

Doocho Park

Ph.D, Senior Economist

Korean Water Resource Corporation

Water Resource Research Institute

dhpark@kowaco.or.kr

1. Introduction

Now, the food shortage problem that Malthus pointed out in his theory of demography has become meaningless due to the green revolution through the development of technology. This shows that the potential of humanity for unlimited technological revolution will certainly be able to solve the water problem that humans are faced with, too. However, we should recognize that the current water problem has reached the point of seriousness, which cannot be resolved by any optimistic ways. In fact pessimistic approaches may be more effective in managing water resource. If we do not prepare thoroughly for the future on account of today's abundance, it may bring about a great loss to the nation.

Many experts point out that it is more effective to manage watersheds integrally rather than to manage by regional unit when considering the unique characteristics of water resources. Up till now Korea has done its utmost to improve its capability to supply water, which has great effect on its economic development. However, there have risen various social and environmental problems as to the use of water, thereby social expenses have accordingly been rising. This means that the water use policy of Korea has positive effect on the national economic development till now, but can have negative effect on the economic development and the entire society in the future if the water resources are not managed effectively.

Diversity in the use of water has especially increased. Namely, until a while ago, men could carry out their economic activities by maintaining the rivers and lakes as they were in the nature and needed no special technology or effort to manage them. But the reality in which we are now placed is not so simple. Conflicts as to the use of water are deepening more and more, and accordingly consequential stakeholders also increase. In other words, the diversity in the use of water is becoming greater, which requires diversity in the management of water resources as well. Thus, Integrated Water Resource Management (IWRM) has been offered as a method of water resource management, and for the management of rivers, the Integrated Water Resource Management is offered by considering the diversity of an entire watershed. Because the conditions of water resources have been changed, it is natural that the management system should also change accordingly.

2. Changing paradigm of Water Resource Conditions

There are two crucial problems coming to the front related to the use of water. The first one is that the water resource becomes scarce as the essential use of water increases, and the second the consequential deterioration of water quality. In the past the amount of water that humans needed was small, which did have little effect on the circulation system of water. The water use pattern was so simple, but the amount of water used by men increase as human population increased, thereby the changing pattern in the use of water required more water. Such a social demand for water has boosted the development of the technology of water management and required various efforts for the smooth supply of water.

It cannot be denied that such efforts and technological development have great effect upon the national well-being as well as the economic development of Korea. Now, our attitude toward water resources should change. In the past water resources required humans to use them wisely but now demand us to manage them effectively. It will be our first step to the solution to water problem to recognize this fact aright. (Figure 1). The Integrated Water Resource Management which has been considered mainly by advanced countries is a process to identify various conditions which have changed with respect to water resources and to make a policy by taking them integrally into account. Therefore, information and data related to such conditions should be first collected and analyzed.

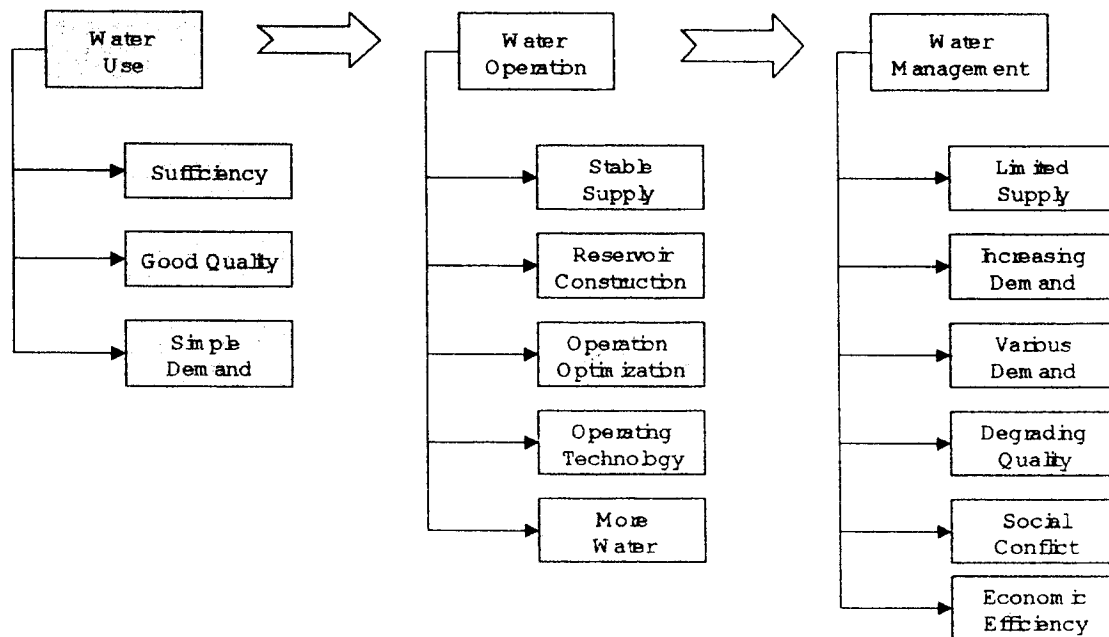


Figure 1. Changing paradigm of water environment

Water problems arise when there is shortage or too much of water. This indicates that the management system of water will become complicated as human behavior to control water resources is complicated. Water resource is not a limitless resource any longer, but has to be managed effectively. It cannot be overemphasized that water is a very valuable resource. We have

