Contribution of "Traditional PIM that is harmonized with conditions in Asia" to enhancement of Integrated Water Resources Management

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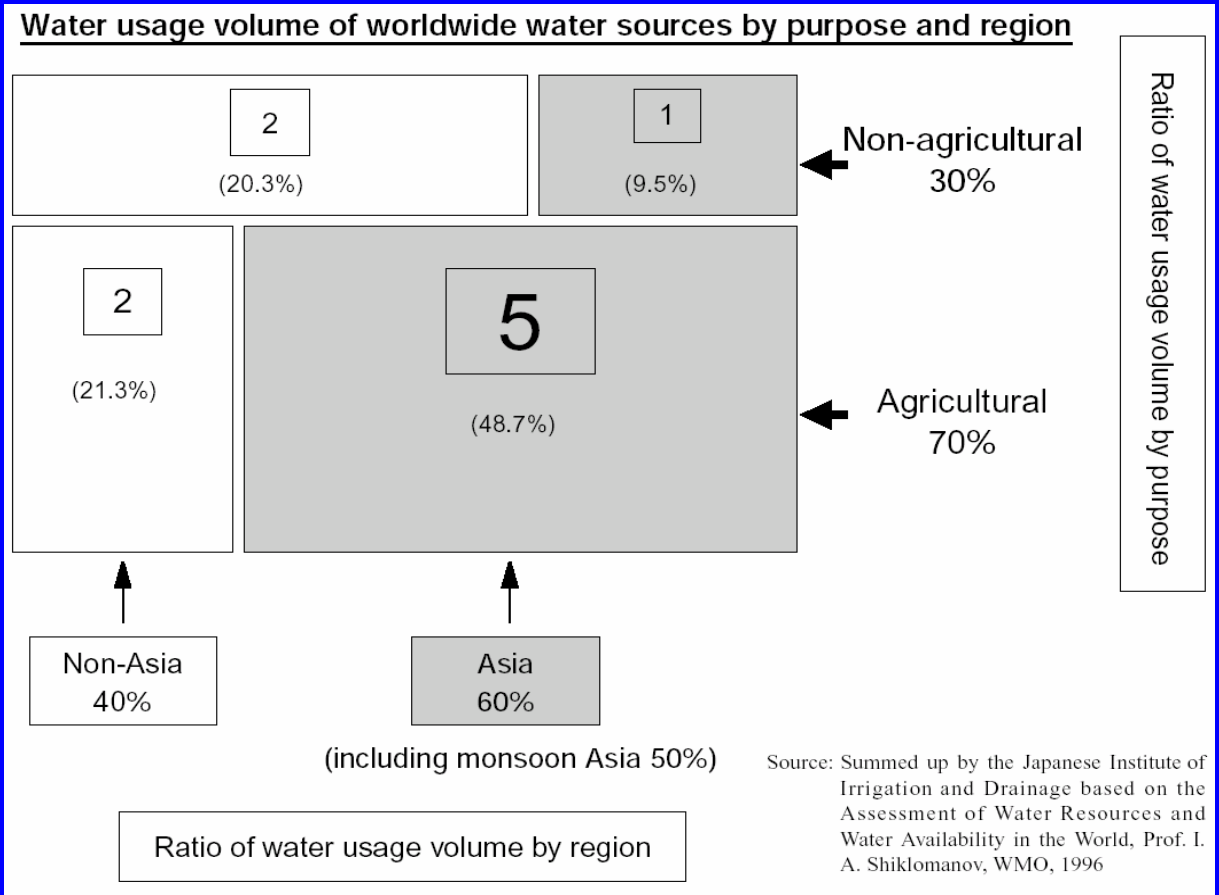
The World's Biggest Water User

Paddy Field Irrigation in the Asia Monsoon Region Accounts for About Half of Global Fresh Water Use for All Purpose



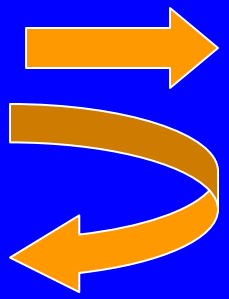
1. IWRM

Integrated Water Resouces Management

Integrated Water Resources Management

A transformation of concept on water resources management

A management philosophy based on the supply side



A management philosophy based on the demand adjustment and management

Aim to distribute water resources appropriately in response to scarce world water resources

Specifically, IWRM refers to a new approach whereby management of water resources is systematically implemented through proper controls and organization at the regional level. It involves gaining the participation of all interested parties within an ecosystem and treatment of water as an economic good.

2. PIM and IWRM

Traditional PIM

that is harmonized with conditions in Asia

An paddy irrigation system or organization which has been established based on hydrology and physiographical characteristics and which is still functioning

Characteristics

- Farmers have a strong sense of ownership of paddy field irrigation systems.
- Farmers are conscious of the fact that they must take the initiative to actively protect and preserve their facilities, and they have a firm awareness of their rights.
- The organizations are associated with regulation of water allocation and maintenance/repair of facilities.
- In many cases, the organizations are closely connected with traditional events, ceremonies, and religious rituals that are related to water and agriculture

Why do we consider "Traditional PIM that is harmonized with conditions in Asia" is important?

Discussion on IWRM has centered until now on how to use IWRM as a means to attain objectives in regions where supply and demand for water is tight to some degree or where water shortages are chronic, such as in arid and semiarid regions.

In the Asia Monsoon Region, where paddy field irrigation is practiced, irrigation water is at times viewed strongly as a common property or environmental asset, and therefore whether or not it is reasonable to treat water as a private economic asset in all cases is disputable.

Thus, it is very possible that IWRM discussion as it has developed so far may not be properly applicable to actual conditions in the Asia Monsoon Region.

3. Characteristics of Regions Where Paddy Rice Agriculture Is Predominant

Asia Monsoon Region

If the world's continental land is broadly divided into tectonic zones where orogenic movement is active and stable zones where the geology is older, this region is physiographically composed of river basins that are influenced by tectonic zones. In terms of climate classification, meanwhile, it should be seen as a high precipitation region that has annual precipitation of more than 1,000 mm and belongs to a warm climate zone (a climate classification encompassing temperate, subtropical and tropical zones).
As a classification of human activity, meanwhile, the region would include a variety of artificial contrivances such as land use focusing on paddy field rice cultivation arising from natural factors, hydro-power development, hillside erosion and sediment control measures, and flood disaster countermeasures.

(a possible proposition suggested by professor Mushiake)

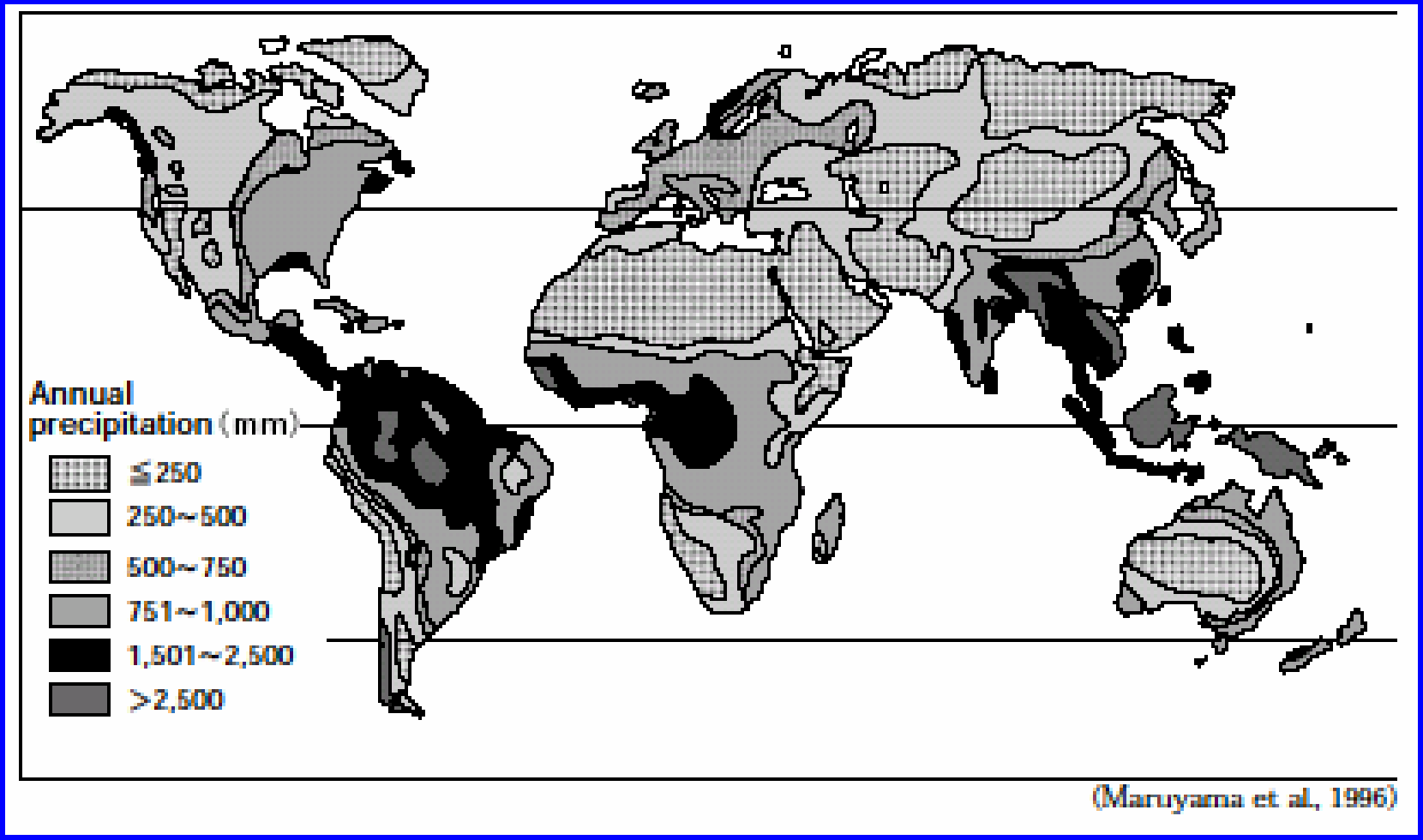
The Asia Monsoon Region: A Warm, Humid Climate with Dynamic Hydrological Conditions

