

# Development of international exchange system for river restoration technology

Kazumasa ITO<sup>\*1</sup>, Junzo SAGO<sup>\*2</sup>, Masafumi ITO<sup>\*3</sup>, Yumi IMANISHI<sup>\*4</sup>

<sup>\*1</sup> General Manager, Planning office, Research Center for Sustainable Communities, CTI Engineering Co., Ltd.

<sup>\*2</sup> Director, Foundation for Riverfront Improvement and Restoration, Japan

<sup>\*3</sup> Researcher, Foundation for Riverfront Improvement and Restoration, Japan

<sup>\*4</sup> Researcher, Research Center for Sustainable Communities, CTI Engineering Co., Ltd

**Abstract:** River restoration which not only focuses on creating of sustainable water environment and habitats but also revitalizing urban areas has become the biggest concern in Asia as well as around the world. However, compared with flood control, it will be effective for Asian countries which have not enough experience and research studies about river restoration to build the international network system. While the network system has mainly worked for exchanging information and developing technologies, it will need to more focus on outreach efforts, such as sending information and building strong relationships among Asia.

Purposes of this paper are to introduce the future visions for river restoration in Japan, and processes of establishing the network system collaborating with Asian countries for exchanging engineering technologies and human resources.

*Key words: River Restoration, Water environment, Network, Environmental restoration*

## 1. INTRODUCTION

Corporation and collaboration between Asian countries have been progressing since collapse of the Soviet Union in the late 20<sup>th</sup> century, establishment of partnerships in EC after reunification of East and West Germany or of NAFTA (North American Free Trade Agreement) in North America. Water resource management in Asia has been shifted from how to control floods to how to accrete with ecosystem and environment. For instance, there have been many projects that emphasize the importance of environment in Korea. The Chinese government has more focused on making harmonious with environment and conservation of environment and ecosystem. It is essential to promote exchanging information and human resources dealing with those social needs.

Purposes of this article is to introduce processes of dealing with problems of river environment and the future vision for river restoration in Japan, and processes of establishing the network system among collaborating with Asian countries for exchanging engineering technologies and human resources in Asia.

## 2. Approaches for dealing with river environment issues in Japan

There are classifications for rivers in Japan which are categorized A-Class River and B-Class River. There are 109 rivers which are categorized A-Class River and 2178 rivers which are categorized B-Class River in Japan. Main large rivers in Japan are Tone River (river basin: 16,840km<sup>2</sup>, length: 322km), Shinano River (river basin: 11,900km<sup>2</sup>, length: 367km), Kiso River (river basin: 9,100km<sup>2</sup>, length: 227km).

Japan has been begun modernizing river improvement since 1869 which were a part of modernization policy promoted by Meiji Government. River improvement, including making and implementing flood control plans and remodeling operations was led by Dutch engineers invited by the government. River improvement has been shifted to rebuild the nation from being destroyed by natural disasters and wars from to build hydro power stations to produce electrical power and to support growth of population.

The result of economic development and concentration of population in urban areas, however, were led to degradation river environment in the nation, especially declining quality of water has been a major issue. Improving water quality has been an important issue in the river policy since 1975. The government has been progressing to make plans for rivers and watersheds environment management in major rivers in Japan. The national government has also been promoting nature-friendly river work since 1990 and river rehabilitation projects since 2002.

Table1. Processes of revision for River Law in Japan

Year	Major purpose	Contents
1896	Flood control	Establishment of Modern River Law
1964	Flood control, water utilization	Development of structured approach for flood control adoption of river management system, development of rules and regulation related with flood control and utilization
1997	Flood control, water utilization, environment	Establishment of comprehensive river environment management system including flood control, water utilization and environment arrangement and conservation of river environment adoption of river improvement plans reflecting residents' intentions