much focused simply upon the establishment of supply system and the effective operation of the system in the past whereas we erred in the management of water. Humans changed the shape of rivers to utilize them in their economic activities without fully recognizing the future possibility of flooding which can be caused by such transformations. Furthermore, it is a greater problem that the subjects of such operation have been different depending on the administration system of the regions and the government concerned. However, a new paradigm for effective management rather than a simple use of water requires that the various technological and engineering elements that were necessary for the operation of rivers should be managed effectively in an integral system.

3. Current Status of Korea' Water Resources and Water Resource Management System

Korea has experienced difficulties with the management of water resources in various aspects because of its bad natural and geographical conditions. In addition Korea is under various adverse conditions to use water resources. The foundation of Korea's economic development is the acquisition of foreign currencies through exports, so large industrial complexes has been formed. The population increase along with such developments has required the increase of water use continually. Furthermore, the industrial and residential areas are concentrated in small areas, which results in water pollution, accordingly increasing the social damage and expenses. As a result, the damage to humans and properties, which is caused by failed river management plans and floods, increases in the residential and industrial areas every year. In addition to these complicated problems rising from the water resources themselves, social disputes from Korea's social and economic problems related to water resources are becoming a harmful element to the people, and accordingly the social expenses are in the trend of increase, too. These matters are looked into more specifically as follows:

3.1 Water Resources in Korea

3.1.1 Amount of Water(MOCT, 2003)

Korea's annual average precipitation is 1,283mm a little higher than that of the world, 973mm, but the precipitation per person is only 2,705m³, 10% of 26,800 m³. The amount of water resource available to a person in Korea was about 1,550m³ as of 1998, so the situation is so serious that the Republic of Korea can be included among of the countries classified as lacking water by the UN such as Belgium, Kenya, Somalia and the Republic of South Africa. The total annual amount of Korea's water resources is 127,600,000,000 m³, the amount of which that is available by means of rivers, underground waters, dams, etc. is 33,100,000,000 m³, 26% of the total. According to the 4 steps of water stress which are classified by the UNSD based on the availability rate of water resources, the availability of the water resources is the level of Medium-High water stress (MHWS), so Korea can be said to be in a situation needing to manage the supply and demand of water.

The water use amount by sector is as follows: The water for agricultural use is 15,800,000,000

m³, 48% of the total use amount; the water for drinking, 7,300,000,000 m³, 22% of the total; the water for industrial use is 2,900,000,000 m³, 9% of the total; the water for maintaining rivers is 7,100,000,000 m³, 21% of the total. The amount of water use is steadily increasing, and if this trend continues, it is forecast that Korea's shortage of usable water will reach up to about 1,800,000,000m³, after year 2011, but some environmental organizations claim that such assumption is excessive, causing social conflicts. However, it cannot be denied that the absolute amount of water use has continually increased (Table 1).

The amount of water use continued to increase due to the population increase, national income increase, industrial development, urbanization, etc., from 5,100,000,000m³ in 1965 to 33,100,000,000m³ in 1998, which was about 6.5 times increase. During the same period, the water for agricultural use increased from 4,500,000,000m³ to 15,800,000,000m³, an 11,300,000,000m³ increase, the most of all sectors, and the water for drinking from 200,000,000m³ to 7,300,000,000m³ which is an 7,100,000,000m³ increase, and the water for industrial use from 400,000,000m³ to 2,900,000,000m³, an 2,500,000,000m³ increase, and the water for maintaining rivers increase by 7,100,000,000m³.