1) These countries and regions are characterized as having very great seasonal or short-term fluctuations in river flow rate, due to their monsoon climate. They include many fast-flowing rivers running down from mountain ranges or volcanoes to alluvial or diluvial plains downstream, oftentimes resulting in flash flooding.

2) They may suffer from severe water shortages and water pollution between monsoon rains, resulting from a temporal imbalance in precipitation and increasing demand for water due to growth in population, lack of adequate reservoirs and other factors.

3) these countries in the Asia Monsoon region are subject to dynamic hydrological conditions that require immense efforts to improve their efficient utilization of water resources.

Annual worldwide distribution of precipitation



The Asia monsoon region is generally taken to include Japan, the Korean peninsula, China (except the northwestern interior, the Yellow River basin, and its surrounding areas), all of Southeast Asia (the Indochina peninsula and the island nations), Nepal, Bhutan, Bangladesh, Sri Lanka, and areas east of the Deccan Plateau plus southwestern coastal regions of India.

4. Characteristics of Water Problems

Arid and Semi-Arid Region

&

Wet Region

Characteristics of water problems in arid and semi-arid regions

- In most cases, these regions experience water shortages throughout much of the year.
- Tense relationships that are rooted in water allocation are constantly pervasive among interested parties.
- Compared with wet regions, water in dry regions is considered as a scarce resource and in most cases its substitutability with other assets is comparatively low.
- The capacity to formulate agreements on distribution of water among interested parties must be continually exercised.

Water issues that must be solved through introduction of IWRM under these conditions are those that are fundamentally constant in nature.

Characteristics of water problems in wet regions

・Compared to arid and semi-arid regions, ordinarily tense relationships among interested parties do not emerge in wet regions, and water is almost never scarce as an asset.

・Water which is almost never scarce and abundant has substitutability with such assets as labor and water use facilities, and aspects of water utility is not so severe problem.

However, if unexpected severe water shortages should occur, water scarcity can rise dramatically.

IWRM is required in wet regions not so much to resolve constant problems, but rather as a function for resolving problems that occur suddenly, such as anomalous water shortages.

Characteristics of water utility environment in Asia Monsoon Region

- High precipitation results in a large absolute amount of water resources.
- The hilly terrain has many mountain streams and networks of small- and medium-sized rivers.

Anybody who wishes to obtain water can ordinarily get it relatively easily and in large amounts if rain falls normally.

In the Asia Monsoon Region, irrigation is managed using the benefits of these conditions.

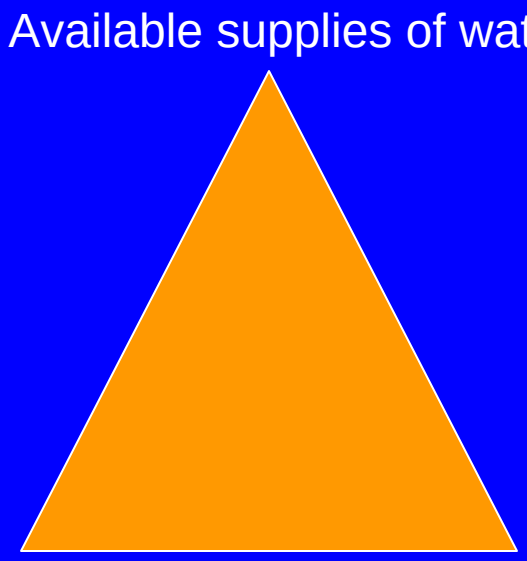
5. Management of Paddy Field Irrigation Adapted to the Environments of Wet Regions

Management that Makes Use of the Advantages of Wet Environments

Abundant of water makes it possible to construct facility economically and operate irrigation system roughly.

- In economic terms, this means that, in most cases, water has an extremely low shadow price. Consequently, even if poorly built canals with many leaks are used, it is possible to convey water to all parts of the field if water is used in such abundance that losses from leaks are covered.
- Because ample water is available, it is easy to manage water distribution at divergence points, and this means that the amount of investment in facilities and labor required for offfarm water management can be reduced.

The three elements of irrigation systems



Irrigation and management.
Irrigation systems are composed overall of irrigation facilities and management activities by people with respect to the available supplies of water, a given variable requirement. The general response in areas with little water is the sophistication of the facilities and large inputs of management activity.

Source: Wisdom based on "Lonf and water", "Land and water", 2002 (Japanese Institute of Irrigation and Drainage)

The amount of water resources supplied, amount of water management labor required, and level of equipment of facilities connected with water resources in wet regions have substitutability with as assets; an item that is costly (many or higher) can be replaced by those that are less costly (few or lower).

→ It is possible to raise the economic efficiency of water use by using cheap water resources in abundance.

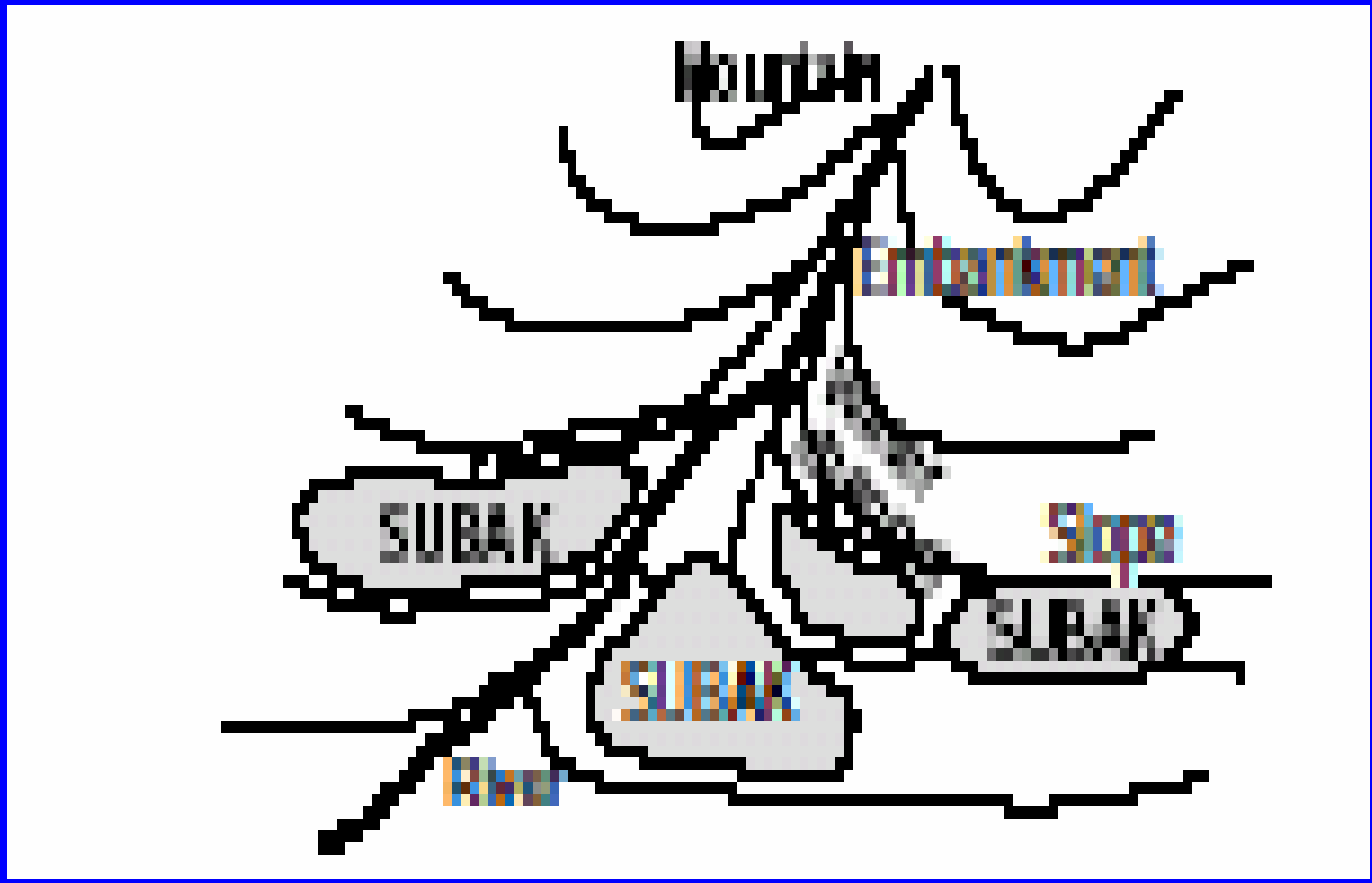
6. Establishment of Regional Societies in the Asia Monsoon Region that Use Water as a Medium

