

Please cite this paper as:

OECD (2008), "Eco-Innovation Policies in the Republic of Korea", Environment Directorate, OECD.



Country profiles on policies to support environment-friendly innovation

Eco-Innovation Policies in the Republic of Korea

Xavier Leflaive



Environment Directorate

FOREWORD

The report is part of a series of country profiles on eco-innovation policies developed for eight non-EU OECD members: Australia, Canada, Japan, Korea, Mexico, New Zealand, Turkey and the US. Country profiles are based on extensive desk research and on field missions in selected countries (Canada, Japan, Korea, the US). Country experts have commented earlier drafts of their country profile.

This series complements the eco-innovation roadmaps developed by EU member countries under the Environmental Technology Action Plan. It provides an empirical basis for further investigation on policies to support eco-innovation.

A short introduction presents the background for this series of country profiles, including the methodology, and a brief overview of some of the instruments identified.

The country profiles were drafted by Xavier Leflaive, under the supervision of Brendan Gillespie. Carla Bertuzzi has provided data and information on measurement issues and has drafted selected sections. IEEP was commissioned for the initial desk research and preliminary identification of policy issues. Country experts have provided most valuable inputs, in terms of time, information and policy relevance: Warren Hughes (Department of the Environment, Water, Heritage and the Arts, Australia), Javier A. Gracia-Garza (Environment Canada), Graham Campbell (Natural Resources Canada), Tim Karlsson (Industry Canada), Noriko Kishimoto (Ministry of the Environment, Japan), Kyu-Shik Park (Ministry of Environment, Republic of Korea), Carlos Muñoz Villarreal (Ministry of Environment and Natural Resources, Mexico), Vera Power and Alison Stringer (Ministry for the Environment, New Zealand), David Widawsky (USEPA), Sebahattin Dokmeci (Ministry of Environment and Forestry, Turkey).

Copyright OECD, 2008.

All requests for permission to reproduce or translate all or part of this material should be submitted to rights@oecd.org. OECD Publishing, 2, rue André Pascal, 75775 Paris Cedex 16, France.

TABLE OF CONTENTS

FOREWORD	2
INTRODUCTION.....	4
Background.....	4
Policy instruments to support eco-innovation	4
COUNTRY PROFILE OF THE REPUBLIC OF KOREA	6
Introduction and country definitions of eco-innovation	6
Policies, initiatives and instruments – a national inventory.....	9
Country Synthesis.....	20
Appendices	22

Tables

Table 1. Trends in environmental industry.....	23
--	----

Figures

Figure 1. Trend of R&D expenditure and ration of R&D to GDP.....	21
--	----

INTRODUCTION

Background

This report is part of the OECD work programme on eco-innovation policies.

The ambition of this report is to provide an empirical inventory of policies in place in Korea to promote eco-innovation. Considering that European countries had developed roadmaps for eco-innovation policies in the context of the European Commission Environmental Technology Action Plan (ETAP), the secretariat prepared an inventory of eco-innovation policies in eight non-EU OECD countries (Australia, Canada, Japan, Korea, Mexico, New Zealand, Turkey and the US). A similar project for China is published separately.

The objective of this work is to complement the knowledge base on eco-innovation policies in OECD countries and to provide empirical material for additional research on policy issues related to eco-innovation. The outline of each country profile is similar to that of ETAP roadmap, to facilitate comparison.

The work was implemented in coordination with country delegations, which have identified experts in each country who could provide additional information and review initial drafts of the country profile of their country.

A consultant (IEEP, Brussels, Belgium) has been commissioned to collect all information publicly available in English on eco-innovation policies in each of the eight non-EU OECD members. Field missions have been organised by the country experts in four countries (Canada, Japan, Korea, the US). During these missions, the secretariat met with the agencies identified and selected by the country expert. Draft country profiles have been developed on the basis of desk research and field missions. They have been reviewed by national experts and revised accordingly. All country profiles present information which was up-to-date at the end of 2007. In most cases, more recent information has been taken into account.

Policy instruments to support eco-innovation

The country profiles confirm that eco-innovation policies deploy a variety of instruments. They have to adjust to the features of the domestic economy, in particular the knowledge base, the size of domestic markets, and the *vigueur* of the venture capital industry.

In most non-EU OECD countries, public research and development (R&D) remains a major orientation. The US and Japan typically allocate significant public finance to environment-related R&D. However, three trends have emerged: i) some countries are concerned by the competition and trade issues related to such support; ii) public resources are increasingly channelled via Departments not directly in charge of environment policies (Energy, Agriculture, Transport), making inter-agency cooperation even more necessary; iii) the role of research organisations is being redefined, to intensify

linkages with the private sector and stimulate the development of marketable outputs; incubators in the US, or the National Institute of Advanced Industrial Science and Technology's (AIST) Technology Licensing Office in Japan illustrate innovative arrangements in this area.

Attracting private funds to finance environmental R&D is another major policy orientation. The main issue is to reduce risks for private investors investing in environmental R&D projects, while making sure that public money is used effectively and does not crowd out private initiatives. A variety of funds have been established to reduce risks to private investors (e.g. Sustainable Technology Development Canada-SDTC in Canada), or incubators (e.g. The Clean Energy Alliance in the US, Environmental Technology Business Incubator in Korea). Measures are taken to stimulate the venture capital industry and to provide incentives for environment-related projects; e.g. this is the role of the Environmental Venture Fund in Korea.

