there is a need to ensure that it is understood that proactive participation in river basin management with an understanding of the river basin to which they belong and its own distinctive properties, and activities with an awareness of maintenance or recovery of a sound water cycle, not only contribute to maintenance or recovery of a sound water cycle in the region but also lead to increased value for the private-sector organizations themselves. For this reason, it is important to launch initiatives to publicize proactively the soundness of the regional water cycle in order to increase the value of the region and to raise awareness both inside and outside of the region.

In addition, to promote social activities by private-sector organizations, it is necessary to resolve issues in areas such as development of human resources with the skills to manage the groups' activities, securing funding for the activities, disclosing information on the activities, providing activity knowledge and know-how, and networking among private-sector organizations involved in activities.

In light of such circumstances, together with stimulating autonomous activities by private-sector organizations and promoting networking to encourage cooperation among private-sector organizations, through means such as developing platforms, efforts will be made in areas such as provision and sharing of information in the possession of administrative agencies and other parties, including case studies concerning knowledge and know-how regarding securing funding for activities, in order to increase value to private-sector organizations.

Furthermore, measures will be advanced to grow activities in areas such as learning about the water cycle across the regions that include the private-sector organizations.

3. Ensuring proper use of water and enjoyment of its benefits

(Securing safe, high-quality water)

Safe, high-quality water benefits all users of consumer water, industrial water, agricultural water, and other types of water. In particular, there is increasing demand for safe, delicious drinking water, and the quality of drinking water is attracting increasing attention in terms of safety and peace of mind. In light of these conditions, further efforts focused on water quality are important.

Under such conditions, efforts will be advanced to preserve water quality in waterworks' water reservoir areas, to revise waterworks' water quality standards gradually, and to implement measures based on the Water Pollution Control Law (Act No. 138 of 1970). In addition, in accordance with regional conditions such as the water quality of waterworks' water sources, to further reduce damage resulting in unusual odors or tastes measures will be advanced such as adoption of advanced water treatment facilities, together with efforts to reduce the pollution burdens in river basins.

(Strategic maintenance, management, and updating of water infrastructure etc.)

Water infrastructure is an important infrastructure that supports the livelihoods of the public and industrial activities. However, since it was developed rapidly beginning in Japan's postwar period of rapid economic growth and the number of facilities that have reached the stage at which renovation is required is increasing rapidly, there is a need for strategic maintenance, management, upgrading, and other efforts while also carrying out appropriate risk management.

In addition, to maintain future facility functions, service levels, and safety, in accordance with regional conditions including depopulation, low birth rates, and aging of the population, it is necessary to implement measures such as strategic maintenance, management, and upgrading together with responding to financial conditions, staff shortages, maintenance of technological capabilities, etc.

In particular, in some cases, projects in areas such as waterworks, sewer systems, and industrial waterworks, for which local public agencies are key actors, cannot necessarily be said to be able to secure sufficient revenues from rates in light of changing social conditions such as population decreases, and for this reason, it is important in preparing

for maintenance, management, and upgrading of aging infrastructure to consider wide-area coordination, appropriate asset management, and diverse public-private partnership, to enhance project infrastructure strategically.

In addition, among agricultural water-use facilities, canals and holding ponds near farmland have until now been supported through joint activities in the region, based on rural communities. However, obstacles to preservation management are arising due to decreases in the functioning of rural communities resulting from developments such as depopulation in rural regions, low birth rates and the aging of the population, and mixture of residential and other functions, and as a result, it is important to develop structures for sustainable preservation management.

In light of the above considerations, strategic maintenance, management, upgrading, and other measures will be promoted to extend the lifespans of aged water infrastructure, upgrade it appropriately, and improve its seismic performance, among other goals.

(Efficient and effective use of water)

With regard to rationalization of water use, efforts are underway such as streamlining of agricultural water facilities and diverting the resulting surplus agricultural water for use in urban areas. In the future as well, from the perspective of effective use of water resources, it will be important, in the event that supply-demand imbalances have arisen within or between uses such as consumer water, industrial water, and agricultural water in a region due to changing social and economic conditions, to further advance diversion of water to other uses in accordance with the regional actual conditions, through mutual understanding among related parties. In addition, with regard to water conservation, an awareness needs to be fostered among members of the public of the importance of using water wisely.

Rainwater and reclaimed water are expected to see use as substitute water sources for use in toilets, sprinklers, and firefighting, both in normal times and in emergencies, as environmental resources used to provide friendly access to, and as energy resources for energy conversation and low-carbon, sustainable energy creation through means such as putting sewage heat to effective use.

For the above reasons, water is a valuable resource shared by the public, with a highly public nature. In light of this fact, measures will be advanced to put water resources to

effective use, including more efficient use of water, water conservation, use of rainwater and reclaimed water.

(Securing and promoting use of groundwater sustainably)

Groundwater itself, as well as the springs where groundwater comes to the surface, are used for diverse purposes including as drinking water, bath water, and other consumer water, industrial water, and agricultural water sources, in snow removal in heavy-snowfall regions, and as energy sources using groundwater heat and its other properties. Furthermore, its other roles include supply to places where biodiversity is preserved, relaxation areas, and environmental learning venues and use as tourism resources.

On the other hand, since in general, groundwater moves at a very slow speed, it takes a very long time to recover from groundwater damage such as ground subsidence, salination, groundwater pollution. In particular, since ground subsidence is an irreversible process, it is very difficult to recover from it once it has occurred.

For this reason, sustainable groundwater preservation and use will be advanced to protect the regional groundwater and use it as a water resource and for other purposes while also preventing damage to groundwater such as ground subsidence, salination, groundwater pollution and preserving ecosystems, among other aims.

Groundwater is a familiar water source put to various uses and is related to regional society and culture in broad-ranging ways. On the other hand, due to factors such as the extremely high regional properties and diversity of the underground structurers where groundwater is present, many aspects, such as groundwater reserves; inflows, outflows, and behavior; and relations between surface water and groundwater, are unclear, and depending on the flows of groundwater and extent of the aquifer, it may be subject to multiple local public agencies. In light of the fact that water is a valuable resource shared by the public, with a highly public nature, there is a need to begin measures such as ascertaining the actual states of groundwater use and behavior, in order to promote sustainable groundwater preservation and use while achieving consensus among related parties in the region.

Since in general, groundwater use and related issues have very high regional natures, local public agencies and other related parties in the region are actors in management of consensus in the region regarding fostering a shared understanding of the issues,

ascertaining and analyzing the actual states of groundwater use and behavior, visualization, preservation of water volumes and water quality, recharge, and extraction, among other factors ("groundwater management" hereinafter), and efforts will be made to coordinate this management while paying attention to the relationship between surface water and groundwater. The role of the Japanese government will be to support the autonomous efforts of local public agencies and other actors in the region.

(Responding to global warming)

The Fifth Assessment Report of the UN's Intergovernmental Panel on Climate Change (IPCC) pointed out there is no room for doubt regarding the warming of the climate system and that there is an extremely high likelihood of stronger, more frequent extreme precipitation on land masses in middle-latitude zones and in other regions, as well as a high likelihood of increases in the strength and duration of regional to global droughts, by the end of the 21st century. In addition, the Ministry of the Environment and the Japan Meteorological Agency predict that while there will be no significant trend in annual precipitation in Japan at the end of the 21st century, the volume of precipitation in heavy downpours and the numbers of days with no precipitation will increase nationwide. For these reasons, there is a need for integrated responses to water-related disasters in river basin management, keeping in mind the possibility that the water cycle could change dramatically in the future due to critical droughts, water disasters, soil disasters, and other causes.

In recent years, Japan has suffered heavy damage due to frequent water and soil disasters, such as the September 2015 torrential downpours in the Kanto and Tohoku regions, the July 2017 torrential downpours in northern Kyushu, the July 2018 torrential downpours, and the 2019 east Japan typhoon. In response to the July 2018 torrential downpours, the Japan Meteorological Agency for the first time mentioned the impact of global warming with regard to an individual disaster, reporting, "There is a possibility that long-term increases in temperature and a long-term increasing trend in water vapor in the atmosphere due to global warming contributed." Thus, it stated clearly that climate change accompanied by global warming already is being realized. The 2019 east Japan typhoon caused loss of life and homes over a wide area and severe social and economic damage due to large-scale flooding resulting from levee breaks and breaches and

suspension of water supply and drainage systems.

There is a possibility that in the future, increased precipitation due to heavy rainfall and rising sea levels could cause water and soil disasters to become increasingly frequent and severe, interrupting water supply and drainage systems overall. In addition, there are concerns about the effects on water treatment of high-turbidity raw water resulting from the increasing frequency of short-term strong downpours and heavy rainfall. Furthermore, there also are concerns about results such as impacts on water safety and increased musty odors affecting water flavor, as well as ecosystem changes, due to coastal groundwater salination and backflows of saltwater from the sea upstream into rivers due to rising sea levels and decreased residual chlorine densities in waterworks water due to rising temperatures. There also is a need to pay attention to decreased quality of agricultural produce due to rising temperature (high-temperature injury) and changes in water demand to prevent this.

There is a possibility that supplies could decrease from levels planned at the time of development of water-resource development facilities due to factors such as increasing numbers of days with no precipitation and decreased snow accumulation, and recent years have seen droughts occur across Japan that required restrictions on water pumping. While quantitative forecasts involve uncertainty, there is a possibility that climate change accompanied by global warming could further reduce available supplies, and there are concerns of increasing risks of drought in the future.

Currently, in accordance with the National Adaptation Plan (November 27, 2018, Cabinet decision) based on the Climate Change Adaptation Act (Act No. 50 of 2018), individual government agencies are proceeding with measures to adapt to various impacts of global warming in addition to mitigation measures centered on reducing greenhouse gases. Global warming and other aspects of climate change will be addressed through efforts to protect the public's lives and property and achieve a sustainable economic society in the future and full-fledged mitigation measures to realize maintenance or recovery of a sound water cycle as well as efforts to avoid and lessen both present and future damage.

(Responding to critical droughts)

To improve the lives of the public and achieve sustainable development of economic

society, national policies are based on securing stable sources of water. To meet rapidly growing water demand during Japan's postwar period of rapid economic growth, water-resource development was conducted with the aim of securing a stable supply of water based on the highest-ranking drought year in a 10-year period in principle. As a result, water-resource facilities have been developed nationwide to a certain level.

However, in some regions, insufficiencies in water supply are apparent, such as some facilities undergoing improvement work or some regions still having unstable water intake. In addition, in recent years, climate change has led to the realization of risks and issues that, while infrequent, could have major impacts on water supply, such as critical droughts. For these reasons, there is a need to convert steadily from traditional demand-driven water-resource development to water-resource polices based on risk management, intended to achieve a stable water supply.

Other necessary measures include assessment of the stability of water supply and risk of drought at existing facilities, assuming that measures will be taken to prevent and lessen drought damage, and sharing of information on drought risk among actors such as the national government, local public agencies, users, businesses, and residents to be ready for a drought in cooperation.

For this reason, based on the history of water networks and regions, their backgrounds, distinctive properties, and actual conditions, the national government, local public agencies and others will anticipate future critical droughts and cooperate with related parties to establish measures to lessen the impact and damage from a drought and promote initiatives to be ready for a critical drought.

In addition, in the seven water systems related to the water-resource development in Japan in which about 50% of the nation's industry and population are concentrated, basic water-resource development plans have been formulated based on comprehensive development of water resources and rationalization of use, and these basic plans will be revised thoroughly to create new plans based on risk management. Through such measures, the water supply and demand balance will be inspected comprehensively, even taking into consideration times of critical drought, and tangible measures will be advanced as basic strategies for thorough utilization of existing facilities as well as necessary intangible measures, in an integrated manner, to develop structures for stable use of safe, reliable water and realize a society in which water's benefits can continue to

be enjoyed in the future.