Table2. Transition of policy for river administration

Year	Items	Contents
1958	Beginning of survey of water quality	Improvement for water contamination
1965	Establishment of procedures of occupancy of the river zone	Ensuring of open spaces
1981	Establishment of general plans for rivers and watersheds environment management	Improvement of hydrophilic nature
1983	Revision of procedure of occupancy of the river zone	Integration of town planning
1987	Establishment of the Foundation for Riverfront Improvement and Restoration	Riverfront improvement, preservation, research
1990	Beginning of nature-friendly river work	Focusing on ecosystems
1997	Amendment to River Law (establishment of basic policy for river improvement and river improvement)	Concern about environment issue
2002	Establishment of regeneration of nature	Requesting of regeneration of nature
2006	Establishment of Asia River Restoration Network	

### 3. Background and outlines of developing for Asia River Restoration Network

Technologies for preservation healthy and rich river environment are a new technology compared with technologies for flood control and water utilization. To develop applicable technologies for river restoration is required to accumulate experiences and knowledge. Especially, Asia Monsoon region has specific characteristics, such as huge seasonal differences of rainfall, growth of rice cultivation on river plains, various organisms in paddy fields, rapid concentration of the population into urban areas. Rehabilitation and restoration in river environment and ecosystem in urban areas have become a major issue in Asia. Asian countries have faced on the issue how to accumulate knowledge and experiences related to river restoration and revitalization.

Population growth and urbanization have become a major environment concern within 50 years in Asia. Japan faced those environmental issues, especially urban areas around rapid economy growth after WWII (approximately 50 years ago). Japan also accumulates experiences and knowledge to restore river environment.

On the other hand, western countries had experienced after industrial revolution (approximately 100 years ago) and accumulated enough experiences and knowledge to deal with those issues. Backgrounds of those environmental issues are caused by rapid population growth, urbanization and economic growth. Asian countries have started to work on river restoration. Recently, river restoration focuses on not only to restore urban environment but also to restore ill-balanced entire ecosystem. Asian countries, including Japan maintain urban infrastructure development for improving nature-friendly water environment and water amenity. There have been many succeeded urban development projects which were centered rivers and waterfront restoration in Asia. Focusing on regeneration of nature has become a main purpose of urban development projects not only in Japan but also Korea and China.

Establishment of network system which introduces succeeded experiences and knowledge and exchanges information around the world is important to improve technologies and knowledge about water environment management. Its activities should be not only to provide information but also to link engineers who involved in river restoration work. Information and cases should be collected by site visitation and use network system effectively and efficiency. Asia River Restoration Network works on both urban development and river restoration which includes states of ecosystem and surroundings. Especially, urban development is essential for Asian countries which are growing rapidly. Main body of the network should cooperate with governmental levels with involvement of administration officials, other public sectors, academic bodies, NGOs and NPOs rather than a voluntary sector. The image of network should link with organizations which have responsibilities from making plans to implement and evaluate projects in each country.

