

**AN ANALYSIS ON THE REVIEWED RESULTS CONDUCTED BY THE
DAM PRELIMINARY-REVIEW COUNCIL FOR TIMELY LAUNCH AND
COMPLETION OF DAM PROJECTS (2013~2017)**

By

YUN, Ju Hyun

CAPSTONE PROJECT

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

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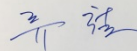
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Abstract

Due to the fierce opposition of stakeholders such as local residents, NGOs, and local governments, many dam projects have been canceled in the past, and still, a lot of new dam projects have been canceled or delayed. For the purpose of solving this problem, the government amended the law so that the dam projects can be put forward only after resolving all conflicts with stakeholders, and the **Dam Preliminary-Review Council (DPRC)** was launched as the conflict management organization. This council has to deal with technological, economic, environmental and social issues to examine dam projects, among them conflict management is addressed in the social issue.

Although it was expected that the dam projects would no longer be canceled or suspended, the results so far are very disappointing. From 2013 to 2017, nine dam projects have been proposed, among them, only three projects could get positive reports, one of them was canceled, and five projects have been still delayed. This result shows that technological, economic and environmental issues are as important as social issues and at the same time it means that the uncertainty in DPRC's examination is larger than before.

Thus, **this paper aims to prepare perfect dam project proposals in advance.** The research paper aims to show what factors were significant that cause success and failure in the examination process of the council. Likewise, this paper will suggest a way to draw a positive report from DPRC. At the same time the final performance of this paper will be suggested as a kind of practical manual, so this research will be of interest to practitioners who are preparing dam projects, at the same time this research may have important implications for the upcoming dam projects which are essential to K-water's sustainable development.

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An Analysis on
The Reviewed Results Conducted by The Dam Preliminary-Review
Council for Timely Launch and Completion of Dam Projects (2013~2017)

Yun, Ju Hyun (201731028)

1. Introduction

As the United Nations raised the issue of water scarcity, the U.S.-based Population Action International (PAI) announced 18 water-scarce countries and nine water-stressed countries, with the rest of the countries defined as water-rich, in 1993. According to this classification, Korea is included among the water-stressed countries (Park, 2012). In addition, precipitation in Korea is constantly decreasing every year due to climate change so that the number of regions suffering from drought is increasing (K-water, 2013). Under these circumstances, additional dam construction has been suggested as the only solution for water shortage by many experts in the water resources field. However, due to the fierce opposition from stakeholders such as local residents, NGOs, and local governments, many dam projects have been canceled or delayed (refer to Table 1). If new dam projects do not obtain consent or support from stakeholders, the project will not be able to proceed. Even if the project starts, it will be accompanied by an enormous amount of social loss due to long-term arguments. Although they agree with the purpose of dam projects to some extent, they do not allow the government to build non-favored facilities in their region. Oh (2011) argues that this

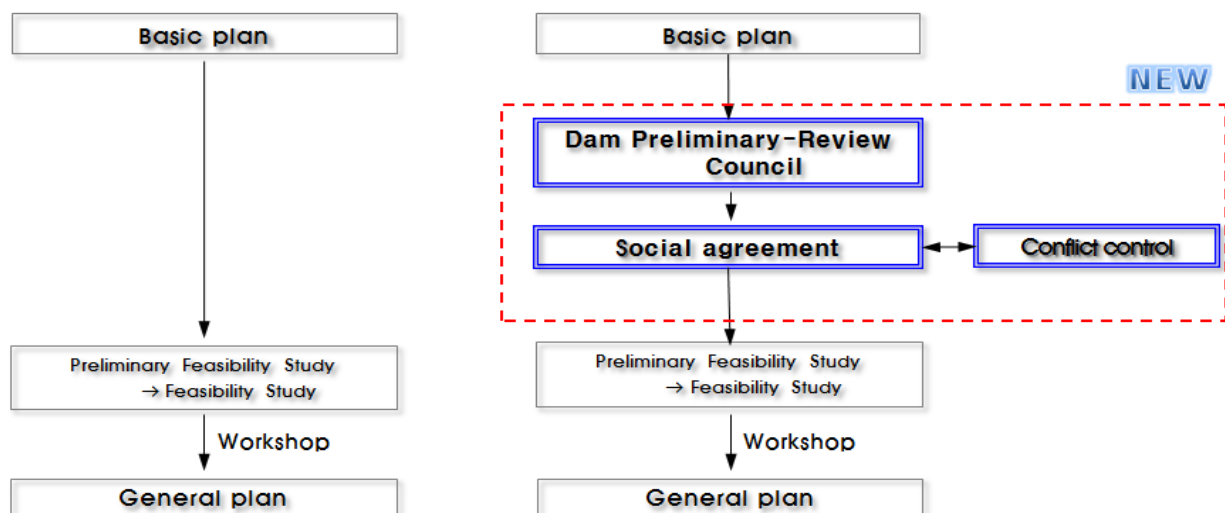
phenomenon is a bad example that the interests of specific regions and groups restrict the interests of the whole country.

Table 1: Conflict cases of a dam project.

Residents	NGO	Local Gov.
Loss of hometown Migration, Livelihood	Environment damage Effect on ecosystem, Consent	Political decision, Property rights Damage area and beneficiary

For the purpose of solving this problem, the government amended the law so that the dam projects can be put forward only after resolving all conflicts with stakeholders, and the **Dam Preliminary-Review Council (DPRC)** was launched as the conflict management organization (refer to Figure 1).

Figure 1 Improvement of dam project procedure.



This council deals with technological, economic, environmental and social issues to examine dam projects; conflict management is addressed in the social issue. According to the

revised law, DPRC can submit a positive report to the Ministry of Land, Infrastructure and Transportation (MOLIT) only if conflicts with stakeholders related to the dam project have been completely resolved. Likewise, MOLIT needs to get a positive report from DPRC in order to proceed with the dam project. Although the positive report is not absolutely essential for launching the project, the report is open to the general public through the DPRC homepage, therefore MOLIT should take the risk to proceed with the project despite the negative report.

