



Good Practices of Integrated Water Resources Management

- Japan's experiences -



Ministry of Land, Infrastructure, Transport and Tourism




We Supply You
with Safe and Quality Water
Incorporated Administrative Agency
Japan Water Agency

Implementation of IWRM approach - Case of Tokyo area -

- Emergence of various issues on water such as the **shortage, pollution and ground subsidence**.
Solving these issues
- To meet these issues, the following countermeasures have been taken:
 - Water shortage: infrastructure, such as dams, were developed upstream of Tone and Ara river systems and developed water resources delivered to beneficiary areas
 - Water pollution: Installing sewerage treatment plants and delivering water to polluted rivers in urban areas for water purification.
 - Ground subsidence: regulations on extraction of groundwater, shift to utilize the surface water and dikes against flood and high tide
- Following these countermeasures, a safe and clean water supply, ecosystem-rich rivers and sound urban environment have been realized.


Issues

Water shortage



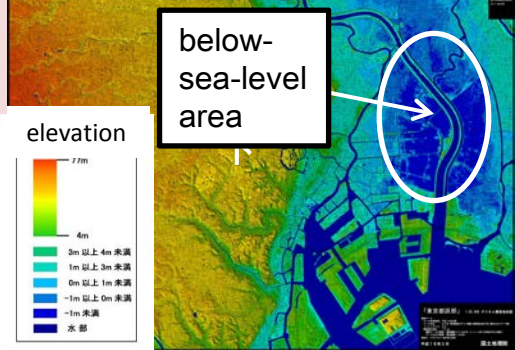
People getting together for Water truck

Water pollution

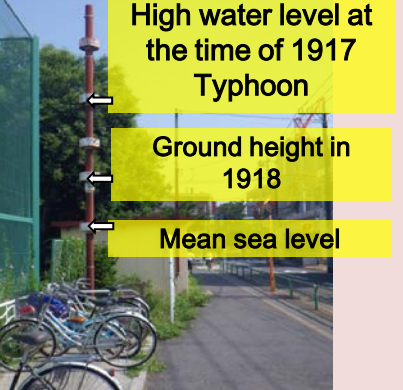


Dirty foam in the Tama River

Ground subsidence



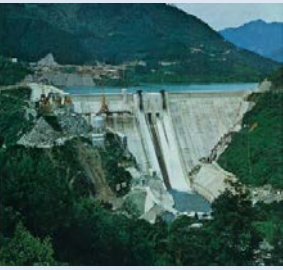
below-sea-level area



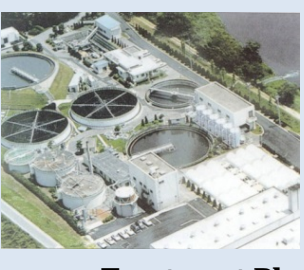
High water level at the time of 1917 Typhoon
Ground height in 1918
Mean sea level