(Responding to disasters)

Throughout its long history, Japan has continued to maintain efforts intended to protect the public's lives and property from harms such as water and soil disasters, earthquakes, and other disasters on its fragile terrain.

As a nation with a high potential risk of flooding, Japan has strived to improve the safety of river improvement with consideration for the environment, to drain floods safety downstream. It also has advanced efforts such as countermeasures against soil disasters and forestry improvement measures in decayed forests. However, not only are disaster countermeasures incomplete in areas such as related facilities, but other factors such as increasing external pressures from sources such as climate change accompanied by global warming are major factors behind concern regarding water and soil disasters becoming increasingly frequent and severe. In addition, compounds disasters such as flooding and inundation, inundation from internal waters, high tides, and mudslides also occur, making disaster prevention and mitigation measures increasingly important. For this reason, in light of flooding in recent years, the awareness of administrators, residents, and others is changing, and there is a need to prepare for river flooding throughout society, based on an understanding that the capacity of facilities is limited and there necessarily will be some large-scale floods that facilities are unable to prevent.

At the same time, large-scale natural disasters such as water disasters and earthquakes in recent years have revealed vulnerabilities in water infrastructure, such as extensive and long-term interruptions in operation of water supply facilities due to facility damage or temporary cutoff of energy and suspicion of the functioning of sewer treatment facilities due to flooding.

There are concerns about large-scale damage to water supply and drainage systems and severe sanitary issues, as well as pollution of public waters and groundwater, in the event that damage to facilities resulting from an anticipated future large-scale disaster requires a lengthy period to recover. At the same time, measures such as seismic retrofitting of water infrastructure still cannot be said to be sufficient.

In addition, since water supply and drainage systems involve multiple facility managers and users, the water infrastructure network is a complex structure of multiple

facilities each developed in line with their own goals. As a result, even though in some cases, the supply from the network may be maintained if only some facilities are damaged, there also are cases in which the impact is broad ranging and long-lasting, due to secondary damage to water supply and drainage systems in addition to the businesses directly affected.

For this reason, efforts will be advanced to protect human life and property from disasters through administrators, residents, and others working together and taking into consideration the views of experts, users, and other parties. Other measures advanced include seismic retrofitting and formation and implementation of business continuity plans (BCPs) to maintain the functionality of water supply and drainage systems at the minimum levels necessary to serve residents and social and economic activities in the event of a large-scale disaster or power failure, development of mutual assistance structures for recovery of water infrastructure and related training, which also assists with human-resources development, and preparations for temporary use of groundwater or other water sources.

4. Maintaining a sound water cycle in use of water

(Water environment)

To maintain a sound water cycle, use the resources needed in people's lives in sustainable ways, and secure good habitats and growing and breeding environments for living creatures, preservation of water environments must be managed appropriately, through means including securing appropriate water volumes and water quality. To avoid or mitigate as much as possible any effects on a sound water cycle and enable efficient water use, it is important both to secure water volumes through cooperation among related parties and to prevent pollution through means such as appropriate treatment and regulation of drain water, in addition to appropriate use of water with consideration for the water environment.

Until now, environmental quality standards have been established as water quality targets for public waters and groundwater, to protect the health of the public and preserve the living environment. Efforts in areas such as drain water and groundwater pollution,

aiming to achieve these standards, have made steady progress on improving water pollution.

On the other hand, numerous issues remain in the water environment, such as the need to improve water quality in lakes and marshes, closed coastal seas, and groundwater, biodiversity preservation, and securing appropriate physical cycles. Accordingly, there is a need to continue progress in preservation and recovery of the water environment.

Furthermore, to work comprehensively toward maintenance or recovery of a sound water cycle, it is important to develop a structure for integrated collection, sharing, and use of information concerning the water cycle, such as water volumes and water quality, surface water and groundwater, and normal and drought conditions, through cooperation among related parties. In addition, for purposes of further improving of water quality, it is important to switch to appropriate treatment facilities.

The goal for the future will be to create a society that preserves and enables sustainable use of the water environment, including water volumes, water quality, and aquatic creatures, in accordance with the river basin's distinctive properties, while coherently carrying out river improvement and irrigation development, from the perspective of maintenance or recovery of a sound water cycle and with consideration for a desirable society, current and future social conditions, technological levels, and quality of life, while also reflecting applicable laws, regulations, etc.

(Water cycle and ecosystems)

The water cycle linking forests, rivers, farmland, urban areas, lakes and marshes, coastal areas, etc. is an important axis of the national network of ecosystems. These links realize movement and dispersal activity of native species and appropriate soil movements, which in turn protect sound physical cycles of materials such as nutritive salt, which helps maintain the habitation, growth, and propagation of not only plankton in coastal areas but specific plants and animals as well.

In this way, the water cycle both serves as a foundation of ecosystems and is very important from the perspective of preservation of biodiversity.

In addition, the water cycle is deeply related to ecosystem services that benefit ecosystems containing diverse creatures, in areas such as drinking water and stability of water and climate. For this reason, it must be noted that appropriate ecosystem

management in river basins not only helps to preserve creatures' habitats and growing and breeding grounds but also is connected to improving of the river basin's ecosystem services, including water storage, water purification, erosion prevention, and supply of fisheries resources such as the fish in the sea, rivers, lakes, and marshes, and to maintenance or recovery of a sound water cycle.

Furthermore, it also is important to demonstrate the vitality of each region to the utmost through mutual complementation of resources suited to the distinctive properties of each region while also forming an autonomous and distributed society and utilizing regional resources, including ecosystems, to the maximum extent.

In light of these factors, ecosystem preservation and rehabilitation efforts will be promoted taking into consideration the river basin as a whole and seeing forests, countryside, rivers, and the sea as a contiguous space.

(Waterside spaces preservation, rehabilitation, and creation)

Waterside spaces such as rivers, lakes, marshes, canals, agricultural drainage ditches, and reservoirs are habitats and growing and breeding environments for diverse creatures as well as places closely related to human living, and they serve as important elements in preservation and creation of regional history, culture, and traditions. They also have roles such as serving as places for relaxation, making a living, recreation, and coming together, and they inspire reverence for nature. Their other functions include replacing lifeline services in a disaster and mitigating the heat-island effect.

On the other hand, rapid economic growth and other factors have caused people to grow less involved in and aware of waterside areas in their lives. Based on these factors, together with further preservation, rehabilitation, and creation of waterside spaces, measures will be advanced further to put waterside spaces in the river basin to effective use and demonstrate their functions effectively.

(Passing along, rehabilitation, and creation of water culture)

Over a long period of time, tangible and intangible water cultures have formed as people in a region have affected its rivers and river basins to use its water wisely. This culture takes shape and is refined over time, while also losing certain of its aspects repeatedly. At the same time, in some regions, it is becoming difficult to pass along

diverse regional water culture due to various issues including the atrophying of community as well as changes in the water cycle brought on by dramatic changes in nature and society, and the effects of such changes. For this reason, efforts will be promoted both to pass along and revive water culture handed down from our ancestors and to create new water culture, through advancing and maintaining initiatives to vitalize the diverse local communities and regional cultures in a river basin.

In addition, in water source areas, together with measures toward rehabilitation of residents' livelihood, measures targeting such regions will continue through means such as various improvements to the living environment and industrial infrastructure.

5. Promoting water-cycle-related initiatives through international cooperation

(Securing international collaboration and promoting international cooperation)

In recent years, severe and devastating floods and droughts have been occurring around the world, and international efforts have become even more important than ever, through means including positioning the responses to each water-related disaster in international goals and sharing of knowledge. In addition, from a global perspective, access to safe water and basic sanitation facilities remains inadequate, while progress in areas such as economic growth and urbanization has led to concerns about water pollution and impacts on ecosystems. As a result, enhancement of water-supply facilities and drainage treatment facilities is becoming an important issue. Furthermore, while there also is a need to promote efficient use of agricultural water to counter food shortages and rural poverty, the state of water management in rural communities is inadequate in terms of both organizations and technologies, and it is important to adopt measures such as improvements to water-management technologies and human-resources development.

Under such circumstances, in order to reaffirm the understanding that water is an asset shared by humanity and to enhance measures around the world in areas such as stable water supplies, appropriate treatment of drain water, and responding to water-related disasters, international coordination and cooperation regarding water will be advanced in cooperation with international institutions, nongovernmental organizations (NGOs), and

others, through means including more effective support for the autonomous efforts of developing countries. In doing so, Japan will contribute to solutions to global water issues by demonstrating leadership and sharing with the international community its own experiences and lessons in areas such as responding to water-related disasters and treatment of drain water.

In addition, there also is a need to further advance overseas expansion of information on Japan's water cycle history and experiences and the outstanding water-related structures, technologies, systems, etc. which have accumulated resultantly, because the overseas expansion will contribute not only to solutions to global water issues but also to stimulation of Japan's economy. For this reason, to steadily advance the infrastructure export strategy that is a part of Japan's strategies for growth and international deployment, overseas expansion of comprehensive and integrated systems will be advanced in accordance with the needs of individual countries, from the vision and planning stages through maintenance and management. In doing so, to enable overseas expansion of infrastructure systems utilizing Japan's outstanding technologies and expertise in the field of water, the government will enhance coordination with local public agencies, businesses, and other partners and support businesses' overseas expansion from the project-formation stage.

These initiatives also will contribute to achievement of the SDGs, and for this reason, it is important for Japan both to communicate information broadly to domestic and overseas related parties and to collect useful knowledge and information from around the world.

Section 2 Water-cycle-related measures to be taken comprehensively and systematically by the Japanese government

1. Promoting cooperation across river basins etc. - Framework of comprehensive and integrated river basin management -

(1) Scope of river basin

Since maintenance or recovery of a sound water cycle requires activities in which related parties share certain courses of action and cooperation with each other, there is a need to build frameworks for doing so within individual regions. For this reason, river basins will be considered as entire regions in which people's activities are impacted by the water cycle, including regions in which groundwater is cultivated, is filtered, flows, and is stored, regions in which water is used, and coastal areas impacted by land areas, in addition to considering them as simple geographical units in which rainwater flows into rivers.

(2) Thinking on comprehensive and integrated river basin management

In river basin management, efforts will be made to implement measures such as establishment of river basin water cycle councils in individual river basins, formulation of river basin water cycle plans to establish basic policies and other matters related to river basin management in the river basins, and appropriate preservation, management, facility development, activities, etc. in the river basin through cooperation among related actors, centered on administrators and other public agencies in the river basin water cycle council, in accordance with the regional actual conditions.

In addition to management of the river basin as a whole as a unit consisting of water systems such as rivers, lakes, and marshes, river basin management also needs to employ management conducted in units such as sub-river basins and administrative areas with specific goals, including tributaries, lakes, and marshes. For this reason, in water systems in which maintenance or recovery of a sound water cycle is necessary for the river basin as a whole, a framework will be set up for establishment of river basin water cycle councils for individual water systems as well as setting up separate river basin water cycle councils for units such as sub-river basins and administrative areas with specific goals, in

accordance with the regional distinctive properties and actual conditions, to promote activities individually while taking into consideration matters including regional economic stimulation. To ensure that they will be sustainable, it is desirable that river basin water cycle councils have funding sources from various means such as subsidies from administrators, private sector funding, and their own funding.

Already, some regions have set up councils and other bodies in which water-related parties address individual issues. River basin water cycle councils basically are positioned as a venue for discussing basic matters related to maintenance or recovery of a sound water cycle, from a comprehensive and overall approach, without impeding the activities of these existing councils and other bodies. It is desirable that the latter gradually become positioned as subcommittees or working groups of the river basin water cycle councils, to establish an integrated framework for the future. If the structures and participating actors in these existing councils and other bodies are suitable in light of the goals and content of river basin management, then they even could be positioned as river basin water cycle councils.

In addition, for purposes of sustainable groundwater preservation and use, groundwater management with these goals will be promoted systematically as a part of cooperation in the river basin.