As conflicts with stakeholders could be resolved through DPRC, it was expected that the dam projects would no longer be canceled or suspended, however, the results so far has been very disappointing. From 2013 to 2017, nine dam projects have been proposed, and, among them, only three projects received positive reports, one of them was canceled, and five projects have been still delayed (refer to Table 2).

Table 2: Proposed dam projects list from 2013 to 2017

No.	Name of Dam	Proposer	Purpose	Proposal Date	Conclusion
1	Dae-Doek	Gim-Choen City	Flood Prevention	2013-12-06	Positive
2	Bong-Hwa	Bong-Hwa County	Flood Prevention	2013-12-06	Positive
3	Won-Ju	Won-Ju City	Flood Prevention	2013-12-06	Positive
4	Young-Yang	MOLIT	Multi	2014-07-07	Canceled
5	Dal-San	MOLIT	Multi	2014-07-07	Delayed
6	Moon-Joeng	MOLIT	Multi	2014-07-07	Delayed
7	Gil-Gok	Wool-Jin County	Flood Prevention	2017-07-03	Delayed
8	Hom-Gol	Gang-Jin County	Flood Prevention	2017-07-03	Delayed
9	Hang-Sa	Po-Hang City	Flood Prevention	2017-07-03	Delayed

Even though the resolution of conflicts was not the main reason for cancelation or delay, still a large proportion of dam projects has difficulty in getting a positive report from DPRC. This result shows that technological, economic and environmental issues are as important as social issues and at the same time it means that the uncertainty in DPRC's examination is larger than before. Therefore, it is very important for a new dam project to pass the DPRC's examination without failure in order to solve the serious water shortage problem of our country. Thus, this paper aims to prepare perfect dam project proposals in advance. It aims to do this by addressing the following questions: 1) What has caused the negative evaluation from DPRC? 2) What was the main issue in each category? 3) What kind of tendencies does an examination council of outside experts have? 4) What was the most important reason for the recently delayed cases?

The topic of this research paper is analyzing on the reviewed results conducted by DPRC. Once a dam project gets a negative report from DPRC, the project would be impossible to proceed any more. Therefore it is very important to prepare the proposal and to meet the requirements in advance so that the project does not fail. The research paper aims to show what factors were significant that caused success and failure in the examination process of the council. Likewise, this paper will suggest a way to receive a positive report from DPRC. Therefore, this research may have important implications for upcoming dam projects which are essential to K-water's sustainable development.

The examination is divided into four categories: Technology, Economy, Environment, and Society (refer to Table 3). Each category is examined by the most authorized experts selected from universities, related institutions, NGOs and government-affiliated organizations.

Practitioners have faced some difficulties in preparing proposals. For example, there are not many cases accumulated yet, furthermore, all the evaluations are conducted subjectively. The final performance of this paper will be suggested as a kind of practical manual, so this research will be of interest to practitioners who are preparing dam projects.

Table 3: Details of Examination Categories in DPRC

Category	Details	
Technology	Necessity	Flood Prevention
		Water Supply
		River-Management Flow
		Other Purposes
	Propriety	Location and Development Scale
	Alternatives	Alternatives for Dam
Economy	Feasibility	Feasibility Study Evaluation
	Urgency	The losses of both life and property caused by Flood
		Damage Reduction Effect
	Regional Balance	Regional Backwardness
Level of Contribution to Regional Development		
Environment	Damage to the Environment	Protection of wildlife and Habitats
		Natural Landscape
		Water Conservation Zone
	Riparian Ecosystem	The Effort to Minimize of Ecosystem Change
		Aquatic Ecosystem Conservation
Society	Local Acceptance	Collecting Opinions from Stake Holders
		Possibility of Conflicts
	Cultural Asset	The way of Cultural Asset Conservation

Whereas, previous research in this area has only focused on analyzing conflict cases (Oh, 2011); suggesting conflict adjustment methods (Lee, 2016); mediation between

government and stakeholders (Kim, 2008), there has been no scholarship that has attempted to analyze the DPRC examination itself. Thus, this paper will focus on analyzing the DPRC examination. This research will be based just on the data obtained from DPRC including four final reports and thirty-nine conference results. The final report contains the reason in detail why the projects finally got positive or negative results. Likewise, as each conference dealt with the sensitive issues of the proposed dam projects, we can prepare a solution or fallback in advance for the next project even without the final report.

This paper is divided into two sections. In the first section, Young-Yang Dam that received the negative report from DPRC will be analyzed. Especially, in the case of Young-Yang Dam, this paper will thoroughly analyze the report of ‘Analysis on Conflict Impact’ that had caused cancellation of the project. In the second section, the three final reports that received the positive report from DPRC will be analyzed thoroughly: Dae-Deok Dam, Bong-Hwa Dam, and Won-Ju Dam. Each section will be divided into 4 parts again: Technology, Economy, Environment and Society. With these analyses, the issues of each dam project and at the same time the solutions for each of those will be provided in detail.

2. Literature Review

By the end of the 1980s, the development policies of the government such as highways, landfills and dams were accepted by the public without great resistance, even though some policies required a sacrifice of some regions. This is because, at that time, people believed that any development led by the government could give them benefits. However, the perspective of the public about development policies implemented by the government has been changing. The current development-oriented strategy is no longer

effective, due to the change of paradigm from development and growth-oriented to environmental protection and sustainability-oriented. No matter how much benefit the development can generate, the public no longer permits the destruction of the environment (Kim, 2008). In addition, the development of IT technology has made it easier for the general public to obtain a lot of information associated with government works, and as the level of education and awareness of the public improved, the government's one-sided policy implementation like the past is not effective anymore (Lee, 2016). As the level of democracy in Korean society developed, it is essential to persuade all stakeholders. Without the participation of all stakeholders such as local residents, NGOs and local governments in the policy-making procedures, any project cannot succeed.