Example from Indonesia

In Bali, there are about 1,700 irrigation collectives called "subak", organized for each water system. As well as water management on the principle of "fair water gathering and free crop selection", they make decisions on when to start planting, the dates of religious rituals, plans for repairs to facilities, and other matters at gatherings held every 35 days.

They also pass down traditions such as festivals, folk dances and music, as a tourism resource.

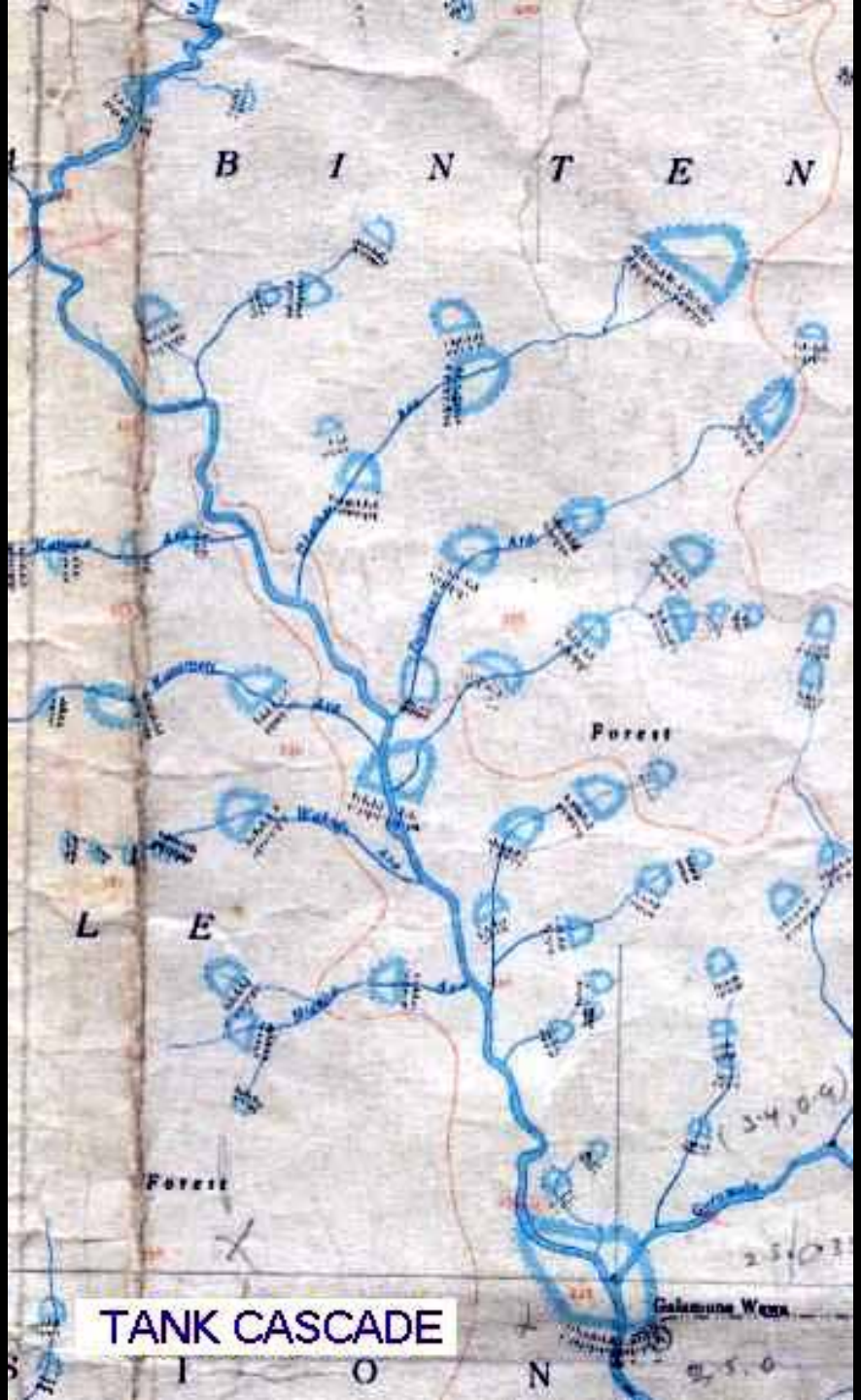
Management of terraced rice paddy field by the Subak



Source: Toshio Tabuchi, Ricepaddies of the world and Japan, 1999
(Yamazaki Agriculture Research Institute)

Example from Sri Lanka

In Sri Lanka, linked network of reservoir irrigation, called the "cascade system", has existed for about two thousand years. Local farmers' organizations maintain and manage sustainable water management systems involving an advanced form of rainwater recycling, contributing to highly productive rice cultivation in paddy fields.


B I N T E N
Forest
L E
Forest
TANK CASCADE
I O N

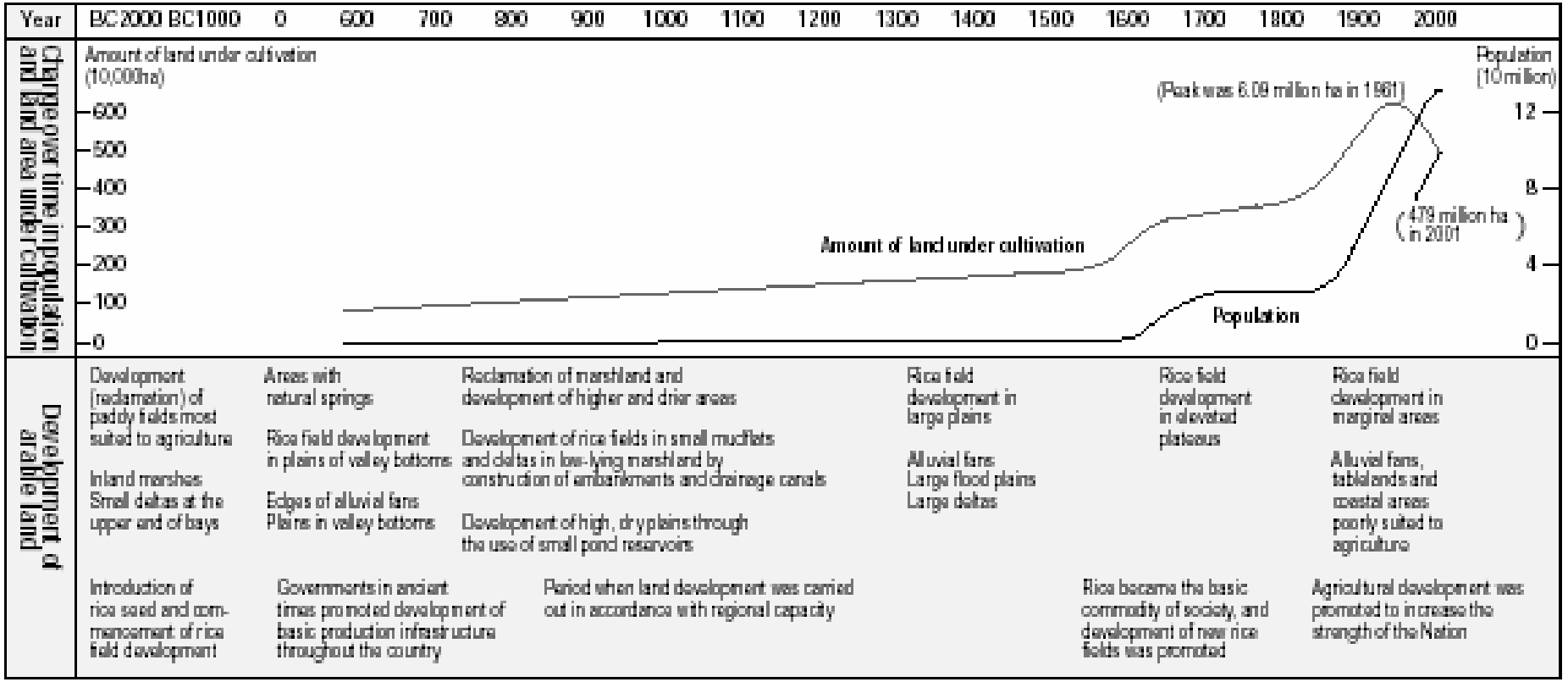
Example from Japan: Histry of rice cropping in Japan

It is believed that rice cropping in Japan began around the 5th century BC. Then, around the 7th century, a system based on Chinese law was established through which the nation provided the people with agricultural land in return for labor. In this way, the government and the people worked together to build paddy fields and irrigation facilities that led to the establishment of Japan as an agricultural nation that is founded on rice cropping.