(3) Establishment of a river basin water cycle council and formulation of a river basin water cycle plan

○ Local public agencies, the national government, and others will strive to establish river basin water cycle councils, with membership including local public agencies, local branch offices of national government agencies, experts, and stakeholders, and promote river basin management initiatives, based on the units of individual river basins, in accordance with the regional actual conditions, including the state of existing cooperation in the river basin.

○ In accordance with the regional actual conditions, it also is conceivable that river basin water cycle councils would be established as councils for addressing specific fields related to the water cycle, such as drought responses, groundwater management, and the water environment, or as subcommittees or working groups in specific fields or units of sub-river basins underneath the water-system river basin

water cycle council.

○ Also, depending on the goals, river basin water cycle councils could be established as multilayered structures for river basins, by setting them up regardless of the size of the river basin, such as the scope of tributaries, lakes and marshes, or aquifers and administrative districts, instead of in units of water systems.

○ To advance water-cycle-related measures, the river basin water cycle council will formulate a river basin water cycle plan through sharing of various types of information related to the water cycle, such as water volumes, water quality, water use, groundwater conditions, environmental conditions, cultural conditions, and water-related disasters, through coordination and cooperation among related parties, while fully reflecting matters such as various opinions in the river basin water cycle council, the river basin's distinctive properties, and other existing plans. In doing so, close attention also will be paid to regional creation efforts, such as improving the regional brand power through water-cycle-related measures. The method of proceeding with formulation of such plans will be decided by the related parties making up the river basin water cycle council, in accordance with the goals of the plan and the scale of its scope.

○ It is desirable that the river basin water cycle council be a part of a structure for mutual coordination among related parties in areas such as urban planning, community development, and land use.

○ To enable local public agencies and others to carry out appropriate and effective river basin management efforts, the government will provide organic coordination and support for local public agencies and others.

○ The government will support coordination and sharing of information on activities among river basin water cycle councils which act in different river basins.

(4) Content of the river basin water cycle plan

○ The river basin water cycle plan will be established in stages based on the regional actual conditions, including (i) current and future issues, (ii) philosophies and visions for the future, (iii) goals related to maintenance or recovery of a sound water cycle, (iv) measures implemented to achieve goals, and (v) indicators of the state of a sound water cycle and progress on related plans.

○ The river basin water cycle council will cooperate with related parties to implement water-cycle-related measures for forests, rivers, farmland, urban areas, lakes and marshes, coastal areas, etc., in order to enable organic cooperation under the basic river basin management policies identified in the river basin water cycle plan.

(5) River basin water cycle planning process and evaluation

○ In formulating the river basin water cycle plan, the river basin water cycle council will strive to coordinate and reflect various views from related parties such as administrators, experts, businesses, groups, and residents. In addition, to reflect the views of residents and others, efforts will be made to develop measures necessary for participation of residents and others in accordance with the regional actual conditions, such as participation of residents' representatives in the river basin water cycle council, concluding surveys, and holding symposia.

○ The river basin water cycle council will endeavor to ensure that progress on the river basin water cycle plan and the state of the water cycle are assessed at appropriate times and the river basin water cycle plan is revised as necessary.

(6) River basin water cycle planning/promotion measures

○ The river basin water cycle plan will be formulated actively by the river basin water cycle council.

○ The government, in cooperation with experts and others, will provide support necessary to advance the formulation of the river basin water cycle plan and continual management of its progress, including preparation and updating of guides identifying basic thinking on establishment of goals for individual river basins and collections of outstanding case studies that would be instructional for reference in river basin management, development of water-cycle-related information infrastructure and communication of information, enhancement of support contacts, establishment of assessment indicators and methods to make visible the soundness of the water cycle in the river basin and the effects of river basin management, holding training and seminars, and awareness-raising and publicity activities. In addition, to advance initiatives for river basin management, support will be provided through means such as dispatch of advisors on the water cycle to local public

agencies and others involved in formulation of river basin water cycle plans.

○ The government will support river basin management initiatives from perspectives such as training of human resources to drive the regional efforts toward maintenance or recovery of a sound water cycle, securing funding sources and development of structures by river basin water cycle councils and others, and awareness-raising and publicity activities to encourage exchange among river basin water cycle councils and participation in river basin management by experts, businesses, groups, residents, and various other actors.

○ Local public agencies will strive to develop the measures necessary to improve water governance, through means such as formulation of river basin water cycle plans by river basin water cycle councils and development of structures to promote water-cycle-related measures based on these plans. They also will strive both to give concrete form to measures related to cooperation among related parties such as administrators, experts, businesses, groups, and residents in the river basin and to deepen related parties' understanding of economic activities in the river basin. Furthermore, they also will encourage the participation in river basin management of local businesses, universities, and other local organizations in the river basin and utilize the knowledge that such organizations possess.

2. Maintenance and improvement of storage and recharge functions

To maintain or recover a sound water cycle, efforts to maintain and improve storage and recharge functions will be promoted throughout the river basin as a whole, through means such as green infrastructure development to utilize wisely the diverse functions of the natural environment, in social capital development, land use, and other areas.

(1) Forests and woods

○ Since in Japan, individual forests often are expected to demonstrate different combinations of multiple functions, there is a need to advance forest improvement and preservation to enable sustained demonstration of multifaceted functions, including water source recharge, in light of factors such as the current states of forests, natural conditions, and regional needs.

○ For the diverse forests across the country, planned and systematic forest improvement and preservation initiatives will be advanced in accordance with individual roles through cooperation among the national government, prefectures, municipalities, forest owners, and others, based on the Forest Planning System. In addition, based on the Forestry Management Act enacted in April 2019 (Act No. 35 of 2018), a forestry management system will be advanced under which management of forests not currently managed appropriately will be entrusted by forest owners to municipalities and other authorities.

○ In privately owned forests, forest improvements will be advanced through means such as consolidation of forestry business, thinning, and development of road networks integrated with thinning, as well as measures such as thinning and conversion to mixed conifer-broadleaf forest by public actors in forests such as interior water source forests where demonstration of a high degree of water source recharge functions is needed but the appropriate development only by owners cannot be expected. In addition, in national forests, which are distributed widely across inner mountainous areas and water reservoir areas, the national government itself will promote appropriate forest improvement and preservation.

○ To contribute to stable supplies of high-quality water and national land preservation through maintenance and improvement of water source recharge functions, forests

serving as important water source areas, such as those upstream from dams, and as rural communities' water sources will be subject to promotion of systematic designation of protected forests and appropriate management thereof. In addition, with regard to these protected forests, those on land with high water filtration and retention capabilities will be maintained and improved, forest improvement facilities needed to revive wasteland and waste forests will be established, and forest improvements will be advanced widely and comprehensively.

○ There is a concern that factors such as advancing depopulation, low birth rates, and the aging of the population, decreasing profitability of forestry, and labor shortages will lead to an increase in numbers of forests for which necessary maintenance and preservation are not conducted. Under such conditions, to enable the sustainable demonstration of the multifaceted functions of forests, such as water source recharge functions, there is a need to maintain and preserve forests through forest production activities that enable mountain community residents to live there year long and create stable employment in such communities. For this reason, through means such as creation of demand for new lumber materials such as cross-laminated timber (CLT) and development of stable supply structures for domestic materials to meet consumer needs, efforts will be made to stimulate mountain communities through making forestry and the lumber industry, which play important roles in employment creation in mountain communities, into growth industries and supporting efforts to secure and train new workers and to utilize mountain communities' regional resources.

(2) Rivers etc.

○ In light of the fact that the water cycle involves circulation of surface water or groundwater chiefly through river basins, efforts will be made to maintain necessary river flows.

○ To respond to increased flows to rivers during flooding, as a result of urbanization, and water damage that is increasingly frequent and severe in recent years, comprehensive river improvement measures will be promoted to flow flood water and rainwater safely downstream through rivers and sewer systems and to secure the water retention and storage functions of individual river basins through rainwater

storage and infiltration facilities.

(3) Farmland

○ Farmland, which is the basis of food production, demonstrates functions in areas such as diversion of water from rivers and storage and recharge of rainwater etc., through continual agricultural production activities. For this reason, to secure farmland and maintain and improve its production conditions, as well as carrying out appropriate preservation management of the irrigation and drainage channels network that takes agricultural water from rivers and other sources to farmland and then returns it to rivers and other sources, and enabling the demonstration of multifaceted functions, support will be provided for joint activities by local communities with the participation of diverse actors including not only farmers but also local governments, women's associations, nonprofits, and other non-farmers and residents of urban areas.

(4) Urban areas

○ In addition to improving groundwater recharge functions and maintaining valuable storage and recharge capacity in urban areas, green infrastructure, which enriches the living environment through places for relaxation while also helping restrain rising temperatures and beautifying the landscape, will be promoted through preservation and creation of landscaped areas and greenification of private and public facilities, with the participation of diverse actors.

○ By promoting appropriate storage and recharge of rainwater, through means such as encouraging the establishment of rainwater storage and infiltration facilities by private-sector organizations, efforts will be made to lessen damage from flooding and create waterside spaces.

3. Promoting appropriate and effective water use etc.

(1) Securing stable water supplies and drainage etc.

a. Securing safe, high-quality water

○ To ensure that water systems can provide safe, high-quality water at all times, together with water quality preservation efforts at waterworks water sources, means such as water safety plans will be used to ascertain and manage risks at all stages from water sources to taps, as part of comprehensive water quality management.

○ To ensure the safety of waterworks water, water quality standards will be revised as necessary in light of the latest scientific knowledge from the World Health Organization (WHO) and the Cabinet Office Food Safety Commission and results of testing clean water.

○ For purposes of water quality conservation in public waters and groundwater serving as water sources of waterworks, efforts will be advanced such as regulation of effluent from factories and workplaces, appropriate wastewater treatment at wastewater treatment facilities, regulations on soil penetration, and risk management of chemical substances.

○ Measures will be advanced to further reduce odor and taste damage to water through means such as adoption of advanced water treatment facilities in accordance with regional conditions such as the water quality of waterworks water sources.

○ For purposes such as reducing risks of water quality incidents, water supply systems will be developed that are resistant to the effects of changes in water sources' water quality, through means such as sourcing water upstream, while also managing river flows necessary for the river environment and water use by users of rivers.

○ To respond to unforeseen situations such as water quality incidents, appropriate human resources will be assigned who are able to make decisions on steps such as suspending intake of water or suspending supply, appropriate operating manuals will be distributed, and training will be enhanced, in addition to strengthening monitoring and communications systems through cooperation among waterworks businesses, river managers, agencies related to water quality, and others.

○ Systematic efforts will be promoted to preserve water quality in public waters, through appropriate division of responsibilities among sewer systems, agricultural

community sewage treatment facilities, and Johkasou, decentralized wastewater treatment system.

○ To secure high-quality agricultural water, development of facilities such as agricultural water facilities and water purification facilities will be advanced.

○ Forest improvement and preservation will be promoted comprehensively to ensure that water source forests demonstrate their water source recharge functions and store and cultivate safe, high-quality water.

○ To promote appropriate use of rainwater, case studies will be collected and published from rainwater-usage facilities, water purification facilities, and other facilities developed by the national government, local public agencies, and private-sector organizations.

b. Responding to critical droughts

○ To advance efforts to address critical droughts, the national government, local public agencies, and others, with consideration for water system and regional history, background, distinctive properties, and actual conditions, will cooperate with related parties in preparation of drought timelines (time-series action plans) describing measures for purposes such as lessening the impacts and damage of droughts.

○ In preparing and using drought timelines, information and understandings will be shared through the establishment of a drought management council consisting of members such as those involved in adjustment of and responding to water use, those managing water-supply facilities, and those involved in water distribution activities after receiving water supplies and business activities utilizing river water.

○ The government will assess the safety and drought risk of the water supply from existing facilities and share drought risk information with local public agencies, users, businesses, residents, and other actors, to enable cooperation in responding to droughts.

