As one of the most densely populated countries, South Korea is a global powerhouse of economic growth and development. The nation ranks 27th in the world for its population size of 51 million residents (2013), and has a density of 506 people per square kilometer. After Bangladesh, South Korea is the nation with the third largest population density among countries with over 10 million in population.

Torted by high population density, the nation has undergone large-scale development and economic advancement at unprecedented rates within the last five decades. More specifically, growing numbers of land development and urbanization projects have led to an increase in environmental issues and various degradation of ecosystems. The urbanization rate of Korea stands at 85.4%, which is double the average of 47.1% for 34 OECD member states. Such high rates of urbanization have accelerated the deformation and destruction of natural ecosystems, leading to key environmental problems that have recently come to light.

From the 1990s, however, environmental issues have taken a prominent role with broader public emissions and participation. Various networks have been forged between the government and civil society to prevent further degradation and improve the nation's environmental status. With combined efforts from nongovernmental organizations and the government, progress continues to be made. From the reduction of toxic and atmospheric pollutants to the restoration and improvement of environmental quality.

In order to monitor changes in national environmental status, the government conducts periodic surveys on the atmosphere, water quality, forests, and other ecosystems. National environmental status has further become a public agenda as various environmental organizations have also been continuously contributing input. This has led to an expansion of environmental education programs and a boost in the number of nongovernmental organizations. By the end of December 2014, 176 groups registered as nonprofit-nongovernmental organizations and have been participating in public service assistance projects promoted by the central and local governments.

After the UN Conference on Environment and Development in 1992, Korea established a national strategy to pursue sustainable development in the spirit of the Rio Declaration and Agenda 21. Korea's national agendas for action were declared in the 1996 Presidential Planning Committee for Earth Environmental Problems. In March 1996, the Agenda 21 plan for national action was adopted, while on June 5, 2000, a comprehensive strategic plan, the "New Millennium Vision for the National Environment," was announced. Soon after in September 2000, the Presidential Committee for Sustainable Development (PCSD) was declared. Composed of various stakeholders, this committee has spearheaded national sustainable development strategies in economic, social, and environmental fields to set up viable national objectives and policy directions.

With the 5-year interval from 2006 to 2015, Korea established and implemented the first and second rounds of the "Basic Plan for Sustainable Development." Following changes in domestic and international social, economic, and environmental status, the nation has taken action to meet the main objectives of the Sustainable Development Goals adopted by the 70th UN General Assembly in September 2015. In order to guarantee the national sustainable development plan and to strengthen global partnerships, Korea has launched the third round of the "Basic Plan for Sustainable Development (2016 – 2018)" for the next 20 years.
South Korea devised the National Environmental Zoning Map (NEZM) for environmental land use planning. This national map classifies land into five grades according to different environmental values. It provides an overall evaluation on diverse environmental data of the land, making it easier to identify the existing status of the environment and locate critical environmental factors.

In the process of creating and updating the NEZM, thematic maps of 65 evaluation criteria (57 legal criteria and 8 environmental biological criteria) are reviewed and analyzed. The highest grade of the resulting analysis is then designated as the grade of a particular area. The legal criteria include water conservation zones, ecological landscape preservation zones, and so forth. The environmental and ecological criteria items correspond to their respective values, such as biodiversity, natural ecological status, and distribution of protected and endangered species. The land is classified into five grades according to these values; with the first grade representing an area of high conservation value and the fifth referring to an area that is undergoing pre-development.

The NEZM was first completed in 2005. Since then, it has been continuously updated and expanded to improve spatial resolution and utilization. The NEZM is open to the public and utilized in pre-environmental investigation and environmental impact assessment. This is to avert social conflict that may arise from high-risk facilities to be located in an environmentally critical area. Therefore, the NEZM effectively prevents socio-economic losses in advance and avoids inappropriate site selections by developers.