Environment-related performance standards are being set with the aim of stimulating innovation in goods and services. Such standards are pursued in particular in the field of energy and resource efficiency. However, standards may provide disincentives and can only have a lasting positive effect on innovation if they are timely revised. Schemes such as the Top Runner programme in Japan aim to address this challenge.

Market-based instruments are burgeoning in non-EU OECD Countries. A number of new projects and initiatives have been identified at national or local level. One interesting case is the all-encompassing Emission Trading Scheme envisioned in New Zealand, where equitable sharing of responsibility across sectors and stakeholders is based on the principle of equity across sectors.

There is some evidence that, besides environmental policy instruments and regulation, soft instruments such as voluntary commitments, eco-audits and eco-labels play a role as determinants of innovative behaviour in firms. Voluntary initiatives can become mandatory over time (cf. Stand-by Korea). Industry initiatives abound and, in particular contexts, can change the relationship between the administration in charge of environment policies and the business sector. This is illustrated by Performance Tracks in the US, where the US Environmental Protection Agency (USEPA) and firms enrolled in the programme construct a collaborative relationship. This typifies what can be seen as a new phase in environmental policies which sets out to promote broader sustainability, rather than address one single environmental issue. In that perspective, governments rely less on regulatory tools and endeavour to work with industries, in sectors which use materials and/or energy.

In line with the OECD Council Recommendation on Improving the Environmental Performance of Public Procurement [C(2002)3], green procurement initiatives are burgeoning at local and national levels. Guidelines are supported by websites, green products databases, and *pro forma* requests for tenders. The Green Purchasing Network is an international network active in this area.

Some initiatives set out to promote technologies and products developed by one country. Others try to alleviate barriers to the deployment of environment-friendly technologies and products; shared definitions, standards and labels contribute to a level playing field for the creation and diffusion of environment-friendly technologies, products and life-styles. Such efforts are still plagued by institutional problems related to intellectual property rights and international monetary transfers. Typically, the capacity of a national agency to (financially) support one country's side of a multinational joint venture depends on how countries will share the intellectual property rights. Few cooperation projects reach developing countries (with the exception of East Asia, and China in particular).

COUNTRY PROFILE OF THE REPUBLIC OF KOREA

Introduction and country definitions of eco-innovation

Definitions related to eco-innovation used in the country

A definition of environmental technology is provided in the Korean Act on Environmental Technology Development and Support in Korea¹. Environmental technology is defined as:

“technology necessary for preserving and managing the environment including the enhancement of assimilative capacity, suppressing and removing causes of environmental damages on humans and nature, preventing and reducing environmental pollution, and recovering polluted and destroyed environment”.

Institutions playing a major role on eco-innovation

In Korea, there are many governmental bodies and research institutes dealing with research and innovation. The ones listed below are the main institutions encountered in the preparation of this report.

Ministry of Environment (MOE)

<http://eng.me.go.kr/docs/index.html>

The Korean Ministry of Environment is responsible for works related to the protection of natural and ambient environment and the prevention of environmental pollution.

In the field of environmental technologies, Environmental Management Corporation (EMC) is a non-profit, representative public environmental organization under the Ministry of Environment. It specializes in environmental technology and deals with comprehensive environmental issues. Its extensive works include: reviewing and supporting environmental policies and technology application, building and operating environmental tele-monitoring systems of environmental pollution measurement, designing and supervising environmental facility construction and operation such as landfill, incinerator, wastewater treatment, drinking water and sewage pipe line, analysing and verifying environmental pollutants such as dioxin and contaminated soil, evaluating and diagnosing environmental facilities, managing watershed area, supporting national climate change response, researching and developing renewable energy technology, supporting developing countries for their environmental protection, etc.

Ministry of Knowledge Economy (MKE)

<http://english.mke.go.kr/language/eng/main.jsp>

¹ Ministry of Environment, 2005

MKE (former Ministry of Commerce, Industry and Energy, MOCIE) is the ministry responsible for policies concerning industry, trade, and energy and resources. Among its tasks, MKE aims to establish an innovation-driven industry and implement policies on energy conservation, alternative energy, energy safety and development of domestic and overseas resources. One of the priorities in 2008 is working towards the establishment of a carbon market.

Korea's Energy Management Corporation (KEMCO) receives its mandate from MKE: MKE regulates; KEMCO implements and reports to MKE. The focus is on energy efficiency, new sources of energy and renewables (fuels cell, photovoltaic, and wind power).

<http://www.kemco.or.kr/>

Ministry of Education, Science and Technology (MEST)

<http://english.mest.go.kr/>

The mandate of MEST (created as MOST in 2004, renamed as MEST as of 2008 February 29th), is to provide central direction, planning, coordination and evaluation of all science and technology activities in the country, and to formulate science and technology policies, programs and projects including technology cooperation, space technology, and atomic energy in support of national development priorities. It has no specific programme on environment or energy, as MOE and MKE have their own research programmes.

The Korea Eco-Products Institute (KOECO)

www.koeco.or.kr/eng/index.asp

KOECO is a public institution established by national law to promote consumption and production of environmentally preferable products. KOECO is responsible for the administration of the eco-labelling program, the management of public green procurement, and the provision of eco-products information and technical assistance for industries.

Korean Agency for Technology and Standards (KATS)

<http://www.kats.go.kr/english/index.asp>

The KATS is a specialized institute establishing national industrial standards (including environmental ones) and technical evaluation in Korea. Its main missions include promoting the conformity of Korean standards with international standards and certifying new technologies and quality of products for industries in Korea.

