A STUDY ON INTEGRATED FUNCTION AND VALUE ENHANCEMENT OF NATIONAL WATER RESOURCES FACILITIES: REDEVELOPMENT OF AN AGRICULTURAL DAM AS A MULTI-PURPOSE DAM

By

CHOI, Yongjin

CAPSTONE PROJECT

Submitted to

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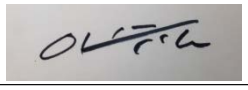
Professor Suil LEE 

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Abstract

There has been a growing interest in making use of a limited amount of water efficiently and responding to climate uncertainty in Korea because climate change is increasing the risk of droughts and floods. There are several organizations which manage dams in Korea. A joint project between K-water and KRCC was implemented in 2001 to maximize the utilization of existing agricultural dams. The first cooperative project between K-water and KRC was the Seong-Deok Dam Redevelopment Project in which the existing agricultural dam was redeveloped into a multipurpose dam. This project failed in terms of cooperation between two agencies. However, now the situation has changed a lot due to the enactment of the Water Management Basic Law this year. In Korea's future integrated water decision-making organization based on the law in which all stakeholders participate, the water management organization will help not only the redevelopment of existing dams but also various water disputes. Therefore, the government should pay more attention to the efficient utilization of existing dams in terms of integrated water management and make much efforts in preparation of law and institution.

Ⅰ. Introduction

There has been a growing interest in making use of a limited amount of water efficiently and responding to climate uncertainty in Korea because climate change is increasing the risk of droughts and floods (Water Vision 2020, 2016). According to the paper, the third lowest rainfall in Korea in 2015 was recorded due to the abnormal drought caused by climate change, and the local drought has increased consistently since the 1970s. Also, in recent years, the possibility of flood damage has increased due to changes in the rainfall patterns, such as increase in the frequency of heavy rainfall and rainfall intensity compared to the past.

So far, Korea's water policy has been implemented to promote economic growth by building new large dams all over the country. There are several organizations which manage dams in Korea, such as Korea Water Resources Corporation, hereafter, K-water, for managing multipurpose dams under the Ministry of Environment, hereafter, MOE, Korea Rural Community Corporation, hereafter, KRCC, for managing agricultural dams under the Ministry of Agriculture, Food and Rural Affairs, hereafter, MAFRA, and Korea Hydro & Nuclear Power Corporation, hereafter, KHNP, for managing hydroelectric dams under the Ministry of Trade, Industry and Energy, hereafter, MOTIE (Yoon, 2015). Water resources management policies in Korea have been implemented according to the individual laws of each government department, resulting in duplicate investment and waste of budget. To solve these problems, several efforts have been made to establish a cooperative system among separate dam management institutions and to utilize limited water resources efficiently.

In the case of hydropower generation dams, the negotiation is ongoing between K-water and KHNP regarding consignment management of hydropower dams by K-water resulted from the policy decision of the Ministry of Economy and Finance, hereafter, MOEF to make hydroelectric dams and multi-purpose dams operate in conjunction. It would not be

easy to reach a conclusion because of conflicts of interests between two agencies. Nevertheless, these efforts will eventually promote the realization of integrated water management in Korea.

On the other hand, there seems to be a lack of interest in the integrated use of agricultural dams which have a very important position in terms of water quantity and dam location suitability. In fact, a joint project between K-water and KRCC was implemented in 2001 to maximize the utilization of existing agricultural dams. The first cooperative project between K-water and KRCC was the Seong-Deok Dam Redevelopment Project in which the existing agricultural dam was redeveloped into a multipurpose dam. The project failed in terms of cooperation between two agencies because of the dispute over the water right. Had the project created a win-win situation for each other, cooperation between K-water and KRCC would have been actively pursued thereafter. It must have been impossible to set up an example of successful dam cooperation under the present laws and systems of dam management in Korea.

However, now the situation has changed a lot due to the enactment of the Water Management Basic Law this year, and it is expected that the integrated water management policy in Korea will be carried out more smoothly. Under these circumstances, I will attempt to identify unexpected problems between K-water and KRCC revealed during the project implementation process. The paper will specifically focus on the case of Seong-Deok Dam redevelopment project and find measures to facilitate future redevelopment cooperation projects between K-water and KRCC in terms of laws and institutions.

In addition, The Water Management Basic Law, which many have looked forward to, was passed at the National Assembly this year as well, so implementation of integrated water resources management policy through participation of various stakeholders will be accelerated. Considering this, I will take a look at the cases of the institutions regarding the

integrated water resources management in overseas. The precedent of foreign countries will be great references in Korea for promoting integrated watershed-oriented water management policies in the future.

The following research questions will guide this research paper. First, why do we have to redevelop the existing dams? Second, why did the Seong-Deok Multipurpose Dam Project, which was the first dam redevelopment project between K-water and KRCC, fail in terms of win-win strategy? Third, what kind of legal and institutional measures are necessary to promote the cooperative dam projects between two organizations? Fourth, what kind of water management institutions has been successfully implemented abroad in terms of integrated water resources management?