Ground subsidence and below-sea-level area


Countermeasures



Dam



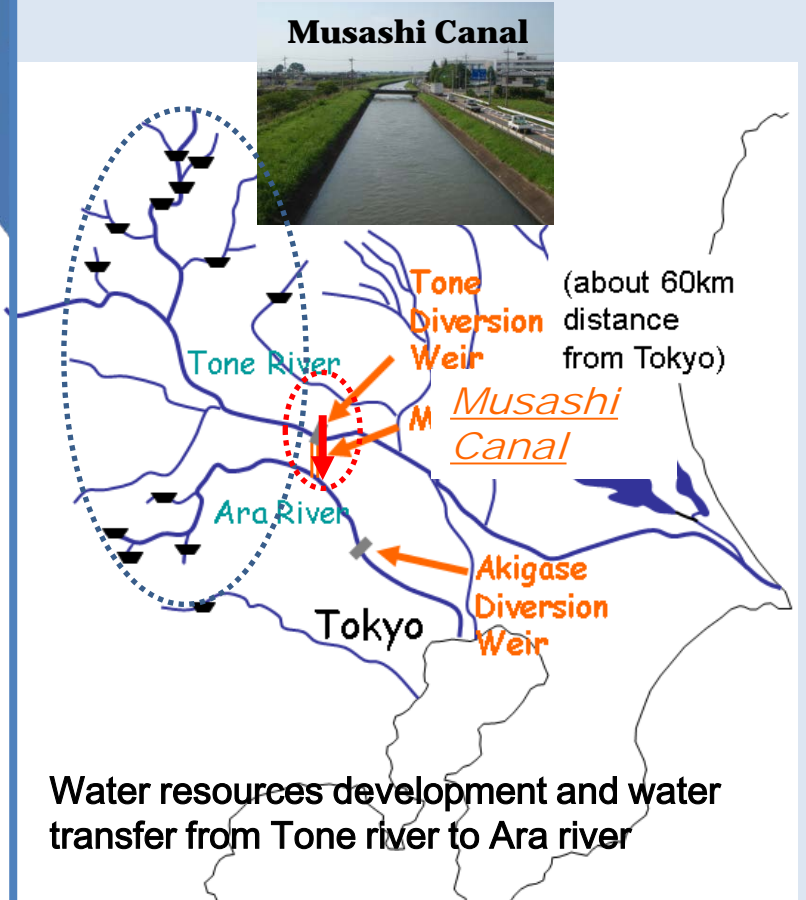
Sewerage Treatment Plant



Dike against flood and high tide



Shift to the surface water



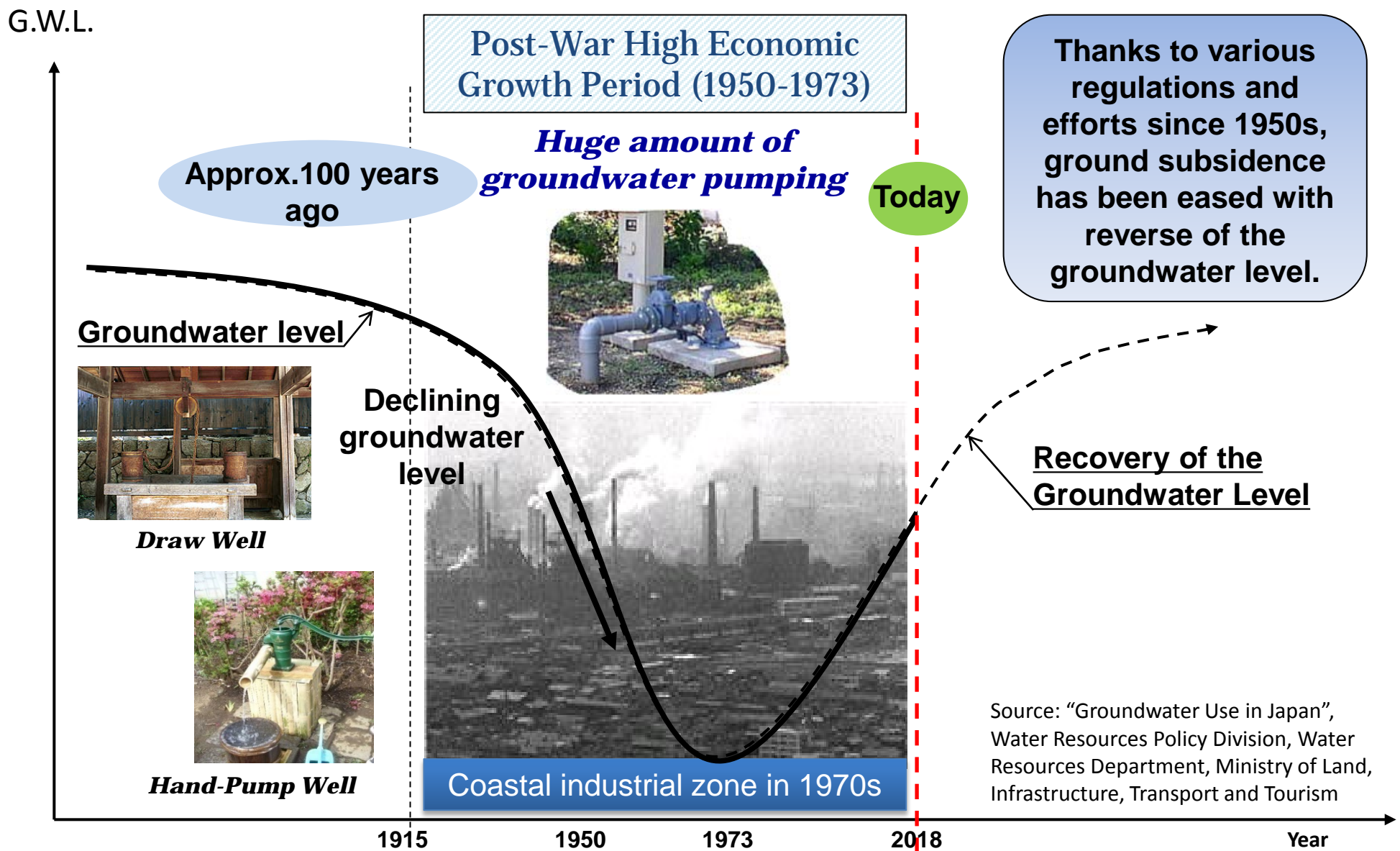
Achievement

Safe and clean water enable ecosystem-rich rivers and a sound urban environment



Comprehensive approach to resolve the issue on ground subsidence

- Collaboration with civil society and practice by stakeholders -



Software package of ground subsidence measures

Initially, it was assumed that earthquakes and crustal movement in the deep underground caused the ground subsidence, but it was determined by the Tokyo Metropolitan Government and academic organizations through long-term research that the extraction of groundwater was the main cause.

Based on the above, the following governance measures for infrastructure development proved effective.

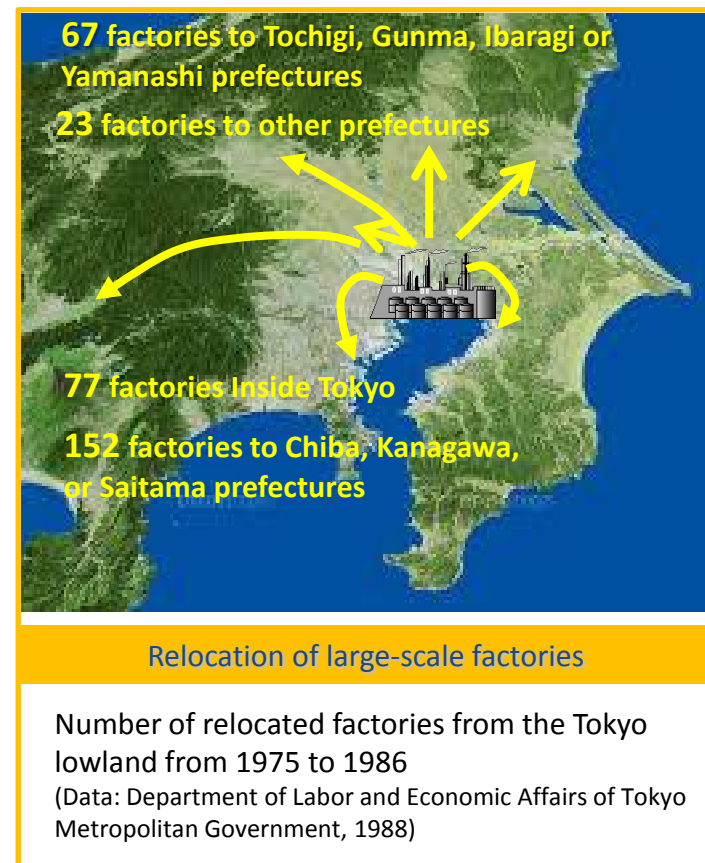
(1) Legal regulations on the groundwater extraction

Acts and ordinances to regulate groundwater extraction by large volume water users, like industrial factories and buildings in designated zones, needed to be set up.

(2) Regulations against the expansion of new large scale factories and facilitation of relocation of factories from the designated zones (See the right figure)

- Acts and ordinances to regulate new large-scale factories
- Soft loans and tax incentives for factory relocation
- Land acquisition of a relocated factory for public use and redevelopment of urban area in the future

※ This factory relocation policy was partly for countermeasures on water and partly for air pollution control.