Table 1 Change of Water Use

	Year 1965 (100,000,000m ³ /year)	Year 1998 (100,000,000m ³ /year)	Increase (100,000,000 m ³ /year)	Increase Rate (times)
Water Use Amount	51.2	331	280	6.5
Agriculture	45	158	113	3.5
Drinking	2	73	71	36.5
Industry	4	29	25	7.3
Population(1,000)	28,705	46,430	18,355	1.62
Gross National Income(10,000 won)	40	940	900	22.5

Source: MOCT, 2003

3.2.1 Water Quality

The water quality problem in Korea was somewhat predictable. The high population density in a small land and the fast growth were telling it, but it was not easy to promote a water quality prevention policy which needs an enormous cost. But the social expense recently incurred in connection with the water pollution can rather be higher than the expense needed to reduce water pollution. After all, the situation has worsened to the state which will need an enormous amount of money if the problem is not addressed. Recently the Ministry of Environment and civic groups are making much effort, yet Korea is lacking in various aspects to have a systematic method and its implementation. The problem is summarized as follows:

First, one element of the problem is failure to achieve the goal for water quality improvement and deepening of water quality deterioration. The rivers were grouped into 194 sections according

to their use purposes, for which the water quality goals were set up and managed accordingly, but the average rate of meeting the environmental standards was only 27.8% as of year 2000, wherein the Han River was 38.5%, the highest in the rate and followed by the Geumgang River, the Nakdong River and the Yeongsangang River in descending order.

Second, another is difficulty with improving the water quality on account of the poor water handling facilities and their operation. About 39,000 waste water producers across the nation are producing about 2,618,000m³ waste water, but the investment for controlling the waste water is insufficient. The waste water disposal capacity against the waste water from livestock and people is only 50~55%, so this is still insufficient to improve water quality and to reduce pollutants.

Third, another is the deepening of the deterioration of water quality owing to the shortage of the water for maintaining rivers as times goes by. According to the Seoul metropolitan administration, this city is managing 35 rivers, and all other rivers except for the national rivers such as the Han River, the Junglan River, the Ahnyang River are dried. The reckless underground water development, the increase of the land development following the urbanization, the establishment of poor sewage pipelines, etc. have decreased the water amount of rivers, not only causing frequent river drying but also becoming a major source of water quality deterioration.

Fourth, the last element of the problem is the weak will to control the waste water and difficulty with controlling it. Water quality improvement and water quality preservation should fundamentally stop the influx of pollutants discharged by pollution sources by means of sufficient treating facilities.

3.2 Flood control

Floods give more damage to Koreans than any other natural disaster does. The damage by floods reaches up to about 86% of the natural disaster damage given to Korea. During the last decade, an average of 129 people died because of floods a year and an average of 22,320 people became flood victims. The property damage was enormous, reaching up to about 1 trillion and three hundred million won a year on average. Moreover, the expense for recovering from the damage reached up to about 2 trillion won a year. This estimation of the damage is only based on the what is seen. If the damage not seen and the aftereffects included, the damage will soar (Figure 2).

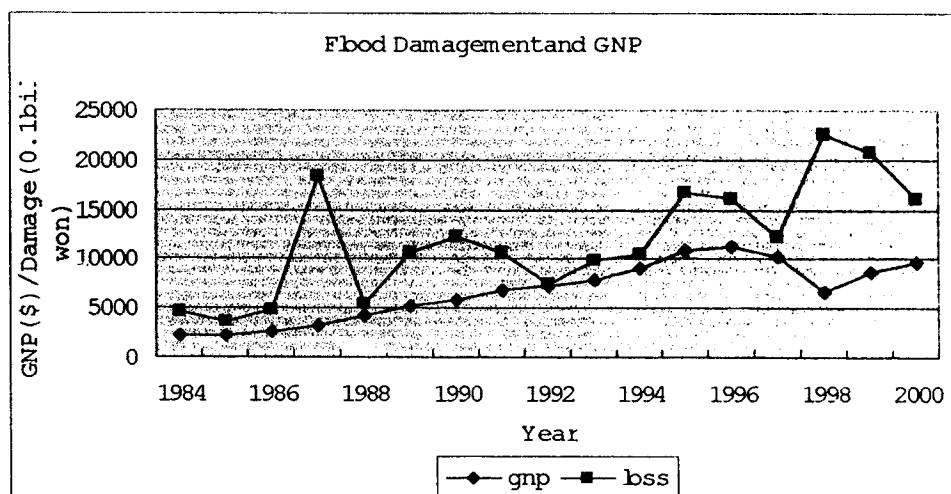


Figure 2. Flood damage and GNP

3.3 History of Water Resource Policy

The use of water resources was mainly limited to the agricultural use before 1960s. The water control policy was also relatively negative only by repairing rivers and building embankments or dikes. Large water resource development projects started after year 1960 together with the establishment of economic development plans. In 1961 the Steam & River Act was enacted, which can be said to be the beginning step of a full-fledged water control project. Recently after 1990, the policies which considered the sustainable concept of the use and management of water resources and also the ecosystem and environment have been positively applied to the management and control of water resources.

