South Korea

Since 2010, South Korea has worked to integrate green growth into its overall industrial development strategy. As a result, the market is making great strides in the implementation of advanced water treatment systems, air pollution control measures, and waste treatment and recycling. With an overall market valued at USD 20.6 billion and the U.S.–Korea FTA (KORUS) in place, Korea is a growing market for U.S. environmental technologies exporters. Domestic competition, however, is highly sophisticated, and understanding how to work within the Chaebol system is necessary.

State of the Environmental Regime

South Korea’s environmental regime is above average for an emerging market, with a score of 5.3 on The Environmental Business Journal-OECD Environmental Stringency Survey, which ranks environmental regimes on a scale from 1 to 7 (with 1 being lax and 7 being among the most stringent in the world). This score is a 1.8 point improvement over its ranking of 3.4 in 2005. On the World Economic Forum’s 2011 Index for Regulatory Stringency, South Korea ranked 41st and 36th globally, with scores of 4.13 and 4.07 for regulatory stringency and enforcement, respectively.

Market Barriers

The U.S.-Korea FTA (KORUS) was implemented on March 15, 2012. By 2017, 95 percent of tariffs on U.S. exports to South Korea, including environmental goods, will be eliminated. KORUS also has expanded opportunities for trade in services, improved transparency in South Korea’s regulatory system, strengthened intellectual property protection and enhanced market access for U.S. exporters of all sizes. Potential challenges for foreign firms wishing to enter the market derive from the need for specialized, locally-focused knowledge about South Korea’s
business sector, including the language and culture, as well as the workings of its Chaebol system.

Industry experts in the Office of Energy and Environmental Industries (OEEI) have identified the following potential barriers for environmental technologies companies attempting to export to, or work in, South Korea:

1. **Price sensitivity**
   Expectations by South Korean buyers for high quality at “rock bottom” prices may make contract negotiations challenging and may adversely impact the competitiveness of U.S. technologies as compared with lower-priced alternatives.

2. **Standards and marking requirements**
   The Korean Agency for Technology and Standards (KATS) requires separate, often redundant, safety certifications for certain electrical products. Additional testing for products that already meet international standards can be required and, together with Korea-specific labeling stipulations, can be burdensome for U.S. companies.

**Market Opportunities**

**Air Pollution Control**

**Air Quality Monitoring**

In its Nationally Determined Contribution (NDC) under the December 2015 Paris Climate Agreement, South Korea committed to reduce its greenhouse gas (GHG) emissions by 37 percent from a business-as-usual level across all economic sectors by 2030.

In 2010, the government implemented its National Strategy for Low Carbon Green Growth, including medium and long-term greenhouse gas emissions targets. Objectives of the Strategy include expanding the green technology sector and integrating standards for low GHG emissions into industries such as transportation, finance and tourism. The Strategy emphasizes working with small and medium enterprises to help “green” their businesses. In 2014, South Korea developed a Roadmap to achieve its GHG reduction targets that includes the building, transportation, agricultural, industrial and waste sectors. The government aims to manage large GHG emitters and energy consumers that are not covered by the emissions trading scheme through a national-level GHG and Energy Target Management System (TMS). In 2015, it launched a nationwide Emissions Trading Scheme (ETS) that includes 525 of the country’s largest polluters in 23 sectors and accounts for two-thirds of the nation’s non-vehicular emissions.\(^4\)

The government has paid increasing attention to urban air quality in recent years, including through setting up monitoring stations in and around Seoul and other cities and making the data publicly available online. Seoul’s First Metropolitan Air Quality Control Master Plan (2005-2014) emphasized reduction of PM10 and nitrogen dioxide concentrations in particular, with a goal of reaching 40 micrograms per cubic meter and 20 ppb, respectively, by the end of the plan period. The Second Master Plan (2015-2024) added ultrafine particles (PM 2.5) and ozone to the list of managed pollutants, which also includes SOx, NOx and Volatile Organic Compounds (VOCs). The Second Master Plan aims to reduce the emission of each pollutant by 34 to 56 percent of business-as-usual.\(^5\) Air quality monitoring tenders are listed on South Korea’s Public Procurement Service (PPS) website.

