

## **FRESHWATER COUNTRY PROFILE**

### **REPUBLIC OF KOREA**

#### **Decision-Making**

#### **Programs and Projects**

- A. Integrated Water Resources Development and Management
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**Decision-Making: Sustainable development.** The Presidential Commission on Sustainable Development (PCSD) was established in 2000 directly under the Presidential office. Since then the Presidential Decree, which provides a legal basis for the establishment of the Commission, has been revised three times, focusing on the expansion of its membership and responsibilities while taking into account the outcomes of the World Summit on Sustainable Development (WSSD). Currently, the Commission is composed of 77 members, all appointed by the President. 48 members were appointed based on the recommendations of local governments and local civil organizations. The remaining 27 members are from citizens' organizations, academia, business, and the research and legal communities active at the national level. The PCSD aims to facilitate dialogue among its members concerning sustainability issues. The PCSD, as an advisory organization to the President, is responsible for addressing the following: matters relating to establishing direction and planning of major policy for development and conservation; matters relating to the formulation and implementation of the plans related to Agenda 21 and WSSD Plan of Implementation; matters relating to corresponding strategies to major international conventions on the environment including UNFCCC; other matters relating to environmentally friendly and sustainable development.

In 1996, the Republic of Korea adopted a National Action Plan for Agenda 21. The Ministry of Environment (MOE) played a key role in the preparation of the action plan within the Government. The MOE is also responsible for the policies relating to Environmental Impact Assessments (EIA). Those who plan to carry out projects that are subject to EIA must prepare draft assessments, which are made public, and hold a public hearing on the proposed project. Along with the governmental Assessment System, the Prior Environmental Review System (PERS), one of the major preventive policy instruments, aims to balance development and preservation by identifying possible environmental impacts of development plans or projects in the early stages of planning. The MOE is also implementing mid and long term environmental conservation plans which lay down guidelines for all sectors for harmonizing efforts for environmental improvement. In order to implement Green Vision 21, a long term environmental plan covering the period 1996-2005, the MOE established the second mid-term comprehensive plan (1998-2002) for environmental improvement, originally established in 1997. The second plan reflects the government's desire for sustainable development in the 21st century and consists of 141 unit projects, in which 16 central government agencies are involved along with local governments.

In 2002, the Environmental Preservation Committee was abolished under the revision of the Framework Act on Environmental Policy. In its place, PCSD now coordinates environmental policies. In order to help integrate sustainable development issues into the decision-making process, multi-disciplinary experts should participate in national environmental plans and policies; capacity-building programs should be developed for experts in the government ministries; and inter-ministerial coordinating panels and consultative meetings to coordinate and integrate inter-ministerial policies for sustaining national development projects should be revitalized. For information regarding gender equality and women's participation in decision-making, please refer to relevant paragraphs in the sub-section on Decision-Making in the Human Settlement Country Profile. Water resource management: The Ministry of Construction and Transportation (MOCT) and the MOE are charged with the overall responsibility for the management of fresh water and water supply security. The Comprehensive Water Resources Management and Development Plan defines the national water resources approach in the Republic of Korea. At the performance level, the MOCT is responsible for securing the water supply, especially building dams and wide area water supply systems, while the MOE is responsible for creating nationwide policies to protect water quality and building local area water supply systems. When the Ministries' opinions differ considerably, policy coordination becomes the responsibility of the Commission on Protection of the Quality and Supply of Freshwater Resources under the Office of the Prime Minister. This Commission is also charged with integrating and coordinating water management policy and water quality improvement between the central and local governments. In addition, there are bodies at the sub-national level dealing with water management such as the Local Environment Management Offices and the Local Land

Management Offices. At the river basin level, there are Committees on River Management and Committees on Water Management Countermeasures. These offices and committees are entrusted with clarifying local policies related to water resources management and environmental issues, performing environmental impact assessments (EIAs), and operating the water quality measurement network. They are also in charge of consulting on the management and development of water resources, including the maintenance and management of local water quality in cooperation with local government and related agencies. Local authorities are responsible for creating environmental protection policies and managing the area of water resources under their jurisdiction in addition to other activities delegated to them by MOE and MOCT. Especially in this field, NGOs play an important intermediary role between the government and the people. NGOs promote environmental awareness and voluntary public participation to protect freshwater, while conveying the demands and concerns of the public to the government. It is noteworthy that women's participation in NGO activities is steadily increasing.