3.4 The Limitation of the Current Management System

Korea's current water resource management system has its functions dispersed to different ministries. To view largely, the water amount management is in the charge of the Ministry of Construction and Transportation, the water quality management in the charge of the Ministry of Environment, the flood management in the charge of the Ministry of Construction and Transportation and the Ministry of Government Administration and Home Affairs, the water for agricultural use in the charge of the Ministry of Agriculture, Forest and Fisheries and the water for industrial use in the charge of the Ministry of Industry and Energy. If considering the varying characteristics of water resources, the water resource management and water use management are likely distinguished by function because of the diversity of water resources.

Table 2. Development Process of Korea's Water Resource Policies

	Water Management Policy	Water Control Policy
'60	Beginning step of water resource development	Beginning step of full-fledged water control
'70	Full-fledged multipurpose water resource development due to the economic growth	Modernization step of river management method
'80	Adoption of water management function and of the concept of water quality preservation	Implementation step of water control policy by water system
'90	Strengthening of the eco-function of rivers in water resource policy	Water control implementation step of integrating the main rivers and their branches
'00	Extension of the sustainable development concept of water resources	Introduction step of the watershed management concept

What matters is that the work dispersed into various ministries is overlapping between ministries and that the coordination and cooperation between them are very poor. When IWRM concept was recently introduced, there was misunderstanding of the concept as "integration of organizations," and thus some presented objections to the concept. It is an approach which has not considered the various special characteristics of water resources to interpret the concept of IWRM as an integration of organizations although the mutual cooperation between organizations is weak. The limitation of the current management system is the very absence of coordination of the dispersed functions between organizations. Of course, there are the Water Quality Planning Board under the prime minister and the Sustainable Development Committee which is an advisory body to the President, but their coordination function and policy implementation function are still very weak. The water resource managing or controlling work related to the main function of each ministry should be conducted by the ministry, yet it needs a more systematic coordination function to maximize social convenience and benefit from the use and management of water resources.

4. The Necessity and Implementation Method of IWRM

4.1 The Concept of IWRM

The integrated approach to the development, management and use of water resources has been gaining momentum in the last few years(UNEP). This is exactly same in European Union. The Federal Ministry for the Environment (2001) introduced, as a new strategy, the integrated planning and management of water resources, which is the central element of the EC Water Framework Directive. The advent of this concept must have been caused by the recognition of the global importance of water resources and of the necessity of international cooperation between regions and nations. Then, what is the accurate concept of Integrated Water Resource Management? The concept of IWRM still remains controversial, and the accurate definition of it is varying. Therefore,

each regional or national organization should establish its own concept of IWRM by taking advantage of its own and international cooperation systems.

The Global Water Program is a process to maximize the economy and social well-being of the world by means of developing and managing water, land and their resources in a fair way without harming the ecosystem(GWP, 2000). Namely, it is a process of managing not only water resources but also all matters related directly or indirectly to water resources so as to maximize the social usage of water resources. However, what matters here is “What and how should be integrated?” The issue related to the effective management of water resources is broad and varying, but there is many limitations to the integration of all these. There may be lots of obstacles to the implementation process of IWRM such as political, social and cultural issues. The national or regional limitations to securing financial resources will be an important factor to the decision of the level of integration. Hence, it is an important task for the subject of water resource management to set up priorities on the integration by taking its financial conditions into account.

What is the background that pushed IWRM to appear? As indicated in the Dublin Principle, water resources are economic goods with economic values, that is, values that give an authority to use them by paying a certain price. Of course, they were free when their absolute use amount was small, but came to be no longer free as the available amount of water decreased and the water quality continued to deteriorated. However, the reality is that water is the most basic element to the living and economic activities of people. Therefore, the reality in general has put lots of limitations on the management of private enterprises and has made the government and public organizations supply and manage water resources. The difficulty with the management of water resources lies here. Water resources are public goods as well as economic goods. Although the government and public enterprises are taking a certain role, an efficient management of water resources can be made only when market economy is applied to it. In addition, the use of water resources generates externalities. These two factors cause the failure of market as indicated in the economics, delete resources and various disputes and conflicts in connection with water resources(Figure 3).