○ Based on drought risk information and other information, the national government, local public agencies, and others will, while taking into consideration matters such as water system and regional history, background, distinctive properties, and actual conditions as well as anticipated impacts on and damage to socioeconomic activities, and the lives of members of the public, consider matters such as dam impoundment

and precipitation conditions, from the perspective of effective utilization of existing water sources, in studying the possibility of more efficient water supplies through means such as integrated operation of multiple dams.

○ The government will comprehensively review the water demand and supply balance, including that during a critical drought, in light of uncertainties in demand and supply within the water-resource development system, to formulate a new water-resource development basic plan from a risk-management approach. In this way, new supply goals will be added such as securing the minimum necessary water to avoid serious impacts on the lives of members of the public and economic activities even in the event of a critical drought, to advance in an integrated manner tangible measures and necessary intangible measures based on a basic strategy of thorough utilization of existing facilities.

(2) Responding to disasters

a. Efforts to protect people's lives and property from disasters

○ To realize national resilience to help build a safe, secure nation, regions, and economic society characterized by strength and flexibility, disaster prevention and mitigation measures based on appropriate combination of tangibles and intangibles will be advanced further while also striving to secure water retention and storage capacity.

○ To enhance the readiness for river floods of society as a whole, based on the point of view that large-scale floods that cannot be prevented by flood-control facilities necessarily will occur at times, efforts such as the following will be focused on as initiatives to realize a society with an awareness of water-disaster prevention: tangible disaster-prevention measures in advance to minimize the socioeconomic damage of compound disasters such as flooding and inundation, inundation from internal waters, high tides, and mudslides, as well as tangible evaluation measures to secure places where people can evacuate in an emergency and to extend the time before damage strikes evacuation routes as much as possible, and intangible measures by residents such as preparation of individual timelines - all as part of efforts to focus on tangible and intangible measures in combination.

○ Through evaluation and proactive conservation and restoration of ecosystems functions that help lessen disaster risk, such as the water-retention functions of wetlands, Ecosystem-based Disaster Risk Reduction (Eco-DRR) will be promoted, in order both to contribute to biodiversity conservation and to respond with increasingly severe natural disasters as well as issues arising from to structural changes in society such as population decreases and the aging of water infrastructure and other social capital.

○ In light of the increasing severity of water and soil disasters in recent years, consideration will be given to cooperative efforts among not only the national government and local public agencies but also businesses and residents, including conversion to river improvement plans that take into consideration rising precipitation due to climate change, promotion of levee reinforcement and dredging throughout the river basin as a whole, effective use of irrigation dams and other facilities, creation of effective evacuation structures utilizing hazard maps, and promotion of disaster prevention and mitigation measures integrated with community development.

○ In cooperation with the media, the national government and local public agencies will strive to enhance disaster information and real-time information to assist in evacuation activities, in normal times as well.

○ To help improve regional stability through prevention of soil disasters and mountain disasters arising due to torrential downpours or earthquakes and minimizing their damage, efforts will be made to install erosion control and forest improvement facilities as well as improving forests whose functions have deteriorated.

○ Increasing mixture of farming and non-farming residents and urbanization in rural regions is leading to agricultural drainage facilities serving as drainage facilities for the entire region, and to prevent disasters in the region, these facilities will be improved and appropriate operation and preservation management carried out.

○ To respond to disasters caused by typhoons or heavy rainfall, in addition to efforts to improve the precision of predicting these and to enhance measurement structures, efforts such as promotion of improvements to and utilization of disaster weather information to assist residents in evacuating will be used to strengthen regional disaster resilience.

b. Securing the functions of water supply and drainage systems etc. during large-scale disasters and power failures

○ Together with promoting seismic retrofitting, waterproofing, installation of private power generation equipment, and other measures for water infrastructure to secure the minimum functions of water supply and drainage systems in cases such as large-scale disasters and power failures, in order to enable swift recovery from disaster, the national government, local public agencies, and others will promote formulation and review of business continuity plans (BCP) reflecting the lessons from disasters in recent years.

○ To provide technological support for affected local public agencies' efforts to quickly ascertain the state of damage, prevent its spread, and recover affected areas quickly in the event of a large-scale natural disaster or similar incident, the structure and functions of the Technical Emergency Control Force (TEC-FORCE) will be expanded and enhanced.

○ The national government, local public agencies, and others will provide technological support for recovery of water infrastructure, support development of mutual aid structures through means such as dispatch of personnel, implement training, secure and supply emergency aid materials, and ascertain volumes of water available to use in a disaster.

○ To secure water supply and drainage even in a large-scale disaster affecting a broad area, the national government, local public agencies, and others will promote development of water-supply systems and storage facilities in waterworks facilities to make it possible to send water from other systems, enhance emergency water supply and other structures, and implement measures such as mutual supplementation of networks.

○ Case studies will be collected on solutions such as use of industrial water as consumer water in large-scale disasters and shared with all industrial water businesses.

○ Together with promoting temporary use of groundwater in disasters and similar cases, the national government, local public agencies, and others shall strive to promote use of groundwater and other sources in large-scale disasters, through means such as considering related concepts and responses even in normal times and identifying

necessary measures such as registration of emergency wells in disasters. To advance these efforts by local public agencies, the national government will advance research and development on emergency groundwater usage systems and conduct studies toward implementation of the results in society through means such as preparation of manuals.

○ The national government will formulate new basic water-resource development plans based on risk management for the water-resource development water system. In this way, together with securing the minimum water necessary for the lives of the public and economic activities even after a large-scale natural disaster such as an earthquake, new supply goals will be added under the basic water-resource development plans such as minimizing damage to facilities and achieving swift recovery, and in an integrated manner tangible measures and necessary intangibles will be promoted based on the basic strategy of thorough utilization of existing facilities.

(3) Securing and promoting use of groundwater sustainably

Sustainable groundwater preservation and use will be promoted to protect the regional groundwater and use it for purposes such as water sources, while preventing harm to groundwater from causes such as ground subsidence, salinization, and groundwater pollution and preserving ecosystems. For this purpose, efforts will be made to provide support under various guidelines etc. and to manage groundwater in accordance with the regional actual conditions.

Many faces of groundwater remain unclear, including groundwater basin structures, groundwater retention, facts of groundwater use, impacts of extracting groundwater, behavior related to groundwater volumes, quality, and temperature, and the relationship between surface water and groundwater. For this reason, the national government, local public agencies, and others will cooperate in observation, research, data collection, and analysis of these factors, based on the regional actual conditions, while also utilizing findings from research institutes and other organizations. The national government will promote research on elucidation of the actual state of the water cycle, including groundwater.

In addition, at present, measures such as restriction of extraction of water are

underway through cooperation between the national government and local public agencies in the regions of the Nobi Plain, the Chikugo and Saga Plains, and the northern Kanto Plain through means such as sharing of observation data by the national government with related prefectures and municipalities, in accordance with the guidelines on measures to prevent ground subsidence. As necessary, local public agencies, the national government, and others will consider use of such wide-area groundwater management structures and groundwater management methods across multiple local public agencies, through water cycle analysis and other means.

a. Groundwater management

○ To achieve sustainable groundwater preservation and use, groundwater management will be promoted systematically in accordance with the regional actual conditions.

○ The national government will advance efforts such as (i) development of an environment for purposes such as building a shared groundwater database for mutual use of data collected and sorted by the national government, local public agencies, and others, and (ii) ascertaining behavior related to groundwater inflows and outflows and groundwater volumes and quality as well as ground deformation, and promoting development of research and analysis technologies for this purpose.

○ As necessary, the local branch offices of national government agencies will participate proactively in the groundwater councils described below under "b. Structural improvements," as well as cooperating with local public agencies and others on environmental development and initiatives in accordance with the regional actual conditions.

○ In cooperation with the national government, prefectures will develop their own structures for promoting groundwater management in line with the regional actual conditions, support awareness-raising activities to encourage autonomous and active efforts by municipalities, and promote the efforts in stages.

○ Local public agencies, the national government, and others will promote the establishment and management of groundwater councils in accordance with the regional actual conditions (including establishment of groundwater councils across multiple prefectures or municipalities in light of the extent of the aquifer and other factors).

○ In accordance with the regional actual conditions, local public agencies, the national government, and others will (i) monitor groundwater and (ii) promote efforts based on the decisions of the groundwater councils (including establishment of ordinances).

○ Efforts related to ascertaining the facts of groundwater, recharge, raising awareness, and other matters related to sustainable groundwater preservation and use will be advanced in stages in each region in accordance with their degree of progress, while respecting the regional history and background of groundwater preservation and use and existing efforts and structures.

b. Structural improvements

○ To achieve coordination and reconciliation among related parties with regard to groundwater preservation and use, local public agencies, the national government, and others will take measures as necessary to improve water governance, including encouraging the establishment of councils (referred to in this Plan as "groundwater councils") as necessary.

○ In addition to local public agencies and local branch offices of national government agencies, groundwater councils should consist of flexible organizations including groundwater extractors, groundwater users, parties strongly affecting or affected by groundwater volumes or quality, parties able to contribute greatly to groundwater recharge or other aspects of its preservation, and other diverse related parties, in accordance with the regional actual conditions and the stage of progress of efforts. In addition, as needed, groundwater councils will obtain advice from experts on topics such as groundwater-related systems and technologies.

○ Groundwater councils shall specify the areas subject to groundwater management, in light of considerations such as groundwater recharge, filtration, flows, retention, use, etc., the existing background, issues faced by the region, and administrative districts. As necessary, matters such as the scope of the impacts of groundwater behavior and extraction will be ascertained through means such as water-cycle analysis. In addition, attention will be paid to the fact that cooperation with related administrators and other public agencies, research institutes, experts, groups, etc. also is effective for research and analysis.

○ While fully reflecting issues and actual conditions in the region, to promote

sustainable groundwater preservation and use, groundwater councils will ascertain actual conditions of groundwater and establish basic policies on its preservation and use, recharge, raising awareness, and other matters. Based on these efforts, they will carry out in stages awareness-raising to promote related efforts, monitoring of groundwater, and initiatives based on council decisions.

○ Under policies for comprehensive and integrated management of the river basin, each groundwater council should strive toward integrated management with the river basin water cycle council for the water system. However, since in some cases, the scope of the river-basin water system or aquifer may extend broadly, the directions of these two bodies might not coincide in some cases. For this reason, together with establishing these bodies simultaneously for the time being, they will operate in cooperation with each other and, when possible, attempt integrated management.

c. Measures to ensure the efficacy of measures

○ To promote sustainable groundwater preservation and use smoothly amid diversification of values among members of the public, it is important to ensure that study processes and other activities are transparent and fair, and for this reason, information will be disclosed proactively and the participation of diverse actors including residents will be promoted.

○ With regard to the state of sustainable groundwater preservation and use under a. and c. and progress on related measures, groundwater councils shall carry out assessment at appropriate times and publish the results, as well as revising basic policies and other matters as necessary.

(4) Strategic maintenance, management, and updating of water infrastructure etc.

○ After formulating a plan for extending life of infrastructure (action plan) based on the basic plan for extending life of infrastructure established by the national government, local public agencies, and others will formulate plans for extending the lifespans of individual facilities (individual facility plans) covering matters such as thinking on prioritization of measures, the state of water infrastructure, the content and timing of measures, and the costs of measures. They will strive to advance

measures based on these plans.

○ Through risk management by means such as monitoring and diagnosis of facility functions and development and use of an information infrastructure, the national government, local public agencies, and others will strive to carry out strategic maintenance, management, and upgrading (anti-aging measures) for facilities.

○ In doing so, after securing necessary investment related to safety and peace of mind, they will support measures to reduce total costs through means such as medium- to long-term maintenance, management, and upgrading, to level out budgeting, and to realize sound business administration. They will carry out research and development, testing, and adoption of new technologies to contribute to extending life spans.

