Translating Experience into Action

～ **Experience of JAPAN** ～

March 2003

Ministries and Agencies of the Government of Japan

- Cabinet Secretariat
- Ministry of Foreign Affairs
- Ministry of Education, Culture, Sports, Science and Technology
- Ministry of Health, Labor and Welfare
- Ministry of Agriculture, Forestry and Fisheries
- Ministry of Economy, Trade and Industry
- Ministry of Land, Infrastructure and Transport
- Ministry of the Environment
- Forestry Agency

CONTENTS

Message 1.1

Safe drinking water is of paramount importance in improving both health and living conditions.

(Background

- In the late 19th century, Japan, at that time having a population of 36 million, experienced two cholera epidemics each of which killed more than 100,000 people.
- Control of waterborne infectious diseases such as cholera was an urgent national issue.

Year	Cholera	
	Incidence (No. of persons)	Deaths (No. of persons)
1877	13,816	8,027
1878	902	275
1879	162,637	105,786
1880	1,570	589
1881	9,328	6,197
1882	51,631	33,784
1883	969	434
1884	900	415
1885	13,772	9,310
1886	155,923	108,405

(Proposition)

In 1887, the Central Sanitation Council (established within the former Ministry of the Interior to deliberate public sanitation issues) submitted the "Report on Sanitation Systems in Tokyo" to the Government.

<Main proposals>

(1) The development of a water supply and sewerage system should be given top priority, not as a remedial measure but as a preventive one.

(2) Because the system required the investment of large sums of money, water supply was given priority.

(Reaction of the government)

1887 Cabinet made 'Deciding on the objective of water system construction'

- Governmental policy framework to promote the water supply system -
- Principle of building and management by local water authorities
- Principle of giving the public interest the highest priority

1888 Formation of the government subsidy programs

- Local water authorities had one third of the civil work expenditure subsidized by central government.

1890 Establishment of 'Water Supply Regulations'

Objective: To promote modern water supply system and prevent infectious diseases arising from contaminated drinking water

Contents: -the water supply system will be developed with the public funds of localities
-water works require license from the Minister of Interior
-Governors of Prefecture are responsible for on-site inspection and order necessary important actions to municipalities.

<KEY POINT>

A series of governmental initiatives created favorable conditions to securing development of the water system. These included concentrated investment in facility development through government subsidies and legislation to support the principle of 'public interest first.

Even after construction of the water supply system started in 1887, there were repeated epidemics of waterborne infectious diseases. However, the number of patients infected during these epidemics began to fall, and in the early 20th century, this number had fallen to tens of thousands for each epidemic (see Table 1).

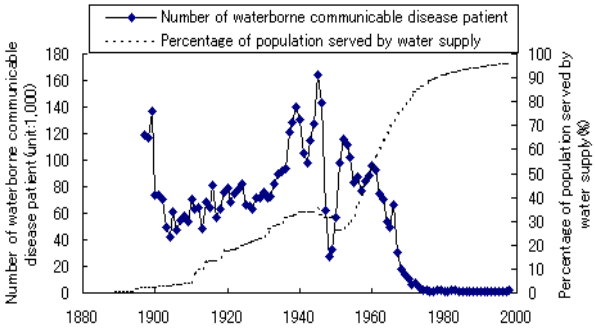


Table 1: Percentage of population served by modern water supply and number of waterborne infectious disease patients

Photo 1: A woman drawing water

(Background)

In comparison with urban areas, small rural villages lagged behind in the development of modern water supply systems Drawing water, which was mainly done by housewives and children, was hard labor both physically and mentally.

(Efforts by local communities)

The idea of ownership spread across the nation through the use of films explaining sanitary education and water systems benefits and boosted local initiatives to expand small-scale water-supply systems. This included the 'Egg Savings Campaign' (selling eggs produced by domestic chickens and setting aside the money for a new water system) and a labor service campaign to reduce the local financial burden.

(Achievements)

- The joint efforts of governmental bodies and local communities led to the rapid development of a modern water supply system. After the 1960s (when the percentage of the population served by modern water supply exceeded 40%) the number of patients suffering from infectious diseases showed a sharp decline. Infant mortality rate, which is often influenced by waterborne infectious disease, also declined steadily (see Table 2). Housewives and children were also freed from the burdensome chore of drawing water.
- At the end of the fiscal year 2000, the percentage of the population served reached 96.6%. The main objective of the Water Supply Law, that is, the improvement of public health and living environment, was thus achieved throughout the country.

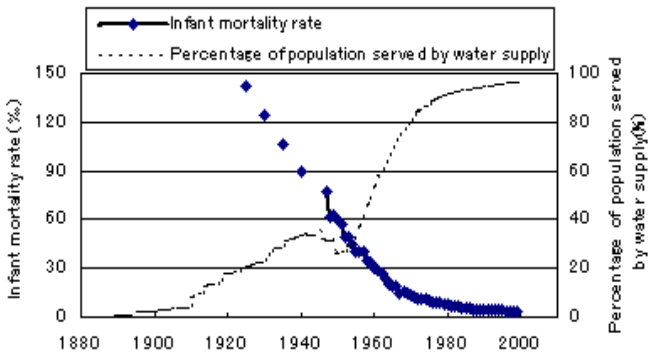


Table 2: Percentage of population served by modern water supply and infant mortality rate

In order to ensure sustainable water supply, prompt measures are necessary. These include ways of dealing with new kinds of water pollution such as trace chemical substances and pathogenic microorganisms and the implementation of measures for quality assurance, water shortages and preparations for earthquakes.

Message 1.2

Development of sanitation facility to improve public hygiene is important

(Problems)

- Prior to modernization, Japan was an agricultural nation. Night soil, including from urban areas, was spread in the farms, and toilets were of the "pit toilet" design that allowed the excrement to be collected. However, the urbanization and the increased use of chemical fertilizers resulted in excessive quantities of night soil in urban areas, making adequate treatment a necessity.
- In the urban areas which have large population, a need arose for the construction of sewer to prevent the deterioration of public hygiene due to stagnant wastewater, and to prevent inundation.

(Social movement)

- Unique Japanese night soil treatment systems were constructed, in which the excrement from pit toilets was collected and treated at night soil treatment facilities.
- Considering citizens' request for flush toilet, the pit toilet gradually decreased.
- Due to economic development, the quality of water in public water bodies deteriorated by wastewater. In order to deal with this urgent situation, construction of sewerage systems with treatment plants began.
- Even in areas where little progress was made on the construction of sewerage systems, there was a great demand for the conversion from pit to flush toilets, and residents began to install septic tanks as on-site treatment facilities.

Kanda Sewer (constructed in Tokyo in 1884 and still utilized today)

Mikawashima Treatment Plant (constructed in Tokyo in 1922)

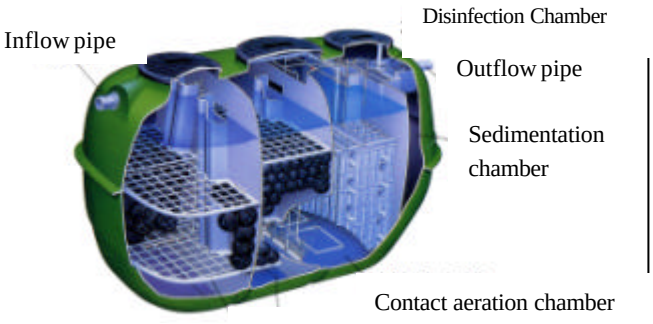
(New problems occurred)

- Under circumstance of deteriorated public hygiene accompanied by urbanization, the government set the law in 1895 and strengthened the regulation on wastewater and waste collection / treatment. However, it had little effect without any concrete projects.
- The government enacted the Sewerage Law to promote sewage works. However, due to financing problems and a low level of public interest in sewerage, little progress was made on these projects.
- The septic tanks constructed at the time were "single treatment" septic tanks that could only treat human waste, so domestic wastewater was discharged untreated into rivers and so on.

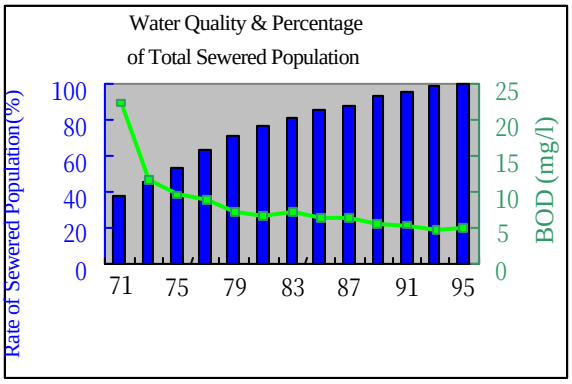
(Measures and Projects)

- 1897 Establishment of a national government subsidy for cities suffering from financial difficulties to promote sewerage development (subsidy ratio 1/4-1/3)
- 1901 Sewerage Law enacted to establish the role of local governments as implementing organization, national government and provide a legal basis for sewerage.
- 1958 Revision of Sewerage Law to define the prevention of inundation and the improvement public hygiene in urban areas as the objective of sewerage development and also provided a legal basis for a national subsidy program.
- 1970 Revision of the Sewerage Law to define the water quality preservation of public water bodies as the object of sewerage development and make the treatment of wastewater mandatory. Comprehensive basin-wide planning of sewerage systems and regional sewerage systems were established to enable the implementation of works from a basin-wide perspective. This established sewerage as a national minimum facility with basin-wide characteristics.
- 1983 Johkaso Law enacted to guarantee the proper manufacture, installation, maintenance and management of individual (on-site) treatment system.

• 1987 Established a national subsidy to encourage the usage of "Johkaso" that are able to treat urine and living wastewater on-site.

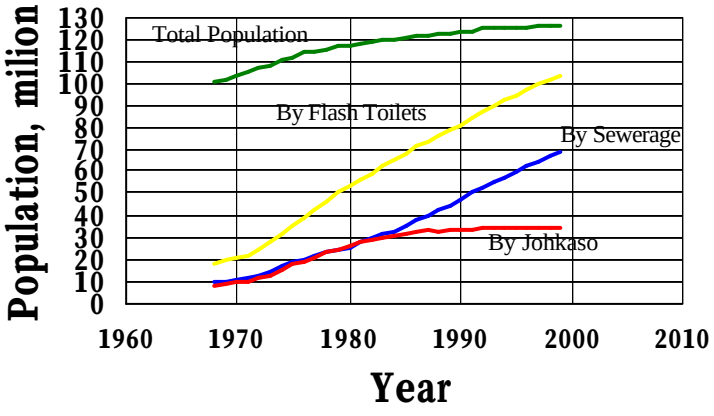


Johkasou (for 5 people use)



The water quality of the Sumida River was greatly improved by the development of the sewerage system.

Water Quality Improvement of the Sumida River



Change in the population served by various sanitation

Message 1.3

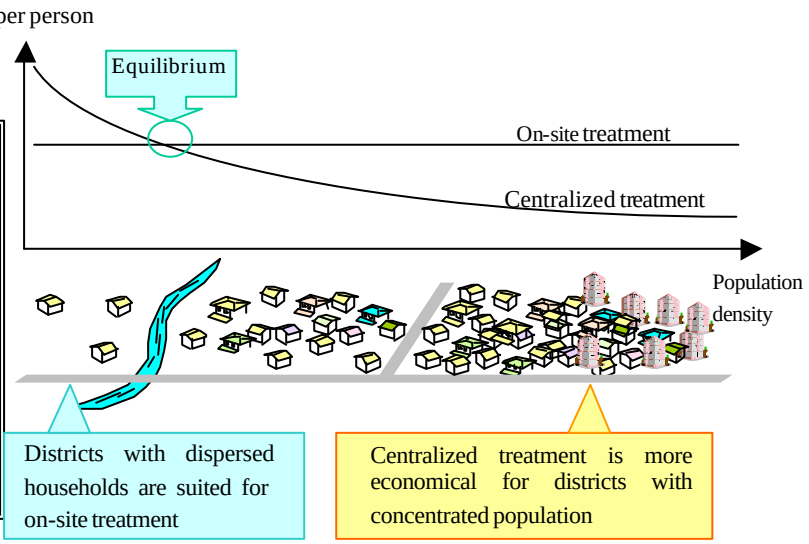
Planning is important for the efficient development of sanitation facility, considering population density, current situation of water environment, land use and other conditions.

(Problems)

Treatment facilities consist of centralized treatment system such as sewerage and on-site treatment system such as Johkasou, however, in some regions, the planning were not well coordinated and this leaded to inefficient development.

(Efforts)

The relevant ministries and agencies published guidelines to ensure that local governments take into consideration project characteristics, regional characteristics, and other factors in deciding the zoning of centralized or on-site treatment at the planning stage.



Comparison of Lifecycle Costs for Centralized and On-site Treatment

(Measures and Projects)

- To promote the economic and efficient development of sanitation facility, prefectures are drafting plans for dividing local districts into centralized treatment and on-site treatment facility areas. These plans decide treatment areas, treatment methods and implementation schedule, taking into account existing facilities, population density, current situation of water environment, land use and other conditions.
- These plans were drafted by all prefectures until 1998.
- Plans will be re-evaluated in accordance with changes in social conditions.

Message 1.4

Appropriate legislative measures are important to ensure project effective.

(Problems)

- Under the Sewerage Law enacted in 1901, local government is to conduct sewage works but budgetary measures were lacking. For this reason, although local governments began sewage works, they were faced by financial difficulties.
- Although construction of sewers and treatment facilities was implemented by local government, house connection and conversion to flush toilets for households were left to residents. When sewage works were started, such financial burdens held back the development of house connection and flush toilets.
- When hazardous wastewater is discharged from factories into the sewerage system, it could damage sewerage facilities and harm treatment capacity of treatment facilities.
- The installation, maintenance and management of individual treatment tanks were completely left to residents.

(Efforts)

- Some local governments began to consider charging sewerage user fee from around 1903. However, since the legal basis for charging such fee was unclear, there was great debate on the possibility of such measures.
- Local governments began a public relations campaign for sewerage facilities to encourage residents to install house connection and some local governments provided subsidies for relevant installation costs.
- Various training seminars were held to facilitate the development of experts in the installation, maintenance, and management of individual treatment tanks.

(Measures and Projects)

- The Sewerage Law was revised in 1958 to provide a legal basis for the collection of user fee for local government, make the installation of house connection and the conversion to flush toilets mandatory, also regulate the water quality of effluent from factories and other facilities into the sewerage system.
- In 1983, the Johkasou Law was established to regulate the manufacture, establishment, inspection, and cleaning of individual treatment tank. Also, in 1994, regulations established localities as the basic regulating body for the installation and management of Johkasou.

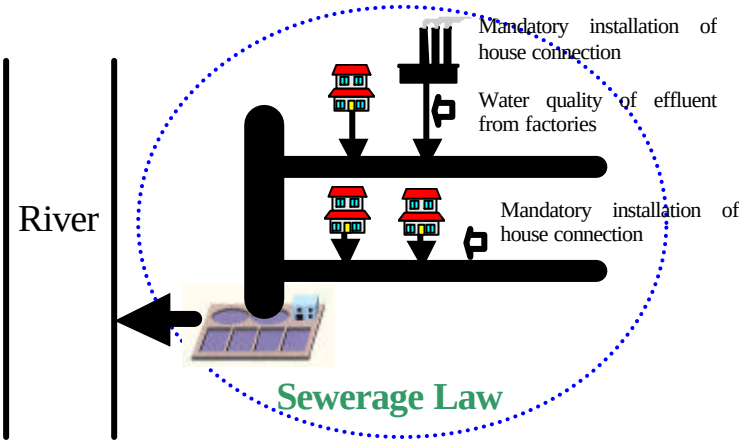


Image of the Sewerage System

Mandatory installation of house connection:

Once sewerage facilities are developed, the owner of property in sewerage area must install house connection to the sewerage facilities without delay.

Conversion to Flush Toilets:

The owner of buildings with pit toilets in treatment area must convert to flush toilets within a period of 3 years.

Message 2.1

Introducing Participatory Irrigation Management (PIM) for good agricultural water management.

<The use of farmers' associations for irrigation management>

- Since ancient times, in Japan as well as in other countries in Monsoon Asia region, paddy agriculture has formed the backbone of food production and agricultural activities. The management of irrigation water and facilities was carried out by community based farmers' associations, which were reorganized into Land Improvement Districts (LIDs) by the Land Improvement Act of 1949.

- Annual rainfall in Japan is about 1,700 mm, nearly twice the world average. Since the Japanese landscape is characterized by high mountain ranges in the center, stretching from north to south, with steep slopes, rivers are very steep and rapid and soil suffers erosion under heavy rain. Due to these climatic and geographical characteristics, Japan imported wet-rice cultivation techniques from China and Korea in about 3rd century BC. Subsequently, by 3rd century AD, rice cultivation spread to the tip of northern Honshu (latitude 40 degrees north). Paddy field cultivation began in the most suitable areas, such as inland wetlands and small deltas at the head of bays. As society became stable, in the 17th century, paddy fields were developed in locations with adverse land conditions, such as the floodplains of rivers. With the development of civil engineering works and technology, large-scale earthworks were carried out to divert irrigation water from rivers. This promoted the development of paddy fields in diluvial plains and at the center of alluvial fans, where water was not readily available.

- Operation and management of water for rice cultivation has always been an important issue. The typical Japanese farm was very small and owned land was scattered. Individual farmers had difficulty in adjusting water usage. Over a long period of time, water user groups made up of farming households were set up in each district and water management systems for the entire region were established.

- The Land Improvement Act of 1949 reorganized water user groups into Land Improvement Districts (LIDs). LIDs are voluntary organizations of farmers responsible for operating and maintaining the agricultural water supply facilities and managing the supply of agricultural water in compliance with the operation and maintenance plans based on the Land Improvement Act. National and local Governments provide technical assistance.

Farmer maintenance activities to remove silt from farmers irrigation canals (right).

<Japanese assistance and experience in international cooperation>

- Japan provides assistance to form Participatory Irrigation Management (PIM), water users associations that operate, maintain and bear the cost of irrigation facilities themselves to encourage water conservation.

- In many developing countries, irrigation facilities are constructed as national governmental projects. In such circumstances, government staff operates irrigation facilities and governments provide the operation and maintenance budgets. But these projects can face a number of problems, such as:

    1) A shortage of available governmental funds can affect a project's operational viability.
    2) A lack of accountability and responsibility can affect operation and maintenance of irrigation facilities and water maintenance.
    3) These factors inhibit optimal maintenance and operation efficiency in ways that contribute negatively to water governance.

- In this situation, many countries introduced Participatory Irrigation Management (PIM) to improve operation, maintenance and management (OMM). The Japanese LID system is the basic model for PIM.

- Concepts of PIM are as follows.

    1) Establishment of water users' association by farmers for OMM of irrigation/drainage systems. The costs incurred in the OMM of irrigation/drainage systems are borne in principle by the farmers.
    2) Once farmer ownership is established and OMM is improved, government assists associations and provides technical assistance for farmers through official development aid (ODA) programs.
    3) Improvement in OMM brings cost reductions and water savings.

- After the introduction of PIM systems, agricultural productivity has improved in many cases.

Message 2.2
Multifunctional roles of agriculture and preservation activities

- Irrigation water is used not only for agriculture, but also for fire fighting/prevention, washing vegetables and machines, melting snow, and ecosystem preservation.

The red message states “IGUCHI Fire Department” and indicates that this water canal is allocated for fire fighting purposes (left).

- Paddy agriculture is an economic activity which produces food and creates both tangible and intangible values like the formation of scenic landscapes, flood control, fostering water resources, preventing land erosion, protecting ecosystems and etc.

- Paddy fields preserve ecosystem: a paddy field as a feeding and dwelling place for migratory birds in winter (right).

- While the use of terraced paddy fields has decreased because of its low productivity, there has been a recognition of the multifunctional roles of terraced paddy fields, and nationwide efforts to preserve them are underway.

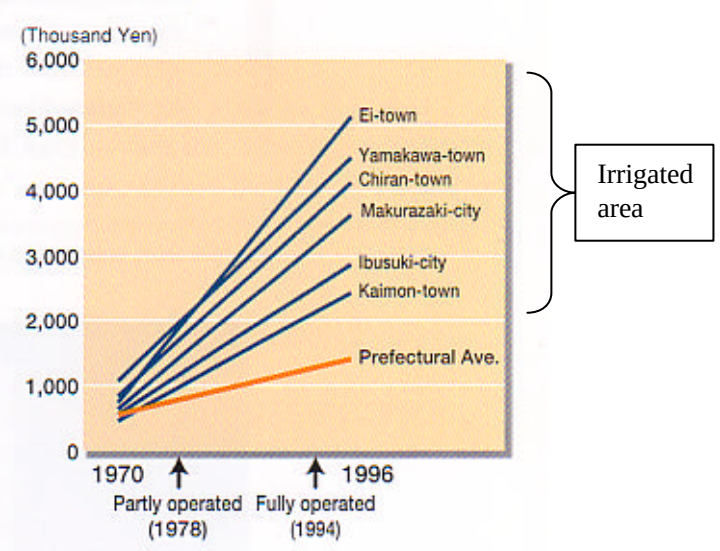
- With collaboration among urban and rural residents, preservation activities of rice paddy terraces have been undertaken.

Terraced paddy fields control floods, foster groundwater, and prevent soil erosion (left).

Message 2.3
Irrigation development increases income

■ Agricultural production and farmers' income increased after irrigation development of upland fields.

Districts with irrigation systems in upland fields have transformed themselves into highly productive areas. This figure shows the average income of irrigated areas increased 4-5 times after the development of an irrigation system.



■ Using conversion, paddy fields are being consolidated into large plots to enable the development of large-scale mechanized farming

Until the 1950s, Japan had small and scattered farm lots with low productivity. The consolidation of paddy fields and development of irrigation and drainage systems, has reduced the amount of labor required per 10a (one tenth of a hectare) from 190 hours in 1955 to 35 hours in 1999. The yield (unpolished rice as the base) per 10a increased from 325kg to 512kg, representing an 8 times increase in labor productivity from 1.76 kg/hr/10a to 14.75 kg/hr/10a from 1955 to 1999, respectively.

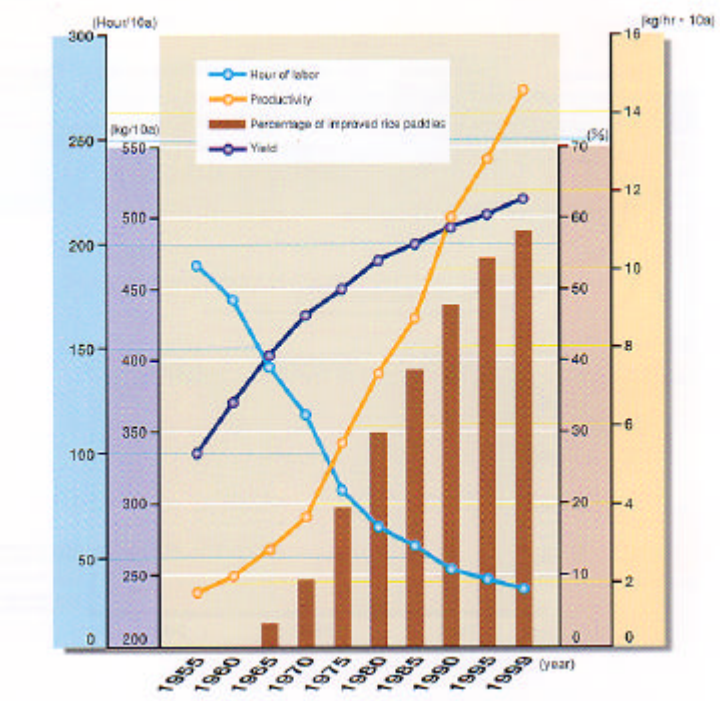
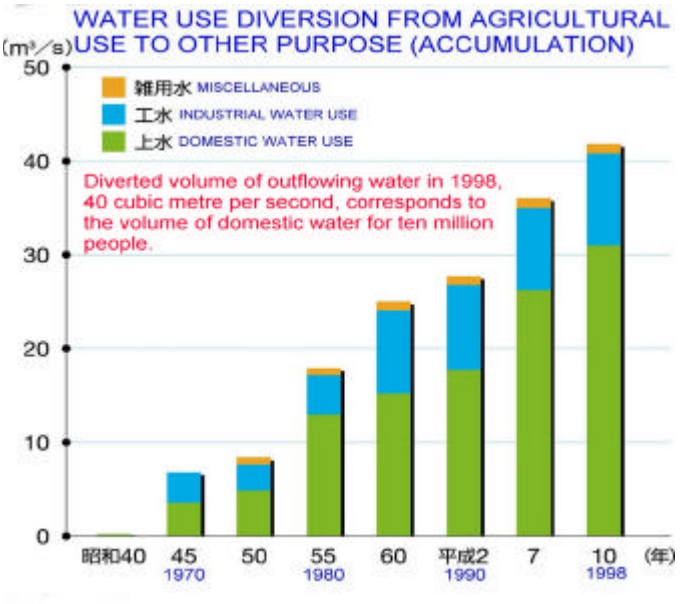


Fig. Relationship between paddy field improvement and productivity

Message 2.4

Improved water efficiency has allowed water diversion from agriculture to other purposes.