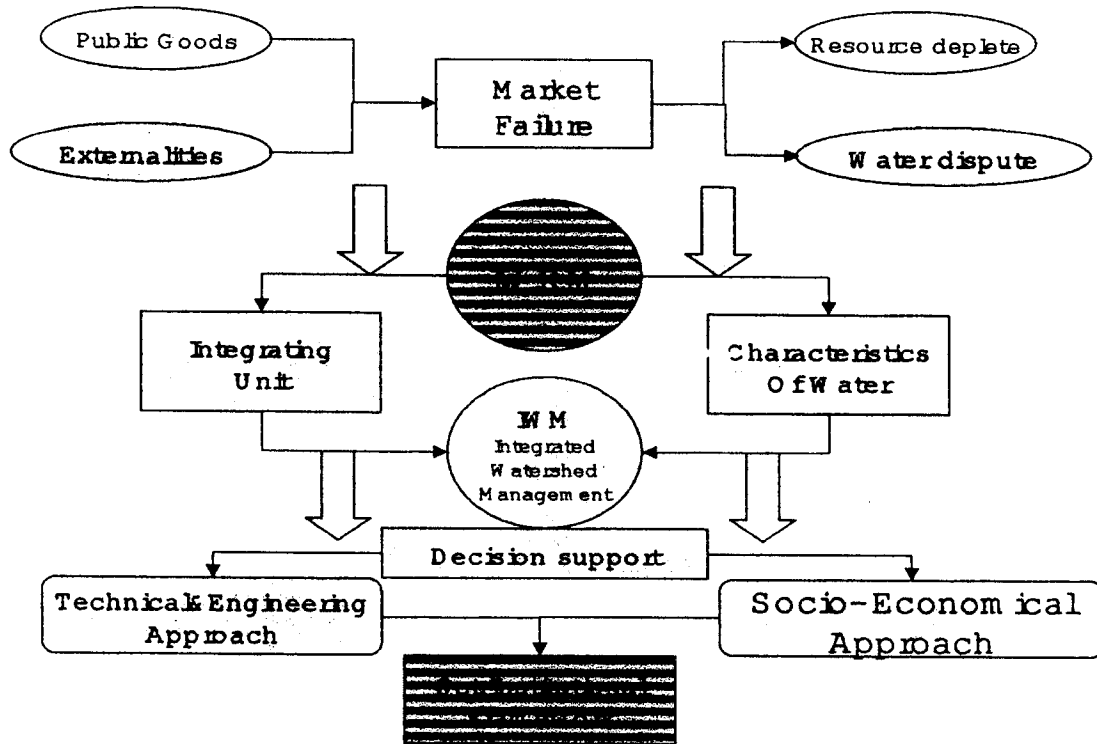


Figure 3 Cause and Implementation Process of IWRM

Therefore, it is necessary that not only the implementation step of a water resource system (design, construction and operation) but also the preparatory step (initiation and planning) should be thoroughly managed and agreed on in order to effectively manage and continually use water resources. And next, why is the term “integration” used? It is because the word “integration” gives higher goals, demands a new approach compared with the conventional ones and makes it possible to make “wise decisions.”

Consequently, the justification of adding the word “integrated” to water resource management is not only by the fact that the problem is studied in its multi-sectoral characteristic but rather that decisions were made under the integrated water resource management by systematically incorporating the conflicting aspirations of different decision makers along with the presence of competing agencies, institutions and representatives of the public into the process (UNEP).

The basic concept of IWRM like this provides the justification of the effective management and use of water resources based on the economic, social and systematical integration of water resources. Viewing from the point of economy, the integration of sectors is to remove overlapping and inefficient work and thus to maximize the social convenience and benefit of the use of water resources. Viewed from the point of society, the holistic approach to water resources can reduce the social expense and conflicts through the balanced consideration of the distribution of water resources between regions or uses. A well-organized system is very necessary in order to solve complicated problems related to water resources. Additionally, the system requires an integrated view point rather than sectoral views.

4.2 Implementation of IWRM

Strictly speaking, it is difficult to find cases of having implemented the Integrated Water Resource Management(IWRM). The concept of IWRM has just been established and come up with its general guideline for what should be integrated and how. If considering that advanced countries are comprehensively managing water resources compared with underdeveloped countries, they are making advanced integrated water resource management. Of course, although their management is not the ideal integrated management in its true sense, their accumulated experiences are good examples to us. Integrated water resource management covers very broad areas. It is not easy to make a decision on what should be integrated and how.

The USA and European countries have established an integrated watershed management system as a unit of integrated water resource management for a long time. The regional unit as an object of integration is an approach to the management of river watersheds by a management unit. Garcia(1998) wrote that the approach by means of the management of water systems or watersheds is an method of IWRM to solve disputes between competing users or uses as a participation mechanism through incentives. Here, we need to correctly identify the relation between IWRM and integrated watershed management. IWRM can be the ideal of water resource management that has been introduced very recently and recognized internationally whereas the integrated watershed management is a tool to realize the ideal.

There are four major rivers in Korea. Each river basin is connected to many local districts. In the past the management of rivers in Korea was made regionally under the central administration departments. Therefore, the system or administrative system for the management of watersheds has almost not been arranged, and there are lots of obstacles to the introduction of a watershed management system to implement integrated water resource management. Local autonomic organizations, large and small, are near the four major river watersheds, and they are accustomed to water resource management by the central or local administration organizations, so it is in reality difficult to manage watersheds. Their interests between the central government departments especially are becoming a big stumbling stone to the implementation of watershed management.