The River Act (1961) defines the basic principles on water resources management in Korea. In addition, the Water Quality Conservation Act (1990), Ground Water Act (1993), and Dam Construction and Support Act (1999) comprise the general legal and regulatory framework for water resource management and development in Korea. The Agriculture and Fishery Improvement Act (1997) covers the use of water by agriculture; the Water Supply and Waterworks Installation Act (1961) and the Sewerage Act (1966) cover water use by industry, and Management of Drinking Water Act (1965) addresses issues related to the control of drinking water quality. Lastly, in accordance with the Water Quality Conservation Act (1997), the government established the Special Comprehensive Measures for Han River Water Quality (1998), followed by similar measures for the Nakdong River (1999), Geum River (2000), and Yeongsan River (2000), respectively. Other legislations and regulations that pertain to water and sanitation include the following: Environmental Impact Assessment Act; Public Waters Management Act; Public Waters Reclamation Act; Wastes Management Act, Act Relating to the Treatment of Sewage, Night Soil and Livestock Wastewater; Wetland Conservation Act; Water Quality Conservation Act; Laws for management of agrochemicals; etc.

Because the country has limited water resources, it is imperative that it secures the required amount of water resources to sustain its future economic development. The Long Term Comprehensive Water Resources Plan is being formulated and implemented in order to promote the efficient allocation of water. To prevent drought, a water supply plan for distant rivers and the development of a plan for the use of ground water has been formulated and implemented. In March 2000, the Ministry of Environment developed the Comprehensive Water Saving Plans to address future water scarcity, saving approximately 589 million tons of water by the end of 2003. The government also intends to launch full-scale demand-side water management through such measures as installation of water-saving devices and designation of water demand management target for each local government.

In order to secure high quality water resources, in view of rapid industrialization and urbanization, the Republic of Korea is formulating and implementing a Water Environment Plan. This plan includes measures to prevent the pollution of freshwater supplies such as EIA requirements that have been promulgated, environmental and emissions standards that have been established and basic environmental facilities that have been expanded. The designation and management of Water Resources Protection Areas and Special Zones have been undertaken in order to protect and conserve freshwater. Also there is the continuous measurement of water quality and limitations placed on the location of industrial facilities. For comprehensive water resource development and the establishment of an efficient management system, the Ministry of Construction and Transportation, setting 2011 as the target year, will establish a long-term Dam Construction plan. According to this plan, various actions will be undertaken by 2011 to secure an additional 1.2 billion tons of water supply capacity.

The Commission on National Policy has decided to establish adequate comprehensive national territorial plans and to manage sustained policies for developing water resources. The Central River Management Committee, the Central Environment Preservation Consultative Committee and the Consultative Committee for Water Policy Adjustment are the mechanisms which provide for participation of all major stakeholders in the decision-making process. Major environmental policies are discussed with the Policy Council of Private Environmental Organizations that consists of sixteen private environmental organizations. The private sector participates in the establishment and implementation of policies related to freshwater resources through councils or committees, and various measures are being taken to increase women's participation in these groups.

### **Programs and Projects:**

A. Integrated Water Resources Development and Management: The Comprehensive Measures for Clean Water Supply was launched in 1993 in order to promote an integrated water management policy. Formulated as a five-year-plan with a budget of 15.9 trillion won, these measures concern water quality control, water resources management, and potable water supply. In 1996, these measures were succeeded by the Comprehensive Measures for Water Management, which constituted a long-term plan for water management with a 10-year program for water quality and a 15-year program for water resources. As mentioned in the section on Decision-Making, the government established the Special Comprehensive Measures for four major rivers in Korea: Han River Water Quality (1998), Nakdong River (1999), Geum River (2000), and Yeongsan River (2000).

In 1996, the Water Quality Improvement Task Force was founded by the Office of the Prime Minister to improve the water quality of the four major rivers. Its responsibilities include: integrating and coordinating water management policies; directing, supervising and coordinating related government agencies; devising policies to protect drinking water sources and improve water quality; addressing matters relating to the installation of basic environmental facilities; addressing and mediating conflicting interests while implementing measures for improving water quality; directing, supervising and coordinating the jurisdictions of the central government and local governments; and lastly, conducting performance reviews of the water quality measures. MOCT has undertaken a plan to build 12 environmentally sustainable multi-purpose dams by 2011 to expand water supply capacity by 1.2 billion tons per year. As of 2002, one multi-purpose dam was under construction. Also six existing agricultural and hydropower dams will be redeveloped to strengthen water supply capacity and utilize developed water resources more efficiently. Nine small dams will be made to mitigate repeated water shortages in small areas. To transport the developed water resources efficiently, eleven strategic regional waterworks and five industrial waterworks are being constructed. Additionally, 27 strategic regional waterworks and industrial waterworks are planned to be built by 2011. By then, the ratio of water resources supplied by strategic waterworks should be 65% (54% at the end of 2001).

