

# Approach for International Exchange of River Restoration Technology

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**Abstract:** About 50% of the population and 75% of the properties concentrate on the flood plain in Japan. The rivers have intimate relationship with our lives. Those conditions have been seen after modern river improvement projects that began about a century ago. The technology which was introduced from foreign countries was improved in conformity with geographical features and the climate condition of our nation, and has redeveloped as a Japanese original technology. In 1940's, Japan had serious natural disasters that were caused by large-scale typhoons. Those typhoons wiped out everything completely. Even though the government realized the importance of flood control and management after those natural disasters, civil work still aimed to economic development. Those construction works have become the one of factors for concentrating population and degrading natural environment in urban areas. Deterioration of river environment has become serious issue in urban development and main cause of pollution.

The approaches for environmental restorations which were started about 30 years ago aimed to harmonize with nature environment and cities and human lives. There have been going on many projects called "river environmental improvement projects", the "nature friendly river works" and "natural restoration projects." The society has tried to find a way to live in harmony with nature.

As for societies symbiotic with habitats will form the safe country in the history and the spectacle. Such as the symbiotic of the river or the basin where discharge, water quality, nature, the history, landscape, the local society and also for culture were built in is achieved. Examples of working, applied to restoration technologies and the one to describe the mechanism construction are been shown in the paper. Furthermore, write for an international spread of the river technology of Japan to attempt.

**Keywords:** Nature restoration, Nature Friendly River works, Asia monsoon region, Human interchange, Web tool

## 1 INTRODUCTION

After several historical events, such as the collapse of the Soviet Union and the reunification of East and West Germany, many nations have been making economic groups for improving coordination and cooperation with other nations. For instance, there are several big economic alliances, EC and NAFTA (North America Free Trade Agreement) around the world. There has been growing awareness for the importance of making an economic group in East Asia.

Water resource management has been shifted from how to prevent floods and drought to how to preserve healthy environment. Engineers have more focused on not only their countries' conditions but also global-scale environment system. In Korea and China, the governments have promoted environment friendly projects to protect environment. River engineering in East Asian countries included Japan have moved forward to protect environment and ecosystem.

The cooperation and coordination among East Asia Region have been more important to improve engineering technology, especially what the most important is to exchange information and people-to-people exchange.

This article describes how to develop Asia river restoration network system between Japan, china and Korea and how the network will work for near the future. Main points of this project were:

(1) Urbanization in watersheds and resulting problems in that urban rivers (2) efforts of urban river restoration which were carried out (3) Viewpoints on efforts of urban river restoration and some example. Further it will be reported on urban river restoration in Asian countries with remarkable development, including (4) examples, and (5) the establishment of an information network for river environments in Asia.

## 2 THE CONCEPT OF ASIAN RIVER RESTORATION NETWORK

On the Amendment of the Act of Rivers in 1997, the act clearly mentioned river environmental arrangement and conservation as a part of river management.

Since more than 15 years have passed the time when Europe countries started to use nature-oriented construction method, Japan have completed a framework for environment improvement by established the act of Natural Restoration. A lot of river restoration technology has developed, such as focusing on improving water environment and scenery and restoring ecosystem.

The 3<sup>rd</sup> World Water Forum in 2003 compiled the information about river restoration technology that Japan had practiced, announced the guideline for river restoration to collect information, and discussed to build a network to share technology, knowledge, and practices around the world. The networks that exchange information, technology and manpower have been developed not only in Japan, china and Korea but also including Philippine, Malaysia, Singapore, the U.S. and Europe.

River restoration is considered the most urgent problem in 21<sup>st</sup> century that is not only related to water environment and ecosystem but also urban redevelopment in Korea, China and other East Asia countries.

Making a network tried to be build by each country effort but Asian countries reached the agreement that Asian countries have similar geographical features and climate so that it is essential to build a network system to share and put out information and coordinate with each other.