Not only in Korea, but also in many countries around the world today, stakeholder participation has contributed to public acceptance of the decisions associated with dams and development. Although there is no guarantee that public participation in a decision-making process will prevent conflict or lead to broad public acceptance of a dam project, there is evidence that good practice can both reduce the scope of conflicts and improve decisions (Baldwin & Twyford, 2007). Therefore, Baldwin (2007) argues that: “Although participation did not prevent the development of the dam or lead to its widespread acceptance, it did serve to mitigate some of the adverse impacts of the development” (p.3). For example, the Kotmale project in Sri Lanka expanded the time allowed for discussion and consent due to opposition arising from concerns about the effect of a dam on scenic waterfalls, about instability and erosion, and about the necessity of relocating 600 families.

Before proceeding further, it is necessary to clearly define the key terminologies referred to in this paper. In particular, we should clarify the meaning and the history of DAD

and DCPS. In the past, without serious consideration of conflict management, MOLIT (K-water) had proceeded a lot of dam projects. As a result, many dam projects such as Yeong-Wol Dam, Yeong-Yang Dam and Hantan River Dam caused tremendous social conflicts and among them, Yeong-Wol Dam and Yeong-Yang Dam were eventually canceled. Since the **DAD (Decide-Announce-Defend)** method was applied to all of these dam projects, it was not easy for these dam project to manage conflict.

DAD is one of the traditional conflict management methods in the public sector. This method is a closed approach to conflict management, where the government excludes a large number of stakeholders in the decision-making process and allows only a small number of experts to join the process. Cheonggyecheon Restoration Project is a representative example that applied the DAD method (Park, 2006). Even though this method has a strong point in proceeding projects fast and efficiently, this method has caused a lot of conflicts in the past due to its unilateral way of decision making.

A lot of previous studies and failed cases above show that DAD method is a fallacious in managing conflicts, so the **Deliberative Citizen Participation System (DCPS)** was highly recommended as a new conflict management method in the public sector (Oh, 2011). The DCPS is an alternative conflict management method in which citizens can participate in a decision-making process so that a lot of social conflicts have been solved by this method so far. Because of this democratic way of problem-solving, DCPS is becoming important among recent democratic societies (Ha, 2009). In the same vein, MOLIT established DPRC, a conflict management organization, to manage conflicts caused by dam projects in 2013.

The purpose of this study is not to identify the fundamental reason for conflicts and suggest a solution. Instead, this study will only focus on the technical skills to get a positive

report from DPRC so that K-water can rapidly progress with dam construction. Many previous studies have been done about the management conflicts generated by dam projects (K-water, 2013). However, the solutions found out in previous studies could not be applied to every case elsewhere, because each dam project has its own problems and situations were various. It is beyond the scope of this paper to study about the management conflicts since these have been the subject of previous studies. Instead, this paper focuses on the reasons that caused delays and cancellations in the progress of DPRC examination. For practical considerations, this paper is limited to analysis on the results of DPRC's examination to get a positive report without failure.

3. Methods

This study uses the '**Case Study Method**' which intensively analyzes specific cases that have occurred in the past. The case study method is a form of research that helps solve problems by intensively describing the characteristics of a phenomenon through an example case. This method is also useful for both academic research and practical use because it provides a basis for practical concepts, hypotheses and laws, and enables collecting and reviewing cases to enable the application and integration of multiple disciplines (Lee, 2006). A case study is expected to capture the complexity of a single case, and the methodology which enables this has developed within the social sciences. Such methodology is applied not only in the social sciences, such as psychology, sociology, anthropology, and economics, but also in practice-oriented fields such as environmental studies, social work, education, and business studies (Johansson, 2003).

The data collection method used in this study is “The Literature Survey and Interview”. First, in order to establish the logical direction of case study through literature survey method, previous research contents were analyzed and re-examined through literature review. The best way to identify hypotheses that have been discussed in previous studies is to research and analyze related literature in that field in depth. Second, the interview method is a means of obtaining direct knowledge about the social phenomenon that the researcher can experience. Particularly in this case, interviews are a very important source of useful information on conflicts related to non-favorable facilities. In this way, not only the thoughts and opinions of the interviewees related to the non-favored facilities but also facts not shown in papers can be discovered (Lee, 2006).

4. Analysis and findings

4.1. Young-Yang Dam

Proposal Date	July 2014
Proposer	MOLIT (K-water)
Purpose	<ul style="list-style-type: none"> · Supply Industrial Water for Gyeong-San City · Prevent Flood
Location	Young-Yang County, Gyeongsangbuk-do Province
Water Storage	57,000,000 m ³
Scale of Dam	Height 76m × Length 480m
Effects	<ul style="list-style-type: none"> · Water Supply: 74,000 m³/day · Flood Management: 6,000,000 m³ · Hydroelectric Power: 2.9 GWh/year

Total Project Cost	₩313,900,000,000-
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Young-Yang Dam is the first project that received a negative report from DPRC. The main reason this dam project received a negative report is because MOLIT (K-water) failed to provide the council with objective data to support the necessity of a new dam project. The council analyzed the data related to the amount of water available for use in Yeong-Cheon and Chil-Gok county's neighboring cities of Gyeong-San City. After analysis of data, the council confirmed that the lack of industrial water in Gyeong-San City could be settled not by construction of new dam but by the residual water from Yeong-Cheon and Chil-Gok. Furthermore, according to the "Multi-Regional Waterworks System Maintenance Basic Plans" established by MOLIT in 2015 and "Water Supply Basic Plan" established by Yeong-Cheon and Chil-Gok city, it is estimated that water supply will be more than the water demand in these regions until 2025 (Refer to table 4). Therefore, if Gyeong-San City makes the best use of residual water in Yeong-Cheon and Chil-Gok, it will be possible to supply enough industrial water to Kyung-San County. After all, the council concluded that construction of a new dam was not the only way to solve the industrial water shortage problem in Gyeong-San City. At last, after two years of careful review, DPRC submitted a negative report on Young-Yang Dam to MOLIT in October 2016.