Viewed from the national dimension of water resource management, IWRM and Integrated Watershed Management(IWM) can be the most effective methods. However, as in the Dublin declaration, the important elements that should be integrated are the demanders of water resources and their stakeholders, so they should participate in the decision-making and policy-making for water resource management because any watershed management without considering the demands of local governments and residents and without their positive participation therein can be sustainable. Any watershed management without the participation of the public is highly possible to fail. The neglect of public input into risk mitigation and allocation decisions arises in major part from the way professionals have typically defined risk(Rees, 2002). Japan has focused on IWRM

after the Third world Water Forum. They also recognize the role of public participation in their Yodo River System. Kinki Regional Infrastructure Development Bureau solicits the reaction and opinions of the public to its proposals(Lake Biwa Construction Office, 2003). However, public participation is not easy for the large river basin due to the complex stakeholder in large area. Consequently, Implementation of IWRM can be approached, relatively easily, from small watersheds.

5. Integrated River Basin Management: Ahnyang River in Korea

5.1 Study Area

The Ahnyang River is the first branch of the Han River, the second biggest river of the Han River branches (Figure 4). The Ahnyang River has its watershed seven districts of Seoul City and seven cities of Gyeongido province and its river basin is about 288km² and 32.5km long. The continual increase of human population and industrial development have deteriorated the water quality of the Ahnyang River. Civic groups and residents along with the local governments came to arrange measures after having judged that the Ahnyang River is losing its function as a river. Notwithstanding, the extensions of residential areas and industrial complexes has been made without consistence and have caused a great difficulty because urbanization therein has already progressed much. Therefore, 14 local governments has made a “General Measure to Save the Ahnyang River.” As a result, the water quality is improving little by little through their control on the pollution and making additional environmental basic facilities.

The “Water Quality Counterplan Council(WQCC) consisting of the chiefs of 13 local governments and “Ahnyang River Preservation Network” consisting of civic groups especially are making a general measure. Being boosted by the efforts of the local governments, there has been made a foundation for more basic planning to better the water circulation of the Ahnyang River and to form a watershed consultation body for the Ahnyang River. This project is a process of realizing integrated water resource management through the bottom-up integrated watershed management, the first of its kind, and will surely be a good example to the integrated water resource management in other watersheds.

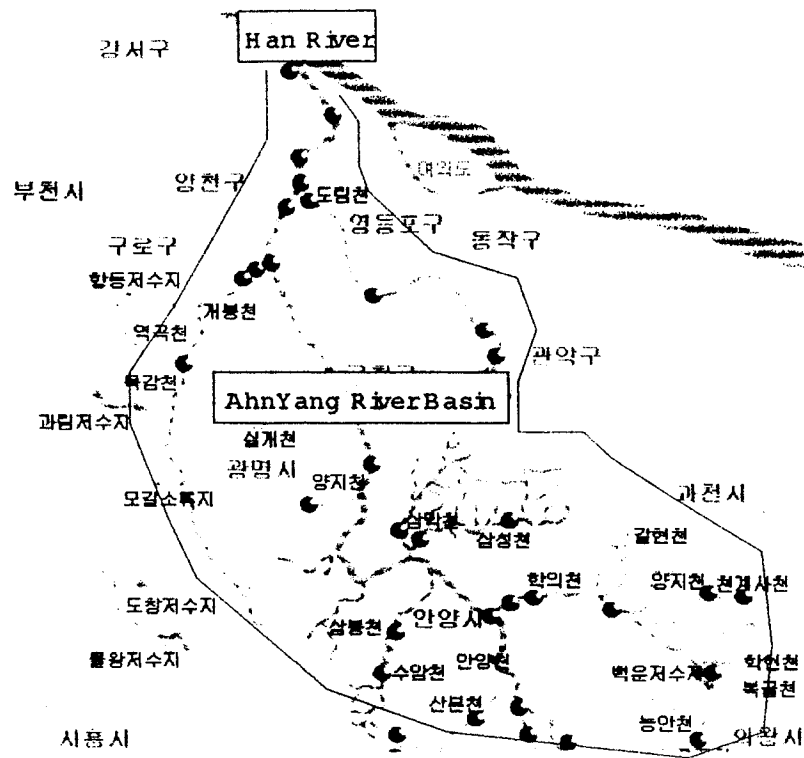


Figure 4. Ahnyang River Basin

5.2 Planning Process

The integrated watershed management plan for the Ahnyang River begins with the general assessment and survey of the Ahnyang watershed (Figure 5). The general assessment set up the objective for the project period and the strategic goal and indicator through the socioeconomic approach together with the technical and engineering approaches as the decision-making standards which are needed to achieve the objective. The integrated watershed management of the Ahnyang River will be put into operation by means of the assessment of the alternative ideas and the bottom-up agreements through constant feedbacks.

