Water in Japan

Water Resources Department,
Water and Disaster Management Bureau,
Ministry of Land, Infrastructure, Transport and Tourism

"Water" is a limited and valuable resource

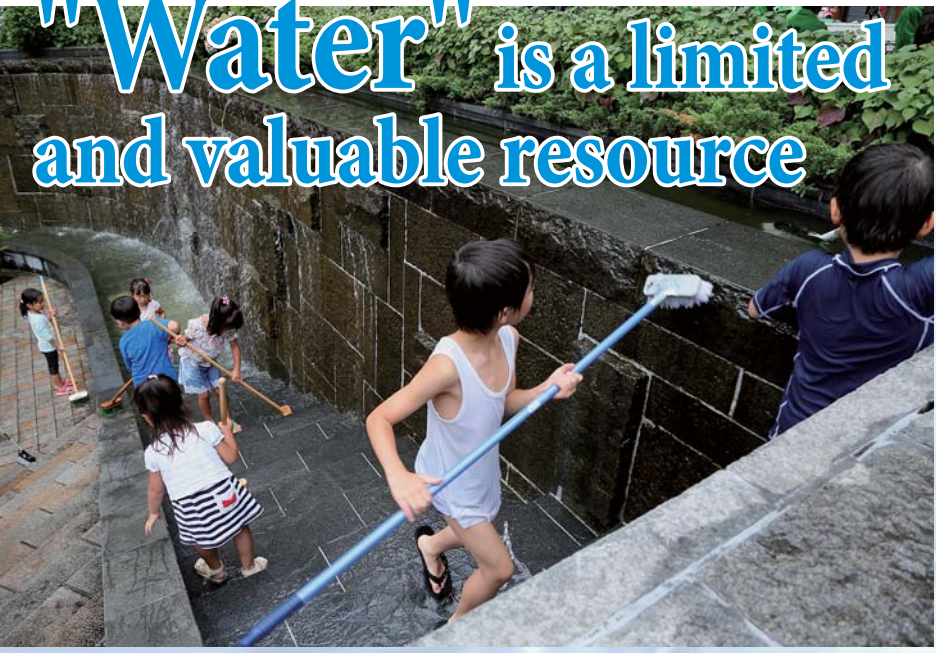


Table of Contents

※The cover picture: "Go-gatsu Itsuka no Omono Nerai" (Targeting a Biggie on May 5), the Grand Prix photo of the 28th Mizu tono Fureai Photo Contest (Relationship with Water Photo Contest), by Mr. Yuji Matsuda
The Picture on the Table of Contents: "Seiso no Hi" (Cleaning Day), Excellent Award Photo of the 28th Mizu tono Fureai Photo Contest (Relationship with Water Photo Contest), by Mr. Hideo Kashima

Water is a source of life.

Water is essential; not only for human beings, but all living things on Earth.

It is also a precious and irreplaceable resource supporting our daily lives, agriculture, manufacturing and other industrial activities.

Besides, we have a close relationship with water in various areas, including electric power generation, ship transportation, and recreation.

However, rather than being abundant, this precious water is now a limited and valuable resource.

I Water Cycle

Water Cycle

Water on Earth evaporates from the sea and land into clouds, turns into rain and snow to fall on the land again, becomes rivers, and partially groundwater, returning to the sea before long.

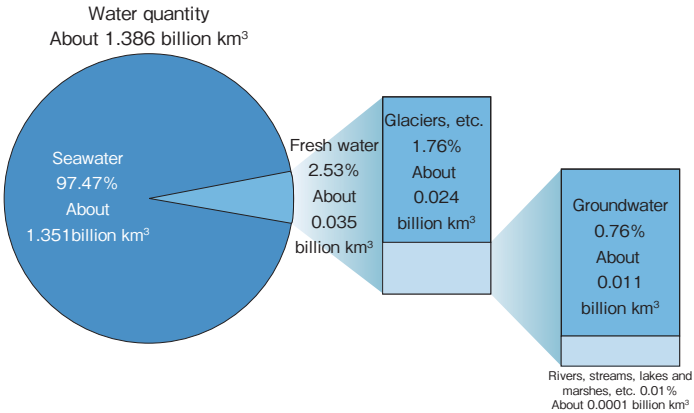
Looking at the water cycle per river basin, we notice that forests in upstream areas cultivate the Water Sources and rain falling upstream reaches the sea after several cycles recirculated and utilized as city and agricultural water in upstream, midstream, and downstream areas, hence river basins are closely interconnected through water utilization.

Water has a characteristic of repeated usability if used effectively.

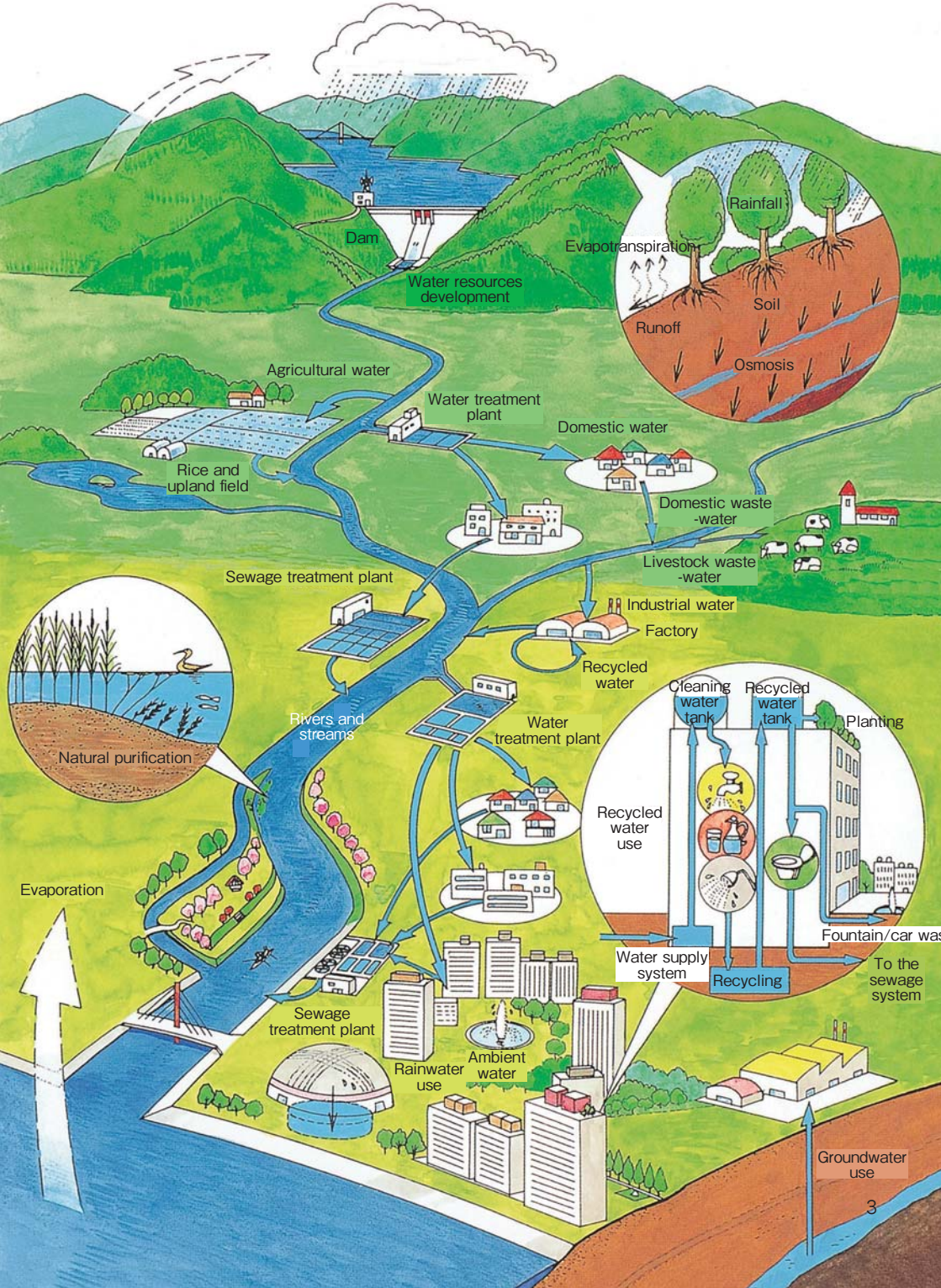
Water Resources on Earth

Although the Earth is known as the "water planet," 97.5 % of its water is seawater and others and fresh water comprises only about 2.5%. In addition, most fresh water is in the form of glaciers at the North and South Poles. We can only recycle and use 0.01% of water in rivers, lakes and marshes with relative ease.

Water Resources on Earth



Notes:
1. Created by the Water Resources Department of the Ministry of Land, Infrastructure, Transport and Tourism based on World Water Resources at the Beginning of the 21st Century; UNESCO, 2003
2. Groundwater in the Antarctic Continent is not included.