Korea Institute of Environmental Science & Technology (KIEST)

<http://www.kiest.re.kr/eng/index.jsp>

KIEST was established in 2001 to support the planning, evaluation and management of R&D projects in the field of environmental technology, conduct demand surveys, make technological forecasts, and facilitate the penetration and practical application of the technologies developed. It manages such programmes as the former G7 project (see below), Eco-technopia 21 Project for next generation, National Long-term Ecological Research, Geo-Advanced Innovative Action Project, Soil-Pollution Diffusion Prevention Project, PCBs Research, ET Edu-innovation Project.

Moreover, KIEST supports participation of companies in international environmental exhibitions and promotes projects on exchange of human resources with developing countries, in an effort to increase the exports of technologies.

Regional Environmental Technology Development Centres

Universities, administrative agencies, research institutes, industries and non-governmental organizations constitute Regional Environmental Technology Development Centers that collectively attempt to solve unique local environmental problems. The responsibilities of each center include analysis and study of local environmental pollution, development of environmental technology, environmental education and technical support to enterprises coping with environmental management problems, dissemination of new environmental technologies, and promotion and education of new environmental technologies to local people.

Policy documents related to eco-innovation

A number of documents related to technology and innovation are mentioned in relevant web sites and official documentation. The main ones have been listed below, though no available English version has been found.

In addition, the Special Act on Seoul Metropolitan Air Quality Improvement (which came into force in January 2005) also stimulates environment-friendly regulation. The Special Act includes the implementation of total pollution load management in industries, gradual emission reduction through wide supply of low emission vehicles, attachment of pollution-reduction device to cars, and other concrete measures to reduce air pollution.

10-year Basic Plan for the Development and Dissemination of New and Renewable Technology

The 10-Year National Plan for Energy Technology Development, released in 2003, selected fuel cells, photovoltaic (PV), wind power as high-priority areas. The Korean government planned to invest approximately US\$ 200 million in the development and dissemination of fuel cell from 2004 to 2011 and US\$2.42 billion for the photovoltaic².

Strategies for Environmental Technology Development

The First Phase Environmental Industry Development Strategy (2001~2003) and the Mid- & Long-term Strategy on Fostering Environmental Industry (2005~2010) aimed at advancing the Environmental Technology to the level of other developed countries by 2010.

² <http://www.oecd.org/dataoecd/12/13/31967755.pdf>

The Long-term Vision for Science and Technology Development Toward 2025

The Korean government launched a long-term strategic initiative, the Long-term Vision for Science and Technology Development toward 2025 (or Vision 2025), in 1999. The plan set the directions and goals of the Korean government's mid-long-term science and technology (S&T) policies. Among its major features, the plan promotes: shifting innovation system from government-led to private sector-led ones; improving the effectiveness of national R&D investment; aligning R&D system from a domestic to a global network; and meeting the challenges of the information technology and biotechnology revolution³.

Basic Plan of Science and Technology 2003-2007

The plan identifies, among its policy priorities, technology development for establishing sustainable economic growth.

Policies, initiatives and instruments – a national inventory

Research and Development

The Korean Government leads research and development (R&D) activities in collaboration with industry, universities and research institutes. Priority projects are financed by the government budget and energy-related funds from the Government and industry. Three important long term projects focusing on R&D are:

- 21st Century Frontier R&D Program;
- Eco-Technopia 21 Project, including Eco-Star;
- National Research Laboratory (NRL).

21st Century Frontier R&D Program

The Frontier 21 programme, launched in 1999 and run by the MOST, is a 10 year effort to develop core technologies in near to market areas by 2010. This programme supports 23 projects in areas such as bioscience, nanotechnology, intelligence and information technology, at a total cost of over US\$3.5 billion. Among these, the government financed projects on Carbon Dioxide Reduction and Sequestration (in 2002), and on Hydrogen Energy (in 2003)⁴.

Eco-Technopia 21 Project

The project has started to follow up the G7 project since 2001, which was a 10-year project, run by MOE, launched in 1992 with the aim to develop seven areas of environmental technology to the level of G7 countries. The G7 project helped close the technological gap that existed between Korea and advanced countries – especially on the so called 'post-treatment technologies' (such as dust collection, advanced waste water treatment, and small-scale incineration). For example, technologies

³ <http://unpan1.un.org/intradoc/groups/public/documents/APCITY/UNPAN008049.pdf>

⁴ <http://www.britishembassy.gov.uk/servlet/Front?pagename=OpenMarket/Xcelerate/ShowPage&c=Page&cid=1101395195467>

such as high efficiency dust collecting technology and exhaust gas desulfurization technology have been upgraded⁵.

Achievements: a total of 331 projects were successfully completed by the end of 2003

The Eco-Technopia 21 Project is a ten year project, initiated in 2001. MOE plans to invest about 1 trillion Korean won (800 million USD) by 2010⁶, along three stages:

- 2001-2003: the focus is on the development of pollution control technologies; it followed a bottom-up approach;
- 2004-2007: the focus shifts to the development of mid- and long term strategic technologies; a top-down approach is used to designate projects;
- 2008-2010: the focus will be on environmental technology development for future generations.

The private sector is expected to invest some 348 million USD on the project. A follow-up project will be designed before the end of the third stage.

The project focuses on the promotion of environmental technology in a number of specific areas, including environmental conservation/restoration and precautionary pollution prevention. Three steps in the technology development process are being promoted: generic technology, applied technology, and technology commercialization. Eco-Technopia 21 is open to international consortia (the project leader can commission a foreign entity to take charge of part of the research); over 2004-07, 40 projects involved Chinese parties.