The purpose of this paper is to find ways to promote redevelopment of agricultural dams into multipurpose dams through a case study of Seong-Deok Dam redevelopment project. This will further guide the water policy direction in Korea by providing a good opportunity to look at the overseas integrated water management policies. This paper is divided into three sections. First, I will present a thorough literature review on the integrated dam utilization and water policies. Next, I will mention what the problems are with the Seong-Deok Multipurpose Dam project and what measures should be implemented. Finally, I will propose some possible solutions including overseas cases. This research will be of interest to policymakers, government officers, and experts of water resources management in public institutions like K-water and KRCC.

Ⅱ. Literature Review

In this section, I will provide an account of the development of scholarship in the field of the integrated dam utilization and water policies in Korea. Before proceeding further, it is necessary to clearly define dam and water resources, which are the key terminologies

referred to in this paper. In this paper, dams can be described as workpiece installed to prevent the flow of river in order to use the water for domestic and industrial supply, agricultural use and power generation and control flood. Dams can be divided into agricultural dams, hydropower dams and multipurpose dams in a large category. Water resources in this paper can be described as freshwater produced from rainwater including river and lake water.

The historical review of dam development policies has been actively discussed by scholars (Woo, 2001; Water Vision 2020, 2016). Woo (2001), for example, argues that land development in Korea, which began in the 1960s, has inevitably led to the development of land and the use of more water. As people gathered and built a factory with rapid urbanization, they constructed multipurpose dams upstream of the river to supply water to downstream urban areas and prevent floods. The Soyanggang Dam and Chungju Dam, which were developed from the 1960s to the 1980s, are examples of multipurpose dams.

Development of dams for multi-purpose use of water resources such as water supply and hydroelectric power generation was carried out through national land development projects from the 1960s to 1980s. In the 1990s, the development of dams gradually decreased, as the negative aspect of dam development became more prominent in society and the supply of water was stabilized by the continuous development of water resources. In the end, the government officially canceled the plan for the Yeongwol Dam, which is called Donggang Dam, in 2000 because of opposition from residents and environmental groups, and since then, the atmosphere for dam construction has become increasingly disadvantageous. (Woo, 2001).

There has also been a lot of research on the positive role of dams in spite of the fact that the voices against dam construction for water supply and flood control are still growing. According to the Legislative and Policy Report(Kim, 2017), dams and reservoirs supply 18.8 billion ㎥/year in Korea, which is 57% of the total water use of 33.3 billion ㎥/year. 11.8 billion ㎥/year, which is 63% of 18.8 billion ㎥/year in the entire dam water supply in Korea, is supplied from multipurpose dams and water supply dams managed by K-water.

Hydroelectric dams supply 1.3 billion ㎥/year, which is about 7% of total dam water supply. Most dams are located in the Han river system playing an important role as a water source in the metropolitan area. On top of that, Woo (2001) points out that the flood control among the various functions of multi-purpose dams is also a major function of the dam. Normally, People tend to think of dams as facilities for water supply only, but actually flood control is another primary function. For example, Soyanggang Dam and Chungju Dam upstream of the Han River basin have played a decisive role in preventing flooding in the metropolitan area since the 1980s (Kim, 1995).

This notwithstanding, some scholars point out that the management of various types of dams by separate government departments and agencies can cause many problems in a river system.(Shim, 2014; Kim, 2017). According to Shim (2014), dams in Korea are managed on individual laws and regulations by separate government departments and agencies. He points out that there are difficulties in efficient water management due to diversified management. Due to the dispersion of dam management based on the functions of the dam such as water supply, energy and disaster prevention, there are some conflicts between government ministries and some difficulties in securing the connection among various dam related projects. However, there is a limit to the integrated and systematic water management due to the lack of a system to coordinate these conflicts and difficulties. The efficiency of water management is deteriorating due to conflicts among various regulations in a few kinds of dams. (Shim, 2014)

In addition, many scholars point out the issue of water rights and dam aging among many problems in specific dam policies. According to Kim (2017), the concept of water rights in the river is not clear in Korea, allowing some disputes and conflicts about the use of limited water resources continue to arise. In particular, agricultural water right, which accounts for a large part of water right in Korea, is hard to deal with to handle because of free water supply policy for agricultural water and lack of management system. Besides, the amount of agricultural water actually used at the farm site is not managed and the farmers do not consciously try to save water. Therefore, for an efficient use of agricultural water, it is

necessary to conduct a survey on the amount of agricultural water usage by season. Also, using river water newly is difficult due to the water rights owned by agricultural dams, so it is needed to establish a reasonable adjustment plan for water rights in the river.

The safety issue of aging dams is also a major social issue in dam management field. In particular, since natural disasters such as earthquakes and abnormal floods are increasing, the safety issue of old dams has recently become an important policy task in Korea. Actually earthquakes are known to be one of the major causes of dam breaks that result in great damage to people's lives and property. In September 2016, the largest earthquake of 5.8 magnitude occurred in Gyeongju city, Korea, with more than 550 aftershocks. As a result, there has been growing concern that Korea is no longer a safe area for earthquakes (Kim, 2017).

Though many studies have mentioned the need of the integrated management of diversified water resources facilities, it cannot be denied that efforts to establish and implement specific policies have been lacking. Considering this, the Seong-Deok Dam redevelopment project, which was first started in 2001 as part of the dam development paradigm shift, seemed to be a timely and meaningful plan. Therefore, in this study, problems and solutions of integrated dam management policy through the case study of Seong-deok Dam will be covered and examples of overseas water management policies will be mentioned in detail.