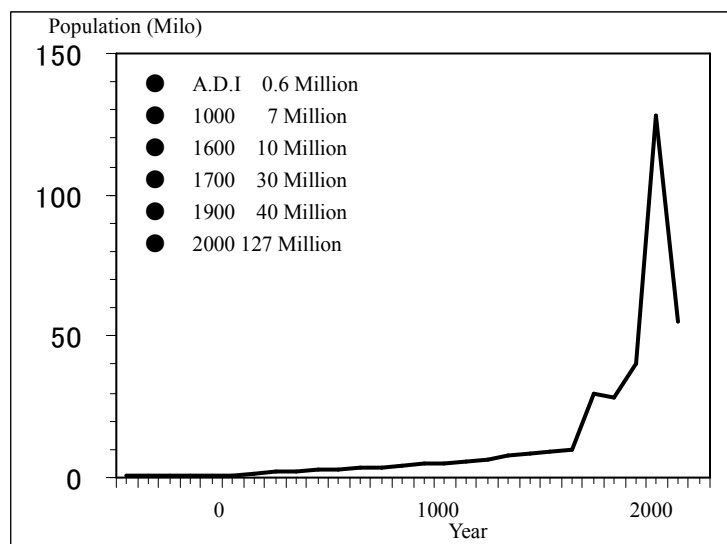


Fig.1 Transition of population growth in Japan

#### 4 Issues and Case Studies of River Restoration in Asia

Technologies for Pioneer practices in western countries conducted as a part of urban infrastructure development in London, the United Kingdom, Paris, France, Vienna, Austria, and Boston, the United States. Noteworthy examples in comparatively recent years, approximately 20 years ago, implemented in Boston, San Francisco, and San Antonio, the United States. These were followed by activities in Japan including the restoration of Sumida River (Photographs 1 and 2), the restoration of Dokai Bay and Murasaki River in Kita-Kyushu city (Photographs 3 and 4), and the restoration of Shinmachi River in Tokushima prefecture. Other projects that have gotten attention in recent years are the restoration of Singapore River in Singapore, the restoration of Cheonggye River, which removed highways over the river in Seoul, Korea, and the restoration of Suzhou River in Shanghai and Tenga in Beijing, China.

There are several approaches to restore river environment: one is “Naturhafer Wasserbau” construction method in Europe; another is nature oriented river work in Japan, and similar efforts in Korea. Regarding with river basins, there have been examples such as Mersey River basin in the United Kingdom, where the industrial revolution began. Its project achieves both improvement water quality and local economic recovery. Japan has just launched river restoration projects, such as Tsurumi River basin and surrounding area Inba-numa.

Further examples that might be cited include the projects implemented in Boston, other parts of Massachusetts, where has long history of river restoration, and San Francisco Bay and basin area. The projects implemented restoration of waterfront in Boston Bay, improvements in water quality and removal of elevated highways. With regard to the restoration of ecosystems, Kissimmee River basin in Florida and Skjern River basin in Denmark are famous. Those river basins were used to use for agricultural purposes (e.g. Japanese rivers had been turned into cultivated fields). A similar project has recently been implemented in the Kushiro river basin in Japan.

There are several large-scale examples: one is a project in the mid reaches of Rhine River in Germany and France which targeted both to restore ecosystem and to decrease risks of flooding because of losses of water storage functions in wetlands (the hydrological cycle problem) and transformation of navigation improvement in river (new installation of waterways); Another is a project in Chang Jiang river basin in China which aims of restoring water storage areas and planting in the river basin after floods of 1997.

We can learn a lot from those cases. Even though there have been various reports and information, it is useful for Japan and other Asian countries to build a network which can have linkages of engineers and other human resources.

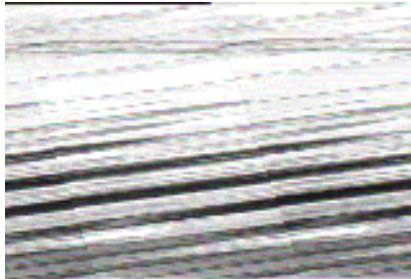


Photo.1: The time when water quality of Sumida River was very poor and emitted strong stench.

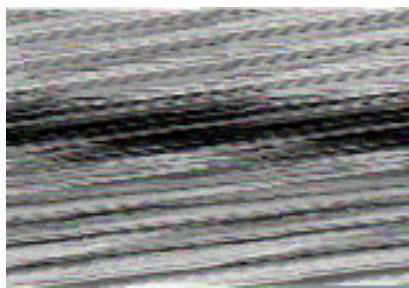


Photo.2: Current condition of Sumida River after implementation of urban improvement project that improved water quality, renovated walkways along with the river, and constructed super levees.

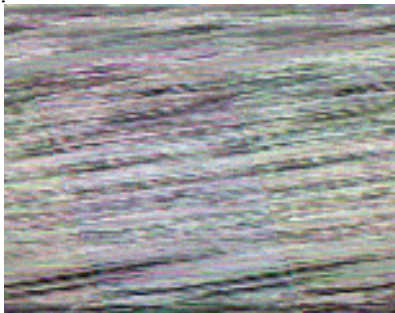


Photo.3: Comparison between previous condition and current condition of Dokai Bay in Kitakyushu city.