Environmental Impact Assessment System

The Environmental Impact Assessment (EIA) process, analyses, and evaluates environmental impacts of various policies and development projects. Ultimately, it is a policy for preventing environmental destruction and pollution ahead of time, the EIA aims to create and maintain a pleasant environment by guiding environmentally sound and sustainable development. The Korean government enacted the assessment method, targeting initiatives such as large-scale development projects or specific programs under the Environmental Impact Assessment Act to minimize the distribution of adverse and environmental pollution. As a means of preventive protection, the EIA is designed to consider not only economic and technical aspects but also environmental factors when establishing or conducting a development project, allowing for environmentally healthy planning. According to the Act as amended on July 23, 2012, Korea carries out environmental impact assessments that are divided into the following three areas: “Strategic Environmental Impact Assessment,” “Environmental Impact Assessment,” and “Small-Scale Environmental Impact Assessment.”
Many environmental indicators in South Korea are steadily improving due to the efforts of the citizens, public organizations, and the government. With air to shape a healthy and safe environment for the nation, these actions are collectively strengthening precautionary measures for environmental management. They are developing efficient land utilization techniques, strictly controlling the use of chemical substances, and creating responsive systems to environmental diseases.

Throughout the 2000s, South Korea’s environmental policies to satisfy industrial, residential, and governmental sectors, and to ensure environmental safety. To minimize the impact on the environment, the government has introduced the “Act on Integrated Management of Environmental Pollution Facilities,” which assists big industries in complying with the best available technology (BAT) that guarantees an economically and environmentally suitable control system. This measure is also expected to create new job opportunities and increase revenue.

Global concerns regarding climate change have led to proactive efforts on the local level to reduce greenhouse gas emissions. Maintaining pace with the international society, Korea aims to reduce 30% of greenhouse gas emissions by 2020 while utilizing a low-carbon economy structure. The government is also maximizing measures to reduce greenhouse gas emissions. Furthermore, the divided and standardized regulations have been criticized for failing to address the environmental changes. However, this method has been met with limitations as it failed to flexibly address the circumstances.

On the other hand, the nation is pursuing comprehensive and effective environmental management, which mitigates the burden of obtaining multiple environmental licensing for industries and advances their implementation of R&D. This leads not only to a parallel improvement in environmentally sound technologies and innovations in environmental quality, but also the calculation of industries and their competitiveness.

Minimize contamination and technological development strategies to reduce pollution levels. Other enhancements of environmental indicators include the expansion of recycling spaces, consideration of biodiversity management, mitigation of stream ecosystems, and tightened regulations on ultra-particulate matter, noise, and odors. Parks and protected areas are steadily expanding across natural parks designated and managed for environmental education and ecological exploration.

As such, it is imperative to permit open environmental policies to satisfy industrial, residential, and governmental sectors, and to ensure environmental safety. To minimize the impact on the environment, the government has introduced the “Act on Integrated Management of Environmental Pollution Facilities,” which assists big industries in complying with the best available technology (BAT) that guarantees an economically and environmentally suitable control system. This measure is also expected to create new job opportunities and increase revenue. Global concerns regarding climate change have led to proactive efforts on the local level to reduce greenhouse gas emissions. Maintaining pace with the international society, Korea aims to reduce 30% of greenhouse gas emissions by 2020 while utilizing a low-carbon economy structure. The government is also maximizing measures to reduce greenhouse gas emissions. Furthermore, the divided and standardized regulations have been criticized for failing to address the environmental changes. However, this method has been met with limitations as it failed to flexibly address the circumstances.