From 1998 to 2007, the Korea Forest Service is implementing the Fourth Forest Development Plan. Under this plan, the Korea Forest Service will complete a government-initiated reforestation program and switch to a forest management program based on the self-regulation and promotion of forest owners. To meet the diverse social demands for forests and recent trends in international forest policy, the primary objective of the fourth plan is to establish and develop sustainable forest management. The Korea Forest Service will endeavor to achieve the following goals: developing valuable forest resources; fostering a competitive forest industry; and promoting a healthy and pleasant forest environment for the public. In order to achieve these goals, the Korea Forest Service will improve the national forest land management system through environmentally sound utilization of forests and forest management. In 2003, the Forest Service made an assessment for the first part of the Fourth Forest Development Plan between 1998-2002 and identified major policy issues to be dealt with during the remaining period of the plan. One of the issues was the strengthening of the function of forests as a common public good, with particular emphasis on the clean water supply and water reservoir capacities of forests. For this, the Forest Service decided to

designate the surrounding areas of major rivers as water resource fostering forest zones and to undertake other ecologically sound forest management activities, such as forest rearing and forestation with broad-leaved trees. GIS is employed in water conservation efforts in major river basins. The Fourth Comprehensive National Territory Plan aims to establish a full-scale management system to enhance harmony between the development and conservation of the national land environment. First, the plan places priority on the conservation and restoration of mountain, river, and coastal ecosystems. Second, the plan is designed to provide a clean and sound living environment by purifying and preventing environmental pollution. Third, to provide a clean water supply, an integrated foundation for water resource management will be built by zone to secure the quality of water resources. Three National Territory Plans have been implemented since the 1970s. The First Plan (1972-1981) focused on establishing developmental centers as the foundation for rapid economic growth; the Second Plan (1982-1991) sought to control the excessive population concentration in the capital region and to foster regional development by balancing population distribution throughout the nation and by improving the living environment; and the Third Plan (1992-2001) aimed to improve public welfare and conserve the natural environment by dispersing development regionally and nurturing local industrial belts.

*Environmental aspects:* The Framework Act on Environment Policy and water and air pollution-related regulations are being amended or newly enacted with the objective of harmonizing environmental and development goals in national land planning.

*Social aspects:* The Fourth Comprehensive National Territory Plan also suggests that the power of execution for sustainable development be enhanced by enacting the “Framework Act on National Territory”. The measures to achieve sustainable rural communities can be categorized into four parts: (1) developing diverse income sources under the consideration of each mountain village’s physical, social, and economic characteristics; (2) improving forestry and agricultural production conditions; (3) reforming the living environment including transportation, telecommunications, public health, clean water, and sewage systems; and (4) enhancing the scenic beauty of villages within forests to promote forest lodging. These measures aim to increase public awareness of mountain village areas and to contribute to the health and comfort of village residents.

Several other major programs include: Comprehensive Management Plan for the Lake Shihwa Special Management Area; Establishment of the Coastal Management Information System; etc. The participation of major groups: The recent cancellation of the Dong River dam construction plan in June 2000 marks a case where the NGOs and the press played major roles in impacting national decision making processes related to sustainable development. The dam was to be constructed as a multipurpose dam to secure the water supply, control flooding, and generate electricity. The plan was discussed over a long period of time, and its basic and detailed designs were already complete in 1996-97. An organized movement against the construction plan was led by NGOs to preserve the ecosystem around the Dong River basin. The media gave their full support for these activities and helped form public opinion in favor of canceling the dam project. Responding to this, the government established a joint investigation committee comprised of NGO representatives and officials from the government agencies concerned. After reviewing the conflicting positions on the construction plan, the committee ultimately determined that the plan should be cancelled. The Dong River dam will remain a good example of the positive role that NGOs and the media can play in promoting sustainable development. Still, however, the incident also brought to light the failings of institutional decision-making mechanisms by not having various stakeholder opinions reflected in the final decision.

B. Water Resources Assessment: To enhance scientific understanding of current water conditions, standardization of environmental monitoring methods for water will be pursued through increased investments in new technology.

C. Protection of Water Resources, Water Quality and Aquatic Ecosystems: In order to effectively improve the water quality, the government partitioned the national territory into four large zones and 11 medium-sized zones in 1991, based on the basins of the four largest rivers (Han, Nakdong, Geum, and Yeongsan Rivers). Since 1998, the government has prepared and been implementing comprehensive special measures to improve the water quality of the four major rivers (Han, Nakdong, Geum, and Yeongsan River). Some of these measures include a maximum pollutant load system, riparian buffer zone designation, water usage charges and local resident support programs. The government plans to introduce the the maximum pollutant load system in Gwangju- city near the Han River in 2004. It will next introduce this system in Taegu and Busan in August 2004. Until 2008, this system will be gradually introduced into cities near the other major rivers. To protect the ecosystem and improve the water quality in the four major rivers, the government has established riparian buffer zones around the upper portion of those rivers since 1999. Between 1999 and 2002, a total of 1,073 square kilometers have been designated as buffer zones. Within these buffer zones, the government places strict restrictions against development projects that could result in water pollution. Afforestation efforts are promoted to manage the water quality and ecosystems. In addition to the government's financial support for the implementation of these special measures, the government has also introduced water usage charges that are levied on those who use rivers as drinking water supply sources. The revenue raised from these charges is the main source of the River System Management Fund, which is used for fostering projects such as local resident support initiatives, the installation of basic environmental infrastructure and afforestation in riparian buffer zones. As of 2004, the Han River water usage charge is 120 won per ton of water used. Water usage charges for the other major rivers are: 110 won for the Nakdong River, 130 won for the Geum River and 130 for the Yeongsan River.

