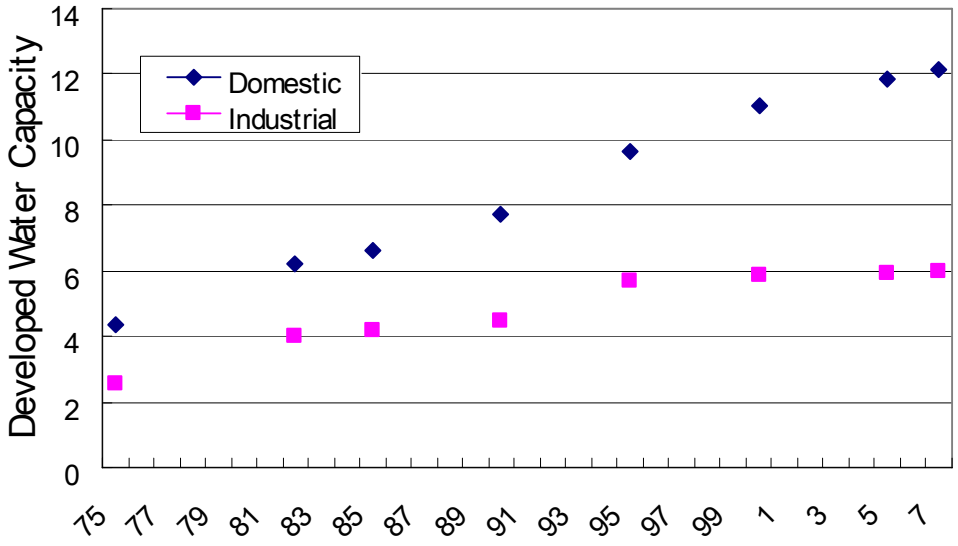
The Status and Challenges of Water Infrastructure in Japan

1. Status of water infrastructure

Japan has developed various infrastructures since after the Second World War, especially, to advancing a rapid industrialization, urbanization, and enhancement of the citizen life, the water resource development has been placed as the most important priority in Japan. The water supply diffusion for all citizens has been completed satisfactorily in 1970s, but sewage system has not been constructed on the same speed. Thus, the water environment has become worse in those days. Now that sewage system also has been completed and the wastewater discharge regulation has been strengthened, urban water quality has been maintained at the certain level condition. Recently, we have started to recognize a problem that qualities of the closed water areas such as a nature and dam's lake have not been improved in spite of the completed sewage system. Non-point source pollution such as road pollutants or discharge from fertilizer will have to be considered as the important persistent problem in the future.

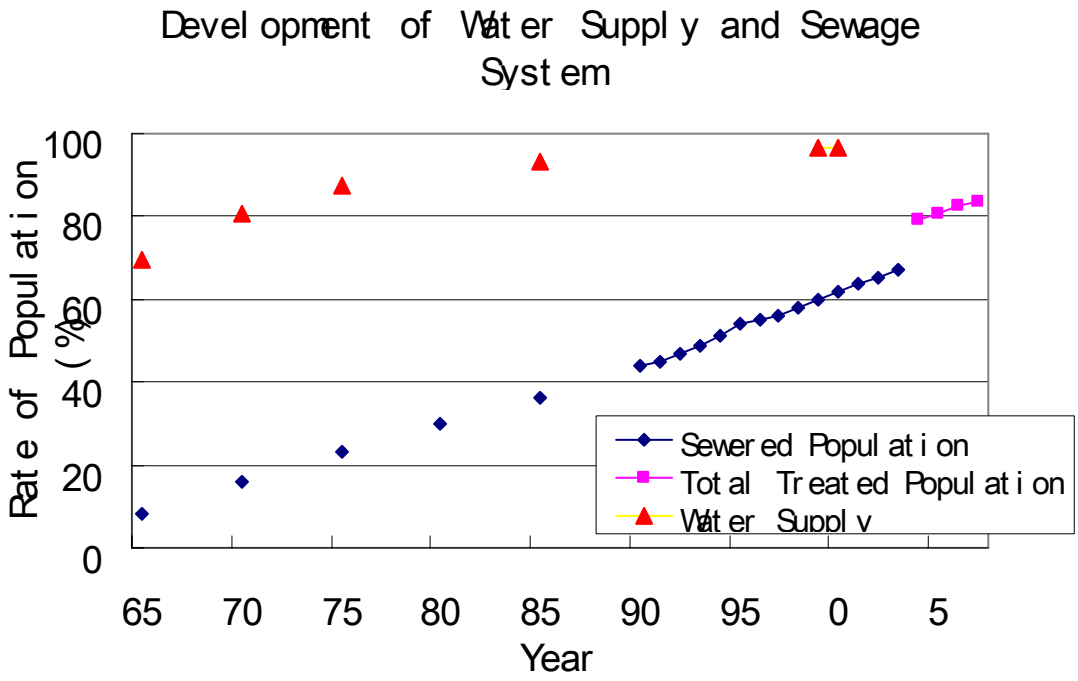
Underground water is a valuable resource for urban water demands. However, there are not enough effective regulations to restrict the water quantity.