For systematic implementation of Eco-Technopia 21 Project, MOE developed a 10-year Master Plan for Eco-Technopia 21 in July 2002. With this plan, MOE outlined concrete goals and strategies by phases, while introducing the Technology Road Map (TRM) of the nation.

Eco-STAR (Eco-Science & Technology Advancement Research)

The Eco-STAR plan, which is a part of Eco-Technopia 21 Project developed by MOE, sets mid- and long-term strategies to develop promising environmental technologies by sector. It is focused on projects which can deliver world-class technologies that will compete on global markets. The rationale is to maximise synergistic effects through joint or multilateral R&D on projects unable to achieve targets independently. Projects are selected according to their commercialisation and success potential; they are financed through a matching fund system, where the government works with industry.

In 2004, two pilot centres were set up: the 'Centre for Environmentally Friendly Vehicle' focusing on developing technologies for vehicle emission reduction (with the investment of 65 billion won by 2010), and the 'Innovation & Integration Centre for XXIst Century Water Technology', devoted to advancing sewage and wastewater treatment technologies (with an investment of 65 billion won).

⁵ http://eng.me.go.kr/docs/common/common_view.html?idx=28&av_pg=1&mcode=10&classno=15

⁶ http://eng.me.go.kr/docs/common/common_view.html?idx=28&av_pg=1&mcode=10&classno=15

Based on the outcomes and experiences from these pilot initiatives, MOE has planned to promote a gradual expansion of the Eco-STAR Project and has launched two new centres in 2007: the 'Centre for Aquatic Ecosystem Restoration', devoted to restore and control eco-system; and the 'Centre for Waste Eco-Energy and Greenhouse Gases', designed to respond to energy and climate change.

National Research Laboratory (NRL)

The programme identifies and cultivates outstanding laboratories in the fields of core technology that will be key elements for national competitiveness. This strategic national R&D program maintains and develops the core technologies that can be the common basis for many industries and products. It also supports efficient utilization of the science and technology resources in industry, academia, and research institutes throughout the nation. Up to 2005 about 40 laboratories set up in this context were related to environment⁷. See: http://www.kosef.re.kr/english_new/programs/programs_02_03.html

Verification of technologies

Environmental Technology Verification (ETV) Program

Korea ETV Program operated since 1997 is the system to certify or verify the environmental technology that developed or improved in Korea. It sets out to accelerate the development of environmental technologies and promote environmental industry.

There are two types of Korea ETV Program, i) 'New Excellent Technology' (NET), and ii) 'Technology Verification'. NET consists of on-site inspection (1 day only) and document review. Technology Verification consists of on-site verification and document review; it can last from 6 to 12 months. As of January 2008, 258 technologies had been verified, 108 through technology verification, 150 through NET; water and wastewater accounted for 2/3 of overall verifications (80% of technology verifications).

Through NET and Technology Verification, technology-users can use NET-technologies with trust and enterprises can efficiently apply the developed technologies into the field. The certified or verified technologies benefit from extra points at public project biddings, the recognition of construction record, advertisement in website and conferences, etc. Ministry of environment (MOE) is supporting within 50% of verification cost for promoting commercialization of developed environmental technologies since 2003 (refer to <http://www.koetv.or.kr/eng/index.html>)⁸.

Performance Targets

The main environmental performance targets are:

- Rational Energy Utilisation Plan – 2004;
- Building code standards;
- Standby Korea 2010;

⁷ Ministry of Environment, 2005

⁸ European Commission, 2004: Overview of Existing Environmental Technologies Evaluation/Verification Programs http://ec.europa.eu/environment/etap/pdfs/overview_env techno verification.pdf

- Voluntary agreement;
- Voluntary Fuel Efficiency Standards.

Rational Energy Utilisation Plan - 2004

Since 1993, Korea has executed Rational Energy Utilisation Plans spanning five year periods. The 3rd plan (2004-2008) establishes a target of 7% reduction of the expected total primary energy consumption in 2008⁹.

Building code standards

To improve Korea's standards for the energy intensity of buildings, the Building Energy Policy Council began in July 2005 to review energy efficiency assessment standards and develop policies to raise energy efficiency. The building code standards are 38 kWh/m³-year for the residential sector and 130 kWh/m³-year. Korea's building insulation standard varies by region and type of building, but an average figure for outer wall insulation in urban buildings is 0.47 W/m³K¹⁰.

In 2006, the Korean government mandated every three years energy audits for buildings consuming more than 2 ktoe per year. Buildings that achieve outstanding energy performance are exempted from this requirement¹¹.

Standby Korea 2010

MKE implemented a three-stage program with the ultimate goal of reducing standby power of each electrical device below one watt by 2010. The first voluntary stage of the plan has been running from 2005 to 2007 and targets 18 products, including computers, monitors, fax machines, etc. Products that satisfy the one-watt target will have an advantage in being chosen for government procurement. The second stage between 2008 and 2009 will prepare for the full-fledged implementation in 2010. The third mandatory stage, after 2010, will expand to 30 products.



See: http://www.kemco.or.kr/english/sub03_energyefficiency02.asp?defmenu=3

Achievements: if well-implemented, the policy is expected to save 121 billion KW annually by 2010; standby power use by each household is expected to fall 4.3% by 2020 - compared to 2003 levels.