Efficient use of water resources: The Republic of Korea is adopting regulatory policies, economic instruments and social policies to promote the efficient use of water resources. For example, water fees will gradually be raised to reflect the full cost of supplying and preserving the quality of water and maintaining the resource base. The conservation of the resource base is promoted by a national campaign for water conservation. The wide use of water-saving equipment is another way to reduce the waste of water resources. Standardization of equipment is now promoted and legal recommendations are used through the amendment of laws related to construction and housing that promotes the installation of water saving equipment. The adoption of a water reclamation and recycling system has been initiated and preferential taxation is given to such facilities. Protection of aquatic ecosystems: The government regularly conducts natural environmental surveys, and designates and supervises so-called ecosystem Conservation Areas. One of the seven sites designated as a National Ecosystem Conservation Area is the migratory waterfowls habitat found at the Nakdong River estuary. In 1997, the government formulated a long-term National Biodiversity Strategy to ensure the systematic management of the nation's biological diversity. The Strategy includes various programs for the protection and sustainable use of biological diversity through, for example, designation and management of protected areas, surveys of biodiversity in forests, wetlands and coastal areas, etc.

For information related to saving water in food production, please refer to Subsection F. Water for Sustainable Food Production and Rural Development. For information regarding sanitation, please refer to the Sanitation Profile.

D. Drinking Water Supply and Sanitation: In order to supply high quality water, the central government and the local authorities are expanding wide area water supply systems, tap water conservation facilities, and drainage and sewage systems. Since May 2001 the government has been implementing comprehensive inter-ministerial measures to strengthen the management of tap water quality. For example, in June 2002 seven different ministries within the government jointly implemented measures to strengthen the hygienic control of tap water throughout the supply chain by expanding the number of categories of test standards for drinking water from 47 to 55. Since August 2002, the government has also

introduced purification measures for removing up to 99.9% of viruses, protozoans and other microorganisms from drinking water.

E. Water and Sustainable Urban Development: The MOE has issued permits and provided government subsidies to local municipalities for water supply improvement projects related to urban development. For other related details, please refer to Subsection C. Protection of Water Resources, Water Quality and Aquatic Ecosystems.

F. Water for Sustainable Food Production and Rural Development: The Korean Agricultural & Rural Infrastructure Corporation (KARICO) supplies irrigation water to farmers free of charge. The government has constructed drainage facilities, such as pumping stations, sluice gates, and canals, in areas that are subject to habitual flooding. The construction is usually carried out by the municipal authorities or KARICO. Approximately 234,560 hectares of agricultural land are prone to flooding, about 43% of which had been improved by 2000. The remainder will be completed by 2009.

The government recognizes the need to increase the efficiency of agricultural water use and has made great efforts to conserve water and increase the stability of the infrastructure by renovating superannuated irrigation facilities. Small-scale irrigation systems are managed by farming communities under the supervision of local authorities, and all expenses are charged to the farmers. “The Ten Year Rural Water Development Plan” (1995-2004) was adopted to meet the water demand of the early or pre-summer droughts with the following objectives: developing irrigation systems in all paddy fields located in Agricultural Promotion Zones; developing supplementary irrigation in areas susceptible to severe drought; and conserving water and increasing the stability of the agricultural water supply by renovating superannuated irrigation facilities. In July 1996, an “Agro-Environmental Policy Towards the 21<sup>st</sup> Century” was established. The policy’s goals include decreasing the use of pesticides and fertilizers, as well as expanding sewage and wastewater treatment facilities in rural areas to effectively address pollution problems arising from agricultural production.

Formulating policy measures to maintain a food production base include projects for farmland maintenance, developing water resources for agriculture, and improving irrigation and drainage, taking into full consideration the fact that rice production at an optimal level is essential for achieving domestic food security. Measures to achieve sustainable rural communities include providing clean water for daily use and developing sewage systems in forest communities.

G. Impacts of Climate Change on Water Resources: Recent study conducted by the Korea Meteorological Administration (KMA) showed that the average surface temperature has risen about 1.5 degree Celsius during the last century in Korea, which is considerably higher than the rise in the global average surface temperature as reported by the Inter-governmental Panel on Climate Change (IPCC). Other research funded by the Ministry of Science and Technology (MOST) indicated that one of the effects of climate change in Korea would be greater seasonal and regional variation in the pattern of rainfall than ever before. It is expected that these variations will have significant impact, particularly on water resource management and agriculture.

In order to deal effectively with climate change, the Republic of Korea organized the Inter-ministerial Committee on Climate Change led by the Prime Minister in 1998. The committee develops and implements comprehensive measures to combat climate change every three years: the first set of comprehensive measures were developed and implemented from 1999 to 2001 and the second set from 2002 –to 2004. As a part of the second set of comprehensive measures, the MOE has been conducting climate change impact assessments in order to prepare for future national adaptation programs. As of 2003, research funded by the MOE has included climate change impact studies on sea-level rise, forest ecosystems and public health in Korea.