On the other hand, the nation is pursuing comprehensive and effective environmental management, which mitigates the burden of obtaining multiple environmental licensing for industries and advances their implementation of R&D. This leads not only to a parallel improvement in environmentally sound technologies and innovations in environmental quality, but also the calculation of industries and their competitiveness.
Korea has conducted various environmental projects monitoring factors responsible for environmental pollution, (e.g., waters, soil, noise, and indubitably) which eventually affect the quality of life. As of May 2015, the national air pollution monitoring network (1,114 stations) was implemented throughout the country to investigate the status and trends of ambient air pollution and to demonstrate whether air quality standards are being achieved. This network is comprised of an urban air monitoring network (270 stations), a roadside air monitoring network (30 stations), a national background monitoring network (10 stations), a suburban air monitoring networks (39 stations), an acid deposition monitoring network (8 stations), an atmospheric heavy metal monitoring network (34 stations), a hazardous air pollution monitoring network (12 stations), a photochemical air pollution monitoring network (27 stations), a global atmosphere monitoring network (3 stations), a PM2.5 monitoring network (35 stations), and an air-stress monitoring network (6 stations). Data collected by the national air pollution monitoring network is stored at the National Air Quality Monitoring System (NAMS). Data on air pollution is published in real-time through “Air Korea” (www.airkorea.or.kr), launched in December 2008.

In response to increased public concern regarding urban air pollution, the Ministry of Environment (MOE) installed a monitoring network to measure air pollutants such as fine dust and ozone. Approximately 380 monitoring networks— including urban air, suburban air, national background, and suburban air monitoring networks—measure PM10 and publicly provide real-time data on air quality. In addition, there are 16 automatic monitoring stations that prevent damage caused by air pollution by providing a more in-depth analysis on air quality.

To reduce air pollutants that are toxic or hazardous to human health, the MOE launched a PM10 forecasting program for metropolitan areas in August 2013 and expanded it throughout the country in 2019. Forecasting was extended to include PM2.5 and ozone. The forecast level is classified into 5 stages to indicate the level of the ambient air quality associated with health risks of air pollution. To integrate the PM2.5 environmental standards newly implemented in 2017, the MOE expanded the PM2.5 monitoring network and established guidelines for its management of automatic data measurements. Currently, there are 164 automatic monitoring stations that measure PM2.5 concentration (16 stations by the national government, 128 operated by local governments) and 2,551 standard monitoring networks.

The Korean government also implemented an air pollution warning system for severe levels. Used for early warning and management of air pollutants under high concentrations of ozone and particulate matter, the system prevents and reduces damage by providing specific instructions for each alert level. It effectively assists respiratory disease patients, the elderly, and children that are prone to hazardous levels of ozone concentrations, and also strives to encourage the voluntary cooperation of citizens. While the system was first national in 1995 in Seoul, all local governments of Korea now utilize it to verify ozone concentrations and issue warnings accordingly.
The water quality monitoring network is operated to understand the status of water quality and aquatic ecosystems in public water bodies such as rivers and lakes. Water quality monitoring sites are selected based on the following criteria: sites to analyze contaminant inputs into rivers and their effects on the rivers, or sites to investigate pollution load due to industrial discharge at the mixing point of freshwater and seawater. Currently, water quality monitoring is carried out at a total of 2,178 sites. Data on water pollution is published through the “Water Resources Management Information System (www.wamis.go.kr).” The information from these monitoring networks is provided through the “Marine Environment Information System (www.meis.go.kr).”

Korea regularly monitors its marine environment and conditions of coastal waters, as well as the sources of marine pollution. The marine environment monitoring network aims to comprehensively understand the marine environment, and the collected information is used to establish rational management and conservation policies. This monitoring network is composed of four different network types: port, coastal and offshore, environmental management waters, and estuaries. The monitoring is carried out in February, May, August, and November of every year at a total of 417 stations. In addition, the automatic seawater quality monitoring network collects data from Yellow Sea, Korea Strait, Ulleungdo, Jeju Island, and the coastal areas of Busan in order to measure the water quality of estuaries and pollution hot spots, and to monitor coastal pollution.