The purpose of this study is not to focus on the redevelopment of all kinds of dams in Korea. Instead, this study is just concentrated on the redevelopment of agricultural dams into multipurpose dams. This study attempts to provide the background of the redevelopment and go over some difficulties faced in the process of the project through a case study of Seong-Deok Dam. This paper will also deeply discuss policy improvements to promote new dam redevelopment projects, in terms of laws and institutions under the new water policy environment after the enactment of the Water Management Basic Law in 2018.

However, this paper will slightly mention about the new water policy being established by the new law. It seems appropriate to limit the study's scope because the

detailed policies are in the process of being developed by the MOE under the Water Management Basic Law. Instead, this could be the subject of future valuable research.

Ⅲ. Seong-Deok Multipurpose Dam Project Case Study

1) The need to redevelop existing dams

The average annual precipitation in Korea is 1,277mm, which is 1.6 times of the world average, but the total precipitation per capita is 1/6 of the world average. According to the Water Poverty Index (UN WWAP), Korea's water poverty index is 62.4, which is the 43rd place among the 147 countries surveyed, making Korea classified as a water stress country. Water resources on the earth are limited and unevenly distributed. Seasonal imbalance of precipitation and recent climate change require efficient river water use in Korea.

It is hard to deny that dams and reservoirs have regulated the irregular flow rate of water for a long time in a timely manner to provide stable water supply during drought and reduce the flood risks during rainy season. In addition to major functions such as water supply, hydropower generation, and flood control, dams have additional benefits such as tourism, infrastructure improvement, and employment expansion. Despite the obvious benefits of building dams, the dam construction could cause socio-economic and environmental problems. The socio-economic problem is related to the benefits and damages of dam construction. Inhabitants upstream of the dam are forced to migrate due to submersion, and residents downstream of the dam benefit from the dam functions. The environmental problem is the degradation of the ecological environment of the rivers caused by the permanent change of stream flow, which is of great natural value. Dam construction inevitably destroys the habitat of river organisms and disturbs ecosystems.

Redevelopment of existing dams can be a solution to maximize the main functions of dams while minimizing the socio-economic and environmental problems. Especially, if agricultural dams can be redeveloped in Korea, it would be possible to provide more benefits to the people by converting single purpose dams into multipurpose dams. It may also contribute to the prevention of the collapse of aged agricultural dams, which could be caused by earthquake and abnormal flood.

According to a recent study on the aging of agriculture dams by Lee (2017), the KRCC conducted precision safety diagnosis of agricultural reservoirs of 4,081 districts for 19 years. As a result, it was found that 3,862 reservoirs accounting for 94.6% of surveyed reservoirs are c-rated or above, which requires maintenance and reinforcement. In addition, about 3,000 agricultural dams nationwide are located upstream of most major small and medium sized rivers, and they are entitled to vested water rights. Therefore, it is becoming increasingly difficult to develop new multi-purpose dams without interference from existing agricultural dams. In this situation, the redevelopment of agricultural dams as a multipurpose dam would be a natural change in the dam development policy. In this context, the dam redevelopment project of Sung-deok Dam was proposed in the Dam Construction Long-term Plan established in 2001 by the Ministry of Land, Infrastructure and Transport, hereafter, MOLIT, through negotiation with the MAFRA.

2) Seong-deok Dam Redevelopment Plan Overview

Seong-deok Multipurpose Dam located in Cheongsong City, Gyeongbuk-Province is the first case of redevelopment of an agricultural dam to a multi-purpose dam in Korea. This dam redevelopment project was planned to solve the water shortage in Cheongsong City, Gyeongsan City, and Yeongcheon City by increasing existing reservoir capacity. As it became more difficult to find a place to construct a new dam, KRCC, which owns existing

agricultural reservoirs, and the K-water, which manages the multi-purpose dams, started the dam redevelopment project. The redevelopment project for the Seong-deok multipurpose dam was commenced in November 2006 and completed in October 2015. However, cooperation between the two institutions was not easy as expected. The Sung-deok Dam redevelopment project first appeared in December 2001 in the Dam Construction Long-term Plan established by the MOLIT and the history of the dam project is as follows.

<The history of the Seong-deok multi-purpose Dam Project>

◦ Dec 2001 : Establishment of Dam Construction Long-term Plan

(by MOLIT, including Seong-deok Dam)

◦ August 2002 : Preliminary Feasibility Study (Ministry of Economy and Finance/KDI)

◦ Dec. 2002 : Seong-deok dam project Feasibility Study (MOLIT/K-water)

◦ Dec. 2003 : Seong-deok dam project Implemented Design (MOLIT/K-water)

◦ October 2004 : Completion of environmental impact assessment consultation

◦ January 2006 : Ground plan approval notification (Notice No. 2006-13 from MOLIT)

◦ July 2006 : Launch of the basic and detailed design of the Sungdeok Dam road

◦ November 2006 : Implementation plan approval notification

(Notice NO. 2006-253 from MOLIT Busan bureau)

◦ November 2006 : Construction of the Seongdeok Dam

(construction cost: 44,227 million KRW)