Table 4: Water over/shortage in 2030 according to Water Supply Basic Plan.

Name of Plan	Over and Shortage
Multi-Regional Waterworks Maintenance Basic Plan (established by MOLIT in 2015)	Gyeong-San City: 32,000 m ³ /day (-) Young-Cheon City: 32,000 m ³ /day (+) Chil-Gok County: 72,000 m ³ /day (+)
Water Supply Basic Plan (established by Young-Choen City)	Young-Cheon City: 19,000 m ³ /day (+)

Water Supply Basic Plan (established by Chil-Gok County)	Chil-Gok County: 61,000 m ³ /day (+)
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At the same time, regardless of a negative report, the council requested MOLIT to conduct following-up measures. First, MOLIT should actively engage in cooperation with related local governments and ministries to supply residual water of Yeong-Cheon City and Chil-Gok County to Gyeong-San City. Second, MOLIT should make efforts to find alternatives with local governments and residents in order to prevent flood damage in Gyeong-San City, and supply water for keeping river flow and provide it to Young-Yang County. Third, it is recommended that MOLIT should find out a resolution to smoothen conflicts generated by Young-Yang Dam project, and to increase acceptability of stakeholders with DPRC decisions.

Another reason for the cancellation of the Young-Yang Dam project is conflict with stakeholders. In order to resolve the conflicts among stakeholders caused by the construction of Young-Yang Dam, MOLIT conducted a survey on these conflicts. This survey was conducted through direct visits to related institutions, local governments and local residents, and interviews with field surveys. As a result of the survey, the major stakeholders suffering from conflicts and the reasons that caused these conflicts are as follow.

Stakeholders	Reasons for Con (Pro)
MOLIT	<ul style="list-style-type: none"> · Prevent Flood · Supply water to water scarcity region · Control national water quantity

Ministry of Environment	<ul style="list-style-type: none"> · Destruction of ecosystem · Incorrect estimated data: flood damage, water deficit
Local Government	<ul style="list-style-type: none"> · Prevent Flood · Activation of the underdeveloped local economy
NGO	<ul style="list-style-type: none"> · Destruction of ecosystem · An effect of flood prevention is low · Cost Benefit calculation result is poor
Residents (pro)	<ul style="list-style-type: none"> · Activation of the underdeveloped local economy · High land compensation, Flood Prevention
Residents (con)	<ul style="list-style-type: none"> · Agricultural damage · Low land compensation · Relocation of families

The MOLIT has proposed the following solutions for the successful dam project after the conflict investigation. First, conflicts between government ministries such as MOE and MOLIT adjust conflicts through the mediation of the Office of the Prime Minister, a senior organization. The two ministries must follow the decision of the Office of the Prime Minister. Second, MOLIT holds occasional public debates with local residents and NGOs to know why they are opposed to the dam project. At the same time, experts in the objective position should participate in this debate to make the debate fair. Third, economical and technical benefits that can be achieved through the dam construction should be recalculated objectively through the specialized agencies. NGOs and residents opposed to the dam construction distrust the data MOLIT provided, so the agency should strive to produce data that is fair and accurate. Fourth, MOLIT should invent an efficient way for stakeholders to provide accurate information at all times so that they do not oppose dam construction with inaccurate information.

The failure of Young-Yang Dam project left K-water with several damages as follows. First, the failure of the dam project caused K-water to incur huge sunk-cost such as money, time and efforts. From 2012 to 2016, about 1 billion KRW was invested in the feasibility study, basic design and other activities. The total cost is expected to reach several billion KRW if labor costs and other incidental expenses are included (K-water, 2013). Second, Young-Yang Dam project caused serious conflicts with stakeholders, especially local residents and NGOs, so that it resulted in a lot of social costs. This social cost cannot be accurately estimated by money, but it is an obvious big national loss. Third, Young-Yang Dam project gave the general public a negative impression of K-water. The public viewed K-water as an organization that proceeds with projects only for its survival and, not for the nation or the people. This kind of distrust of K-water is expected to be a significant barrier in proceeding with a new dam project in the future by generating blind opposition to dam project among people.

K-water should make sure to prepare the following aspects for the new dam project in the future after the Young-Yang Dam project failure case. First, K-water should thoroughly review basic data such as the amount of residual water in neighboring cities of dam site in advance, when they launch a new dam project. If this kind of review had been conducted in advance, Young-Yang Dam project would have not been proposed, and a lot of problems such as conflicts with residents, sunk cost loss also would have not occurred. Second, it is necessary for K-water to persuade stakeholders that the dam construction is an urgent facility not only to settle water scarcity but also to prepare for floods and droughts. Young-Yang Dam project got a negative report from the council because these types of urgent reasons were not highlighted in the proposal. Third, it is necessary for K-water to provide

stakeholders with sufficient data related to the necessity of dam construction in advance; these efforts can prevent stakeholders from holding negative opinions about dam construction.

4.2. Dae-Deok Dam

Proposal Date	December 2013
Proposer	Gim-Cheon City
Purpose	Flood Prevention in Gim-Cheon City
Location	Gim-Cheon City, Gyeongsangbuk-do Province
Water Storage	15,800,000 m ³
Scale of Dam	Height 38m × Length 180m
Effects	Flood Management: 15,800,000 m ³
Total Project Cost	₩82,200,000,000-

The opinions of the council for each category on Gim-Cheon City's Dae-Deok Dam project proposal are as follows.