Dam
Water resources development
Rainfall
Evapotranspiration
Soil
Runoff
Osmosis
Agricultural water
Water treatment plant
Domestic water
Rice and upland field
Domestic waste -water
Livestock waste -water
Sewage treatment plant
Industrial water
Factory
Recycled water
Natural purification
Rivers and streams
Water treatment plant
Cleaning water tank
Recycled water tank
Planting
Recycled water use
Fountain/car was
Water supply system
Recycling
To the sewage system
Evaporation
Sewage treatment plant
Rainwater use
Ambient water
Groundwater use

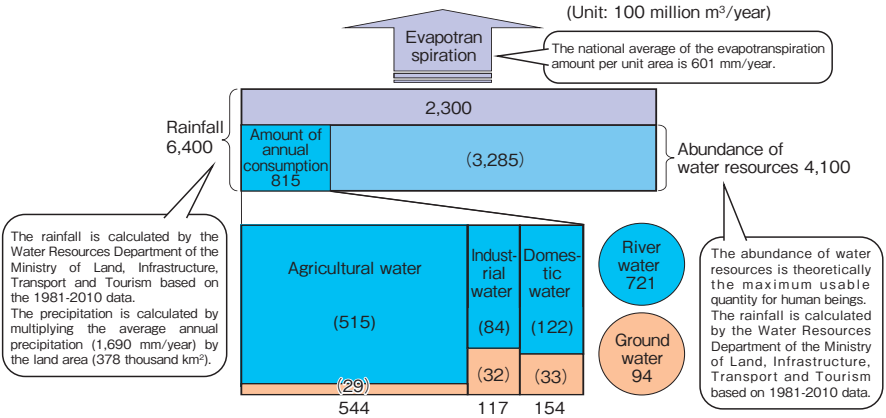
Usable Water Volume

The annual precipitation in Japan is 1,690 mm, about twice the global average. However, Japan has a large population in its narrow territory and the precipitation per person is about one-third of the global average.

In addition, Japan is at a disadvantage when using water resources: the rainfall centers on rainy, typhoon, and snowfall seasons and is significantly dependent on the weather. Besides, the country is so steep that most rainfall quickly runs off into the sea.

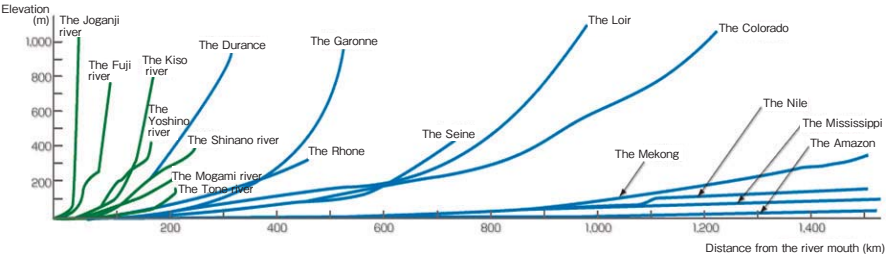
Japan has made various efforts to ensure water resources under such conditions and built life's rich foundations.

Japan's Abundance and Consumption of Water Resources



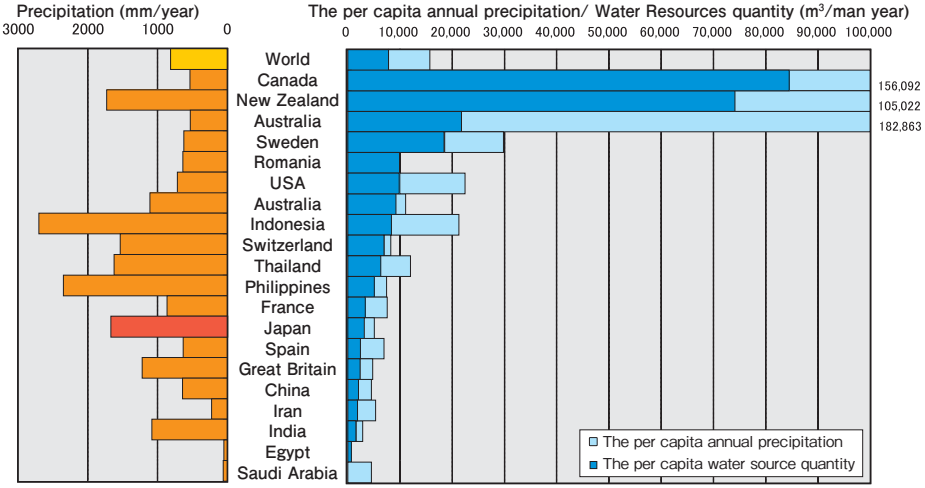
Notes:
1. Prepared by the Water Resources Department of the Ministry of Land, Infrastructure, Transport and Tourism
2. The values of water used as domestic and industrial water are from 2010 and investigated by the Water Resources Department of the Ministry of Land, Infrastructure, Transport and Tourism.
3. The value of river water in agricultural water is from 2010 and investigated by the Water Resources Department of the Ministry of Land, Infrastructure, Transport and Tourism. The groundwater is according to "Dai Gokai Nogyo yo Chikasui Riyo Jittai Chosa" (Fifth Investigation of Actual Circumstances of Agricultural Groundwater Use) (investigated in 2008).
4. The totals may differ due to rounding of numbers.

Extension and gradient of rivers and streams



Source: Yutaka Takahashi, "Kasen Kogaku" (River Engineering), University of Tokyo Press, 2006

Precipitation in Countries of the World, etc.



Notes:
1. Prepared by the Water Resources Department of the Ministry of Land, Infrastructure, Transport and Tourism; based on published data of "AQUASTAT" by the Food and Agriculture Organization of the United Nations (FAO) as of April 2013.
2. The "World" value is based on the data of 176 countries shown in the "Total Renewable Water Resources (Actual)" in "AQUASTAT."

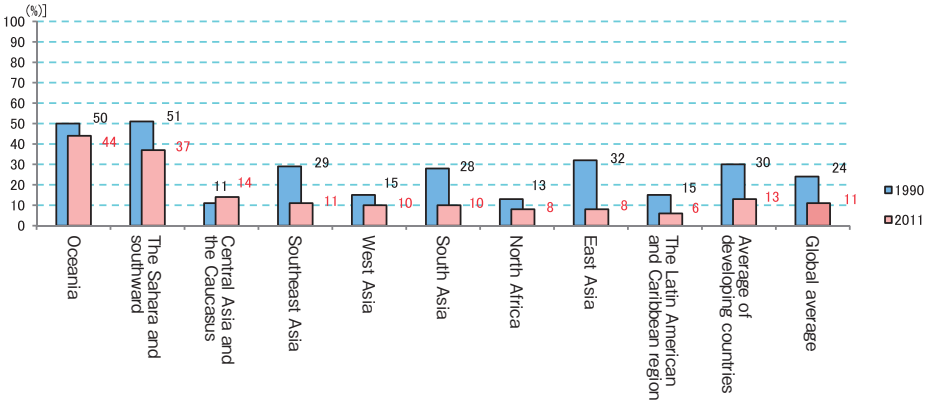
World's Water Problem

In global society in the 21st century, the water problem is one of the key challenges. Globally, the number of people facing serious water-related problems, including shortages, pollution, and the increase in flood damages is considerable.

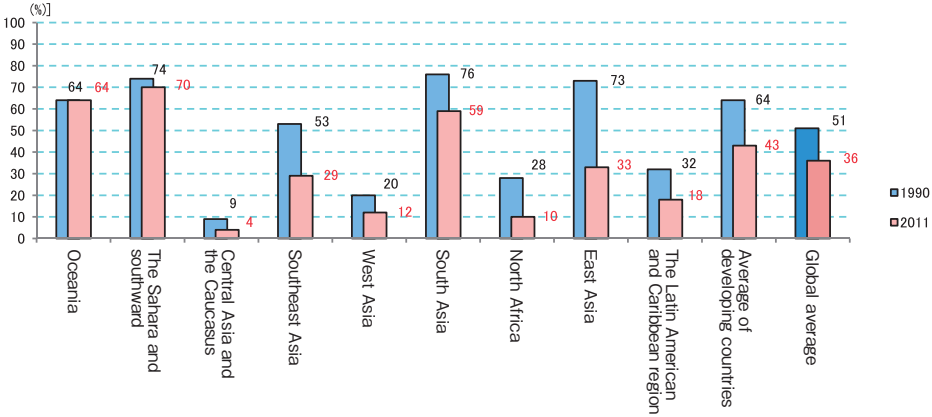
The UN says of 2011, about 768 million people, 11% of the global population, could not use safe drinking water, while about 2.5 billion, 36%, could not use sanitation facilities including toilets.

Those who cannot ensure safe drinking water spend hours each day "drawing up water" to get the water they need to live, with which children or women are tasked in many developing countries. If more safe water is ensured, they will no longer have to draw up water, children will have time to attend school and it will stimulate the social progress of women. Ensuring safe water is crucial.

Drinking -water coverage trends by developing regions and the world, 1990-2011



Sanitation coverage trends by developing regions and the world, 1990-2011



Notes: Prepared by the Water Resources Department of the Ministry of Land, Infrastructure, Transport and Tourism based on WHO and UNICEF, "PROGRESS ON SANITATION AND DRINKING-WATER 2013 UPDATE"

Whether safe drinking water can be used is determined by whether improved water sources can be used. "Improved" means bringing running water to households, or the presence of public water towers, artesian wells, antipollution wells, springs, and rainwater collecting devices, etc. "Unimproved" means wells and springs are bare, water in rivers and ponds, water sold by traders, or supplied by water tank truck is used.