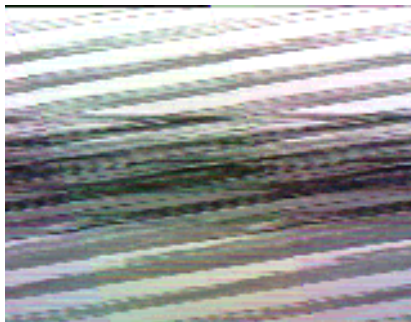


Photo.4: Comparison between previous condition and current condition of Murasaki River in Kitakyushu city.

## 5. Construction of international networks

The following are some of the premises for the construction of international networks.

### 5.1 Conceptual image related to the exchange of information

Structure of the international networks should be to collect and provide information both from Japan and other countries (Fig. 2). As the first step, the international network started to provide information and practices around the world in four languages (Japanese, English, Korean, and Chinese) through the website of the Foundation for Riverfront Improvement and Restoration in April 2004. Cases which are introduced are Itachi, Moizari, Sumida, Tama, Tsurumi, Kushiro, Shibetsu, and Arakawa Rivers and Dokai Bay in Japan, Cheonggye River in Korea, Chang Jiang and Huangpu Jiang Rivers in China, Singapore River in Singapore, Boston Bay and Chesapeake Bay, Kissimmee River and Everglades in the U.S., Rhine River in Germany, and Skjern River in Denmark (<http://www.a-rr.net/>).

The information requires being regularly updating and supplemented for this website to serve as vital and primary information resources. We intend to provide information from members of all countries and create vital linkages each other. In the future, we expect that networks actively work to connect with organizations and individuals who posse original items of information directly. The main mission of the international network is to provide accurate and effective information quickly to members of the network.

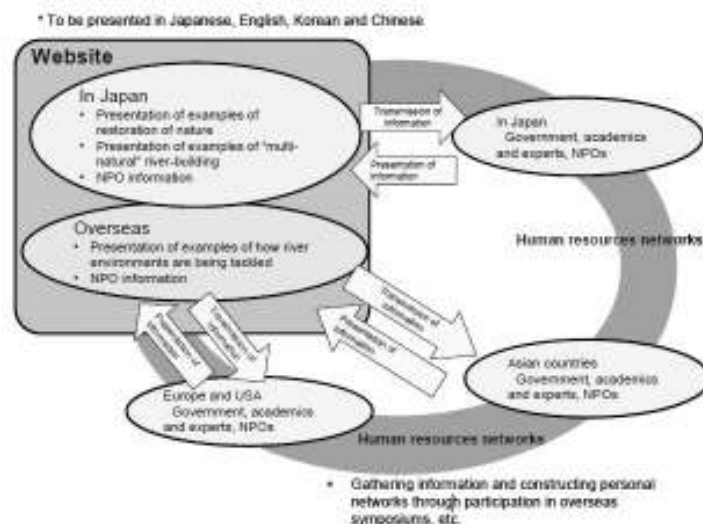


Fig.2 Concept for an information network related to river environments

Almost of all members are professionals, planners, practitioners and residents who have various experiences, knowledge and backgrounds. Those members are valuable assets for the network. It is important to establish network system with

free access that can easily and quickly share information using information technology.

## 5.2 The networks of human resources

We are presently working on the formation of human resources network in Asia. Establishment of human resources network has become important. We are currently in processes of collaborating with key persons of Korea, China, Taiwan, Singapore and Philippine, and we are also working on building relationships with other countries. The international network will continue to organize international forums, symposiums and panel discussions to strengthen relationships with members, such as the International Forum on Waterfront and Watershed Restoration which was held in January and October in 2005 and November in 2006. For this purpose, we are receiving guidance from academics and other experts who have already established networks consisting of other academics, experts, and administrators in Asian countries. We are acquainted with the names and affiliations of relevant people and will be contacting them in the near future. We also intend to continue organizing international and mini forums such as that was held in January 2005, as part of our efforts to stimulate relationships between network participants.

