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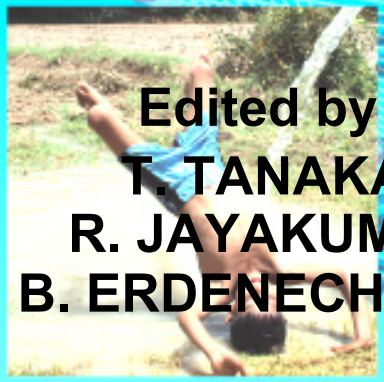

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UNESCO-IHP in East Asia

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Abstract For over 30 years, IHP has been actively operating as an UNESCO's international scientific cooperative programme in water research, water resources management, education and capacity-building, and the only broadly-based science programme of the UN system in this area. By a number of initiatives and networks, IHP has progressively carried out activities on the quantity and quality of global/regional water resources, transboundary water resources management, mitigation of water related hazard, water education. While addressing comprehensive areas over water challenges, greater emphasis has been placed on the role of water resources management for sustainable development and with respect to the expected changes in climate and environmental conditions. WWAP (World Water Assessment Programme) and its major product WWDR (World Water Development Report) in East Asia are under the framework of IHP which supports field oriented activities on monitoring freshwater, developing case studies, enhancing national assessment capacity, and facilitating decision making processes. In light of transboundary water in IHP, Regional Steering Committee (RSC) plays a focal role for facilitating regional cooperation in the Southeast and East Asia and Pacific States. Furthermore, International Sediment Initiative (ISI) and International Flood Initiative (IFI) have significant roles, respectively, for the management of erosion and sedimentation in line with river system or reservoir management, and for the flood management focusing on capacity building of each country in East Asia. Mitigating water conflicts on transboundary aquifers (ISARM), water management of arid areas (Asian G-WADI), sustainable management of groundwater by UNESCO Water Chair, and water education (SWIM-EDU) are also major areas of concern under UNESCO's IHP Programme in East Asia.

Key Words: UNESCO-IHP, East Asia, water resources

INTRODUCTION

It was recognized in the World Summit on Sustainable Development, held in Johnhansberg 2002, that sciences have an indispensable role in providing solid underpinning for sound decision and policy-making process on sustainable development. The findings and recommendations stemmed from the summit, together with those from the World Sciences Forum held before, have guided United Nations Educational Scientific and Cultural Organization (UNESCO) in further shaping its science programmes, defining missions of the programme as "*the Promoter and Broker of Sciences*". The mission was further structured into two major programmes of:

- Science, environment and sustainable development, aimed to improve human security through a better management of the environment
- Capacity-building in science and technology for development, that seeks to enhance human and institutional capacities in science and technology to allow the widest possible participation in the knowledge society, and also to adapt science policy to societal needs

Both of the programmes are endeavoured to pursue the UN Millennium Development Goals (MDGs), in particular those in relation to the eradication of poverty, gender, environmental sustainability and the development of a global partnership for peace and development.

THE INTERNATIONAL HYDROLOGICAL PROGRAMME (IHP)

IHP is UNESCO's international scientific cooperative programme in water research, water resources management, education and capacity-building, and the only broadly-based science programme of the UN system in this area. For 30 years (1975–2005), IHP has been committed to developing the science of hydrology to meet requests derived from social development. Its primary aim is to draw together scientists worldwide in order to establish the scientific and technological bases for the rational management of water resources with respect to water quantity and quality. UNESCO contributed to the preparation of the first United Nations Conference on Water held at Mar del Plate, Argentina, in March 1977. This conference attended by representative of 116 governments and of many international organisations, had a paramount importance in the international recognition of water as a key factor in socio-economic development.

In January 1992, UNESCO was one of the twenty bodies and agencies of UN system which organized the International Conference on Water and the Environment (ICWE) in Dublin, Ireland. The Dublin Statement enunciates four basic principles:

1. Freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment
2. Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels
3. Women play a central part in the provision, management and safeguarding of water
4. Water has an economic value in all its competing uses and should be recognized as an economic good

The ICWE was designed as an input to the UN Conference on Environment and Development (The Earth Summit) held in Rio de Janeiro, Brazil in June1992. The Agenda 21 adopted by the conference mentions, inter alia, that "The holistic management of freshwater and the integration of sectoral water plans and programmes within the framework of national economic and social policies are of paramount importance of action in the 1990s and beyond". The above-mentioned principles are fully in line with the basic philosophy of the IHP (Sorin Dumitrescu, 2006).

