



**General instructions:** POSTERS must not exceed 2 pages of text and a maximum of 10 pages of letter paper (8.5 by 11 inches) in Arial 11 point font. Page margins are 1 inch (25 mm) in all sides.

Papers in excess of 10 pages (inclusive of text, figures, tables, references and annexes) will be rejected

**Abstract** – Summarizes the objectives and main findings/recommendations of the paper – no more than 500 words – Should be derived from abstract submitted for original consideration

**Keywords** – please provide a maximum of 8 key words, including the geographic focus of the paper if this is relevant.

**Introduction** – This defines the coverage of the paper – what is to be discussed, why is it important, where is it important, who is it important to?

**Key Issues and Challenges** - The paper must highlight the key issues and remaining challenges.

**Opportunities** - The paper presents opportunities and options to resolve the issues introduced above.

**Recommendations/Findings/Options/Questions** - This section is intended to provoke discussion of the recommendations three or four recommendations that can be considered by MDBs and DMCs

**Tables/Figures** - **author(s) can** include tables and graphs and in relevant places – All figures, tables etc must be referenced in the text and be relevant to the context of the paper. Minimum font size to be used in tables and figures is Arial 10pt.

**References** – All Material used must be properly referenced.



## **Water Management in Korea Progress & Implications for IWRM**

### **Abstract**

Due to such distinguishing characteristics of water resources and topological conditions, water development plans in Korea have been an instrumental part of the national development plans and successful practice of those plans furnished a steppingstone toward remarkable economic growth. The periodic changes in the water management plans are as follow. Basic water infrastructures were built during the industrialization in order to support the economic boost, and in the following period, the plans became more environment conscious as a countermeasure for environmental pollution. Lastly the issues of climate change, sustainability, and conflict were addressed in the 21<sup>st</sup> centuries.

In the early 2000s, the idea of green growth was initiated in response to the high environmental cost of rapid economic development and urbanization. Water and green growth is a new concept which the Government of Korea (MLTM and K-water) is trying to promote in collaboration with the World Water Council (WWC), and it is to achieve green growth and sustainable development by strengthening roles of water in the process. The 4 Major Rivers Restoration Project is considered as a good case of water and green growth.

The 4 Major Rivers Restoration Project was first announced as part of the 'Green New Deal' policy launched in January 2009, and it was designed to provide new drivers for low-carbon, green growth to many different regions and to promote exchanges among local economies and cultures. The main objectives of the project were to secure abundant water resources, implement comprehensive flood control system, protect ecosystems, create multipurpose waterfront spaces, and to promote regional economies.

What is distinctive about Korea's water resources management plans was that it was planned in careful consideration and combination with economic development plans and national territorial development plans. The National Water Resources Plan (NWRP) served as a subordinate to the Comprehensive National Territorial Plan.



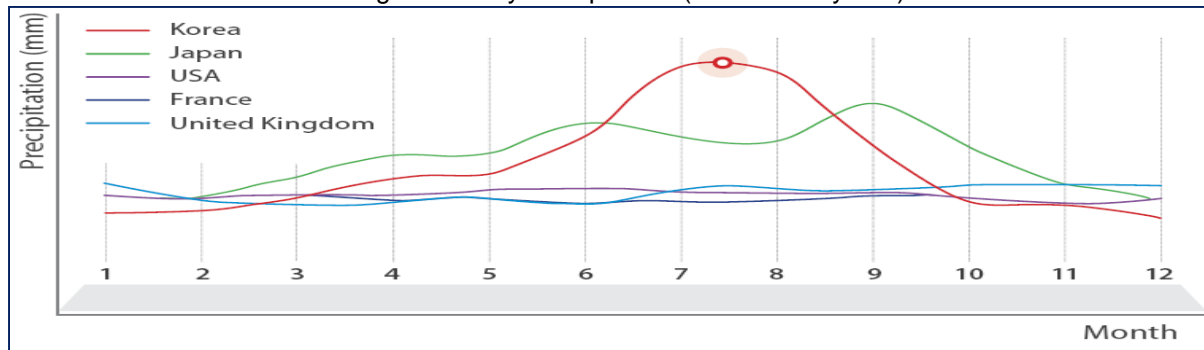
## Water Management in Korea Progress & Implications for IWRM