Beginning in the 12th century, development of paddy fields and use of diverted waters from rivers (primarily small- and medium-sized rivers) began. Then, during Japan's Warring States Period of the 16th century, flood control works were begun to protect paddy fields as a means of maintaining rice production.

17th century, development of new fields in alluvial floodplains, which had been untouched in previous times. Some 1.17 million hectares of new paddy field were developed during the Edo Period.

History of agricultural water in Japan



Source: Prepared by the Farming Village Promotion Bureau based on Agriculture History Research Association, Impression on the Land, 1988 (Kogyo-Jigyo-Tsushinsha)

Example of Developing irrigation system process in Japan (1)

・Plans for many of the paddy field irrigation systems that were found throughout the country today were devised by farmers, village leaders, or locally influential merchants. These people would submit their plans to the ruling clan or shogunal government, which served as the policymaker in such matters, for funds and technical assistance before beginning construction. Farmers that would directly benefit from the facilities also contributed, labor, and materials.

・After the fields were completed, the farmers would form communal organizations for independent irrigation management. These organizations established discipline, managed water distribution, and maintained and managed facilities. The people that benefited from the fields worked together to perform regular maintenance (such as removing mud and weeds from canals, repairing canals, and removing grass) as well as repairs following catastrophic flooding.

Example of Developing irrigation system process in Japan (2)

- Water distribution issues caused repeating cycles of conflict and reconciliation between farming families or villages, which led to the establishment of public order or arrangement that reflected the social values and standards of the region.

Farmers gained a strong awareness of their rights and obligations with regard to water.

The kind of system that is necessary in wet regions-i.e., one that can accurately be described as an IWRM system for agricultural water-was created that could provide water distribution management during times of emergency, such as anomalous water shortage.

Other examples of both voluntary and group PIM in the Asia Monsoon Region

the *So and Igumi* in Japan (the antecedents of the modern LIDs), *funnonge* (basic unit of farmland improvement districts) in South Korea, *beichuan* (basic unit of paddy field water use associations) of Taiwan, *Yutan* of China, *tsuanferra* in the Philippines, *subak* in Indonesia, *mounfai* in Thailand, *samakumu* and *korumataju* in Cambodia, *nawan* in Laos, *komira* in Bangladesh, *torisu* in Nepal *warabandei* in India and Pakistan, *kanna* in Sri Lanka

In all of these examples, farmers have a strong sense of ownership of paddy field irrigation systems because they see them as their own facilities and assets. They are therefore conscious of the fact that they must take the initiative to actively protect and preserve their facilities, and they have a firm awareness of their rights. Furthermore, while the above organizations are associated with regulation of water allocation and maintenance/repair of facilities, there are many cases in which they are closely connected with traditional events, ceremonies, and religious rituals that are related to water and agriculture. In this sense, they share a role in developing regional society.

7. Land Improvement District

Establishment of Land Improvement District

The framework-in which farmers participate together in planning, construction, and management-became established in all parts of the country. The framework was carried into in the 19th century, when small-scale irrigations systems were integrated into larger systems. The framework also exists today as Land Improvement Districts (LIDs).

Land Improvement Act (1949) describes a procedure of establishment of LID.

Basic Principle of Land Improvement Act

Land Improvement Act describes necessary items and procedures of the Land Improvement Projects such as improvement of land, development of agricultural land, conservation of agricultural land, etc, etc, so that the Land Improvement Projects is managed properly and smoothly.

Two Basic Principals of Land Improvement Projects based on the Land Improvement Act

①Basically Projects are proposed by qualified farmers.

②If two third of farmers within a benefited area agree to implement the project and pay the project cost, then whole of the farmers within the benefited area should obey the agreement.

Right and Obligation of LID's Membership

Mmember Farmers:

・have right to use water

・pay a membership fee for water allocation management and facilities' operation and maintenance.

・are required to provide the labor required for removing weeds in irrigation canals, cleaning, and other tasks.

Currently there are 6,816 organizations in land improvement districts located throughout Japan, with a combined membership of 4.26 million people. (2001)

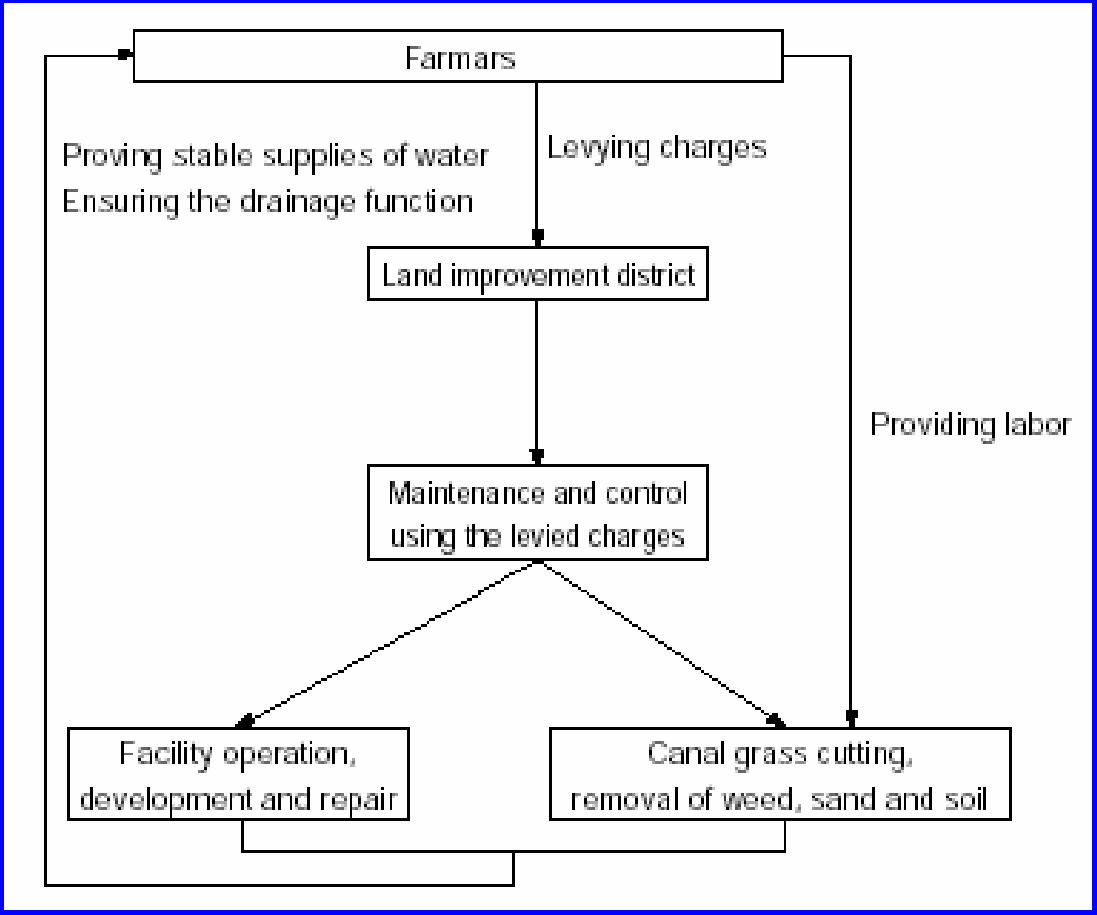
Intensive and Collaborative Voluntary Labors by Farmers / Residents for Maintaining Irrigation Canals

Management of the "Arterial Network of National Land" Borne by Land Improvement Districts: A Management System that Offers High Sustainability

Land improvement districts organized by farmers in Japan take responsibility for developing and maintaining these vast irrigation facilities as well as managing the distribution of agricultural water. Organizations of irrigation associations have existed in rural areas for a long time.

But the enactment of the Land Improvement Law in 1949 made it possible to construct, improve and manage irrigation facilities in certain regions using modern legal procedures. This Law requires compulsory enrolment of union members and mandatory levies of fees.