⁹ Source: <http://www.iea.org/Textbase/pm/?mode=re&id=2136&action=detail>

¹⁰ <http://www.iea.org/Textbase/pm/?mode=pm&id=2564&action=detail>

¹¹ <http://www.iea.org/Textbase/pm/?mode=pm&id=2563&action=detail>

Voluntary Agreement (VA)

The Voluntary Agreement, a joint program between the government and industry, is managed by the Ministry of Knowledge Economy and the Ministry of Environment. A company which intends to join the agreement should submit a concrete action plan, specifying energy consumption and greenhouse gas emission reduction target. The company that concludes successfully a VA agreement will be provided with low interest loans and tax incentives to promote energy conservation and greenhouse gas reduction. Technical support as well as PR promotion for the company will be offered as well.

See: http://www.kemco.or.kr/english/sub03_VA.asp

Achievements: as of 2004, a total of 1,021 companies have participated in the agreement, covering the fields of steel, chemicals, textiles, paper, ceramics and the food industry. They are committed to reducing their CO₂ emissions by 8,647 million tonnes of carbon (TC) in five years by enhancing energy efficiency by 10.6 percent through the adoption of energy efficiency technologies, installation of alternative energy utilizing facilities such as combined heat and power (CHP), improvement of manufacturing processes, utilization of clean energy sources and collected waste heat, and improvement of operation management.

Voluntary Fuel Efficiency Standards

The five major Korean automobile manufacturers agreed on December 2005 to improve the fuel efficiency of cars by more than 15% by 2012, and expand R&D in hybrid and fuel cell-powered vehicles. The Government imposes more stringent standards year by year.

Achievements: the country calls for energy savings of 220,000 kl per year, (equal to 313 billion Korean won), and reduce the emission of carbon dioxide by 350,000 metric tons annually¹².

http://www.kemco.or.kr/english/sub03_energyefficiency.asp?defmenu=3

Mobilisation of Financing

The main financial programs related to eco-innovation include:

- Demonstration & Dissemination Program ;
- Environmental Venture Fund.

Demonstration & Dissemination Program

To promote the marketing of developed New and Renewable Energy (N&RE) technologies, the government subsidizes 70 percent of the associated installation costs. Some 10.5 billion won of subsidies were provided by the government from 1993 to 2003: for PV Power Generation Systems, Solar Thermal Water Heating Systems and Bio-Methane Generation Systems. Another 4.7 billion won were provided in 2004 to deploy developed N&RE technologies: PV, solar thermal water heating, geothermal systems and wind power generation systems.

¹² <http://www.iea.org/Textbase/pm/?mode=weo&id=2380&action=detail>

Achievements: as the part of dissemination programs, the Solar-roof 100,000 Project started in 2004. The goal was to set up 100,000 solar-roofs by 2012. The government subsidized 6.4 billion won and 311 units were installed in 2004¹³.

Environmental Venture Fund

In order to support environmental technologies, the Korean Ministry of Environment has created an Environmental Venture Fund and has actively identified and supported promising venture companies.

Environmental Technology Business Incubator (ETBI) has been set up under the supervision of the Korea Institute of Environmental Science and Technology (KIEST) to assist venture activities of those at the frontier of environmental technology development¹⁴.

Market-based Instruments

The most relevant market based instruments promoting eco-innovation in Korea include:

- Feed-in Tariff for Renewables (Electricity Business Law)
- Tax Incentives
- Loans
- Hybrid and Fuel-Cell Powered Vehicles Plan
- Green procurement

Feed-in Tariff for Renewables (Electricity Business Law)

The Electricity Business Law mandates both the purchase and the fixed price of electricity generated from renewable sources. Any renewable energy generator that is connected to the grid is eligible to sell electricity to the grid at fixed prices. Korea Electric Power Corporation (KEPCO) is responsible for purchasing electricity from renewables. The government compensates for the difference between N&RE power generation cost and fossil fuel generation prices.

From October 2006 on, the power sources subject to the standard price have been extended. Standard prices were ramified into nineteen prices for nine power sources. Starting in 2009, a decremental rate will be applied to photovoltaics and wind power; a decremental rate will apply to fuel cell from 2010 on. The standard price for each power source is applied for 15 years; minimal capacities are required to qualify for feed in tariff (100, 1000, 50 MW for photovoltaics, wind power and fuel cell respectively).

¹³ http://www.kemco.or.kr/english/sub03_R&D02.asp

¹⁴ European Commission, 2004: Overview of Existing Environmental Technologies Evaluation/Verification Programs http://ec.europa.eu/environment/etap/pdfs/overview_env techno_verification.pdf

Tax Incentives

The government provides tax incentives for energy efficiency investments for the replacement of old industrial kilns; the installation of energy-saving facilities; the installation of alternative fuel-using facilities and of other facilities reducing energy consumption by more than 10 %. Before 2001, the tax incentive was for 5 % of income tax credit, but it was changed to 10 % in 2001 and 7 % in 2003.

See: http://www.kemco.or.kr/english/sub03_financial02.asp?defmenu=4

Loans

The Korean government has provided long-term and low interest loans from the '*Fund for the Rational Use of Energy*', along with tax incentives, for energy efficiency and conservation investments. KEMCO is responsible for its management and monitoring.

See: http://www.kemco.or.kr/english/sub03_financial.asp?defmenu=4

Achievements: The total loan performance was US\$515.9m in 2004

Hybrid and Fuel-Cell Powered Vehicles Plan

A five-year plan, developed by MKE, would allow the country to develop its own hybrid car technologies and test-drive fuel cell cars by 2010. Consumers who buy hybrid vehicles would be offered various incentives such as subsidies, tax breaks, and discounted parking fees. In addition, to further promote the use of hybrid vehicles, government agencies will purchase hybrid cars for official use.

Achievements: the country has started producing hybrid vehicles at the end of 2006 and is expected to reach a production capacity of 300,000 units by 2010¹⁵.