Floods have often damaged to urban densely populated areas. As the result, the infrastructures that can be functioned as both flood prevention and water utilization have historically been needed. Reservoirs such as dams, weirs, and small ponds are the most important water infrastructure at the present day.



Developed Water Capacity for Urbanization (Billion m3 per year)
(Water development in Japan 2008)

- Domestic 12 Billion m3 per year is equivalent to about 250 l per day per capita.



Progresses of Water Supply and Sewage System

	Surface Water	Underground Water	Total
Domestic	12. 36	3. 49	15. 85
Industrial	8. 91	3. 71	12. 62
Agulical tural	51. 64	3. 30	54. 94
Total	72. 91	10. 50	83. 41

Water Consumption in 2005 (Billion m3 / Year) in Japan

Central and local governments have built water infrastructures and operated them. Significant river structures which have a wide river basin located in plural prefectures (local government) are generally managed by a central government. Prefectures and municipalities regulate other water infrastructures, and the subsidies for the construction are allocated by the central government's budget.

To develop and preserve current water infrastructures,

- Closed water areas particularly should be more protected from various pollutant effluences.
- More stable water resources to enable further to prevent flood disaster would be needed against climate change.
- Creating familiar water spots which make urban inhabitants aware the importance of water resources should be needed in urban development plans.

Budget relevant to water development and protection in FY2008

	National Government Expenses (Million JPY)
Domestic Water Supply	100,848
Industrial Water	3,340
Irrigation	236,556
Water Development	648,028
Water Reuse	11
Water Protection and Sewage Works	782,292
Erosion Control and Aforestation	267,885
Underground Water Protection	129
Water Source Area	83
Total	2,039,172

(Water development in Japan 2008)

We have to look for a solution to improve as mentioned above, and make up appropriate action schemes.

- Integrated water resource management including a united legal framework will be needed for developing water infrastructure consistently, since the resource development, conservation and flood prevention are administrated by each authority in Japan.
- Flood management should be combined closely with water resource development. The climate change will bring more critical flooding, therefore, the excessive flooding surface water should be utilized for the enlargement of reservoir's stocks.
- It is necessary for inhabitants in urban areas that they can aware of the water environmental condition. Public awareness for water protection does not grow without contacting with water environment.

2. Challenging issues for eco efficient water infrastructure

The perception of eco efficient water infrastructures has gradually increased with growing the public awareness of which surface water is a precious resource. Recent efforts for the infrastructure are as follows,

Water Reuse and Recycle

- We have three major reuse and recycle systems: first system is the internal reuse whose system circulates the simple treated wastewater for using flush toilet water in buildings.
- Second one is the rainwater recycle in houses and businesses, and the facilities

make the public aware of the importance of water and keep urban life secure.

- Last one is a sewage water reuse which treated by wastewater treatment plants, and treated water is utilized for the multiple water demands.
- Japan has developed abundant natural water resources. Consequently, people can use water supply services with reasonable charges. Since reuse and recycle systems are needed the maintenance cost which nearly equals the water supply charge, the systems do not quickly disseminate over households and businesses.

Rainwater Storage and Infiltration

- These facilities have various effects for nature environment and our urban life, such as a mitigation of flooding and heat island phenomenon, growth of ground water, and reduction of pollutant effluence to the water areas.
- As regards flood control, various urban buildings can store rainwater. A large number of the small storage facilities can secure equivalent capacity of large dams.
- At the beginning, storage and infiltration were introduced as one of the comprehensive measures for flood prevention. Urban developers and building owners are obliged to set storage facilities in flood prone areas based on the specified urban flood control law. Storage and infiltration have to be reassessed to the effective facilities that grow various invisible values for the future.
- Retarding and retention ponds of which storage capacity has a medium scale were constructed with the artificial and hydraulic flames. Reservoirs have been improved to keep ecological water condition such as small rivers and plants.

Water Resource Conservation Sharing by Downstream Inhabitant Expenses

- The argument advances in Japan that urban inhabitant in downstream areas should share the obligation for protecting upstream water resource because people in urban areas get lots of benefits on utilizing enough comfortable water. Many local governments established frameworks of which a citizen can cooperate in promoting forestation or rural sewage projects in upstream areas by the methods such as additional taxes, extra water charge fees and donations for water resource funds.
- Most of prefectures impose a duty to preserve forests and water resources. The charge is almost a few hundred of Japanese Yens per capita per year, and people estimates the important value.

3. Priority of regional cooperation for development of eco efficient water infrastructure

Inhabitants in the same river basin have to share equivalent obligations and advantages. To develop eco efficient water infrastructures, each local region has to receive its own role and responsibility. Japan's action of which people in downstream areas contributes upstream water conservation has just started in recent years, but this considerable dissemination would help the infrastructure develop in the future.

To cope urgently with a rapid expansion of the water pollution in the developing countries, Japan's technologies such as energy-saving treatment processes or the direct river purification may be utilized in some cases.

4. Recommendation

As a global climate will fluctuate to the extreme condition between floods and droughts, a development of the surface water retention would be the most important activity, and surface water should remain on the ground as long as possible. Eco efficient water infrastructures such as a reuse, recycle, or storage of water could help water storage functions more developed. Inhabitants in the same river basin should equally share the water protection cost, and local governments cooperate each other beyond administrative boundaries.