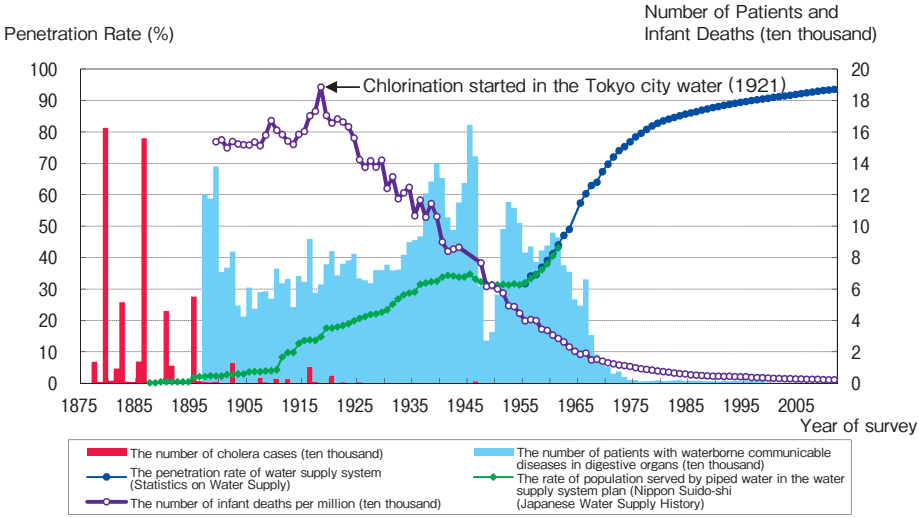
Photo provided by Shinichi Kuno / JICA

II Water Use

Improvement of Water Use and Sanitary Environment

In Japan, cholera broke out at the beginning of the Meiji Era (1868-1912), and the construction of modern water facilities started as a sanitary measure. The introduction of chlorination slashed the number of infant deaths and fatalities among patients with waterborne communicable diseases in digestive organs, such as cholera and dysentery. In Japan, the water supply system is at the highest level in the world and constitutes infrastructure that supports the life of people and socioeconomic activities, with a penetration rate exceeding 97%. Anyone, including non-Japanese, can directly drink tap water with peace of mind anywhere in Japan.

Water Supply System Coverage Rate, the Numbers of Patients with Waterborne Communicable Diseases and Infant Deaths



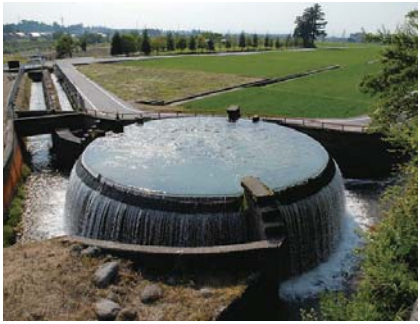
Notes:
1. Prepared by the Water Resources Department of the Ministry of Land, Infrastructure, Transport and Tourism
2. The penetration rate of the water supply system is according to "Nippon Suido-shi" (Japanese Water Supply History) and "Statistics on Water Supply" (the Ministry of Health, Labour and Welfare).
3. The number of cholera cases is according to "Nippon Suido-shi" (Japanese Water Supply History) and "Statistics on Water Supply" (the Ministry of Health, Labour and Welfare).
4. The number of infant deaths is according to "Demographic Statistics" (the Ministry of Health, Labour and Welfare).
5. The number of patients with waterborne communicable diseases in digestive organs is the number of cholera, dysentery, typhoid, and paratyphoid patients according to "Nippon Suido-shi" (Japanese Water Supply History) (1877-1896) "Epidemic Statistics" (the Ministry of Health, Labour and Welfare) (1897-1999) (no statistical data in and after 2000).

Wisdom and Ingenuity to Use Water

Japan, which has been growing rice since old times, has a history of frequent conflicts over water, which is essential for rice cultivation. To settle such conflicts over water peacefully, Japan has developed turn-out sluices such as water division inlets and circular tank diversion works and effective techniques to mitigate drought such as rotative irrigation systems.

Sanbu-ichi Yusui (Hokuto city, Yamanashi prefecture)
Photo provided by Hokuto city

A facility to distribute agricultural water evenly. It is said that in the Sengoku period, triangular stones were placed in the water division inlet to channel the flowing water into three directions and distribute agricultural water evenly to downstream villages. Together with the surrounding springs, Sanbu-ichi Yusui belongs to the plateau springs in the southern foothills of Yatsugatake and is selected by the Ministry of the Environment as one of a hundred exquisite waters of Japan. About 8,500 tons of water at 10 degrees centigrade pours out per date.



CircularTank Diversion (Uozu city, Toyama prefecture)
Photo provided by the Uozu Chamber of Commerce and Industry

A facility to distribute agricultural water fairly. Water which pours out of the central cylindrical water tank is distributed to water channels according to a predetermined distribution ratio. Regardless of whether the quantity is large or small, the distribution ratio remains unchanged and the approach is clear. It has been built all over Japan since the Taisho Period (1912-1926) as a facility that can distribute water fairly.

Facility to Use Water

Various facilities are constructed and operated to enable us to use water safely and on a daily basis with peace of mind. The facilities include "dams" to store water, "weirs" to withdraw river water, "water channels" to carry water, "water treatment plant" to purify the drawn water, "sewage treatment plants" to purify water used at homes, plants, etc., and others.

Dam
A facility storing water so that it can be used at any time in plowlands, factories, and our daily lives. It prevents flooding during rainstorms and enables us to use water during a drought (Photo: Naramata Dam
(Japan Water Agency))

Waterway
A facility carrying water taken from a river to another, a water treatment plant, and other necessary places. (Photo: Tone Driving Channel
(Japan Water Agency))

Weir
A facility taking water (raw water) for use water in rivers, etc.
An estuary weir also prevents salt damage caused by the reverse-flow of seawater. (Photo: Tone River Estuary Weir (Japan Water Agency))

Water Treatment Plant
A facility purifying water e.g. taken from a river, etc. (raw water) into tap water that can be safely drunk. (Photo: Asaka Purification Plant (Tokyo Metropolitan Government Bureau of Sewerage))

Sewage Treatment Plant
A facility treating water already used and recycling it into clean water. (Photo: Shibaura Water Reclamation Center (Tokyo Metropolitan Government Bureau of Sewerage))

Many facilities for using water were constructed with a sense of urgency from the mid-1950s to cope with the surge in water demand during the high economic growth period in Japan.

Currently, the number of such facilities having exceeded their expected service lives is increasing and in future, a further surge in aging facilities is expected.

There is therefore a need to update buildings according to the plan as well as performing daily maintenance activities, including inspections/inspection tours of facilities, abnormality monitoring, repairs, etc.

People Supporting Water Infrastructure

Night-time water pipe leakage detection
Photo provided by the Tokyo Metropolitan Government Bureau of Sewerage

Investigating water quality at the Water Quality Center
Photo provided by the Tokyo Metropolitan Government Bureau of Sewerage

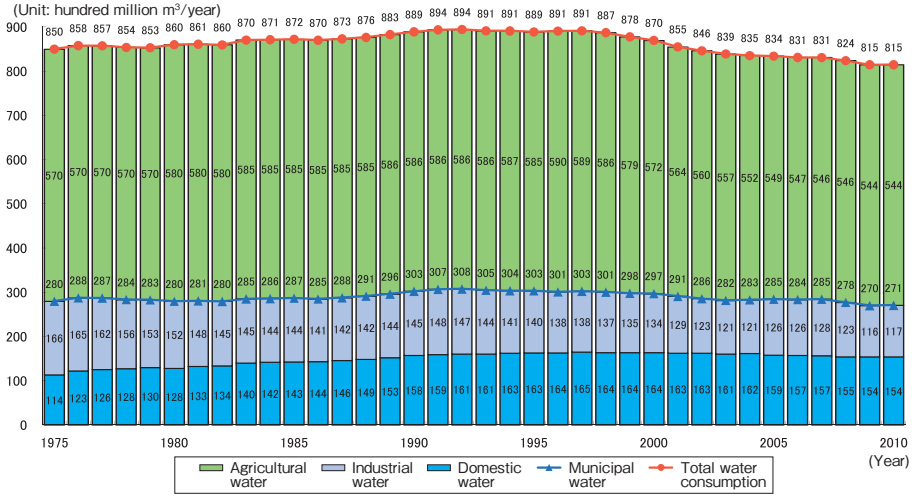
Leak measurement in the dike (Shimokubo Dam)
Photo provided by: Japan Water Agency

Current Status of Water Use

The 2010 water use in Japan is about 81.5 billion m^3 a year, broken down as follows: about 15.4 billion m^3 for domestic water, about 11.7 billion m^3 for industrial water, and about 54.4 billion m^3 for agricultural water.

Water is also used to generate hydraulic power, ambient water, snow-melting, aquiculture, etc., and is a precious resource for Japan, which lacks natural resources.

Water Use Nationwide

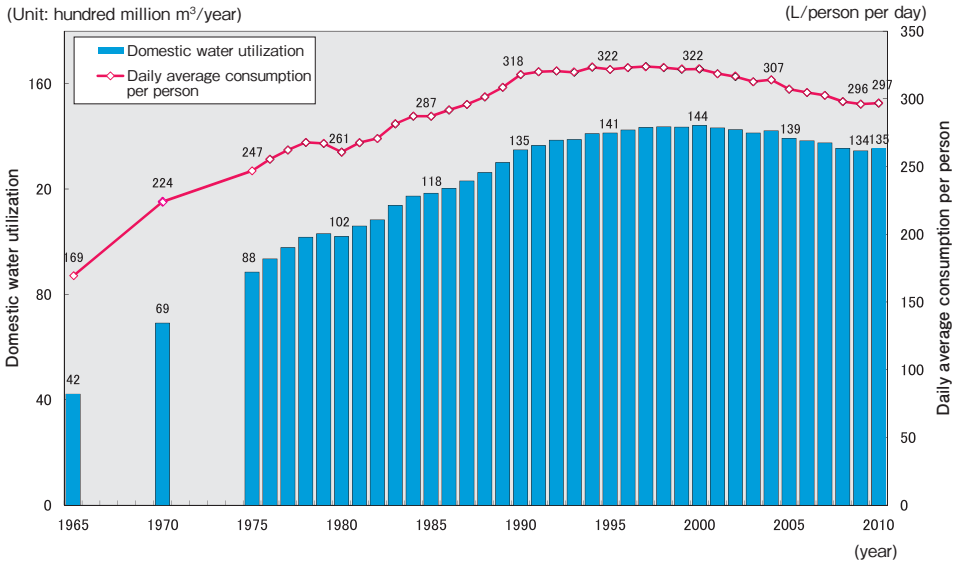


Notes:
1. Prepared by the Water Resources Department of the Ministry of Land, Infrastructure, Transport and Tourism
2. Values are based on the quantity of water intake estimated by the Water Resources Department, the Ministry of Land, Infrastructure, Transport and Tourism, including the quantity of water reduced to rivers again after use.
3. Industrial water is the amount of fresh water provided to business places with four or more employees. However, the water used in public services is not included.
4. As for agricultural water, the 1980 estimated figures are used for the 1981-1982 values, the 1983 estimated figures for 1984-1988 values, and 1989 estimated figures for 1990-1993 values.
5. The totals may differ due to rounding off of the numbers.