○ To advance these measures steadily, technological support will be provided through means such as preparation of standards, guidelines, and manuals suited to the distinctive properties for each project and enhancing training and lessons.

○ To strengthen the project infrastructures of waterworks, sewer systems, and industrial water projects, it is essential to carry out facility development and project operation in accordance with the conditions of the region, taking into consideration matters such as future population. For this reason, as necessary, together with measures such as facility consolidation and downsizing, resurrecting of facilities through adopting wider-area management, management integration and cooperation, and rationalization, at the same time as updating etc., public-private partnerships will be supported to utilize the management expertise, funding abilities, and technological capabilities of the private sector.

○ With regard to the roles and conditions of agricultural water facilities, including their public nature, together with sharing of information with related parties, through appropriate preservation management of farmland canals and other facilities, in order to promote demonstration of the multifaceted functions of agricultural water, joint activities in areas such as maintenance and repair by the community with the participation of diverse human resources will be promoted.

○ For the purposes of strategic maintenance, management, upgrading, etc. of river management facilities and sewer system facilities, development, application, etc. of inspection and diagnostics technologies using new technologies such as next-generation infrastructure robotics will be promoted.

○ Cooperation will be promoted among managers of interrelated water infrastructure, through means such as proactive sharing of information.

○ To minimize as much as possible the volume of water lost through leaks in waterworks pipes, periodic pipe investigation and countermeasures to prevent leaking will be carried out in addition to systematic updating of aged pipes.

(5) Efficient and effective use of water

a. Rationalization of water use

○ Based on the understanding that water is a valuable asset shared by members of the public, conversion of water uses within and between uses such as consumer water, industrial water, and agricultural water will be promoted in accordance with the regional needs and actual conditions, through encouraging mutual understanding among related parties by sharing information on water use and on rivers, such as current flows, to reflect changing socioeconomic conditions and the regional distinctive properties.

○ To make agriculture more competitive, measures will be advanced such as conversion of canals to pipelines, installation of facilities to regulate water use, consolidation and closure of water supply access points, and adoption of ICT to improve agricultural water facilities, with the goals of further labor savings in management and advances in use as well as appropriate allocation of agricultural water.

b. Promoting use of rainwater and reclaimed water

(Rainwater use)

○ Pursuant to the Act on the Promotion of Rainwater Utilization (Act No. 17 of 2014), intended to put water resources to more effective use and restrict flow to sewer systems, rivers, etc., use of rainwater will be promoted through installation of facilities for rainwater use when constructing buildings and use of rainwater in sewer system facilities. In addition, awareness of rainwater use will be raised through publicity activities and other measures.

○ Based on the policies they themselves have established for point of rainwater use,

the national government and local public agencies will study uses such as water for flushing toilets in emergency and firefighting water to promote rainwater use in disasters.

○ Research will be conducted and published on standards for rainwater-usage facilities (e.g., storage tanks) and assessment of them.

(Use of reclaimed water)

○ Further technological development and results will be achieved from perspectives such as water volumes, water quality, ecosystems, urban landscapes, and energy conservation to enable use of reclaimed water for diverse purposes, and such use will be promoted systematically in accordance with regional conditions.

○ Progress will be made in areas such as development of facilities for emergency use of reclaimed water as sewage treatment water during droughts and other emergencies.

○ To promote use of reclaimed water, use of more advanced membrane treatment and other water treatment technologies, appropriate water quality monitoring technologies, etc. will be advanced.

○ Agriculture use of reclaimed water will be promoted through appropriate treatment of raw sewage, miscellaneous consumer drain water, and other sewage at facilities such as agricultural community sewage treatment facilities.

c. Water conservation

○ To promote further water conservation, case studies on advanced water conservation in Japan and overseas will be identified, improvements and use of water conservation technologies and other technologies will be advanced through industry-academy-government cooperation led by the private sector, adoption of water conservation equipment, facilities, etc. will be promoted, necessary information and technological advice will be provided for droughts, and awareness-raising and other activities will be conducted to foster an awareness among members of the public of the need to use water wisely.

(6) Water environment

(Efforts to secure water volumes and water quality)

○ In individual river basins, the national government and local public agencies, with consideration for water system and regional history, backgrounds, and actual conditions, as well as deliberations in river basin water cycle councils and other bodies, will study ways to secure appropriate water volumes and water quality for each river basin from perspectives including those of time and space, and related parties in the river basin will promote related measures as necessary.

○ Through cooperation among river managers, related local public agencies, and others, efforts will be made to secure water volumes and water quality from the perspective of appropriate management of rivers environments, based on materials such as plans for management and measurement of water volumes and water quality of rivers.

(Environmental quality standards, drainage regulation, etc.)

○ Environmental quality standards related to water pollution in public waters and groundwater will be revised as necessary based on scientific knowledge and other considerations.

○ Progress will be made on specifying types of bottom-layer dissolved oxygen content, which has been added to environmental quality standards, and these will be used to enhance water quality conservation measures in areas such as lakes and marshes and closed coastal seas.

○ Regarding coli bacillus, for which environmental quality standards have been established, studies will proceed on revision to indicators to enable more appropriate treatment of fecal sewage.

○ Drainage restrictions on factories and business sites will be revised and added as necessary to enable maintenance and achievement of environmental quality standards.

(Reducing pollution burdens etc.)

○ To realize sustainable sewage treatment systems, systematic measures to address consumer drainage will be promoted through appropriate division of responsibilities based on prefectural visions, in which effective maintenance and management methods are chosen based on comprehensive consideration of matters such as the

distinctive properties and economic potential of sewer systems, agricultural community sewage treatment facilities, and Johkasou, decentralized wastewater treatment systems.

○ Measures will be advanced to reduce the pollution burden of combined sewerage to levels similar to those of separate sewerage. In addition, the impact on water use in waters where discharge is released will be ascertained and countermeasures advanced as necessary.

○ Conversion from old type decentralized wastewater treatment system called "imitation Johkasou" whose performance is low with treating the black water only to current Johkasou will be promoted further through measures such as assistance with the costs of such conversion using the measures and budgets established under the Act on Partial Amendment of the Johkasou Act (Act No. 40 of 2019), enacted in April 2020.

○ To reduce pollution burdens from surface sources such as farming and livestock, appropriate fertilization and appropriate management of livestock wastes will be promoted.

○ Regarding wide-area groundwater pollution caused by nitrate nitrogen and nitrite nitrogen, means such as guidelines and analytical models will be used to ascertain current conditions and make issues clear, in order to build consensus among related parties in the region and advance efforts to reduce nitrogen burdens.

○ Research will be carried out on the distribution of microplastics in rivers, lakes and marshes, and other bodies of water.

(Purification, dredging, etc.)

○ Water quality improvements will be advanced through cooperation among related agencies in rivers, lakes and marshes, canals, etc. where water environmental degradation is severe, to reduce pollution burdens from land, dredging, and diversion.

○ In rural communities where there is a need to remediate drain water purification in public waters or prevent and restrain soil loss, efforts will be advanced such as use of the natural purifying functions of farmland and water plants to improve canal networks, installation of sedimentation basins, and restraining slopes on farmland.

(Water environmental improvements in lakes and marshes, closed coastal seas, etc.)

○ To improve water quality in lakes and marshes, closed coastal seas, and other bodies of water, measures will be advanced such as partial modification of existing sewer system facilities, adoption of advanced treatment methods including advance treatment in stages through changes to management methods, and promotion of advanced treatment Johkasou. In addition, to advance effort targeting pollution from surface sources, more effective water quality improvement measures will be studied through cooperation among related actors and regions.

○ At sewage treatment facilities, studies and adaptation measures will be advanced with regard to drain water management in waters that need them.

○ When using water from lakes and marshes for purposes such as irrigation of wet fields, in order to preserve water quality progress will be made in areas such as development of water quality preservation facilities including cyclical irrigation facilities and plant purification zones.

○ In closed coastal seas, while ascertaining the pollution burdens from the land and the state of water quality in the sea, together with advances in restrictions on factory and business site drainage and efforts based on the water quantity total emission reduction system, comprehensive water environment improvement measures will be advanced.

(Technological development, promotion, etc.)

○ Advanced environmental technologies thought to be effective for purposes such as water purification in lakes and marshes and closed coastal seas will be promoted in line with their effects, economic potential, etc.

○ For purposes such as environmental preservation in rivers downstream from dams, water from flexible management of dams with flood-control capacity will be used to flush out sludge sedimentation and algae from rivers and in medium-scale flushing affecting the forms of rivers (e.g., rapids and pools). In addition, as necessary, efforts will be promoted to supplement sedimentation upstream from dams downstream.

○ Technological development and promotion will be carried out in areas such as highly efficient and effective water treatment technologies.

(Regional activities etc.)

○ Support will be provided for joint activities to preserve the water environment such as landscaping and biotope development in canals and holding ponds with the participation of diverse members of local communities.

(7) Water cycle and ecosystems

(Research)

○ For effective and efficient implementation of various measures related to ecosystem preservation and recovery in connection with the water cycle, natural environmental surveys of matters such as plant and animal distributions will be conducted and monitored on a continual basis across wide areas. In addition, to ascertain basic information on the water-related natural environment, periodic and continuous surveys of information such as habitats and growth of living creatures in rivers, lakes and marshes, coastal areas, etc. will be conducted using data such as the National Survey on the Natural Environment, the National Census on River Environment, and the National Aquatic Survey.

(Data enhancement)

○ Together with systematically advancing collection, provision, etc. of survey data with the cooperation of various actors, monitoring in which residents participate will be enhanced and information will be shared through enhancement of networks including universities, the national government and local public agencies, private-sector research institutes, museums, and other institutions, to enhance the natural environmental data available for use.

(Ecosystem preservation etc.)

○ Wetlands, which are important habitats for migratory water birds, will be preserved through building and maintenance of wetland networks and designation as Wildlife Protection Areas, among other means.

○ “Wetlands important from the perspective of biodiversity preservation,” which are identified as particularly important to biodiversity, will be given special consideration in preservation.

○ The habitats and growing and breeding environments of living creatures and diverse river landscapes will be preserved and created through river management to create nature-oriented river works, with consideration for the natural blessings of rivers as a whole and harmony with the local lifestyle, history, and culture.

○ Ecosystem functions that help lessen disaster risk, such as water-retention functions of wetlands, will be evaluated and proactively conserverd and restored, to promote Ecosystem-based Disaster Risk Reduction (Eco-DRR). This will contribute to biodiversity conservation in addition to responding to issues arising from structural changes in society, such as population decreases, and aging of water infrastructure and other social capital as well as increasingly severe natural disasters.

○ Ecosystem preservation and rehabilitation will be advanced through efforts such as wetland rehabilitation and development of fish channels, conducted through means such as natural rehabilitation projects in rivers, lakes and marshes, etc. Together with implementing such initiatives, ecosystem networks will be formed in coordination with river-basin measures by diverse actors in the region and contribute to biodiversity preservation and regional development and economic vitalization.

○ Farmland and agricultural water facilities not only serve as infrastructure for food production but also play important roles as habitats and growing and breeding environments for living creatures. For this reason, to preserve and recover ecosystem networks in rural communities, improvement of the environment for fish swimming upstream and downstream and improvement of canals with consideration for preservation of the habitats and growing and breeding environments of fish and other aquatic creatures will be advanced by installing and improving fish channels at pump facilities in rivers, lakes, and marshes and securing continuity of wet fields and canals.

○ Preservation methods for freshwater fish will be considered while utilizing new technologies, as examples of using ecosystem networks that include not only rivers, lakes and marshes, wetlands, and springs but also accumulated artificial bodies of water such as wet fields, holding ponds, and canals to preserve rare fish.