In the general framework of IHP, greater emphasis has been placed on the role of water resources management for sustainable development and with respect to the expected changes in climate and environmental conditions. Progress has also been achieved in methodologies for hydrological studies, training and education in the water sciences. One of IHP's continuing objectives is to integrate developing countries into research and training efforts, thereby reinforcing regional aspects while maintaining global coordination.

The current phase IHP-VII (2008–2013) titled as 'Water Dependencies: Systems under Stress and Societal Responses' will focus on the strengthening of the existing scientific knowledge to provide new directions for science and research to develop scientific tools and responses to help mitigate and reverse these trends.

OVERVIEW OF FRESH WATER SITUATION IN EAST ASIA

Global water resources scenario

In 2006, the 2nd version of the World Water Development Report (WWDR) was issued by the World Water Assessment Progreamme (WWAP). The report is the flagship report of WWAP, a programme under the UN Water—a cross-agency entity coordinating 24 UN agencies dealing with water issues. The report not only includes latest data and information reflecting the world water situation, but also grasps major themes of the general trend for researches and management on water issues.

As is addressed in the 2nd version of the World Water Development Report, one of the major themes identified is the changing context of the world water situation. The changes may come from both natural and social origins. In the natural part, more and more scientific data are verifying the fact that the natural environment is subject to the influences of a changing climate. This may have given rise to natural changes and even disasters such as the Indian Ocean Tsunami, and the frequent hurricane attacking the Caribbean and Pacific coasts. Moreover, changes are also brought forth from the social aspect, including population growth, immigration, and transboundary management of water resources. Some of these matters may even incur water related tensions and conflicts in areas suffering from serious water scarcity. In addition, the recent fast-paced economic development, especially in developing countries like China, has generated large amount of pollution that is threatening the safety of drinking water resources. Moreover, an efficient and strong governance mechanism needs also to be urgently set up to sustainably protect and manage precious water resources.

Water resources of East Asia

Table1 shows that water availability varies greatly in this region. To illustrate, Mongolia enjoys the highest water resources availability rate. Although Mongolia is comparatively rich in water resources stemming from precipitation in the high mountains, in its desert south, western and eastern provinces, the water resources are much scarcer and are generally of poorer quality with increasing salts and diminishing water levels in groundwater tables, streams and lakes (FAO-AQUASTAT, 1999). Another country share the problem of uneven water distribution is China (FAO-AQUASTAT, 1999). Besides low water availability per capita, the water resources in

China are unevenly distributed in terms of time and space. Affected by monsoons, precipitation occurs mostly in the summer months providing 60-80% of the total annual precipitation, which is advantageous for agriculture. This pattern of precipitation tends to result in droughts in spring and floods and waterlogging in the summer. Furthermore, quality of fresh water resources in this region varies greatly. Japan and R.O. Korea yield much higher water quality than the rest.

Water availability varies in different seasons. Most of the East Asia area is subject to the monsoon climate, the warm and wet winds in spring and summer times bring most of the annual precipitation. However, in the winter seasons, the climate tends to be cold and dry. This situation often makes this area vulnerable to natural disasters such as hurricane and storm in summer and drought in winter. For instance, the Chinese capital Beijing has been experiencing continuous drought from 1999 to 2006 in winters. The per capita water resources per year are less than 300 cubic meters, which is only 1/30 of the world's average. To cope with the situation, groundwater has become one of the major alternative resources for cities like Beijing. Unfortunately, the groundwater consumption often follows an excessive manner, leaving a series of problems such as land subsidence and sea water intrusion. The problems can be particularly worsened when climate change brought higher temperatures, reducing amount of precipitation but increasing that of evaporation.

Table 1. Water availability of East Asian countries.

