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Integrated watershed management system in Korea

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ABSTRACT: A watershed management system divides a river into management units and promotes public participation such as inhabitants, local governments, civil society, experts and other stakeholders of the watershed management unit in the decision-making process. Therefore, participation and cooperation, exchange of ideas and effective decision making process is an important element to this democratic management system. Furthermore, a watershed management system brings together into consideration other horizontal issues such as nature protection, land-use plans, forest management, and historic and cultural characteristics under the common goal of watershed environment improvement. Following is the main content of the watershed management system for the 4 major rivers;

- Policies for effective water quality management: buffer zone system, land-purchase system, total pollution load management system.
- Policies for promoting exchange of different opinions by the stakeholders living within the watershed: Financial and administrative support for the inhabitants near 'Source Water Management Areas' (for encouraging local resident participation), water quality monitoring activities by the citizens (for encouraging NGO groups participation), and basic environmental survey projects (for encouraging expert and academia participation).
- Financial sources for the implementation of watershed management: water-use charge system, Basin Management Funds.
- Decision-making and execution: Establishment of 'Basin Management Committees' and regional 'Water Basin Environment Office', subsidiary bodies under the Ministry of Environment.

KEYWORDS: watershed management, policies for quality management, public participation, Korea

1. Introduction

The processes of developing special measures for watershed management in four major rivers, which commenced in 1998, significantly contributedto the environmental policy advancement in Korea. Such measures are not just an administrative program by which some projects are developed and thereby investment is made as set forth by related laws, but they involve a task to establish the efficient "watershed management system" based on intensive analysis of existing measures with different scenarios. That is, the special measures for four major rivers related to the 'Reform Program' reflect the concept of the nation's 21st century water management policy, as well as a blueprint for the Special Act on four major rivers.

Especially in the course of establishing such measures, the government has experienced abandoning bureaucratic systems which have been controlled by the central gov-

ernment, and negotiating with heart-to-heart discussions and debates between the residents in watershed regions. By gaining agreements, the government successfully established the watershed management system. This is deemed to be a victory achieved as a result of its hard efforts made for the five years (1998~2002) in order to accomplish the original objective, 'transformation into a watershed management system'.

2. Significance of the special measures for four major rivers

In the course of reconstructing Korea's water quality-related policy during the last five years(1998-2002), the government faced challenges to set up watershed management system. The following is the key contents adopted in the special measures for four major rivers.

- The measures are based on the discussions between the residents in the upstream and downstream regions. The residents in the upstream regions are not allowed to develop facilities abusing water- or land-resources, whereas the residents in the downstream regions should not require overly heavy restrictions be placed upon the upstream regions to fulfill their own environmental needs. The primary principle was that reaching a compromise should be based on the agreements made by both parties.
- By adopting the 'user pay principle' on the measures, the government introduced the 'water-use charge system'. This system enforces that the residents in each watershed region make a payment for their own benefits gained from the implementation of watershed management, helping to resolve the equity problem occurring between the restricted zones and the non-restricted zones.
- Recently introduced 'Buffer Zone System' and 'Total volume-based pollution load management system' are effective tools for watershed management. These systems are derived based on scientific and reasonable approaches.
- The 'Basin Management Committee' was organized as a decision-making body, and the 'Watershed Environment Office' was founded as an executive body for watershed management. This new administrative system ensured effectiveness in the government's decision-making process and the strength of its executive system.
- These special measures help create a new way of community culture, based on active participation in debates, discussions and agreements for both the government and civilian from the beginning stage through final decision and execution. That is, such measures help form a framework for the 'common interests between upstream and downstream regions' through debates, discussions and agreements between the members (i.e., self-governing bodies, local residents, and NGOs) of each watershed.

