



Ministry of Environment



Korea Environment Institute



River Management Funds for the Four Major River Systems

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Summary

This brochure introduces River Management Funds (RMFs) that Korean government has implemented to improve water quality of four major river systems which provide many tangible and/or intangible benefits to the society in Korea. To ensure more systematic efforts for improving water quality, the government proposed collecting water use charges which became the seed money for RMFs. Based upon the Users–Pay Principle, the RMFs were introduced to offset the losses in opportunity costs associated with regulations against various economic activities in upstream regions. The RMFs were intended to provide win–win solutions for both upstream and downstream regions to share burdens and costs required to maintain good water quality in a fair manner. The RMFs have been providing financial resources for a variety of projects intended to improve upstream water quality for midstream and downstream communities. Thanks to RMF–supported projects, the water quality in the four major rivers has been significantly improved.

I . Introduction

The four major river systems in Korea involve the Han River, the Geum River, the Nakdong River, and the Yeongsan–Seomjin River. These four major river systems cater to populations of 25 million in the Seoul–Gyeonggi region, 13 million in the Yeongnam region, and 7 million in the Chungcheong–Honam region.

Starting with the Comprehensive Plan on Water Management (CPWM), the Korean government has established a number of master plans to ensure safe and clean drinking water and made investments and introduced regulatory controls according to the plans. Yet, these nationwide plans have done relatively little to improve the quality of drinking water.

Projects for improving polluted water in major water bodies, such as Paldang Lake that forms the origin of the Han River, required significant expansion of sewage treatment infrastructure in 1998. Such projects, however, were put on hold due to shortages of fiscal (local subsidization) resources.

In an attempt to enable more systematic efforts for improving water quality, the National Assembly enacted the Act on the Improvement of Water Quality and Support for Residents of the Han River Basin in February 1999. This law included a proposal to introduce water use charges as an additional way to mobilize necessary financial resources for purifying water in Paldang Lake. After having over 450 public opinion with diverse stakeholders that included upstream, midstream, and downstream municipalities, religious communities, academia, and nongovernmental organizations (NGOs), a water use charge system was finally introduced for the Han River system. Regions affected by the other three major river systems soon followed the suit and adopted water use charges of their own.

The water use charges collected for the Han River became the seed money for the River Management Fund established in August 1999. River Management Funds (RMFs) for the other 3 major river systems were also launched in 2002.