General Maintenance and Management system in Land Improvement District



Number of Government Facilities by Management Entity (as of end 2001) *

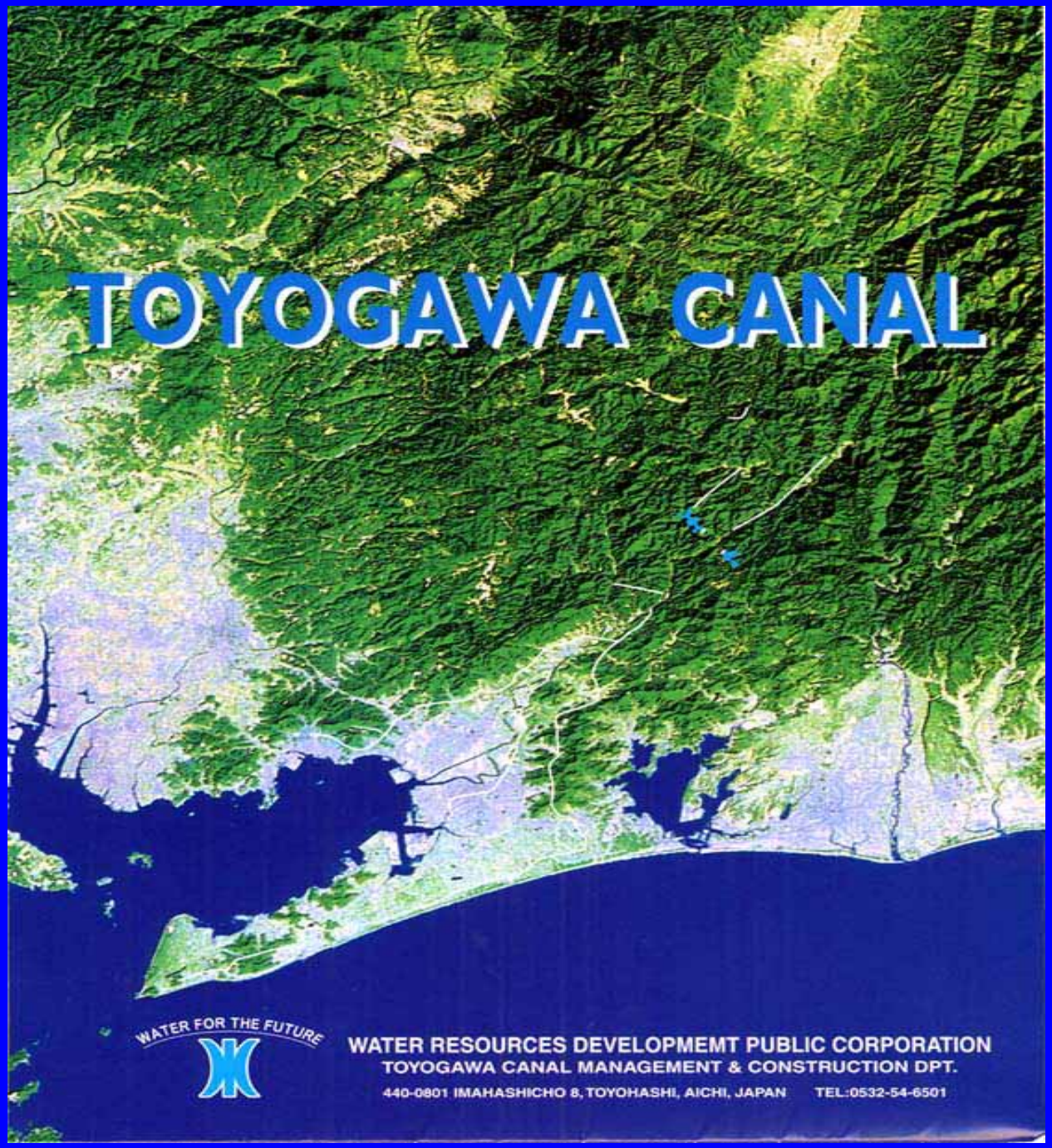
	Main facilities		Irrigation and drainage canals	
	No. of facilities	Ratio	Length(km)	Ratio
National	20	1.3%	94	0.5%
Prefectural	247	15.6%	576	2.9%
Municipal	265	16.7%	6,939	35.1%
Land Improvement Districts	1,042	65.8%	12,133	61.3%
Other	10	0.6%	52	0.2%
Total	1,584	100.0%	19,794	100.0%

Note: Main facilities consist of 170 dams and reservoirs, 296 headworks, 893 pumping stations, and 106 sluices