Serious Water Issues during the High Economic Growth

● Post-war period (since 1950)

- Remarkable industrial development
- Sharp increase in volume and density of urban population by urbanization
- Increased standard of living

Investment for economic growth



Highway



Shinkansen

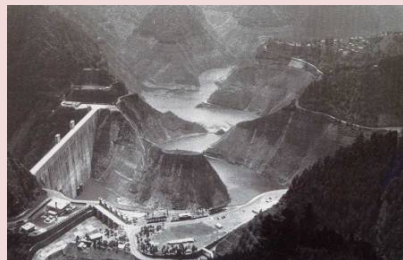


Tokyo Olympics

● Metropolitan areas

- Sharp increase in water demand -**Serious water shortages**

Serious nationwide water shortages



Dried-up reservoir



Emergency water supply

Policy approach to meet urgent needs of water

- Securing stable supply of water
- Comprehensive and efficient development of river systems

Difficult background to meet above needs

- Insufficient water supply and difficulty in smoothly achieving consensus
- Insufficient funds for water resources development



● Water Resources Development Promotion Act (1961)

(Basis for streamlining the comprehensive development and use of water resources)

- Based on yearly water demand and consensus built among multiple stakeholders in basin and areas benefitting from new water supply, **the Master Plan, so-called, "Full Plan"** was established, then updated frequently.

● Water Resources Public Corporation Act (1961)

(To supply water in an efficient manner to meet urgent needs)

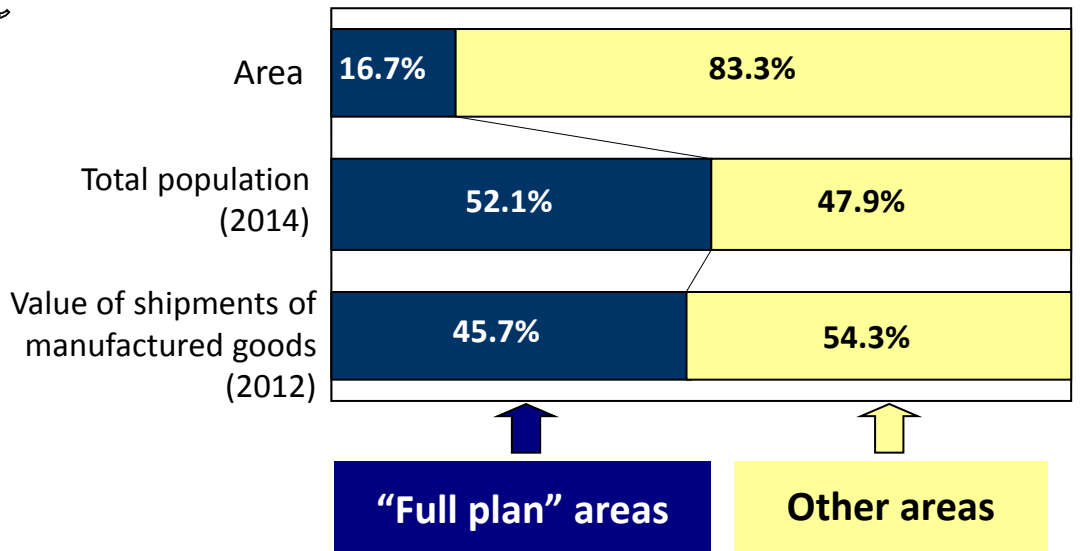
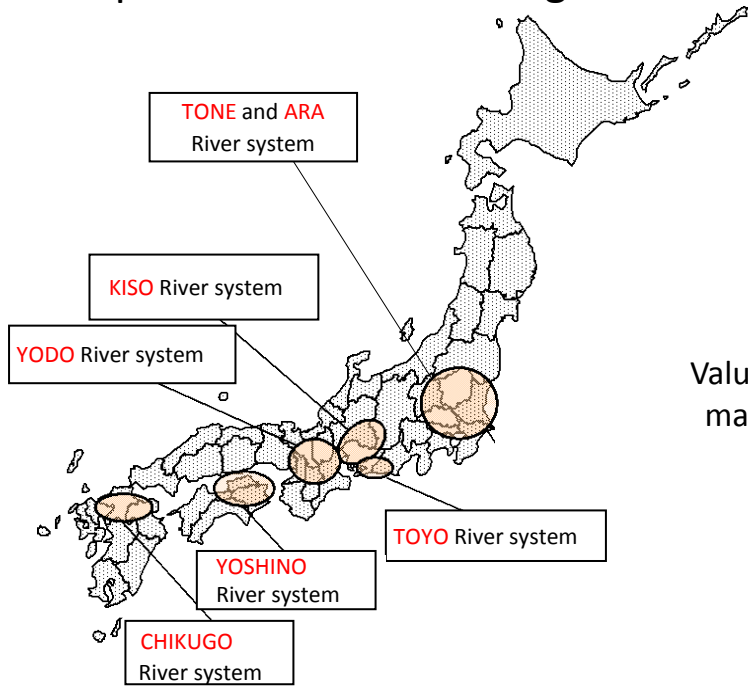
- Upfront investment by the national government through fiscal investment and loans, and the public corporation ^{*}, was established as an executing body.
- Promotion and operation of integrated projects in river systems

*) Water Resources Development Public Corporation ➡ **Japan Water Agency (JWA)** (2003)