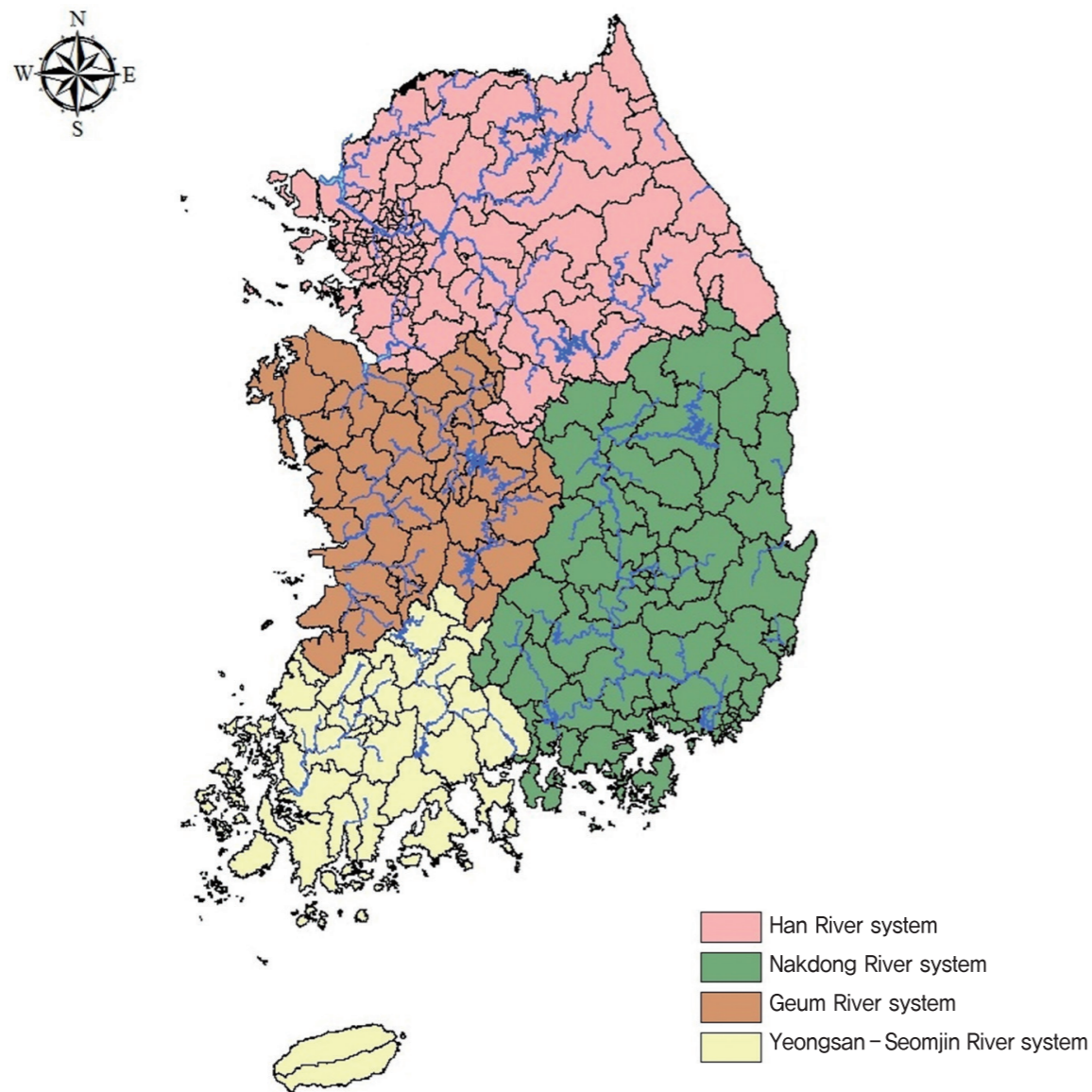
Water use charges, based upon the Users–Pay Principle (UPP), were introduced to offset the losses in opportunity costs associated with regulations against various economic activities in upstream regions.

RMFs were thus formed to provide win–win solutions for both upstream and downstream regions to share burdens and costs in a fair manner. The funds have been providing financial resources for resident support projects for upstream communities who face greater restraints on their economic freedom due to the need to protect clean water to be supplied to midstream and downstream communities. The funds have been also supporting the expansion of the environmental infrastructure and other water quality improvement projects implemented in upstream municipalities.

III. Four Major River Systems Today

The Han River system encompasses 28 mid-sized regions, 7 metropolitan cities and provinces including 112 *sis*, *guns*, and *gus*; the Geum River system, 22 mid-sized regions, 8 metropolitan cities and provinces including 47 *sis*, *guns*, and *gus*; the Nakdong River system, 33 mid-sized regions, 9 metropolitan cities and provinces including 87 *sis*, *guns*, and *gus*; the Yeongsan-Seomjin River system including 31 mid-sized regions, 5 metropolitan cities and provinces, and 42 *sis*, *guns*, and *gus* (Refer to Figure 1).

〈Figure 1〉 Four Major River Systems



The four major river systems are connected together to water pipes extending for 185,710 kilometers in total and sewer pipes extending for 132,679 kilometers in total. The water service rates are quite high, ranging from 92% to 98% across the four systems, and reaching an average of 94.3%. The sewage service rates are also high, ranging from 85% to 96%, at an average of 90.3% (Refer to Table 1).

〈Table 1〉 Water and Sewage Services Connected to the Four Major River Systems

River system	Water pipes (km)	Water service rate (%)	Sewer pipes (km)	Sewer service rate (%)
Han	65,388	97.9	49,711	95.6
Nakdong	55,890	95.9	42,174	90.7
Geum	35,414	91.7	21,742	85.3
Yeongsan-Seomjin	29,018	91.7	19,052	89.6
Total	185,710	Avg. 94.3	132,679	Avg. 90.3

Sources: Ministry of Environment (ME, 2015), Statistics on Water Service in 2014; ME (2014), Statistics on Sewage Service in 2013.