### The characteristics/status of water resources in Korea

Water management is not an easy task in Korea, since the nation features some distinguishing characteristics of water resources and vulnerable topological conditions. Korea's annual rainfall is 1,277mm, which is higher than the world average of 807mm. However it shows great seasonal variations: approximately 70% of annual precipitation is focused in the short summer rainy season. Moreover localized torrential downpours in the monsoon season cause floods and subsequent damages. In contrast to that, the nation is hit by severe droughts in the dry seasons of fall and winter. Since the 1990s, the droughts started to occur every 7 years and it has led to some chronic damages.

Additionally, Korea does not have enough water resources. In terms of sources of water, Korea significantly lacks amount of groundwater, thus depend highly on the surface water resources such as rivers and reservoirs. However the nation loses vast amount of its surface water resources because of its topological conditions. 65% of the territory is covered with mountains, and it makes natural water storage capacity very low.<sup>1</sup>

Fig 1. Monthly Precipitation (Mean of 10 years)



(Source: MLTM, The River Revitalization of Korea)

Added to the above mentioned conditions, climate change makes water resource management and improvement of water security even more difficult. Globally, changes in the climatic circumstances alter the patterns of precipitation, freshwater availability, flooding and more, Korea is not an exception. It is expected that the temperature would rise by 2.5°C by 2050, and soon the peninsula would enter the semi-tropical climatic zone due to global warming caused by climate changes.<sup>2</sup>

<sup>1</sup> MLTM, The River Revitalization of Korea, Brochure, p.10

<sup>2</sup> Green Growth Korea, Green Growth and the 4 Rivers Restoration, Presentation material

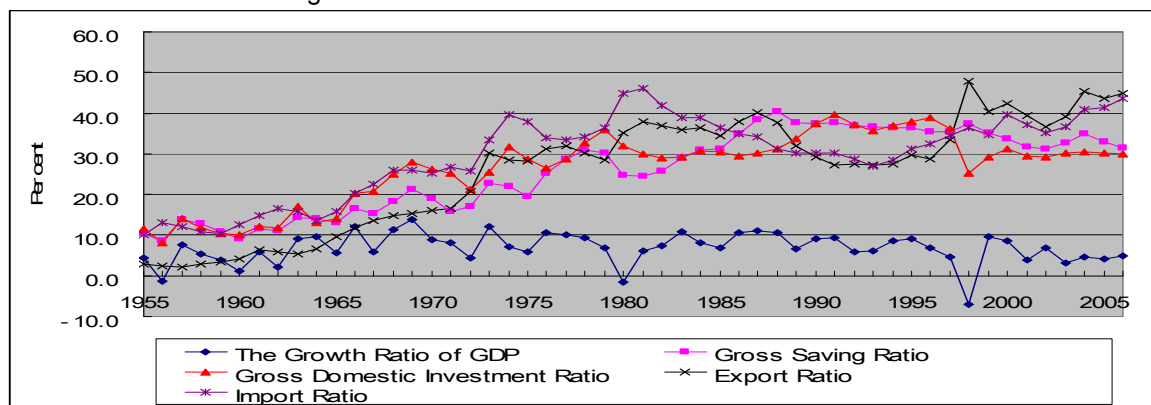


Korea has put in the situation where it has to worry about more challenges of water resources management. First water must be stored, allocated and used efficiently in order to make sure its maximum level of water use efficiency. Secondly, wise solutions must be sought to prepare for sporadic and extreme meteorological conditions such as flooding and drought. Lastly water management has to be sustainable.