Water demand has been increased in urban areas. Under the constraint of limited water resources, it is essential that the agricultural sector reorganize irrigation systems and improve water efficiency to divert water from agricultural uses to domestic and industrial uses.



[Drought and water saving efforts in agriculture]

During drought periods, farmers save as much water as possible by rotating water use, inspecting water use to prevent water loss, and promoting recycling of drainage water. Water saved through these activities is allocated to drinking water in the cities. Water users in the same basin cooperate with each other to cope with droughts.

Table:　Examples of actual water saving ratio during water shortage period (%)

Name of Basin	Ooi-gawa	Kiso-gawa	Asahi-kawa	Chikugo-gawa
Agricultural	50	65	50	79
Industrial	38	65	30	30
Domestic	20	30	20	50

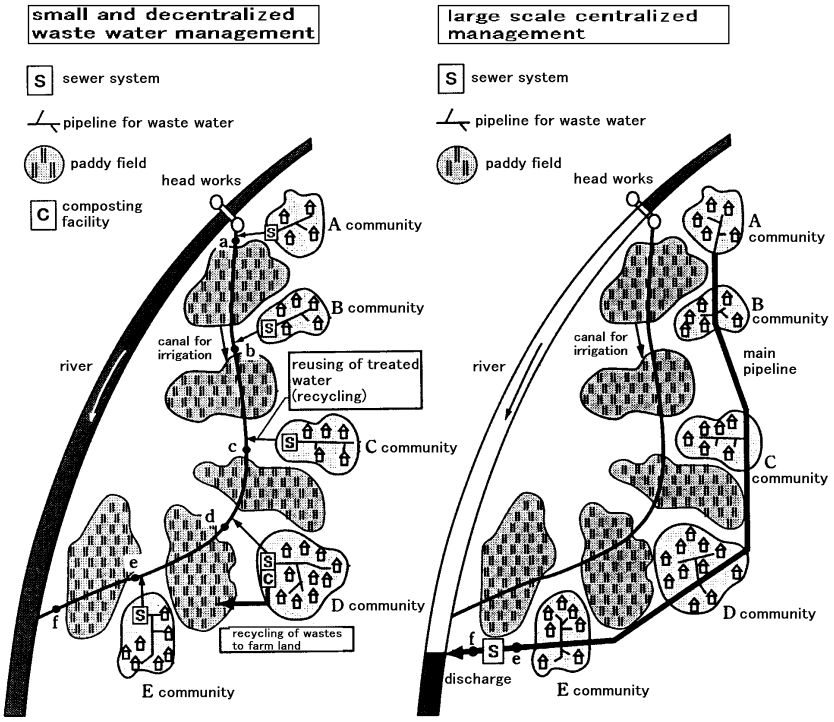
In the event of a serious water shortage, management practices, such as the intensification of rotational supply and recycling do not work effectively. Under such conditions, farmers sacrifice a field by cutting off water to some parts of the paddy, to save other parts.

Message 2.5

In rural areas, small and decentralized wastewater treatment systems to enable the reuse of wastewater for irrigation

The balance between supply and demand of freshwater resources has become tight due to population growth and worsening water pollution in rural areas. Food problems are also caused by water shortages.

In Japan, wastewater treatment systems are regarded as important not only for preserving the quality of public water bodies, but also for the efficient use of limited and variable water resources. As illustrated in the figure below, treated wastewater flows into irrigation canals in rural areas, and can be reused as irrigation water.

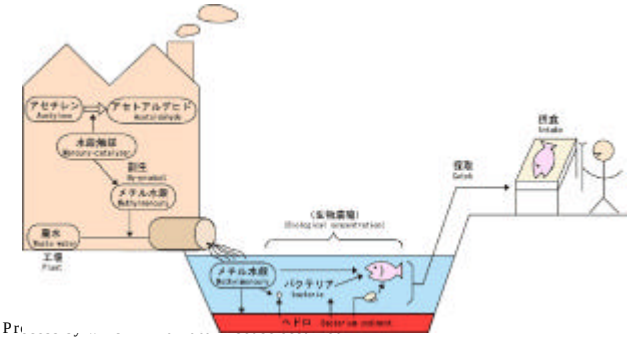


Message 3.1

Legislation to control water pollution systematically along with well-organized monitoring are important in the mitigation of water quality degradation occurring as a result of economic activities.

Water quality degradation and pollution

Water quality degradation precedes Japan's period of modernization, having started in the Meiji era, which began in 1868. The first major case of pollution causing extensive damage was that of the Ashio Copper Mine poisoning case, which occurred in the 1890s. With an increased pollution burden arising from the modernization of industry, the problem of water quality degradation occurred nationwide.



(Source: Kumamoto Prefecture web site)

The Ashio Copper Mine at the time of the poisoning incident
(Source: Mainichi Newspaper web site)

During the period of industrial reconstruction following the end of the Second World War, the problem of water quality degradation spread, primarily in major urban areas and industrial cities, and from the beginning of the 1950's this began resulting in serious harm, including the famous Minamata Disease case.

Start of legal regulation

In the light of this situation, local public bodies enacted ordinances and took various other measures, while at the national level, the Water Quality Conservation Law and the Factory Wastewater Regulation Law (known in Japan as the "two water quality laws") were enacted in 1958. These steps marked the beginning of legal regulation of water quality. However, the regulation as set forth in the two water quality laws was limited to those situations in which damage from water quality degradation had already occurred, and did not proactively prevent degradation of water quality. Consequently, the laws were unable to provide sufficient coverage with regard to environmental conservation.

Water Pollution Control Law and establishment of the Environment Agency

As pollution problems came to be both more widespread and more serious, the Agano River mercury pollution case, said to be the 'second Minamata Disease case,' the "Itai-Itai" Disease case, and more occurred in quick succession. For this reason, the Basic Law for Environmental Pollution Control was enacted in 1967, setting out an approach toward the promotion of comprehensive pollution-related measures.

The so-called "Pollution Diet" session of 1970 conducted a drastic upgrade of legislation for pollution control, establishing the Water Pollution Control Law to address water quality degradation. This law represented a complete amendment of the two water quality laws, introducing uniform national control and more.

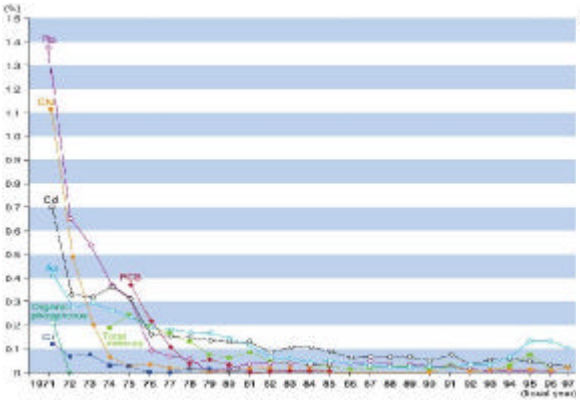
Water Pollution Control Law of 1970

1. Measures to overcome "catch-up" administrative attitude
   - Shift from specified-area regulation to national regulation
   - Uniform wastewater standards + more stringent prefectural effluent standards
2. Regulations tightened to ensure strict compliance with standards
   - Direct penalties for violations
3. Unification of the legal system in principle

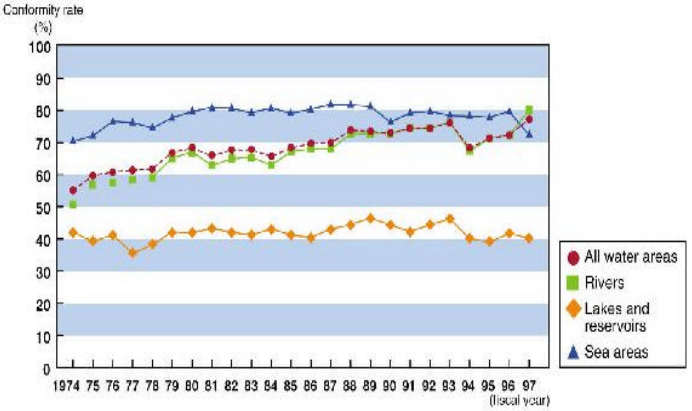
The following year, in 1971, the Environment Agency was established (in 2001, the Agency became the Ministry of the Environment) and was placed in unified charge of the administration of water quality

conservation from an environmental conservation approach. At the same time, environmental standards for water quality were set, and, in order to clarify administrative goals, environmental quality standards, including health indicators and living environment indicators, were established.

Health Indicators



Living Environment Indicators (BOD or COD)



Strengthening of administration of water quality conservation

In the 1970s, the centralization of population and industry in areas bordering the Seto Inland Sea and other enclosed coastal seas resulted in increasing water quality degradation and frequent occurrence of “red tides.” To cope with this situation, regulation of total maximum daily loading and other water quality conservation measures were formulated.

In 1988, the Water Pollution Control Law was amended to prevent the pollution of ground water by toxic substances.

In 1993, the environmental quality standards (health indicators) were significantly augmented and tightened to prevent the pollution of public water areas by emerging chemical substances. In addition, 23 items were established as "items to be monitored" that would not be immediately subject to environmental standards but for which data-gathering efforts were to be continued.

Water quality monitoring (regular monitoring) (1988~)

In accordance with the degree of risk posed, environmental standards, "items to be monitored," and "items to be surveyed" have been established, and water monitoring is being implemented on a phased basis.

- Environmental standards (health indicators): 26
  As of 2000, monitoring was conducted at 4,098 river sites, 392 lake sites and 1,234 sea sites.
- Items to be monitored: 22
  As of 2000, monitoring was conducted at 1,644 river sites, 92 lake sites and 304 sea sites.
- Items to be surveyed: 300
  Scientific information currently being gathered

Japan’s experience

Japan experienced an increase in the diversity and magnitude of pollution burdens which resulted from economic growth, causing serious water quality degradation nationwide and becoming an unprecedented pollution problem with many victims. Subsequently, Japan changed from establishing “catch-up” measures to proactive measures which include the setting of environmental quality standards for all public water and groundwater, the promotion of emission controls and sewerage facilities, and confirmation and assessment through monitoring. As a result of these policies and measures, water quality in Japan has improved to a certain extent.

Message 3.2

Upgrading existing water supply facilities through introduction of advanced treatment technologies is essential to secure the water quality at taps to cope with degradation of water environment particularly eutrophication of lakes and reservoirs.

- Historical / social background

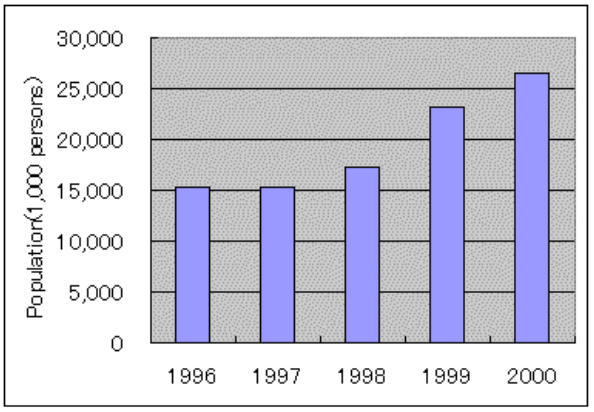
  Since rapid economic growth in 1960s, increase of industrial and domestic effluents discharged to public water bodies caused serious degradation of the quality of raw water sources. Taste and odor problems by eutrophication of lakes and reservoirs and disinfection by-products such as halocarbons are major issues in these days.

- Actions taken by national and local governments

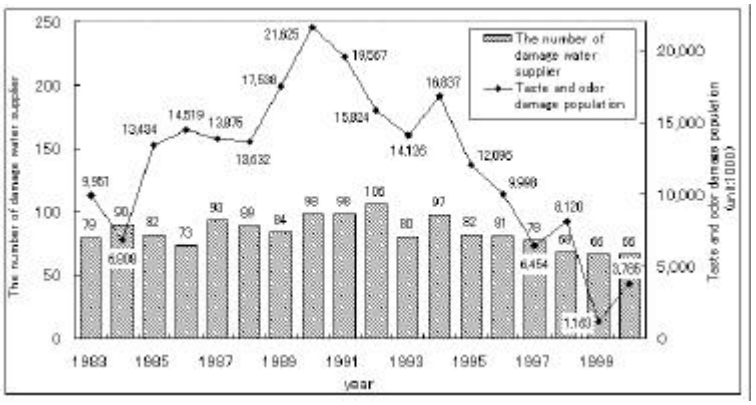
  National and local governments have implemented a series of policies and measures. These include introduction of activated carbon filtration, ozonation, biological treatment and membrane filtration. In 1988, limited subsidy program was established to encourage water authorities to install advanced water treatment facilities.

- Results

  Currently advanced water treatment facilities have been introduced at 300 treatment plants, approximately 15% of the treatment plants in the nation, and around 27 million people or one-fourth of the water supply population of Japan receive the benefits of these facilities (Figure 1). The number of persons suffering from water with a foul odor or taste is declining each year (Figure 2).



<Figure 1 Population served by water from advanced water treatment facilities>



<Figure 2 Population with water having an foul odor or taste>

- An example of measures taken by national and local governments

[Preservation of the source water for the raw water sources]

In addition, under the Law on execution of preservation Projects on Water Resources Quality for Water Supply and other laws, various related projects are being promoted as policies to preserve the source water for the water supply. These include sewerage system, drainage facilities for farm villages, "on-site wastewater treatment" and so on, and river treatment, etc. from which water for the water supply is taken. Individual local governments are also promoting various measures such as enacting ordinances to preserve source water, establishing source water preservation funds, participating in forest cultivation in water source regions, and other measures to preserve the quality of the source water for the public water supply.

<Preservation Project of Water Resources Quality for water supply>

Implementation of policies to protect raw water sources

Policy	**Implementation status**
Establishment of ordinances for water source protection and other	180 municipalities etc. (5 prefectures, 44 cities, 104 towns, 26 villages and 1 organization)
Establishment of guidelines and procedures for water source protection and other	14 municipalities etc. (11 cities and 3 towns)
Establishment of funds for water source	33municipalities etc. (2 prefectures, 14 cities, 13 towns, 2 villages and 2 organizations)
Participation in forest cultivation in water source areas	85 municipalities etc. (7 prefectures, 42 cities, 27 towns, 3 villages and 6 organizations)
Organization and participation in watershed councils	97 municipalities etc. (6 prefectures, 45 cities, 25 towns, 11 villages and 10 organizations)
Assistance for wastewater treatment facilities in upstream areas	24 municipalities etc. (2 prefectures, 13 cities, 6 towns, 2 villages and 1 organization)
Other	65 municipalities etc. (5 prefectures, 32 cities, 21 towns, 6 villages and 1 organization)

Message 3.3

It is important to implement comprehensive and advanced water quality preservation works from a watershed perspective to preserve water source and eco system.

(Problems)

- In order to ensure water quality preservation complying with water quality environmental standards, it is important not only to regulate water quality from factories and industries but also to treat the large amount of wastewater from households.
- Sewerage is the most fundamental and effective measure for domestic wastewater and the development of sewerage systems is the most important factor in protecting water quality.

(Efforts)

1960s

- Case-studies in Western countries, comprehensive river basin management plans to contribute to effective purification of the entire river basin sewerage development within a single river basin.
- A survey was implemented for a regional sewerage project in the Neya river basin in Osaka where water quality deteriorated and inundation occurred.
- The efficiency and economic merits of a basin-wide sewerage development was verified and projects for the Neya river basin were began in 1965 by relevant local authorities.
- Deliberation occurred on the responsibility of local governments for sewerage plans and project implementation from the basin-wide perspective.

(Measures and Projects)

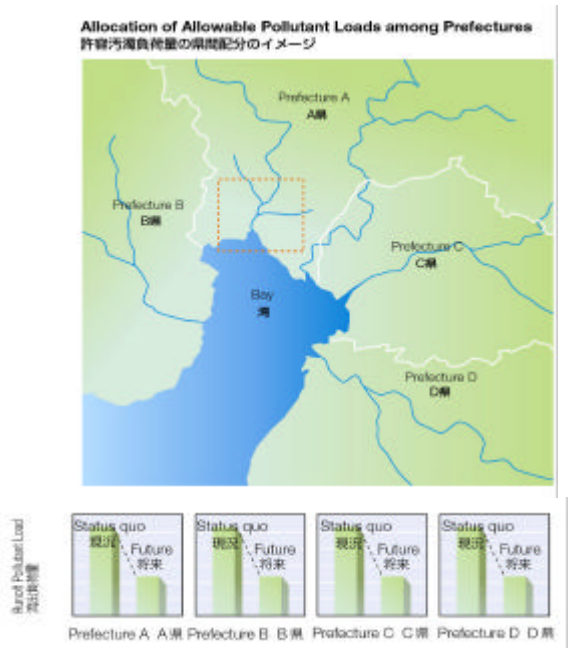
1970s

The Sewerage Law was revised and the following works were defined.

- To achieve water environment quality standards, prefectures draft comprehensive basic plan (comprehensive basin-wide planning of sewerage systems (regional sewerage systems)).
- For the region specified within the above basin plan, individual sewerage projects must be compatible with the plan.
- Establishment of comprehensive sewerage system where wastewater from more than two municipalities are moved and treated.

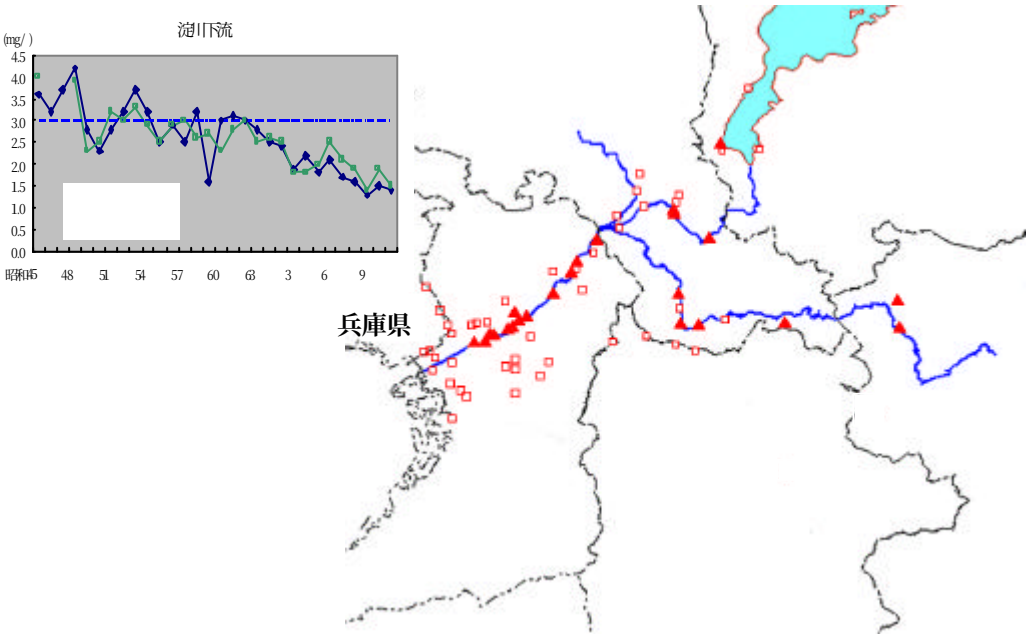
（Measures for enclosed coastal seas）

For watersheds that extend over several prefectures, the national government take responsibility to allocate the amount of pollution load to reduce to relevant prefectures. Based on this distribution, the prefectures establish “Comprehensive basin-made planning of Sewerage Systems” and determine treatment areas efficient water quality.



（Advanced treatment）

Considering for water use at discharged river, sewage treatment is more advanced than standard sewage treatment is implemented.



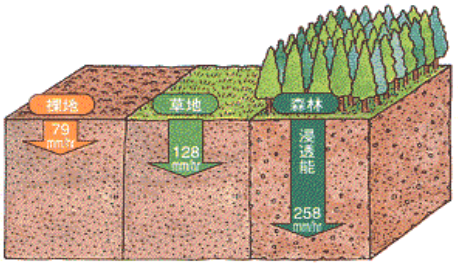
Message 3.4

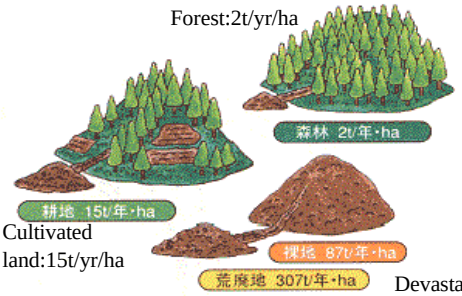
Forests endow multi-functions and benefits (protection of biodiversity and the global environment, conservation of national land, providing people with health and relaxation area, providing water resources etc.)

Due to Japan's topographical conditions, the country is susceptible to both flooding and drought. For this reason, forests play a particularly important role in conserving water resources to reduce the danger of flooding and so on.
In addition, by preventing soil outflow and hillside failure, forests prevent the sedimentation of sand at dams, stabilize the riverbed, and otherwise play an essential role in helping to conserve water resources.

<Functions>

- Absorb carbon dioxide
- Substitute for fossil fuels
- Prevent surface erosion
- Prevent collapse of surface layers
- Mitigate floods
- Store water resources
- Provide a place for health and recreation
- Other

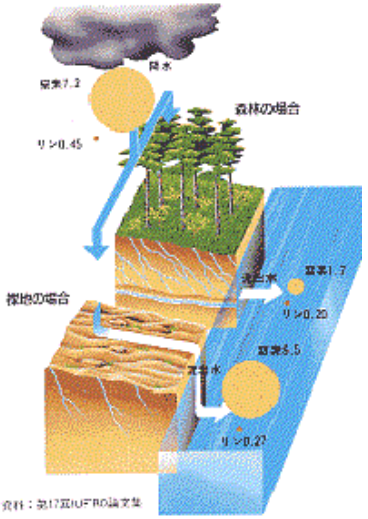




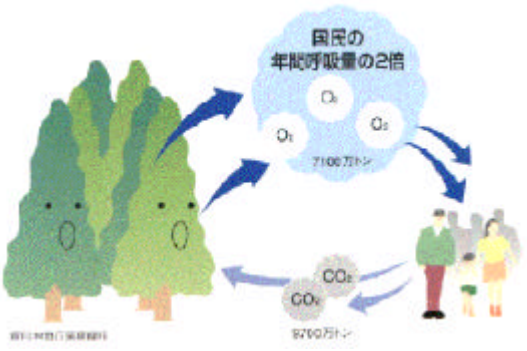
Cultivated land:15t/yr/ha

Devastated land:307t/yr/ha

<Example of regional infiltration capacit y and the amount of sediment discharge>



<Example of water quality purification>



<Carbon dioxide absorption by forests>

In the Meiji era (which began in 1868), Japan began to promote modernization, introducing Western European culture at a rapid pace. Lumber was used not only for building purposes but for mine shaft piles, telephone poles, railway ties and various other uses accompanying the development of modern industry. In the latter part of the Meiji era (around the turn of the century and thereafter), the increased demand for lumber as fuel for steel and salt manufacture and so on caused many forests to suffer severe degradation, with the result that around one-tenth of the entire land area of Japan became devastated, creating concern for a decline in the water retention capacity of headwater areas.
In 1897, the Protection Forest system was created, imposing restrictions on forest harvesting and other management, in an effort to protect forest areas.
During the Second World War, the devastation of the forests proceeded, as forests were cut down one after another to satisfy military demand. Enormous quantities of lumber were needed in the period of reconstruction after the war as well, and large quantities of forest trees fell, resulting in severe degradation.
For this reason, areas in which restoration was particularly urgent, such as those in which hillside failure had occurred, restoration projects were carried out entirely by the public funds. For those forests where land is left naked after harvesting, partial supports by public funds were also provided to forest owners to promote replanting trees. Due to these projects, there are now almost no bald mountains remaining.