Effluent Quality Standards for Pollutants by Province

Water Pollution Level at the 4 Major Rivers

Chemical Oxygen Demand (COD) of National Coasts by Year

Distribution of Water Quality Observatories

Distribution of Marine Environment Observatories

Korea regularly monitors its marine environment and conditions of coastal waters, as well as the sources of marine pollution. The marine environment monitoring network aims to comprehensively understand the marine environment, and the collected information is used to establish rational management and conservation policies. This monitoring network is composed of four different network types: port, coastal and offshore, environmental management waters, and estuaries. The monitoring is carried out in February, May, August, and November of every year at a total of 417 stations. In addition, the automatic seawater quality monitoring network collects data from Yellow Sea, Korea Strait, Ulleungdo, Jeju Island, and the coastal areas of Busan in order to measure the water quality of estuaries and pollution hot spots, and to monitor coastal pollution. The information from these monitoring networks is provided through the “Marine Environment Information System (www.meis.go.kr).”
Environmental radioactivity refers to radioactive materials that are produced from nature as well as from man-made sources. It is monitored nationally by national environmental radiation monitoring stations, which control and manage disasters related to natural and induced radioactivity and prepare response measures. The Korea Institute of Nuclear Safety monitors environmental radioactivity across the nation at all times and conducts radiocesium research on the living environment. There are 15 regional radiocesium monitoring stations and 53 central radiocesium monitoring stations that periodically measure particles, radiocesium fallout, and beta and gamma emissions from precipitation. Data is collected in real time to observe changes in indicator levels, and provided to the public through the “Integrated Environmental Radiation Monitoring Network” (KINS).

- The Ministry of Environment has been monitoring national soil contains since 1987. Monitoring points set in place to establish policies for soil contamination prevention, purification, and control. The soil monitoring network has expanded from 250 stations (stations in each location) in 1990 to 9,000 in 1994, and the number of forms of data collection, such as radionuclide (Cesium) levels and soil acidity, have increased from 9 factors to 12 over the same time period. The soil monitoring network is operated as a chief system, with the national network and regional network networks monitoring soil contaminant emissions. The national network is operated by the central government, and the regional network is operated by national agricultural land, industrial complexes, and residential areas. The evaluation of soil contamination and monitoring locations are identified by the distribution of soil contaminates and their areas of influence.

- Noise pollution is a growing concern for city-dwelling residents that are reaching their breaking point. In a 2016 evaluation, Diagnos and Geogar(12) meet the 2014 environmental standard of 68 dB, whereas for the nighttime standard (55 dB), all国际化 areas are excluding Daejeon failed to conform. In the last 3 years, the noise level has often shown a slight fluctuation within 67 dB, but remains constant throughout urban areas. This is a result of continued noise mitigation efforts, despite a steady increase of motor vehicles, roads, urban construction sites, and other noise pollution factors. Sound proof infrastructure, traffic noise management policies, and other noise-reducing measures have been introduced to suppress noise pollution.

The 1996 and 2006 Intergovernmental Panel on Climate Change (IPCC) guidelines for national greenhouse gas inventories have provided international standards for national greenhouse gas (GHG) emissions estimation. Korea’s current national GHG inventory has been formulated according to the 1996 IPCC guidelines. The government established the Greenhouse Gas Dictionary and Research Center of Korea (GIR), which conducts monitoring and research on GHG emissions and reduction strategies. The total GHG emissions in 2013 were recorded at 698.5 million tons CO2-eq. This represents an increase of 137.0% compared with 292.3 million tons CO2-eq in 1990, and 1.5% compared with 684.3 million tons CO2-eq in 2012. But emissions were recorded at 657.7 million tons CO2-eq. as of 2013, representing an increase of 152.5% compared with 251.3 million tons CO2-eq. in 1990, and 1.9% compared with 639.5 million tons CO2-eq. in 2012.