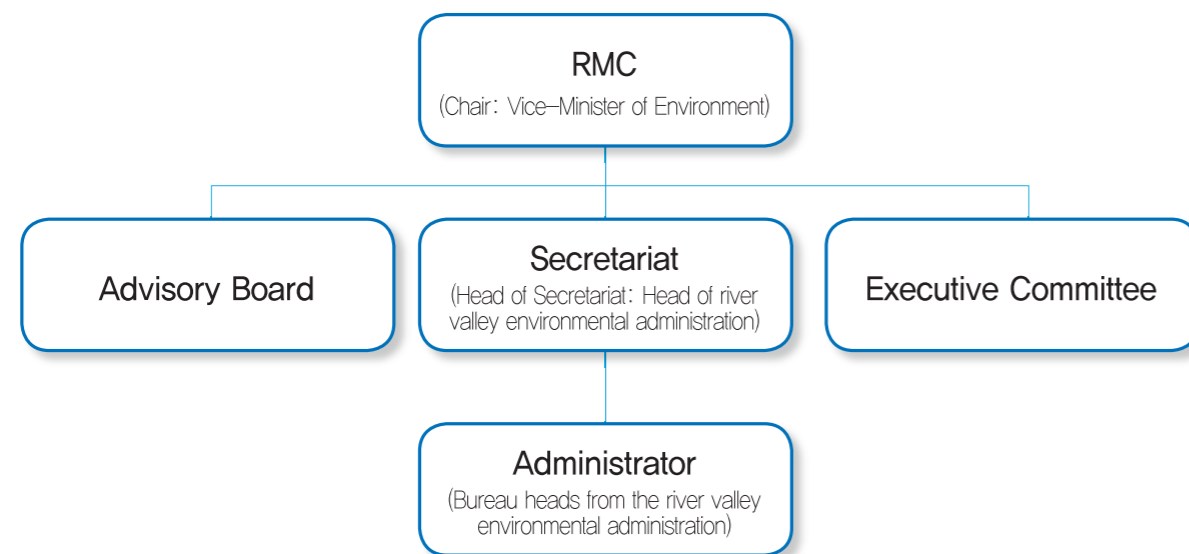
RMFs: Overview

1. RMCs

The River Management Committees (RMCs) are important public bodies that coordinate and intermeditate the interests of diverse stakeholders involved in river systems over matters of water quality improvement and management policy projects. Pursuant to the acts on water management and resident support concerning the four rivers, the RMC for the Han River was first established in 1999, followed by the establishment of the RMCs for the other 3 rivers in 2002.

While the exact composition of the RMCs differ from river to river, each RMC generally includes the Vice-Ministers of Environment as the chair, heads of national government bureaus, vice-governor or vice-mayor of the local government, and chairs of public corporations as their members.

〈Figure 2〉 Standard RMC Organization



As decentralized decision-making bodies, RMCs review and coordinate different opinions on various matters of river system management policies, including plans for reducing water pollutants, imposing and levying water use charges, setting up and managing RMFs, plans for resident support projects, and the like.

The Advisory Boards assist the RMCs' decision-making by efficiently organizing necessary research and providing informative advices. These boards are representative bodies made up of diverse stakeholders, including local residents, NGOs, business communities, and environmental experts.

The Executive Committees, which review and coordinate issues placed on the RMCs' agendas, include members of the governmental and public organizations involved, heads of national and local government bureaus, and senior officials of public corporations.

Given the characteristics of conflicts of interests between upstream and downstream communities, the national government refrains arbitrarily from making decisions on how the RMFs are to be managed on its own. Instead, it has each RMC handle the issues through organizing in-depth discussions and reviews among diverse stakeholders involved.

2. Management of the RMFs

The RMFs were introduced in an effort to ensure win-win cooperation among upstream, midstream, and downstream communities as well as users of water resources by effectively managing and mitigating their conflicts of interests.

The RMFs is based on the UPP that those who benefit from using natural resources, such as water, ought to pay for not only the losses their use causes to the given resources, but also all the expenses involved in providing them the services and benefits they need.¹⁾

The overarching objective of the RMFs is thus to raise and manage the financial resources necessary to ensure appropriate management of water resources and pollutants through effective water management projects and resident support projects for upstream communities.