<Types, Functions and Areas of Protection Forest in Japan>

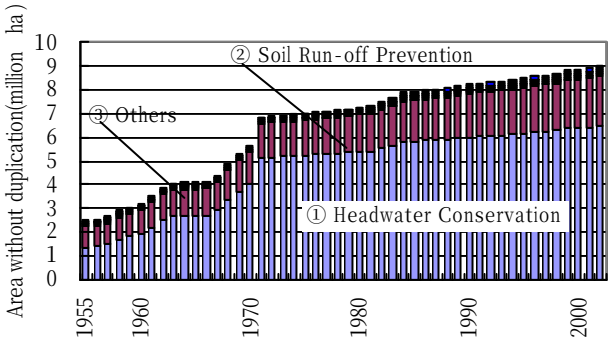
(As of March 31, 2002)

Type	Function	Area (1,000 ha)	Proportion (%)
Headwater Conservation	Control flood, drought and water quality	6,522	67.3
Soil Run-off Prevention	Controlsoil erosion	2,141	22.1
Landslide Prevention	Prevents collapse of steep slopes with unstable foundations, protecting homes, agricultural lands etc.	53	0.5
Shifting Sand Prevention	Prevents sand from blowing, protecting homes and cultivated land	16	0.2
Windbreak	Provides protection from strong winds, protecting homes and cultivated land	55	0.6
Flood Damage Prevention	Prevents damage from river flooding	1	0.0
Tidal Wave and Salty Wind Prevention	Protects crops from damage caused by salts, and provides protection from tidal waves and high surf	14	0.1
Drought Prevention	Prevents a local source of a small scale water supply	87	0.9
Snow Drift Prevention	Protects roads and railways from blizzards	0	0.0
Fog Inflow Prevention	Prevents fog from rolling in from the ocean, protecting crops	59	0.6
Avalanche Prevention	Prevents occurrence of avalanches and resulting damage	20	0.2
Rock-fall Prevention	Provides protection from the danger of falling rocks	2	0.0
Fire Prevention	Prevents the spread of fires	0	0.0
Fish Breeding	Aids in fish habitation and propagation	31	0.3
Navigation Landmarks	Serves as a landmark for ship navigation	1	0.0
Public Health	Provides a place for forest recreation activities; purifies the air, serves as a noise barrier and otherwise protects the living environment	662	6.8
Scenic Site conservation	Preserves tourist spots, historical remains and other atmospheric scenery	27	0.3

Note: Some Protection Forests are designated as 2 or more types

The "Protection Forest Improving Plan" with ten years as one term was established to urgently and systematically designate and improve Protection Forests. There are 17 types of protection forest, and approximately 9.05 million hectares (without duplication) or about one-third of all of the forested land in Japan has been designated as protection forest at present, and headwater conservation forests account for 67% of the total.

Trends in Protection Forest Area



<Case Study: Cape Erimo, Hokkaido>

At Cape Erimo in Hokkaido, the northern island of Japan, the forests had been decreased due to excessive cutting and the grazing of livestock, and local residents suffered from the effects of strong winds and blowing sand. Moreover, turbid river water flowed into the ocean, dramatically reducing the fish catch in coastal areas.
Subsequently, reforestation was promoted through forest conservation projects. With the increase in revegetated areas, the fish catch has been also restored.

Year	"Greening" Area (ha)	Fish Catch (t/year)
1965	58.81	227
1975	83.32	685
1985	112.26	1,581
1998	165.64	1,446

Notes
1. The revegetated area does not include grass land.
2. The fish catch does not include seaweed.

(1953) (1991)

In this manner, maintenance activities by forest owners, primarily the residents of mountain villages, have been the basis of forest management in Japan, with public assistance programs employed when necessary. This system has resulted in activities to conserve forests and helped to conserve water resources. Such techniques of forest management and improvement with the participation of local residents are also being employed in developing countries.

Message 3.5

To conserve wetland ecosystem, some approaches are important such as selecting important wetlands, promoting designating conservation areas, and registering wetlands from the point of international view.

Selection of important wetlands

1. Outline of the selection of important wetlands

Responding to the increasing momentum toward wetland conservation, including opposition from citizens regarding their recent decrease and deterioration and including the commitment to double the registered number of wetlands in a meeting related to The Ramsar Convention on Wetlands, the Ministry of the Environment selected and announced the 500 important wetlands, determined after consideration of the size of the wetlands, existence of rare species, etc., in consultation with experts, in December, 2001.

This information comprises the basic foundation for Japan's conservation measures. It is to be used for specification of reserved areas and is to be considered when planning development projects to be conducted near these wetlands.

2. Process of selection

- An exploratory Committee consisting of experts from each biological classification (22 people in total) was convened at intervals over two years, enjoying cooperation from several hundred experts.
- Important mires, rivers, lakes, marshes, tidal flats, seaweed/seagrass beds, mangrove forests, coral reefs, etc. were selected from the point of view of conserving biodiversity.

3. Criteria for Selecting Japan's 500 Important Wetlands

1. A typical or considerably large area of mires/salt marshes, rivers/lakes and marshes, tidal flats/mangrove forests, seaweed/seagrass beds, or coral reefs that provides the habitat/spawning ground for living organisms;
2. An area that provides the habitat/spawning ground for rare or endemic species;
3. An area with rich biota;
4. An area that provides the habitat for a considerably large population of a specified species;
5. An area that is indispensable (feeding and spawning grounds, etc.) in the life history of a living organism.

4. Relevance to conservation measures

- Information of Japan's 500 Important Wetlands will be used as a basic foundation for the country's conservation measures and would be used for considering and designate conservation area.
- Attention will be kept to conservation of the important wetlands and their surrounding area when development projects are planned.
- Growth of the movement towards wetland conservation will be encouraged by placing information on the website of the Internet nature research institute (http://www.sizenken.biodic.go.jp), and by similar measures.

From the international point of view

Japan's effort related to the Ramsar convention

Japan became one of the contracting parties to the Ramsar Convention in October, 1980. Designated wetlands of international importance in Japan to the present is 13 sites having 84,089 ha in total. All of these Ramsar sites have been designated as National Wildlife Protection Areas or National/Quasi-National Parks. As of January 2003, there were 1,235 Ramsar sites totaling approximately 106.6 million ha worldwide.

Name	*Relevant Prefecture*	*Area (ha)*	*Ramsar Registration (year)*	*Typical Relevant Wildlife Species*
Kushiro-shitsugen	Hokkaido	7,863	1980	Ducks, Swans and Red Crowned Cranes
Izu-numa and Uchi-numa	Miyagi	559	1985	Anatidae, especially White-fronted Goose
Kutcharo-ko	Hokkaido	1,607	1989	Anatidae, especially Bewick's Swan
Utonai-ko	Hokkaido	510	1991	Anatidae
Kiritappu-shitsugen	Hokkaido	2,504	1993	Anatidae, especially Whooper Swan and Bean Goose
Atsukeshi-ko and Bekanushi-shitsugen	Hokkaido	4,896	1993	Whooper Swan and Red Crowned Crane
Yatsu-higata	Chiba	40	1993	Shorebirds
Katano-kamoike	Ishikawa	10	1993	Anatidae, especially White-fronted Goose, Bean Goose and Baikal Teal
Biwa-ko	Shiga	65,602	1993	Bewick's Swan and Great Bean Goose
Sakata	Niigata	76	1996	Anatidae, especially Great Bean Goose
Man-ko	Okinawa	58	1999	Mangroves, Shorebirds
Miyajima-numa	Hokkaido	41	2002	Anatidae, especially White-fronted Goose
Fujimae-higata	Aichi	323	2002	Shorebirds

Message 3. 6

Surveys and studies for conservation of river environment

(1)Aqua Restoration Research Center

Aqua Restoration Research Center (ARRC) was established and with a view to conducting basic and applied research on ways to conserve and restore natural riverine and lacustrine environments and disseminating research results. ARRC has three 800-meter-long test channels, which are among the largest in the world.

The goal of ARRC is to address the technical challenge of securing healthy habitat while maintaining safety against floods. Using the test channels and other facilities, ARRC is conducting research on subjects such as the relationship between stream geometry (e.g., riffles, pools) and habitat conditions, the relationship between inundation frequency and plant growth and the influence of streamflow fluctuations on the river environment, in cooperation with researchers in various disciplines.

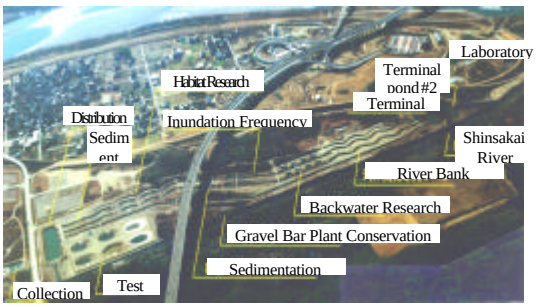


Photo. 1 Bird's eye view of Aqua Restoration Research Center

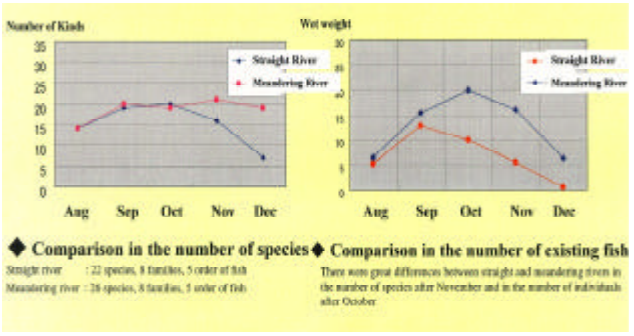


Figure 1 How much does meandering river differ from a straight-line river in the amount of habitations for fishes?

(2)Research in river ecology

The purpose of this study is gain an understanding of rivers from an ecological perspective and to determine the ideal states that they should attain. To achieve these goals, the following themes were selected for this research.

Ⅰ. To understand how rivers responded to the changes in the riverine environment and topography in historical time.

Ⅱ. To classify the riverine habitats, and elucidate their formation, maintenance mechanisms, and ecological functions.

Ⅲ. To understands the structure and function of the river ecosystem and the role of organisms in maintaining a healthy river by studying the biomass, species composition, biological diversity, material cycle, and energy flow of this ecosystem. To estimate the carrying capacity of the river environment from the finding of such study.

Ⅳ. To clarify the effects of the natural impact caused by such natural disturbances as floods and droughts, and the human impact caused by such activities as waterway and flow management and discharge of waste material.

Ⅴ. To introduce conservation and restoration measures, and monitor and evaluate their effects.

Ⅵ. To synthesize the results of Ⅰ～Ⅵ above and examine the way the rivers should be managed taking the ecological viewpoint into consideration.

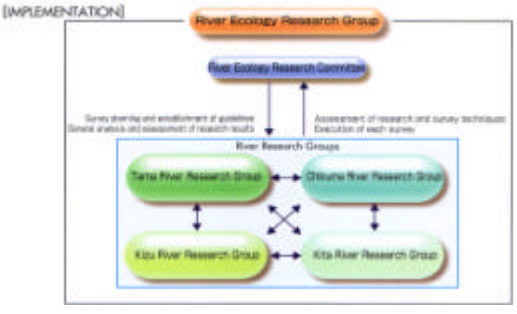


Figure 2 Organizations involved in river ecology research

Photo. 2 Elucidating species using freezing core

Message 3. 7

Efforts for river environment conservation and restoration

(1) Conservation and restoration of river environment: "nature-oriented" approach

The 1997 revision of the River Law established "improvement and conservation of river environment" as one of the goals of the law. Since this revision, "creation of nature-oriented river works" has become a basic goal of river improvement. Efforts are under way to avoid or, if that is not possible, minimize alteration of healthy habitat conditions while securing the required level of flood safety and to leave rivers in such a condition that a healthy river environment can be restored.

In the case of the Izumi River in Kanagawa Prefecture, a river channel whose bottom and sides were lined completely with steel sheeting was restored to a nature-rich river where children can play.

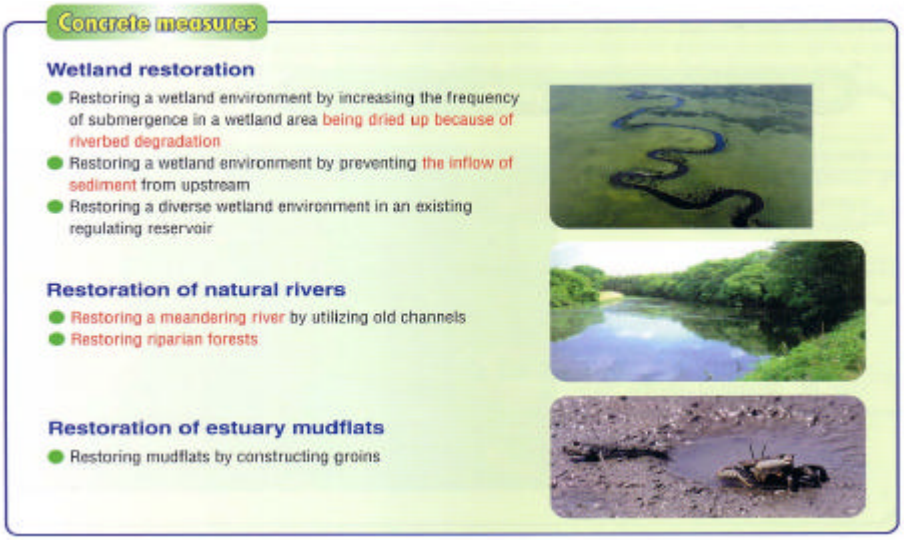
Before restoration work (1993)　　After restoration work (1995)

Photo. 3　Restoration of close-to-nature river (Izumi River)

(2) "A river restoration project" designed to rehabilitate, or restore, the river system is necessary

The purpose of a river restoration project is not to protest a river environment through mitigarion measures implemented as part of a flood control or water utilization project. Instead, a river restoration project is a new type of river project that aims to conserve the river environment by restoring the river system from the standpoint of the river basin.

Restorarion project also aim to make the most of the natural resilience of rivers by minimizing human intervention.



There are three key points to remember in planning and implementing a nature restoration project.

Point 1: Draw up plans from the standpoint of the river basin.

Point 2: Adaptive management

Point 3: Cooperation with NPOs.

Message 3. 8

Participation of citizens in river projects and environmental education

(1) Cooperation between citizens and government: Asaza Project at Lake Kasumigaura

After Lake Biwa, Lake Kasumigaura is the second largest lake in Japan. At Lake Kasumigaura, Asaza Project, a joint project of citizens and government for environmental restoration, is currently in progress. Asaza Project aims to restore lakeshore vegetation by growing an aquatic plant called "asaza" (*Nymphoides peltata*, also known as "floating heart"), a native species that was once widely distributed in the now biologically impoverished Lake Kasumigaura.

Various forms of cooperative effort are now being carried out in the form of joint projects involving citizens groups, residents, administrative agencies, forestry cooperatives and fisheries cooperatives. These efforts include a "foster parent" system under which local elementary schools and residents grow now-endangered asaza plants, and utilization of thinned-out trees purchased from local forestry cooperatives in Lake Kasumigaura so as to help asaza plants to form communities. These joint efforts involving citizens are being implemented not only at Lake Kasumigaura but also in other parts of the country.

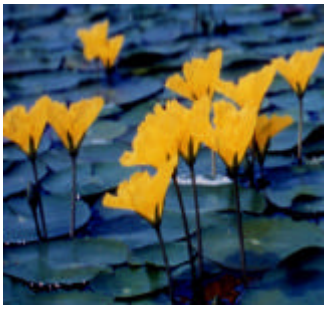


Photo. 4 Asaza (*Nymphoides peltata*) in Lake Kasumigaura

Photo. 5 Activity under Asaza Project

(2) Environmental education utilizing rivers: "Waterside School" and "Children's Watersides" projects

A "Waterside School Project" aims to make rivers places for play and places of education for children from nearby elementary schools. Institutional arrangements have been made and watersides improved at 197 registered sites in 187 cities, towns and villages throughout the country, in cooperation with local volunteers and nonprofit organizations, to prepare watersides that are rich in nature and safe for children. These sites are used for various educational programs.

Also in progress is a "Children's Watersides" Rediscovery Project. Under this project, boards of education, river administrators and environment-related government agencies cooperate in surveying watersides, select watersides that can be used as places of outdoor nature education, and promote the use of such watersides. The Children's Watersides Project program is being implemented jointly by the Ministry of Education, Culture, Sports, Science and Technology, the Ministry of Land, Infrastructure and Transport and the Ministry of the Environment. To date, 22 sites have been registered, and about 100 more are now being prepared for registration.

Photo. 6 "Waterside School" activity

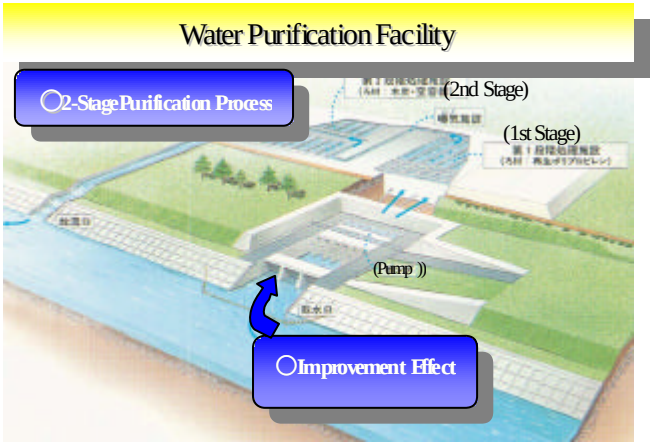
Message 3.9

As administrator of rivers and lakes in Japan, Ministery of Land, Infrastructure and Transport (M.L.I.T.) and prefectural Government carries various measures for building healthy hydrological cycle of river and lake. As an example, M.L.I.T .and prefectural Government carries environmental improvement projects on direct controlled river and lake by cooperating with other measures which treat source of water pollution.

Efforts on River Water Purification

As administrator, in charge of flood controll, water use and river environment conservation of river and lake in Japan ,M.L.I.T. and prefectural Government carries various measures for building healthy hydrological cycle of river and lake. As an example, M.L.I.T and prefectural Government carries environmental improvement projects on direct controlled river and lake by cooperating with other measures which cures source of water pollution. M.I.L.T also subsidizes local government to promote their river purification projects.

Water Quality Improvement Project



Basic idea of water quality improvement is a pollution source management in water area such as drainage control and sewage construction. But if those measures don't work well, M.L.I.T carries following water quality improvement projects.

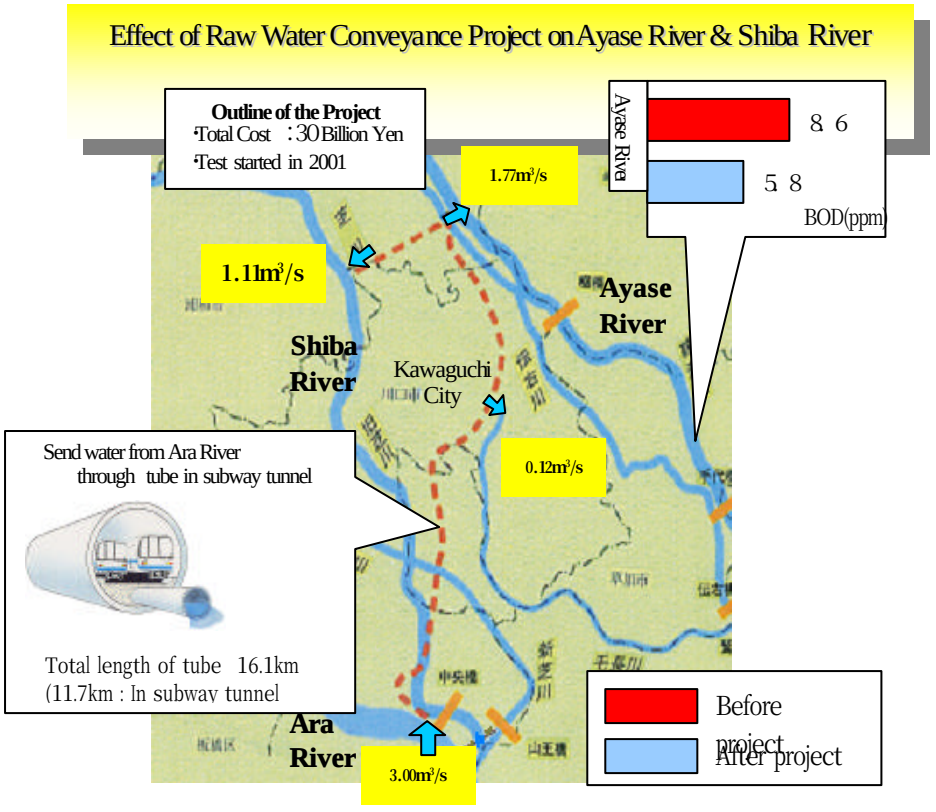
① Construction of direct river water purification facility.

Up until fiscal 1999, the Ministry had built 41facilities to directly reduce pollution loads in river water. River water purification methods adopted include the contact oxidation method where the sedimentation and absorption of pollutants by filling contact materials such as gravels into a water tank and the passing water is purified through the contact materials by the activity of microorganism decomposition and other similar effects; and the purification method using the ability of aquatic plants and soil to absorb pollutants. The Ministry has also been drawing up a provisional method to improve the ability of rivers to clean water by promoting self-purification in shoals and deep water areas, and restoring the cleaning functions of lakes by artificially reconstructing inner lakes (small lakes formed around large lakes by sediment accumulation) which play an important role in cleaning lake water and preserving the ecosystem.

② Construction of raw water conveyance for purification

This is an effective water cleaning method because it can directly improve water quality diluting water in polluted areas, improving hydraulic conditions, to transport bed load sediments and shortening the water resident time. However, projects using this method should be carried out while analyzing the feasibility of reducing pollutants discharged from catchment areas and of restoring the original flow rates in rivers and lakes.

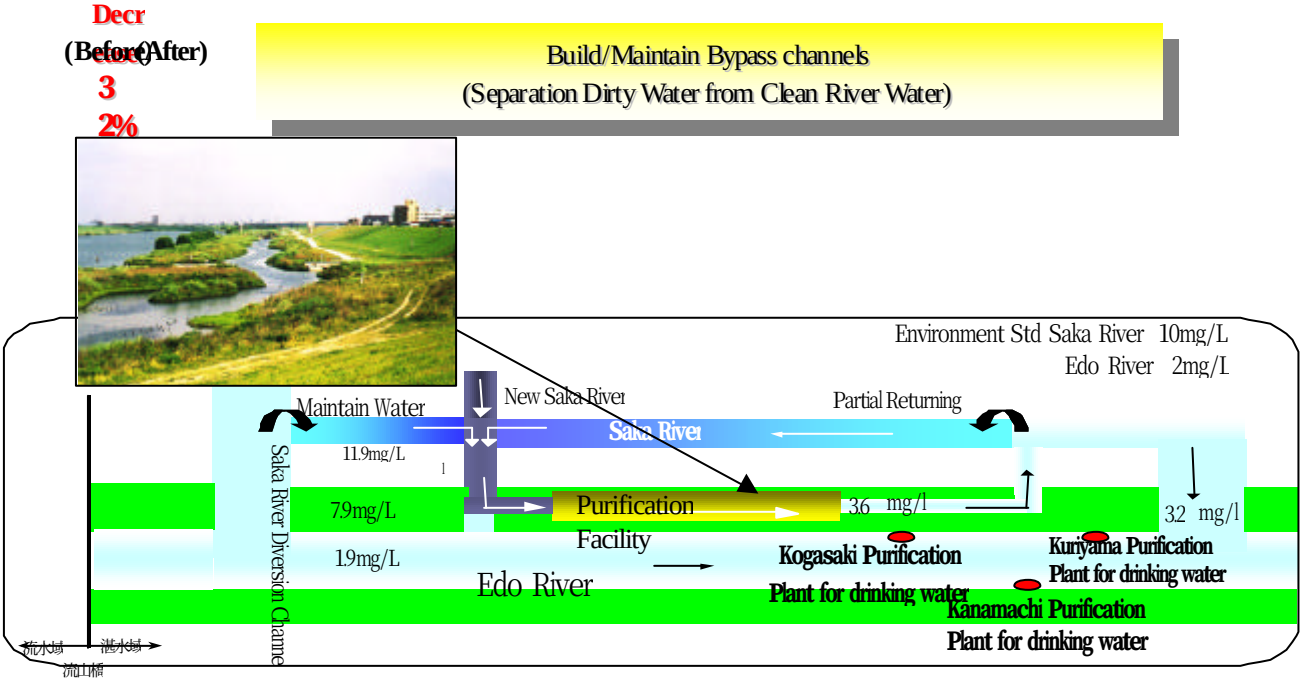
It will start in summer of 2004, water that amounts a maximum of 3 m3/s from the main stream of Ara River which flows between Tokyo and



Saitama has been introduced to Ayase river and Shiba reiver.