Technology

The Gam stream watershed in Gim-Cheon City is an area where huge flood damage has been continuously inflicted by typhoons every year. Especially, there was a significant loss of life and property throughout the watershed when the typhoons Rusa in 2002, typhoon Mae-Mi in 2013 and typhoon San-Ba in 2012 occurred. Even though the stream had been constantly maintained whenever flood damages occurred, Gim-Cheon City had to declare a 'Special Disaster Area' when the typhoon San-Ba occurred in 2012. In addition, stream

maintenance was limited by the urban development of the Gam stream watershed and a large number of bridges across the rivers. Thus, it was clear that river maintenance could not be an alternative to dam construction, so there has been a need for another effective solution to prevent the Gam stream watershed from flood damage. Since the late 1990s, it has been constantly argued that the new dam construction is desperately needed to prevent flood damage in the Gam stream watershed. In conclusion, the construction of Dae-Deok Dam is technically feasible considering the current status of flood damage in the Gam stream watershed, limitations of maintenance on the watershed, and a lack of alternatives.

Economy

Alternatives to the dam construction, such as river maintenance, bypass stream, dredging the stream bottom, and reservoirs, are less economical than dam construction. First, river maintenance is not an effective way due to watershed development and many bridges across rivers. Furthermore, in case of a bank revetment, the total project cost is about 85 billion KRW, which is 32.6 billion KRW more than dam construction cost (K-water, 2013). Second, in case of bypass stream, even though effectiveness is the same as dams, the cost of construction is much higher than that of a new dam. Third, although the flood protection effect of dredging is relatively good, it needs to be conducted every year. Fourth, in case of reservoirs, it is not easy to find a suitable site and it also needs an enormous amount of land compensation. Therefore, dam construction is the most economical not only for preventing floods, but also for creating various added value such as utilization of tourism resources around dams.

Environment

Gam stream is one of the major streams that plays an important role in supplying sand to the Nak-Dong River system, hence Dae-Duk Dam should be designed as an open dam that keeps stream flow. This will allow the sand flow not be blocked, combined with a facility to discharge the sand downstream. Generally, since the river ecosystem changes from a flowing water environment to a stopped water environment after dam construction, side effects such as changes in river fauna and flora and disconnection from the dam external ecosystem are expected. Therefore, it is required that the ecosystem and habitat changes of Dae-Deok Dam are continuously monitored after dam construction.

Gim-Cheon City submitted the basic survey results to the council based on the “National Natural Environment Survey Report (2000)” by the Ministry of Environment and the “Gim-Cheon Stream Basic Plan Report (2010)” by the Busan Regional Management Administration. Therefore, Gim-Cheon City should carry out an ‘Environmental Impact Assessment (EIA)’ to figure out how much the dam impacts the Gam stream watershed ecosystem. After on-site survey, and if even one of the legally protected species is found around Dae-Deok Dam, ecological restoration measures such as alternative habitats and ecological transportation paths should be taken.

In addition, compared with the existing dams that remove all the trees below the maximum water level of the dam, the ‘Flood Control Dam’ like Dae-Deok Dam temporarily stores water in the flood season, Gim-Cheon City should analyze the effect on the plant ecology at the time when the inner site of the dam is drowned in the water, and devise ways to minimize the amount of logging. It is expected that fine dust, noise, vibration, soil loss and so on will occur during the construction of the dam. Therefore, it is necessary for Gim-Cheon

City to establish a pollution prevention plan such as an installation of a dustproof device, soundproof wall and soil loss prevention membrane in advance. In addition, Gim-Cheon City should pay attention to the ecosystem damage caused by low-temperature discharged water from Dae-Deok Dam.

Gim-Cheon City should establish a construction plan to make Dae-Deok Dam in harmony with the surroundings and restore the damaged plants due to the construction. Dae-Deok Dam should be constructed with an eco-friendly method to harmonize human and nature. There is another dam, Bu-Hang Dam, not far from Dae-Deok Dam. After the construction of Dae-Deok Dam, these two dams are expected to have a great influence on the ecosystem such as local weather and water quality. Therefore, in carrying out the EIA of Dae-Deok Dam, Gim-Cheon City should analyze the evaluation data in conjunction with the EIA after Construction, and try to minimize the impact on the environment.

□ Society & Culture

Gim-Cheon City and City Council strongly desire Dae-Deok Dam construction, and local residents are generally in favor of dam construction, so the social acceptance of Dae-Deok Dam is very strong. However, the possible conflict causes still remain such as differences in interests between upper stream and lower stream residents, compensation for migrants, livelihood measures for migrants, and crop damages.

Gim-Cheon City should give sufficient explanation about the necessity of dam, limitation caused by dam construction, and infringement of property right to a small number of people who oppose the construction of a dam at a public hearing. In the same vein, Gim-

Cheon City should consider the opposing minority opinions to be more important than the majority opinions in favor of dam construction to prevent conflicts. Similarly, Gim-Cheon City should strive to prevent conflicts by collecting opinions of local residents through DPRC and sharing information with them. When conducting feasibility studies and EIA in the future, it is also important to collect opinions and share information.

On the other hand, in accordance with Article 36 and Article 40 of the current law ‘Dam Act’, the supporting project for the residents in the surrounding area of a dam is limited to a reservoir area of 2 million m² and a capacity of 20 million m³ or more. However, it is necessary to revise the law so that the residents in the surrounding area of small dams, such as Dae-Deok Dam, can enjoy benefits such as livelihood improvement subsidies as well. When it comes to cultural property, it is confirmed that there is no cultural property to be preserved or relocated in the planned dam construction area.

4.3. Bong-Hwa Dam

Proposal Date	December 2013
Proposer	Bong-Hwa County
Purpose	Flood Prevention in Bong-Hwa County
Location	Bong-Hwa County, Gyeongsangbuk-do Province
Water Storage	4,500,000 m ³
Scale of Dam	Height 52m × Length 300m
Effects	· Flood Management: 2,800,000 m ³ · Water Supply: 9,315 m ³ /day
Total Project Cost	₩39,600,000,000-

The opinions of the council for each category on Bong-Hwa County's Dam project proposal are as follows.