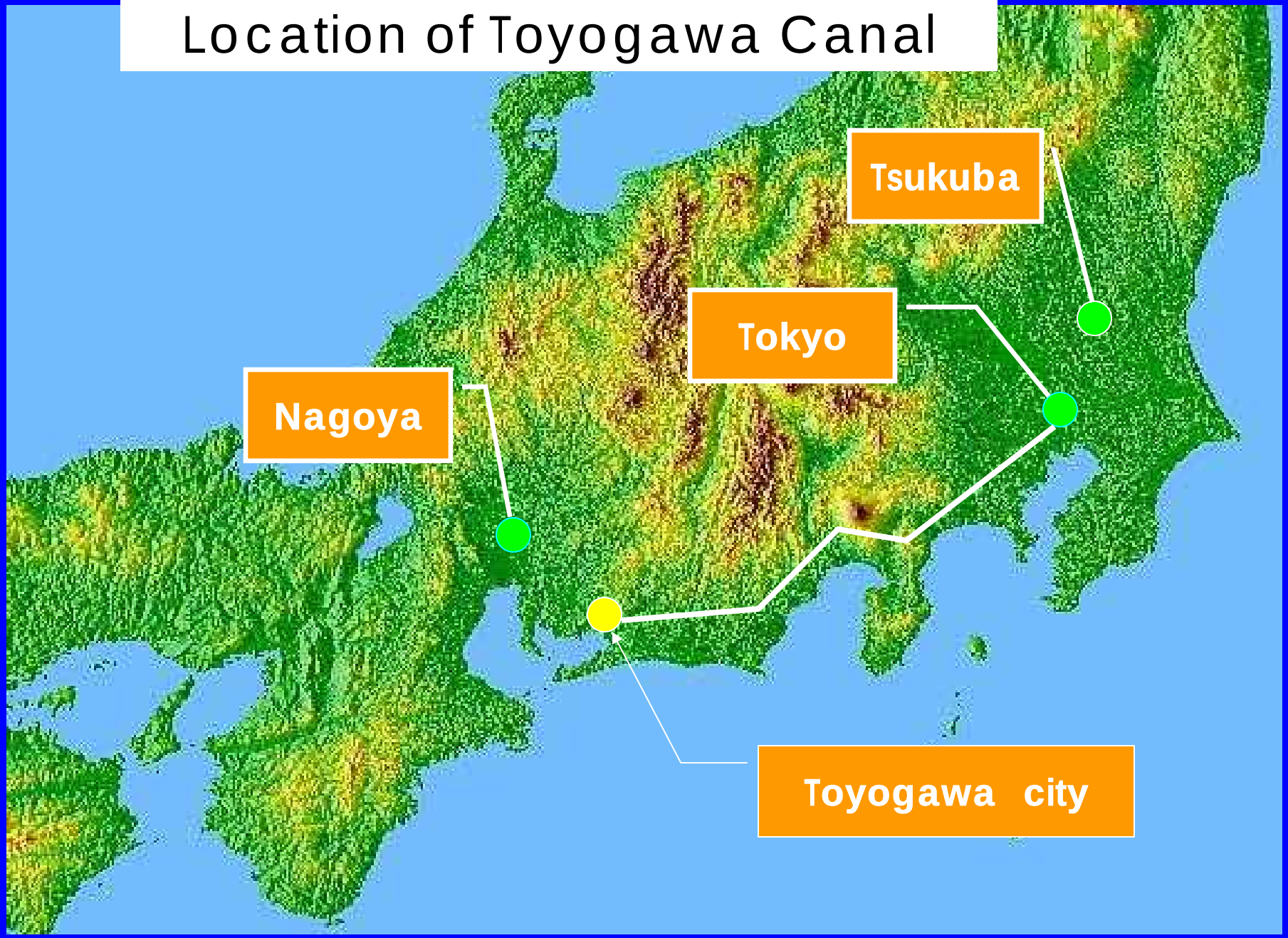
8. Example of Water Management

-Toyogawa Canal Project-

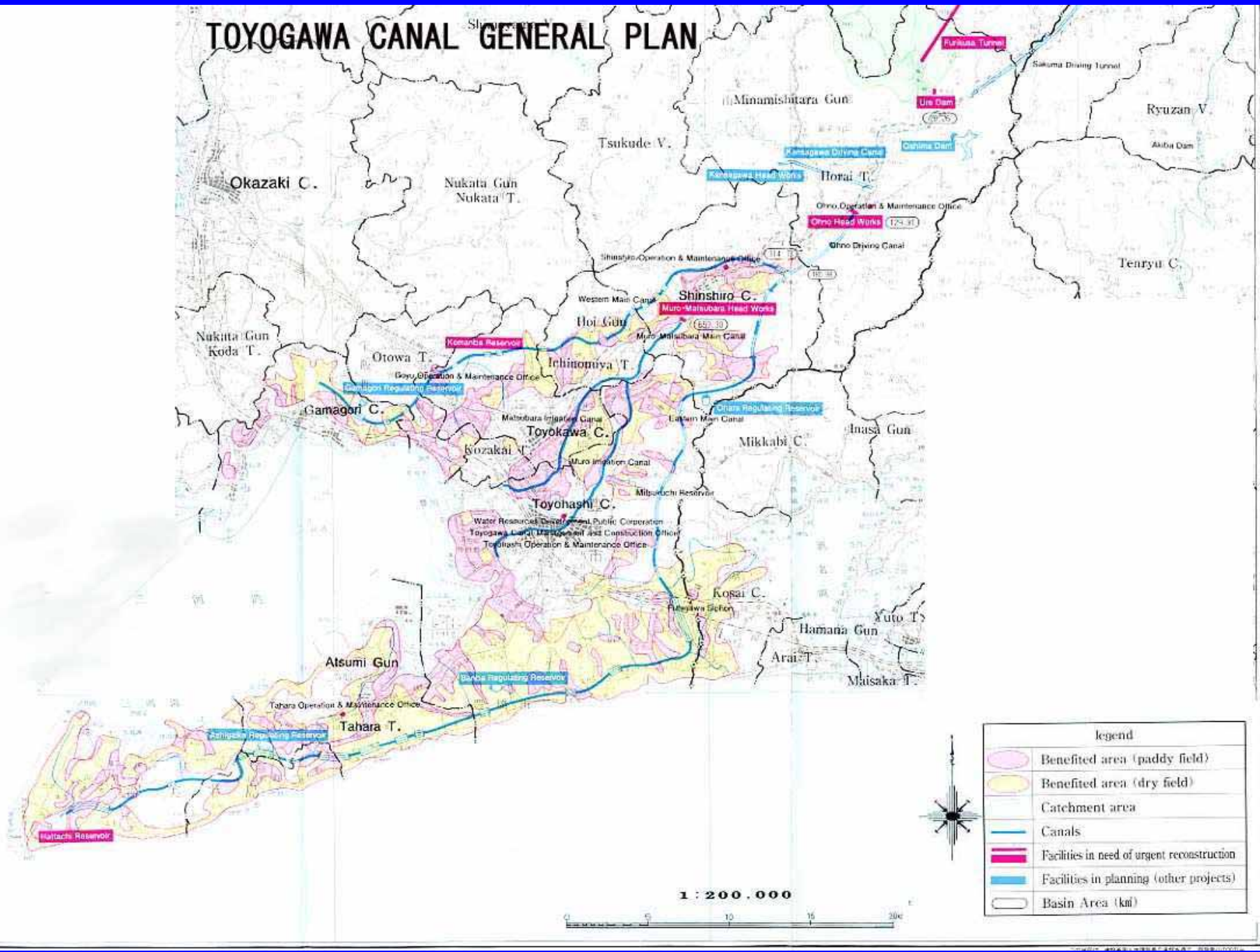
Collaboration between Japan Water Agency and Toyogawa Comprehensive Land Improvement District


TOYOGAWA CANAL
WATER FOR THE FUTURE
WATER RESOURCES DEVELOPMEMT PUBLIC CORPORATION
TOYOGAWA CANAL MANAGEMENT & CONSTRUCTION DPT.
440-0801 IMAHASHICHO 8, TOYOHASHI, AICHI, JAPAN TEL:0532-54-6501