Country	Population	Precipi-tation Rate[1]	TARWR Volume 2005	TARWR[2] Per Capita 2000	TARWR Per Capita 2005	Surface water ratio to TARWR	Ground-water ratio to TARWR	Over-lap[3] ratio	Incoming water ratio to TARWR	Outgoing[4] water ratio to TARWR	Total use ratio to TARWR
	10^6	mm/yr	km^3/yr	m^3/yr	m^3/yr	%	%	%	%	%	%
China	1,320,892	600	2,830	2,259	2,140	96	29	26	1	25	~
China, Taiwan Prov.	22,894	2,400	67	~	2,930	94	6	0	0	~	~
DPR Korea	22,776	1,400	77	3,464	3,390	86	17	16	13	6	12
Japan	127,800	1,700	430	3,383	3,360	98	6	4	0	0	21
Mongolia	2,630	200	35	13,739	13,230	94	18	11	0	76	1
RO Korea	47,951	1,100	70	1,491	1,450	89	19	15	7	~	27

Source: FAO-AQUASTAT, 2005, the table was extracted from World Water Development Report 2 (**1**Average Precipitation (1961-90 from IPCC (Intergovernmental Panel on Climate Change) (mm/year). As in the FAO-AQUASTAT Database, for some countries large discrepancies exist between national and IPCC data on rainfall average. In these cases, IPCC data were modified to ensure consistency with water resources data. **2**TARWR stands for Total Actual Renewable Water Resources. **3**Overlap is the water that is shared by both the surface water and groundwater systems. **4**Outflow - Sep. 2004 for surface water and Aug. 2005 for groundwater)

Regional cooperation on transboundary waters

Transboundary water include any surface or groundwater that mark, cross or located on the boundaries between two or more Sates. In other words, wherever transboundary water flow directly into the sea, these transboundary waters end at a straight line across their respective mouths between points on the low-water line of the banks (Helsinki Convention 1992). By the year 2006, 263 transboundary waters were identified in the world and the number has increased by emergence of the newly independent states after the breakup of the former Soviet Union. Europe alone has 100 transboundary groundwater aquifers and more are expected to be identified in the future (United Nations Development Programme, 2006). About 60 % of the global population depends on these transboundary waters which often preserve natural ecosystems. However, due to the increasing pressure of economic development and competition for scarce resources, many international water basins have to suffer serious environmental, social and political problems. The United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992 adopted Agenda 21, recognizing the muti-sectoral nature of water resources development as well as the diverse interests in their utilization (United Nations University, 1990). While there have been much efforts among European, South-American and Middle-East countries for cooperation on transboundary water between neighbouring countries, East Asia has relatively low number of transboundary waters and thus less cooperative work regarding sharing waters.

China shares 12 main rivers with six neighbouring counties, including Mongolia, Pakistan, India, Kazakhstan, the Kyrgyz Republic, Myanmar, Lao People's Democratic Republic and Viet Nam. The mean annual volume of water entering the country is 17.2 km³, of which 4.2 percent in the Heilongjiang basin, 52.9 percent in inland rivers, 0.7 percent in rivers in the southwest, and 42.2 percent in the Pearl River basin. The table 2 presents data on rivers entering into and flowing out of China.

In light of international cooperation regarding water sharing problems UNESCO's PCCP (Potential Conflict to Cooperation Potential) facilitates multi-level and interdisciplinary dialogues to foster peace, cooperation and development. It uses methodologies of joint research and training activities to find ways to enhance the concerned parties' knowledge of the shared water resources as well as to achieve progress on the cooperation and development.

IHP IN EAST ASIA

Regional Steering Committee (RSC)

Regional Steering Committee (RSC) is a regional network of IHP in the Southeast Asia. Its members consist of representatives from 14 IHP National Committees from this region. This has made it easier for regional cooperation to carry out IHP initiatives. Since 1993, annual RSC meetings have been convened in different countries of the region to report, evaluate and review a wide range of activities conducted in the framework of IHP as well as to design new ones.

With strong support from the Japanese Government through providing a Funds-in-Trust contribution on a regular basis, in co-operation with UNESCO Jakarta and the participating member states, the RSC has coordinated a wide spectrum of initiatives over the ten years covering research studies, technical projects, workshops, training courses and annual symposia, bringing together many specialists in the field of water activities. Among initiatives generated by RSC, the most notable ones include the AP-FRIEND (Asian Pacific Flow Regimes from International and Experimental Network Data) project, the Asian Pacific Water Archive and the Catalogue of Rivers.

International Sediment Initiative (ISI)

The management of erosion and sedimentation has been an important part for catchments, river system, and reservoir management. It has been recognized that, without appropriate treatment methods, more than 50 % of the world's reservoir capacity will be lost in the next decades due to erosion and sedimentation. Nevertheless, relevant investigations on sedimentation and erosion need to be further promoted in a world scale.