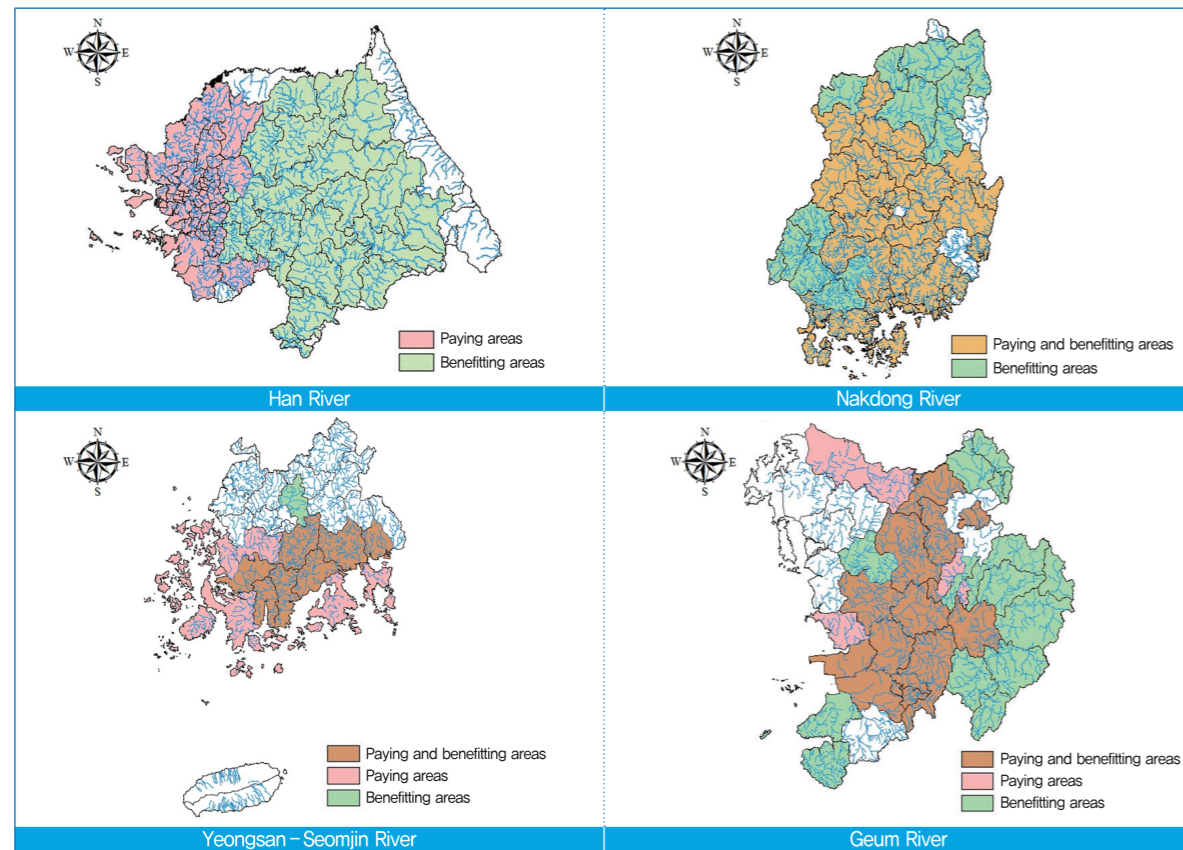
The RMFs are mostly made up of water use charges. In addition to them, other sources of funding include profits generated by land acquired or sold, as well as returns on the investments made with the RMFs.

Water service providers and respective RMCs impose water use charges on end users of water, either directly drawn or purified from the public water bodies as defined by the laws related with four river systems, in proportion to the amounts of water those users receive and use. Water charges for end users are indicated on water utility bills and levied by local water service providers. For those who use private waterworks or river water, water charges are directly levied by the RMCs.

After having discussion with RMC the Minister of Environment decides and announces water use charge rates every two years, as determined based on the amount of financial resources needed to achieve the target level of water quality pursuant to the law.

1) Han River Management Committee: <http://www.hanriver.or.kr/>.

〈Figure 3〉 Areas Paying and Benefitting from Water Use Charges



The rates of water use charges have increased steadily, reflecting the needs to raise RMFs year in and year out due to the increase in the population benefitting from the four river systems. As of 2016, the water use charge rates are KRW 170 per ton for the Han, Nakdong, and Geum Rivers, and KRW 160 per ton for the Yeongsan-Seomjin River.