③ Build/Maintain Bypass channels

Bypass channels have been built in three rivers in order to ensure clean river water flows by setting new a low flow channel in the river area of rivers where water utilization has advanced and by separating the water in the main stream from the water in polluted tributaries. The Edo River bypass channel, the first example of this kind of structure, has proved effective for improving water quality at the point of dinking intake, by separating polluted water in the Saka River that had flowed into the water supply sources at the Kanamachi, Kogasaki and Kuriyama water purifying plants, which are important water supply sources for the Tokyo metropolitan area.



④ Dredging

Up to fiscal 1999, dredging works had been carried out in 94 rivers and lakes to remove bottom sediment that causes offensive odor and the elution of nutrient salts, which then causes eutrophication.

Important points concerning the dredging work are that it is necessary to investigate the status first to determine the dredging area and to examine optimum methods to dispose of or effectively use the dredged sediment. Removing the bottom sediment itself clearly directly removes the accumulating pollutants.

Message 4.1

It is difficult for individuals to fight disasters and it is important for the public sector to take responsibility for the performance of disaster mitigation and risk management in order to conserve and develop the national land, maintain public safety, and promote the public welfare.

(Background)

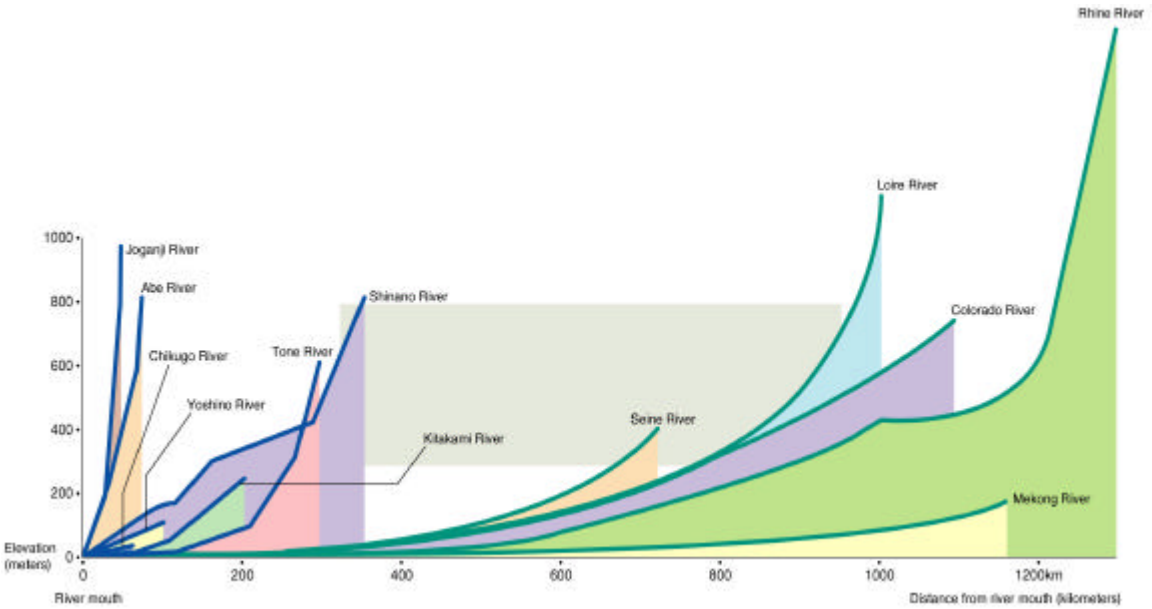
- Disasters not only claim human lives and destroy property; they also severely disrupt stable land use and economic activities.
- Features of the national land of Japan that is part of the Asian Monsoon Region include rainfall that fluctuates widely from season to season and steep topography formed by mountain ranges running the length of the archipelago.
- Conditions in Japan make it vulnerable to disastrous flooding caused by flood waters rushing down many of its rivers following heavy rainfall.
- A characteristic of Japan's national land that severely restricts its ability to continuously use a fixed quantity of water is the wide seasonal fluctuation of the flow volume of its rivers, which results in the quantity of water available for use in Japan each year being far smaller than the quantity discharged into the sea.

(Measures taken by the government)

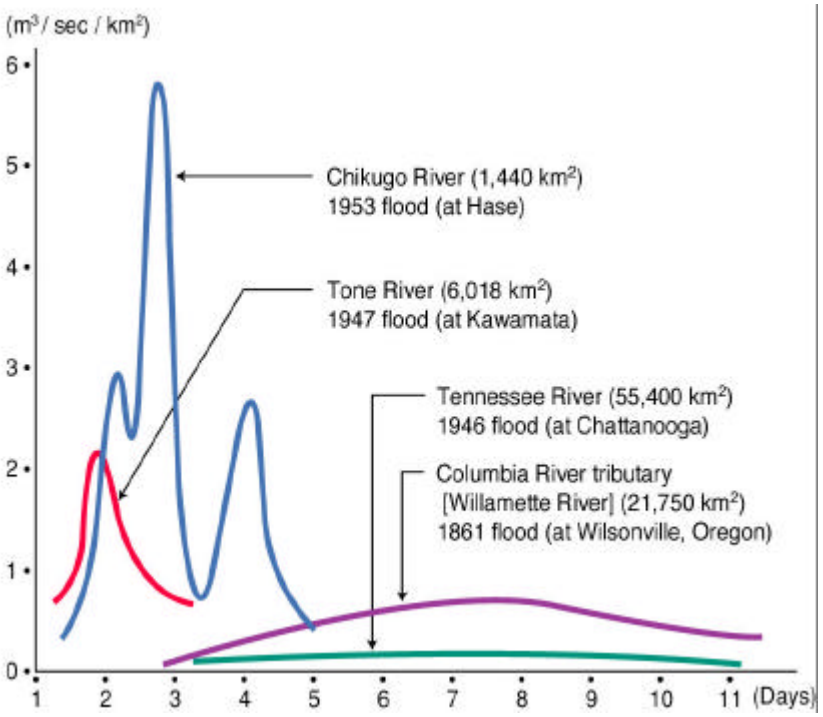
- In order to mitigate disasters by floods that cause particularly severe damage, the government directly implements important river works at the same time as its guides and monitors river administration activities by regional governments (enactment of the River Law in 1886).
- To prevent abnormal sediment disasters originating in upstream mountainous regions and the rise of downstream riverbeds, it captures dangerous sediment in the upstream and midstream parts of rivers at the same time as it establishes designated sediment control districts and regulates harmful activities in these districts in order to carry out sediment control works to stabilize river courses. (enactment of the Sabo Law in 1897)
- By establishing the Protected Forest System that restricts quarrying and requires reforestation, it conserves and improves forests to enhance their water source nurturing and mountainside disaster prevention functions. (enactment of the Forest Law in 1887)

Achievement of goals

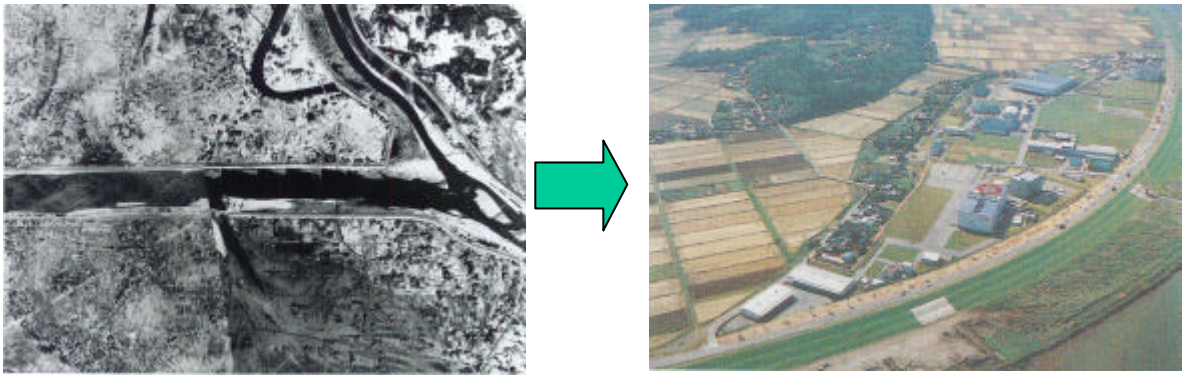
- During the nineteen-fifties, flooding claimed victims numbering in the thousands, but during the nineteen-nineties, only a few tens of lives were lost to floods.
- Flood control measures have been steadily implemented, but because flood disasters that submerge people's homes and cause other damage continue to occur frequently, there is a high demand for more flood control measures.



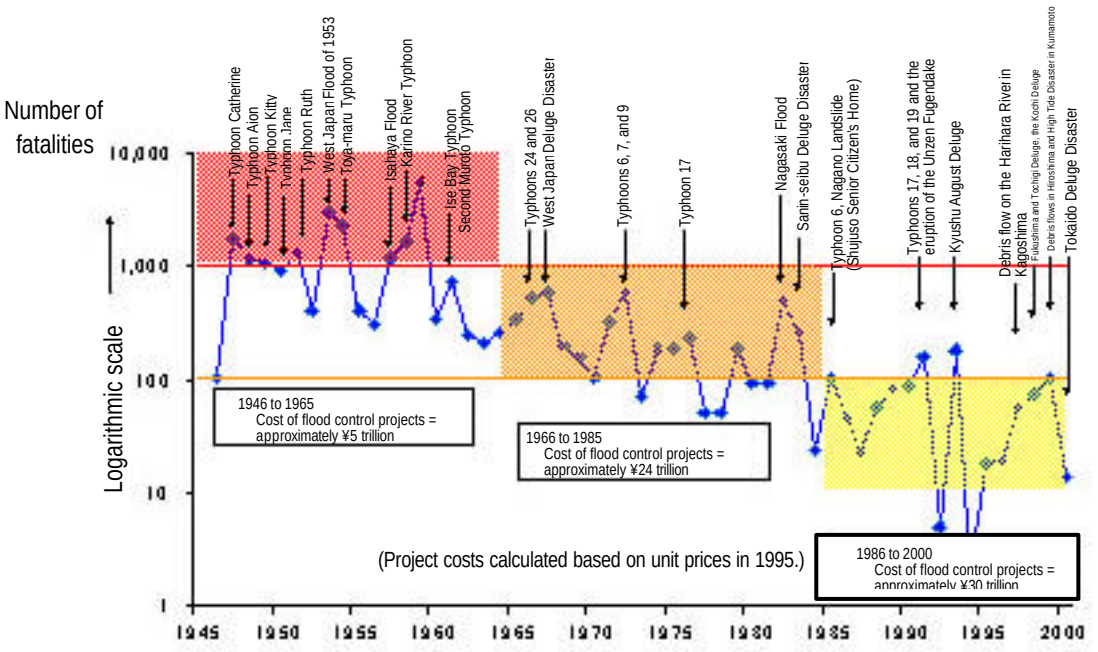
Comparison of Riverbed Gradients



Comparison of Days Elapsed Until the Arrival of Flood Waters

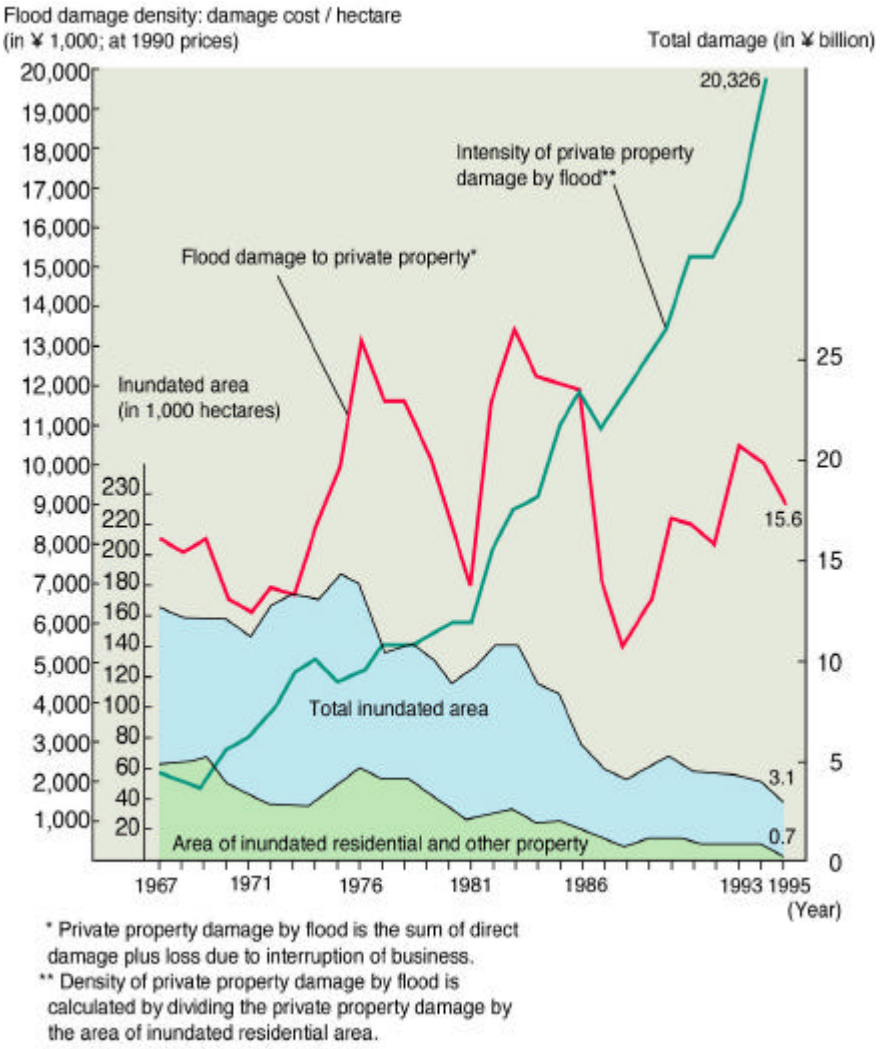


Improvement of Safety by Flood Control Projects (Levee Construction) (Tone River)



- The graph shows the total number of fatalities caused by floods, sediment disasters, and volcanic eruptions.
- The number of fatalities is based on disaster statistics (River Bureau) (1946 – 1952 and a survey by the National Police Agency (from 1953).
- The cost of flood control projects are actual amounts (calculated based on flood control project cost indices for 1995), and represent the total cost of flood control projects included those subsidized by the national government (but from 1946 to 1959, because of the statistical documents, they are calculated including costs of flood control projects borne completely by regional governments.)

Fatalities Caused by Storms and Flooding



Flood Disasters that Continue to Occur Frequently

Message 4.2　Flood Control

Flood control is very important in Japan, a densely populated country with concentrated assets susceptible to flood damage.

（History）

- Due to the national land conditions and restrictions in land use, cities have been developed in downstream alluvial plains in major rivers. Socioeconomic activities have long been concentrated in inundation areas.
- Most of the cities are located below the water level of flooded rivers and use land susceptible to flood damage.
- Population, assets and activities are increasingly concentrated in the cities in recent years in particular, and the potential for flood damage is increasing accordingly.
- Rice paddies in alluvial plains were often flooded in the late 19th century, resulting in unstable rice harvests.

（Government Measures）

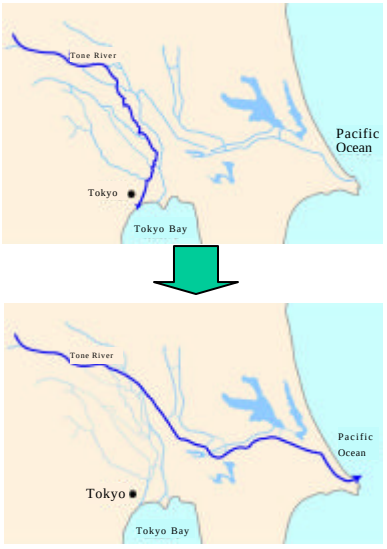
- 1886 Enactment of River Law
  To mitigate serious flood damage, the government directly engaged important river works and guided and supervised municipalities in river administration.
- 1955 Enactment of the Act on Emergency Measures for Forest Protection and Flood Control
  Under the law, long-term and systematic investments were made in flood control..

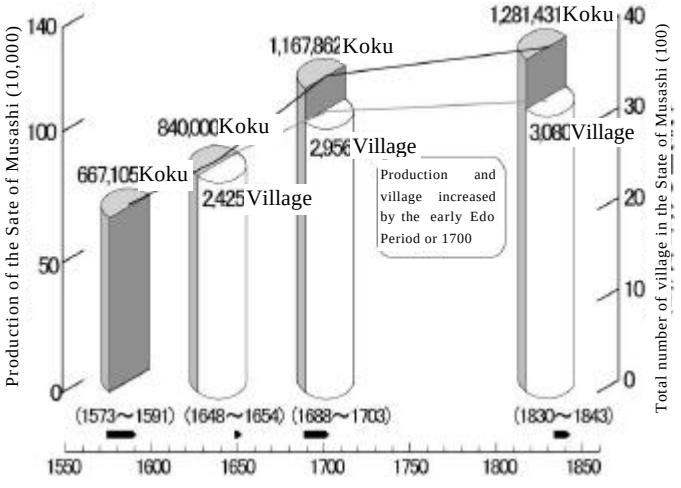
（Achievement of Purposes）

- Economic development was spurred by the progressive improvement of major rivers directly undertaken by the government, as large cities and sophisticated agriculture developed in the downstream alluvial plains. .
- However, rivers must be developed further, and continued flood control is important in view of the concentration of the population and the sophisticated assets in the alluvial plains.

（Example 1　Formation of a city by flood control）

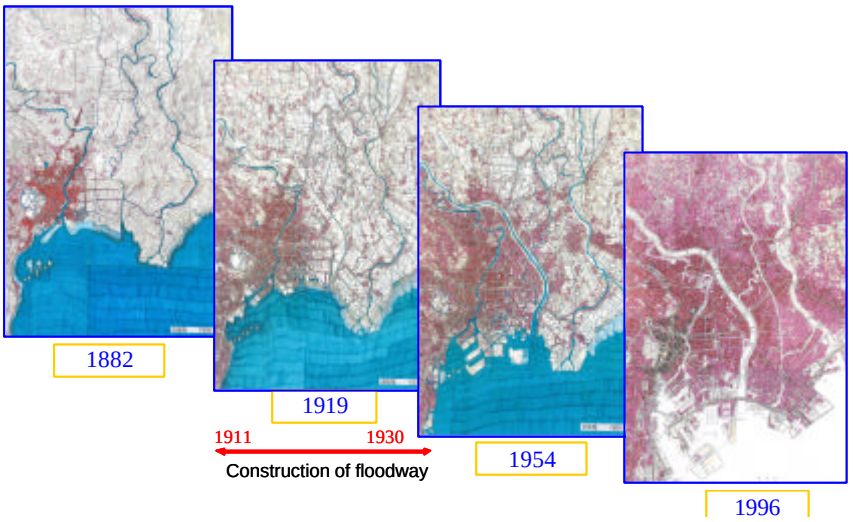
The Tone River which was flowing into the Tokyo Bay took the present form of flowing into the Pacific Ocean after river works lasting about 60 years from 1590. The combination of watercourses such as the Tone and Ara Rivers, which had turbulently flowed in the lowlands, water was effectively discharged into the swampy lowlands and a great farm belt was created in the Tone River Basin. The development of new fields boosted both production and population, and the development of Tokyo into a great metropolis.





（Example 2 Urban Development by Floodway）

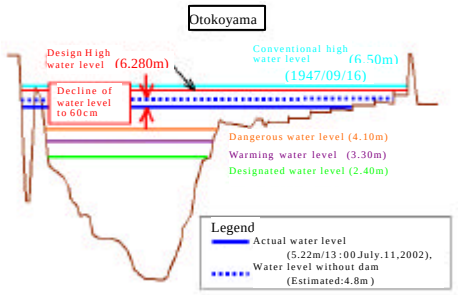
As the population of the Kanto District progressively increased,, construction of 22km-long and 500m wide floodway was begun in the Ara River in 1910. Completed in 1930, the floodway spurred ongoing economic develo pment of the eastern urban area, as stable development was achieved due to the improved protection against floods. The area now has a population of 1.6 million and a vast concentration of assets.



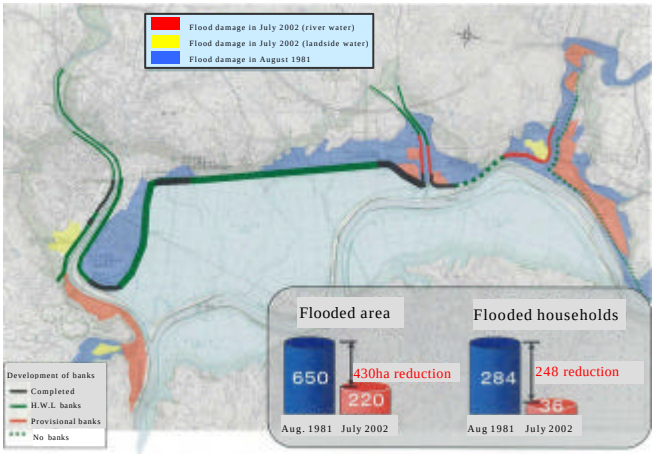
（Example 3 Flood Control by Detention Basins and Dams）

Ichinoseki City, Iwate and its vicinity suffered great flood damage due to typhoons in the late 1940s. For protection against flood damage in cities and flood control in the entire river system, detention basins were developed in the midstream area, taking advantage of the natural topography. The detention basins are effectively used for agriculture as before, allowing some risk of flood.

The inundation area greatly decreased by 430ha and flooded households by 248 at the time of a typhoon in July 2002 as compared to the flood in 1981. It is estimated that the peak water level was decreased by 40-60cm in the midstream area by flood control provided by five upstream dams.



Decline of water level in the midstream area



Dam controlling flood

Message 4.3 Drought measures

It is important to develop infrastructure and establish cooperation among stakeholders in order to equally distribute limited water resources to all people during periods of drought.

(History)

- Droughts began to frequently occur due to rapid expansion of demand for water arising from the explosion of urban populations during the period of high economic growth .