5.2.1 River Basin Assessment

It is essential to the production of effective alternatives to accurately grasp the current status of the Ahnyang River. Hence, this research project first looked into what are the problems related to the Ahnyang River. The existing water circulation system of the Ahnyang River has been destroyed owing to the increase of the urbanized land areas and of the water use as well as the change of the global climate and repairs of the river bringing the water table down and reducing the water amount of the river, thus deteriorating the preservation of the ecosystem and normal function of the river. Although recovering work on the river has been done in order to improve the deteriorated ecosystem of the urban river, the interpretation of the watershed water circulation to solve the

fundamental problem and the development of the technology for the normalization of the water circulation are still in the primitive stage. The watershed assessment of the Ahnyang River is being made by means of the technical assessment to make the water circulation healthy and the investigation of the related administrative organization, financial status and of the demand for the induction of the residents' participation.

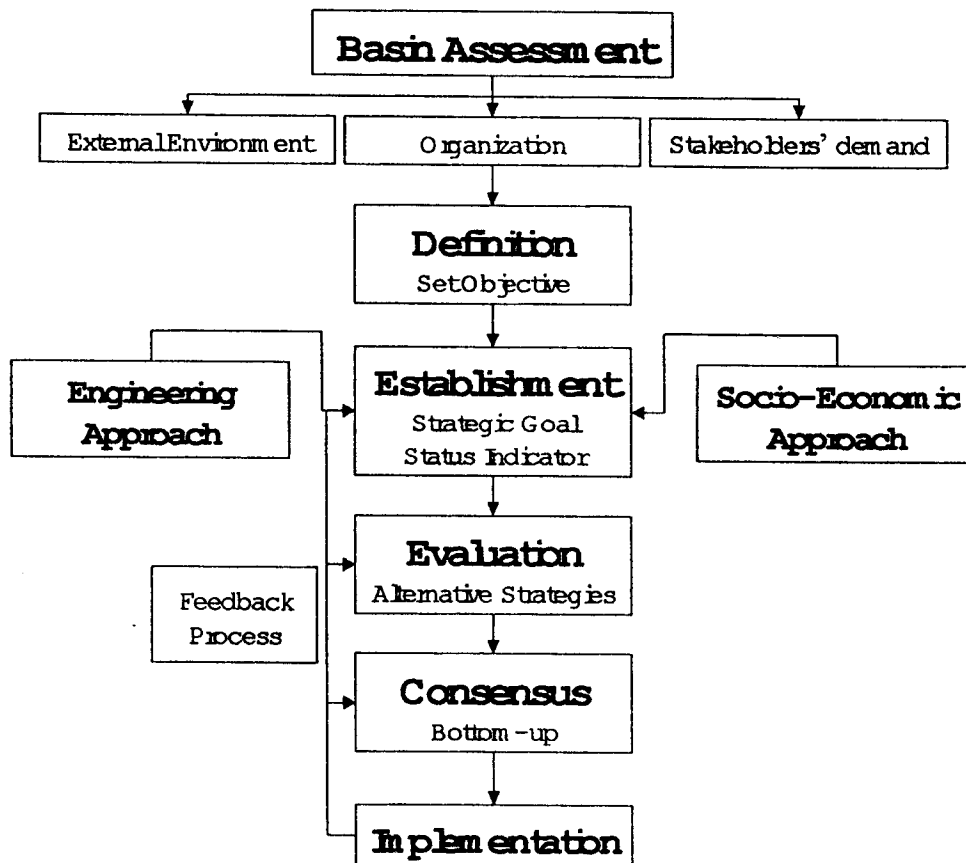


Figure 5. Planning Process of Ahnyang River Basin

5.2.2 Definition, Establishment and Evaluation

The general plan for the Ahynag River watershed centered on this research project presents the specific study objectives as follows:

First, securing the water amount to maintain the river by means of making the water circulation healthy.

Second, maintaining the water clean enough to make water-related recreation possible and preserving its neighboring ecosystem.

Third, strengthening the stable water control by means of stabilizing the basin and road of the river.

Fourth, making up the watershed council to pursue the above three objectives sustainably.

The methods to achieve these objectives are as follows: 1) continual monitoring of the water circulation of the Ahnyang River; 2) developing the technology of interpreting water circulation; 3) reviewing the alternative technologies for making the water circulation healthy; 4) establishing a website for information sharing. In addition, this study will set up sectoral indicators based on the pre-assessment to check the general conditions of the river. In other words, it will set up detailed indicators to effectively monitor and assess the changes of the river from the present conditions to when the general plan has been completed so as to establish the assessment system. Without a proper assessment system, it will not be possible to know what is going well and what is going bad in the process, and thus it will pose a great risk to make the policy fail.