Green procurement

The Act on the Promotion of the Purchase of Environment-friendly Products , enforced in July 2005, aims to encourage the purchasing of environment-friendly products and services by means of mandating public agencies to buy environment-friendly products and services and supporting industry and household-level green consumption. In addition, KOECO organises the Green-Purchasing Convention.

Achievements: around 30,000 public agencies are now subject to participate in the green procurement systems. Eco-products market in Korea has been growing dramatically to reach 12 trillion won as of December 2006¹⁶.

Awareness raising and training

Several initiatives to promote the consumption and production of environmentally preferable products are coordinated by the KOECO. The main ones are the following:

- Eco-labelling Program,

¹⁵ <http://www.iea.org/Textbase/pm/?mode=weo&id=2379&action=detail>

¹⁶ Source: http://eng.me.go.kr/docs/news/press_view.html?seq=352&page=1&mcode

- Environmental Declaration of Products (EDP) Program,
- Other initiatives by KOECO,
- Act on the Promotion of the Purchase of Environment-friendly Products.

Other awareness raising and training programmes in Korea include:

- Kids ISO 14000 Program,
- Energy Conservation Month/Day,
- Energy Conservation Exhibition and Convention,
- Korea Environmental Technology Awards,
- National Environmental Technology Information System,
- Environmentally friendly Company Certification System.

Eco-labelling Programme

The Korea Eco-labelling Programme, operated by the KOECO, is a voluntary certification program started in 1992. The Eco-label is awarded to products meeting certain environmental standards to verify lifecycle based environmental preferability of products and services.



See: http://www.koeco.or.kr/eng/business/business01_01.asp?search=1_1

Environmental Declaration of Products (EDP) Program

The EDP Program is National type III environmental declaration program to disclose quantified environmental impacts information on the life cycle of a product, including production, distribution, consumption, and disposal. It is introduced to guarantee the reliability of environmental information of products. The Program is administered by KOECO.

See: http://www.koeco.or.kr/eng/business/business02_01.asp?search=2_1

Other initiatives by KOECO

KOECO also manages a number of other initiatives promoting sustainable production and consumption, such as: operating the Eco-Supply Chain Management Network (involving such industries as steel, pulp and paper, the automobile industry) and the Trade & Environment Information Network, providing the Eco-Design technical assistance service, organising Eco-Products Exhibition, etc.

Kids ISO 14000 Program

The Kids ISO 14000 Program is an international project designed to stimulate environmental awareness among children and to take practical steps to preserve the environment. It involves one

hundred elementary school students, who learn about various energy saving methods and waste recycling processes. The programme is run by the Agency for Technology and Standards (Kats)¹⁷.

See: www.iso.org/iso/en/kidsiso14000/index.html

Energy Efficiency Labelling Program

The Energy Efficiency Labelling program, run by KEMCO, aims to save energy by enabling the consumers to identify the high efficiency energy saving type products and encouraging the manufacturers/importers to produce and sell energy saving products.



See: http://www.kemco.or.kr/english/sub03_energyefficiency.asp?defmenu=3

Energy Conservation Month/Day

Each year November is the month designated by the government as the ‘Energy Conservation Month’. In this month various events are held to draw the attention of the public toward energy conservation. Furthermore, the first Fridays of each month are designated as ‘Energy Conservation Day’¹⁸.

Energy Conservation Exhibition and Convention

The Energy Conservation Exhibition (ENCONEX) has been annually organized by KEMCO since 1975 to promote the latest energy conservation technologies and equipment. The Energy Conservation Convention is held annually to heighten public energy conservation awareness¹⁹.

Korea Environmental Technology Awards

Korea Environmental Technology Awards, hosted and organized by MOE and KREST since 1995, is a ceremony to identify and reward persons who made notable contribution to environmental improvement by developing or commercializing excellent environmental technology or products. It aims to promote environmental technology development in private sector and encourage creative technology development efforts.

¹⁷ Source: <http://www.iea.org/Textbase/pm/?mode=pm&id=2384&action=detail>

¹⁸ Source : http://www.kemco.or.kr/english/sub03_other03.asp?defmenu=7

¹⁹ Source : http://www.kemco.or.kr/english/sub03_other03.asp?defmenu=7

National Environmental Technology Information System

The system was launched by MOE in 2000 to stimulate and promote development of innovative environmental technologies and its implementation. In addition, it also aims to foster environmental industries technologies and encourage creative technology development efforts. Through the Information System, MOE has been providing information on the latest technology to people in environment-related sectors. Currently, it has established some 43,000 databases at 14 DB such as information on technical support and information on planning and construction.

Environmentally friendly Company Certification System

Through the Environmentally Friendly Enterprise Certification System, companies are recognized on the basis of performance and employee participation in proper treatment of pollution from the company, as well as precautionary environmental management and environmental improvement efforts. Introduced in April 1995, a total of 146 companies were designated in the year 2003.

Certified companies can increase information exchange with each other and strengthen capacity to provide technology support and consulting to small and medium sized enterprises (SMEs) through the nationwide online network (www.ef21.co.kr) established in 2001, led by the Korean Association of Environmentally Friendly Enterprises. In addition, certified companies play key roles in relation to the environmental management know-how being developed and distributed by MOE such as environmental reporting, performance review and accounting.²⁰ See: <http://www.ef21.co.kr/english/index.htm>

Achievements: the System has awarded 137 companies by 2003.