### Water resources management played a pivotal role in economic development

Korea has achieved economic development that is extraordinary, and is often referred to as ‘the Miracle on the Han River’. In the 1950s, Korea had to suffer greatly from aftermath of the Korean War. However barely after three decades since it started large scale industrialization, Korea has become a member of OECD. The figure 2 below demonstrates that the economy in Korea grew with a high average growth of 6.78% per year during the period from 1955 to 2006 despite severe global economic slowdowns around the 1980 and 1997.<sup>3</sup>

Fig 2. Main Economic Indicators between 1955 and 2006<sup>4</sup>



Source: Bank of Korea (2007d)

Water development plans in Korea have been an instrumental part of the national development plans and successful practice of those plans furnished a steppingstone toward remarkable economic growth.

Industrialization in Korea took place from the mid 1960s to 1980s, and the water management and development policies have centered on building basic infrastructures such as multipurpose dams to supply water and support expansion of the industries. Total of more than 30 dams including 16 multipurpose dams were built and the industries have been benefited from water supply and energy generation.

<sup>3</sup> Min.K, 2011. The Role of the State and the Market in the Korean Water Sector: Strategic Decision Making Approach for Good Governance

<sup>4</sup> BANK OF KOREA, 2007d. *Juyo bunseok jipyo [Major analysis indicators]* [on-line]. Bank of Korea. Available from: <http://ecos.bok.or.kr/> [Accessed 12 November 2007].



Side effects of fast economic growth were regional imbalances in social and economic development, and environmental deterioration. The classic example of water pollution was ‘the Phenol incident’ in 1991. The high concentrate of Phenol substance was discharged into the Nakdong River and contaminated the water supply channels of the area. The incident not only provoked severe concerns and mistrust from the public, also it has changed the directions of water resource management plans to be more environment conscious. Water and wastewater services have expanded nation-wide as well.

Water management in the 21<sup>st</sup> centuries started to address the issues of climate change, sustainability, conflicts and such, while that of earlier period have focused on resolving fundamental water problems. With a global trend of greening growth, which incorporates policy strategies to enhance social development and protect the environmental ecosystem, water management took a turn toward more collaborative, integrated and holistic approaches of IWRM.

### **Water and Green Growth, the new paradigm of IWRM<sup>5</sup>**

The idea of green growth was initiated in response to the high environmental cost of rapid economic development and urbanization, and it advocates a virtuous cycle between environmental protection and economic growth. However the concept was not free from the criticism that it has neglected the social development. In short, achievement of economic growth and environmental protection do not automatically guarantee good quality of life.

The baseline approach of water and green growth is an attempt to turn the attentions of countries toward forward looking solutions with which countries can achieve economic growth as well as environmental protection centered on water issues. Moreover concept puts considerable emphasis on multi-faceted nature of water in understanding and expanding the boundaries of the green growth framework including social development, and is expected to serve as a steppingstone to attain sustainable water management and development. The 4 Major Rivers Restoration Project is a good case of water and green growth in Korea.

### **The 4 Major Rivers Restoration Project (4MRRP)**

Rivers are the source of abundant water resources and an important ecological foundation for fauna and flora. Rivers in Korea hold more values since the nation highly relies on the surface water resources due to natural deficiency of groundwater resources. However during the industrialization period, intensive use of rivers led to greater pollution and degradation of river ecosystems. It was the develop-first-clean-up-later type of economic development that threw implications for larger investment in environmental infrastructures and environment-oriented development plans.

Until the 1980s, the focus on river management was placed on irrigation and river improvement, such as building waterways, and it was shifted to river restoration and management for healthy rivers in the 1990s. Today river management embraces more diverse and green scopes such as sustainable landscapes, cultural values, local history, and qualitative growth of local economies.