For further details, please refer to the relevant information at [www.me.go.kr](http://www.me.go.kr) and [www.gihoo.or.kr](http://www.gihoo.or.kr).

**Status:** Socio-economic aspects: The percentage of the population living in absolute poverty in the Republic of Korea has drastically decreased due to rapid economic growth. Absolute poverty comprised approximately 40.9 % of the total population in 1965; within three decades, it had decreased to 3.9 % in 1995. However, the economic crisis at the end of 1997 resulted in massive unemployment. It caused a great increase in the number of poor and the number of recipients of Livelihood Protection. Due to this crisis, poverty was recognized as a huge social problem. Therefore, the expansion and reinforcement of the social safety net was necessary for coping with this problem. Present public assistance programs include living expense aid, health care, educational assistance, funeral expense support, small business loans, and job creation projects, among others. Living expense aid is provided for households whose income does not meet the minimum cost of living, regardless of age and ability to work. The number of recipients receiving living expense aid has increased approximately three times from 540 thousand persons in 1999 to 1,540 thousand persons in 2000. After carefully assessing a recipient's need to work, among those who are able to work, including desire for work experience, age, health, and family situation, a self-support aid plan for each household is made by a public social worker. After that, the direction and the kind of services necessary for self-support are determined, and services such as job search assistance, vocational training, job placement and financing for self-reliance are provided.

The Republic of Korea's fertility rate has rapidly declined from 6.0 in 1960 to 1.47 in 2000 as a result of the successful implementation of family planning programs. The population growth rate declined from 3.0 % in 1960 to 0.71 % in 2000. The population growth rate still continues to decline, and it is expected to stabilize in the year 2023; thus the Republic of Korea has reached the last stage of demographic transition. The drastic decline in the fertility rate to below the replacement level since the mid 1980's has brought about new population problems, such as population aging, labor force shortages, and a decrease in the school-age population. Because of this, the government adopted new population policies in 1996 with an emphasis on the quantitative and welfare context for the advancement of the quality of life.

The tourism industry currently comprises 4.72% of GDP and employment in the tourism industry constitutes 9.3% of the employment of the population (1998, K-TSA). Tourism is one of the three highest value-added industries. The number of foreign visitors to Korea for tourism purposes increased from 2,340,000 to 5,321,000 between 1988 and 2000, an increase of 127.4%. Tourism profits during that time increased from US\$ 3,265 billion to 6,609 billion, a 102.4% increase. Foreign tourists visiting Korea totaled 5,321 thousand in 2000, with an increase of 14.2% from the preceding year. This broke the record of 5 million tourists visiting Korea for the first time in the history of the Republic and showed the highest growth rate in the 1990s.

*Ecosystem:* As of 2002, the forest land area in Korea was 6,412,000 ha, covering about 64% of total land area and the growing stock per ha is 70 ? . The forest is composed of conifers (42%), broad-leaved trees (26%), mixed-forests (30%), and others (2%) by species. Most of forests have been reforested after severe devastation during the Korean War. As a result, 68% of forests are under the age of 30 and are in need of active tending, such as weed control, fertilization, thinning and cleaning to grow into healthy forests. At the end of 1997, Korea faced a financial crisis and received financial assistance from the International Monetary Fund (IMF). The dire economic situation resulted in a rapid increase in unemployment. In 1998, KFS launched a 6year Forest Tending Program. The objectives of this program were to cultivate healthy forests and ease the burden of unemployment. This program has not only increased the growing stock by changing previously unused forest space into well-managed forests but has also helped in the reduction of landslides, production of clean air and increase of water storage capacity. KFS plans to continue this program.

The Republic of Korea is located in a temperate monsoon climate zone where the average annual rainfall of 1,283mm is considered adequate. However, two thirds of the rainfall is concentrated during the summer and there are frequent early or pre-summer droughts when water demand for agriculture peaks.

Aspects of water resource: Freshwater is essential to the maintenance of economic and cultural activities as well as to the survival of living species and the ecosystem. Although the supply of water seems infinite, freshwater is limited. Of the total supply of annual water resources in the Republic of Korea, which is estimated to be 127.6 billion tons, about 54.5 billion tons are lost and about 49.3 billion tons are discharged or lost during floods. The overall shortage of fresh water supply in the Republic of Korea will be 1.8 billion tons in 2011. Industry is responsible for about 9.2% of total fresh water use, and water supply is not a constraint to industrial development. The government is, however, implementing strict regulations on industrial wastewater discharge, including the designation of 29 water polluting substances and standards for the discharge of each of them. Industries are trying to develop waste water reuse technologies and are vigorously expanding investment to wastewater treatment facilities in industrial complexes.