◦ May 2009 : Approval notification of ground plan change (the plan for road)

◦ November 2009 : Construction of the road construction project

(construction cost: 50,465 million KRW)

◦ September 2012 : Approval notification of basic plan change

(Reflecting the plan for public and public water intake facility)

◦ Dec. 2012 : Notification of implementation plan change (the plan for water intake facility)

◦ Dec 2013 : Road construction completion and opening

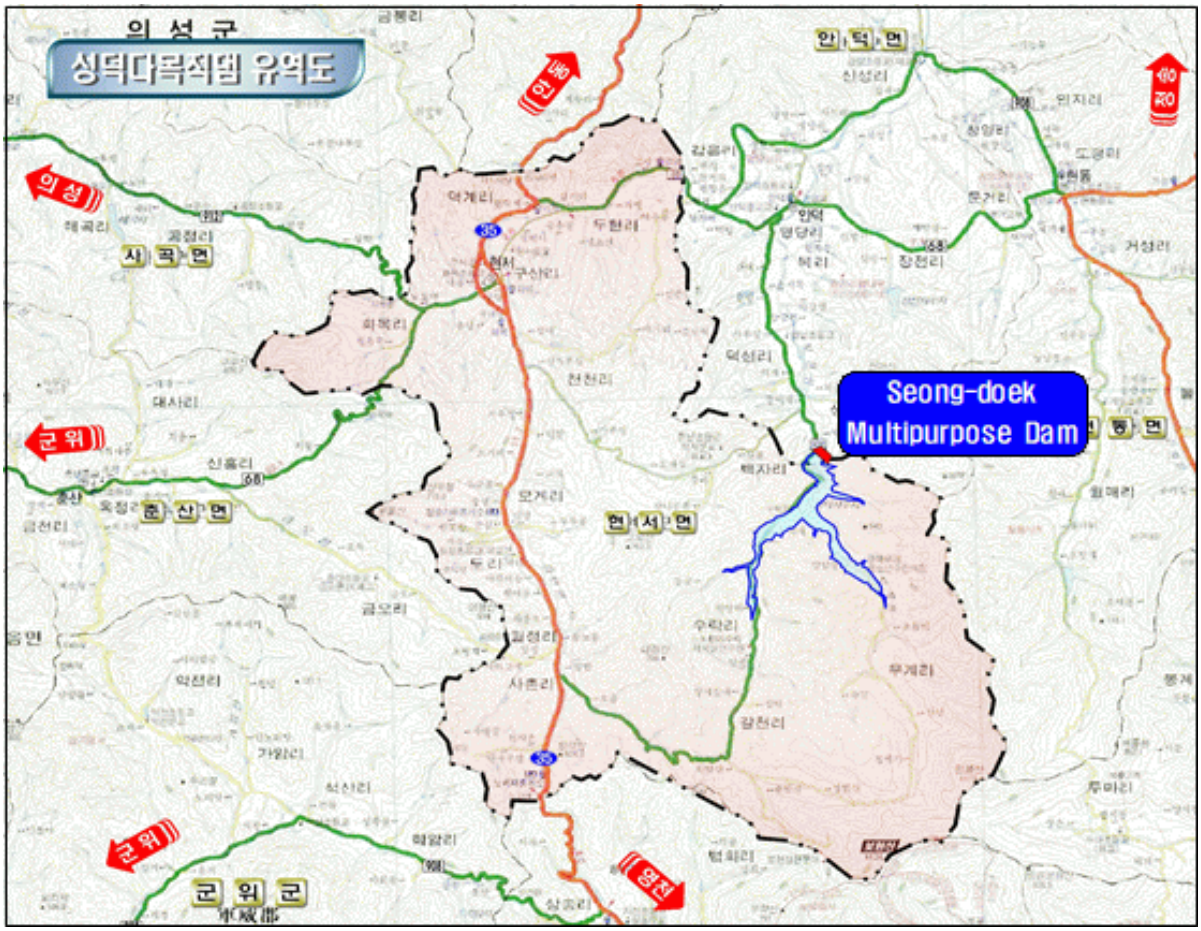
◦ November 2016: Seong-deok Dam construction completion

classification	**unit**	**dam feature** (agricultural dam)		**dam feature** (multipurpose dam)
◦ Watershed area	㎢	30.6		31.4
◦ Dam type	-	Earth Fill Dam		C.F.R.D
◦ Dam size	m	(H) 13 × (L) 196	⇨	(H) 47 × (L) 325
◦ Total water storage capacity	Million ㎥	0.7		21.7
◦ Flood control capacity	Million ㎥	-		4.7
◦ Total project cost	Billion KRW	-		102

Outline of the Seong-deok Redevelopment Dam is as follows,

<The view of Seong-deok Dam>

<Seong-doek Multipurpose Dam Watershed Map>



The redevelopment project of the Seong-deok Dam was initiated by the MOLIT

after a negotiation with the MAFRA. At the time, the two government departments agreed to the principle of efficient use of the limited water resources through the redevelopment of existing dams, undertaking the project for the first time. They decided to continue negotiations and consultations about the details such as setting the water right and compensation of existing facilities, while carrying on the project. The redevelopment project of the Seong-deok Dam, which was administered by the MOLIT and K-water, was a project to redevelop the existing agricultural dam as the multipurpose dam based on the Act on Construction of Dams and Assistance, etc. to Their Environs. The legal basis for the dam implementation and the project entities are as follows.