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<sup>5</sup> Water and Green Growth Report Edition 2 (under progress, unpublished)



The goal of 4MRRP stood in the same line with this new paradigm of river management, and was first announced as part of the 'Green New Deal' policy launched in January 2009. It was designed to provide new drivers for low-carbon, green growth to many different regions and promotes exchanges among local economies and cultures. The project consists of 3 sets of sub-projects: (1) Main projects – revitalization of the Han, Nakdong, Geum and Yongsan Rivers (seen in fig 3), (2) realigning the 14 tributaries of the major rivers, and (3) refurbishing smaller streams. The project had 5 major goals: (1) securing abundant water resources, (2) implementing comprehensive flood control systems, (3) improving water quality and preserving ecosystems, (4) creating multipurpose waterfront spaces for local residents, and (5) promoting regional economy through regional development centered on river basins.<sup>6</sup>

The project has entered its full completion as of December 2012, and evaluations of some expected benefits have already delivered. First, the effects of flood-proof were proved in June 2011 when the typhoon 'Meari' passed the peninsula. From 22 to 27 June, it rained a total national average of 207.7mm, which is equivalent to 17% of annual rainfall. Despite the concerns, the damages from the rainfall were meagre. The economic benefits which were created by job creation were significant as well. According to the analysis done by the Ministry of Labour in June 2011, 88,400 new employment opportunities were created through the project. As more investment in the R&D for project operation and management is expected, the economic benefits would continue to grow.

### **Institutional & organizational development<sup>7</sup>**

What is distinctive about Korea's water resources management plans was that it was planned in careful consideration and combination with economic development plans and national territorial development plans.

The figure 3 shows the current institutional framework of water and wastewater sector in Korean and the relation between the plans and the acts. The Framework Act on the National Land is the basic law for development and conservation of national land. This act provides a basis of the Comprehensive National Territorial Plan<sup>8</sup>, the basic national land plan. The plan includes the utilization and management of land, water, forest and ocean resources, the improvement of the living environment by housing and water and wastewater services, and the prevention of natural disasters. According to the plan, the local governments should make local land plans. The National Water Resources Plan (NWRP) is subordinate to the Comprehensive National Territorial Plan. The NWRP contains the analysis of water demand and supply, the development, provision and management of water resources, and the prevention of flood disaster. The River

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<sup>6</sup> Cha, J, et al. 2011. The Four Major Rivers Restoration Project, Submission for the UN-Water Int'l Conf 2011

<sup>7</sup> Min.K, 2011. The Role of the State and the Market in the Korean Water Sector: Strategic Decision Making Approach for Good Governance

<sup>8</sup> The Comprehensive National Territorial Plan was renamed from the CNTDP in 2000 for the purpose of balancing environment with development.