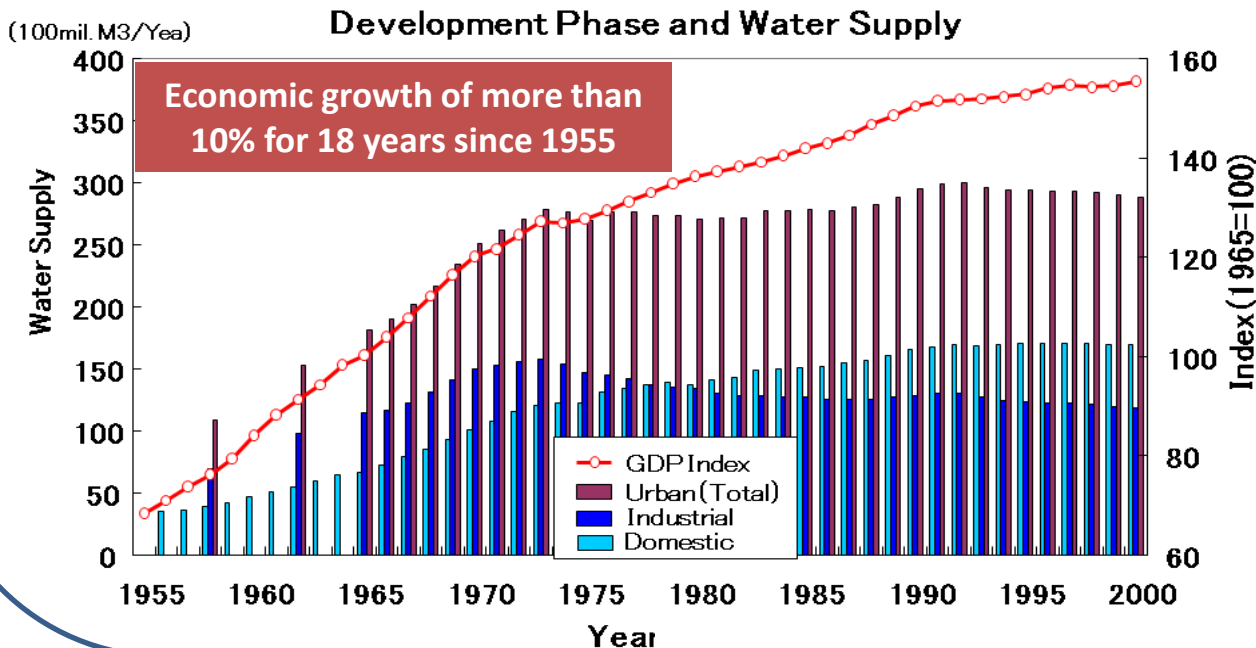
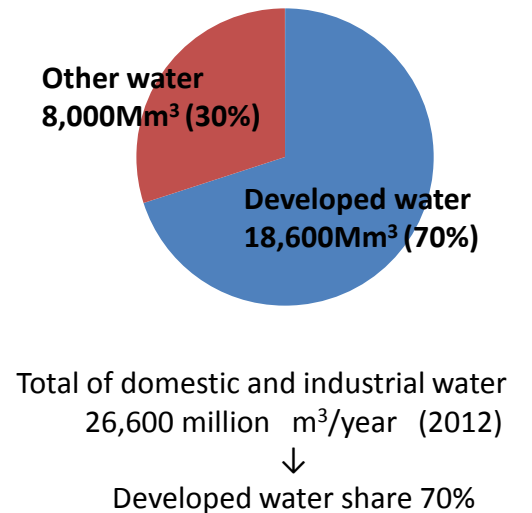
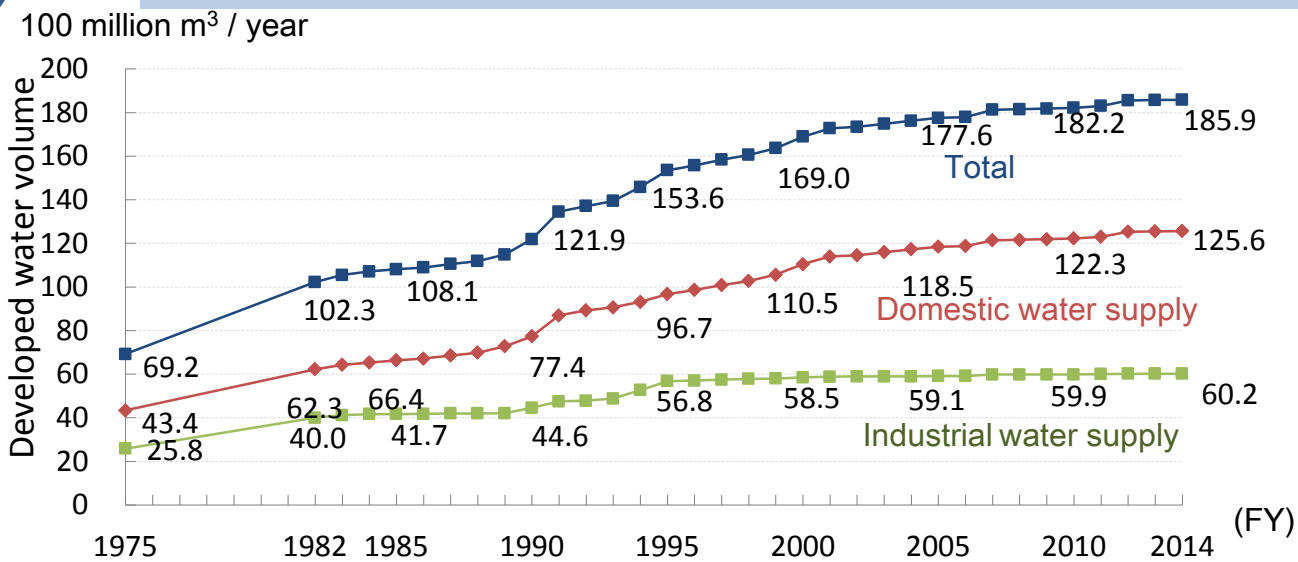
Master Plan for 7 major rivers

Master Plan for Water Resources Development at 7 major river systems → “Full Plan”

- Stipulation of purpose-specific demand forecasts and supply targets
- Implementation following the Cabinet decision



Developed water volume nationwide



➤ Water resources development based on the Master Plan (Full Plan) and developed water nationwide contributes to the economic growth and supports people's life.