3. Major watershed management policies

1) Total Pollution Load Management System (TPLM)

This system involves determining the target water quality standard for each block of the water systems, computing the maximum allowable load, and regulating/controlling the amount of pollutants discharged from the total pollution load management watershed unit (a watershed within a water system route for which the target level of water quality is determined) within the maximum permissible load. In addition, this system helps achieve a balance between preservation-oriented and development-oriented aspects in

carrying out regional development projects approved by the government, given that their target water quality levels are attainable. Korea's total pollution load management system distinguishes Han River from the other three rivers. For the Han River water system, self-governing bodies may put to operate the system at their option, whereas for the water system of the other three rivers (Nakdong River, Geum River and Yeongsan River), neighboring large city (Kwangyokshi) and city/county should adhere to the total pollution load management system if local self-governing body fail to attain its water quality standard on the system. Major items related to determining the target water quality standard, choosing priorities, producing the action plan, allocating pollution quotas, investigating and assessing the performance, and punishing against non-performers are described in detail below.

2) Buffer Zone System

Without having long-running stream paths for natural purification, the regions near stream(s) are more likely to deteriorate water quality compared to those far away from the stream(s). The buffer zone system produces two desired results by blocking the entry of pollution sources; it can block the entry of pollution sources from storm water in advance, and reduce the pollutants from neighborhood regions if forest covers the most of the buffer zone. The buffer zone system was introduced for all national-level measures targeting the four major rivers, to mitigate non-point pollution sources by blocking the entry of pollution sources and purifying pollutants with buffer forests.

The buffer zone system was introduced for the purpose of securing a healthy ecosystem and clean water by conserving and restoring the waterfront areas connecting aquatic ecosystem and terrestrial ecosystem. Especially in the land, the 'water-user charge system' is used to purchase the land and create riparian forest inside the buffer zones. This helps to reduce water pollution originating from non-point sources (i.e., road surface drainage, urban surface drainage, out-flowing water from the grassless land, etc.). Recognizing high environmental/ecological value of the buffer zone, the government has introduced buffer zone systems throughout the four major rivers since 1998. The government, based on the buffer zone system, has been regulating development of the area designated as a buffer zone while encouraging creation of riparian forest near the buffer area by purchasing the land. Such purchase was financially supported by the 'Basin management fund (water-use charge)'.

3) Land Purchase System

The land purchase system is initiated to reduce the water pollution, and to conserve the riparian ecosystem in the buffer zone. This is accomplished by increasing public land within the water supply zone, which is intended for pollution prevention and the imposition of controls on the use of the land within the area. As described above, the purchase system is financially supported through the 'Basin management funds'. The priorities to purchase the land are determined base on the following order: the land directly affects the reservoir's water quality, the land of high density of pollutant discharge, the potential land to exacerbate water pollution, the land of high water pollutant load, the timing of application date for sale, and other lands. In the case of Han River, the allocated points described in the following table are used to set priorities on which lands to buy. The purchased land is managed by the government (i.e., the Minister of Environment). The government should maintain the ownership of purchased land, and

improve land use for water quality through transformation of the land into forests and densely vegetated area. The only exception is when the 'Basin management committee' completely agrees. Any profits derived from the purchased land are deposited as the 'Basin management funds'.

4) Supports for the Source Water Management Areas (SWMA)

The government supports for the SWMA are divided into two categories: (1) support for the residents, and (2) support for the self-governing authorities within the region. The support system for the residents aims to enhance cooperation and participation by residents in establishing the water quality conservation programs for the public water supply. Among the supports for the residents, improvement of the living conditions by repairing and expanding house and providing various sources of income are used as an effective tool to alleviate potential opposition of the nearby residents in the watershed. Among the support for the self-governing authority are to install basic environmental facilities, financially support operating expenses, promote the environmentally friendly purification industry, and make pollution purification projects for abused streams.

The funding of local government support is partially financed by the 'Basin management funds', and come from the annual subsidy for water management. The central government provides financial supports for sewage treatment facilities, drain pipes, and ditches of local municipalities as support programs, so to alleviate financial burden on the local government. The ratio of support level by the 'Basin management funds' varies depending on different basins. The central government usually covers about 20~100% of installation expenses for facilities and about 50-91.2% of the total operating expenses for maintaining and operating facilities. The funds also are used to enhance environmental friendly purification industry, financially support management costs for the conservation of clean water sources, purify polluted streams, install and operate water quality monitoring system, and prevent algae in streams.