	Related Law	Project Entity	Ministry
Agricultural Dam	Agricultural and Fishing Villages Improvement Act, hereafter, the Agricultural Improvement Law	KRCC	MAFRA
Multipurpose Dam	Act on Construction of Dams and Assistance, etc. to Their Environs, hereafter, the Dam Construction Law	K-water	MOLIT

3) Key issues and difficulties

Due to the disputes on the water right for agricultural water between the two sides, the meetings on the redevelopment of the Seongdeok Dam did not proceed smoothly. At the time of planning, it was expected that negotiations would work well, but in the process of

consulting in detail, it turned out that it was not easy. Since the contents of the redevelopment of the dam were not specifically mentioned in any law, it was natural that the disagreements were revealed in the process of the dam redevelopment negotiations of both sides.

The key issue was related to water rights in agricultural water, the right of dam usage in agricultural water strictly speaking. The right of dam usage is a right that is set by the law only in the multi-purpose dam, a kind of a property right that secures a certain amount of water in the multipurpose dam by sharing the construction cost and gives the right to use or sell water in the dam. In general, the right of dam usage for domestic, industrial water supply and power generation is owned by K-water at the expense of that construction cost, and the right of dam usage for flood control and irrigation water is owned by MOLIT (Now, it is the MOE after the governmental reorganization in June 2018). During the meeting related to the redevelopment of the Seong-deok Dam, KRCC requested the designation of the right of dam usage in irrigation water as well as the compensation for existing agricultural dam facilities and sites to be submerged. However, the MOLIT and K-water which are in charge of the project were supposed to compensate the existing property rights and guarantee the supply of agricultural water to KRCC. Therefore, they thought if KRCC is given the right of dam without paying for it, it could be a duplicate benefit to KRCC.

In addition, if KRCC have the right of dam usage, it shall pay annual maintenance costs of the dam. However, KRCC did not even want to pay for the maintenance costs of the dam by the Dam Construction Law because it had paid little maintenance costs for the agricultural dam. Both sides had difficulties in reaching a consensus, and these differences were not narrowed down because there were no specific provisions in the relevant law. Even though there were some disagreements, including the right to use the dam, the approval notification of Seong-deok Multipurpose Dam plan came out for the successful cooperation business. After the approval notification of the plan, the K-water and KRCC signed a

redevelopment agreement for Seong-deok multi-purpose dam on December 12, 2006. The main contents of the agreement are as follows.

<The main contents of the agreement between K-water and KRCC>

	contents
water right for agricultural water	the right of dam usage will be given to KRCC (* From K-water's point of view, it would be only possible if KRCC pay the appropriate cost by the Dam Construction Law)
Existing land and facility compensation	Land and facilities that are submerged will be compensated in accordance with the Compensation Law.
construction management	management and supervision by a joint construction office in which both parties participate will be held.
dam operation and maintenance	- agricultural facility : KRCC, - entire facilities excluding the agricultural facility : K-water
further redevelopment of agricultural dam in the future	Both sides will cooperate in the redevelopment project based on cooperation of Seong-deok Dam.
modifying the law	Joint efforts will be made in the revision of the Dam Construction Law to establish legal basis for the redevelopment of agricultural dam

<The history of negotiation between K-water and KRCC>

◦ from 2002 to 2004 : Consultation on existing dam redevelopment direction between K-water (MOLIT) and KRCC (MAFRA)

◦ from 2005 to 2006 : Consultation on specific project implementation plan between K-water and KRCC

◦ Dec. 2006 : signing an agreement on the redevelopment of Seong-deok Dam between K-water and KRCC

◦ from June 2007 to December 2013 : operating the joint construction office of K-water and KRCC

◦ October 2012 : conducting joint legal advice for resolving disputes

◦ October 2013 : property appraisal to compensate agricultural land and facilities

◦ From January to July 2014 : Compensation consultation and compensation payment for agricultural land and facilities (K-water ↔ KRCC)

◦ From 2014 to 2015 : Discussions on resolving disputes between the two sides regarding the right of dam usage (failure to reach consensus)

◦ February 2016 : Signing an agreement on the acquisition and maintenance of agricultural facilities in Seong-deok multipurpose dam (between K-water and KRCC)

The Sung-deok Multipurpose Dam construction project, the first cooperative project to redevelop agricultural dams into multi-purpose dams, started with close consultation between the MOLIT(K-water) and the KAFRA(KRCC) under the common interests of efficiently using limited water resources. However, it was not easy to redevelop dams that were constructed and managed by each law and to create the win-win. From 2002 to 2016, the two sides negotiated the issue of water right in parallel with the project's progress, but in the end the KRCC did not obtain the right of dam usage in Seong-deok dam under the present law. After that, further cooperation projects became more difficult. There are several reasons for this bad situation.