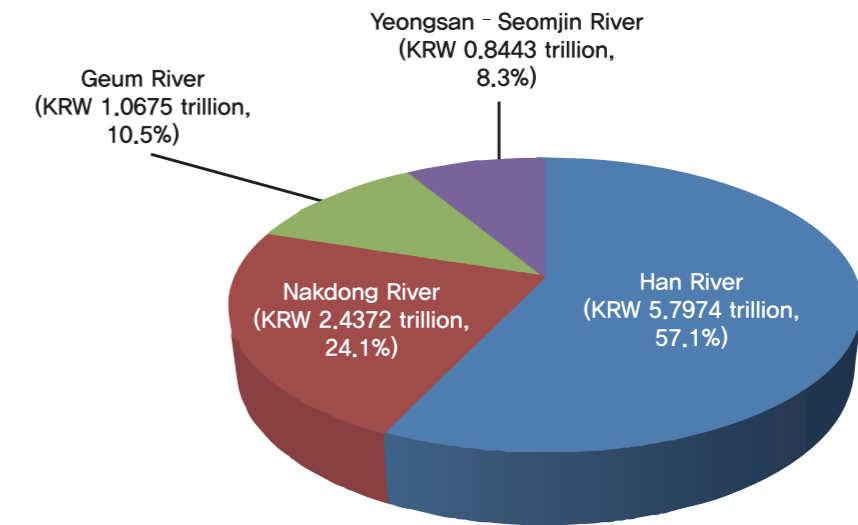
The water use charges have been introduced to compensate upstream communities for the restrictions on their economic activities, which are necessary to provide clean water to midstream and downstream communities. The charges are levied from midstream and downstream communities and channeled to upstream ones.

Figure 3 indicates the areas that pay water use charges and the areas that benefit from water use charges. In the Han River system, 60 municipalities (cities, guns and gus) are required to pay water use charges, and 35 municipalities benefit from them.

Based on water use charges and returns on their investment, the RMFs raised a total of KRW 10,1436 trillion in fund by 2015.²⁾ The Han River system contributed 57.1%; the Nakdong River system, 24.1%; the

Geum River system, 10.5%; and the Yeongsan-Seomjin River system, 8.3% (Refer to Figure 4).

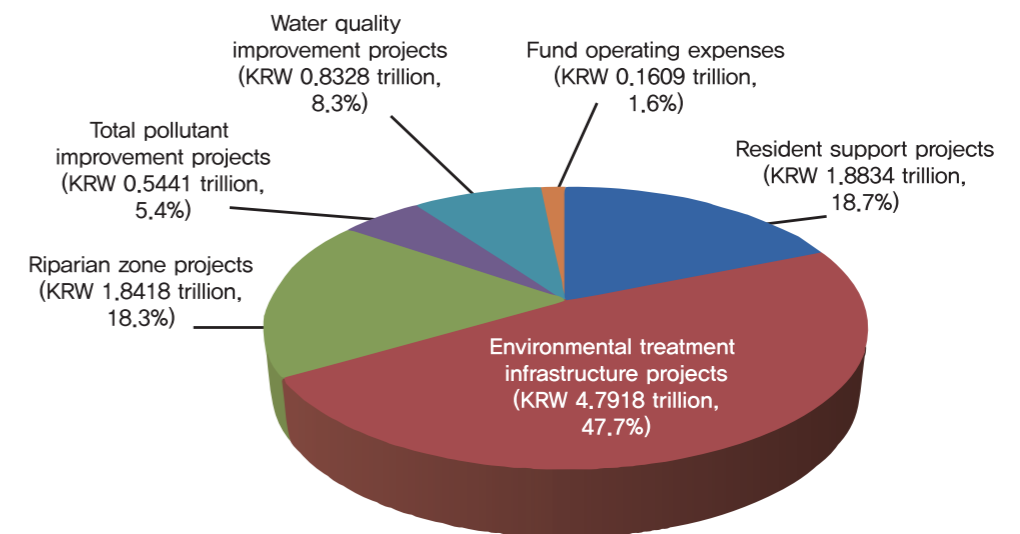
〈Figure 4〉 Total and Shares of the Four River Management Funds



The RMFs support a variety of projects for managing and improving upstream water quality. There are mainly five types of such projects, as resident support projects, environmental treatment infrastructure projects, water quality improvement projects, land purchase and riparian zone projects, and the total pollutant load management projects.