Domestic Water

Domestic water has various uses, such as drinking, cooking, washing, bathing, cleaning, flushing lavatories, and water spray, as well as in urban fields such as schools, offices, hospitals, department stores, hotels, and restaurants. The 2010 domestic water consumption was about 13.5 billion m^3 a year and is gradually declining after peaking in around 1998. In addition, the daily average consumption per person in 2010 is 297 L/person per day and has been gradually declining over the years.

Transition in Domestic Water Consumption



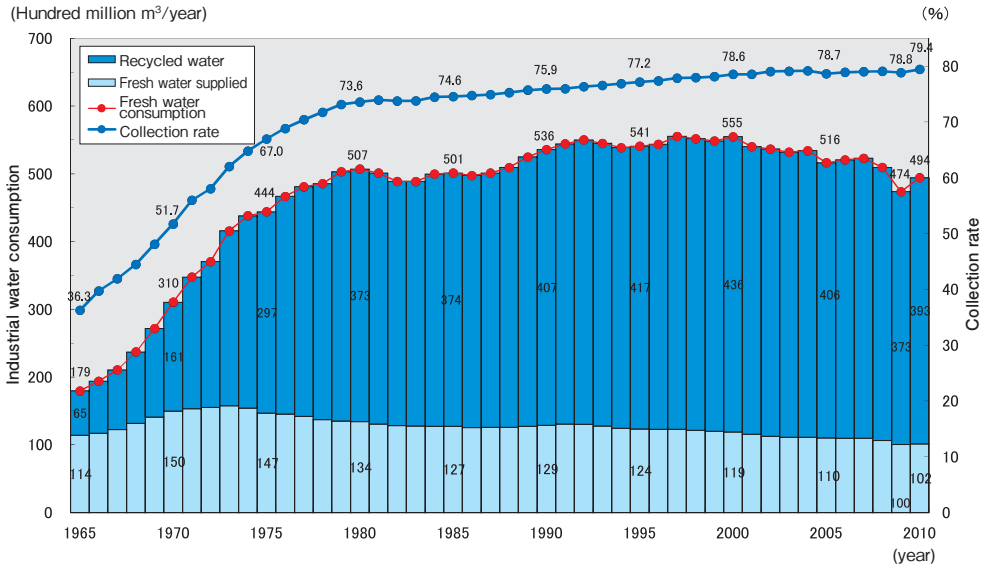
Notes:
1. Prepared by the Water Resources Department of the Ministry of Land, Infrastructure, Transport and Tourism
2. Values in and after 1975 were Investigated by the Water Resources Department of the Ministry of Land, Infrastructure, Transport and Tourism.
3. Values in 1965 and 1970 are according to the "Statistics on Water Supply" by the Ministry of Health, Labour and Welfare.
4. Based on the effective water volume.

Industrial Water

Industrial water is supplied for industrial activities, including the manufacturing industry and used over a wide scope, such as for raw materials, product treatment/washing, boilers, and temperature control.

Freshwater consumption for industrial water (the total water volume used in the product processing) was skyrocketing until the first half of the 1970s, but has remained virtually constant in recent years. This is thanks to successful water-saving efforts by companies, and due to changes occurring in the industrial structure from heavy industry to mechanical industry and other manufacturing/assembling industries; and latter ratio of which is higher. In addition, the recycling rate (recycled water quantity/fresh water consumption) rocketed in the 1970s and has continued increasing slightly from the mid-1980s. The recycling rate has also improved as well as using water effectively, although action is still required for the environmental effluent standard. Consequently, the amount of fresh water (new water supply from rivers, etc.) continued to increase by the mid-1970s, but has been declining or leveling off since 1974.

Transition in Industrial Water Consumption



Notes:

1. Prepared by the Water Resources Department of the Ministry of Land, Infrastructure, Transport and Tourism based on "Census of Manufactures" by the Ministry of Economy, Trade and Industry. (As "Census of Manufactures" released daily amounts, the annual amount is calculated by multiplying it by 365.)
2. The values are those of business places with 30 or more employees.
3. However, the water consumed in public services is not included.

Agricultural Water

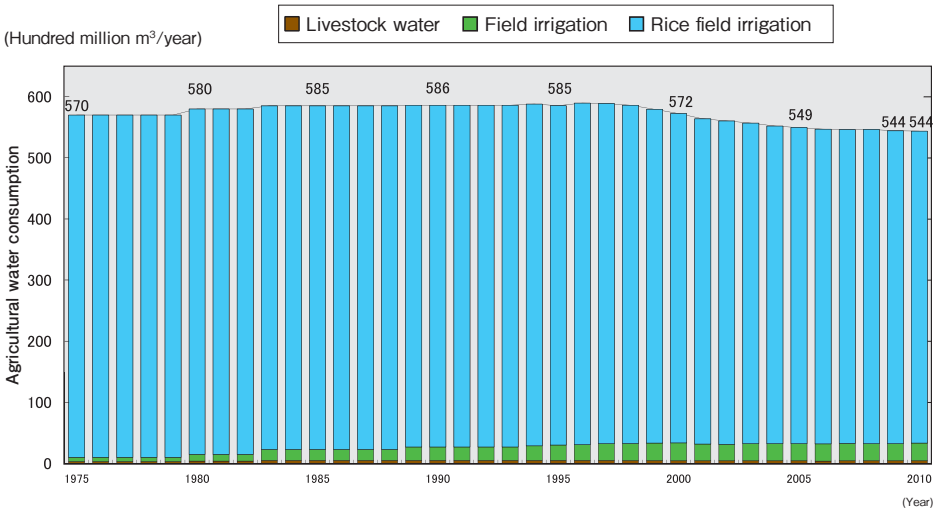
Agricultural water comprises (1) rice field irrigation required to raise irrigated rice, (2) field irrigation required to raise or improve the qualities of vegetables and fruit, and (3) livestock water required to feed animals such as cattle, pigs, and chickens. Rice field irrigation comprises about 94% of agricultural water.

However, rice field irrigation, which consumes the majority of agricultural water, has been declining in recent years, while field irrigation has remained virtually constant. The 2010 consumption was about 54.4 billion m^3/year.

Agricultural water is not only used for agricultural production – it also functions as a basic local resource in rural areas, playing important roles in soil conservation, groundwater occurrence, the creation of space to enjoy water (easy access to water), and preserving scenery and biological ecosystem.

The consumption of agricultural water is considerable, although most of the water returns to rivers and groundwater to be reused as domestic and agricultural water downstream.

Transition in Agricultural Water Consumption



Notes:
1. Prepared by the Water Resources Department of the Ministry of Land, Infrastructure, Transport and Tourism
2. The agricultural water consumptions here are estimated volumes.
3. The value in 1975 is estimated by the Ministry of Agriculture, Forestry and Fisheries (MAFF) and those in other ages by the Water Resources Department of the Ministry of Land, Infrastructure, Transport and Tourism. Incidentally, the 1975 estimated figures are used for the 1976-1979 values, the 1980 estimated figures for 1981-1982 values, the 1983 estimated figures fir 1984-1988, and 1989 estimated figures for 1990-1993 values.
4. Part of the estimation method is reviewed from 1995 and on.

Water for Power Generation

Water for power generation uses the potential energy of water to generate hydraulic power and hydraulic power generation comprises about 8.3% of energy generated in Japan.

Compared with other energy sources, hydraulic power generation constitutes purely domestic energy, which can be used on a semi-permanent basis and has high stability of supply, reflecting the characteristics of a renewable clean energy that does not produce carbon dioxide (CO_2) or sulfur oxides along with electric power generation.

In addition, the number of smaller hydraulic power generation units generating output of 100 kw or less using existing irrigation channels has been increasing in recent years.

Hydraulic Power Generation (Dam)
The hydroelectric plant generates electricity, effectively using water discharged from Urayama Dam.
(Photo: Urayama Dam (Japan Water Agency))

Ambient Water

As the demand for a rich, moisturizing, and comfortable living environment has been escalating in recent years, waterfront spaces including rivers and waterways are prioritized from the perspective of enjoying water (and easy access to it). It is therefore desirable to improve access to water such as via accessible rivers and waterways, artificially flushing water, and further purifying it. The water to be used for these purposes is ambient water.