(Government Measures)

- Special provisions of the River Law were drawn up concerning construction and management of multipurpose dams to achieve their prompt and sufficient effects by establishing rights to use dams. (Enactment of Specified Multipurpose Dam Act in 1957)
- To ensure water supply to the areas undergoing industrial development and with increased urban populations, water resources were preserved and recharged, under comprehensive development plans for rational utilization in river basins to contribute to the growth of the national economy and improvement of people's lives. (Enactment of Water Resources Development Promotion Act in 1961)
- Integrated river management was introduced to foster basic planning, including flood water levels, integrating the whole river system. Water utilization provisions were established. (1964 amendment of the River Law)
- If it becomes difficult for users of river water to secure permitted amounts of water due to abnormal drought, they shall engage in consultation to mutually adjust the amounts of use in a spirit of mutual concession and may smoothly transfer water between them. (1997 amendment to the River Law)

(Achievements)

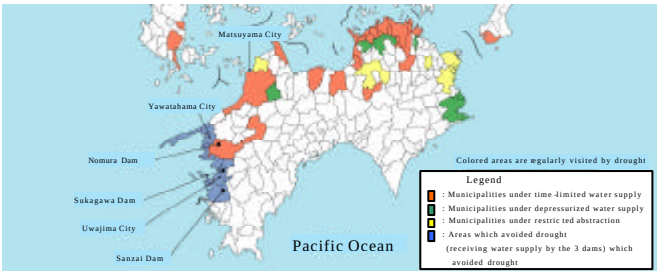
- The dams constructed in the past enabled stable water utilization by providing for annual storage and replenishment.
- As drought is highly likely to occur, it is necessary to maintain the initiatives for securing stable water resources.

(Example 1. Water Supply by Dam Construction)

The coastal area in Nanyo region, Ehime Prefecture, suffers from annual water shortages due to a lack of major rivers. In the great drought in 1967, the water supply was stopped or restricted and major agricultural damage such as blighted citrus fruit occurred.

After completion of three dams between 1976 and 1981, they had no drought damage despite rainfall in 1994 as small as that in 1967.

Water supplying vehicle in drought

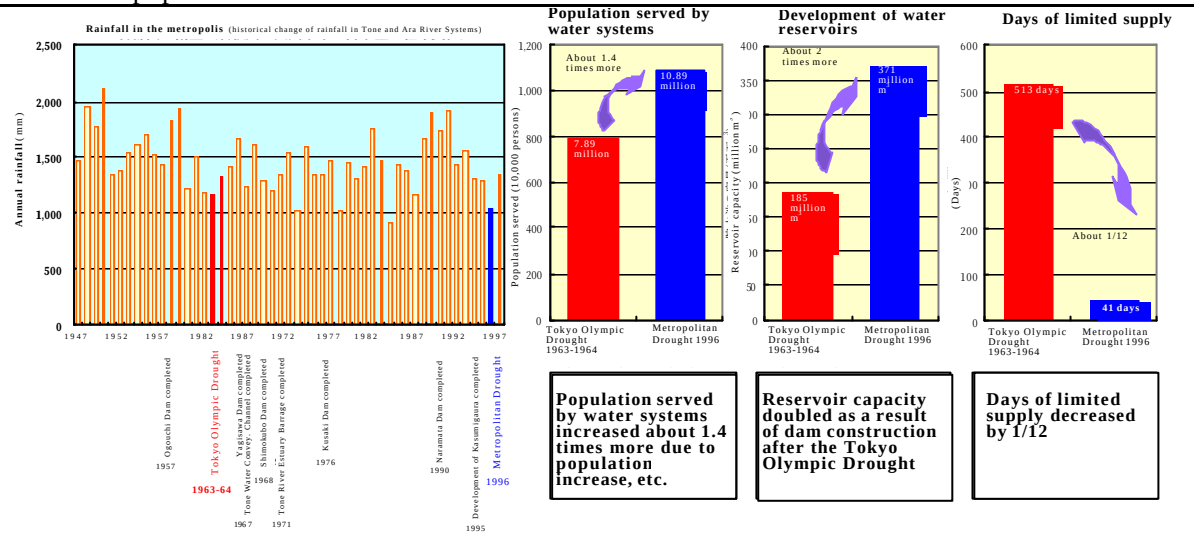


Nanyo Area which avoided drought by 3 dams

(Example 2. Water Supply by Dam Construction)

The water supply-demand situation is tight in the metropolis due to the concentration of population and industries, and the area is susceptible to restricted water supply during drought. During the abnormal drought in 1963-1964, water supply was restricted for 513 days, resulting in adverse effects on citizens' lives.

The reservoir capacity doubled by dam construction and the restriction of water supply in 1996 was reduced to 41 days or 1/12 that of the period of abnormal drought mentioned above, despite 1.4 times more population served and smaller rainfall.



(Water rights and drought conciliation)

Water has been important for a long time and we have worked out rules for use of water. In the early eighth century, the Taihoryo ordinance provided for priority in water use, permission procedure and users' burden. After agricultural development in the Edo Period and water resources development in the Showa Era for a growing urban population, public control of river water was established by the 1964 new River Law.

The river law requires permission of river administrators when using river water for agriculture, water supply and industry. Permitted persons can use river water continuously and exclusively. These rights are called water rights.

Water use is permitted after coordination for all users to secure required water for each use even in the event of drought occurring once in 10 years, unless it is an abnormal drought. In a time of abnormal drought, conciliation such as limited abstraction will be made in a spirit of mutual concessions among water users.

To address problems occurred during the nationwide drought in 1994, the River Law was amended in 1997 as follows:

(1) Smoother drought conciliation

Users should endeavor to adjust amounts of use mutually when it is or is likely to be difficult to be able to fully use water during periods of abnormal drought. The river administrators should endeavor to provide hydrological information required for such adjustments.

(2) Smoother transfer of water among users

Upon approval of the river administrator, a water user may allow other water users to use his water based on his water right.

Message 4.4 Environmental Protection and Residents Participation

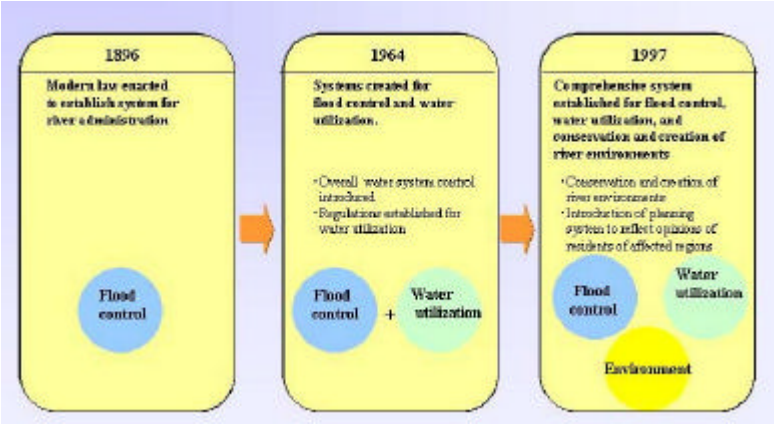
It is important to implement river management integrating the whole river basin by striking a comprehensive balance between flood control, water use and environment.

(History and Government Measures)

- Japan is susceptible to flood damage due to the rapid flow of water in many rivers when heavy rain occurs.
- 1886 Enactment of River Law
  To prevent serious flood damage, the government has directly undertaken important river works and guided/supervised river administration by municipalities.
- 1945～1955 In devastated areas serious disasters frequently occurred due to series of large typhoons.
- 1955 Enactment of the Act on Emergency Measures for Forest Protection and Flood Control
  Long-term investments were made for flood control under the law.
- 1955～ Basins were developed along with the socioeconomic development, and demand for industrial and urban water soared.
- 1964 Amendment of the River Law
  Introduced integrated river management to encompass entire river systems for basic planning of such matters as flood water levels.
  Water use provisions were improved.
- Rainwater storage/infiltration measures together with river improvement and comprehensive flood control programs including provision of warning and evacuation systems were implemented. (Interim Recommendation for Promotion of Comprehensive Flood Control Measures in 1977)
- Rapid social change such as population growth and industrial development resulted in a decrease of water and vegetation in river basins. The urgent and efficient promotion of flood control and water use projects lacked consideration for the environment. ("Basic Directions of Future River Improvement in the 21st Century" in 1996 (Recommendation))
- 1997 Amendment of the River Law
  Conduct river management integrating entire river systems by striking a comprehensive balance between flood control, water use and environmental protection.
  Rivers are important as waterfronts where people can relax and as habitats of a diversity of animals. In view of this the government sought to protect rivers as unique and important elements of local climates and cultures.

(Achievements)

- Establishment of river management system integrating the whole river basin balancing flood control, water use and environment by taking advantage of various water functions, considering river characteristics, local culture.
- Future river improvement should be conducted on the basis of this river management concept.

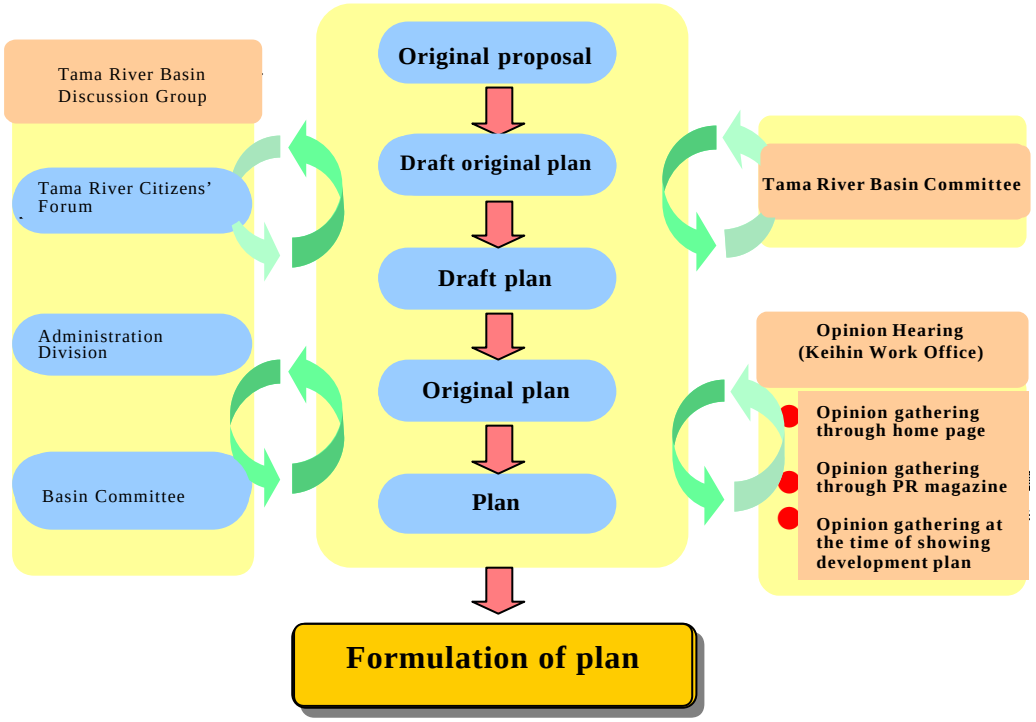


Change in river management concepts

（Example A river development plan reflecting local opinions

From 1970 in areas along the Tama River in Tokyo, citizens' groups developed activities to protect the river as an oasis of water and plants surviving in the urban areas; direct dialogue with the river administrator continued from 1975.

Based on the River Law as amended in 1997, the river administrator invited and considered comments on the original river improvement plan on river works and maintenance to be conducted over the next 20-30 years; this was done through the River Basin Committee where citizens, scholars and the administration met and the Internet. The result was the final version of the river improvement plan in March 2001.



Flow of formulating Tama River Improvement Plan

Message 4.5 Comprehensive flood control measures

To minimize flood damage and mitigate flood impact, it is important to conduct comprehensive flood control measures such as river improvement and development of rainwater storage/infiltration and warning/evacuation systems while giving full consideration to local conditions and river characteristics.

(History)

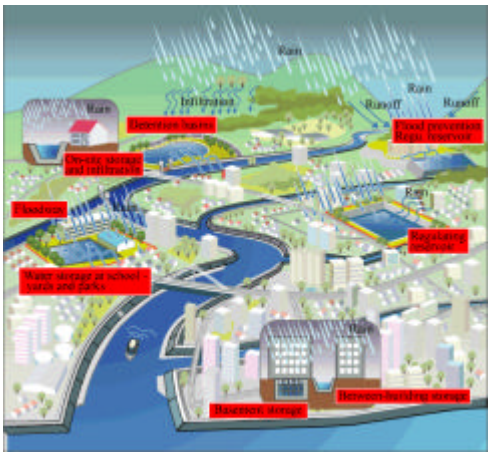
- Disasters such as floods may result in grave damage because of the dense populations and concentrations of assets resulting from urbanization.

(Government Measures)

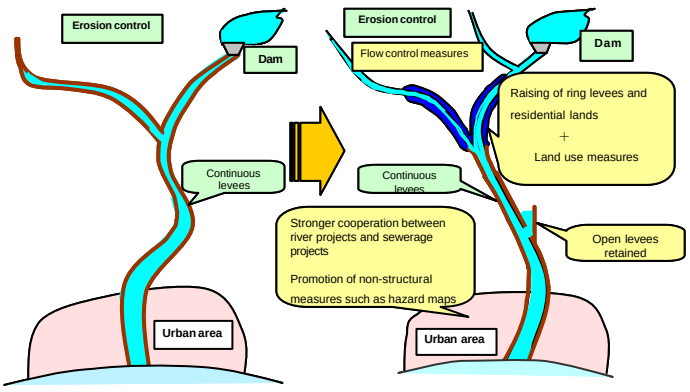
- 1977 Interim Recommendations for Promoting Comprehensive Flood Control
  - Efforts should be made to maintain water retention and detention functions of river basins by promoting development of flood control facilities and minimizing flood runoff and sediment runoff resulting from basin development.
  - In flood risk areas and debris flow risk areas, methods should be established for safe land use, particularly for protection against floods, should be established in response to the development of flood control facilities, and warning/evacuation systems for floods should be improved. Comprehensive flood control activity work should be conducted, including rainwater storage/infiltration measures, the development of warning/evacuation systems and river improvement.
- 2000 Interim Recommendation for Effective and Desirable Flood Control including Response in River Basins
  - New and diversified river basin measures were introduced in addition to conventional river improvement to promote effective flood control..

(Achievements)

Mitigation of flood damage was made possible by an organic combination of levees, detention basins, dams, etc. in urban rivers. Effective flood control measures were made possible by combining various measures, while fully considering local conditions and river characteristics.



Comprehensive flood control concept



Conventional flood control

Future flood control

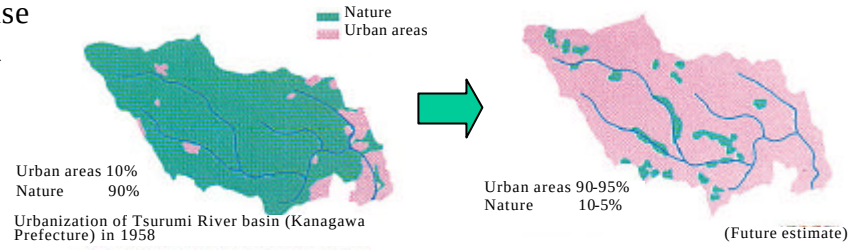
（Example 1. Comprehensive flood control in cities）

The area around the Tsurumi River basin in the Kanto Region, whererapid urbanization has taken place, and flood control measures for the entire basin were adopted to respond to severe floods. River channels were dug, detention basins were developed for river improvement, and basin measures such as regulation reservoirs and damage mitigation measures such as in-building storage have been conducted as well.

Historical change of land use

1958: 10% urbanization →

1997: 84.3% urbanization



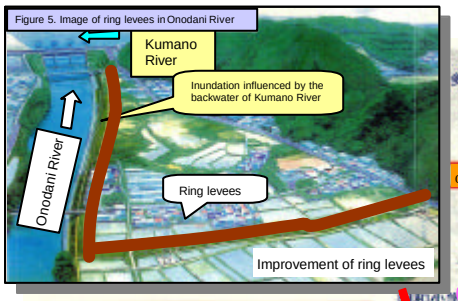
Urbanization of Tsurumi River basin (Kanagawa Prefecture) in 1958

Regulating reservoir used as tennis courts at normal times.

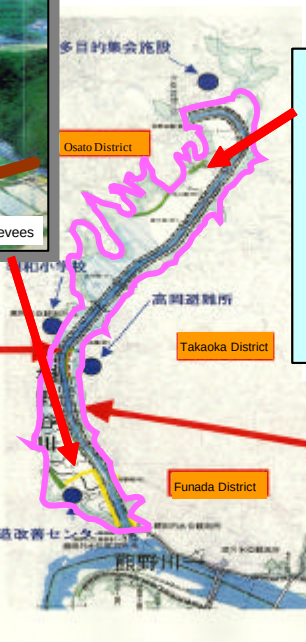
（Example 2. Flood control in mountains）

The area along the Onodani River in the Kinki Region suffered from floods due to backwater from the Kumano River. As the Onodani River flows in the mountains, farmlands are limited. Continuous levees, therefore, would deprive the residents of farmlands as production bases. In areas requiring greater safety measures due to higher concentrations of houses, ring levees were constructed and housing lands were raised. In other areas, building regulations were adopted. The lives of residents were protected by effective flood control measures taken at the regional level.

Land use restriction and flood control in Onodani River



Inundation in 2001 (Takaoka District)



- Restriction of house building in inundation area
  → Designation as disaster danger area
- Flood control for houses
  → Raising of ring levees and housing lands

Inundation in 2001 (Funada District)

Message 4.6 Non-structural measures

Residents' voluntary activities and utilization of information technology for prompt acquisition of precise information are effective for mitigation of flood damage.

(History)

- In Japan, local communities have traditionally conducted regional flood fighting activities voluntarily.
- Urbanization discouraged local disaster prevention awareness.
- Observation networks have been improved along with flood projection technology and development of IT.
- No reduction of floods caused by dykes breaking along small and medium-sized rivers.
- Potential for grave damage has increased in cities due to sophisticated land use; problems caused by urban floods such as paralysis of city functions and inundation of underground spaces have arisen.

(Government Measures)

- 1949 Enactment of Flood Fighting Act
  Flood damage was mitigated by a combination of infrastructural development, flood fighting and evacuation by communities, and fostering of flood fighting awareness of among citizens.
- 1955 Amendment of Flood Fighting Act
  Start of disaster compensation and flood warning system (jointly managed by river administrators and the Meteorological Agency)
- 2001 Amendment of Flood Fighting Act
  - The flood warning system covers small and medium rivers.
  - Announcement of estimated inundation area.
  - Fixed items for smooth and prompt evacuation and using hazard maps and other tools to keep residents fully informed.
  - Transmission of precise flood projections to users of underground spaces.
- Active utilization of information technology for immediate dissemination of precise river information.

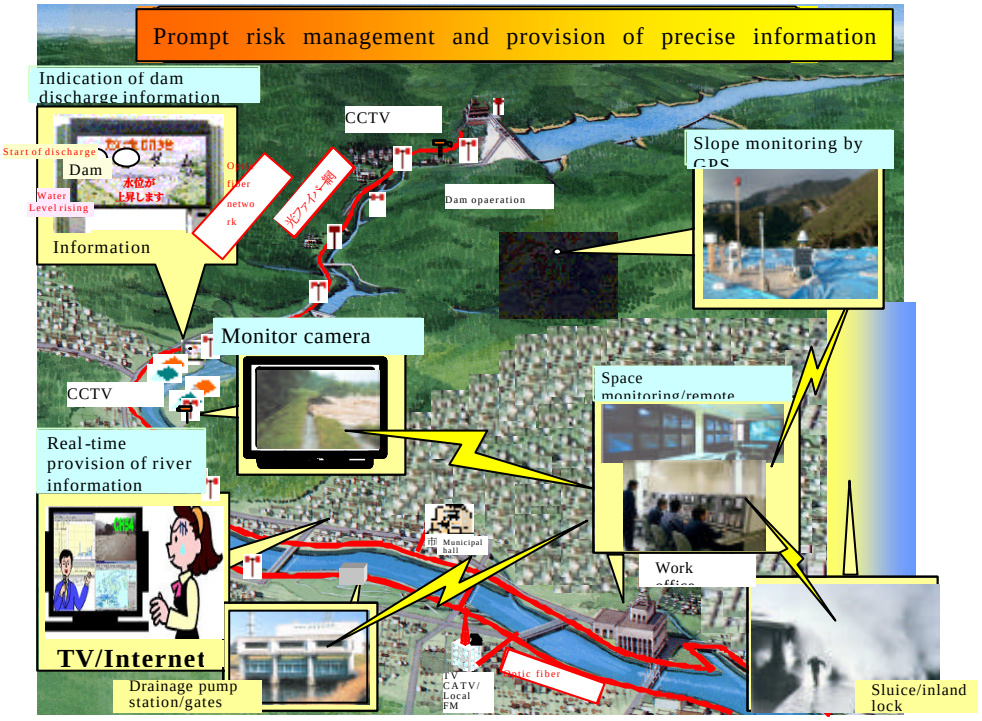
(Achievements)

- Prompt acquisition of precise information and raising general awareness of flood prevention among citizens has enabled early evacuation and response and reduced numbers of victims.

(Example 1. Provision of hydrological river information)

Mitigation of flood damage requires a wise combination of infrastructure such as levees, dams and detention basins, community flood fighting and evacuation, and improvement of general awareness of flood fighting among citizens.

River administrators acquire hydrological river information concerning important rivers in Japan and are providing it to citizens in general through mobile phones, CATV, the Internet, etc. for immediate identification of precise river information.



(Example 2. Hazard map improves resident awareness.)

Hazard maps prepared by municipalities under the Flood Fighting Act comprehensively show inundation depths and evacuation directions during floods for distribution to citizens in general. Studies indicate that those who see hazard maps evacuate about one hour earlier than those who did not, showing the effectiveness of hazard maps in reducing numbers of victims.

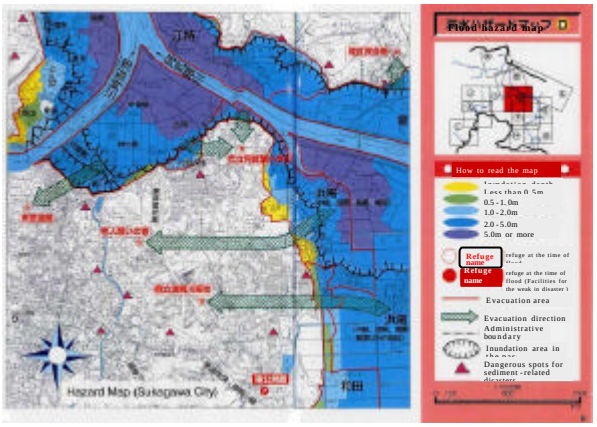
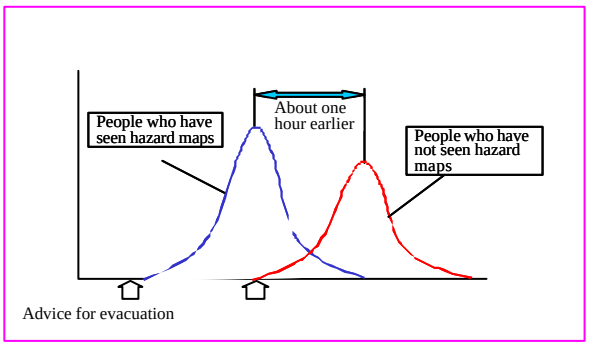


Image of Hazard map



Evacuation time reduced by hazard map
Source: Katada Laboratory, Gunma University

(Prepared on the basis of "Investigation Report concerning the Behavior of the Citizens of Koriyama at the time of Heavy Rain in the end of August 1998.")

Message 4.7

Proper sediment and erosion management in river basin is the best way to reduce and/or prevent damage caused by flood and sediment-related disasters.

Background

- Japan is particularly vulnerable to sediment-related disasters, for a number of reasons: some 70% of its total land area is mountainous or hilly country; it has many fast-flowing rivers; it has high annual rainfall; and earthquake and volcanic activity are common.
- As a result of these environmental and climatic conditions, erosion and sediment of mud and debris flow are causing river beds to rise in Japan, leading to increasingly frequent flooding.
- Modern industrial development in the Meiji Era (End of 20th Century) generated demand for the construction of shipping routes and ports and harbors.
- Mudflow damage led to sediment build-up in rivers and ports, obstructing shipping traffic and hindering the collection of water for farming use.

Action taken by government

・1897 Sabo Control Act
The Sabo Control Act was enacted in 1897 in a bid to eliminate obstructions to shipping traffic and reduce or prevent damage from frequent flooding and sediment-related disasters. The Act restricts destructive activities in designated sediment and erosion control zones and areas where sediment and erosion control programs are in place.