○ Together with restrictions on their raising and release, designated invasive alien species under the Act on the Prevention of Adverse Ecological Impacts Caused by Designated Invasive Alien Species (Act No. 78 of 2004) will be removed from

bodies of water such as rivers, lakes and marshes, and holding ponds in accordance with their priorities. In addition, with regard to invasive species in general, including those other than designated invasive alien species, efforts will be promoted to raise awareness of the Three Principles to Prevent Damage by Alien Species to prevent their invasion and spread.

○ Of the designated areas such as natural parks and natural conservation areas, natural mountain areas play an important role in water cycle and will be protected and managed.

○ Based on basic nature restoration policies under the Act for the Promotion of Nature Restoration (Act No. 148 of 2002), nature restoration efforts will be promoted to restore natural environments lost in the past in areas such as rivers, lakes and marshes, wetlands, and tidal wetlands, in cooperation with diverse actors from the region.

(Support for activities)

○ Cooperation bodies for river management and other organizations will be promoted to support private-sector organizations' activities to preserve river basin ecosystems.

○ Together with supporting ecosystems management conducted through cooperation among regions, linking with ecosystems in the river basin as a whole and ecosystem services built up in the water cycle, with consideration of balancing elements of ecosystem services, activities to raise public awareness will be carried out in order to realize communities in coexistence with nature, supported by these ecosystem services.

○ Together with preservation management in farmland and agricultural drainage canal, active ecosystem preservation and recovery activities will be supported with the participation of diverse human resources in the community.

(8) Waterside spaces preservation, rehabilitation, and creation

○ In light of the distinctive natural, cultural, historical, and other properties of rivers, municipalities, private-sector businesses, river managers, and others will cooperate to promote riverside and town vitalization aiming to use waterside areas to vitalize communities. Awards will be provided to exemplary initiatives as well. In addition, the Waterfront School Project will be promoted through environmental learning and

hands-on nature activities to enable children to get close to the waterside in safety, through cooperation with municipalities, river managers, and others.

○ Since a perspective based on the units of river basins including recharge areas is important to preservation of water springs, together with surveying the actual state of spring water and publicizing the findings, measures such as promotion of guidelines on spring water preservation and recovery will be used to support community efforts.

○ To secure attractive waterside spaces such as moats, ponds, and marshes in urban areas and elsewhere, together with water-quality improvement efforts through means such as countering blue-green algae in the summer and diversion, promotion of effective technologies will be advanced.

○ Progress will be made in preservation of waterside environment in rural communities through means such as development of agricultural canals and holding ponds with consideration for friendly access to water and preservation of the scenery. In addition, various technological materials will be prepared for this purpose, and support will be provided through provision of technological information.

○ To promote activities utilizing waterside spaces, hands-on tourism activities and other initiatives will be promoted in regions such as the upstream areas of rivers.

○ Waterside spaces will be rehabilitated and created through means such as diversion into rivers and canals using reclaimed water and water released from Johkasou.

(9) Passing along, rehabilitation, and creation of water culture

○ Opportunities such as Water Week will be used to promote diverse upstream and downstream cooperation, together with communication of information about water culture, in order to pass along diverse water culture in the river basin and vitalize the community that serves as the basis for such activities.

○ To pass along, rehabilitate, and create water culture, a water community support project will be carried out to uncover attractive local specialties and tourism resources in the water reservoir areas etc. and promote them, in cooperation with the tourism industry.

○ Activities such as water reservoir area development projects pursuant to the Act on Special Measures Concerning the Reservoir Areas Development (Act No. 118 of

1973) will be carried out, to develop the living environment, industrial infrastructure, etc. for residents who are engaged in water culture in the region.

○ To pass along water culture such as the feats of ancestors who dug agricultural canals, the activities supported by canals, and festivals held to pray for a good harvest or safety in water passing work year long, support will be provided for activities such as communication of information through websites and holding gatherings in which tellers and people talk about their experiences in regional history.

(10) Responding to global warming

a. Adaptation measures

○ The national government and government agencies will cooperate to advance measures related to adaptation to climate change in various fields related to the water cycle, based on climate change adaptation plans.

○ Based on results of assessment of the impact of climate change accompanied by global warming, adaptation measures will be promoted such as responses to water-related disaster risk and to impacts on water quality and ecosystems.

○ Similarly, local public agencies also will cooperate with their appropriate departments to incorporate the perspective of adaptation to climate change into their water-cycle-related measures.

○ In light of the fact that changes in water quality and other factors are expected to result from climate change, together with continuing research on monitoring and forecasting water quality, water quality conservation measures will be promoted.

b. Mitigation measures

(Forests and woods)

○ In light of the fact that the forests serving as foundations of Japan's water cycle play important roles in countering global warming by absorbing greenhouse gases, their improvement and preservation will be advanced.

(Hydroelectric power)

○ Hydroelectric power is highly stable and serves as an important low-carbon domestic

energy source. To encourage its proactive adoption, in addition to the large-scale hydroelectric power development that has advanced to a considerable degree until now, its effective use will be promoted in cooperation with related parties at existing dams and other facilities, for example through installation of generation equipment at existing dams not currently used for power generation.

○ To adopt small-scale hydroelectric power using river flows, agricultural water, waterworks water, and sewage, water use procedures will be made easier and support provided for related studies and designs, in addition to promoting research and development on reducing the costs of installation and operation.

(Global warming countermeasures in processes such as water treatment and water conveyance)

○ Through means such as development and promotion of new technologies, efforts will be carried out to encourage use of energy-conservation measures in sewage treatment, such as water treatment that consumes less energy, and use of rainwater and reclaimed water, as well as putting to effective use renewable energy such as sewage sludge and sewage heat, through means including biomass power generation from sewage sludge and area heating and air-conditioning using sewage heat, and thereby suppress emission of greenhouse gases. In addition, renewable use of sewage sludge as fertilizer, which is expected to help restrain CO2 emissions from transport of materials, will be promoted.

○ To cut energy consumption in transporting water, equipment will be adopted at waterworks facilities to conserve energy and use renewable energy, and efforts to use potential energy will be promoted through means such as sourcing water upstream.

○ In addition to promoting effective use of renewable energy at agricultural water facilities, efforts will be made to return treatment water emitted from agricultural community sewage treatment facilities to the farmland through reclamation as agricultural water and use of sludge in fertilizer, and energy-conservation technologies will be developed and tested and then adopted.

○ To reduce energy used in Johkasou, efforts will be made to promote use of low-carbon type Johkasou and further carbon savings throughout Johkasou systems.

○ Along with sustainable preservation and use of groundwater, use of geothermal heat, a renewable energy source, will be promoted.

4. Promoting education concerning a sound water cycle etc.

(1) Promoting education on the water cycle

(Promotion in school education)

○ Education will be promoted in elementary, middle, and high schools based on their courses of study, to teach about water cycles in individual stages of development and increase understanding of sound water cycle.

○ As educational tools, materials will be prepared and updated in accordance with the regional distinctive properties, including collections of case studies and manuals on practical education about the water cycle and supplemental materials related to the water cycle that can be used in school education. Efforts will be made to develop an environment in which those in the field in school education can carry out active and continual efforts in this area.

(Promotion of education through cooperation)

○ From the perspective of developing comprehensive support structure for water cycle education, organic cooperation will be promoted with parties related to school education, water infrastructure managers, various groups involved in activities in venues for learning about the water cycle, and others, and reference case studies will be published broadly.

○ Systems will be developed under which specialists in various fields such as meteorology, forestry, rivers, agriculture, urban areas, waterworks, sewer systems, the environment, groundwater, rainwater management, living creatures, and chemistry participate in promotion of education on a sound water cycle.

○ Active educational activities by the community and the private sector will be carried out, based on scientific knowledge of the water cycle.

○ Through means such as implementation of environmental education programs incorporating the perspective of education on sustainable development (ESD), understanding of a sound water cycle to aid in achieving sustainable development will be promoted along with cooperation among diverse actors in the region.

(Promotion of education through on-site experience)

○ To deepen the understanding and involvement of members of the public regarding

multifaceted functions of forests and farmland such as water source recharge, preservation of the national land infrastructure, and prevention of global warming, as well as necessary development for achievement of the functions, water cycle education will be advanced through opportunities for hands-on activities in forests and farmland by young people and others and instructor training, among other activities.

○ Through means such as on-site tours of river improvement projects and irrigation projects as well as visiting lectures, education on a sound water cycle and activities to deepen understanding of it will be advanced.

(2) Promoting awareness raising activities related to water cycle

(Promotion of events related to Water Day and Water Week)

○ To deepen understanding of the importance of and interest in a sound water cycle broadly among members of the public, and to increase their understanding of these subjects, the national government will collect, and publicize via a website, information on awareness-raising and publicity activities by various actors in connection with Water Day and Water Week events as well as information on Water Day and Water Week events held by the national government, local public agencies, and others. In addition, to deepen understanding of and interest in the history and culture related to water and people in the region, among the public broadly, from young to old, efforts such as awareness-raising and educational activities on the close ties between everyday living and water use will be used to encourage public participation in events and advance projects suited to Water Day and Water Week.

(Strategic communication of information etc.)

○ Together with proactive and strategic activities to raise awareness of maintenance or recovery of a sound water cycle, the national government and local public agencies also will proactively support the activities of nonprofits and other groups. Specific efforts will include systematic promotion of awards for individuals and groups that have made outstanding contributions to promotion of awareness-raising activities and scientific research or other activities in areas such as promotion of water reservoir areas, communication of information via the media and the Internet, use of

indicators that are easy to understand or that make it possible to assess water cycle soundness comprehensively, creating systems to incentivize related parties working toward a sound water cycle, activities to raise awareness through other events, competitions, lectures, etc., and activities in which residents can participate on the theme of water.

○ Through collection, organization, and communication of understandable information on subjects such as activities to raise awareness of maintenance or recovery of a sound water cycle, the national government and local public agencies will carry out continual efforts in cooperation with diverse actors.

○ The government will collect information on water-cycle efforts of various actors from the perspective of achievement of the SDGs and publicize such information using a website.

○ To deepen understanding of the water environment behind a sound water cycle and promote opportunities for appropriate preservation and utilization, awards will be presented to outstanding water environment, such as the Selection of 100 Japan Waters, the selected 100 canals of Japan, and 100 famous water source forests, and related information will be communicated domestically and internationally.

(Support for awareness raising activities by private-sector businesses and others)

○ Through government-wide initiatives to promote active, autonomous, and proactive activities by private-sector actors related to maintenance or recovery of a sound water cycle, using a shared logo and website, a broad range of efforts will be promoted nationwide by deepening public understanding and interest in a broad sense and creating opportunities for coordination and cooperation among divers actors including members of the public.

(International communication of information)

○ Information will be communicated through multilingual communication, international conferences, and other means to raise awareness broadly around the world of water safety in Japan, beautiful scenery involving water, and water-cycle-related systems.

5. Measures to promote autonomous activities by private organizations and others

(Support for cooperative activities etc.)

○ To deepen public understanding of and interest in a sound water cycle, cooperative activities will be promoted such as water environment surveys and awareness-raising activities by private-sector organizations.

○ To encourage the demonstration of multifaceted functions of agriculture and rural communities in areas such as maintenance of a sound water cycle, based on the Act on the Promotion of the Fulfillment of Multifunctionality of Agriculture (Act No. 78 of 2014), support will be provided for joint community activities, with participation of diverse human resources in the community, to manage preservation of community resources such as farmland and canals.

○ To demonstrate the multifaceted functions of forests, such as water source recharge, support will be provided for activities by residents in rural, mountainous, forested, and other areas in consideration of scenic improvement.

○ To deepen interest in the ties between water sources and nearby forests and the sea, and in society and culture in water reservoir areas, support will be provided for cooperative activities to deepen exchange between upstream and downstream areas in river basin.

(Use of human-resources development and groups support activities)

○ Through human-resources development programs and the registration system under human-resources certification programs based on the Act on the Promotion of Environmental Conservation Activities through Environmental Education (Act No. 130 of 2003), members of the public will be made aware of training programs and qualification testing for positions such as forest instructors, who guide hands-on activities in forests.