First, there are several governance bodies under each law by type of dam in the same watershed. It is not easy to carry out dam redevelopment under the current system because this dam management structure is focused only on promoting their own projects. In addition, KRCC, which manages agricultural dams, wants to have rights corresponding to the existing water and property right after dam redevelopment. On the other hand, K-water, which manages multi-purpose dams, has inherent limitations in that it is obliged to allocate the right of dam usage in accordance with the Dam Construction Law. Therefore, K-water

can not be flexible about setting the right of dam usage in agricultural water.

The second reason is that the principles or detailed procedures for dam redevelopment are not mentioned in any laws and regulations. Under the current system, both sides are forced to make decisions through not laws and regulations but consultation on dam redevelopment only under the foundation of sincerity and trust. Therefore, in case of disagreement on some issues, it takes too much consultation period and it is difficult to judge whether the decision is appropriate or not.

The third reason is that there is no decision-making organization to judge water issues with consistent policy direction and responsibility when the two sides are not consulted smoothly in the process of cooperation. Fortunately, however, the situation has changed a lot in the water management policy since the passing of the Water Management Basic Law this year; this problem is expected to be resolved.

Unless these problems are solved, it will be difficult to promote the redevelopment of existing dams in the future. As mentioned above, dam development is an effective way to cope with drought and flood, which are frequent in climate change, by efficiently utilizing limited national water resources. Therefore, it is necessary to implement policies that can lead to active redevelopment of dams by improving these insufficient systems.

Ⅳ. Policy Proposal

1) Domestic policy environment

Although citizens are demanding clean, stable water and a friendly environment, it is a fact that many national projects are being held due to conflict of water distribution and

utilization all over Korea. Due to the diversified water management system, sharing and cooperation of water information among the organizations is insufficient and some residents near the islands and tributary streams are still excluded from water welfare, vulnerable to drought and flood. Thus, in order to solve chronic water problems and adapt to the changing water environment, it became necessary to manage water resources from an integrated point of view.

In this light, the government implemented water management unification policy by revision of the Government Organization Act in May 2018. As a result, the government department in charge of national water resources management was transferred from the MOLIT to the MOE. In addition, the Water Management Basic Law, which many water experts have long sought, was enacted in June 2018, so that the water management policies distributed among the various government departments are now able to have a unified and consistent policy direction and contribute to the improvement of the water welfare of the people. In the future, all the stakeholders related to the water management policy will participate in the National Water Management Committee, which will be established on the basis of this law, to implement integrated water management policies and handle water issues such as proper water allocation and water conflict resolution.

The water management policy in Korea has been divided among several government departments and there is no integrated decision-making organization, so it has not been able to manage and utilize limited water resources in an integrated way. Especially, it was difficult to utilize the various dams, which plays an important role in water use and flood control in an integrated and efficient manner, due to the diversified management bodies. In the case of hydroelectric dams located in the Han River basin in the Seoul metropolitan area and owned by the KHNP, a lot of consultation between KHNP and K-water has been going on to utilize hydroelectric dams as a multipurpose after pointing out the need for multi-use by the the

Board of Audit and Inspection in 1984. However, it has not been proceeding smoothly due to the passive attitude of KHNP under the Ministry of Commerce, Industry and Energy and disagreement.

There has also been an attempt to utilize the agricultural dam as multipurpose. Although K-water and KRCC jointly pursued the redevelopment project of Seong-deok Dam, the final agreement on the right of dam usage in agricultural water was not reached in the end. Therefore, it is now unclear to promote further cooperation projects between K-water and KRCC for the redevelopment of agricultural dams. Under these circumstance, the Water Management Committee based on the Water Management Basic Law will promote the integrated utilization and management of limited water resources in Korea in terms of national water security, rather than the interests of the institutions, and it will accelerate the realization of real integrated water management in Korea.

2) Overseas cases

Since the Water Management Basic Law has been passed and many water resources policies are about to change in the future, it is necessary to review and establish detailed water management policies in various aspects. In this situation, it would be important and meaningful to examine the precedents of advanced countries that have improved the functions and values of water resources through the integrated water resources management policies ahead of us.

1. France

France is one of the leading countries that implement successful water policy. The integrated watershed-based water resource management policy implemented by the new

Water Law in 1964 divided France into six regions based on the watershed rather than administrative units. In each region, the watershed management agencies, Agences de l'eau, were installed to collect taxes on pollutant emissions and water use in the watershed, reinvigorate regional water resources development, and conserve water quality. Since the policy had been creating some problems for over 30 years, the Water Law was amended in 1992. In the central government, the new department of water resources management, Direction de l'Eau was established by integrating the various departments that had been in charge of managing water resources, and in the local governments, the new department for water resources management, Directions Regionalesde l'Environnement (DIREN) was established for comprehensive water resource management.

A water management plan was established for the entire watershed, and a regional water resource management plan was established for each regional river in the watershed, linking central and local areas and implementing comprehensive water resources management. The most important aspect of the Water Law in 1964 was that it established a watershed committee in each region which was composed of representatives of various social interest groups in six regions and enabled cooperation in water management. This means that watershed integrated water resource management was introduced into each region based on river basins to plan and implement its own water resource policy.