Before Passing Water

After Passing Water

Case of Sendai City, Rokugo Canal, and Shichigo Canal
No water flows in Rokugo and Shichigo Canals during the non-irrigation period (winter) when no agricultural water is used. Local residents requested improvement to let water flow, allowing the landscape to recover and to help mitigate odors. Therefore, parties ruling on irrigation in Sendai city re-evaluated their stance and after a trial involving the channeling of water in 1999, water introduction started in January 2005. Many local residents replied to questionnaire surveys, saying, "The landscape in the surrounding of waterway has improved," "Odor has been eliminated or alleviated," and "Water should be conveyed year-round in future."
Source provided by the Ministry of the Environment and Sendai city

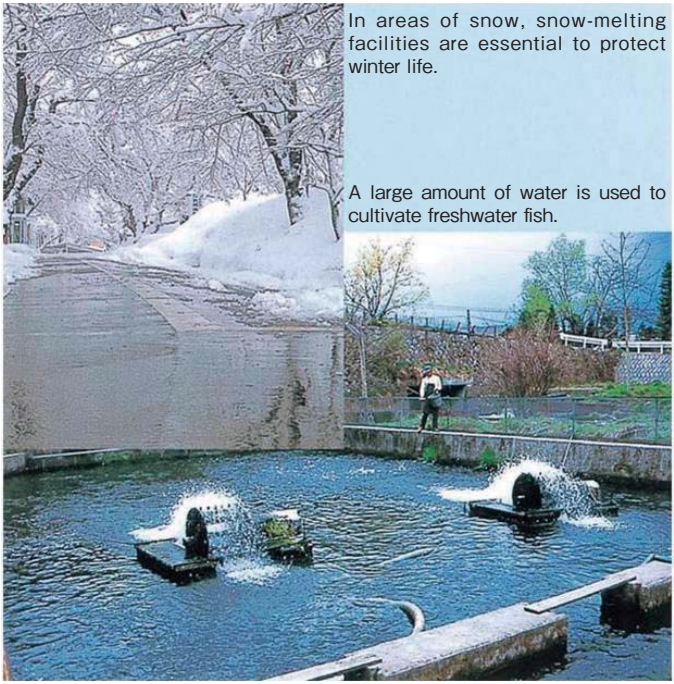
Venues for recreation and relaxation and playgrounds featuring water, offering moisture and peace of mind are established by restoring clear streams in irrigation channels previously having dried up and building artificial streams in various regions.

Other Water Use

Snow is often removed by snow-melting facilities using water such as snow-melting pipes for snow on roads and removing snow in snow-carrying ditches in heavy snowfall areas along the Japan Sea coast and inland regions from Hokkaido to the Sanin region.

As snow-melting water requires a relatively high temperature, about 40% of overall consumption (1.33 billion m^3 in 2011) depends on groundwater, meaning some regions suffer from decreasing groundwater level.

Fish farming water is used to farm trout, sweetfish, eel, colored carp and goldfish, etc. A large amount of water is used for fish farming, although most is returned to rivers to be recycled.



In areas of snow, snow-melting facilities are essential to protect winter life.

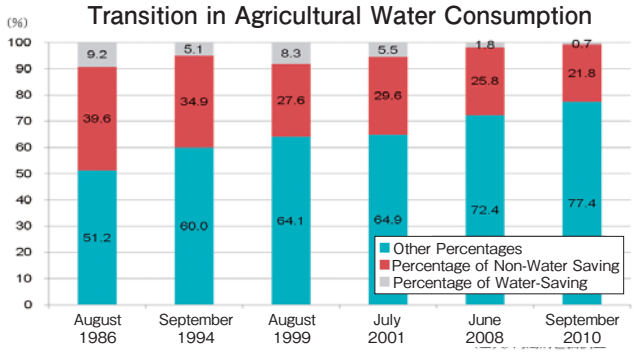
A large amount of water is used to cultivate freshwater fish.

Effective Use of Water

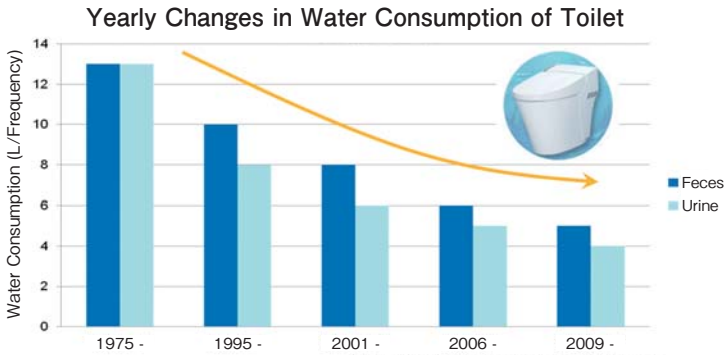
Efforts are made to use domestic water effectively by taking measures to prevent water leakage from pipes and spreading water-saving equipment such as water-saving type toilets, etc. As for city water supplies, measures against leaks from water pipes have been developed, whereupon fewer leaks have occurred and the efficacy rate (water amount excluding leaked water from the supplied quantity) has reached a globally unrivaled level of 90%. In addition, according to an opinion poll by the Cabinet Office, the rate of those saving water is 77.4%. Compared with past similar polls, this shows increasing awareness of the need to save water.

Efforts are made to use industrial water effectively from the perspective of saving water and preserving the environment, by repeatedly using water after cooling and purifying water which has already been used.

Efforts are also made to use agricultural water effectively, such as repairing old waterways and establishing pipelines to prevent water leakage.



Source: Public Opinion Survey by Cabinet Office



Source: Prepared by the Water Resources Department of the Ministry of Land, Infrastructure, Transport and Tourism Based on Documents of the Japan Sanitary Equipment Industry Association

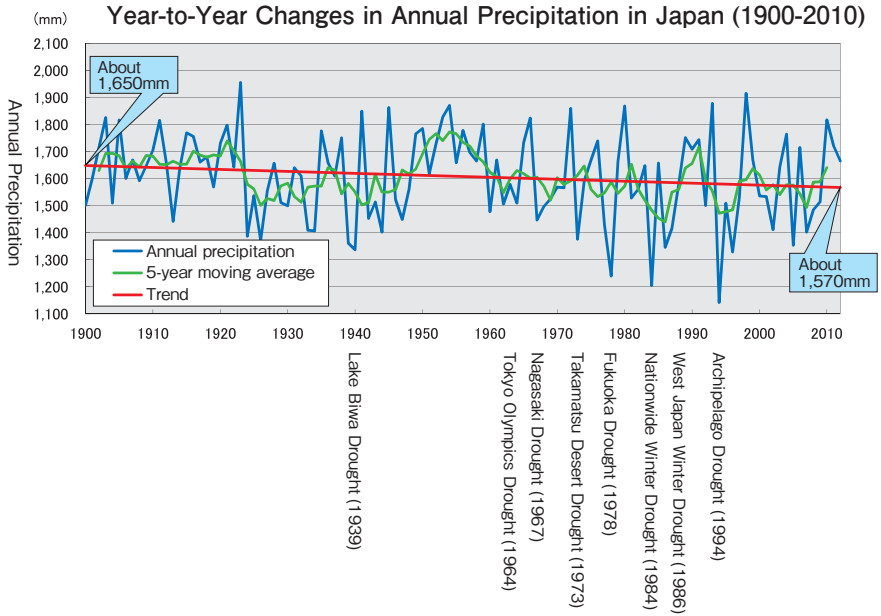
III Frequent Drought

Drought

The trend of a nationwide decline in rainfall started in around 1965, when drought affected various regions. To date, large-scale droughts have occurred, including the 1978 Fukuoka Drought, the 1994 Archipelago Drought, and the 2005 drought centering in West Japan. Over the past 20 - 30 years in particular, the gap has gradually widened in annual precipitation between years with little rain and those with abundant rain.

When a drought occurs, city water is cut off and water is supplied under reduced pressure, which significantly impairs domestic life and social activities, hindering the ability to prepare for a meal and use a flush lavatory. In addition, socioeconomic activities are also significantly affected. As for industrial water, factory operations are reduced or stopped and limitations on agricultural water mean crops fail to thrive and die.

This is proof that water is an important resource needed daily and without fail.