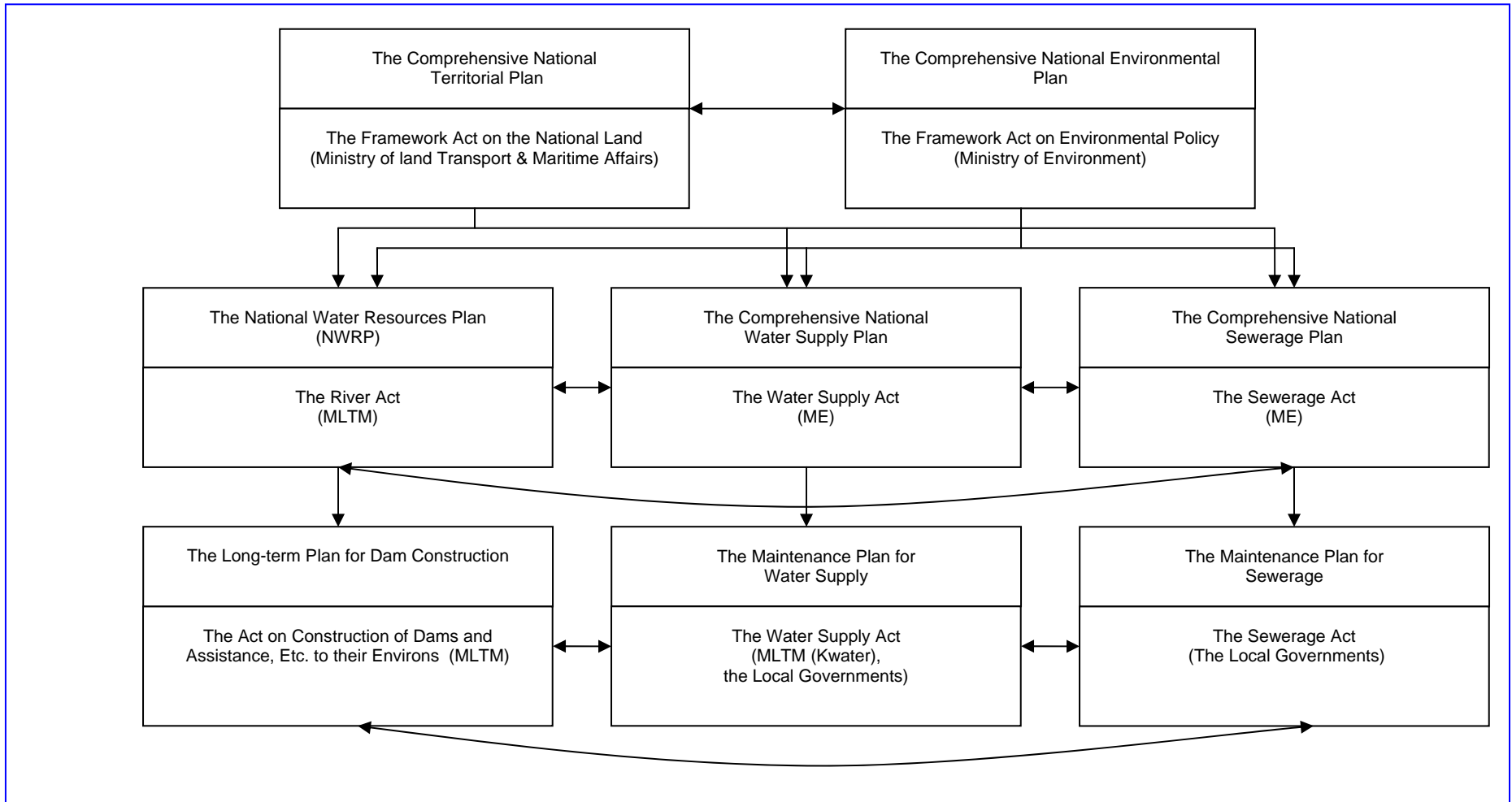
Act stipulates articles for the investigation of rivers, the Comprehensive River Basin Improvement Plan, and the River Maintenance Plan. The Long-term Plan for Dam Construction, a subject plan of the NWRP, decides the number, size, and location of dam constructions.

The Ministry of Environment (ME) must prepare the Comprehensive National Environmental Plan by the Framework Act on Environmental Policy. The Comprehensive National Environmental Plan, as a basic plan for environmental preservation, comprises the conservation of ocean, land, air and water environment, and the provision of water and wastewater services. Therefore, consistency can be achieved between an environment-oriented plan and a supply-oriented plan. The Comprehensive National Water Supply Plan consists of the developmental plans for multi-regional, industrial, local and village water supply systems, the securing plan for water supply source, and the managerial improvement of the water sector. Based on this plan, the local governments and the Ministry of Land, Transport, and Maritime affairs (MLTM) have to prepare the Maintenance Plan for Water Supply every ten years, which determines the arrangement, structure, and capacity of developing water supply systems. The Comprehensive National Sewerage Plan includes the target of sewerage rate, the development and maintenance of sewerage systems, and the establishment of multi-regional sewerage systems. The Sewerage Act places responsibility for preparing the Maintenance Plan for Sewerage on the local governments.

The acts force competent ministries or administrative agencies to consult other related ministries and agencies when they prepare the above plans, in order to keep consistency between the plans. To illustrate, if the MLTM plans to construct a dam to secure water resources and to prevent flooding, the plan affects the Comprehensive National Water Supply Plan and the Comprehensive National Sewerage Plan. The Comprehensive National Water Supply Plan and the Maintenance Plan for Water Supply should refer to the NWRP and the Long-term Plan for Dam Construction in order to decide the location and amount of water intake. In addition, the Comprehensive National Sewerage Plan and the Maintenance Plan for Sewerage might be revised to preserve water quality in a reservoir made by a dam.



Figure 3. The Present Institutional Framework of the Water Industry



(Min, 2011)