Since the Republic of Korea is heavily dependent on its surface water resources, the government places a high priority on the recovery and improvement of the water quality of its surface water resources. To accomplish this, the government is strengthening standards for the permitted level of emission of industrial water effluents and the discharge of effluents by public waste disposal facilities. The government has induced reduction of pollutant emissions by public waste disposal facilities and is introducing the effluent charge tariff, which assess a discharge fee according to the quantity of actual discharge. Furthermore, inspection, development, and management of underground water resources are underway as well as the development of water conservation measures.

The capacity for treating wastewater in the Republic of Korea is 20,233 thousand ? per day; 75.8% of sewage was being treated as of 2000. The specific target established for coverage of the water supply is to increase it from 83.6% in 1996 to 95% in the year 2011; the target for sanitation coverage is an increase from 52.6% in 1996 to 80% in 2005. The technological needs for wastewater treatment are the elimination of nitrogen and phosphorus and treatment of insoluble materials; for water purification technology is needed to assist in the elimination of algae. Some of these technologies are being developed in domestic research institutions. To effectively manage water resources and secure the necessary water supply, the government has constructed many dams including 13 multi-purpose dams. In addition, the government will reinforce demand-side, water-saving management strategies; for those areas that are found lacking, a blueprint for sustainable dam construction will be drawn up, incorporating a range of public opinions. About 40.1% of the 33.1 billion tons of annual water consumed is supplied from these dams. 22% of total water consumed is used for municipal purposes, 48% for agricultural purposes, 9% for industrial purposes, and 21% for maintenance of river function including preservation of the ecosystem. Of the total population of 48.5 million people, about 43 million, or 88.7% of the total population are beneficiaries of the public water supply system. As of 2002, daily per capita water consumption has been about 362 liters. About 86.5% of the total water costs are recovered through pricing and the government will continue to raise water prices gradually.

In the last 30 years, the development of industrial complexes and many new cities in the Korean coastal area has made the disposal of industrial water effluents and sewage from urban areas an urgent issue. For the conservation and sustainable use of living marine resources, Korean waters have become the focus for the prevention of marine pollution from land-based activities and sea-based activities. The government is conducting a long-term research program to monitor and assess changes in the marine ecosystem caused by marine pollution. Based on the results of this research, ecosystem distribution status is being reported and an environmental sensitivity map and a map of the wetlands are being made.

Per capita freshwater availability is 1,500 m<sup>2</sup>, a level insufficient for sustainability. Since the Republic of Korea's population density is known to be one of the highest in the world, the pollution intensities per area for water are much higher than in other countries at a comparable development stage and living standard. For this reason, the environmental stress level is extremely high in the ROK.

<Distribution and Use of Waterworks>

	1995	1997	1999	2001	2002
<b>Supply ratio (%)</b>	<b>82.9</b>	<b>84.5</b>	<b>86.1</b>	<b>87.8</b>	<b>88.7</b>
<b>Supply capacity (10,000 ton/day)</b>	<b>2,200</b>	<b>2,396</b>	<b>2,659</b>	<b>2,775</b>	<b>2,856</b>
<b>Water supplied per capita per day (L)</b>	<b>398</b>	<b>395</b>	<b>382</b>	<b>374</b>	<b>362</b>

\* Data: The Ministry of Environment, Statistics of Waterworks 2002

Water quality management, as it is directly linked to human health and the quality of life, is one of the most pressing challenges facing the ROK. Since the supply of drinking water depends heavily on rivers, it is critical to preserve the quality of the water in rivers. And since the sources of pollution are geographically dispersed and originate not only from industry and residential areas, but also from agriculture and livestock farming, water pollution is not easy to control. Many sources of pollution are directly linked to the daily lives of inhabitants and the usage of land. As such, there are many obstacles to ensuring water quality management, including limitations due to private property rights.

Despite such difficulties, the water quality figures of the four largest major rivers, the Han, the Nakdong, the Geum and the Yeongsan, have been maintained over the last ten years(see Table below). This is due to the establishment and implementation of comprehensive plans for water quality management for the major rivers, which constitute the primary sources of potable water.

<Changes in Water Quality: the Four Major Rivers>

Unit: BOD (ppm)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Han R. (Paldang)	1.1	1.2	1.2	1.3	1.4	1.5	1.5	1.5	1.4	<b>1.3</b>	<b>1.4</b>	<b>1.3</b>
Nakdong R. (Mulkeum)	3.3	3.4	4.6	5.1	4.8	4.2	3.0	2.8	2.7	<b>3.0</b>	<b>2.6</b>	<b>2.1</b>
<b>Geum R. (Daechung)</b>	<b>1.6</b>	<b>1.6</b>	<b>1.5</b>	<b>1.2</b>	<b>1.5</b>	<b>1.2</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.1</b>
<b>Yeongsan R. (Juam)</b>	-	-	-	-	-	-	<b>0.8</b>	<b>0.9</b>	<b>0.8</b>	<b>0.7</b>	<b>0.9</b>	<b>1.2</b>

Source: The Ministry of Environment

At the end of 2003, the water quality in the Han (Paldang) and the Geum (Taechung) Rivers were approximately at Level 1. The Yeongsan (Juam) River deteriorated slightly due to unusual rapid algae growth during that summer. Lastly the water quality in the Nakdong (Mulkeum) River continued to improve, maintaining its Level 2 status. One of the major achievements of the Fourth Forest Development Plan (1998-2007), which is now in effect, is the innovative management of about 1.2 million ha of forests alongside major rivers with a view to improving the water quality.