Acting Globally

International projects on eco-innovation include:

- Korea-China Environmental Industry initiatives
- Environmental Industry Round-Tables
- APEC Expert Groups
- KEMCO bilateral collaborations
- Clean Development Mechanisms (CDM)

KOECO also cooperates with international agencies such as GEN (Global Eco-labelling Network), GEDnet (Global Type III Environmental Product Declarations Network) and IGPN (International Green Purchasing Network) and signed Mutual Recognition Agreements (MRA) with six countries including Japan and China.

²⁰ http://eng.me.go.kr/docs/common/common_view.html?idx=34&av_pg=1&mcode=10&classno=15

Korea-China Environmental Industry initiatives

Environmental cooperation with China is especially active in the field of environmental industry, with jointly run 'Korea-China Environmental Industry Centers,' pilot projects in 10 selected provinces and cities²¹. In July 2002, the Korea-China Environmental Industry Investment Forum was organized in China to present Korean environmental industries and technologies.

In July 2001, Korea established the Korea Environmental Technology Exhibition Center in Beijing, China. The center exhibits environmental technologies of sixteen Korean companies and provides a collection of Chinese market research²².

Achievements: about US \$2 billion of exports were achieved by twenty environmental companies in Korea.

Environmental Industry Round-Tables

Korea, China and Japan organized environmental industry round-tables to boost environmental industry cooperation²³.

APEC Expert Groups

KEMCO has joined the APEC (Asia-Pacific Economic Cooperation) Expert Groups on Energy Efficiency & Conservation and New & Renewable Energy Technologies and produced numerous innovations²⁴.

KEMCO maintains close relations with other associated organizations abroad to exchange energy information and develop collaborative programs such as joint-seminar, training or research projects. Its main partners are ECCJ, NEDO, DOE, LBNL, DENA, NREL, ADEME, NOVEM, ENEA, SEDA and FES²⁵.

Clean Development Mechanisms (CDM)

The Korean government funds approximately \$1 billion a year to finance energy saving and conservation projects. MOE and MKE promote and support the development and commercialisation of GHG reduction technologies which may be considered as CDM projects. A number of CDM projects in renewable energy such as landfill gas power generation, energy efficiency are already in practice and actively being discussed with overseas investors²⁶.

21 http://eng.me.go.kr/docs/common/common_view.html?idx=33&mcode=10&av_pg=1&classno=15

22 http://eng.me.go.kr/docs/common/common_view.html?idx=35&av_pg=1&mcode=10&classno=15

23 http://eng.me.go.kr/docs/common/common_view.html?idx=8&av_pg=1&mcode=30&classno=14

24 Source : http://www.kemco.or.kr/english/sub03_int02.asp?defmenu=6

25 http://www.kemco.or.kr/english/sub03_int.asp?defmenu=6

26 Source : <http://www.iea.org/Textbase/pm/?mode=pm&id=969&action=detail>

Country Synthesis

Eco-innovation and national competitiveness

Korea explicitly identifies innovation at large, and eco-innovation more specifically, as a vehicle to increase economic growth and national competitiveness.

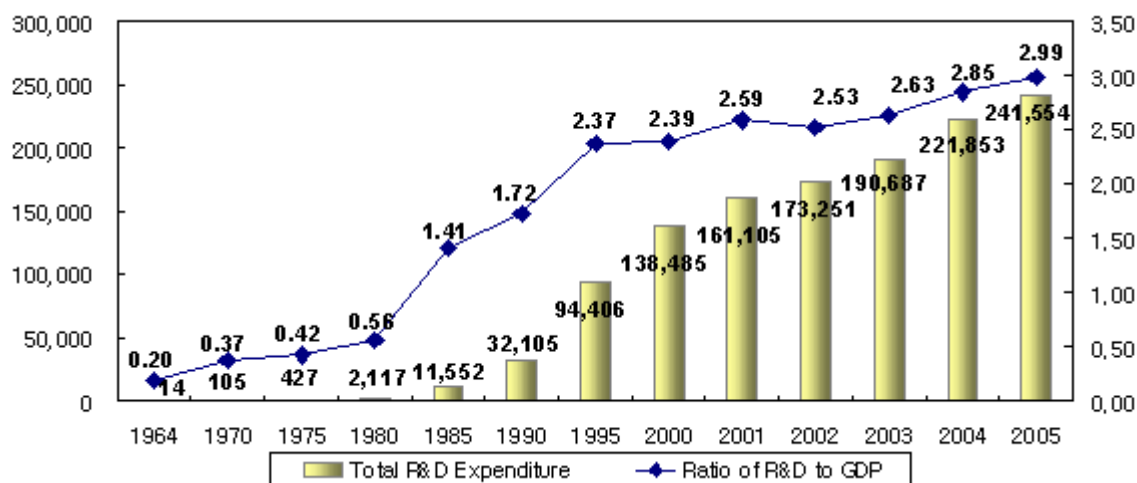
Initially, Korea's national science and technology policies focused mainly on the introduction, absorption, and application of foreign technologies. In the 1980s, the emphasis shifted to the planning and conducting of national R&D projects to raise the level of scientific and technological skills, using G7 countries as a benchmark. In 2003, the government placed science and technology at the top of its policy agenda to spur economic growth. In 2004, the government announced a plan to restructure the National Innovation System (NIS). The plan emphasizes shifting from a catch-up model to a more innovation-driven one. At the same time, Korea committed to strengthen its involvement in global issues, such as the preservation of the environment²⁷.