The characteristics of the water management policy in France can be divided into three categories. First, each watershed management institution, such as the watershed committee and the watershed management corporation, is economically independent. The second is that the district has been designated based on watershed boundaries regardless of traditional political and administrative boundaries. Third, it focuses on resolving conflicts around water use between central and local governments. New institutions were established in central and local governments to realize the integrated watershed-based water resource

management. The National Water Committee was established at the central government and the River Basin Committee was established on six basins. The National Water Committee provides opinions to the Prime Minister regarding water resource management, river development and pollution prevention. The six River Basin Committees are responsible for drafting and reviewing water policy, plans as well as approving annual business plans and pricing standards for the River Basin Administration. In the watershed-based integrated water resource management system, lots of opinions of various classes are accepted and actively reflected in the policy through water resource representative organizations such as the National Water Committee and the River Basin Committee.

This watershed-based water management policy in France is similar to the one which is being implemented recently in Korea since the enactment of the Water Management Basic Law. In Korea’s future integrated water decision-making organization in which all stakeholders participate, the water management organization will help not only the redevelopment of existing dams but also various water disputes. In this situation, the water management policy in France would be a reference to Korea. In the case of Korea, it would be necessary to pay more attention to efficient water resource management. In South Korea, which is much smaller than France, water management policy based on several river basins could lead to inefficiencies in policy implementation. Therefore, in the future, water management policy in Korea should take it into consideration and resolve conflicts among stakeholder groups without impairing efficiency.

2. Germany

Germany's water management system is divided into 16 local governments and the central government's water management functions are distributed among various departments

in accordance with various policy objectives. Especially, the Department of Environment, Nature Conservation and Nuclear Safety plays a major role in the central government's water management. As part of environmental policy, the department is responsible for leading water resources management and regional cooperation through the Sewerage Act, the Taxation Act, and the Federal Nature Conservation Act. It also plays a role in representing the German government in the EU's water-related affairs. The core task of this department in water management is to set up sewage treatment standards and charges sewer operators. Other water-related federal agencies include the Food, Agriculture and Consumer Protection Department, which controls water resources management in rural areas, including flow regulation, flood control, and protection of the North Sea and Baltic Sea coasts. The Ministry of Health establishes and supervises tap water quality standards in accordance with EU tap water guidelines. Water issues are supported by the Central Government Environment Agency. The Department of Transportation, Housing and Construction oversees all aspects of canal management and inland and maritime traffic. The Ministry of Economy and Technology keeps the economic benefits of environmental protection and take general responsibility for the prices, charges and fees of water and sewage services. The Ministry of Economic Cooperation and Development oversees international cooperation on water issues.

Germany has emphasized the role of the local government in national administration. Especially, in the field of conservation of nature, landscape protection and water management, the status and autonomy of the local governments are greatly guaranteed. The Water Management Basic Law of 1957 in Germany granted the legal authority relating to water to 11 provinces at that time. The role of the central government was limited to setting minimum water quality standards and sewage discharge water quality standards and establishing and managing rules for inland and coastal operations. All other water related legislative and administrative powers were made at the state level. As a result, each local

government has enacted separate water policy. It is responsible for not only water quality but also the control of water use and water related organizations.

Since a wide range of autonomy was given to the local governments, they could enforce the law of each government. With the minimum interference of the Water Management Basic Law, local governments have implemented water resources policies that meet their own conditions. Water management in Germany was not done by the central government, but by way of delegating authority to local governments.

Germany's water management policy is not based on river basins but is based on administrative units. Germany's water management is delegated to local governments. On the other hand, the water management policy in Korea is based on river basins under the Water Management Basic Law and is being led by the central government. In fact, it is hard to say with certainty which policy is right. The area of Germany is three times the size of South Korea, and most of the land is made up of plain land. These are favorable conditions for water resource management. However, Korea, unlike Germany, has a mountainous territory and is vulnerable to the management of water resources because of difference of rainfall according to season. Nevertheless, in the long run, it could be possible to consider improving water management autonomy by delegating more authority to local governments in water management in Korea. However, in terms of efficient management of water resources, careful consideration in the characteristics of Korea's land, geography, and hydrology will be needed.

3) Policy proposal for redevelopment of agricultural dams

Since the 1960s, the Korean government has started comprehensive national water resources development. In the 1970s, along with national industrial economic growth, water

infrastructures such as multipurpose dams have been built and in the 2000s, quantitative growth of water facilities was almost finished. In particular, the dam has contributed greatly to the national economy and the people's lives as a key tool in Korea's water resources policy. In the future, the role of dams in the water resources sector will not change much in Korea.

Nevertheless, a more advanced and precise water policy will be needed in response to climate change. For example, existing dams can be upgraded, integrated, or linked to maximize the use of existing water resources. However, the administrative system of the dam management in Korea is diversified into the several ministries such as the MOE (K-water), the MOTIE (KHNP), and the MAFRA (KRCC). Therefore, it has been difficult to conduct the unified water resources management in Korea. This problem could be found in the case of consultation on the unification of management of hydroelectric dam between KHNP and K-water, and the Seong-deok Dam redevelopment project between KRCC and K-water. Diversified dam management can cause inefficient plans as well as over investment due to duplication of similar projects.

However, the government has not paid much attention to the efficient utilization of existing dams in terms of integrated water management and has not made much efforts in preparation of the laws and measures. In fact, through the case of the Seong-deok Dam redevelopment project, which was actively started with the cooperation between K-water and KRCC, we could know about the systematic weaknesses in terms of integrated water management. In fact, in the course of the Seong-deok Dam redevelopment project, which was actively promoted by the cooperation of the government ministries, institutional weaknesses appeared in the aspect of integrated water management.