New Policy –Water Cycle Management Policy-

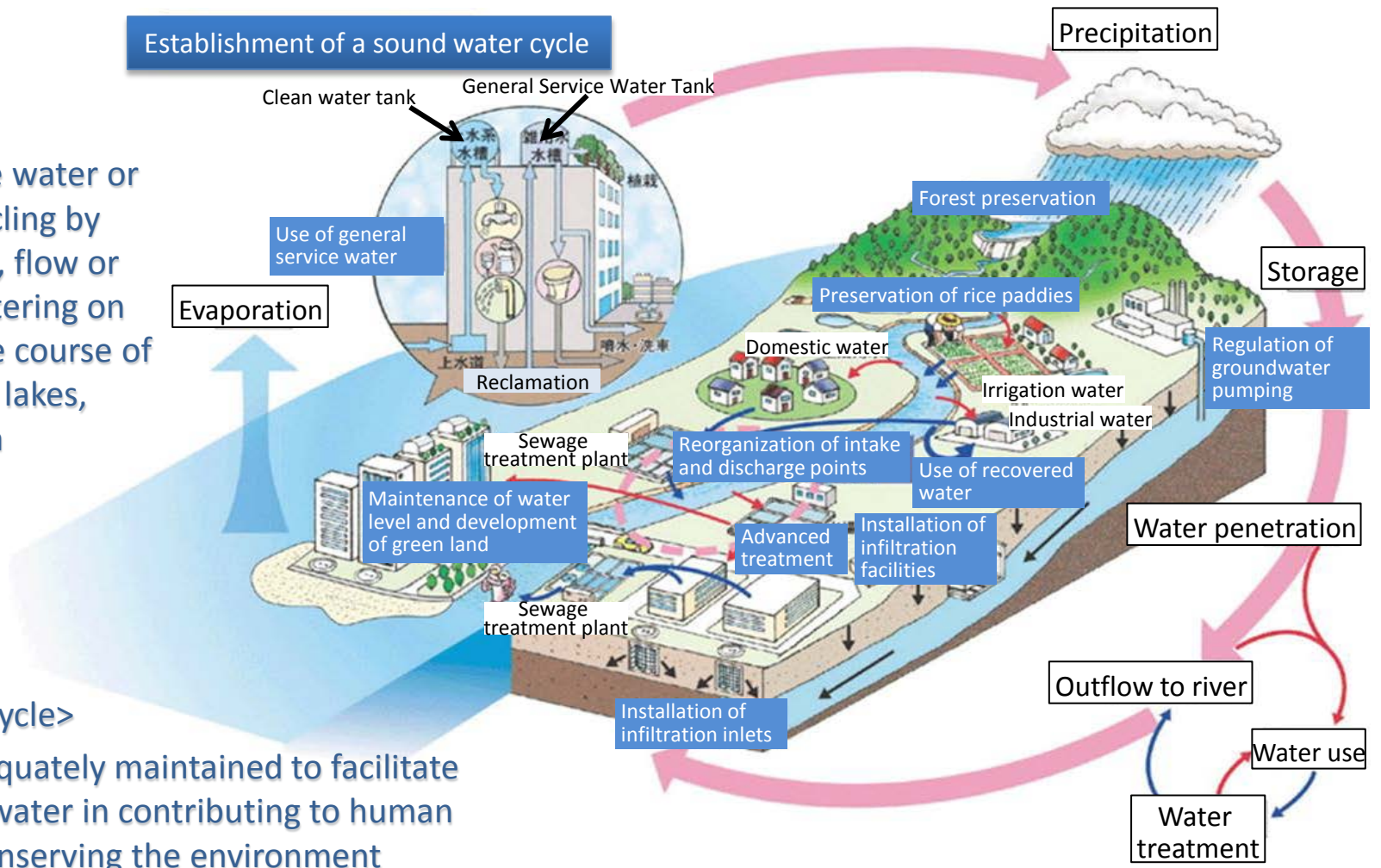
What are “Water Cycle” and “Sound Water Cycle”?

<Water Cycle>

Water as surface water or groundwater cycling by evaporation, fall, flow or permeation centering on watershed in the course of its flow down to lakes, ponds or the sea

<Sound Water Cycle>

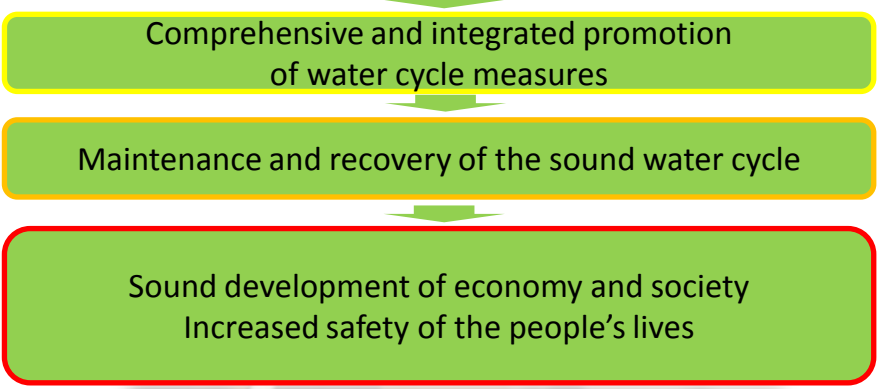
Water cycle adequately maintained to facilitate the function of water in contributing to human activities and conserving the environment



Basic Act on Water Cycle (enforced as of Jul 1, 2014)

Important Points of the Basic Act on Water Cycle

1. Establishment of **the Headquarters for Water Cycle Policy** to promote water cycle policy
2. Clarification of basic principles for the implementation of water cycle measures
3. Clarification of responsibilities of concerned parties such as national and local governments, operators and the public
4. Development of **a water cycle basic plan**
5. Clarification of basic actions to promote water cycle measures



Headquarters for Water Cycle Policy – Established in the Cabinet

Purpose	To promote water cycle measures in a “focused” and “comprehensive” manner
Organization	Director-General: Prime Minister Vice-Director-General: Chief Cabinet Secretary and Minister for Water Cycle Policy Members: All Ministers
Duties	<ul style="list-style-type: none"> ✓ Development of the draft of the Basic Plan on Water Cycle Policy and promotion of the implementation of the plan ✓ General coordination of the measures implemented by relevant administrative organizations based on the Basic Plan ✓ Planning, development and general coordination of important water cycle measures



Prime Minister Abe speaking at the 1st Meeting of the Headquarters for Water Cycle Policy (July 18, 2014)

Examples of Good Practices on Water Cycle Management

- The extreme River Basin Management for maximization of the benefit for all -

The Basic Plan on the Water Cycle established the concept of the River Basin Management whereby official organizations like government, private businesses, groups and residents, who have common interest in river basins, work in cooperation through various activities to upkeep in good condition or improve people's lives: water flows, water quality, and the natural environment related to water in forest, rivers, agricultural land, cities, lakes, coastal zones, etc. The central government provides support for local governments which are implementing advanced activities and conducts model studies to collect, analyze and organize other referential examples to introduce them nationwide.

Case of Hadano City, Kanagawa Prefecture

Necessity of Groundwater Management

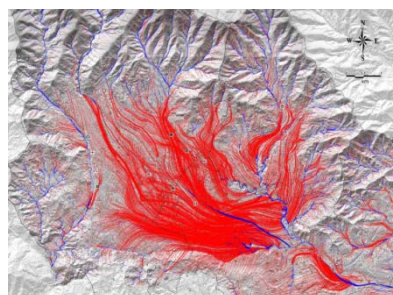
- By sharp increase of water demand from 1965, the groundwater balance was lost and decrease of groundwater level and temporal water supply suspension, drying up of spring were occurred.