**Capacity-Building, Education, Training and Awareness-Raising:** The residents of the Republic of Korea have become more aware of the importance of water resources and efforts are being made to

increase this awareness following a series of droughts and floods. Each ministry formulates and implements policies and programs related to changing consumption patterns, including the use of water resources. For example, the Ministry of Environment, MOCT and the Korea Water Resources Corporation have a joint water conservation campaign, and each year on March 22 (World Water Day), the government sponsors a variety of activities to remind people of the importance of water. Also, the government extensively promotes water saving through media outreach. A variety of educational programs such as water-saving facility study tours, are also being developed to help and encourage people practice water-saving. The IPM (Integrated Pest Management) Program has provided IPM training for extension service staff members and farmers since 1997. Through the IPM Program, the Government has offered IPM validation and training in nine provinces on non-rice crops.

**Information:** The MOE is implementing research projects for developing Sustainable Indicators and a System of Integrated Environment and Economic Accounts (green GDP). The Eco-labeling and the Green Building Certificate System are also in force. An information network for water resources management is in the process of being developed. The Ministry of Agriculture and Forestry and the Ministry of Construction and Transportation have been collecting relevant information from the agricultural sectors and the Ministry of Environment while the Ministry of Construction and Transportation have been collecting such information for the household and industrial sectors.

The information on water resources is being managed, updated and provided through web pages and other digital data formats through the “Water Resource Management Information System” operated by the Ministry of Construction and Transportation. Information has been distributed through the media to related agencies, including research institutions, and the general public. Foreign distribution has been accomplished through a World Wide Web Site. Although there is no way to include all of the information related to sustainable development, the National Statistical Office publishes a yearbook with a core set of data gathered from each part of the government.

The OECD requires that various environmental documents and information be published for the OECD every other year. The Republic of Korea has yet to provide all of the data required by the OECD. The Ministry of Environment has developed a long-term environmental statistics development plan in order to satisfy this requirement. The plan also improves the methods of evaluating and analyzing data and enhances comparability among the OECD countries. In 1999, the Republic of Korea established the Northeast Asian Information Center for the Environment to exchange information between countries in the region. An Environmental Information Center will soon be established jointly with China, Mongolia and Russia to collect and exchange environmental information on the Tumen River basin.

**Research and Technologies:** The promotion of innovation in the ESTs is being undertaken through the implementation of the Environmental Engineering Technology Development Project (1992-2001) and the Basic Environmental Technology Development Project as well as through the establishment of the Long-Term Comprehensive Plan for Environmental Technology Development (1998-2007). The Highly Advanced National Project (HAN Project) is an environmental research project that includes a technology project which covers non-polluting manufacturing technology, clean product development, and clean production methods. In order to systematically and comprehensively develop and cultivate domestic ESTs and promote the development of low-pollution technologies, the Ministry of Environment is annually implementing research projects such as Eco-technopia 21 and encouraging the relevant agencies to use advanced ESTs to meet the environmental standards. In addition, in order to promote low-pollution technology development and raise consumer awareness of environmental preservation, an eco-labeling system was adopted.

The 21st Century Frontier R&D Program is an ambitious long-term program following up on the HAN Project. The programme was initiated in 1999, and its mission is to develop core technologies to help

secure leading-edge technologies in promising areas, including industrial waste recycling, crop functional genomics, sustainable water resources, plant diversity, and so on. In 1995, the Ministry of Environment decided to introduce the Environment-Friendly Business Operation (EFBO) program, defined as a proactive environmental management practice that promotes cooperation between industries and the government, and development of innovative technologies and practices by NGOs. Business organizations adopting this method are asked to strictly re-evaluate, manage, and develop new environmentally friendly product designs, production processes, and final treatment processes. The evaluation of environmental impact includes the entire production and supply chain, from product design to raw material acquisition, input, production and post-treatment of pollutants. The EFBO program also includes revised environmental protection standards, clearly defined roles and responsibilities, a public education and awareness training program, prevention and clean up procedures, in-door inspection plans, and urgent action plans. The Ministry of Environment expects industries to implement pollution abatement production processes.

The government is working on details for the development of environmental technology in the areas of water and clean technology. Research on sustainable water resources is being carried out to expand and secure available and sustainable water resources by 3 billion tons, which is about 10% of water consumption in the Republic of Korea as of 1998. About US\$ 77 million will be invested in this research project by 2010.