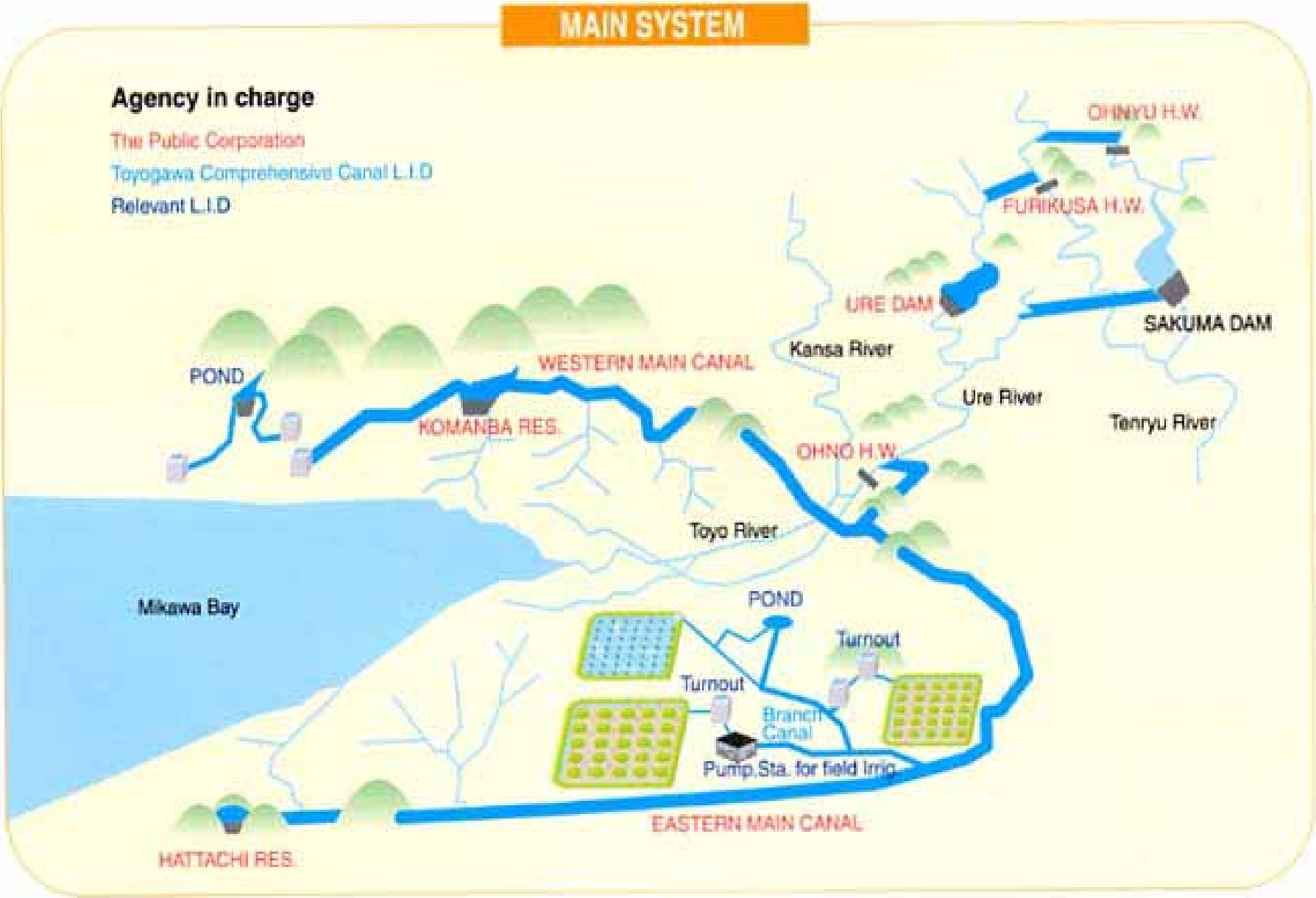
Location of Toyogawa Canal



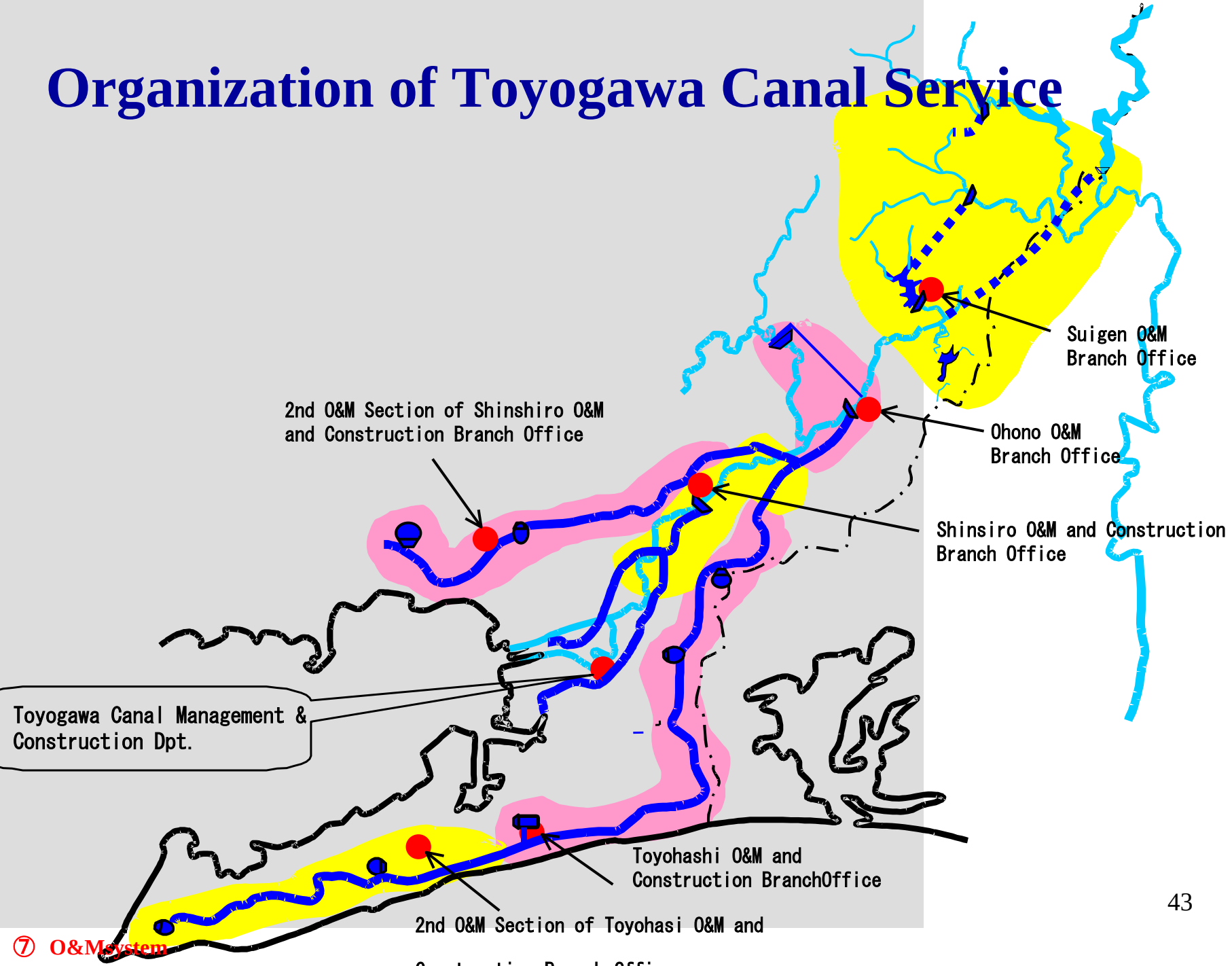
TOYOGAWA CANAL GENERAL PLAN



MAIN SYSTEM


Agency in charge
The Public Corporation
Toyogawa Comprehensive Canal L.I.D
Relevant L.I.D
OHNYU H.W.
FURIKUSA H.W.
URE DAM
SAKUMA DAM
Kansa River
Ure River
Tenryu River
WESTERN MAIN CANAL
POND
KOMANBA RES.
OHNO H.W.
Toyo River
Mikawa Bay
POND
Turnout
Turnout
Branch Canal
Pump.Sta. for field Irrig.
EASTERN MAIN CANAL
HATTACHI RES.

Organization of Toyogawa Canal Service



Main Facilities (1)

Dam（2Nos）: Ure Dam: Concrete Gravity

Oshima Dam: Concrete Gravity

Headworks (5Nos): Ohnyu, Furiksa, Kansagawa, Ohno, Muro-matubara

Main Canal: Ohno Head Race 6.3km

East Main Canal 75.7km

West Main Canal 36km

Muro-matsubara Main Canal 5.3km

Muro Main Canal 7.7km

Matsubara Main Canal 0.4km

Main Facilities (2)

Regulating Reservoir (7 Nos):

- Ohara Regulating Reservoir (2 million cu.m)
- Mitsukuchi-ike Regulating Reservoir (0.2 million cu.m)
- Banba Regulating Reservoir (5.0 million cu.m)
- Ashiga-ike Regulating Reservoir (2 million cu.m)
- Hattichi-ike Regulating Reservoir (1.6 million cu.m)
- Komanba-ike Regulating Reservoir (0.8 million cu.m)
- Gamagori Regulating Reservoir (0.5 million c.m)

Purpose of the Toyogawa Canal Project

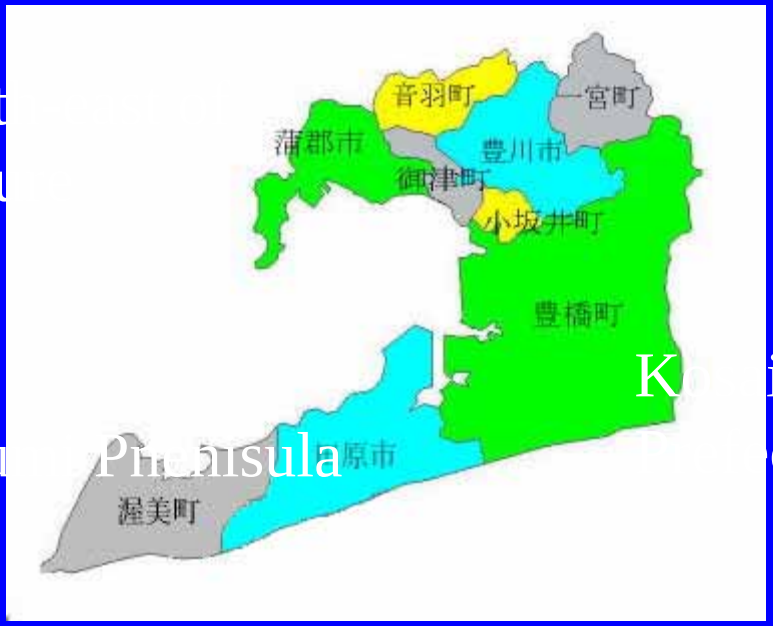
Agricultural water

Industrial Water

Domestic Water

Supply

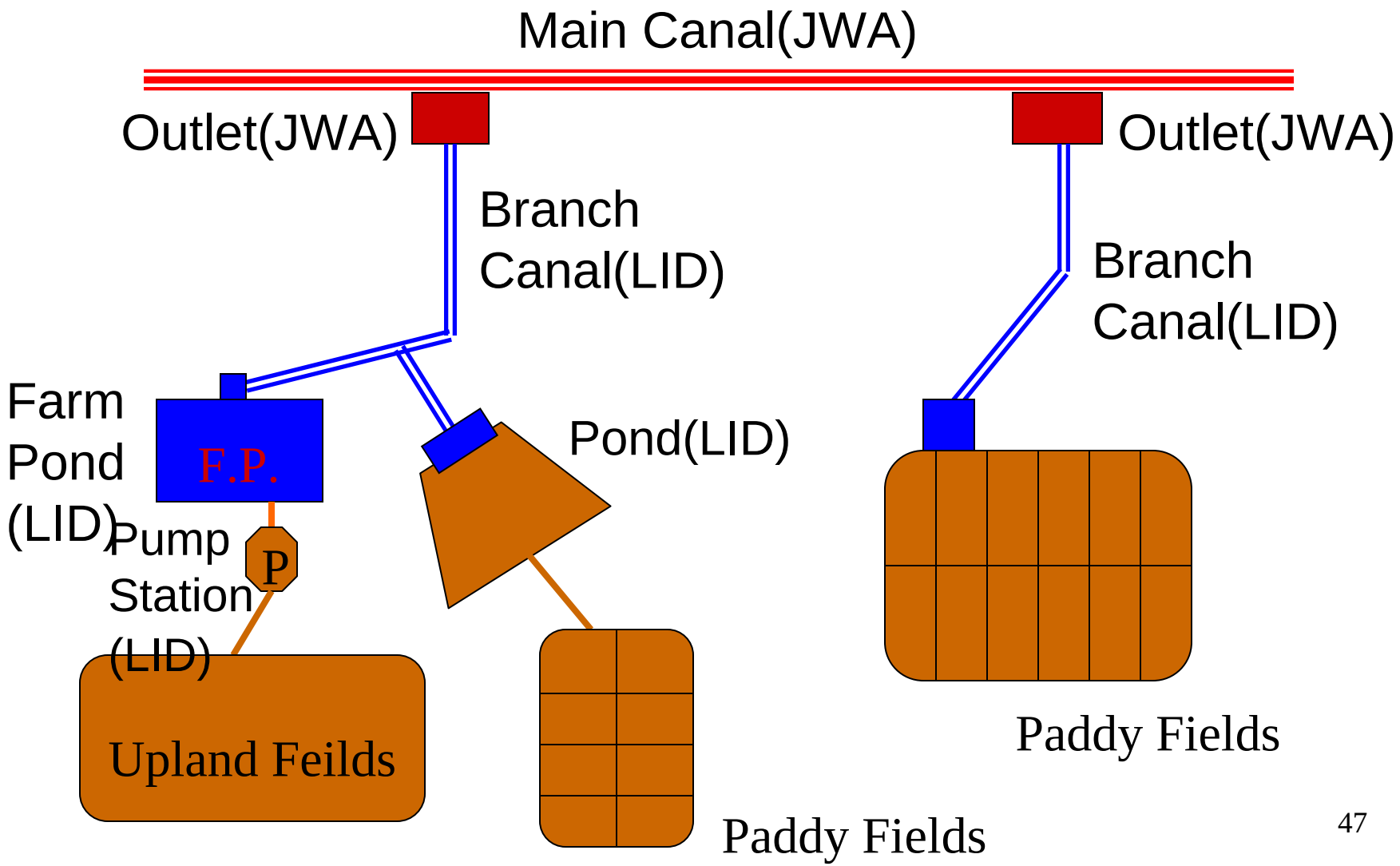
Plain of Sout
Aich prefectu



K i-city, Shizuoka

Atu Pn nsula cture

Classification of Toyogawa Canal Facilities and Organization in Charge



Toyogawa Canal Management Board (1)

Purpose

Toyogawa Canal Management Board deliberate important items about which are consulted by the Japan Water Agency.