The energy sector accounted for the largest portion in 2013 at 668.5 million tons CO2-eq. (87.3%) of total GHG emissions, followed by the industrial processes sector at 52.6 million tons CO2-eq. (7.4%), the agricultural sector at 21.7 million tons CO2-eq. (3.0%), and the waste sector at 13.3 million tons CO2-eq. (1.9%).
Environmental Issues and Actions

<table>
<thead>
<tr>
<th>Date</th>
<th>Action/Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>Ulsan Samsan Plain: Crop damage</td>
</tr>
<tr>
<td>1979</td>
<td>Ulsan Yeocheon-dong: Outbreak of skin disease</td>
</tr>
<tr>
<td>1984</td>
<td>Yeongnam Chemical in the Ulsan Industrial Complex, causing a BOD level downstream of Jungnangcheon</td>
</tr>
<tr>
<td>1989</td>
<td>Onsan Disease Incident</td>
</tr>
<tr>
<td>1990</td>
<td>Donggang Dam: Hydrofluoric Gas Leakage</td>
</tr>
<tr>
<td>1991</td>
<td>Seoul’s Chollado: 78,918 Coast Gallons Spill Incident</td>
</tr>
<tr>
<td>1991</td>
<td>Gunsan Dongyang Chemical TDI Spill of December 7, 2007</td>
</tr>
<tr>
<td>1993</td>
<td>Anmyeondo: Nullification of nuclear waste disposal site</td>
</tr>
<tr>
<td>1994</td>
<td>Sihwaho incident</td>
</tr>
<tr>
<td>1995</td>
<td>Nakdonggang: Phenol spill incident</td>
</tr>
<tr>
<td>1998</td>
<td>Ulsan: 10,000 people sick</td>
</tr>
<tr>
<td>2000</td>
<td>Donggang Dam: Hydrofluoric Gas Leakage</td>
</tr>
<tr>
<td>2001</td>
<td>2001 Campaign against construction of road through Bukhansan</td>
</tr>
</tbody>
</table>

Major Environmental Issues

Implementation of a Vikame-Rangou Dipped System
The vickame-rangou-dipped system was installed in January 1989 as part of a waste minimization policy. It was introduced to reduce the amount of garbage generated as a result of the separate discharge of waste, which led to a remarkable reduction in waste generation. This system was based on the principle of separating waste into different categories, which helped reduce waste generation.

Gunsan Dongyang Chemical TDI Spill
On December 7, 2007, about 2 million gallons of the Heibei Spirit Oil Spill Accident occurred on the coast of Taean-gun, Chungcheongnam-do. 78,918 Coast Gallons Spill) occurred on December 7, 2007 when the Heibei Spirit Oil Spill Accident (Ocean Research Station). The leak resulted in the pollution of surrounding areas, thus triggering an environmental movement for the demolition of the chemical plants. Along with the spills of crude phenol at a Doosan Electronics plant in Gunsan Dongyang Chemical in the Ulsan Industrial Complex, causing extensive damage to humans, animals, and plants in the surrounding areas as a special countermeasure area to manage water at an ecosystem/watershed was designated as an ecosystem reserve. This paved the way for the formation of a committee to manage water to restore an ecosystem/anthroposphere.

Environmental Perception and Policy Changes

The era of increasing environmental problems in the 1970s led to the enactment of “The Pollution Prevention Act” (the first environmental law) in 1979. This act focused on the control of pollution and the promotion of environmental protection in areas with high concentrations of pollution. The act was implemented to address the rapid increase in industrial activities and the associated environmental problems. The act required industries to develop environmental management systems and adopt pollution prevention and control technologies. The act also established penalties for violations of environmental regulations and set standards for environmental quality.

The era of increasing environmental problems in the 1970s led to the enactment of “The Pollution Prevention Act” (the first environmental law) in 1979. This act focused on the control of pollution and the promotion of environmental protection in areas with high concentrations of pollution. The act was implemented to address the rapid increase in industrial activities and the associated environmental problems. The act required industries to develop environmental management systems and adopt pollution prevention and control technologies. The act also established penalties for violations of environmental regulations and set standards for environmental quality.
International Cooperation

Sustainable development is the most frequently cited term at international conferences in the 21st century. As humans and the planet become at risk due to excessive development, global leaders, governmental representatives, international organizations, and NGOs pulled together under the supervision of the UN to discuss sustainable development. This meeting, named the Earth Summit, was held in Rio de Janeiro in 1992. The agenda was to find measures to control development without damaging the environment of the earth.