Together, the RMFs expended KRW 10,0519 trillion on such projects as of 2015. 47.7% of total expenses went to environmental treatment infrastructure projects; 18.7% to resident support projects; 18.3% to riparian zone projects; 8.3% to water quality improvement projects; 5.4% to total pollutant management projects; and 1.6% to fund operating expenses (Refer to Figure 5).

〈Figure 5〉 Spending Items of the RMFs



2) The Han, Nakdong, Geum, and Yeongsan-Seomjin RMF statistics in 2015.

3. Projects financed by the RMFs

1) Resident support projects

Resident support projects are undertaken to compensate residents of upstream communities for the lost economic and financial opportunities due to the environmental regulations, by giving them opportunities to increase their income and improve their living environments. These projects also serve to strengthen the communities' support for water quality conservation (Refer to Figure 6).

〈Figure 6〉 Examples of Resident Support Projects



Source: Water use charge leaflets for the Nakdong, Geum, and Yeongsan-Seomjin River Systems.

Resident support projects are divided into four types, including direct resident support provided by the local authorities, resident support project evaluation and database establishment, financial subsidies, and compensations for fishers who have lost their living due to the environmental regulation (Refer to Table 2).

〈Table 2〉 Types of Resident Support Projects

Type	Description	Authority
Direct resident support provided by the local authorities	Additional income and living environment improvement projects, which were launched and managed by local authorities, to help residents of communities facing financial losses and limits on their economic freedom due to regulatory measures (designations of preserved upstream areas, special measures areas, and riparian areas) for preserving upstream rivers.	Local governments
	General and special subsidies are provided. General subsidies go toward income-increasing, welfare-enhancing, community-supporting, and pollution-reducing projects as well as direct-support projects. Amounts of subsidies provided differ by type of communities or areas.	
Resident support project evaluation and database establishment	Evaluates and keeps records of resident support projects.	RMCs
Financial subsidies for eco-friendly farming	Developing and maintaining systematic databases on the beneficiaries of resident support projects, changes to beneficiaries' assets (land and buildings), etc. and on progresses made by support projects.	Local governments
Compensations for fishers, etc.	Replacing the current (market) interest rates on the loans taken out by farming households seeking to convert to eco-friendly farming (in response to regulations restricting the use of pesticides and chemical fertilizers that could pollute water) with special government rates.	
	Providing compensations for fishers and others who lose their sources of income and living due to regulations forbidding fishing and other such economic activities in designated upstream areas.	

Source: The Han, Nakdong, Geum, and Yeongsan-Seomjin RMF statistics in 2015.

2) Environmental treatment infrastructure projects

Environmental treatment infrastructure projects, in part involving subsidies for local governments in budget shortage, are for installing, expanding, and operating environmental treatment facilities in upstream areas so as to process pollutants and improve water quality (Refer to Figure 7).

〈Figure 7〉 Examples of Environmental Treatment Infrastructure Projects



Source: Water use charge leaflets for the Nakdong, Geum, and Yeongsan-Seomjin River Systems.

These projects can be divided into two types: installing and developing environmental treatment facilities, and operating them. Both are under the supervision of local governments (Refer to Table 3).

〈Table 3〉 Types of Environmental Treatment Infrastructure Projects

Type	Description	Authority
Development and installation	Matching the subsidy funds provided by the national treasury for local governments that create and install facilities upstream for sewage treatment, small-scale sewer pipes, sewer management, human and animal excrement treatment, etc.	Local governments
Operation	Subsidizing part of the costs of operating facilities upstream for sewage treatment, small-scale sewer pipes, human and animal excrement treatment, etc. Helping small local governments with insufficient fiscal resources achieve effective and efficient management of environmental treatment facilities and infrastructure in their respective jurisdiction.	

Source: The Han, Nakdong, Geum, and Yeongsan-Seomjin RMF statistics in 2015.

3) Land purchase and riparian zone projects

These projects involve public (local) authorities that purchase privately owned land in upstream riparian areas in order to prevent private development and eliminate all possible sources of contamination, solve the problems of private property involved, and transform the acquired land into riparian greeneries (Refer to Figure 8).

〈Figure 8〉 Examples of Land Purchase and Riparian Zone Projects



Source: Water use charge leaflets for the Nakdong, Geum, and Yeongsan-Seomjin River Systems.