・Various sediment and erosion control programs have been introduced throughout Japan in a bid to eliminate flooding and other damage attributable to the higher river beds created by sedimentation.

・The pace of social change (particularly with respect to rising population levels and rapid industrial growth) has significantly increased the potential extensive damage from flooding due to sedimentation and erosion.

・Where a river originates from a mountain region that is severely devastated, accumulated earth and sand from the upper reaches of the river makes the river bed higher, exacerbating the damage caused by flooding throughout the entire river basin.

・The sediment and erosion control programs described above are designed to control downstream sedimentation through rivers and keep river bed heights as constant as possible in the lower reaches.

Achievements

・Proper river basin sediment and erosion management has reduced and in some cases eliminated flood and damage caused by sediment-related disasters.

・Even so, Japan has experienced around 1,000 sediment-related disasters per year (on average) over the past decade, with around 33,000 ha of land inundated by flooding every year. Thus, river basin sediment and erosion management is still as important as ever.

Example 1: Sediment and erosion control in the Yodo river basin

The river bed height in the lower reaches of the Yodo river increased substantially as a result of earth and sand movement from the denuded Mt. Tanakami mountain region, where the river originates. The increased river bed height exacerbated the damage caused by flooding due to sedimentation in the lower reaches of the river, and obstructed shipping traffic traveling upstream from Osaka Bay. The sediment and erosion control program included afforestation of Mt. Tanakami.

Yodo River—location map

Photograph 1:
Increase in river bed height downstream of Mt. Tanakami

Photograph 2:
Improvement in vegetation cover on Mt. Tanakami
(Otsu City, Shiga Prefecture)

Photograph 3:
Lower reaches of the Yodo river today

Example 2: How sediment and erosion control works have boosted regional prosperity in the Hikawa river basin
The Hikawa river basin was caught in a natural disaster cycle in which flooding triggered earth and sand movement, which increased the height of the river bed, which then led to more flooding. The result was catastrophic damage to agricultural and residential land, as well as endless human suffering. Sediment and erosion countermeasures in the mountainous region of the river basin have mitigated flood damage attributable to mudflows and debris flow, while also stabilizing water supplies and making the land a safer place to live and work, thereby boosting fruit production across the entire lower river basin area.

Figure 1: Breakdown of land use in the Hikawa river basin in 1896

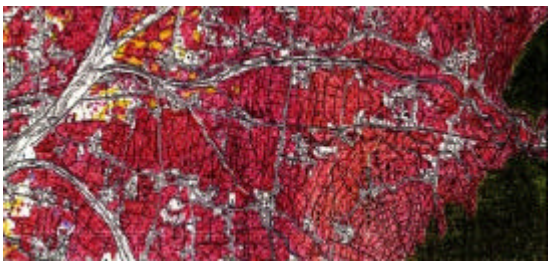


Figure 2: Breakdown of land use in the Hikawa river basin in 1970

Message 4.8

Tsunami and floodtides are capable of wreaking extensive damage. Coastal damage protection programs, consisting of both physical and non-physical elements, are required in order to protect population centers located on or near the coastline, as well as the assets of the nation.

Background

Japan is surrounded by water on all sides. A number of complex coastal shipping routes ply up and down the length of the country. Japan has a staggering 35,000 km of coastline. It is a narrow country with only limited flat plain areas. Japan's population, assets, and infrastructure are concentrated on and near the coast.

- Japan suffers from very harsh environmental conditions, being frequently subject to earthquakes, typhoons, strong winter winds and heavy seas. In addition, Japan is vulnerable to damage (particularly coastal erosion) from tsunamis, floodtides, and high seas.
- Coastal erosion is caused by a combination of factors, most significantly a reduction in the volume of sand and sediment arriving at the coast, which has affected the equilibrium of sand and sediment movement.

Action taken by government

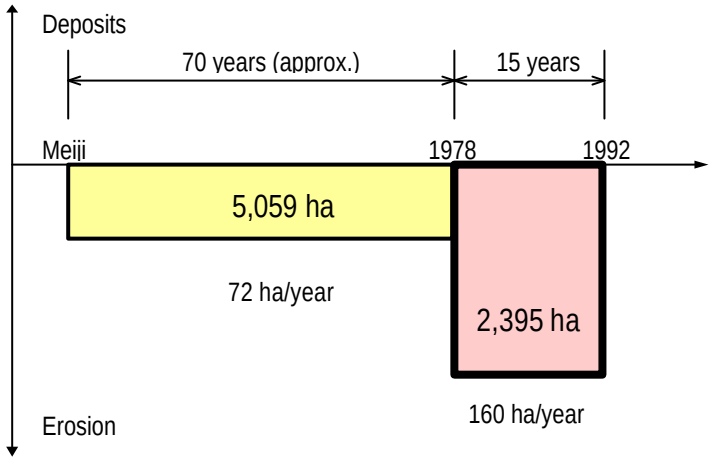
- Shortly after the end of the war, government bodies responsible for reclaimed land, fishing ports, ports and harbors, and other facilities along the coastline were charged with repairing damage and restoring facilities as part of a concerted effort to rehabilitate the nation's assets.
- Once this task had been accomplished, the focus shifted to prevention of unexpected disasters. The 1956 Coastal Act introduced a formal coastal management structure under which local governments were given responsibility for conservation along the coastline.
- The Coastal Act was amended in 1999 to accommodate the rising popularity of coastal recreation pursuits and increasing public awareness of environmental issues. The original aim of the Act—protection of the coastline—was supplemented with the new aims of environmental conservation and recreational usage.

Achievements

- Thanks to a steady stream of coastal management projects, the conservation of coastal facilities is expected to reach 48% by the end of March 2003.
- Despite these efforts, over the decade from 1991 to 2000, an average of 6,400 people per year are affected by coastal disasters. It is important that coastal protection work is continued in the future.

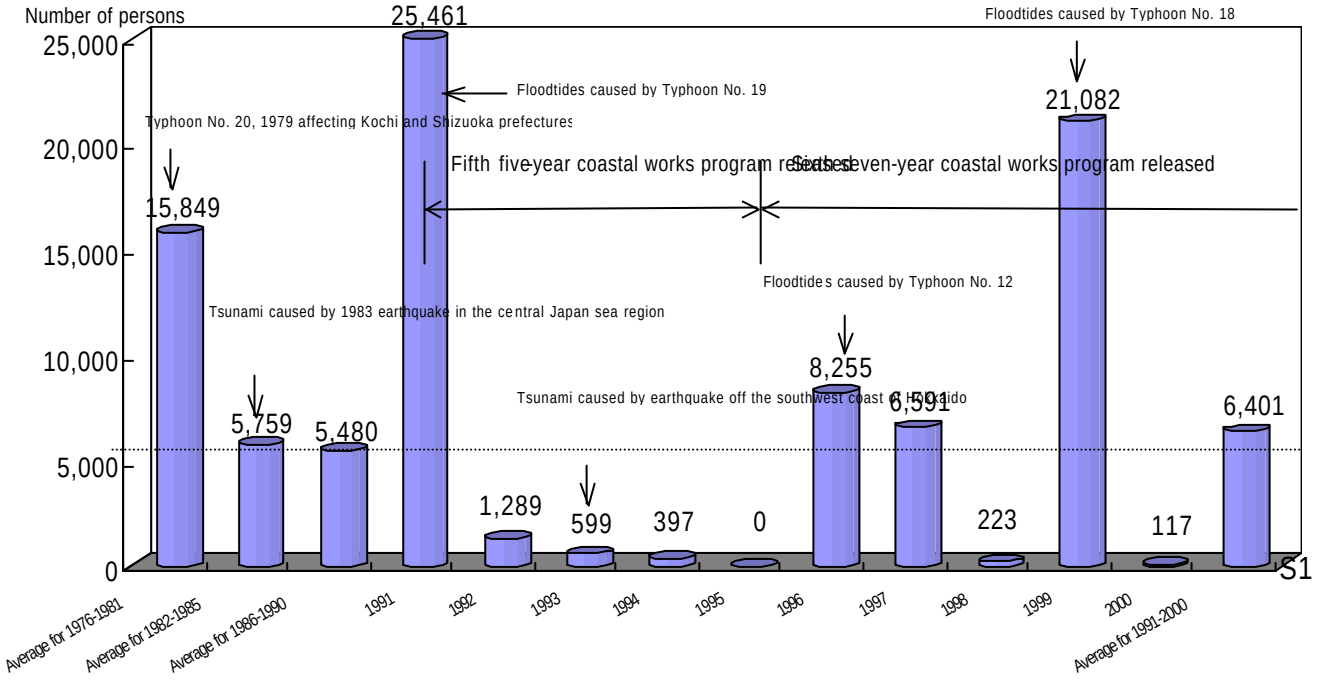
◆Tsunami
Damage sustained by the town of Okushiri-cho as a result of a tsunami caused by an earthquake off the southwest coast of Hokkaido in 1993

◆Floodtide
Damage sustained by the town of Shiranu-machi in Kumamoto prefecture during Typhoon No. 18 in 1999



◆Increase in coastal erosion in sandy coastal areas

Source: Study of coastal disasters by type of unusual weather phenomenon, taken from *Coastal Statistics* for the relevant years



◆Human toll from tsunamis and floodtides

Message 5.1

- Water is the key to growth. It is essential to develop water resources and provide water in a planned manner.
- Thorough prior assessments of the impact of water use on the surrounding environment are essential.

Japan experienced rapid urbanization and industrialization and the like nationwide, particularly during the period of recovery following the end of the Second World War and the period of rapid economic growth that began in the late 1950s. As a result, the demand for municipal water skyrocketed.

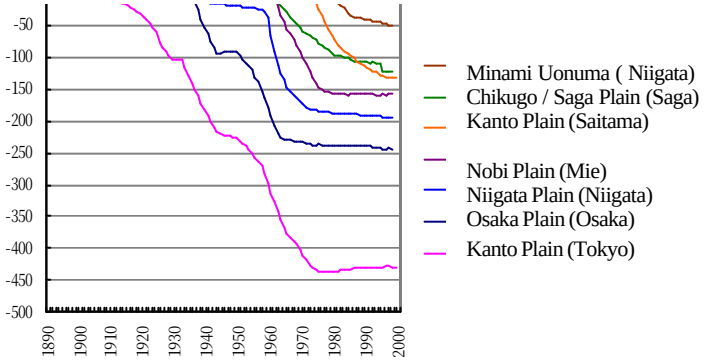
Water resource acquisition and energy development urgent issue

- Increase in various indicators　1955 -> 1980
- Population　90 million -> 117 million (1.3x)
- GDP　14 trillion yen -> 290 trillion yen (20x)
- Change in water demand　10 billion tons / year -> 28 billion tons / year (2.8x)

In response to the sudden increase in demand for water, the initial action was made by using ground water.

Excessive use of ground water caused the problem of ground settling

Cumulative Subsidence



- For prevention of ground settling, ground water use was replaced by the planned development of water resources.
- Start of maintenance and Legal system creation to ensure the efficient and systematic implementation of water resource development through the construction of dams

Multi-purpose dam

- Water resource development through dams couldn't catch up to the increase of water demand, and ground water use remained.

Continuance of ground settling and escalation

- Implementation of water resource development through dams requires enormous funds.

Ground settling subsided, but the ground that had settled did not return to its previous state.

Thorough prior assessments of the impact of water use on the surrounding environment are essential.

[Steps taken by the government]

- Creation of Industrial Water Law and other laws relating to the amount of ground water use
  - Since independent legal systems could not be expected to have a great impact, guidelines for measures to prevent ground settling and the like were established by means of a Meeting of Cabinet Ministers Concerned with the Prevention of Ground Settling, etc. (from seven relevant ministries), and comprehensive measures were implemented to deal with ground water use, ground settling and so on.
  - Limits for the amount of ground water use that would not cause ground settling were established in order to control ground water resources in quantitative terms, and corrective projects were implemented for regions in which ground settling had occurred.
- Legislative measures for the promotion of water resources development projects
  - In accordance with the development of industry and urban concentration, measures are necessary for the rapid implementation of water resources development in areas of heavy water demand
  - Establish legislation to develop water resources through dams and other measures.

Message 5.2

It is essential to create the mechanisms (both financing and systems) to promote water projects.

Legal systems to ensure the efficient and systematic implementation of water resource development through dam construction
(Water Resources Development Promotion Law and Water Resources Development Public Corporation Law: 1961)

- Water Resources Development Promotion Law
  - Seven water systems were designated as water resources development water systems requiring wide area water usage measures in accordance with industrial development and urban concentration.
  - Integrated water resources development through the drafting of Basic Plans for Water Resource Development
- Water Resources Development Public Corporation Law
  - Implementation of projects for the development and utilization of water resources for water resources development water systems under Basic Plans for Water Resource Development
  - Overall integration ranging from water resource development to facility control

■ Features
- Achieved concentrated investment through the loan of government funds
- A system was established in which funds were procured through the acquisition of loans, etc. which were paid off in installments by water use companies after the completion of the facilities

Allow for stable financial procurement for the early realization of water resources development projects

Overview of project cost burden

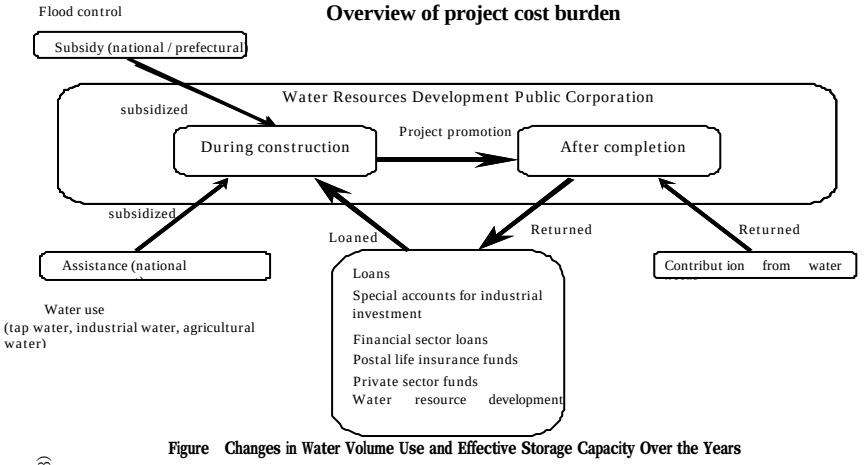
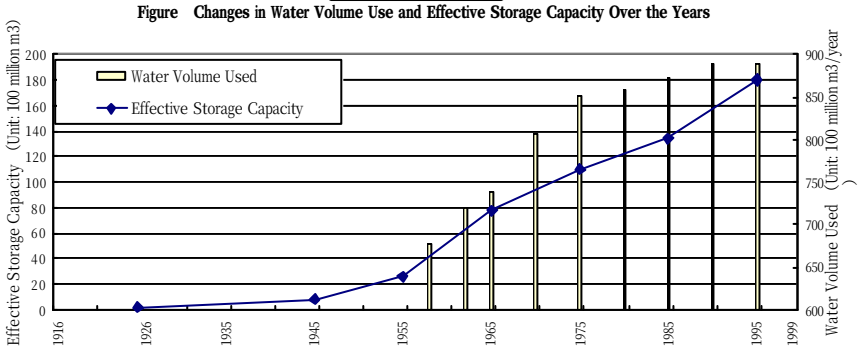


Figure Changes in Water Volume Use and Effective Storage Capacity Over the Years

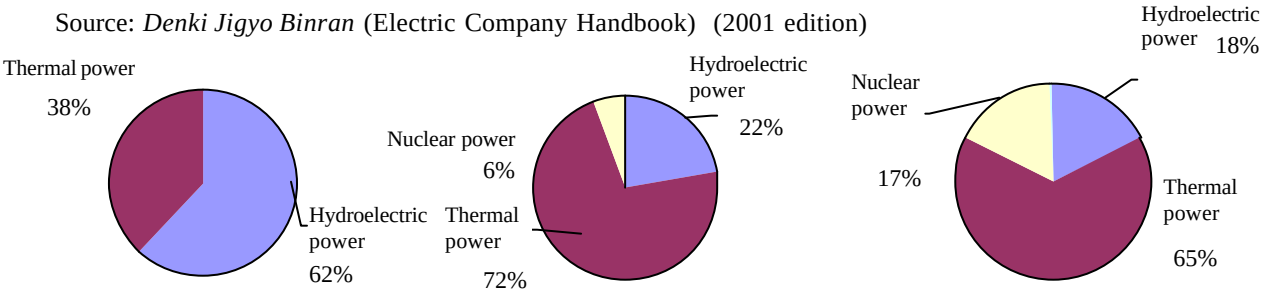


Message 5.3

Effective use of water resources to provide a stable source of energy and help alleviate global warming.

■ Power generation facilities by period

Source: *Denki Jigyo Binran* (Electric Company Handbook) (2001 edition)



1945
Total 10.38 million kW

1975
Total 112.28 million kW

2000
Total 258.84 million kW

Kyoto City, Kyoto :

Keage Power Plant

This was the first hydroelectric power plant providing power for electric company use. It was completed in 1891.

Shinkawa-gun, Toyama :

Kurobe River No.4 Power Plant

This plant was completed in 1963. Hydroelectric power played a vital role in satisfying the demand for power in Japan at a time that the power demand was experiencing explosive growth.

Maniwa-gun, Okayama

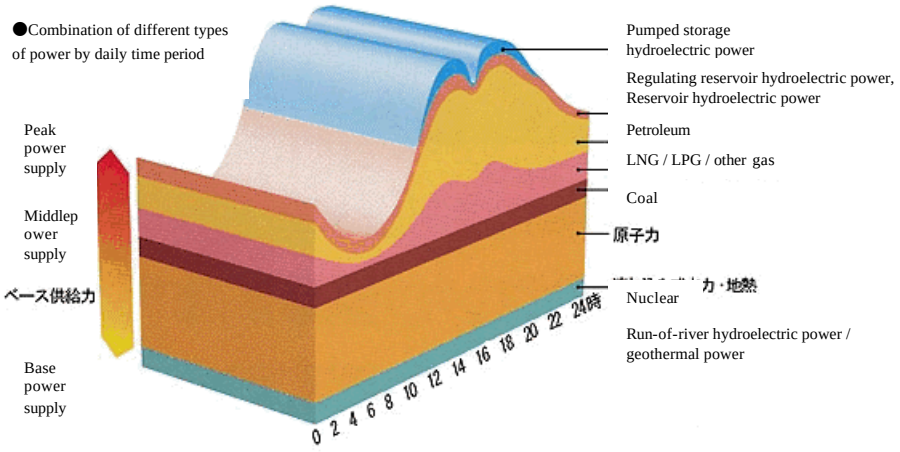
Yorimizu Power Plant

Hydroelectric power generation emits little CO2 and is attracting widespread attention as a recyclable energy that is environmentally friendly. As large-scale development efforts come to a close, the development of small and medium-scale hydroelectric power generation is being pursued, with care taken to ensure harmony with the surrounding environment.

■ Hydroelectric power: playing a vital energy role

Hydroelectric power generation is characterized by its ability to start generating electricity in an extremely short period of time (3 - 5 minutes) and by its ability to quickly adjust to changes in power demand (with the exception of run-of-river type power stations).

Utilizing these characteristics, run-of-river type power stations are used for the base power supply, while regulating reservoir type, reservoir type and pumped storage power stations are used for peak power supply. In this way, hydroelectric power generation plays an essential role in providing power.



Message 5.4

Integrated water resource management and mechanisms to share benefits from a watershed perspective.

■ Most of Japan's water resources are supplied from river surface water.
■ Water resources were furthered for the usage of river surface water.

↓ ↓ ↓ ↓

- It is important to conduct water resource management from a watershed perspective.
- At the same time, a mechanism that provides benefits so that there is no conflict among any of the stakeholders in water supply within the watershed is essential.

➢ Legislation and framework for Water resource management from a watershed perspective
➢ Sharing of benefits in accordance with the Relationship between upper and lower reaches(construction of reservoir areas in the upper reaches using funds from recipient regions in the lower reaches) is important
➢ Effective use and re-use of water resources and the control of latent demand for water resources is important

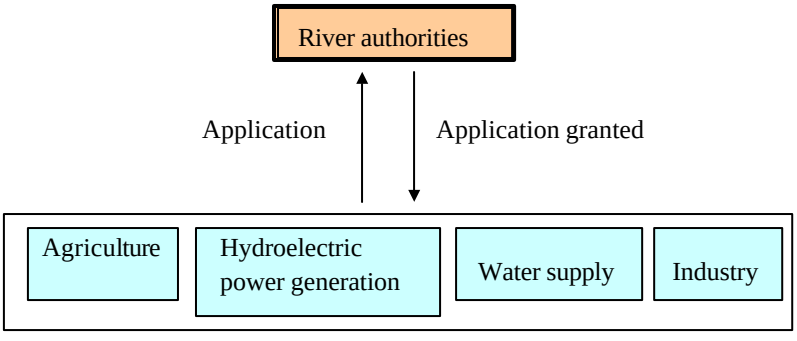
➢ Legal systems and frameworks are important for water resource management from a watershed perspective

■ There are cases when using water, in which the interests of the upper and lower reaches or right and left banks of the river conflict, and in which it is difficult to resolve these conflicts on the local government and community level.
■ The orderly and efficient usage (distribution) of water resources is important under normal and drought conditions.
➢ For effective distribution of water resources, having complete control of the rights to use river water (water use rights) is effective.
➢ In the event of a drought, owners of water use rights consult with one another to limit their water use in order to ensure the river flow.

Coordination of water use rights and drought periods

Definition: Right of exclusive and continuous river water use

Content: Objective, intake locations, intake method, intake quantities and intake periods



River authorities have complete control of water use rights

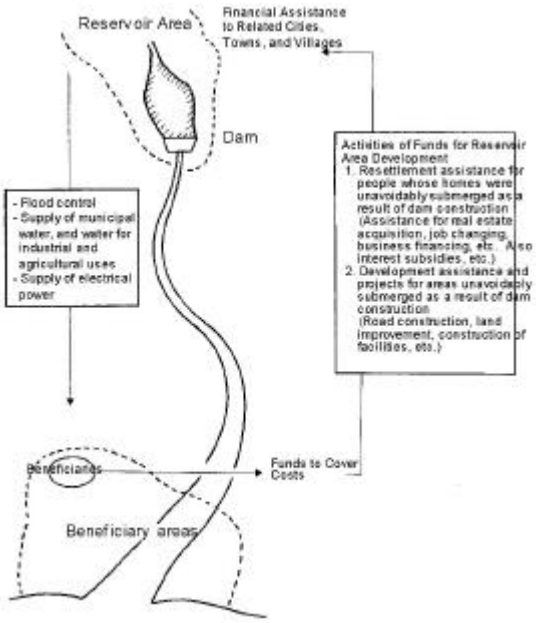
Coordination council made up of related parties is organized in the event of a drought

Message 5.5

Benefit sharing through relationship between upper and lower reaches (construction of reservoir areas in the upper reaches using funds from recipient regions in the lower reaches) is important

- Measures for water source region plans
- Subsidies given by the dam project owner.
- Measures in accordance with the Law for Water Source Region Measures.
- Measures for living re-establishment using the water source region trust funds.

- The delay in implementing measures to help residents whose homes have been submerged as a result of dam construction to rebuild their lives has impeded the smooth promotion of water resource development.
- Active promotion of measures to help residents whose homes have been submerged as a result of dam construction to rebuild their lives and to restore reservoir areas is needed.