□ Technology

Woon-Gok stream watershed in Bong-Hwa County, like Gim-Cheon city, is an area where huge flood damage has been continuously inflicted by typhoons every year. Especially, there was a huge loss of life and property throughout the watershed when the typhoon Rusa in 2002 and typhoon Mae-Mi in 2013 occurred. Even though the stream was constantly maintained whenever flood damage occurred, a local heavy rain has caused a lot of damage in this watershed. Bong-Hwa County eventually declared a 'Special Disaster Area' when the local heavy rain occurred in 2008, after then residents have lived with anxiety.

Woon-Gok stream watershed is classified as a region with a high flood risk in the 'Long-term Plan for Water Resources' published by MOLIT. The necessity of dam construction in this area was acknowledged by the MOLIT, so that the Bong-Hwa Dam was included in the 'Long-term Plan for Dam Construction'. The amount of water flowing in the Woon-Gok stream as of now would be about twice as much as the amount of water that was expected in the 'River maintenance Basic plan' made by MOLIT. While the 2008 floods in Woon-Gok, Bong-Hwa County has restored the stream embankments based on the 'River Maintenance Basic plan', its ability to defend floods is still weak. It was confirmed that the Council reviewed the estimated flood volume ($1,327 \text{ m}^3/\text{s}$) and the flood control effect of Bong-Hwa Dam ($0.33\text{m} \sim 0.51\text{m}$) submitted by the Bong-Hwa County. In addition, Bong-Hwa Dam can supply the necessary water ($470 \text{ m}^3/\text{day}$) to the 'Baekdudaegan' arboretum locating nearby the dam as well as can prevent flood damage.

The results of the review on several alternatives to the Bong-Hwa Dam are as follows. First, the way to heighten the stream embankment is practically impossible because it affects nearby apartments, interferes with the railway, and requires 5 addition bridges. Second, it is difficult to secure space for the detention pond due to the steep flow and the narrow slope. Furthermore, even if developed, the flood control quantity of the detention pond (47,000 m³) is much smaller than Bong-Hwa Dam (2,800,000 m³). Third, it is difficult to develop the agricultural reservoirs located upstream of the Woon-Gok Stream, because they are located on the plains. In addition, this reservoir is not suitable for flood control use because the water storage capacity is less than 10,000 m³.

□ Economy

Given the geographical characteristics and social acceptability, it is not feasible to implement flood defense alternatives other than dams, such as development of agricultural reservoirs, stream watershed reservoirs, river maintenance and so on. Most importantly, all alternatives are not appropriate ways to prevent a flood.

Extending the stream width and raising the embankment cause various problems such as interfering with railways and bridges, wasting national finances, and transferring large-scale residents. In particular, the construction cost of the embankment is about 39.4 billion, which is more than KRW12.1 billion more than dam construction cost of 27.3 billion KRW.

Bong-Hwa County should try to create diverse benefits such as a revitalization of the local economy and a job creation by making a connection between the dam and the ‘Bong-

Hwa Development Plan’. In addition, Bong-Hwa County should shape its plan of making full use of dams as tourism resources.

□ Environment

Bong-Hwa County submitted the survey results to the council based on the “National Natural Environment Survey Report (2007)” by the Ministry of Environment and the “Prior Environmental Review Report of the National Baekdudaegan Arboretum (2010)” by the Korea Forest Service. Therefore, Bong-Hwa County should carry out an ‘Environmental Impact Assessment (EIA)’ to figure out how much the dam impacts on the Woon-Gok stream watershed ecosystem, after on-site survey, and if even one of the legally protected species is found around Bong-Hwa Dam, ecological restoration measures such as alternative habitats and ecological transportation paths should be taken.

At the same time, Bong-Hwa County should take measures to protect four kinds of legally protected animals - Mandarin Duck, Scops Owl, Kestrel, Otter - known to live in the Woon-Gok stream and should seek expert advice from EIA step to find out how to protect them. Although the planned dam construction site is more than 2km away from the animal and vegetation protection area designated by the Ministry of Environment, in terms of environmental importance this area is highly valuable, so Bong-Hwa County should try to minimize ecosystem damage.

Since there are residents who worry about the effects of fog and cold weather on agriculture due to dam construction, Bong-Hwa County needs to establish measures to minimize damage and share information with residents. Bong-Hwa County should establish a

construction plan to make Bong-Hwa Dam in harmony with the surroundings and restore the damaged plants due to the construction. Bong-Hwa Dam should be constructed with an eco-friendly method to harmonize human and nature. Generally, the river ecosystem changes from a flowing water environment to a stopped water environment after dam construction. The resulting side effects such as changes in river fauna and flora and disconnection from the dam external ecosystem are expected. Therefore, it is required that the ecosystem and habitat changes of Bong-Hwa Dam should be continuously monitored after dam construction.

Since Woon-Gok and Wol-Nho stream may have a negative impact on stream ecosystems due to a decrease in river water during periods of low precipitation, sufficient water must be continuously supplied to these rivers with the construction of Bong-Hwa Dam. According to recent media reports, the groundwater near the dam construction site is inadequate for drinking water because there is a lot of lime and iron, so construction of Bong-Hwa Dam is very necessary, in terms of safe drinking water. It is also necessary to acquire data on changes in water quality of ground-water and surface-water after dam construction.

Based on the Environmental Impact Assessment Act, Bong-Hwa County should conduct ‘Strategic Environmental Impact Assessment’ at the feasibility stage and EIA at the implementation stage. In addition, Bong-Hwa County should collect opinions from local residents, local environmental NGOs, and environmental experts at each stage to minimize damage to the ecosystem around the dam.

Society & Culture

The contents is almost same as that of Dae-Deok Dam project.

4.4. Won-Ju Dam

Proposal Date	December 2013
Proposer	Won-Ju City
Purpose	Flood Prevention in Won-Ju City
Location	Won-Ju City, Gang-Won Province
Water Storage	1,100,000 m ³
Scale of Dam	Height 39m × Length 183m
Effects	Flood Management: 1,100,000 m ³
Total Project Cost	₩42,100,000,000-

The opinions of the council for each category on Won-Ju City's Dam project proposal are as follows.