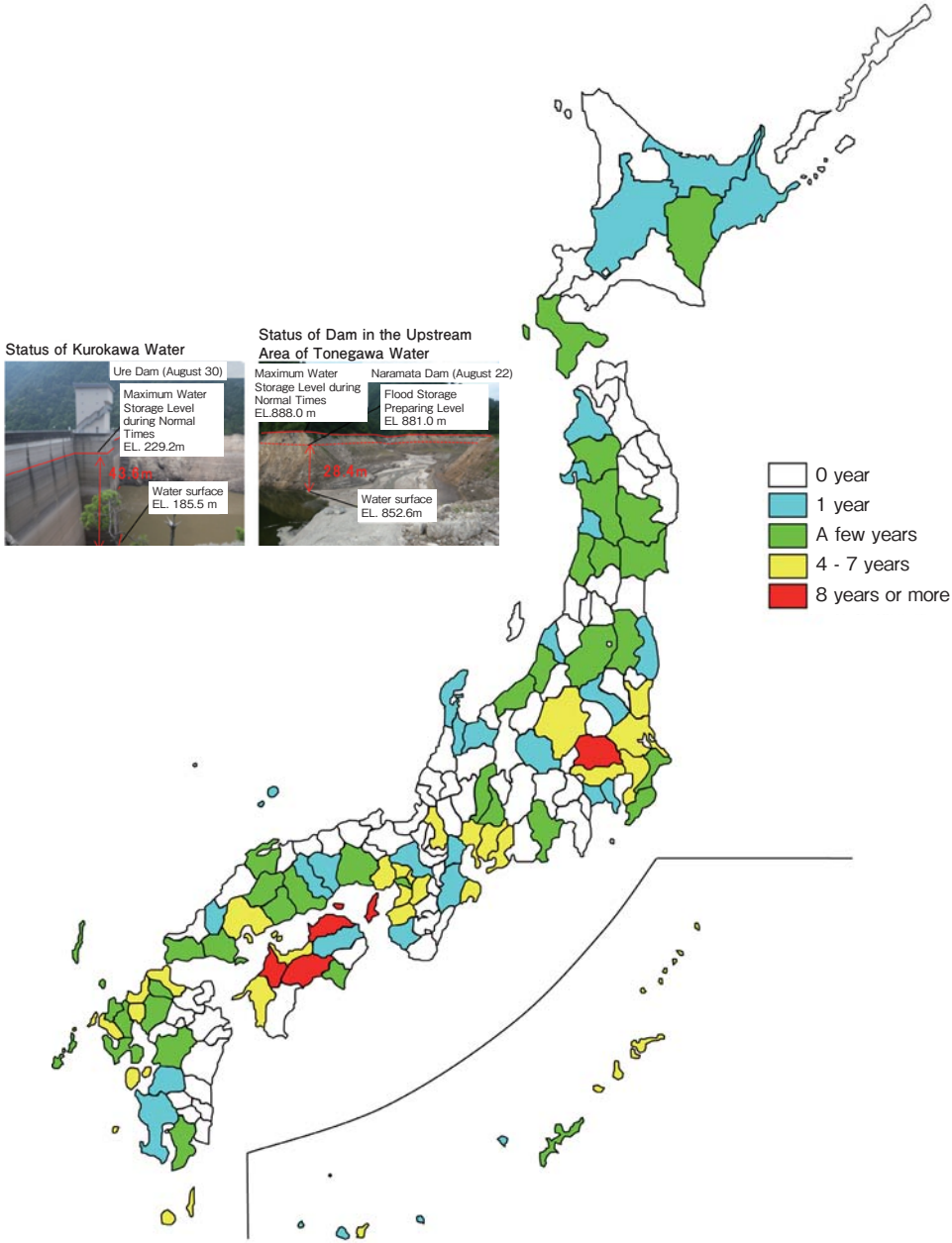
Notes:
1. Prepared by the Water Resources Department of the Ministry of Land, Infrastructure, Transport and Tourism based on JMA documents
2. The arithmetical mean of 51 points in Japan
3. The trend is based on a regression line.
4. The number of observation stations may change year by year and may not be 51 due to missing observations, etc.

Comparison between Precipitation A Century Ago and Current Precipitation (Unit: mm/year)

Precipitation (Trend)		Fluctuation Band		
		Period	Lower - Upper Limits	Standard Deviation
1900	About 1650 mm	1900 ～ 1909	-150 ～ +180	112.2
2012	About 1570 mm	2003 ～ 2012	-220 ～ +250	159.2

*Precipitation (trend) is a calculated value based on the data from 1900 to 2012 by regression computation.

The Status of Drought Occurrence over These 30 Years

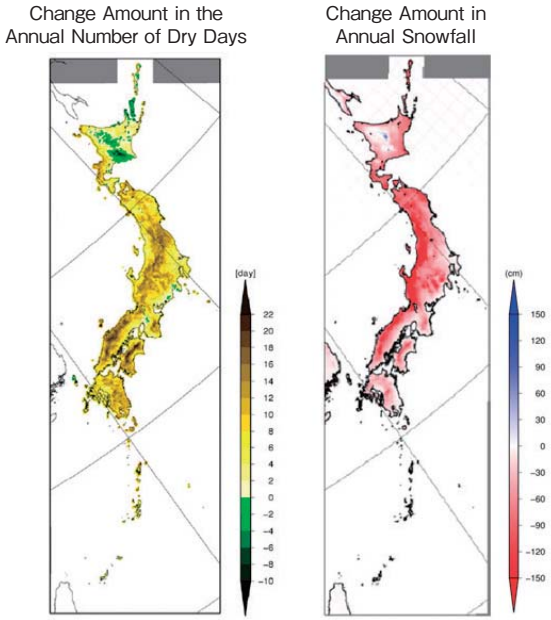


Notes:
1. Investigated by the Water Resources Department of the Ministry of Land, Infrastructure, Transport and Tourism
2. The number of years when the decrease/stoppage of water occurs in the water supply system for 30 years from 1983 to 2012.

Impact of Climate Change on Water Resources

The Working Group I (WGI) Fifth Assessment Report "Intergovernmental Panel on Climate Change (IPCC)" was released in September 2013 and showed there is no room for doubt concerning warming of the climate system, which is likely to cause the global mean temperature to rise by 0.3 - 4.8 degrees Celsius, global mean sea levels to rise by 0.26 - 0.82 m, and significantly increase the likelihood of stronger and more frequent extreme precipitation.

It is pointed out that in Japan at the end of the 21st century, the average annual temperature will rise by 3 degrees Celsius, the sea level around Japan will be 0.09 - 0.19 m per century in case of the A1B scenario of IPCC SRES scenario and 0.05 - 0.14 m/century in case of the B1 scenario. (This, however, does not include the contribution made by the reduction in the ice caps in Greenland and Antarctica.) As for precipitation, intensified drought due to the increase in the number of dry days and the decrease in snow accumulation are expected.



Japan Medical Association (JMA) Model (NHRCM 5km), SRES A1B Scenario is used. Future (Average Value between 2076 - 2095) - (Average Value between 1980 - 1999)
Source:Chikyu Ondan-ka Yosoku Joho Dai 8 Kan (Global Warming Precipitation Information Vol.8)

Notes:
1. A1B Scenario: the "high-growth society scenario," and the world will see further economic growth and significant reforms will be made in education, technology, and others. Balancing the various energy sources is prioritized.
2. B1 scenario: the "sustainable Development society scenario," which helps both preserve the environment and boost economic development on a global scale.

IV Meeting the Demand for Water

Development of River Water

River water is the most common water source. The 2010 intake of municipal water (domestic and industrial water) and agricultural water constituted about 81.5 billion m^3 per year; 80% or more of which was taken from rivers.

As water resources are developed for multiple purposes and should be developed in advance from the long-term perspective, development should be promoted according to the plan from a broader comprehensive perspective.

Sameura Dam (Kochi prefecture)
by Japan Water Agency

Tone Driving Channel
(Saitama and Gunma prefectures)
by Japan Water Agency

Forests Protecting Water Sources

We use water and reap the benefit from forests protected and cultivated by many people for generations in reservoir areas.

Forests also have a water-yielding function to provide relief during flooding and drought and purifying water by the action of soil created in forests. This function is vital in a country like Japan with many steep mountains and significant seasonal variation in precipitation.

To ensure water resources are available, there is a need to build and maintain Water Resource supply facilities including dams as well as protect and cultivate forests, which play key roles in water source yield, as national common property.

Tokuyama Dam (Gifu Prefecture) by Japan Water Agency

Preservation and Use of Groundwater

Groundwater has excellent characteristics of easy utilization in close water resources, minimal variation in year-round water temperature, and good drinking water.

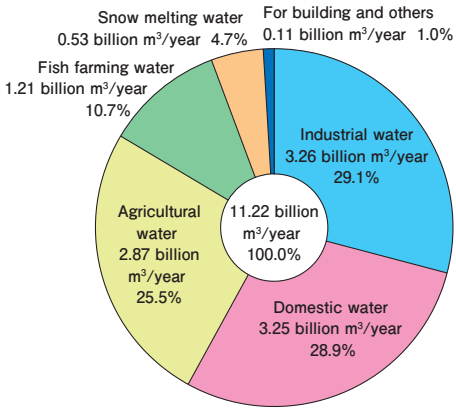
These characteristics explain why it has been used through the ages. In recent years, it has been used for various purposes, exploiting specific characteristics and constitutes an important water resource, accounting for about 12% of total water consumption.

Conversely, excessive drawing of groundwater triggers environmental problems, including land subsidence and salinization of groundwater. After World War II, the consumption of groundwater increased as industry developed and some regions drew excessive amounts, triggering a range of environmental issues.

Groundwater drawing was then restricted in such areas and attempts were made to use it properly as well as to turn water resources from groundwater to rivers by building dams and other facilities.

At the same time, attempts were made to recharge groundwater through osmosis of rainwater into the ground and building underground dams to use groundwater effectively.

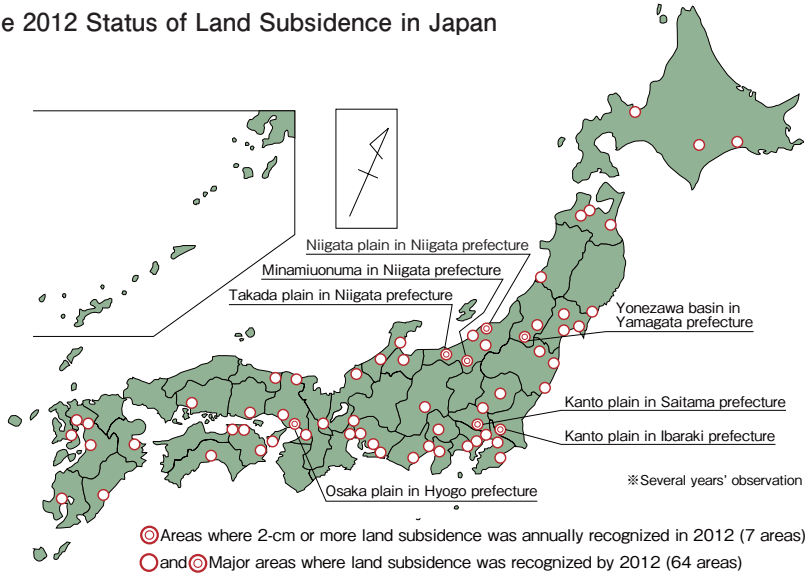
Percentages of Ground Water Uses



Notes:

1. Values of domestic and industrial water (the 2010 consumption) are estimated through investigation by the Water Resources Department of the Ministry of Land, Infrastructure, Transport and Tourism
2. Agricultural water is according to "Dai Gokai Nogyo yo Chikasui Riyo Jittai Chosa (Fifth Investigation of Actual Circumstances of Agricultural Groundwater Use)" (investigated in 2008).
3. Values of fish farming and snow-melting water are estimated through investigation by the Water Resources Department of the Ministry of Land, Infrastructure, Transport and Tourism
4. The value of water for building and others is from the investigation by the Ministry of the Environment, and constitutes the total usage by local authorities (13 prefectures) the water consumption of which in 2010 is reported by notices according to regulations.