### 3 URBANIZATION OF WATERSHEADS AND PROBLEMS OF URBAN RIVERS IN JAPAN

After the war, river basins have become urbanized (Fig.1), and problems have occurred since population increased rapidly. Due to pollution from residential and industrial waste water, water quality of rivers was deteriorated, and rivers smelled badly in the 1970's (Photo 1). A volume of water supplying from the ground was declined due to increasing pavement. Rainwater has been directly discharged into rivers. A peak flow of floods got larger, and arrival times of peak flows were shortened. Urban river flows were declined because of declining water supply from groundwater. Flood control measures were needed to prevent floods in urbanized watersheds. Rivers in urbanized areas faced difficulties to broaden width of rivers because of adjacent buildings. In consequence, rivers had to be dredged deeply and slopes and edges of rivers had to be protected by concretion (Photo 2). As a result, rivers became less hydrophilic. Those rivers could not supply various habitats for flora and fauna and biodiversity was degraded and reduced in combination with bad water quality and reduction of normal flow discharge. Most river systems disappeared (Fig.2) and citizen did not care about rivers.

### 4 EFFORTS OF URBAN RIVER RESTORATION IN JAPAN

Before river restoration methods that had been practiced in Europe were adopted as *tashizenkoho* or nature-oriented construction method in 1990, some river improvements from the viewpoint of making use of river spaces for towns and communities had already been implemented. One of

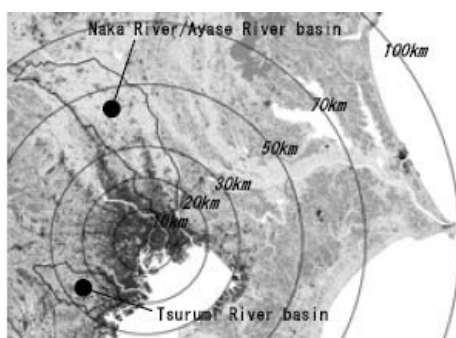


Fig.1: Satellite picture of Tokyo Metropolitan area (2000/11/24. Black part is urbanized area. )



Photo1: Sumida R. Smelled badly in 1970's



Photo2: Shibuya R.

those examples are the Itachi River (Photo 3). It had been straightened for flood control measures and become monotonous. Then its riverbed was dredged, and the dredged sediment was placed along embankments and vegetation grown on it and riverwalks set up along this river, as well as access was ensured. Table1 shows how the restoration was starting gradually around 1990. Examples that combine the restoration of rivers with urban regeneration, such as Murasaki River and Hori River, could be seen. Since 2002, the Council of Science and Technology Policy, Cabinet Office promoted an initiative for watersheds and urban restoration in accord with nature. Research includes not only nature restoration in rivers but the entire circulation systems, ecosystems, landscape, design as well as presentation of watershed and urban regeneration scenarios with land usage and

economic activity in watersheds. As such an effort, the Tsurumi River Basin Water Master Plan and the Urgent Action Plan in Marsh Imba were drawn up at 2004.

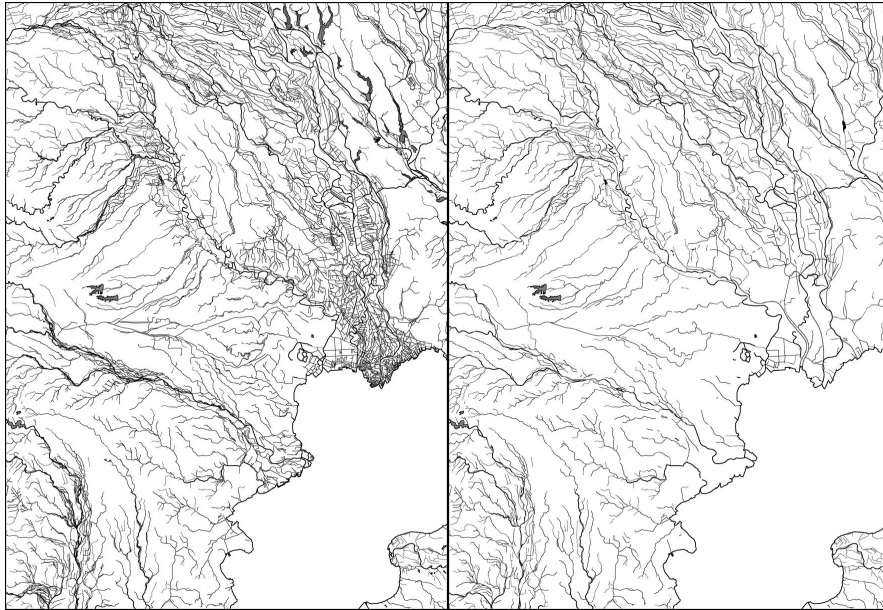


Fig. 2: Old and present distribution of rivers in Tokyo Metropolitan Area (left : around 1907(100 years ago), right : in 2001)