Technology

The Won-Ju stream watershed has been continuously suffering flood damage due to heavy rainfall and typhoon due to recent climate change. So many experts have encouraged governments to build dams in this area to prevent flood damage. Since there are many residential areas, scattered small factories and many bridges across the stream, there is a limit to prevent floods in the watershed just with stream maintenance construction.

As a result of the scrutiny of expected flood volume conducted by the council, it was confirmed that the flood damage reduction effect from Won-Ju dam construction was huge. Furthermore, Won-Ju Dam is an open type dam, so it does not interfere with the flow of

water, and it is expected that damage to an ecosystem will not be significant since most of the areas that are submerged in water after dam construction are farmland.

Economy

As alternatives to the Won-Ju Dam, such as the bank elevation, the widening of the river width, and the watershed reservoir are economically inferior to the dam construction because of the extra cost due to interference with existing facilities. In case of the bank elevation, the rough construction cost is 27.4 billion KRW, which is similar to the dam construction cost 29.2 billion KRW, but the total cost is more than that of dam construction due to additional construction cost such as road, bridges, relocation of residents, draining facilities. In case of the widening of the river width, it is practically impossible, since there are many residential areas, scattered small factories and many bridges across the stream. In case of the watershed reservoir, the rough total construction cost is 680 billion KRW, so it is economically not feasible.

Won-Ju City should try to create diverse added values such as a revitalization of the local economy and a job creation. In addition, Won-Ju City should shape its plan of making full use of dams as tourism resources.

Environment

The contents is almost same as that of Dae-Deok Dam project.

Society & Culture

The contents is almost same as that of Dae-Deok Dam project.

5. Conclusion

Before this study begun, it was expected that the critical reason for the final cancellation of the Young-Yang Dam project was the failure to manage conflicts with stakeholders such as local residents, NGOs and local governments. This notion was grounded on the ample media coverage that there has had a difficulty in dam business due to the opposition of local residents and NGO's. However, research has shown that the most crucial reason for the cancellation of the Young-Yang Dam project was a very minor error. That is, the data related to the water shortage proposed by business proponent K-water was not accurate. The lack of industrial water in Gyeong-San City was one of the most important reasons for the construction of Young-Yang Dam. However, the shortage of industrial water in Gyeong-San city could be settled with residual water of Yeong-Cheon and Chil-Gok, neighboring cities of Gyeong-San city.

Of course, opposition from local residents and NGOs, which resisted strongly due to property rights violations and environmental destruction, was one of the causes of dam project failure. However, this kind of conflicts with these stakeholders could have been resolved in some day with enough time. In other words, such conflicts could be solved through the conflict management system in the DPRK and the 'Local Opinion Gathering' process after the council. The problem was not the conflict, but the reason for the construction of the dam. In conclusion, K-water has been promoting the construction of dams

that were not necessary from the beginning. This was the most crucial failure reason of Young-Yang Dam business.

The data on the amount of deficient industrial water in Gyeong-San City and the amount of residual water in Yeong-Cheon and Chil-Gok were not difficult to obtain from K-water's database, and analyzing these data also did not require a high level of analysis techniques. Based on this data, therefore, the council could easily reach the conclusion that dam construction is not the only alternative. So, K-water, the largest water company in Korea, did not know about this fault or proceed the dam project in spite of being aware of it? Whatever the reason, it will cause serious problems for K-water. First, if K-water did not know the data on the deficit and surplus water, it means that K-water did not have a manual for a dam project. Without even reviewing these basic data, K-water should reflect deeply on its inexperienced ability to handle the business if it has pursued a dam project that has been put into the enormous treasury and sacrificed a lot of people. If the DPRC had not pointed this out, the Young-Yang Dam could eventually be built and cause irreversible losses. In order to prevent this kind of mistakes, it is necessary to prepare a checklist to proceed a dam project. The checklist should include all of the preliminary checks on the four areas of technology, economy, environment, and society, which are subject to review by DPRC, as well as confirmation of the shortage water volume and residual water volume. In the future, K-water should not attempt to design a dam project that is not prepared like a Young-Yang Dam.

Second, K-water cannot avoid the criticism from the people if we have been doing business while knowing these data in advance. Regardless of social and economic benefits, this is a serious problem if K-water has unreasonably undertaken the dam project only for the

survival of their organization. It is because K-water can lose credibility from the people if they seek immediate gains. Once lost credibility, it takes a tremendous amount of time for corporate to recover it. K-water is investing a lot of publicity and advertising costs to improve corporate image, but if they lose credibility in this way, all of these investments become useless. If K-water does not improve these past practices, K-water will face the great resistance of the people who are full of distrust. A high level of administrative transparency is required in order not to commit unreasonable administration caused by such organizational selfishness. In the case of the Young-Yang Dam, if the deficient water volume and the residual water volume data had been disclosed to the public, K-water would not have been promoting the dam business due to lack of industrial water in Gyeong-San City. Therefore, for transparent administration, K-water must disclose information about the proposed dam project through the DPRC website at all times.

Meanwhile, not only Young-Yang Dam, but also the successful business of: Dae-Deok, Bong-Hwa, and Won-Ju Dam, provided the following significant points. First, in the field of technology, all members of the council focused on finding alternatives to dam construction. It was confirmed throughout the final report and several meetings that the council was trying to find alternatives as much as possible rather than dam construction, which causes a lot of costs and conflicts. The alternatives for flood prevention purposes were bank revetment, stream maintenance, extending the stream width, dredging, reservoirs, and bypass stream. In addition, as an alternative for the supply of water, there was the utilization of residual water in the neighboring cities. Since Dae-Deok, Bong-Hwa and Won-Ju Dam are designed for flood prevention, alternative measures such as bank revetment, stream maintenance of these dams have been thoroughly reviewed by the council. In the case of Dae-Deok, Bong-Hwa and Won-Ju Dam, all proposed alternatives were not accepted because of

interference with existing facilities, small flood control effect, and the impossibility of technical application, so that these dam projects were approved. However, in the case of Young-Yang Dam, K-water did not prepare for such alternatives and the project was finally canceled. In the future, if K-water proposes a new dam, it is necessary to thoroughly analyze such alternatives and prepare data so that the council does not delay the time for reviewing the alternatives. In addition, K-water needs to emphasize that dam construction is a comparative advantage over other alternatives in terms of safety and environmental protection.