A research system was established to develop sustainable technologies and to monitor the status of the agricultural environment in terms of water quality. A study on the environmental improvement around Shiwha Lake is being conducted. National research and development programs in environmental science and technology and HAN's G-7 Projects were planned and evaluated by the National Science and Technology Council, in which private sector experts participate; and the 21st Century Frontier R&D Program was launched in 1999, which covers, among other things, water resources development & management. MOCT has participated in and carried out International Hydrology Programmes (IHP) with UNESCO since 1975. Various research projects have been completed and valuable results have been made and applied to water resources development and river management. The 6th stage of IHP will be completed by 2007. River Basin Investigation programs have been undertaken to review basic data related to water use and river basin management including rainfall, water use trends, flood data and so on. MOCT will invest about US\$ 23 million into River Basin Investigation programs.

About US\$ 27 million is being spent annually on the development of research and technology on water resources. The government has pushed ahead with several research programs such as promoting the efficiency of purification facilities and developing a highly-purifying treatment process as part of the G-7 project. Based on the results of these research programs, the government will promote the development of a new treatment technology for drinking water such as a next-generation purification system to be put into practical use in future. The government will also concentrate its efforts on developing technologies related to the whole system of producing and supplying tap water by managing purification facilities in a science/information-oriented way to reinforce the management of the existing facilities, systematizing the management of a pipelines network and establishing a leakage prevention system. Also, the government is pushing forward with research such as developing devices and systems for water conservation and recycling, to help rationalize demand management.

**Financing:** To efficiently prioritize investment and secure new revenue sources, the government introduced the Special Account for Environmental Improvement in January 1995. Sources of revenue include various charges imposed on polluters, transfers from general and other accounts, loans from the National Bond Management Fund and foreign loans.

The Korean government will invest about US\$ 30 billion by 2005 in water supply and water quality improvement. There are no external resources invested in this sector which is funded entirely by the National Treasury. The budget for water quality improvement has increased as follows:

<Table: Environmental Budget>

(Unit: 100 Million Won)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
MOE Budget	1,887	4,716	6,729	8,851	10,802	11,131	11,536	13,023	14,143	14,336	14,036
Allowance for Water Quality Improvement	2,500	2,490	3,121	3,978	6,867	6,132	6,714	9,317	12,250	14,293	15,837
Total (Environmental Budget)	4,387	7,206	9,850	12,829	17,669	17,263	18,250	22,340	26,393	28,629	29,873

Source: The Ministry of Environment

**Cooperation:** The Republic of Korea actively participates in regional environmental cooperative mechanisms in Northeast Asia, including the Tripartite Environment Ministers Meeting between China, Japan, and Korea (TEMM), the Meeting of Senior Officials on Environmental Cooperation in Northeast Asia (NEASPEC), the Northeast Asia Conference on Environmental Cooperation (NEAEC), and the Northwest Pacific Action Plan (NOWPAP). The activities of these mechanisms include the exchange of information on the role of local authorities, the use of economic instruments, and energy efficient technologies, etc.

MOCT has maintained a relationship for cooperation on policy and technology related to water resources with the Japanese and Chinese governments since 1978 and 1995 respectively. A regular meeting has been held every year. Policies and pending issues on water resources and management are discussed and exchanged at these meetings. Under the direction of the MOCT, the Korea Water Resources Corporation has provided technical support for water resources development and management in underdeveloped countries such as Nepal, Vietnam and Cambodia. The Korea International Cooperation Agency has been playing an important role as a financial and administrative assistant to these countries. Korea Water Resources Corporation is operating educational and training programs for government officials and technical staff from developing countries working in the field of water resources development and management: these programs are planned to be strengthened and expanded in the near future.

At the bilateral and international level, cooperation takes place in the following areas: participation in the tourism working group for the Tumen River Area Development Program supported by the UNDP; and, enhancement of regional cooperation for the development of environmentally sound tourism in the Tumen River area. An Environmental Information Center will soon be established jointly with China, Mongolia and Russia to collect and exchange environmental information on the Tumen River basin. The Republic of Korea has accumulated valuable experience and technology from past reforestation and erosion control projects in denuded lands. Therefore, its vast experience and modern technology could be used to solve desertification problems in seriously affected countries in Asia. The Republic of Korea has strengthened cooperation with various countries in forestry development and management through such efforts as the signing of the Forestry Techniques Agreement with Germany for reforesting the land. Since the 1980s, the Korean government has invited many officials from developing countries in Southeast Asia and other regions to observe successfully returned forests. Recently, international cooperation with neighboring countries in this field, especially China and Mongolia, for the exchange of forestry experts

and joint research programs has been strengthened. Bilaterally, the Korea International Cooperation Agency(KOICA) has provided funding for an afforestation project in China, particularly in the Miyun Reservoir, to implement an agreement made during the summit between Korea and China in 1998. The ROK is also participating in the project of Friendship Forest Establishment in China and Mongolia , which was initiated by the Northeast Asian Forest Forum in 2000.

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