○ Through the system for cooperation body for river management, intended for private-sector organizations engaging in autonomous activities in areas such as rivers environmental preservation, efforts conducted through cooperation between river managers and private-sector organizations will be promoted.

○ To broaden rainwater use throughout society, means such as preparation of

collections of case studies on rainwater use and communication of information on rainwater use will be used to support promotion of technician training and qualifications programs conducted by private-sector organizations.

(Awards)

○ Continual efforts by local public agencies and private-sector organizations across Japan will be promoted through presenting awards to individuals and groups who have made particular contributions in areas such as development and use of water resources and recharge of water sources.

○ Efforts will be promoted to increase the motivation of related parties and their international presence through means such as awards to schools, businesses, local public agencies, the private sector, and research institutes across Japan in order to encourage activities related to water environmental preservation.

(Regional vitalization)

○ Together with building networks for purposes such as collecting and sharing information on vitalization activities for parties active in are vitalization activities and developing new such parties, based on sympathy with and gratitude to the people in water reservoir areas, support will be provided for establishment and operation of river basin coordination organizations upstream, downstream, and in other river basins, through dispatch of advisors and other means, and stimulation of regional industry will be conducted through means such as communication of information on local products, among other efforts, in order to promote activities to increase vitality in water reservoir areas on a continual basis.

(Communication of information)

○ To foster awareness that activities contributing to maintenance or recovery of a sound water cycle increase value to private-sector organizations etc., information will be communicated on subjects such as case studies on advanced efforts by private-sector organizations, to promote active, autonomous, proactive activities by private-sector organizations.

○ Active efforts by local public agencies and private-sector organizations will be

promoted through providing information on various planned water-related events across Japan in advance.

○ Also in the green-infrastructure public-private partnership platform for sharing each knowledge and technologies, in which a wide range of diverse actors such as the national government, local public agencies, private-sector businesses, universities, and research institutes take part in order to help green infrastructure permeate throughout society, information on topics such as efforts to maintain and improve rainwater storage and recharge functions will be communicated proactively.

6. Conducting research necessary to formulate and implement water cycle policies

(1) Survey of current conditions of river basin water cycle

(Surveys of water volumes and water quality)

○ The national government, local public agencies, and others will conduct surveys of precipitation in river basins, river water levels, flows, and water quality as well as levels, water quality, and other properties of public waters and groundwater, while enhancing survey and observation structures and adopting new technologies as necessary, to collect and analyze relevant data.

○ As basic materials for effective measures to counter water pollution in public waters, trends will be ascertained in subjects such as volumes of flows of water pollutants from factories and business sites.

○ The actual state of use of agricultural water will be ascertained in order to secure the agricultural water needed in terms of both water volumes and water quality.

(Water resource surveying)

○ Surveys will be conducted periodically and continuously to ascertain matters such as reserves of water resources, volumes of water use nationwide by purpose, drought conditions, and social conditions related to water resources.

(Surveying of living creatures)

○ To ascertain basic information on the water-related natural environment, periodic and continual surveys of information such as habitats and growth of living creatures in rivers, lakes and marshes, coastal areas, etc. will be conducted using data such as the National Survey on the Natural Environment, the National Census on River Environment, and the National Aquatic Survey.

(Groundwater)

○ The national government and prefectures (and municipalities as necessary) will strive to carry out continual collection and organization of information depending on the regional actual conditions, with consideration for matters such as the structures of groundwater basins (e.g., terrain, geology), actual states of groundwater

use (e.g., purposes of use, extraction volumes, and extraction methods for consumer water, industrial water, agricultural water, etc.), groundwater levels, groundwater quality, groundwater temperature, ground deformation, time-series and spatially distributed data on flows and other subjects, actual conditions of land use, state of spring preservation, and other information as well as improving the utilization efficiency of existing facilities. In addition, the national government will develop a groundwater database to enable mutual use of data on subjects such as groundwater levels, groundwater quality, extraction volumes, and related measurement points, collected and organized by the national government, local public agencies, and others.

(Use of rainwater and reclaimed water)

○ Together with continual fact-finding surveys on subjects such as purposes of use, volumes used, and water-collection surface areas at rainwater-usage facilities, other surveys such as those of volumes stored and rainwater usage rates will be conducted, as necessary to ascertain the impacts of its use on effective use of water resources and restraining concentrated outflows of rainwater.

○ Fact-finding surveys will be conducted on subjects such as purposes of use, volumes used, and water quality at reclaimed-water-usage facilities.

(Publication and effective utilization of results of surveys)

○ The national government, local public agencies, and others will endeavor to publish data obtained in surveys and related activities, along with results of analysis. In doing so, they will strive to enable effective use of data through use of open-data formats, to make the data easy to understand and to use.

(2) Survey of the impacts of climate change on the water cycle and adaptation thereto

○ Regarding the impact of climate change on floods and droughts and accompanying changes in water-related disaster risk and impacts on the water cycle system in normal times, surveys and analysis utilizing scientific knowledge, including medium- to long-term precipitation forecasts, will be conducted.

- ○ Survey and analysis will be conducted on changes to agriculture structures and farm management as well as the impacts of climate change and other factors on agricultural water facilities and adaptation measures for such impacts.
- ○ Structural improvements will be promoted for surveys and observations to confirm from time to time the effects of forest improvement and preservation based on factors such as changes in precipitation and snow melt, to help realize flexible management reflecting the uncertainties of forecasts related to climate change and forest ecosystems.
- ○ Information will be provided on subjects such as weather and forecasts of global warming, to contribute to appropriate management of water resources through means such as responding to droughts. In addition, efforts will be promoted to increase the forecasting precision of such information and utilize it.

7. Promotion of science and technology

(Study and research on river basin water cycle)

○ Based on the latest science and technology and past researches, study and research will be advanced on topics such as methods of assessing the soundness of the water cycle, through cooperation with related research institutes, academic societies, and others.

○ Water cycle monitoring will be promoted in forest communities and their vicinities, for use in research and development on qualitative and quantitative methods of forecasting the impacts of forest change and future factors such as climate change on supplies of water resources to farmland and other users.

○ Studies and research will be advanced on health risk assessment to ensure safe, high-quality water.

(Study and research on groundwater)

○ Research and development will be conducted on ascertaining the facts of the water cycle uniting surface water with groundwater based on weather, terrain, geology, ground cover, water use, water quality, and other factors, and on systems for use of groundwater in disasters utilizing such information.

○ Examination for study will be advanced based on subjects such as ground environmental preservation, toward general use of air-conditioning systems using aquifer heat accumulation through extraction of confined groundwater and returning the same volume of water back to the aquifer, to put the heat energy in groundwater to effective use.

○ Research and development will be promoted on qualitative and quantitative methods of measuring the impacts of changes in forests and future climate change on volumes of water flowing from forest river basins in droughts.

(Study and research on rainwater)

○ To contribute to effective use of water resources and restraining flows to sewer systems, rivers, etc., support will be provided for autonomous research by private-sector organizations on use of rainwater for diverse purposes. In addition, case studies will be collected and published on further technological development on

water quality improvements, use of AI and IoT, and other topics and on effective methods of utilizing these.

○ Efforts will be promoted to collect a wide range of case studies on subjects such as methods and effects of rainwater use and to analyze and publish these.

(Science and technology related to subjects such as effective use of water)

○ To promote the maintenance or recovery of a sound water cycle, measures such as research and development intended to solve social issues will be promoted, aiming to realize the ultra-smart society envisioned by the Society 5.0 concept, in areas such as water infrastructure maintenance management, disaster prevention and mitigation, agriculture, and groundwater preservation.

○ Studies and research will be promoted on increasing the efficiency of use of waterworks water and making usage visible.

○ Development of design support systems for estimating capacities of regulating facilities, to enable flexible allocation of agricultural water, will be promoted.

○ Development will be promoted of tools for assessment and indication of functions for efficient transport and distribution of water in light of the state of management of agricultural water facilities as a whole, and related water-transport management technologies.

○ Support will be provided for development of technologies such as low-cost water treatment technologies with high performance, further advancement of membrane treatment technologies and others.

○ To promote rainwater use, studies and research will be promoted on technologies in areas such as water quality preservation, control of outflows, and maintenance and management, and on standards and other matters related to facilities for rainwater use.

(Science and technology related to the water environment)

○ Technological development will be advanced to monitor the water quality of agricultural water and preserve the water environment.

○ Research and development will be promoted on the impacts of climate change and forestry on forests' water environments, to ensure that forests can better demonstrate

their water source recharge functions amid expectations of extremities in precipitation.

○ Development and promotion of new technologies will be supported through means such as demonstrating of innovative technologies and preparation of guidelines, to encourage advanced treatment and effective use of sewage.

(Studies and research utilizing global observations)

○ By utilizing the international cooperation framework of the Group on Earth Observations (GEO), in which Japan has played a leading role until now, cooperative activities will be promoted to develop and strengthen research and development structures for science and technology related to global observation of the water cycle using satellites, ships, and other means as well as analysis and adaptation, and to put these to use.

○ To enhance water-cycle observation using satellites as well as monitoring of water disasters and related countermeasures, in accordance with the Basic Space Plan (April 1, 2016, Cabinet decision) based on the Aerospace Basic Act (Act No. 43 of 2008), together with development of stationary, continual observation system fleets of environmental monitoring satellites equipped with equipment such as microwave radiometers and precipitation radars, domestic and international synthetic aperture radar (SAR) satellites, and systems for optical satellite coordination, satellite precipitation observation systems and databases will be developed through means such as use of GSMaP for forecast data using resulting observation data along with terrestrial measurements and mathematical models. These will be utilized continually through near-real time communication and precision improvements, and shared with related institutions and other countries.

(Research on the impacts of climate change on the water cycle)

○ Technologies will be developed for forecasting the impact of climate change on water quality in rivers, lakes and marshes, coastal areas, and other bodies of water.

○ In light of the expected increases in severity of floods and droughts accompanying climate change, together with development of a global environmental information platform including data on water resources, climate change forecasting technologies

will be improved and data will be collected for assessment of future impacts on water resources (such as water disasters).

○ Efforts will be advanced to improve forecasting technologies related to precipitation and rainfall patterns in connection with climate change and to develop methods for assessment of river-basin-wide countermeasures against water-related disasters to reduce their risks.

(Effective utilization of research results)

○ The national government, local public agencies, and others will strive to share results of studies and research with educational institutions and private-sector organizations, etc. in order to further advance research concerning the water cycle.

8. Securing continued international collaboration and promoting international cooperation

(1) International collaboration

(Promotion of international cooperation related to the water cycle)

○ Since Japan is the world's leading aid-providing nation in international cooperation related to water and sanitation, it will proactively share with the international community the results of its contributions in various regions around the world in this field as well as utilizing the networks it has built up in international contributions until now and using international conferences as opportunities for mutual sharing of information, among other efforts, to strategically deploy international collaboration related to the water cycle.

○ In light of the importance of the water cycle for sustainable growth and development, Japan will utilize opportunities such as UN World Water Day (March 22), the International Year and International Decade of Water Cooperation, the World Water Forum (WWF) organized by the World Water Council (WWC), the Asia-Pacific Water Summit (APWS) organized by the Asia-Pacific Water Forum (APWF), and other international conferences and activities to communicate information to achieve a shared understanding among the international community of the securing of a sound water cycle as an important issue.

○ Through collaboration and coordination with UN agencies and international institutions related to the water cycle, such as the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Meteorological Organization (WMO), and the Global Water Partnership (GWP), efforts will be promoted toward integrated water resource management at water cycle and various levels in countries worldwide.

○ Efforts also will be promoted toward solutions to water issues in Asia, including those covered in the SDGs, through Japan playing a leading role in discussions in international conferences and other venues, as well as strengthening water-cycle-related collaboration in Asia through the Asia-Pacific Water Forum (APWF), for which Japan played a leading role in its establishment, the Network of Asian River Basin Organizations (NARBO), and the Water Environment Partnership in Asia (WEPA).