We also intend to visit other countries in order to study earlier examples of similar activities as well as to seek human resources and foster relationships. The international network works on not only to provide information but also to seek appropriate human resources. In Europe, we intend to strengthen our relationships with the European Centre for River Restoration, which we have already begun to establish linkages, and the national centers, as well as with individual bodies such as the executive office of the Mersey Basin Campaign. With regards to the United States and other countries, we intend to establish relationships with Chesapeake Bay Program, South Florida Water Management District, and American Heritage Rivers. Participants of the network can easily access information of these on-going projects and directly communicate with project managers.

## 5.3 Network logistics

In order to improve the networks, it is essential to gain enough human and financial resources that can support directed activities of the networks for long period of time. It is necessary to have adequate human resources to allow various activities, such as regular information exchanges and communication, site visitations and on-site surveys in various countries, organizing international forums, symposiums and panel discussions. The resources are also required to enable collection, coordination, and presentation of information, and the arrangement of committee and study meetings. Such activities will also need financial support for certain periods of time. There were increasing opportunities of participating for international conferences, such as the International Conference of the European Centre for River Restoration (May 2005), the International Conference on Hydrology and Water Resources in Asia Pacific Region (October 2006, the third conference was held in Thailand), and the World Water Forum (March 2006 in Mexico).

## 6. Past activities and future schedule

The followings are outlines of activities.

- Development of database of case studies, engineers, researchers and preparation of guidelines followed rules and regulations with the World Water Forum in Mexico
- Holding of the international conferences which can be large-scale conferences to collect and provide information, have active interactions and provide opportunities for discussion and opinion exchange
- Holding of small-scale international conferences which are targeted small groups
- Activities for maintaining the network in domestic working groups (by continuous participation of active members).
- Updating and expanding of the website (addition of information, presentation of detailed information of international forums, etc.).
- Site visitation and on-site surveys in related countries.
- Publication of results of international forums (bilingual, available in local bookstores).
- Improving communication by newsletters, etc.
- Improving interaction and communication (research cooperation, etc.).

### 6.1 Guideline of river restoration

The collection of guidelines of river planning and environmental improvement which were issued in Japan, Europe, Asia and other countries reached approximately 70 in February 2007. The network analyzed its principles and missions, goals, methods and implementations of each guideline. We draw results of the importance of information framework which can be helpful to apply information to various cases, such as river planning projects, improvement of water environment, symbiosis relationships with floods and urban river restoration. Frameworks should be composed with applicability of river scales, environmental issues and social characteristics of rivers (urban rivers or natural rivers). The network is now preparing to provide information of guidelines arranged with indexes. Moreover, we intend to add more information from other countries and develop knowledge information system of river and water environment to provide members. As we set about creating an international network in Asia, we intend to strengthen and improve the system in accordance with the above details. We look forward to the active participation of young researchers and other enthusiastic parties.

### 6.2 Providing information through the website

The website for exchanging information is composed contents to promote communication with various people, such as professionals, residents, students, kids and retired professionals.

- News (newspapers, magazines, columns; news from governments and public offices)
- Events & excursion (seminars, conferences; lecture meetings)
- Projects (domestics and abroad; activities of NPOs)
- Publication (education, magazines; engineering guidelines)
- Database (glossary, technical information; materials, resources, documents and grant information)
- Fun (photos of waterfront, river walks; travel information about rivers)
- People & Network (NPOs, schools, companies; governments and public agencies; academics, researchers)
- Interaction (communication, e-mail, discussion boards)

In addition to creating an international network, we intend to learn about international networks and strengthen relationships each other. We are looking forward joining the networks young researchers and highly motivated professionals. We are going to improve relationships supported by not only establishment of the international networks but also domestic networks.

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