Second, the main debate topic in the economic field was the comparison of the economic feasibility between the various alternatives proposed by the council and dam construction. For example, in case of a bank revetment of Dae-Deok Dam, the total project cost is about 85 billion KRW, which is 32.6 billion KRW more than dam construction cost. However, if only the cost of construction is analyzed in terms of economics, it is very difficult to prevent cancellation of the dam project if an alternative has less construction cost. Therefore, it is essential to present not only the construction cost data but also the data on the added values in the future of dam construction. The added value that can be created in the future due to the construction of the dam may be such as a revitalization of the local economy, provision of a rest area for residents, and tourism resources. These intangible added values should be included in the benefits of dam construction, so that the dam project would not be canceled just because the construction cost is higher than the alternative cost.

Third, in the environmental field, there was a lot of concern about damages to the local residents due to changes in river flow, destruction of surrounding ecosystem, dust, noise, vibration and soil leakage caused by equipment operation during construction. However,

these potential damages are not a major problem at the current project review stage, as they are subject to more constant monitoring through environmental impact assessment for years after the dam construction begins. However, because pollution affecting daily life such as dust, noise, and vibration, and agricultural damage caused by fog, cold, etc., can cause local residents to strongly oppose the dam business, so K-water should fully explain solutions to the council. In addition, K-water should promote the construction of dams by accepting the concept of ecological environment and environment-friendly construction method from the initial planning stage in order to create a dam space that can harmonize human and nature.

Table 5: The result of a council review of each dams

Category	Details		Young Yang	Dae Deok	Bong Hwa	Won Ju
Technology	Necessity	Flood Prevention	N	O	O	O
		Water Supply	N	N	O	N
		River-Management Flow	N	N	O	N
		Other Purposes	N	N	N	N
	Propriety	Location and Development Scale	N	N	N	N
	Alternatives	Alternatives for Dam	X	O	O	O
Economy	Feasibility	Feasibility Study Evaluation	N	O	O	O
	Urgency	The losses of both life and property caused by Flood	N	O	O	O
		Damage Reduction Effect	N	O	O	O
	Regional Balance	Regional Backwardness	N	X	X	X
		Level of Contribution to Regional Development	N	X	X	X
Environment	Damage to the Environment	Protection of wildlife and Habitats	N	X	X	X
		Natural Landscape	N	O	O	O

		Water Conservation Zone	N	N	X	N
	Riparian Ecosystem	The Effort to Minimize of Ecosystem Change	N	X	X	X
		Aquatic Ecosystem Conservation	N	X	X	X
Society	Local Acceptance	Collecting Opinions from Stake Holders	X	O	O	O
		Possibility of Conflicts	X	O	O	O
	Cultural Asset	The way of Cultural Asset Conservation	N	O	O	O

* O: succeed to persuade, X: fail to persuade, N: not addressed

Fourth, the main issues in the social and cultural field are the management of conflicts with stakeholders, and all four dams are required to prepare for the following common issues. The dam project proposer such as K-water or local government should give sufficient explanation about the necessity of dam, limitation caused by dam construction, and infringement of property right to a small number of people who oppose the construction of a dam at a public hearing. In the same vein, a project proposer should consider the opposing minority opinions to be more important than the majority opinions in favor of dam construction to prevent conflicts. At the same time, a project proposer should strive to prevent conflicts by collecting opinions of local residents through DPRC and sharing information with them. When conducting feasibility studies and EIA in the future, it is also important to collect opinions and share information.

As a result of this study, it is now possible to provide a way to minimize the review period of the council and the work manual to the practitioners, in order to prevent cancellation of new dam projects in the future. Thus this study suggests the way to proceed dam projects more promptly and efficiently. Nowadays, the paradigm of government policy is changing from development and growth to environmental protection, and it is so hard to

expand the dam business in Korea any more. Under such circumstances, this study has a very significant meaning to K-water. In the future, practitioners preparing for the new dam project of K-water will be able to lead a more efficient and successful dam project with applying the result of this paper.

Despite these significant achievements, this study has several limitations. The biggest limitation is that the number of samples to be analyzed was too small. More than four years have passed since the commission's inception in 2013, but many projects have not been proposed because of the downturn in the dam business. In four years, the council could barely submit just four final projects to MOLIT, whether positive or negative: Young-Yang Dam, Dae-Deok Dam, Bong-Hwa Dam, Won-Ju Dam. Of course, these four samples alone would have made meaningful conclusions that would be of great help in launching the new dam project, but it is fact that four samples are still not sufficient. However, since each of the dam projects has its own background, regional characteristics, and various stakeholders, it will be difficult to apply the results of four samples to all various dam projects equally.

Therefore, following this study, it is required that additional analysis and studies on the five final reports such as Dan-San, Mun-Jung Dam are conducted. If this additional study were to be carried out, it would possible to obtain universally applicable outputs that would be available for all dams. In addition, it is also necessary to analyze council meetings held before submitting the final report for each dam several times, thus we can find out which issues have been argued and for what reason the review time has been delayed. If these weak points are addressed, we can complete the dam preparation manual, so that it will make it easier and quicker to pass the review with this manual. At the same time, further research is needed on the process of “Gathering Local Opinions”, which is the procedure after the

Council passed. This is because this procedure needs a lot of know-how and it takes a long time to obtain the final approval.

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