○ While collaborating in the activities of the International Commission on Irrigation and Drainage (ICID) and the International Network for Water and Ecosystem in Paddy Fields (INWEPF), Japan will share and communicate information on matters such as efficient water use and demonstration of multifaceted functions in wet-field farming in international conferences such as the World Water Forum (WWF) and the Asia-Pacific Water Summit (APWS).

○ While collaborating with the Water Environment Federation (WEF) in the United States, the European Water Association (EWA), the International Water Association (IWA), and other organizations, Japan will share and communicate information on efficient water management and improvements to treatment technologies, with the goal of contributing to stable supplies of safe water and water environmental preservation worldwide.

○ Through collaboration with the International Lake Environment Committee (ILEC) and the International Center for Environmental Management of Enclosed Coastal Seas (EMECS), Japan will promote efforts toward sound management of lake and marsh environments worldwide and sustainable development in harmony with such management, as well as solutions to environmental preservation issues in closed coastal seas.

(Contributions to setting and achievement of international goals etc.)

○ Japan will contribute to achievement of sustainable water and sanitation around the world based on SDG Goals 6 and 13. With regard to achievement of Goal 6.1 ("By 2030, achieve universal and equitable access to safe and affordable drinking water for all"), Japan will carry out cooperation in improving management of waterworks agencies and fund raising, to improve access to safe water. With regard to achievement of Target 13.1 ("Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries"), Japan will support climate change adaptation measures and securing of drought-resilient water sources. In addition, with regard to achievement of Target 6.2 ("By 2030, achieve access to adequate and equitable sanitation and hygiene facilities for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations"), Japan will contribute to securing sanitation facilities around

the world by advancing measures such as technologies cooperation in regions where drainage measures for use in living, such as development of sewer systems(centralized wastewater treatment system) and decentralized wastewater treatment system, have not yet advanced, in order to improve the living environment and prevent water pollution through increasing rates of treatment of drain water. To contribute to achievement of Target 6.5 ("By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate") and resolve regional water disputes in accordance with regional circumstances, integrated water resources management efforts will be promoted.

○ Through cooperation in the UN and other venues with individual countries and international institutions such as the High-level Expert Panel on Water and Disaster (HLEP), efforts will be made to share experience and raise awareness concerning important water-related issues such as water-related disasters. These will contribute to achievement of SDG Target 1.5 ("By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters") and Target 11.5 ("By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations") as well as the goals of the Sendai Framework for Disaster Risk Reduction and the Paris Agreement.

○ In light of the fact that water-related initiatives have cross-functional importance that concerns all fields, including SDG Goals 6 and 13, to achieve these goals, Japan will share its experience and knowledge with the international society through means including coordination with diverse related parties in the region, both to promote monitoring of the SDGs and to enable practical initiatives by the international society.

○ Utilizing the framework of “International Decade (2018-2028) for Action - Water for Sustainable Development," adopted by the UN General Assembly in December 2016, awareness of achievement of the SDGs will be stimulated in international opinion by accelerating cross-functional initiatives in areas including not only water but also poverty, disaster prevention, and gender.

(2) International cooperation

(Utilization of Japan's development cooperation initiatives)

○ Under the Development Cooperation Framework (February 10, 2015, Cabinet decision), as one of the global issues on which it takes leadership, Japan aims to contribute further to solutions to global water issues through utilizing its development cooperation initiatives as the leading aid-providing nation in the fields of water and sanitation, and taking advantage of the experience and knowledge it has amassed through development cooperation efforts until now, while also promoting a sound water cycle.

(Utilization of Japan's technologies, human resources, standards, etc.)

○ Japan will contribute to improving governance, technologies, and capabilities in water-resource development and management around the word, through utilizing its water-resource development technologies and human resources and enhancing structures for international collaboration related to water resources and while cooperating with the United Nations, international aid agencies, individual countries, and other partners.

○ The experience and expertise that Japan has amassed in integrated water resource management and the public credit and technological capabilities of the Japan Water Agency will be utilized to contribute to high-quality infrastructure in the water-resources field.

○ To promote optimal management of water resources in response to climate change, together with advancing cooperation with the UNESCO Intergovernmental Hydrological Programme (UNESCO-IHP), whose activities include capacity development, human-resources development, and regional networking in the Asia-Pacific region, Japan will promote cooperation related to a co-benefit approach to realize greenhouse-gas emissions reductions and antipollution measures simultaneously in developing countries.

○ Through frameworks such as the Water Environment Partnership in Asia (WEPA), efforts will be made to utilize the knowledge that Japan has accumulated regarding legal systems, technologies, and systems for human-resources development in enhancing collaboration with countries in Asia, sharing information, and

implementing water environmental improvement programs suited to each country's needs, as part of efforts to improve water environmental management systems etc. and transfer water treatment technologies.

○ Efforts will be made to promote and standardize internationally for sewer systems, Johkasou and so-on for domestic wastewater treatment system that are advanced in Japan.

○ Through technological cooperation, efficient use of agricultural water will be promoted through means such as development of water management organizations in which farmers participate.

○ To enable maintenance or recovery of a sound water cycle through forest preservation, combating deforestation and forest degradation and sustainable forest management in developing countries will be supported through technological development and human-resources development.

○ To contribute proactively to lessening the damage caused by water-related disasters worldwide, systems will be developed to use satellite data to sound early warnings of water damage and ascertain the status of flood inundation and other results of disasters, together with collaboration with the International Centre for Water Hazard and Risk Management (ICHARM), cooperation with United Nations agencies, the World Bank (WB), the Asian Development Bank (ADB), the Economic Research Institute for ASEAN and East Asia (ERIA), and utilizing the Asia-Pacific Regional Space Agency Forum (APRSAF), and other agencies to adopt these systems in developing countries.

○ Through means such as cooperation with international institutions, bilateral collaboration, and communication of information in international conferences, Japan will share knowledge from use of the sciences and technologies it has built up regarding groundwater resource assessment and groundwater pollution and other global groundwater issues, as well as promoting technological cooperation, and international dialogue.

(3) Overseas expansion of water businesses

(Supporting overseas expansion of water businesses)

○ Overseas expansion of the leak prevention technologies, water treatment

technologies, non-open-cut pipe laying and renovation technologies, and other outstanding advanced technologies and systems possessed by Japan's water-infrastructure-related businesses and others will be advanced through public-private partnership including financial assistance and technological cooperation.

○ In the field of water resources, overseas expansion of Japan's water-infrastructure-related businesses will be advanced through public-private cooperation utilizing Japan's experience and expertise in realizing stable supplies of safe, high-quality water and improvements to natural rivers and urban environments through integrated water supply management, while also using the public abilities and technological power of the Japan Water Agency.

○ Overseas expansion of Japan's outstanding technologies and experience will be advanced through public-private cooperation by helping counterparty countries to adopt Japan's expertise related to topics such as appropriate operation and management of waterworks and sewer systems as well as development of organizational structures, legal systems structures, and other subjects related to improving water governance.

○ Through means such as water-related project feasibility studies, field demonstration studies, and seminars in countries in Asia and other regions, overseas expansion of water businesses will be advanced proactively by Japanese businesses and local public agencies.

○ Through proactive, leading participation in the process of international standardization in water fields such as water reclamation, sludge treatment and disposal, and rainwater management, establishment of international standards to enable appropriate assessment of Japan's technologies will be advanced.

○ Through combination of structural measures to prevent and lessen water-related disasters and disaster-related system development such as observation and warning systems, tangible and intangible measures will be implemented in an integrated manner, along with other measures such as effective use of dams and other existing facilities, to expand Japan's outstanding technologies and systems overseas through public-private cooperation.

9. Water-cycle-related human-resources development

(1) Human-resource development and international interpersonal exchange through industry-academy-government-resident collaboration

○ To develop specialized and generalized human resources in various fields related to the water cycle, from a medium- to long-term perspective, cooperative efforts will be carried out technological development, education, and research by the national government, local public agencies, related institutions, universities, industries, and other parties.

○ Events such as training sessions and seminars will be held regarding laws, regulations, policies, initiatives, etc. related to the water cycle, so that the actors in river basin management of local public agencies, local branch offices of national government agencies, businesses, groups, and others can secure specialized and generalized human resources.

○ Efforts will be made to improve the technological skills and other abilities of water infrastructure managers, through enhancement of qualification programs related to water infrastructure maintenance, management, and upgrading as well as education, training, and other activities led by outside instructors. In addition, handing down technologies to younger human resources will be promoted through means such as enlisting the aid of retirees.

○ As regional activities, contributions will be made to development of water-cycle human resources in regions through deepening exchange and promoting activities targeting residents of all ages able to contribute to water infrastructure maintenance and management, preservation and rehabilitation of the water environment, and other areas.

○ In addition to interpersonal exchange with international institutions in areas related to the water cycle, such as UN-Water, UN-Habitat, the United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Environment Programme (UNEP), the World Meteorological Organization (WMO), the Food and Agriculture Organization of the United Nations (FAO), the United Nations University (UNU), the World Bank (WB), the Global Water Partnership (GWP), the World Water Council (WWC), the Mekong River Commission (MRC), the International Water Management Institute (IWMI), the Asian Development Bank

(ADB) and other regional development banks, and the Organisation for Economic Co-operation and Development (OECD), means such as dispatch of experts to developing countries as part of international cooperation initiatives will be employed to train global human resources.

Section 3 What is needed to promote water-cycle-related measures comprehensively and systematically

1. Effective implementation of water-cycle-related measures

○ The measures called for in this Plan need to be carried out appropriately and effectively, through proper adaptation to changes in socioeconomic and other conditions related to the water cycle and the needs of society and administrators.

○ If, in the process of advancing the measures called for in this Plan, a need has been identified for steps such as revision of systems, prompt consideration will be taken and the necessary measures will be taken.

2. Duties of related parties and mutual collaboration and cooperation

○ While comprehensive and integrated promotion of water-cycle-related measures is essential in order to maintain or recover a sound water cycle, it is even more important than ever before that the national government and local public agencies, businesses, members of the public, and others involved in such measures collaborate with each other to carry out proactive measures in accordance with their individual roles.

○ It is important that local public agencies, through appropriate division of responsibilities with the national government, carry out water-cycle-related measures flexibly and in stages, in accordance with each regional actual conditions and distinctive properties. In doing so, where there is a need for wide-area efforts across multiple local public agencies, it is important to promote efficient measures through enhanced collaboration among the national government and local public agencies and close collaboration with various agencies.

○ It also is important that businesses, in using water, take measures in areas such as water environmental preservation, autonomous management of water use, and securing efficient and stable water sources. In addition, of particular importance in the future will be efforts to lessen environmental impacts through means such as adoption of small-scale hydroelectric power and energy conservation.

○ It is vital to carry out efforts to deepen understanding of the water cycle among members of the public through participation in water-cycle-related events, conferences, and other activities and enable them to carry out their own efforts in areas such as preservation and rehabilitation of the water environment and maintenance or recovery of a sound water cycle.

○ In planning and implementing water-cycle-related measures, to ensure that such measures are promoted properly, it is important to strive to reflect appropriately in them the views of the public and other related parties.

○ In consideration of the importance of Water Day and Water Week, it must be noted that while awareness of these events is not particularly high, members of the public are highly interested in safe and delicious water. As such, through collaboration among related parties such as the national government and local public agencies, businesses, and private-sector organizations, enhancement of events related to Water Day and Water Week and encouragement of participation should be conducted through means such as stronger collaboration among related parties and proactive provision of information, so that the public broadly has a stronger understanding of and interest in the importance of maintenance or recovery of a sound water cycle.

3. Publication of measures implemented in connection with the water cycle

○ Reports on measures related to the water cycle will be submitted to the Diet annually and published through appropriate methods.