Countermeasures and Achievement

- Groundwater investigation by Prefecture Gov.
- Visualization of groundwater flow for awareness
- Groundwater cultivation at paddy fields
- Groundwater level and water balance as indexes are monitored and their recent data show steady trend. Groundwater is to be utilized based on these indexes.



Aerial photo of Hadano basin



Surface and groundwater flow lines



Projection mapping for awareness



Groundwater cultivation at the paddy

Case of Shimanto River, Kochi Prefecture



11 municipalities in Shimanto River Basin

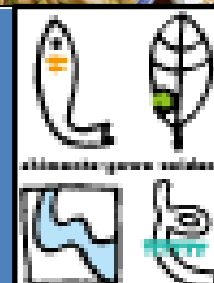
Since 1975, the Shimanto river referred to as the final clear stream got worsen by decreasing of water quantity and deterioration of water quality and flora and fauna environment.

Promotion of River Basin management

- Conservation with Eco-friendly public works, licensing system, standard for clear stream and so on.
- Development vision for Shimanto river basin
- Collaboration among municipalities and resident
- Establishment of the Shimanto Public Interest Incorporated Foundation to manage the projects for promotion of the environment conservation at river basin level and formulation of ordinance



Residents, administrative organizations and private firms are aiming to coexist with the nature and vitalize the community. The sound river basin will be taken over to the generation.



Promotion of international partnership and cooperation

(1) World Water Forum

- Japan has been contributing to the international community in various ways, including lectures by His Imperial Highness the Crown Prince of Japan, the former honorary president of UNSGAB*¹, and other participants such as the MLIT Minister, etc. to discuss water issues and technologies.

*¹UNSGAB=United Nations Secretary-Generals' Advisory Board on Water & Sanitation

- The lectures by His Imperial Highness the Crown Prince of Japan
 - "Waterways connecting Kyoto and local regions" –Focusing on ancient and medieval water transport on Lake Biwa and Yodo River- (3rd WWF: Keynote speech)
 - "Edo and water transportation" (4th WWF: Keynote speech)
 - "Interacting with water" –Close ties between people and water–(5th WWF: Keynote speech)
 - "Fulfilling People's Aspirations on Water" –The relations between water and people through science and technology- (7th WWF: Video message)



His Imperial Highness the Crown Prince at 5th World Water Forum in Istanbul, Turkey

(2) Asia-Pacific Water Summit (APWS)

- In 2006, APWS was established at 4th WWF at the initiative of Japan in order to improve water security in the Asia-Pacific region.
- The 1st APWS was held in Oita Prefecture in Japan and the message from Beppu was adopted in the presence of His Imperial Highness the Crown Prince, the Japanese Prime Minister, top leaders and ministers from the world.
- As outcomes of the APWS, the two main issues of "water disasters" and "urban water issues" in Asia-Pacific Region were subsequently discussed at the WWF as priority issues.



Ministerial roundtable meeting chaired by Japanese MLIT Minister at 7th WWF in Korea

(3) Network of Asian River Basin Organizations (NARBO)

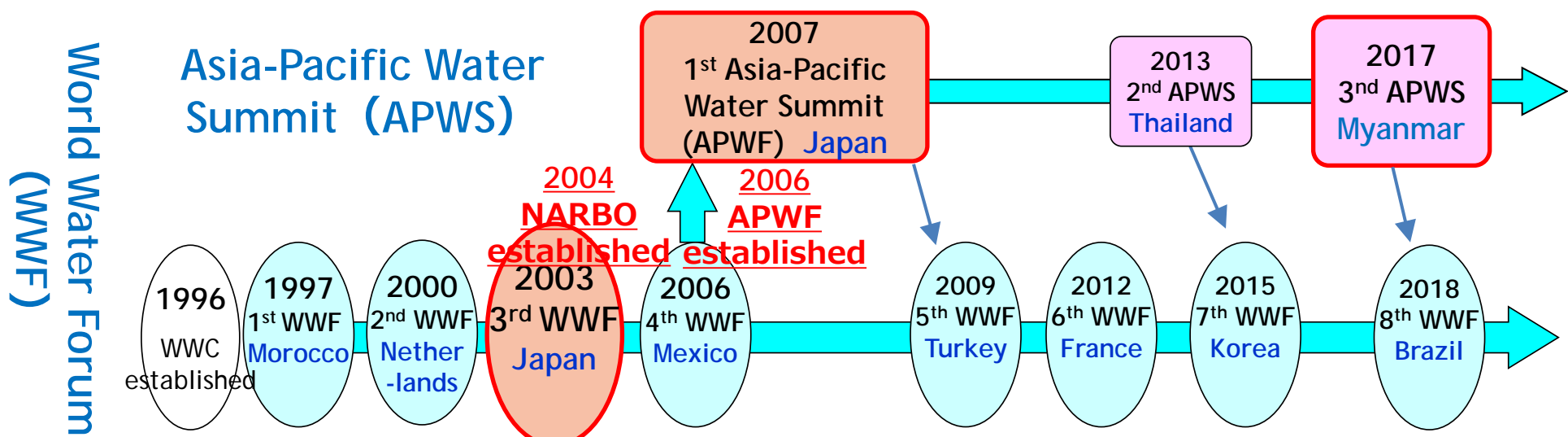
- NARBO's establishment was announced at the 3rd WWF in 2003 and it was officially established in 2004 to promote IWRM in Monsoon Asia region and strengthen the capacity of River Basin Organizations (RBO).
- UNESCO developed IWRM guidelines in close collaboration with JWA/NARBO led by Japanese initiative and published them at the 5th WWF.
- The guidelines illustrate IWRM as an evolving and adaptive, step-by-step process along a Spiral with suggestions on how to gradually improve IWRM. They present examples of actual projects and keys for success and have been widely utilized in various IWRM trainings including NARBO.