These projects can be classified into purchase/acquisition of land, on the one hand, and the transformation and management of acquired land. Both are overseen by the RMCs (Refer to Table 4).

〈Table 4〉 Types of Riparian Zone Projects

Type	Description	Authority
Public purchases of land, etc.	Purchasing land and premises in upstream areas protected under the ME decrees (preserved upstream areas, special measures areas, and riparian areas).	RMCs
Management of riparian greeneries	Solving issues of property claims, preventing antienvironmental development and economic activities, and eliminating sources of pollution. Creating green spaces, restoring ecosystems, fostering forests, and enhancing the water-retaining capacities of publicly purchased land.	

Source: The Han, Nakdong, Geum, and Yeongsan-Seomjin RMF statistics in 2015.

4) Total pollutant management projects

The concept of total pollutant management was introduced in recognition that increases in the total quantity of water pollutants could lead to serious contamination, even when only allowing for the discharge of such pollutants in a restricted manner under the government policy. The objective of these projects is therefore to maintain a balance between the need for local development and the need for environmental preservation.

These projects include management of the total quantity of pollutants released into upstream water, including research and surveys of total pollutant management. Local governments are in charge of planning and executing total pollutant management plans, while RMCs oversee the research and surveys (Refer to Table 5).

〈Table 5〉 Types of Total Pollutant Management Projects

Type	Description	Authority
Total pollutant management	Subsidizing local governments' efforts to create and execute plans for controlling total quantities of pollutants released into upstream water.	Local governments
Research and surveys	Assembling and operating research/survey teams on total pollutant management as well as the water quality and volumes of all the four major river systems.	RMCs

Source: The Han, Nakdong, Geum, and Yeongsan-Seomjin RMF statistics in 2015.

5) Other Water Quality Improvement Projects

In addition to the said projects, other activities to improve the water quality of upstream area is being taken by providing financial support to the specific projects, including preserved upstream area management (monitoring program by NGOs), river ecosystem restoration, nonpoint pollution reduction (Refer to Figure 9).

〈Figure 9〉 Examples of Other Water Quality Improvement Projects



Source: Water use charge leaflets for the Nakdong, Geum, and Yeongsan-Seomjin River Systems.

Each river system implements different water quality improvement projects. Common projects involve management of preserved upstream areas, basic environmental research, and support for NGOs' water quality preservation activities (Refer to Table 6).

〈Table 6〉 Other Water Quality Improvement Projects

River system	Type	Description	Authority
All	Preserved upstream area management	Subsidizing the cost of managing preserved upstream areas.	Local governments
		Removing underwater wastes, improving water quality in small-to-medium river valleys, picking up litter along river banks, etc.	
All	Basic environmental research	Conducting scientific research and keeping databases on water quality, sources of pollution, pollution loads, etc. and developing antipollution technologies, etc.	RMCs
All	Supporting water preserving activities	Encouraging NGOs to monitor and preserve river systems and greater local participation in water quality improvement efforts.	RMCs
			Local governments
Han, Nakdong	Purification subsidization	Subsidizing part of the cost of advanced purification of water in polluted sources.	Local governments
Han	All-stream collaboration	Encouraging upstream and downstream communities to get along and reach win-win solutions.	Local governments
Han	Sediment dredging	Dredging slime and sediments from upstream sources.	RMCs
Han, Nakdong	Nonpoint pollution reduction	Subsidizing the installation and operation of facilities for reducing nonpoint pollution.	RMCs
			Local governments
Han, Nakdong, and Yeongsan	River ecosystem restoration	Restoring ecosystems of polluted and dried-up rivers (e.g., Nakdong Source Waterway Restoration Project).	RMCs

River system	Type	Description	Authority
Nakdong	Water buffer facility operation	Subsidizing the cost of operating water buffer facilities for preventing discharge of contaminated water and other sources of nonpoint pollution, due to precipitation, etc., into rivers.	Local governments
Yeongsan	Public education	Operating a center in a riparian facility acquired publicly for providing public education (for local teenagers and residents) on environmental preservation.	RMCs
Other projects designated by RMCs for improving water quality in the four river systems			RMCs
			Local governments

Source: The Han, Nakdong, Geum, and Yeongsan-Seomjin RMF statistics in 2015.