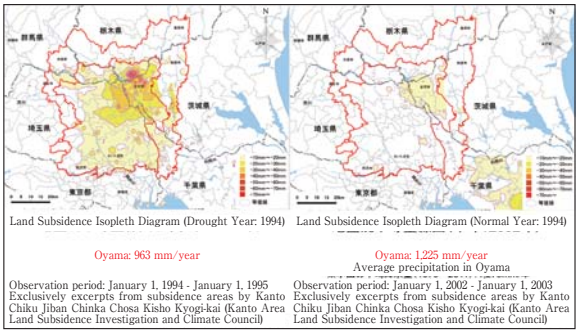
The 2012 Status of Land Subsidence in Japan



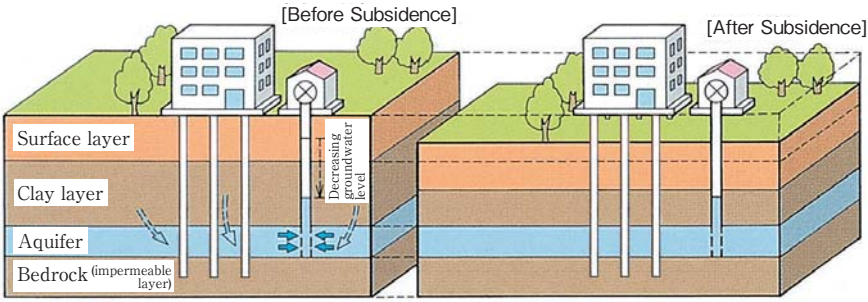
Source: the Ministry of the Environment The 2012 Status of Land Subsidence in Japan

Progress of Land Subsidence in Drought Years

Groundwater drawing restrictions and conversion of water resources into surface water helped ease the significant land subsidence, which had occurred. However, land subsidence affected the northern Kanto plain due to the surge in groundwater drawing at the time of drought.



Land Subsidence Mechanism



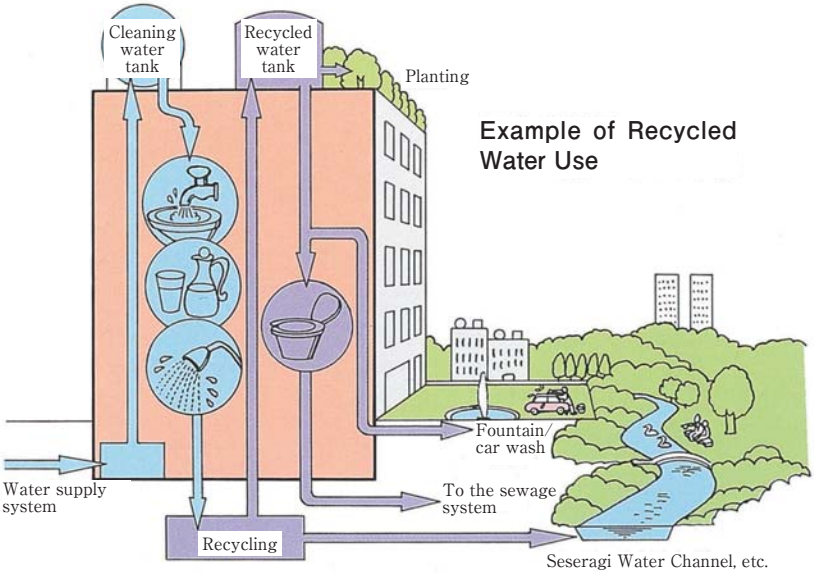
The decrease in groundwater reduces the overall volume due to the squeeze of water in the clay layer, land subsidence, and slippage of wells and foundations of buildings.

Rainwater/Recycled Water Use

The rainwater/recycled water use involves recycling used water and rainwater after water treatment for cooling, flush lavatories, sprays, and others, the quality level which can be lower than drinking water. Compared with water supply and sewage systems, we sometimes use the term "reclaimed wastewater reuse system."

Rainwater/recycled water use is performed in about 3,700 facilities (in about 60% of the Kanto Coastal and Northern Kyushu areas), and it is estimated that the consumption of rain/recycled water constitutes about 260 million m^3/year, equivalent to about 0.3% of domestic water consumption in Japan. (As of the end of 2010, investigated by the Ministry of Land, Infrastructure, Transport and Tourism)

As of now, many challenges remain: the treated water quantity is not stable and the utility cost varies depending on consumption. There is a need to further pursue research and development and systematically promote rainwater/recycled water use in future to use water effectively.



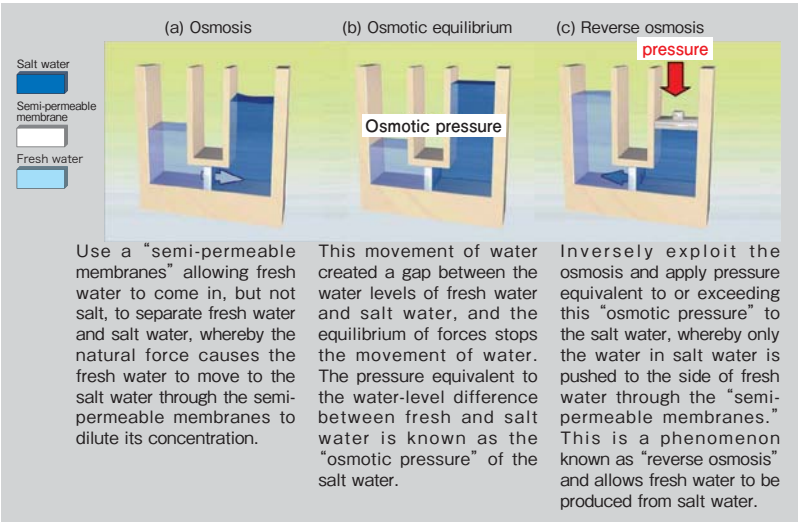
Desalination of Seawater

Expectations for the desalination of seawater, which comprises about 97% of water on Earth, is growing as a new future Water Resource development. Japanese seawater desalination plants reach a water generating capacity of 224 thousand m^3/day as of the end of March 2013. This technology is mainly promoted as a method of obtaining domestic water in regions like remote islands, where Water Resource development, including dams, is difficult. Technology is developed to implement and promote seawater desalination, aiming to reduce costs and save energy.

Uminonakamichi Nata Sea Water Desalination Center

A seawater desalination facility constructed in Nata, Higashi ward, Fukuoka city, Fukuoka prefecture. This is one of the largest Japanese facilities, generating a maximum water volume of 50,000m^3/day. Photo provided by the Fukuoka District Waterworks Agency

Principle of Seawater Desalination (in Case of Reverse Osmosis Method)



V Our Life and the Reservoir Area

While dams must be constructed to utilize water, they sometimes submerge houses and agricultural land and significant impact on the lives of those in surrounding areas as well as the submerged areas and the future of these reservoir areas.

Understanding and cooperation on the part of those in reservoir areas are essential when building a dam. People in areas benefiting from dam water must feel sympathy and gratitude for those in reservoir areas.

Therefore, when a dam is constructed, which triggers a significant change in the status of the local area due to submergence, the national, prefectural, and municipal governments take measures to develop the reservoir area and develop/maintain its living environment and industrial infrastructure to mitigate the impact on the local community and stimulate and support the resettlement of those involved in the submergence. To promote this, downstream beneficiaries support financially in various regions.

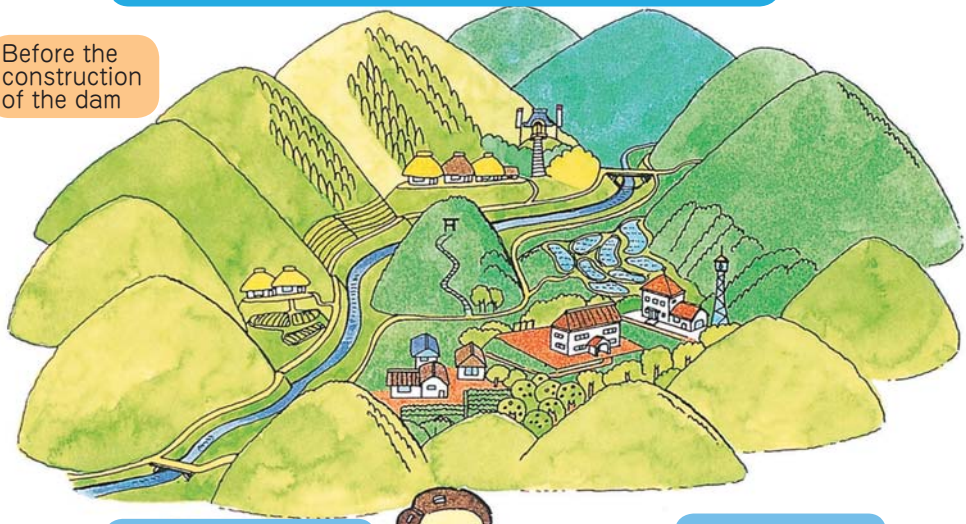
To protect the Water Sources we all use, each of us should deepen our understanding and relationship with people in the reservoir areas by interacting with them; not only during but also after the dam construction and cooperating in various aspects.