In this general backdrop, the International Sedimentation Initiative (ISI) was launched, as a major activity, in the sixth phase of UNESCO-IHP (2002-2006). The initiative was expected to add a new dimension under the general context of sustainable water management, specifically through the two UN Decade of Education for Sustainable Development, and the UN "Water for Life Decade", both of which were launched in 2005.

The initiative is expected to improve awareness on the sedimentation and erosion issues. It is also aimed to provide advices and enhance the making and implementation of policies that would contribute to the sustainable management of erosion and sedimentation. To realize the aims, a series of activities have been carried out. For instance, under the general ISI framework, a global repository was constructed with inputs of data and information, collected by major international research institutes, derived from documents on erosion and sedimentation.

One of such reputable institutes in East Asia is the International Research and Training Center for Erosion and Sedimentation (IRTCES) located in Beijing. Through its competent investigations, IRTECES managed to provide the latest data and information on the situation of the erosion and sedimentation in major river basins areas such as the Yangtze River and the Yellow River. In addition, it also organizes trainings and conferences to improve awareness and capacity to sustainably manage and monitor the erosion and sedimentation in China.

International Flood Initiative (IFI)

As one of the greatest water-related natural disasters, flooding can cause devastating damage that affect millions of people's livelihood, claiming thousands of lives each year. However, on the other hand, the floods are naturally occurred phenomena providing elements not only to the sustainability of particular ecosystems, but also to the development of many human activities.

Unfortunately, water-related disaster is under constant rise as a result of urbanization, climate change and global warming. Since 1992, the yearly number of

water-related disasters has risen from slightly over 50 to more than 150. The disasters have claimed about 25,000 lives and affected over 500 million annually, costing the world economy more than $60 billion. Under the circumstances, during the World Conference on Disaster Reduction (WCDR), International Flood Initiative (IFI) was launched in 2005. IFI aims to reduce human and socio-economic losses from flooding and use of flood plains while increasing social, economic and ecological benefits.

In order to achieve its goals, IFI has engaged many carefully designed activities related to integrated flood management covering research studies, training, information networking, empowering communities with good governance and technical assistance. Through these activities, IFI is expected to develop the capacity of each country to better understand and handle flood involved hazards, vulnerabilities and benefits.

IFI is based in the International Centre for Water Hazard and Risk management (ICHARM) hosted by the Public Works Research Institute in Tsukuba, Japan. ICHARM was endorsed as the global facility and Secretariat responsible for the IFI at UNESCO's 33rd session of its General Conference.

G-WADI Asia

Approximately 80 countries, constituting 40 % of the world's population, were suffering from serious water shortages by the mid-1990s (Asian G-WADI-UNESCO, 2007). In less than 25 years, two-thirds of the world's population will be living in water-stressed countries. Globally, arid and semi-arid areas face the greatest pressures to deliver and manage freshwater resources. Furthermore, these areas are under growing pressure of water management derived from issues including, population growth, agricultural expansion, salinity increases, and agricultural/urban pollution. These problems have exerted further difficulties to realize goals of water resource availability, equity in water management, and strategies to support peace and security.

As a result of growing attention and challenges on water management in arid and semi-arid areas, the 15th session of the Intergovernmental Council of the International Hydrological Programme (IHP) decided to establish a Global Network on Water Resources Management in Arid and Semi-arid Zones, in December 2002. Following this decision, the Global Network on "Water and Development Information for Arid Lands (G-WADI)" was established in the initiating meeting held in Paris on 14 and 15 April 2003. G-WADI's strategic objective is to strengthen the global capacity to manage water resources in arid and semi-arid areas. Its primary aim is to create an effective global community to promote international and regional cooperation in arid and semi-arid areas.

In light of the goal of G-WADI, in March 2005, in Roorkee, Asian G-WADI was established to create a network promoting international and regional cooperation of water management in arid and semi-arid areas with specific emphasis on Asia. This network covers eleven countries including Afghanistan, China, India, Iran, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan. Asian G-WADI serves as a platform for information and resource sharing. Focusing on this aim, Asian G-WADI has formulated guidelines for proposing one or more basins as G-WADI pilot basins in a country, which can contribute to the knowledge base for the region. Asian G-WADI is working effectively in network building of data, ground