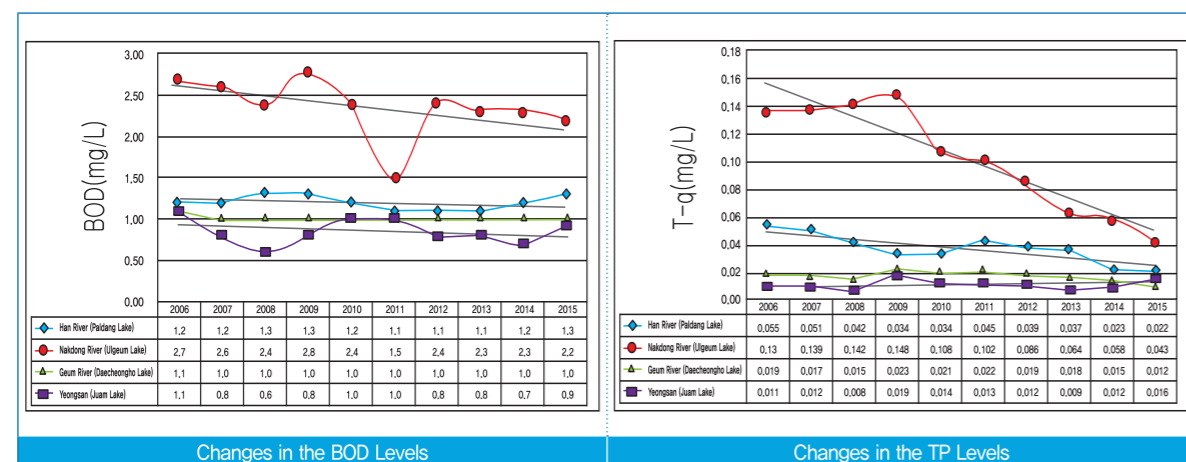
In addition, the RMC and local governments in the Han River system have also launched eco-friendly and sustainable development projects that minimize water pollution.

4. Outcomes of managing the RMFs

As we have seen, the RMFs have been providing financial resources for a variety of projects intended to improve upstream water quality for midstream and downstream communities. The effect of the RMF-supported projects was traced and measured over a 10-year period.

Figure 10 shows the impact that the RMF-supported projects had on water quality at various nodes along the four major rivers in the years 2006 through 2015. In particular, the graphs capture changes in the biochemical oxygen demand (BOD) and total phosphorous (TP) levels in the four river systems.

Figure 10 Changes in Water Quality in the Four River Systems



Sources: ME Water and Environment Information System (www.nier.go.kr); ME (2016), Statistics on the Water and Environmental Policy Results.

The BOD levels do not exceed 3 mg/L in any river systems, indicating that water quality remains or

exceeds Grade-2 level in all of them. The BOD levels in 2015 had improved from the levels observed in 2006 in all the river systems, with the improvement rates ranging from 9.1% to 18.5% (Refer to Figure 10).

The TP levels also remain at 0.1 mg/L or below, indicating good water quality. The TP level for the Nakdong River system, in particular, improved by 68.4% between 2006 and 2015 (Refer to Figure 10).

Of the 114 mid-sized regions making up the four river systems, 83.3% or 95 regions met the requirement for good water quality (3 mg/L or less for BOD). The average sewage service rate in all the river systems also exceeded 90% by 2014 (Refer to Table 7).

The total area of designated riparian zones has also been steadily increasing since the first RMF was introduced, amounting to 1,196.7 square kilometers in total nationwide as of 2015. Riverine Eco Belts (REBs) also made up 68.6% of all publicly purchased land in riparian zones (Refer to Table 7).

Table 7 Indicators of the Four Major River Systems (2015)

Indicator	Han	Geum	Nakdong	Yeongsan - Seomjin	Total
Proportion of mid-sized areas with good water quality	85.7%	72.7%	93.9%	77.4%	83.3%
Sewage service rate (2014)	95.6%	85.3%	90.7%	89.6%	90.3% on average
Area designated as riparian areas (km ²)	186.94	338.36	372.79	298.64	1,196.73
REBs on publicly purchased land in riparian areas	79.3%	72.7%	63.3%	59.2%	68.6% on average

Sources: ME (2015), Environmental White Paper 2015; ME (2016), Annex to the Second Master Plan on Water and Environmental Management (Draft).

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