Mountains in Water Resources
(Naganohara town, Gunma prefecture)

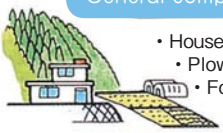
Carrying agricultural/municipal water
Water pipe bridge (Kiso River Water)

Measures for the Reservoir Area Development

Before the construction of the dam



General compensation

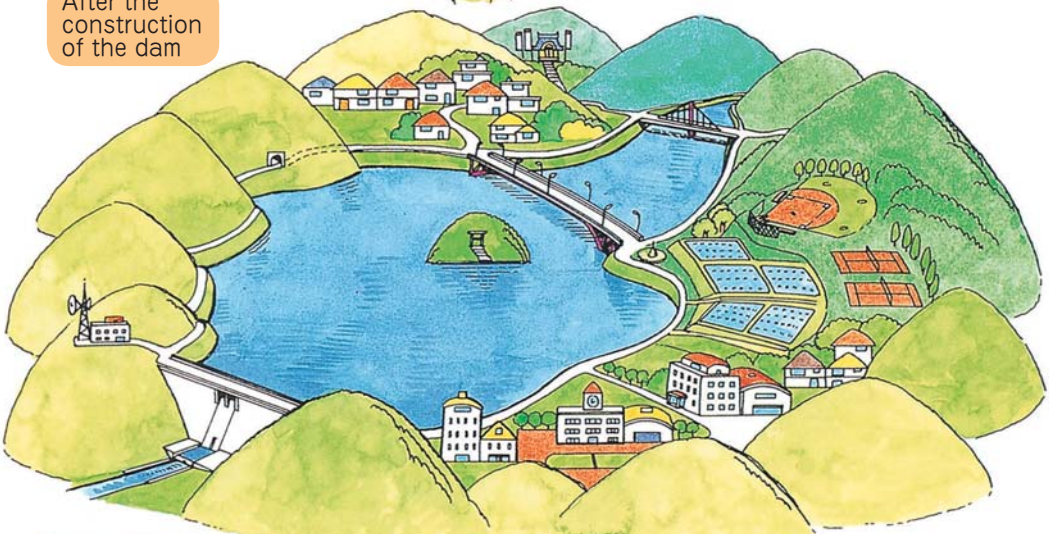


- House
- Plowland
- Forests, etc.

Public indemnity

- Roads
- Schools
- Town halls, etc.

After the construction of the dam



Development project based on the Act on Special Measures concerning Measures Related to Water Resources Areas

- Improvement of industrial infrastructure
- Improvement of living environment
- Water quality conservation facilities, etc.

Livelihood rehabilitation measures, through reservation area funds

- Assignment of livelihood rehabilitation counselors
- Interest subsidy to obtain a substitute land
- Support community development and interaction between upstream and downstream, etc.

VI Construction of a Sound Water Cycle System

Water circulates on Earth by solar energy and the gravitational pull of the Earth. We have used water in this big circulation in an unchanged manner, repeated since time immemorial. We exploit water and change the course of its circulation. In other words, this shows how our individual efforts may significantly contribute to building a sound water cycle system.

However, it is true that this water cycle system has changed against the concentration of population and industries in urban areas during the high-growth period, the expansion of urban areas, depopulation, climate changes in recent years, etc., and caused problems such as water pollution, impacts on ecosystems, and increased floods and drought damage.

This shows the importance of building a society in future to ensure that water functions with an appropriate balance to maintain human behavior and environmental preservation in a series of water flows centering on the river basin (construction of a sound water cycle system).

Specifically, it is important for each of us to use water carefully as well as striving to preserve water source-protecting forests and cultivate groundwater.

■ Renewal Concept of Water Cycle System in the Neyagawa River Basin (Neyagawa city, Osaka prefecture)

The Neyagawa river basin is selected as a model river basin in the renewal concept of the water cycle system in the "Urban Renaissance Project (the third decision)" determined by the Urban Renaissance Headquarters on December 4, 2001. Efforts are made to renew the water cycle system via mutual cooperation among public sectors; transcending the vertically structured administration, and collaboration with local residents and NPOs

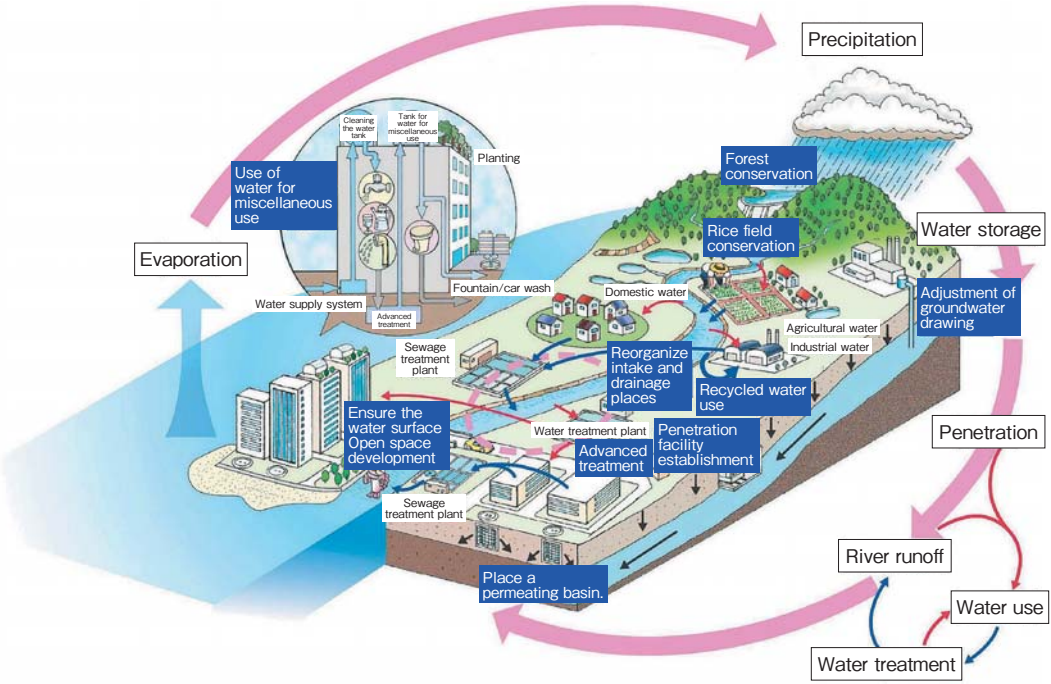
Development of Naturally Diverse Waterfront Space along the Neyagawa River

Before maintenance

After maintenance

Photo provided by Neyagawa city

Construction image of a sound water cycle system



Various problems resulting from urbanization

- Decrease in streamflow during the normal period
- Increase in volume flowing from rivers in rainy weather
- Deterioration of stable feeding capacity of water supply facilities
- Deterioration of water quality
- Depletion of spring water
- Land subsidence, etc.

The water cycle system should be sound

- Ensure safe and delicious water
- Prevention of urban-type flood disasters
- Ensure streamflow in the normal period
- Drought damage alleviation
- Heat island phenomenon restriction
- Assurance of various ecosystems

VII "Japan Water Day" and "Japan Water Week"

To give citizens a chance to reconsider the origin of water used carelessly in daily life, as well as its role and preciousness, Japan designates August 1 as "Japan Water Day" and the week from August 1 to 7 as "Japan Water Week" and nationally holds various events.

Let's participate in events related to Japan Water Week in various regions to collectively consider water.

Japan Water Week Main Events (Example for 2013)

- **The National Water Essay Contests for Junior High School Students**
  The essay contest has been held for junior high school students in Japan and at Japanese schools overseas under the theme of "Think of Water" since 1979.
- **Recognized Achievement in Protecting Water Resources Award Winners**
  Individuals and organizations are recognized for their long-year contribution to measures for water resources, preservation of the water environment, cultivation of sources, effective use of water resources, etc.
- **Mizu tono Fureai Photo Contest** (Relationship with Water Photo Contest)
  A photo contest has been held with themes including waterfront recreation and relaxation and landscape with water since 1986.
- **Gathering to Consider Water (Water Week Symposium)**
  The symposium invites an instructor in keeping with a different theme related to "water" and holds a gathering to consider "water."
- **Water Exhibition**
  Panels are exhibited and a booth is opened on the theme "Let's Learn about Water!" for parents and elementary school students.
- **Water Spring Massive Operation**
  Using secondary treatment water, including the remaining hot water in a bath and recycled waste water, we carry out water springs to use water resources effectively and take measures against heat island.

Status of Events Related to Japan Water Week

Water Week Central Event: Water Exhibition

Water Week Central Event: Water Symposium

The 35th National Water Essay Contests for Junior High School Students Award Winners

The 2013 Achievement in Protecting Water Resources Award Winners

Ministry of Land, Infrastructure and Transport and Tourism

We would like your feedback.

Please give us your opinions and suggestions on this booklet.

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