The biggest problem in the cooperation project for the Seong-deok Dam redevelopment was that there was no decision-making organization to handle the disputes

between two sides. As a result, both sides have tried to coordinate through many individual or joint legal advice. However, because they were trying to keep their own interests, they could not reach an agreement, and eventually joint legal advice was not even accepted. Fortunately, this year, the Water Management Basic Law was enacted, and a new water policy organization called the National Water Management Committee will be created. In the near future, various government departments and stakeholders will participate in this organization to determine the national long-term water resources policy plan and implement the integrated water management policy.

A typical dam project consists of planning, design, construction, maintenance. Therefore, in case of redevelopment of the existing dam, detailed discussions on the implementation plan should be made between the two sides according to the progress stage. However, the current law does not mention detailed procedures for redevelopment of dams, so it takes a lot of time and effort and there is a lot of controversy in the consultation process of both sides. Therefore, in order to promote the dam redevelopment projects in the future, it is necessary to revise the law or to establish specific standards and regulations. A technical consulting outsourcing could be implemented in the National Water Management Committee under the Water Management Basic Law to make detailed plans. The National Water Management Committee, which would be formed sooner or later, will be able to consider the revision of existing laws or improve water policy measures in accordance with the result of the outsourcing.

The most controversial issue in the case of the Seong-deok Dam redevelopment project was about the right of dam usage. Therefore, it is necessary to improve the regulations on the right of dam usage in the Dam Construction Law. The right of dam usage is a right which exists only in multipurpose dams, and this right can be acquired through sharing the construction cost of the dam. The holder of this right can use the water in the dam or sell it

for profit, which is a kind of property right.

On the other hand, in case of agricultural dams, the river water use permission, which does not strictly mean the water right, is applied. The right of dam usage is different from the river water use permission, which is based on the River Act and is simply given from the Flood Control Offices under the MOLIT. Unlike the right of dam usage, the river water use permission is not regarded as property rights that are legally protected. However, the KRCC kept demanding the right of dam usage of agricultural water in the Seong-deok Multipurpose Dam as a substitute compensation for the river water use permission, but KRCC could not obtain it from K-water in the end. In Korea's multipurpose dams, agricultural water charges have not been collected since 1986 and officially exempted in 1995. Therefore, the sales revenue cannot occur in agricultural water at present, so the right of dam usage of agricultural dam is a nominal right rather than a real property right.

For that reason, only in the case of redevelopment dams, the right of dam usage owned by the Ministry of Environment could be set in the KRCC as well as giving the compensation of existing dam facilities to the KRCC by the amendment of Article 20 of the Enforcement Decree of the Dam Construction Law. However, this is only an option that can be applied only while the free supply of agricultural water is maintained. If agricultural water is to be paid to farmers in the future, it would give excessive benefits to the KRCC. Therefore, in that case, KRCC will have to bear a portion of the multipurpose dam construction cost for the right of dam usage of agricultural water.

As for the maintenance cost of dams, according to the current law, organizations which have the right of dam usage shall bear the maintenance and management expenses of the multi-purpose dam every year. However, since the actual profit from the operation of the multipurpose dam occurs only through hydropower generation and sales of domestic and

industrial water, in the case of the redevelopment of existing dams, the maintenance cost could be exempted by the revision of Article 28 of the Enforcement Decree of the Dam Construction Law.

Approximately 3,000 small and medium sized agricultural dams owned by the Korea Rural Community Corporation have occupied positions in the optimal dam construction area in the watershed all over the country since the Japanese colonial rule in the past. There are more than about 14,000 agricultural reservoirs owned by local governments, but the area of the dam basin is too small to be redeveloped. Therefore, in order to utilize limited water resources efficiently through redevelopment of existing dams as multi-purpose dams, it is necessary to cooperate with KRCC. For the sake of smooth cooperation with KRCC, in the case of redevelopment of the existing agricultural dams, setting the right of dam usage free of charge and exempting the dam maintenance cost could be considered an excessive benefit.

However, it would be necessary to acknowledge the right which KRCC has prevailed in the river basin for a long time, because the dam sites already occupied by KRCC are very advantageous position geographically in terms of water resources utilization. Technically speaking, KRCC would not have even more benefits than before, even if the right of dam usage and the exemption from yearly maintenance cost in the redeveloped multi-purpose dama are given to KRCC. In conclusion, K-water and KRCC will be able to implement successful dam redevelopment cooperation projects and reach the win-win situation through revising the Dam Construction Law.

In Korea, the rapid growth of the industry in the past required a large amount of water, so the water policy of multipurpose dams for large scale water supply has been promoted. At present, the need for large-scale water-related facilities such as large

multipurpose dams has greatly reduced nationwide, but the need to respond to abnormal floods and frequent droughts due to climate change has increased. Under these circumstances, it would be good to maximize the utilization of existing water facilities in Korea from the point of view of integrated water resources management. Above all, we advise the dam policy to utilize agricultural dams as multi-purpose dams through redevelopment of existing agricultural dams.

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