Technologies and Services in Demand:
- Continuous emissions monitoring systems
- Ambient air quality monitoring equipment
- Source emissions measurement technologies
- Analytical and laboratory testing goods and services
- Air pollution control equipment
- Fuel vapor control systems

**Industrial Air Pollution Reduction**

Under the National Strategy for Low Carbon Green Growth, South Korea has seen an expansion of the pollution control equipment industry, with imports accounting for about 10 percent of the total market. Japan and the United States are the leading foreign suppliers at 50 percent and 30 percent market share, respectively. Local manufacturers are seeking advanced products and technologies to meet the government’s increasingly strict standards.

Control measures to achieve the goals set forth in the National Strategy consist of automobile management, including a project to reduce exhaust gases from vehicles in operation; management of emission facilities, including the total load management system for large establishments; and management of eco-
friendly energy and cities. Projects to simultaneously reduce air pollutants and greenhouse gases will be carried out to improve air quality and make a positive contribution to climate change. Examples include distribution of low NOx burners households in Seoul, equipping vehicles with idle stop and go systems, and expanding green spaces in urban regions.

In Seoul, the Second Metropolitan Air Quality Control Master Plan also aims to manage high-risk pollutants distributed throughout everyday surroundings. The city government is prescribing strict control measures for VOC sources, such as laundry shops, gas stations, painting facilities, printing offices and everyday consumables. To help reduce total PM 2.5 emissions, the city offered subsidies to help 10,000 Korean barbeque restaurants and 1,135 bathhouses install filters in 2015.

A national chemical emissions survey conducted in 2010 found that approximately 61 percent of the 50,000 tons of annual emissions of 388 hazardous air pollutants (HAPs) were fugitive emissions from non-smokestack facilities and processes. The government responded by amending the Clean Air Conservation Act in 2012. The amendments introduced facility management standards for HAP-emitting facilities, effective as of January 2015. Each facility now is responsible for meeting the permissible emission levels, installation and operation of reduction technologies, leakage monitoring, and maintenance standards.

According to the U.S. Foreign Commercial Service, highly customized solutions for specific applications offer potential opportunities for U.S. exporters.

Key Technologies in Demand:
- Carbon Capture and Storage (CCS)
- Volatile Organic Compounds (VOC) control
- Dioxin abatement
- Advanced sulfur oxides/nitrogen oxides abatement in power plants and steel mills
- Energy saving and waste to energy in steel mills and municipal landfills
- Pollution-free and low-emission vehicles and engineering technology
- Pollution abatement technologies for the automobile and oil refinery industries
- Environmentally-friendly construction materials

### Power Plant Emissions Reduction

According to the U.S. Energy Information Agency, coal-fired power plants currently make up about 28 percent of South Korea’s total generation capacity. Per the country’s proposed new electricity plan, the share of coal capacity will increase to 32.2 percent by 2029. Some estimate that as much at 60 percent of the country’s air pollution is caused by pollution from power generation. South Korea will need advanced abatement technologies if it is to increase its fossil fuel fleet and still attempt to meet its emissions reduction and climate change targets.

Key Technologies in Demand:
- Continuous emissions monitoring systems
- Dry sorbent injection technologies
- Flue gas desulfurization equipment
- Activated carbon injection technologies
- Inspection, adjustment, maintenance and repair services
- Selective catalytic reduction technologies

### Solid Waste and Recycling

Over the past two decades, the Korean government has made substantial efforts to increase recycling and reuse of waste, reduce landfilling and improve waste to energy capacity. The combined volume of commercial, industrial and construction waste generated has increased over 45 percent since 2000, from 180 to 333 thousand tons per day in 2012. Despite the country’s strong economic growth, per capita household waste production has increased only marginally since 1995 due to the implementation of the Volume Based Waste Fee (VBWF) system, which operates under the “producer pays” principle. The Extended Producer Responsibility (EPR) system, implemented in 2003, currently requires manufacturers and importers to recycle certain product categories, including 27 electrical and electronic devices, as well as tires, lubricant, batteries, fluorescent lamps, Styrofoam float and packaging materials. The Ministry of Environment sets a mandatory recycling ratio for each EPR product category annually.
In 2002, the government established the “Allbaro” system, an online mechanism that tracks waste from generation to transport to disposal. The system has streamlined the waste treatment verification process and served as a basis for domestic waste-related policy development.