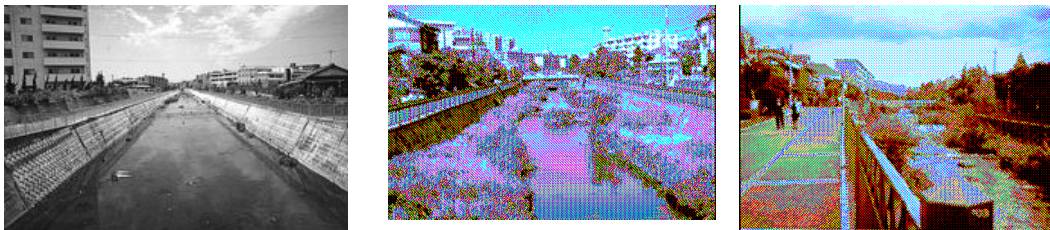


Photo3: Itachi R., Yokohama City (left: before improvement, middle: after improvement, right: river-walk along with the river)

## 5 CONCEPTS AND EXAMPLES OF URBAN RIVER RESTORATION

When river improvements are planned, it is necessary to be aware of target space scales. There are differences between “river space”, “river space with river side area” and “watershed space”. Definitions are followed; *River space*: a space of river surface area; *River space with area along the river*: a river surface area and land adjacent to the river; *Watershed space*: a water catchment area. Table-1 shows that urban river restoration projects started from cases based on river spaces (Itachi river, et al), and cases in which the view was extended to River space with the area along the river (for example Murasaki river). Recently, cases in which watershed space was dealt with (Tsurumi river basin water master plan, et al) are promoted.

Table1: Efforts of river restoration in Japan

Date	Contents of Efforts and Low	Date	Contents of Efforts and Low
1982	Nature-oriented construction method in Itachi River, Yokohama-City	1986	Nature-oriented construction method in Moizari River, Eniwa-City
1988	Urban Restoration from water front restoration, Murasaki River, Kitakyusyu-city	1989	Hori River restoration project, Nagoya-City
1990	Near-natural river construction method was adopted as a model. Super levee project, Sumida River, Tokyo	1991	River projects to facilitate fish migration upstream
1995	River management taking the environment into consideration was proposed by the River elaboration Council.	1997	The River Law was amended, the environment was added to the aims of river management. Nature-oriented construction methods became regarded as the rule for all river improvement.

1998	Nature-oriented construction methods became standard for repair works on disaster-stricken rivers.	1999	The meeting on the creation of “Wa no kuni” under the auspices of the Prime Minister reported <ul style="list-style-type: none"> <li>• The creation of a society in accord with nature</li> <li>• Adaptable ecosystem management</li> <li>• Natural restoration-style public works</li> </ul>
2002	New biodiversity national strategy measures Law promoting natural restoration Initiative for watersheds and urban restoration in accord with nature (the Council of Science and Technology Policy, Cabinet Office)	2003	Dotonbori River restoration project, Osaka-City
2004	Tsurumi River Basin Water Master Plan Urgent Action Plan in Marsh Imba		

From the viewpoint of watershed/urban restoration, it is necessary to take improvements not only of urban rivers and their vicinity but also of entire watersheds. In the latter case, it is required to restore the water/matter circulation, preserve and regenerate the network of water and green (from the viewpoint of biodiversity), to restore the rapport between people and water, green and nature, and furthermore, to make land use projects suitable. Viewpoints on restoration are summarized in Table 2. Examples of restoration are the Sumida River after development of Super Levee and the riverwalk along with Shinmachi River (Photo 4). The Tsurumi River Basin Water Master Plan is as an example of river restoration in a watershed scale (Fig. 4)

Table 2: Views on restoration in each space scale and domestic and foreign examples