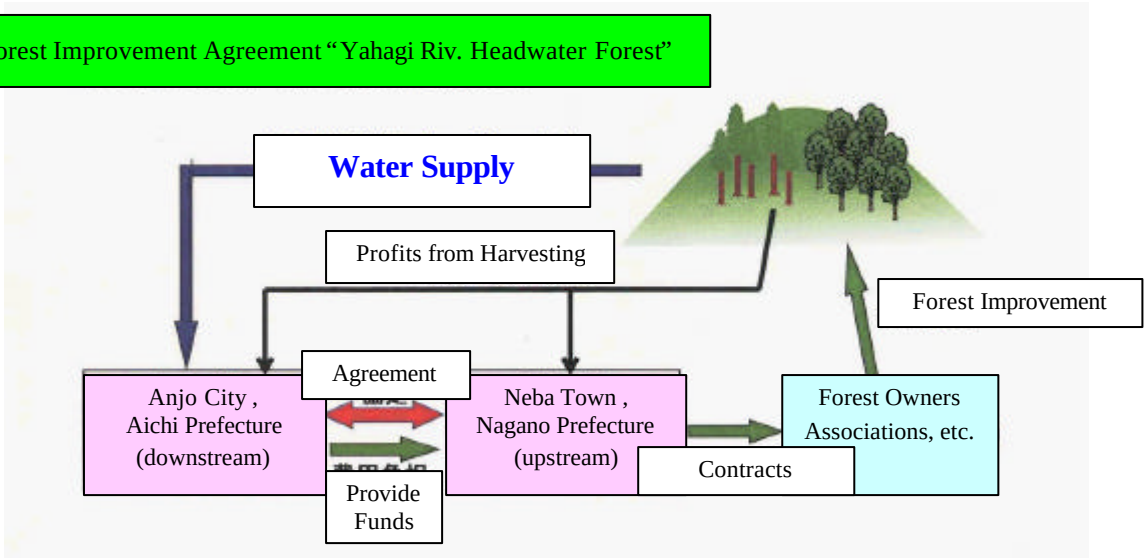
[New Developments in Water Source Region Measures]

Promotion of integrated upstream and downstream (river basin) water source measures in addition to the establishment of healthy water cycles.

[example: Forest Improvement Agreements]

Local governments that are located downstream cooperate with local governments upstream to establish a public corporation and financially support them, or to conclude profit sharing agreements to promote forest management in headwater area.

Forest Improvement Agreement "Yahagi Riv. Headwater Forest"



Message 5.6

Control of potential water resource supply and demand through such measures as effective water use, recycling and so on.

■ While water resource development has steadily improved the stability of the water supply, it was unable to keep up with demand.
■ Due to variation in rainfall and increased water usage,droughts and the like have occurred frequently.
- To guarantee a stable supply of water, it is important to undertake planned water resources development, effective usage of existing facilities, diversification of water sources, and water conservation are important measures for the control of potential water resource supply and demand is needed

? Use of water for miscellaneous use
? Creation of cities based on water conservation
? Reuse of factory wastewater
? etc.

＜Effects＞
- Reduced water use eases the gap between water supply and demand
- Reduction of the quantity of wastewater and the pollutant load eases the burden on sewer systems and other drainage facilities

[Use of water for miscellaneous use]

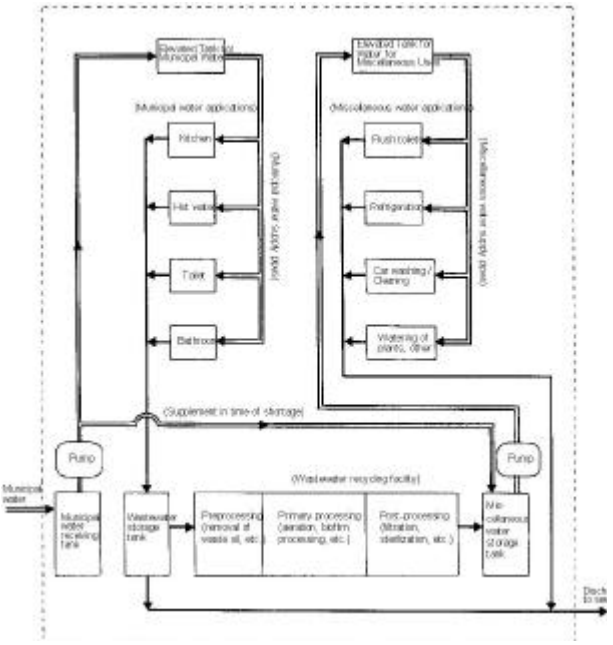
"Water for miscellaneous use" is a general term for water that comes from recycled sewer and industrial wastewater, rainwater and other potential sources and is of a lower quality than tap water. This type of water is provided for that portion of household water that is used in flush toilets, cooling and heating systems, sprinkler systems and so on.

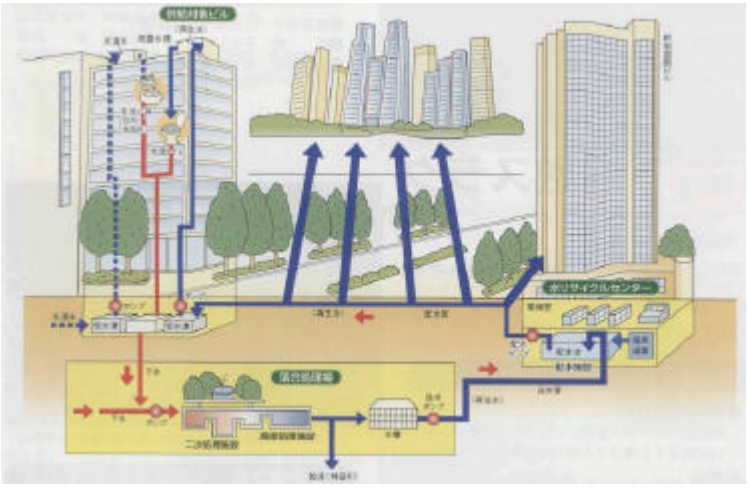
By using abundant and quality treated water for toilets and washing will help contribute to the control of latent demand for water in urban areas.

Various tax systems and funding incentives have been devised as a means of reducing the costs needed to promote the use of water for miscellaneous use.

Examples:

- Tax incentives for treatment facilities used to recycle wastewater and rain water as water for miscellaneous use, etc.
- Low-interest loans for the construction of buildings designed to recycle rainwater or wastewater or the like, in order to make effective use of water resources, prevent rainwater runoff and reduce the pollutant load
- Premium-bearing loans from the Housing Loan Corporation etc. for homes equipped with facilities that use rainwater for flush toilets, sprinklers etc.





[A best practice of water resources conservation]

Case Study: Fukuoka

■ After suffering from record-breaking drought damage in 1978, the city of Fukuoka established "Guidelines for Measures Related to Conservation Type Water Use, etc. in Fukuoka," and the government, industry and private citizens cooperated to promote the creation of a city based on water conservation.

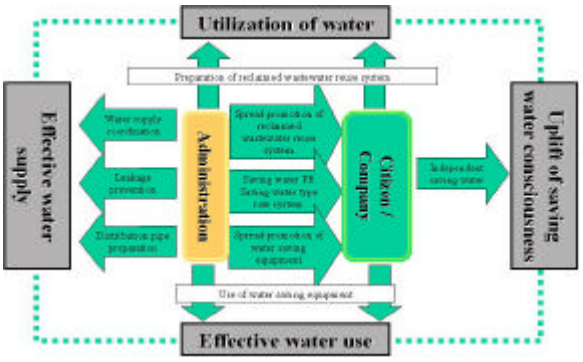
- The government worked to increase water efficiency by means of efficient control of water distribution and measures to prevent leaks.
- Private companies worked to promote effective use through such measures as promoting the use of treated sewer water, rainwater and other miscellaneous use water in the toilets in large buildings and the like.
- On the part of the general public, publicity campaigns on the need to conserve water increased the awareness of water conservation and the streamlining of water use was promoted through the use of water saving packing, water-saving toilets and other water conserving equipment and the like.

As a result, water consumption per person per day in Fukuoka City, has been reduced to approximately 79% of the national average.

In the drought of 1994, suspension of water supply and other drought losses were reduced compared the past droughts (1978) of similar magnitude

[Effects]

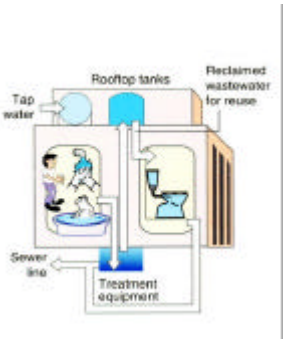
- Promotion of planned water resource facilities development
- Development of water supply systems
- Effective water conservation



Organization of "Guidelines for Measures Related to Conservation-Oriented Water Use, etc. in Fukuoka"

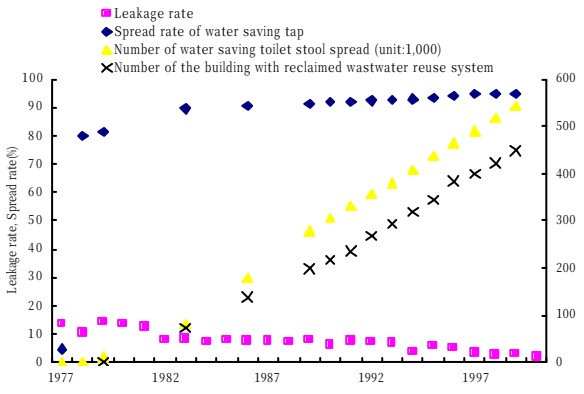
(Water saving packing)

(Miniature pump for recycling bath water)

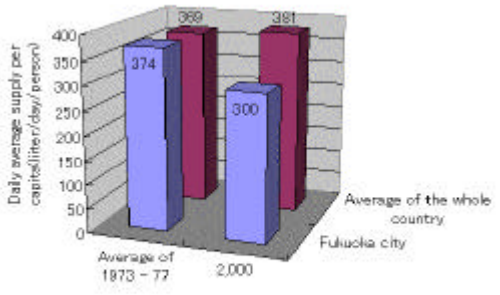


Use of miscellaneous use water buildings

Examples of water conserving equipment



Status of leakage rate water conserving equipment, etc.



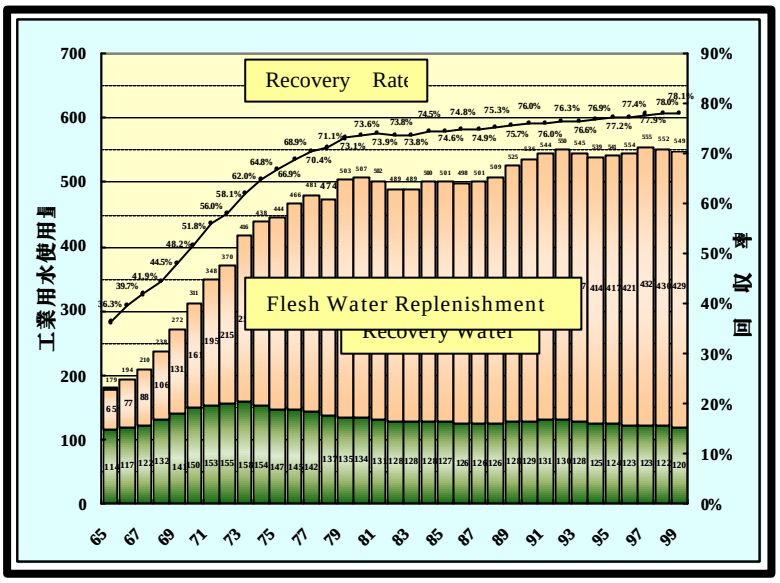
Comparison of per capita water use (Fukuoka City / national average)

[Reuse of industrial wastewater]

From the standpoints of reducing water consumption, environmental conservation and so on, efforts to ensure the effective use of water resources are being made for factory wastewater as well. This will lead to a reduction of unit costs for water use and an improved recovery rate.

Due to water conservation and other efforts on the part of companies, the recovery rate for industry overall has been improved to nearly 80%.

Trends in factory water use, etc.

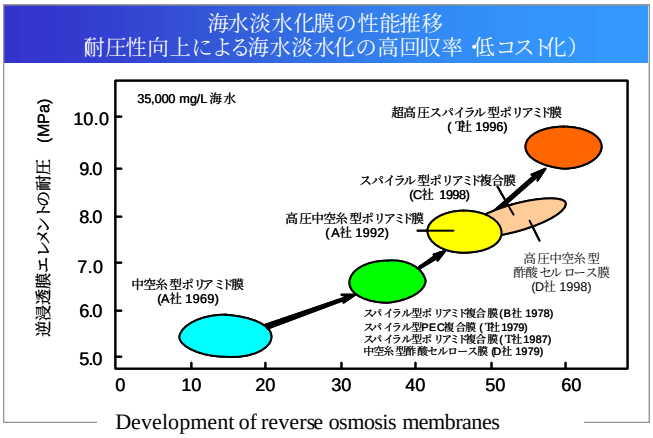


Source: :Ministry of Economy, Trade and Industry "Handbook of Industrial Statistics"

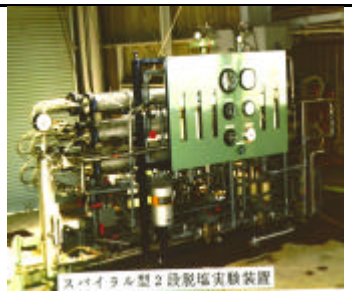
[Various water resources (desalination technologies)]

- In isolated islands and other areas with difficulties in obtaining water supply, desalination technologies (technologies to remove the salt from seawater to create drinking water) are effective.
- It is also effective for the removal of impurities such as sodium and mineral ions from ground water and other uses.

➢ Currently, technical development and a variety of financial incentives are being implemented in an effort to make desalination commercially viable and encourage widespread use.



Development of reverse osmosis membranes

1970s	1980s	1990s
Basic tests (conducted at Chigasaki) (1974 - 1977)	800 tons / day demonstration plant (1978 - 1987)	40,000 tons / day plant in Okinawa (1996 - 1997)
		
Starting in 1974, small-scale desalination tests using membranes of both foreign and domestic manufacture were conducted at the Chigasaki Waterfront Laboratory. These tests confirmed the possibility of creating fresh water by means of a two-stage desalination process.	This plant was completed in September 1979 and incorporated a membrane of domestic manufacture and a commercial-scale energy recovery unit. Demonstration tests with a water recovery rate of 40% were conducted over a ten-year period.	Chatan Desalination Facility is the first large-scale commercial desalination unit in Japan and uses a membrane of domestic manufacture. It is currently in operation.

Message 6.1

It is important to foster consciousness to place a high priority on water resource. Environmental education is also important.

(Examples of the efforts)

- Rapid development caused water & soil pollution in the Asian-Pacific region including Japan.
- Residents were both assailant and victim.

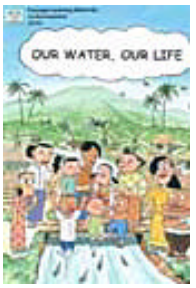
Importance of environmental education → Financial assistance from the government

Asia/Pacific Cultural Centre for UNESCO

- A non-profit organization for Asia and the Pacific regional programme activities in the fields of culture, education and personnel exchange on those planned and implemented jointly by Asian and the Pacific Member States of UNESCO.
- Producing a package of learning materials on environment in cooperation with environment specialists in the region.
- A package is consists of poster, a video and a booklet form, etc.
- Using it in the national broadcast, environment preservation campaign, school classes, regional development programs.
- Production and Dissemination of Children's Books

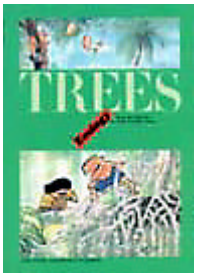
Planet (Package Learning Materials on Environment) — Development and Dissemination of Children's Books

For the purpose of generating motivation for improving current and future environmental conditions, ACCU produce a package of learning materials in video, poster, booklet form, etc., featuring forest conservation, water quality, air pollution and so on, to develop environmental education materials for learners in non-formal and formal education.
It is thought out enabling to think about the environment more deeply and delightfully.



Production and Dissemination of Children's Books — Ecology Series —

About 60 artists, writers, photographers and journalists from countries in Asia and the Pacific co-operated to produce children's books on the theme of
These books are compiled with stories and legends about the nature of Asia and the Pacific, and the people's customs and values, as well as reports on current ecological problems.



Message 6.2

In order to avoid and minimize the effects and problems caused by change in water environment, it is important to make use of science and technology for observation, analysis and prediction of hydrological cycle change, and to promote R&D on water resource management.

Water shortage, water contamination and floods are observed throughout the world. They are the causes of food shortage, disease, poor hygiene and furthermore, international conflicts on water issue. Thus, the demand and supply of water resource and water supply change have attracted wide attention of the international society. It was agreed in the Plan of Implementation of the World Summit on Sustainable Development to "Improve water resource management and scientific understanding of the hydrological cycle through cooperation in joint observation and research…" (Paragraph 27)

Japan established measures on water management aiming at sustainable development. In order to forecast abnormal weather caused by climate change and to mitigate damage from floods, observation, analysis of phenomenon and prediction of hydrologic cycle change should be promoted. Laboratories and universities are conducting research and observation on global hydrological cycle change through international cooperation. (See below).

Promotion of research on hydrological cycle change in Japan

[Observation of global hydrological cycle change]

Establishing global hydrological cycle observing system and data accumulation, such as:
- ○Long-term hydrological cycle change prediction in Asia Monsoon region
- ○Establishing global water observing system
- ○Upgrading four-dimensional data assimilation system and data set

[Development of hydrological cycle change model]

Development of hydrological cycle change model and founding the basis of model that allows prediction of environmental change, such as:
- ○Global hydrological change prediction in the East Asian monsoon region
- ○Development of water resource prediction model

[Assessing the impact on human society]

Quantitative assessment of effects on human society, based on prediction of hydrological cycle and environmental change, such as:
- ○Avoiding ecosystem catastrophe by advanced water use
- ○Prediction of weather and water disaster related to climate change

[Comprehensive assessment of countermeasure scenario and technology development]

Conducting adaptation assessment of existing technologies, aiming for optimal water management, and to promote new technology development and provide optimal countermeasure scenario on water issue such as:
- ○Wide-area hydrological cycle prediction and upgrading countermeasure technologies

Water issue transcends national boundary, and affects international society and economy. It exceeds the capacity of one nation or an international organization to enhance the understanding on global hydrologic cycle and to take appropriate measures. Therefore, cooperation through international observation and research programmes is essential. Against this background, Japan promotes international collaboration through international efforts such as the Integrated Global Observing Strategy (IGOS) Partnership, the Global Climate Observing System (GCOS), the World Climate Research Program WCRP), the International Geosphere-Biosphere Programme and GEWEX Asian Monsoon Experiment (GAME).

The scientific knowledge collected through these observation, research and cooperation are used to decide the appropriate countermeasure scenario and policy.

- ○**Avoiding and minimizing negative effects on human society, caused by demand and supply of water resource and hydrological cycle change.**
- ○**Provision of scientific knowledge and technical foundation to establish water management methods for sustainable development**
- ○**Proposal of optimal water management in Asia**

[Experience on international cooperation]

Good Practice of Message 1.1

Japan constructed water supply facilities in a compound on the outskirts of Lusaka, the capital of Zambia, in order to provide safe drinking water. However, there is no point in providing such facilities unless the capability to operate and maintain the water supply system has taken root in the local community even after the assistance has ended.

For this reason, to attract the participation of local residents after the facilities had been constructed, JICA experts worked together with international NGOs at the site, utilizing each other's strengths to nurture the capacity of residents to operate the facility on a self-sufficient basis by (1) training local resident leaders known as "Tap Leaders" to manage the public water tap (2) working to increase awareness of ownership and (3) conducting hygiene education and other activities.

Sample organization for water supply system maintenance conducted by local residents

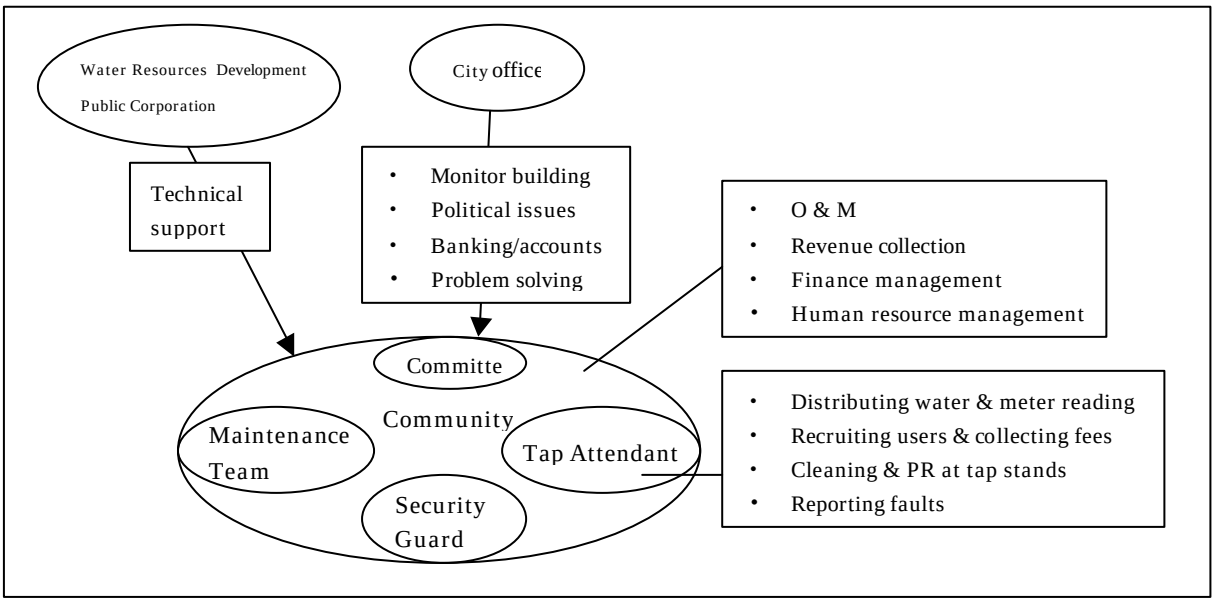


Photo 1：Local resident leaders known as the "Tap Leaders"(the majority are women) ＜Source：JICA＞

Good Practice of Message 1.1

"Battling a Formidable Parasite: The Guinea Worm"

The Guinea worm is a terrifying parasite native to Mali in West Africa. It is transmitted to humans who drink water that has not been properly by boiling. Many victims have difficulty walking, lose their appetite, and in the most extreme cases, weaken and die. Many villages in Mali still suffer poor access to potable water supplies, thus driving up the incidence of Guinea worm infestation. As equipment to boil water for sterilization is quite expensive, one alternative is to dig deep-water wells.

Through its grant aid, Japan assisted Mali in pursuing well-digging projects on a significant scale by building much-needed well facilities. Since then, the incidence of Guinea worm infestation has been on the decline. Another benefit of building wells has been the elimination of the gruelling labour involved in hauling water daily from nearby sources, a task that women and children usually performed.

Photo: Villagers jubilant over the completed construction of a hand pump (Sakuraji, Mali)

Good Practice of Message 1.1

"Peace Brings Improvements in Water Lifeline"

Jordan's capital Amman and its environs are home to about two million people, approximately half of the country's entire population. Low precipitation in the area, overuse of groundwater wells, and the deterioration of pumping facilities have made the supply of drinking water to the Amman area an increasingly formidable and expensive task.

When Jordan was given access to new water resources through the conclusion of a peace treaty in Israel in 1994, the Jordanian government requested grant-based financing from Japan to replace aging pumping facilities in its existing water supply network. Japan decided to assist projects aimed at upgrading the machinery and making related enhancements at pumping stations in four locations. It is expected that these efforts will ease the economic burdens of people who have had to buy their supplies of drinking water at high prices.

Photo: Sedimentation reservoir with chlorination facility

Good Practice of Message 1.1

“NGO Activities: A Community Facilities Project (A well-sinking project in Zambia)”

Meheba in the northwestern part of Zambia has provided a site for a refugee camp built for refugees fleeing the civil war in Angola. The Association to Aid the Refugees was formed in 1979 to provide relief to refugees through medical services, health care, and other activities. Since 1989, the Association has been assisted by the Japanese government through its subsidy system for NGO projects to sink wells in the refugee camp.

By 1993, the Association drilled or restored 20 wells, which have supplied good-quality water to the refugees of the camp. The Association has also succeeded in transferring well-drilling techniques, including Japan’s traditional technique of drilling wells called “Kazusa-bori,” by giving local participants hands-on training and by lending necessary drilling equipment.

Photo: Members of the Association to Aid the Refugees are helping refugees drill and restore wells in a refugee camp in Zambia with equipment supplied by Japan’s NGO project subsidies.