The government has actively facilitated WtE initiatives as well, increasing capacity from just 0.7 million tons in 1995 to 3.1 million tons at 35 WtE plants in 2010. While waste-to-energy can be part of more comprehensive waste management strategies, source reduction and recycling are recognized as preferred methods for solid waste management (“Reduce, Reuse, Recycle”). Additionally, any waste-to-energy solutions should give due attention to air pollution and climate risks.

Key Technologies in Demand:
- Waste collection technologies
- Sanitary landfill systems
- Environmental monitoring and analytical equipment
- Sorting machines
- Crushing and grinding machines
- Materials handling equipment
- Collection services, containers and vehicles
- Recycling process expertise
- Waste incinerators
- Waste-to-energy technology

Hazardous Waste Management

The Korean government has set objectives to reduce pollution generated by industrial activity and restrict the use of hazardous materials in manufacturing. It has supported the development of cleaner technologies, including drafting a strategy to reduce or substitute the use of rare metals used in electronic appliances and automobile manufacturing. As of January 2016, certain types of hazardous waste – including acidic and alkaline waste, spent oil and organic solvents, synthesized high molecular compounds, dust and sludge – must be physically separated from other solid wastes under the country’s Waste Control Act. The Ministry of Environment also recently announced plans to establish a national-level institutional framework for mercury management (2016 to 2020), per the provisions of the Minamata Convention on Mercury, to which South Korea is a signatory, though they have not yet ratified the Convention. The plans include environmental monitoring; emissions reduction; more environmentally-friendly disposal of mercury, including a take-back program for, and the ultimate phase-out of, mercury-containing products.

Key Technologies in Demand:
- Waste handling equipment
- Waste treatment technologies
- Brownfield site remediation design and equipment
- Testing and monitoring equipment

Water and Wastewater Treatment

Municipal Water and Wastewater Treatment

South Korea hosts a comprehensive water treatment system with 78.8 percent of the population connected to a municipal wastewater collection system and 89 percent of the population connected to a municipal drinking water system. The private sector is a major player in the provision of public water systems with the government typically favoring build-own-operate-transfer (BOOT) structured contracts. The federal government typically covers 50 percent of constructions costs with the balance covered by the contractor. High adherence to rate paying among the population has made public water a profitable endeavor in South Korea, and the Chaebols, as well as smaller companies, are increasingly participating in the water technologies market. There is strong demand among these players for more advanced technologies for which they look to potential foreign suppliers.

The government is also implementing advanced treatment processes for drinking water plants nationally. Since 2013, this effort has resulted in the application of advanced treatment process in 32 plants, a total of 3 percent of all facilities. The government plans to increase the ratio up to 53 percent by 2017.

There is a robust market for sludge management that has emerged as result of legal changes prohibiting landfill disposal and limiting the volume of sludge discharged into the ocean. Korea discharges an estimated 2.5 million tons of sewage sludge per year, 72 percent of which is discharged into the ocean. As a result of regulatory changes, demand for advanced solutions for volume reduction and recycling of sewage sludge has increased. The Korean government constructs more than 10 new sewage treatment plants annually, and upgrading existing sewage treatment plants to install tertiary processes, such as activated
carbon filtering and advanced disinfection processes, is common.\textsuperscript{16}

Furthermore, private sewage treatment facilities are constructed where public sewage systems are cost-prohibitive. As of 2012, there are 416,075 private sewage treatment facilities operating outside of the sewage service zone. Since 2007, any private sewage treatment facility of a certain size or larger must have a designated specialist manager and must be constructed by professional service companies.\textsuperscript{17}

Key Technologies in Demand:
- Testing equipment
- Engineering, procurement and construction services
- Advanced filtration
- Membrane filtration
- Waste to energy technology
- Sludge dewatering systems
- Membrane bioreactors
- Anaerobic digestion
- Nitrification
- Biological denitrification
- Biogas and natural gas recovery

\textit{Process Water and Industrial Wastewater Treatment}

Korea’s vast high-tech industrial base and stringent effluent standards\textsuperscript{18} fuel a robust process and industrial wastewater treatment industry. According to South Korea’s Ministry of Environment, there are more than 155 registered industrial complexes and approximately 47,000 operating facilities for small and medium-sized wastewater management firms. Korean industry implements the spectrum of water treatment technologies. There is also demand for ultrapure water treatment technologies to complement the electronics sector.