Countries that formerly prioritized economic growth-oriented development and competitiveness adopted the “Rio Declaration on Environment and Development” and “Agenda 21” as a step toward the peaceful coexistence of humans and nature; development without damaging the environment of the earth.

Environmental Cooperation with Europe and North America

In order to improve national environmental data, Korea has been promoting cooperation with Europe and North America to adopt advanced environmental policy, systems, and technology. Countries such as the United States, Canada, the United Kingdom, France, Denmark, the Netherlands, Germany, and Norway have signed MOUs with Korea, and exchanges have been conducted in the form of joint seminars, collaborative projects, and the exchange of personnel. Since the signing of an MOU with the United States in 1993, Korea has focused on cooperation with countries in the region.

The environmental cooperation between Korea, China, and Japan has strengthened due to rapid industrialization and urbanization. As such, its importance has gradually extended as well. As of May 2015, the Korea-China-Japan workshop has been conducted 18 times, and people are accepting that the key to solving regional-related issues is to control economic growth in order to control environmental destruction.

Environmental Cooperation with Southeast Asia

The environmental cooperation between Korea, China, and Japan has been increasing due to rapid industrialization and urbanization. As such, its importance has gradually extended as well. As of May 2015, the Korea-China-Japan workshop has been conducted 18 times, and people are accepting that the key to solving regional-related issues is to control economic growth in order to control environmental destruction.

Participating International/Environmental Conventions and Treaties

Norway
- Excessive fishing
- Excessive industrial pollution
- Acidification of surface waters
- Air pollution
- Water scarcity

Vietnam
- Industrial pollution
- River Pollution
- Air pollution
- Nuclear power plant location in disaster
- Increase in private vehicles
- Deforestation
- Loss of available water resources
- Trading of endangered species
- Ineffective environmental laws
- Water scarcity

Japan
- Air pollution
- Industrial pollution
- River Pollution
- Nuclear power plant location in disaster
- Ineffective environmental laws
- Trading of endangered species
- Ineffective environmental laws

Treasure, Korea has been promoting cooperation with African countries.

Environmental Cooperation with Africa

As an environmental management in Africa is not in its infancy; investments in the environmental sector remain limited. Consequently, large-scale investments in infrastructure facilities are being requested, and people are accepting that the key to solving regional-related issues is to control economic growth in order to control environmental destruction.

The Ministry of Environment of Korea has been holding the Korea-Africa Environmental Cooperation Forum every year since the groundwork for international cooperation between the two countries was laid in November 2010. In May 2014, Korea hosted a joint workshop with Tunisia along with the 6th Korea-Africa Forum, in which the vice-minister and director of the Tunisian Ministry of Environment, officials from Nigeria and China, and Water and Sanitation for Africa discussed ways to show environmental technology and technology for atmospheric and waste management sectors.

Bi lateral cooperation with individual countries is gradually extending as well. As of May 2015, the Korean government has signed MOUs on environmental cooperation with 6 African countries. Korea has also been working on a variety of projects such as an environmental improvement program in order to strengthen bilateral cooperation with African countries.

Environmental Cooperation with Northeast Asia

The environmental cooperation between Korea, China, and Japan has been increasing due to rapid industrialization and urbanization. As such, its importance has gradually extended as well. As of May 2015, the Korea-China-Japan workshop has been conducted 18 times, and people are accepting that the key to solving regional-related issues is to control economic growth in order to control environmental destruction.

The Tripartite Environment Ministers Meeting among Korea, China, and Japan (TENMM) is an annual meeting that was first proposed by the Korean government in 1992. Its objective is to devise cooperative measures to tackle first-tier environmental issues such as yellow dust, acid rain, atmospheric pollution and hazardous waste management, and to raise a sense of environmental community among the three countries. This meeting is the only minister-level conference in the East Asian region and has served as the highest-level coordination mechanism on environmental cooperation. A total of 39 meetings have been held by May 2014.