5.2.3 Constitution of the Ahnyang River Basin Management Council

It has generally been agreed to establish watershed management systems for integrated water resource management in Korea, too. Now what matters is this question: How should watersheds be grouped into a unit? There are four large watersheds, which are managed directly by the central government, so the management subject of rivers includes the central ministries(the Ministry of Construction and Transportation, the Ministry of Environment, the Ministry of Industry and Energy, the Ministry of Agriculture, Forest and Fisheries, the Ministry of Government Administration and Home Affairs, etc.) and local governments(cities and provinces). Therefore, the watershed management plan for watersheds is linked to the central government's organizational system, which highly possible to arouse conflicts between the ministries. Of course, the ultimate goal of watershed management should be extended to large watersheds. However, it is difficult to establish an implementation plan for large watersheds from the beginning, and the plan is highly possible to fail as seen in cases of other countries.

Viewing from this context, watershed management can succeed only when the residents, civic groups and local governments are positively participated. The watershed management system for rivers flowing into a large watershed will, when viewed from a long term, naturally develop into a watershed management system for the large watershed. Yet Korea has not general river management system by a watershed consultation body, so this project on the Ahnyang River will become a model of watershed management system applicable to other watersheds. The atmosphere of local residents' participation in this project on the Ahnyang River is already created centered around the civic group, "Ahnyang River Preservation Network," and this request of the demanders was already formed by "Water Quality Counterplan Council(WQCC), which is a council of the chiefs of local governments, before this research project. This council is especially in charge of the survey on the Ahnyang River, which is an important part of this study project, converging opinions and inducing positive participation of the public in this project.

Of course, WQCC is a body, which has no enforcing power, and its activity is mainly limited to publicity. The ultimate goal of this research project is to have the resident, NGO groups, experts

and officials of the government agencies participate and thus become the subject of the river management, namely, to form the Ahyang River Basin Management Council(ARMC). Various forms may be possible for this project will form a local organization in a type of corporation which can legally formed under the current local laws and regulations. The most important part in the operation of the organization is likely the sustainable securing of financial resources. To achieve this, various ways will be offered such as charges on water use, taxes by the local tax law and financial assistance by the central government ministries. The river management by the watershed consultation body will have consistence in the plan for water amount, water quality and flood control. Moreover, the establishment of this system will naturally extend to medium-sized and large watersheds, leading to the establishment of the watershed management system of the national water resource management. It is difficult to change the water resource management system which has been settled for decades, so the foundation for integrated water resource management should be established by establishing the watershed management system by bottom-up method starting from medium-sized and large watersheds.

6. Conclusion

This study looked into the concept of IWRM and tried to make an characteristic analysis of the application of it to Korea centered on the discussion of Integrated Watershed Management as a way of implanting IWRM. The various water resource characteristics of Korea such as geographic, meteorological and hydrological characteristics have pointed out there are lots of difficulties with the water resource management. However IWRM may be an international trend for water resource management, Korea need to establish its own concept and to make a systematic consideration of how to implement IWRM. Examples of foreign countries are somewhat only cases that are not verified. Therefore, it is urgent for each country to make its own counter plan through its own diagnosis rather than just listen to such cases of foreign countries.

Being accustomed to the center-collective water resource management system, so it may be difficult for Korea to have a watershed management system for large watersheds owing to its complicated management system. Furthermore, Korea does not need to hastily change its national water resource management system to a watershed management system because the application of IWRM has not been verified yet. However, it is expected that the plan for the integrated watershed management of small watersheds in which there are relatively few stakeholders will be highly successful and it will have effect on the water resource management of other watersheds or large watersheds. If establishing the concept of water resource management system focused on small watersheds and making frames of various systems and laws needed to carry out the established concept, Korea will be able to smoothly implement the watershed management.

References

- [1] Ministry Of Construction & Management, [Http://www.moct.go.kr](http://www.moct.go.kr)
- [2] UNEP, 1997. "Integrated approach to development, management and use of water resources", Priority Actions Programme, Regional Activity Center.
- [3] The Federal Ministry for the Environment, 2001
- [4] Gricia, E.L 1998. Strategy for Integrated Water Resources Management, Washington, D.C. <http://www.iadb.org/sds/doc/1289cng.pdf>, Inter-American Development Bank.
- [5] Rees, A.J, 2002. "Risk and Integrated Watershed Management", GWP TEC Background Papers NO. 6. p.10.
- [6] Lake Biwa Construction Office, 2003. "River Basin Management in Japan", The Third World Water Forum, Japan.