Space scale	Views of restoration	Domestic cases	Foreign cases
River space	Restoration of vegetation in river course Space for access to waterfront	Itachi River, Yokohama City Moizari River, Eniwa-City	
River space with riverside area	Keep the access to rivers Road along with rivers Green along with rivers Restriction on heights of riverside buildings Restoration of space with prosperity by some events et al in riverside	Itachi River Moizari River Super Levee of Sumida River Hori River, Nagoya City Shinmachi River, Tokushima-City Murasaki River, Kitakyusyu-City	Gaoliang Canal (Beijing City) Suzhou Creek (Shanghai City) Singapore River (Singapore) Cheonggye River (Seoul, Korea)
Watershed space	Restoration of sound water circulation Formation of ecosystem network (network of water and green)	Tsurumi River Basin Water Master Plan Urgent Action Plan in Marsh Imba Initiative for watersheds and urban restoration in accord with nature	Mersey River Basin Campaign (UK) Chesapeake Bay Restoration (US)

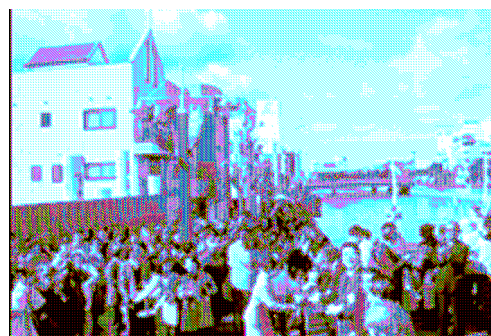


Photo 4: Restoration of spirited space Left: Sumida R., Right: Shinmachi R.





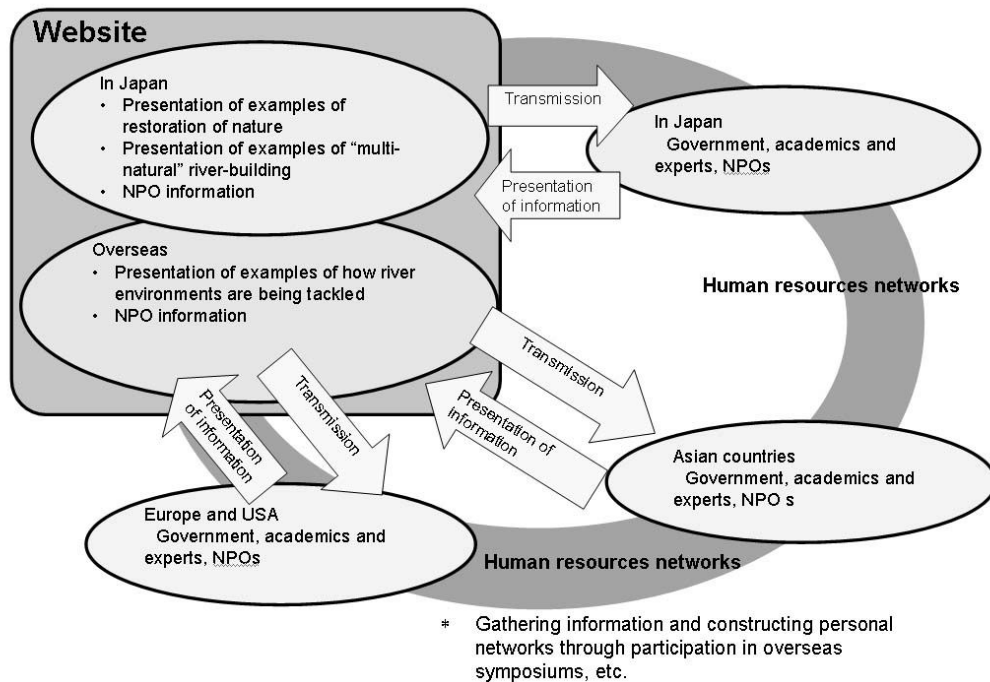


Fig.5: Network on river environments focusing on Asia

## 7 Conclusion

“River space,” “river space with riverside area” and “watershed space” are scales where river improvements are implemented. In Japan, urban river restoration has started from river space and its vicinity. Now efforts on a watershed scale are being implemented. Advanced examples of urban river restoration in Asian countries should be reported in a network for river restoration in Asia.

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