IWRM Training



IWRM Guidelines and Spiral Model





The 3rd Asia-Pacific Water Summit

- The 3rd Asia-Pacific Water Summit was held in Yangon, Myanmar from 11th to 12th December, 2017 to discuss “Water Security for Sustainable Development.
- Mr. Ishii, Minister of MLIT made speeches at the opening and 3 sessions on Water and Disaster, Water Cycle and Wastewater, and presented to representatives from all countries the Japanese experiences in tackling water issues and introduced Japanese technologies for solving those water issues.
- The Yangon Declaration was adopted to illustrate the pathway forward. It calls for the enhancement of water security with concrete actions and solutions for sustainable development.

Prime ministers and cabinet member level representatives from Asia-Pacific region countries together with international organizations joined the conference. Mr. Ishii of MLIT delivered his speech to illustrate Japanese experiences in water issues and offered advanced technologies of Japan to keep assisting the regions and to help secure their safe and prosperous future.

At the water cycle session, staff from Kumamoto City and a government official attended the panel discussions to show how well they tackled the water cycle issues. At the end of the session, Mr. Ishii gave a speech, in which he emphasized the importance of maintenance and recovery of a sound water cycle in order to resolve the water issues in the Asia-Pacific region.



At the opening ceremony



Mr. Ishii, Japanese Minister of MLIT delivering a speech at the opening ceremony



Panel discussions are taking place



Mr. Ishii greeting at the water circulation session

Guidelines for IWRM Practitioners (NARBO)



- One of the biggest water issues in Asian countries is the sustainable maintenance and management of water-related infrastructures. In the NARBO general meeting in 2017, this issue was thoroughly discussed and the summary of the meeting was compiled into the following messages, as the voice of Asian Water Management Practitioners.

(1) Fitting into respective local conditions and fostering domestic businesses

It is essential to enhance sustainability of management. To do so, it is more important to encourage the introduction of facilities that fit into respective local conditions in terms of procurement of materials as well as fostering local human resources.

(2) Developing quality infrastructures for materializing sustainable water management

What it means by high quality infrastructures is not the low initial introduction cost but the less costly life cycle cost through sustainable infrastructures. If they are highly sustainable, supported by appropriate technologies and frameworks, and fit well with local conditions, it could be effective to introduce latest leading-edge technologies in terms of investment efficiency.

(3) Sharing experiences and knowledge which enable the members to find a certain hint to resolve common issues

When introducing a new technology or policies, it is essential to collect and understand multiple application examples and make comparisons from multiple angles. In order to do that, it is more effective to collect the example cases from an information network like NARBO, and in addition, to visit the actual sites and ensure true understanding, and then disseminate the organized data in your local language to share among the people concerned so as to find the best solutions.

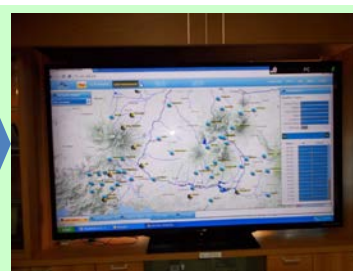
- Being based on the above, collection of examples were compiled for supplement to IWRM Guidelines at River Basin Level.



Water level indicator/water gauge



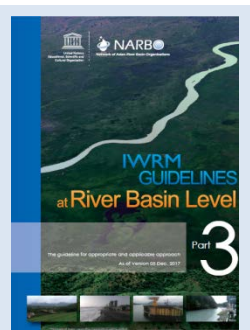
Transmitter receiver



Display board

PJT 1, Indonesia developed the hydrological monitoring system utilizing the materials from local markets at reasonable price, and the working ratio of these equipment scores 99%.
Source : PJT 1.

An example of application in Indonesia

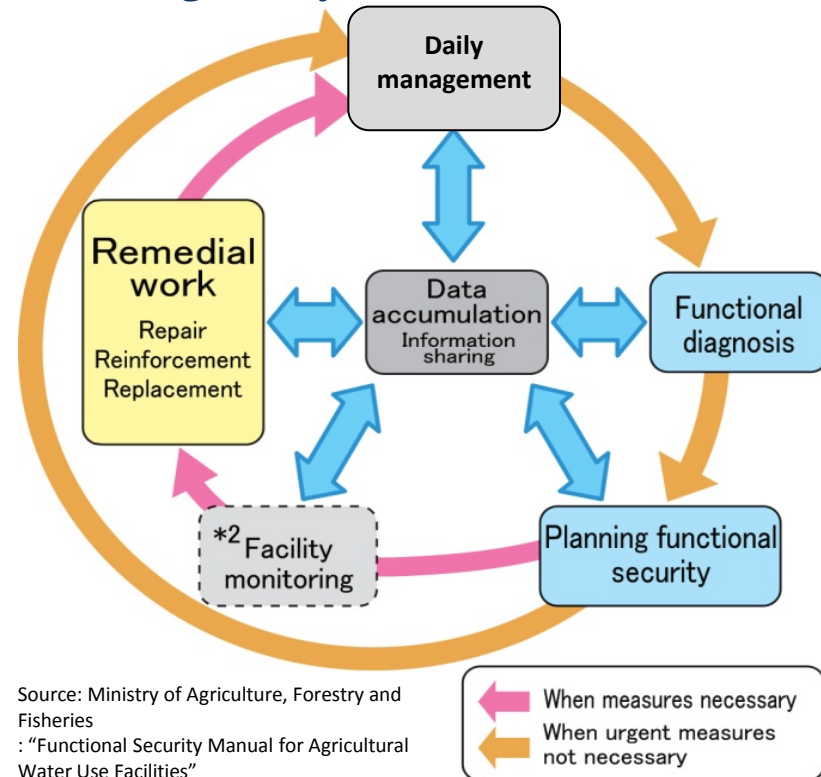


Supplement to IWRM Guidelines at River Basin Level

◆ Proper stock management by extending infrastructure life, reducing life cycle cost and decreasing the risk of incident

- It is crucial to implement a routine inspection and maintenance program, with the limited/small budget, for realizing the long infrastructure life and reduce the life cycle cost (*1).
- These actions are meant to be preventive measures against sudden incidents such as termination of water supply and accidents involving residents.