Key Technologies in Demand:
- Engineering and construction services
- Water reuse equipment and services (process specific)
- Advanced filtration
- Membrane filtration
- Reverse osmosis
- UV disinfection
- Anaerobic digestion
- Nitrification
- Biological denitrification
- Testing equipment.

\textit{Desalination}

Korea is investing heavily in desalination technology. In 2014, South Korea completed construction of its first commercial seawater desalination plant. The plant employs ultrafiltration, reverse osmosis and seawater reverse osmosis methods to supply approximately 30,000 tons of industrial water a day.\textsuperscript{19} The government is setting out to develop new desalination technology using natural gas hydrate. From 2011 to 2016, the Ministry of Land, Transport and Maritime Affairs plans to provide USD 9.2 million to the Korea Institute of Industrial Technology, a state-run think tank, to further develop the technology.\textsuperscript{20} South Korea has also developed a small nuclear reactor design for cogeneration of electricity and potable water.\textsuperscript{21}

Key Technologies in Demand:
- Engineering and construction services
- Advanced filtration
- Membrane filtration
- Reverse osmosis
- UV disinfection
- Flash distillation

\textit{Environmental Consulting and Engineering}

The Integrated Environmental Impacts Assessment Act came into force in July of 2012. The new law streamlines the Environmental Impact Assessment (EIA) process and covers three categories: Strategic Environmental Assessment (SEA) for public and private development projects, EIA, and small scale EIA.\textsuperscript{22} Administrative plans as targets of SEA are divided into policy plans and development master plans based on plan characteristics. As of 2011, main EIA project categories included urban development (156 projects in 2011), road construction (33 projects), industrial complex development (33 projects), ports (39 projects) and public water projects (36 projects). Target projects are determined in advance based on type and size. EIA s are required for 17 development categories: urban and comprehensive regional development projects; industrial site development; infrastructure projects, specifically energy projects, as well as port, road, water resources, rail and airport construction; stream use and development; land and public water reclamation; tourism complexes; mountain area development and mining of soil, sand and minerals; sports facility construction projects; waste treatment facility development; and defense and military construction projects.
Key Technologies in Demand:
- Engineering and construction services
- Environmental Impact Assessment (EIA)

ETWG Agency Initiatives and Programs

U.S. Environmental Solutions Toolkit

The Toolkit compiles the U.S. Environmental Protection Agency’s (U.S. EPA) environmental regulations, related underlying research and a directory of U.S. companies that provide technologies necessary to implement similar environmental regulatory actions abroad.

Power-Gen International Buyer Program

Power-Gen, one of the leading U.S. power generation equipment and services trade shows, has partnered with the U.S. Department of Commerce’s International Buyer Program to encourage foreign participation in the show. This platform was leveraged to exchange relevant technical information with South Korean participants and to introduce Korean buyers to U.S. waste management technology providers.

WasteExpo International Buyer Program

WasteExpo, one of the leading U.S. waste management trade shows, has partnered with the U.S. Department of Commerce’s International Buyer Program to encourage foreign participation in the show. This platform was leveraged to exchange relevant technical information with South Korean participants and to introduce Korean buyers to U.S. waste management technology providers.

Water Environment Federation Technical Exhibition and Conference (WEFTEC) International Buyer Program

The U.S. Department of Commerce, through its International Buyer Program, leads a delegation of Korean officials and business representatives to WEFTEC to explore relevant U.S. technologies and work with U.S. exporters on approaches to water resource management.

Market Contacts and Program References

Ministry of Environment
http://eng.me.go.kr/main.do

Korea National Cleaner Production Center

Public Procurement Service (PPS)
http://www.pps.go.kr/english/

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