Good Practice of Message 1.2

[Improving the environment]

In developing countries, due to rapid urbanization, water pollution in public water bodies became very serious. Japan has dispatched experts to conduct development surveys, provided financial assistance (grand aid and loan aid), prepared manuals and so on, in an effort to help improve the environment in these developing countries.

Photo 1: Sewerage system training center in Thailand

To nurture the sewerage engineer, Japan assisted Thailand in making the curriculum, teaching materials and supported the training for the staffs through technical cooperation.

Photo 2：Project to construct wastewater treatment facilities in the Baia de Guanabara watershed, Brazil

To improve the water environment of the Bay of Guanabara, Japan supported the construction of wastewater treatment plant.

Good Practice of Message 2.1　Participatory Irrigation Management

It is important to promote participatory irrigation management（PIM）which encourages farmers to form water-use organizations, and to operate and maintain and bear the cost of irrigation facilities themselves.

The Ministry of Agriculture, Forestry and Fisheries of Japan promotes the transfer of project know-how and implementation systems about land improvement districts (LID) to many developing countries which cultivate paddy fields. The LID are the same as water users associations（WUA）in Japan.

Picture 1:Egypt
This is a farmer workshop on understanding the function of water users associations.

The coordinator received WUA training from Japanese experts.

Picture 2:
A trainer explains water management techniques used by LID staff in Japan. LIDs are composed of farmers who operate and maintain the irrigation facilities by themselves.

[Example of assistance]

Nation	Project name	Term
Egypt	Water management improvement project in the Nile Delta	2000.3 -- 2005.2
Dominican Republic	Technology improvement project for irrigated agriculture	2001.3 -- 2006.2
Indonesia	Study of irrigation management and water users association empowerment for enhancement of turnover program	2000.4 -- 2001.10
Philippines	Study of irrigation associations strength-building project on national irrigation systems	2002.4 -- 2003.3

Good Practice of Message 2.3 Irrigated Rice Farming Technologies

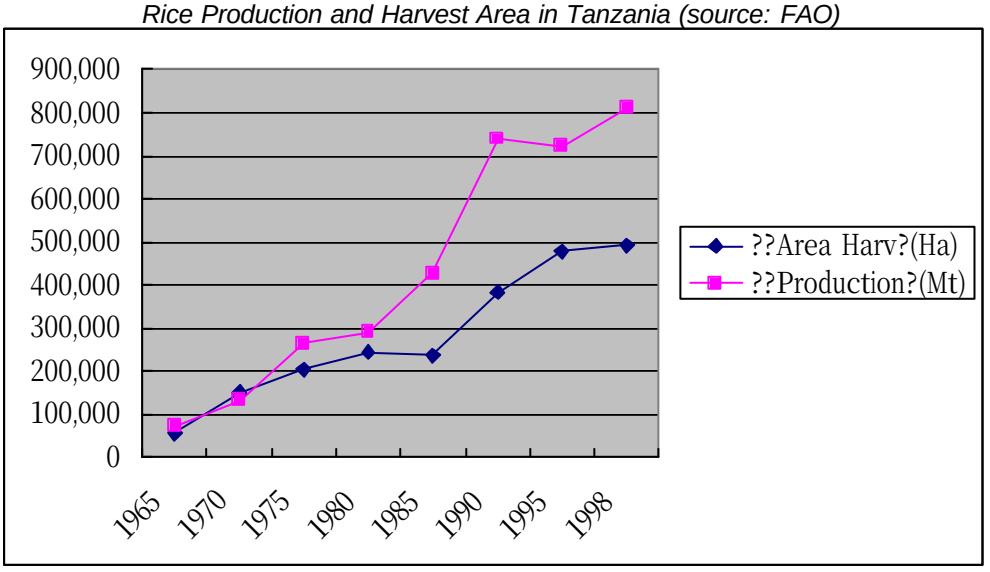
- Eliminating food shortages through the introduction and spread of irrigated rice farming technologies in Tanzania.

Tanzania has 30 million people, 80% of whom live in farming villages growing maize, rice, and cassava. However, the amount of farmland available is insufficient to support the population explosion seen in Tanzania. Because much of the farming in Tanzania relies solely on rain water, food production is severely hampered in times of drought. Therefore, the food supply is unstable and insufficient.

Japanese assistance projects in Tanzania began in 1970s, with a project to establish irrigated rice production technologies. As a result of this project, rice production in the target region increased and technologies spread to neighboring regions as well. This project also led to a noticeable improvement in social effects as village cooperatives were formed, and villagers came to manage the irrigation facilities on their own.

Japanese expert giving instructions on irrigated rice production technology (Tanzania, source: JICA)

Rice Production and Harvest Area in Tanzania (source: FAO)



Good Practice of Message 2.3　Efficient use of irrigation water

As the population has grown since World War II, crop production yield has also increased to meet the growing demand. This has been secured mainly by increasing the irrigation area, not by increasing the cultivated area. At present, the world's irrigated farmland accounts for 17% of the cultivated farmland, and is said to produce 40% of the world's agricultural production. In the future, for food security, reliability, and stability, as the population continues to grow, it is essential to increase the irrigated area as well as repair and maintain existing irrigation facilities in developing countries. Recently, it has also become important to promote the efficient utilization of irrigation water because of water shortages. The Ministry of Agriculture, Forestry and Fisheries of Japan promotes the development and rehabilitation of irrigation systems in many developing countries, with a recent focus on improving the efficient use of traditional irrigation systems.

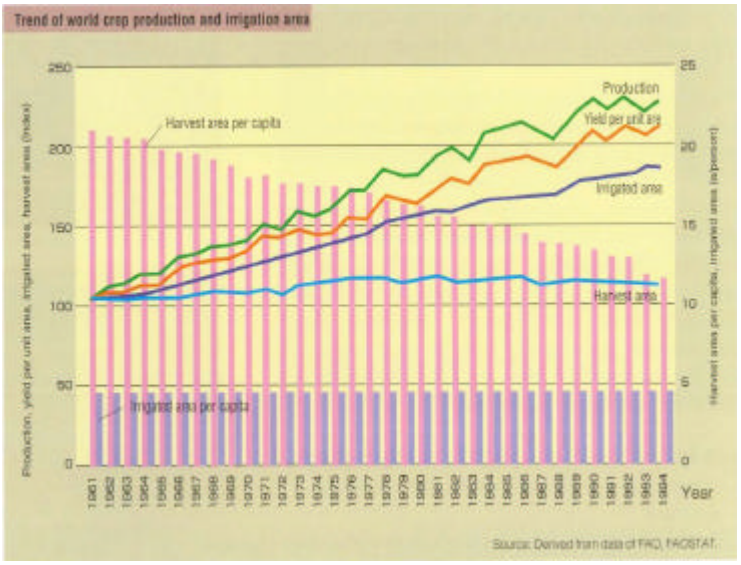


Figure 1:
The population of the world increased 1.7 fold during the 30 years from 1961, while the harvest area increased by just 10% during the same period; thus the harvest area per capita contracted 60%, when compared to the previous level. But the irrigation area per capita remained as it was in 1961, so the yield per unit cultivated area and the production increased about two-fold, in response to the population increase.

Picture1: Myanmar
This is a training class for farmers to acquire new efficient water use in methodologies for paddy field cultivation.

[Example of assistance]

Nation	Project name	Period
Thailand	The modernization of water management system project	1999.4～2004.3
Myanmar	Irrigation technology center project phase Ⅱ	1999.4～2004.3
Cambodia	The agricultural development study of the Mekong flooded area	1995.10～1998.3
Morocco	The development study on rural community development project in semi-arid east Atlas regions with Khettara Rehabilitation	2003.2～2005.12

Good Practice of Message 2.3 Sustainable rural development for poverty alleviation

People in developing countries must contend with population growth, food shortages, and poverty. Subsistence production can result in resource depletion, including excessive cultivation, grazing, shifting cultivation, and felling for firewood and charcoal. In addition to natural causes, such as drought, human factors also exacerbate the degradation of land and water resources. Degradation directly affects the lives of local inhabitants, thus making such problems as poverty even worse. One of the most effective methods of combating these inter-related problems is to establish sustainable agriculture and to develop rural communities, thus increasing agricultural productivity and helping to conserve the rural environment through local community and dweller participation.

The Ministry of Agriculture, Forestry and Fisheries of Japan promotes "participatory integrated rural development," which aims to develop small irrigation, in arid or semi-arid areas of the Monsoon Asia developing countries, as a countermeasure against desertification. Similarly, to meet the peculiar characteristics of Latin America, the countermeasure aims discourage soil erosion.

Picture1: Indonesia
In this project, the construction of a small canal was implemented by local farmers.
Self sufficiency in rice cultivation increased three times due to the farmers' efforts.

[Example of assistance]

Nation	Project name	Term
Indonesia	Integrated agricultural and rural development projects in southeast Sulawesi Province	1991.2--1998.2
Laos	Agricultural and development project in Vientiane Province	1997.11--2002.10
Mari	Study of prevention for desertification in south region of Segou	2000.3--2003.6
Burkina Faso	The study on the system to alleviate the land degradation	2001--2003.6
Bolivia	Verification study on participative rural development and soil and water conservation	1999.4--2004.3
Chile	Conservation project on the environment and rural development with farmers' participation for Mediterranean dry land zone	2000.3--2005.2

Good Practice of Message 2.3 -New rice for Africa-

In order to contribute to the goal of "halv[ing], between 1990 and 2015, the proportion of people who suffer from hunger" as stated in the Millennium Development Goals, Japan is working to encourage the widespread cultivation of "NERICA" (New Rice for Africa) variety in the regions of Africa where food shortages are a serious problem. This initiative aims improve the food situation and reduce poverty in these regions.

NERICA is a new rice variety suited to cultivation in West Africa which is produced by crossbreeding the existing African varieties that are resistant to disease with Asian varieties that offer high productivity. NERICA grows very well in rain fed upland farming regions (and does not necessarily require irrigation), and does not require much fertilizer or agricultural chemicals. Further research and development and studies on ways to encourage the widespread use of cultivation technologies among others using this variety will be implemented in the future.

During the first three years, more than 200 strains of NERICA have been developed, and Participatory Varietal Selection (PVS) program, in which the farmers themselves select the varieties, has been deployed in 17 countries. At least 5,000 farmers directly participated in the selection process, and they expressed satisfaction at the new varieties. The farmers selected five varieties out of 40 different types; the result was that 60 - 80% were the NERICA variety).

Photo 1: Farmers participate directly in the selection of rice varieties (Source: Ministry of Foreign Affairs)

Note: The joint research system for NERICA is a good example of trilateral cooperation. The West Africa Rice Development Association (WARDA), the brain center for the project provided overall coordination. Research institutions in Asia, Europe and North and South America that possess state-of-the-art technology were in charge of genetic analysis for interspecies crossbreeding, while the 17 National Agricultural Research Systems (NARS) of the countries of west and central Africa conducted cultivation trial tests of the new varieties. The results of the research which were fed buck to WARDA proved useful in the development of additional varieties under different conditions. The development of NERICA in sub-Saharan Africa has been made possible by five factors: specialist knowledge from north and south, the combination of existing technologies with state-of-the-art technologies, the participation of farmers in the introduction process, political will, and trilateral cooperation.

Good Practice of Message 3.1

“Monitoring: Environmental Education in Action”

Indonesia has experienced rapid economic growth in the past few decades. Such rapid growth has led, however, to the emergence of increasingly serious environmental problems, including air and water pollution. In 1993, with Japanese grant aid, Indonesia set up its Environment Management Center, which serves as the core institution to aid in the formulation of effective administrative policies on the environment. Among the tasks performed by the Center is to monitor conditions of air and water pollution in the country.

Such monitoring drives also serve as a form of environmental education as people’s awareness of environmental problems are raised when they interact with JICA experts and local counterparts.

Photo: Indonesia’s Environmental Management Center

Good Practice of Message 3.2 -forest management -

Using expertise accumulated in the field of forest management, Japan provides assistance to establish a framework for forest management based on the participation of local residents, in order to enhance the water storage function of the forests and so on.

Country	Region	Project Name	Term of Assistance
Laos	Vientiane	Forest Conservation and Afforestation Project (phase II)	July 1998 - July 2003
China	Sichuan	Model Afforestation Project in Sichuan	July 2000 - June 2005
Nepal	Kaski / Parbat	Community Development and Forest / Watershed Conservation Project (phase II)	July 1999 - July 2004
Panama	Panama Canal western watershed	Canal Watershed Conservation Project	October 2000 - September 2005
Bolivia	Tarija	Afforestation and Erosion Control Project in the Valley of Tarija	October 1998 - September 2003

Photo 1 Laos (Source: JICA)

Photo 2 China

Good Practice of Message 3.4

“The international cooperation activities-Federation of Economic Organizations protection-of-nature fund of a company”

The industrial world of Japan must also promote vigorously the activity which harmonizes with earth environment in consideration of the protection of nature. - The Federation of Economic Organizations established the Federation of Economic Organizations protection-of-nature fund the origin of such an idea in September, 92. This fund is performing activity under cooperation of the Federation of Economic Organizations and a foundation international development high-education mechanism, and is supporting the protection-of-nature project in a developing country which carries out internal and external environmental NGO on the basis of the donation from a company, an individual, etc.

The project supported until now goes up to 354 affairs a total, and a grant-in-aid frame becomes 1,247 million yen. Especially the items of a support enterprise have many projects which protect the various living things left behind to Asia and the Pacific Ocean area.

Photo: A Japanese NGO tree-planting team at work in China's Halasa Desert.

Good Practice of Message 3.4

"Series of Loess Plateau Afforestation Projects (Shaanxi Province, Shanxi Province and Inner-Mongolia Autonomous Region)"

This project, designed to contribute to a stable socio-economic welfare of the three Loess Plateau regions, aims to improve living standards and protect China's natural environment. These goals are to be achieved by improving the region's forestation rate, preventing soil erosion, and raising agricultural income through planting and the cultivation of 100,000ha of protected forests, timber forests, and fruit tree groves.

Japan's environmental cooperation with China extends beyond the conventional government-to-government interface to different levels of intervention involving various stakeholders from the private sector, local government, academia, NGOs, and industries. Simply looking at ODA (e.g. NGO Project Fund) for afforestation projects alone shows the extensiveness and diversity of stakeholders involved. The financial resources provided are used to procure seedlings, fertilizer, vehicles, labour, etc.

Photo: Loess Plateau before the implementation of the afforestation

Good Practice of Message 4.

"Mozambique Emergency Dispatch of a rescue party for Emergency Relief and Medical care of People Suffering from a Flood Disaster"

At the beginning of the year 2000, the worst flood in the past 50 years occurred in the middle and south Mozambique. As a result, thousands of people died and approximately 3 million people suffered from the flood.

Immediately after that, the Japanese government provided the urgent assistance (700 thousand dollars of emergency grant aid and 37.5 million yen of goods, including tents and water-purifying chemical; an equivalent for the total 1million dollars) covering 2 times. In addition to this, the government sent a team, which consist of 19 persons, aiming at emergency relief and medical care.

The medical team engaged in urgent medical activity in a village called Hoquwe, located in about 200km northeast from metropolitan Maputo in Mozambique, and treated 2,611 patients in 9 days. Many patients are suffered from malaria and diarrhea, so the medical team contributed to the treatment of diarrhea, and to prevention-of-epidemics activities by malaria early treatment.

Photo: The medical team examines a child

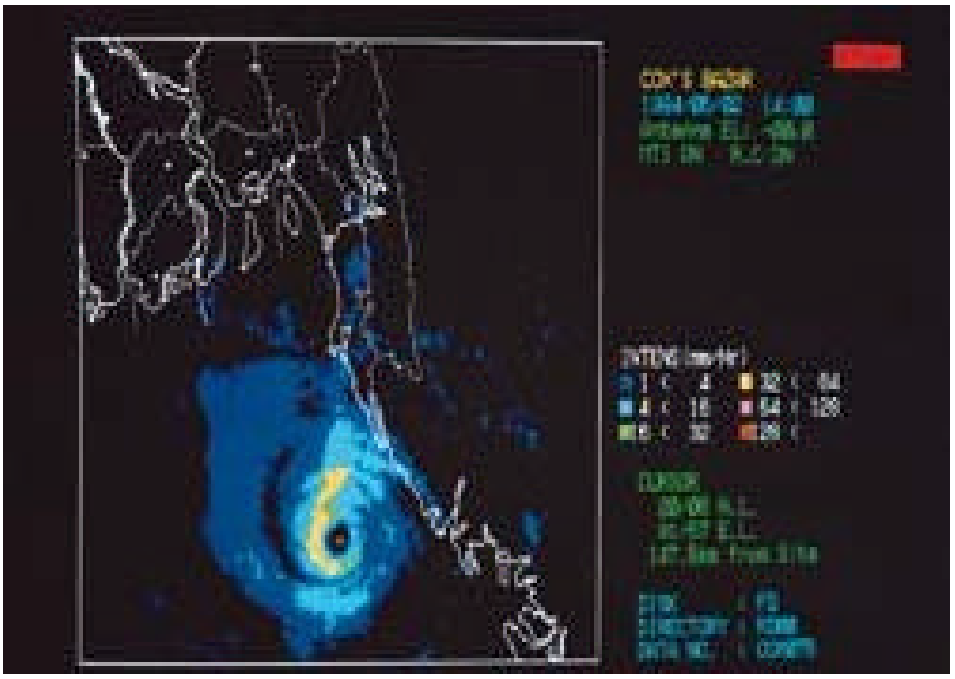
Good Practice of Message 4.3

"Project for the Improvement of Weather Services Related to Natural Disasters in Bangladesh"

In April 1991, Bangladesh was devastated by a cyclone that left about 140,000 citizens dead or missing. Segments of the country's communication network were knocked out by gale winds and rain during the 1991 cyclone. This prevented the transmission of radar images to the Bangladesh Meteorological Department in Dhaka, ultimately adding to the overall extent of the damage.

Therefore, Japan decided to implement a Project for the Establishment of Microwave Link between Storm Warning Center, Dhaka and Radar Stations (FY1992), and in the next phase, launched a Project for the Improvement of Weather Warning Service Related to Natural Disasters (FY1997). The work succeeded in installing a microwave network capable of transmitting cyclone data in real time. Hence, when Bangladesh was struck again by a massive cyclone in 1994, the resulting damage was minimized to 0.1 percent of the scale suffered in 1991.

Photo: An image of the May 2, 1994 cyclone traced by Bangladesh's weather radar system



Good Practice of Message 4.7

Technology against bank erosion—Soda-mattress method

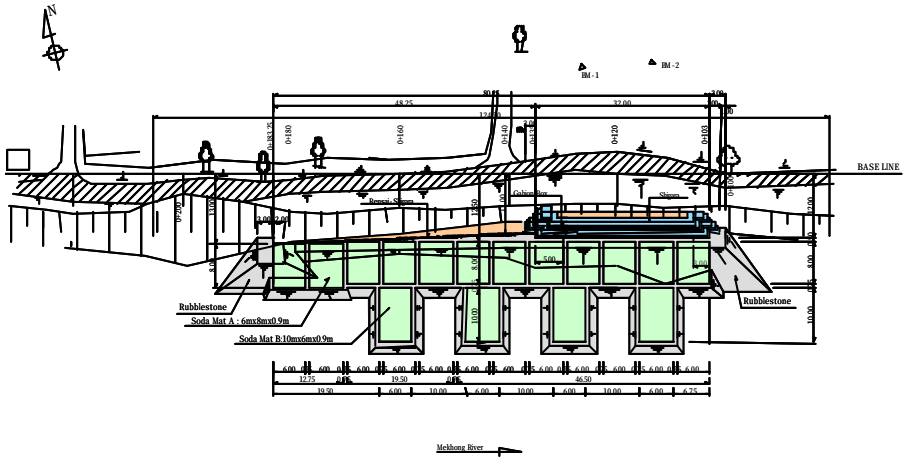
Vientiane, Laos, is near the center of the Indochina Peninsula and affected by changes of the Mekong River channel from ancient times. The recent development of revetment in Thailand, which is located on the other side of the Mekong River, resulted in serious bank erosion. Countermeasures were undertaken with foreign aid and self funding in the 1990s. Most of the measures are based on the basket-mat method but the heavy burden of importing wire mesh mat limits the length of works. The Soda-mattress method, a traditional Japanese method, has therefore been introduced to enable Laos to use materials, equipment and skills available in the country.

Notch-type erosion in the Mekong bank base

＜Japan's cooperation＞

Ministry of Land, Infrastructure and Transport, Japan and the Government of Laos jointly conducted a pilot project to counter bank erosion using the Soda-mattress method in the suburb of Vientiane City between 1999 and 2001. Japanese experts well-versed in the Soda-mattress method and Lao engineers worked together to develop human resources and technology transfer by on-the-job training. Furthermore, JICA promoted development research entitled "Study for Planning Measures against Bank Erosion of the Mekong River near Vientiane, Laos" to be completed in 4 years from 2001. We expect use of the Soda-mattress method to become more widespread in the future.

implementation of measures



Top view of measures against bank erosion

Good Practice of Message 5.3

Wastewater Treatment Technology

To cope with ground settlement and serious water shortage caused by pumping ground water for industrial use, an applicable and low cost industrial water cycle usage system is co-developed with the government of Thailand.

Lagoon Process

Plant of the Purification System for Waste Water

Desalination Technology

In Japan, progress has been made on the practical application of desalination technologies in isolated islands in Okinawa Prefecture and other locations, as a result of efforts to reduce costs by developing energy-saving methods that use semi-permeable membranes. These technologies have proved effective in dealing with droughts. They are being provided overseas as well, in the form of international assistance.

Ceremony to commemorate completion of a seawater desalination plant in the Sultanate of Oman

Good Practice of Message 5.4

Integrated Development of the Brantas River Basin

The integrated development plan for the Brantas River Basin (area: 11,800km^2 , length: 320km), located in the east of Java Island and frequently occurred by debris flow resulting from the eruption of the Kelud Volcano, has been implemented from the 1960s by concerted efforts of relevant government agencies of Indonesia. With frequent assistance of Japan focusing on construction of dam and river improvement for water use and flood control, Surabaya City, located in the basin has developed to become the second largest city in Indonesia.

<Japan's Cooperation>

Japan has implemented master plans over 4 times using integrated river basin management between 1961 and 1998. Ten dams including the Wonorejo Dam were constructed and the mainstream and tributaries of the Brantas River were modified between 1970 and 2000.

Wonorejo Dam (100m high, 545m wide)

The Wonorejo Dam, constructed with financial cooperation from Japan in 2000, not only enabled supply of safe drinking water to residents, but also contributed to preventing flood damage arising from debris flow due to the Mt. Kelud erupting, which happens once in every 15 to 30 years. And the dam also assisted the development of the local society and economy.

For a long time now Surabaya has been free from flood damage. Irrigation facilities and hydroelectric power plants have been constructed one after another in the Surabaya City area, benefiting the local society. Improvement of hygiene resulting from the mitigation of flood damage by integrated basin management also improved the living environment and contributed to gender, environment and poverty issues being solved.

There have been great successes in human resource development and technology transfer. The Ministry of Land, Infrastructure and Transport has extended technical cooperation by dispatching many experts.

Technology Transfer

<Young Mr. Soenarno (3rd from the left. Currently Minister for Settlement and Regional Infrastructure)>

Good Practice of Message 5.5

[East-west corridor]

The Mekong Regional Development Project is currently being promoted, aimed at wide-area development in the countries and regions of the Mekong River watershed that spans international boarders. Japan is actively providing assistance in terms of both physical infrastructure and systems.

The project is expected to strengthen ties among countries in the watershed as well as improve internal disparity in ASEAN by raising the level of new ASEAN member countries and thereby strengthening the unity of the organization.

Map showing countries / regions of the Mekong River watershed (Source: Ministry of Foreign Affairs)

Examples of assistance provided to this region by Japan

- Holding of ministerial meetings, symposiums, workshops etc. to maintain and increase the momentum for the development of the project
- Extending of yen credits for construction of No. 2 Mekong International Bridge connecting Thailand and Laos
- Construction of east-west corridor (roads, bridges, harbors etc.)
- Various studies