Stock Management cycle



Use of the radar exploration to check the back void of concrete lining in the water tunnel



Inspection of aging status of pre-stressed concrete pipe

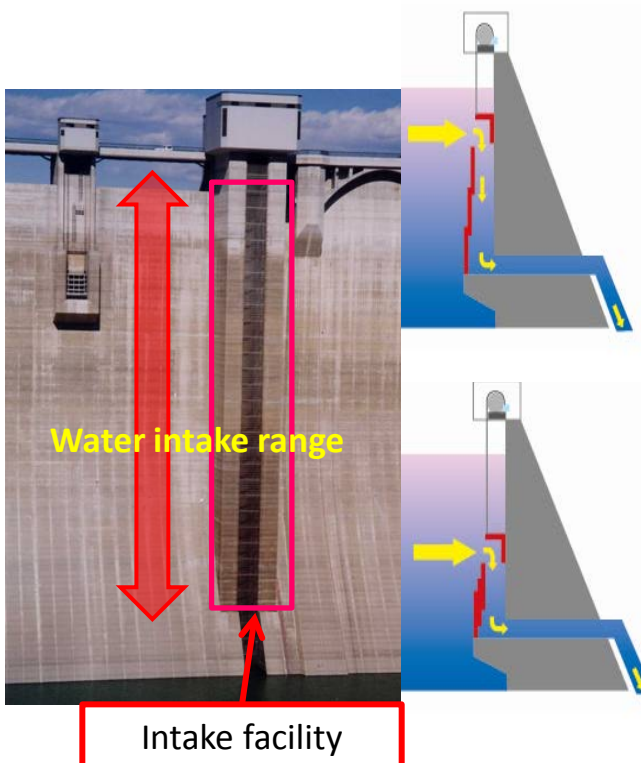
*1 Total cost of facility ownership. It takes into account all costs of design, construction, operation, maintenance, repair, modification, replacement and decommissioning.

*2 Facility monitoring regularly conducted to enhance the quality of the functional security plan and to find the right timing of remedial work

Source: Ministry of Agriculture, Forestry and Fisheries
: "Functional Security Manual for Agricultural Water Use Facilities"

◆ Methods that enable the selection of the depth of intake considering the river environment and proper water quality control of reservoir

- Prevent the turbid or cold water, or the water with abnormal growth of phytoplankton, from outflowing to the lower reach of the river by selecting and discharging water from an arbitrary water layer.
- Also, the water reservoir may be maintained in its normal condition by preventing the turbid water layer, etc. from accumulating in the dam and intentionally discharging it to the lower reach of the river at an early stage.



Water is taken in at an arbitrary depth and discharged to the lower reach of the river.

		time																					
目付		9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26
Q in (m3/s)		2	2	2	2	66	35	15	10	8	5	4	4	5	8	4	4	4	4	4	4	4	3
Q out (m3/s)		1	1	3	1	69	40	14	9	8	5	4	4	4	11	4	4	4	4	4	4	4	3
Turbidity (Q out)		<div style="display: flex; justify-content: space-around;"> Typhoon Depth of intake </div>																					
Elevation		4	4	4	5	101	102	92	86	85	73	61	52	49	10	8	7	6	5	5	5	5	4
Turbidity along the depth of reservoir		540																					
		539																					
		538																					
		537				5																	
		536	5	5	5	5	5	8	8	10	8	8	7	7		6	6	5	5	5	5	5	5
		535	5	5	5	5	5	8	8	10	8	8	7	7	7	6	6	6	5	5	5	5	5
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		528	6	6	6	6	6	103	107	71	66	56	41	36	26	26							
		527	6	6	6	6	6	111	96	87	79	61	46	38	28	30							
		526	6	5	6	5	5	130	106	95	84	68	50	49	37	34							
		525	5	5	5	5	5	105	107	94	83	65	56	52	47	40							
		524	5	5	5	5	5	94	108	97	88	78	64	61	56	52							
		523	5	5	5	5	5	76	109	99	91	87	67	66	63	57	51	46	44	45	42	41	37
		522	5	5	5	5	5	50	88	99	91	86	70	67	66	60	55	48	48	46	45	41	37
		521	5	5	5	5	5	21	44	59	70	74	60	57	50	50	51	45	40	37	38	35	34
		520	5	5	5	5	5													30	27	23	18
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		511																		8	8	8	8
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Following the change of status of turbidity at the lower reach of the river, the proper depth of intake is selected.

Reduction of the risk of reservoir pollution

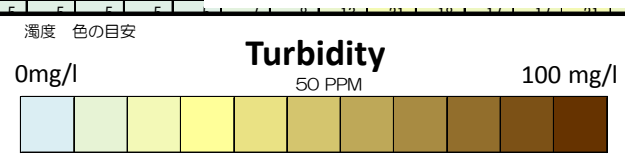
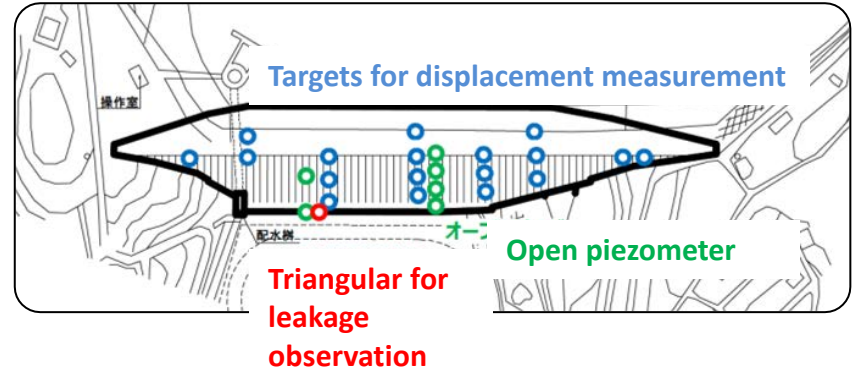


Table: Distribution of turbidity and depth of intake in the reservoir

For further efficient stock management with advanced tech!

◆ Strengthening the stock management and enhancing the capacity on monitoring and risk reduction with installation of advance technology

- Use of GPS and sensors for real time monitoring of dam on the deformation of dam and slope, pore pressure, uplift pressure and leakage, and power generation and pump on temperature and vibration and revolving number, etc., in order to perceive unusual behavior and malfunction
- Sharing the monitoring data immediately just after incidents occur, like an earthquake



Strengthening of the monitoring and prompt response against incidents



Support System for proper monitoring and response

- Automatic and remote control system on gate operation



- Remote system for inspection and capacity development so that any staff can conduct the inspection



Ministry of Land, Infrastructure, Transport and Tourism
Incorporated Administrative Agency Japan Water Agency



URL <http://www.narbo.jp/>