Membership of the Board

Chubu Regional Bureau of JWA(Chairperson), Tokai Regional Agricultural Administrative Office, Chubu Bureau of Economy, Trade and Industry, Shizuoka Prefecture, Aichi Prefecture, Kosai Canal LID, Muro Canal LID, Matsubara Canal LID, Toyogawa Canal Comprehensive LID, Representatives of Waterworks for Domestic and Industrial water, Experts annd well-informed people

Toyogawa Canal Management Board (2)

Call for the Board

Toyogawa Canal Management Board is generally called in February.The Board deliberate Water Utility Plan of fiscal year(from April to March), Budget of fiscal year and other important items.

Expert Committee

Expert Committees can be set up in the Board when the Board agreed with its necessity.

- Expert Committee on Water Distribution
- Expert Committee on Management

Toyogawa Canal Water Saving Measures Committee (1)

Purpose

Toyogawa Canal Water Saving Measures Committee discusses counter measures when water conditions become severe. water saving measures of water users and proper water distribution rules to deliver water to water users when water conditions become severe.

Action

1. Collecting and discussing weather information and water storage information and so on during the draught

2. Discussing and implementing concrete counter measures for saving water during draught

3. Others

Toyogawa Canal Water Saving Measures Committee (2)

Membership of the Committee

Agriculture, Fishery Bureau of Aichi Prefecture, Waterworks Bureau of Aichi Prefecture, Agriculture, Fishery Bureau of Shizuoka Prefecture, Waterworks Bureau of Shizuoka Prefecture, Toyogawa Canal Comprehensive LID, Muro Canal LID, Matsubara Canal LID, Kosai Canal LID, O&M Department of Chubu Regional Bureau(JWA), Toyogawa Canal Management & Construction Department(JWA, chairperson)

9. Directions for IWRM in Wet Regions such as the Asia Monsoon Region

Forming Concept of "Basin-oriented Society" from ancient times in the Asia Monsoon Region

In the pre-modern Asia Monsoon Region, which included Japan, the principal river water users were paddy field farmers in regions on either side of a river and along upper and lower reaches.

Frequent conflicts over water allocation and reconciliation eventually led to farmers' keen awareness of their water rights and obligations, as well as to the creation of social standards and arrangements that they could accept.

water resources management systems were created and handed down that could function appropriately during times of anomalous water shortage.

Directions for IWRM that is Harmonized with Conditions in Wet Regions

The most significant question on people's minds when it comes to water management in wet regions will be how to smoothly administer the fair distribution of water and labor burden during times of anomalous water shortage.

And if it is demanded that water should be viewed as a common property rather than as simply a private economic asset.

Establishing IWRM that is based on "traditional PIM that is harmonized with conditions in Asia" is an effective choice to manage water resources well.

10. Conclusion and Recommendations

Conclusion

1. Pursuing IWRM in a manner that would solve water issues through spontaneous exchange and coordination among users rather than through the leadership of water resource providers.

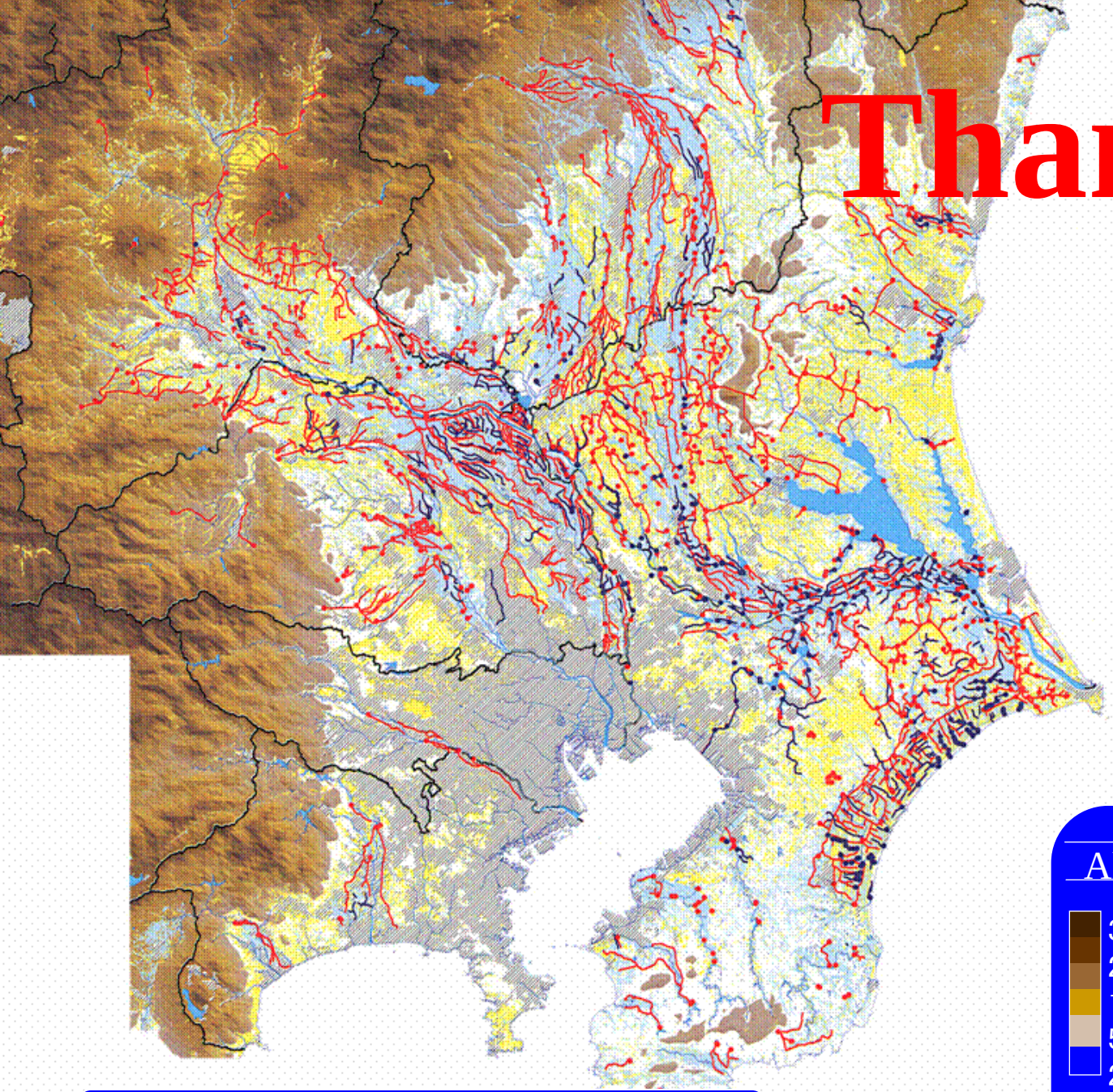
Because IWRM is merely a means for attaining policy objectives, it is first important to present clear policy objectives and to scrutinize the appropriateness of these objectives. Then, it is essential to adequately explain how the framework conforms to the conditions of the region.

Conclusion

2. It is hoped that the various countries of the Asia Monsoon Region-who represent various levels of economic and social development-conduct joint study and research on a framework that broadens "traditional PIM that is harmonized with conditions in Asia" into the cross-cutting water use sectors of river basins.

In wet regions like the Asia Monsoon Region, since there is usually abundant water, reduction of flood damage is sometimes a higher priority in case of low land. Thus, what is desired is a framework, under this condition, that can attain policy objectives for water use in the most effective and efficient way possible, and encourage regional social development through these activities in developing countries.

Thank you



Irrigation and Drainage in *TONE* river basin

Contents of this document is mostly based on "A Message from Japan and Asia to the World Water Discussions" which is issued by the Japanese Institute of Irrigation and Drainage(JIID), 2003.