5) Water Use Charges and the Basin Management Funds

The 'Water Use Charge' system was introduced to charge the water use, based on the 'User Pay Principle', in order to manage water resource efficiently and allocate the resource impartially. Specific objectives of the system are to collect funds for land purchase nearby conservation and buffer zones for drinking water, and to provide financial supports to the residents and local governments near the upstream regions with the funds.

The 'Water Use Charge' system was introduced at the time of taking administrative measures for Han river in 1998, and was included in the 'Special Act on Han River Basin' in 1999. Currently, the 'Water Use Charge' is used for fee assessment upon the inhabitants of the downstream regions in the Han river. The funds have been used to purchase the land, which has great value for water quality control from source water, and to provide financial support to the residents and the local government of the upstream regions in the river. The system commenced in the late 2002 in the Nakdong River, Geum River, and Yeongsan River by the 'Special Act' introduction. As a result, the 'Water Use charge' system is applied to all the regions of the four major rivers. In the Han river basin, the system has been operating since September 1999. The average fee for the system was 80 won per ton until December 2000, and increased to 110 won per ton in January 2001, and 120 won per ton in January 2003. The other regions (i.e.,

Nakdong River, Geum River and Yeongsan River) have been under assessment for the system since July 2002. In 2003, the charge was 100 won per ton in the Nakdong River, 120 won per ton in the Geum River and Yeongsan River. Presidential Order designates that the 'Water Use Charge' is imposed upon the end user of the public water and the installer of water supply for exclusive use. However, the area in the upstream region related to conservation zone and buffer zone is exempted in the 'Water Use Charge'.

'Water Use Charge' is deposited as the 'Basin Management Funds' prepared for each basin of four major rivers. These funds are managed by the related basin management committee. In order to improve the water quality and conserve the public water supply, these funds are used for the installation of basic environmental facilities and their operation, support programs for the residents, land purchase in the buffer zone, support for the local government responsible for essential upsteam regions. Major uses of the funds are summarized in the following:

- Installation and operation of environmental infrastructure (such as sewage treatment plant)
- Support for environmental-friendly purification industry
- Deposit dredging projects in Paldang Lake and Jamsil stream (Han River only)
- Environmental R&D
- Maintenance of source water conservation zones
- Support for civilian water quality monitoring activities
- Stream restoration program
- Installation and operation of natural measurement monitoring facilities for water quality
- Water quality antipollution projects with respect to the development
- Ground water pollution project.
- Algae prevention projects

As of 2003, the total amount of the 'Basin Management Funds' was about 53.13 billion won and these funds were used for the installation of basic environmental infrastructure, support for operation expenses, support programs for the residents, and purchase of land.

4. Conclusion

Korean government has undergone innovative transformation of its previous water quality management policy into the 'watershed (basin) management system', targeting the nation's four major rivers. The significance of such transformation is that the government was able to create the guiding principle for watershed management based on the mutual benefits, discussions and agreements between the residents in the upper and downstream regions. In addition, the system expanded actual participation opportunities for the watershed members and built a decentralized joint decision making system while forming the partnership between the watershed members through financing the government's support projects with the watershed management funds. As a result, the government established a water quality improvement system based on the watershed members' participation and co-operation. In addition, the government introduced effective policy measures to achieve comprehensive watershed management - the designation of buffer zones, the land purchase system, the total pollution load management system, financial support for the applicable residents, and the water use charge system. These

new systems are interrelated to each other in their nature of operation, while acting complementary amongst each other by having special measure zone, the maximum permissible standard, the discharge assessment system, the support system for the residents living in the vicinity of the source water conservation zone.

Whether the watershed management system will be successful or not remains to be seen. However, its success depends on the residents' active participation and co-operation, as well as the government's concrete implementation of the above programs. The watershed management involves founding of sustainable watershed communities based on the committed efforts made by citizens and the government. These are the key to the success of the watershed management system. Furthermore, it is essential to encourage watershed members to have a sense of ownership for their watershed.

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