The total R&D expenditure in the field of science and technology (natural sciences, engineering, agriculture, animal husbandry, fisheries, medicine, pharmacy, etc.) for the year 2005 in Korea was 24,155.4 billion won, showing an increase of 8.9% from the previous year. In 2005 R&D expenditure as a percentage of Gross Domestic Product (GDP) was 2.99% - among the highest worldwide. This equals the EU target for R&D expenditure set by the EU Lisbon Strategy, namely 3% of GDP by 2010. as many Korean firms are reaching knowledge frontiers across several sectors, government has increased its spending on R&D, at a rate more than twice OECD average (see OECD, forthcoming). However, the OECD Review points at some limitations in the efficiency of public R&D spending in Korea: duplication between universities and government research institutes, or between government programmes and projects, weak linkages between business, university and government research institutes have to be remedied, to enhance the transition from a catch-up model of technological progress to a more creative approach. More support to SMEs, emphasis on service industries, and diversification in research areas are important directions for innovation policies in Korea.

A number of projects have been financed in the past 20 year to improve, among others, environmental technologies. Among these, the most noteworthy are the *G7 Project*, followed by the *Eco-Technopia* – the latter more focused on specific areas, like environmental conservation and pollution prevention.

²⁷ http://www.korea.net/korea/kor_loca.asp?code=E0207

Figure 1. Trend of R&D expenditure and ratio of R&D to GDP



Source : MOST (<http://www.most.go.kr/en/sce05/sce0501/sce050101/>)

Creating markets

Several initiatives promote eco-innovation. Funding seems to have shifted from research and development towards the deployment and commercial phase, with several measures stimulating demand through market-based instruments and awareness raising. Labelling and standardisation and technology verification also play an important role in supporting the development of a market for eco-innovation; the harmonization of eco-labelling systems across East Asia provides opportunities to enhance their impacts.

Working with industry and the finance community

Several initiatives are based on voluntary approaches, such as the *Voluntary Agreement*, the *Eco-labelling*, the *Voluntary Fuel Efficiency Standards* etc. An interesting mix of voluntary and mandatory approaches is represented by the *Stand-By Korea* program, which sets voluntary targets at the early stages, to become mandatory at the end of the program.

Korea is keen to promote its technologies abroad, and to exchange information with other countries. In particular, the collaboration between Korea and China on environmental industries is active, with initiatives such as the *Korea-China Environmental Industry initiatives*, the *Korea Environmental Technology Exhibition Center* in Beijing, and the *Environmental Industry Round-Tables* (which include Japan).

Korea has set up initiative to encourage venture capital in green technologies. The performance of the Environmental Venture Fund and of the Environmental Technology Business Incubator (ETBI) deserves a particular analysis.

Regional coordination to address local issues

The *Regional Environment Technology Development Centres* are interesting examples of cooperation between administrative agencies, research institutes, industries and non-governmental organizations, centred on universities. The responsibilities of each centre (about 16 in 2006) include

identification and analysis of local environmental pollution, development of environmental technology, environmental education and technical support to enterprises coping with environmental management problems, and dissemination of new environmental technologies. Environmental education programs are also being administered, including courses for environmental managers and citizens and joint seminars among industries, research institutes and academic communities.

Appendices

Summary table

Actions	Initiatives
Research and Development	21st Century Frontier R&D Program Core Environmental Technology R&D Program for next generation National Research Laboratory (NRL)
Verification of Technology	Environmental Technology Verification (ETV) Program Integrated Energy Policy (IEP) Mandatory Energy Audits for Large Power Consumers
Performance Targets	Rational Energy Utilisation Plan - 2004 Building code standards Standby Korea 2010 Voluntary Fuel Efficiency Standards Energy Efficiency Labelling Program
Mobilisation of Financing	G7 Project (Leading Technology Development Project) Eco-Technopia 21 Project Eco-STAR (Eco-Science & Technology Advancement Research) Demonstration & Dissemination Program Environmental Venture Fund
Market-based Instruments and State Aid	Feed-in Tariff for Renewables (Electricity Business Law) Voluntary Agreement (VA) Tax Incentives Loans Hybrid and Fuel-Cell Powered Vehicles Plan
Labelling and Procurement	Eco-labelling Program Environmental Declaration of Products (EDP) Program Other initiatives by KOECO Act on the Promotion of the Purchase of Environment-friendly Products
Awareness Rising and Training	Kids ISO 14000 Program Energy Conservation Month/Day Energy Conservation Exhibition and Convention National Environmental Technology Information System Environmentally friendly Company Designation System Corporate Environmental Information Disclosure System
Acting Globally	Korea-China Environmental Industry initiatives Korea Environmental Technology Exhibition Center Environmental Industry Round-Tables APEC Expert Groups KEMCO bilateral collaborations Clean Development Mechanisms (CDM)
Others	Act on the Promotion of the Development, Use and Dissemination of New and Renewable Energy

Eco-industries in Korea

After the 1990s, Korea unveiled a gradual development of the environmental industry in accordance with growth in public awareness and governmental efforts toward environmental protection. The ministry of the Environment has also been working towards promoting joint environmental industry development and exchange, especially with China and other Northeast Asian countries²⁸.

Between 1995 and 2005 the environmental industry in Korea has grown by 13.4 percent annually. In 2005 the green industry was worth more than 20,000 billion won (see Table 2 below), and is expected to grow to about 28,000 billion by 2015.

Table 1. Trends in environmental industry

unit: 1000 billion Won, %

Domain	1995	2005	2015	Annual growth rate 1995-2005	Annual growth rate 2005-2015
Water	2.89	8.23	8.49	11.0	0.3
Air pollution	1.08	3.46	4.24	12.3	2.1
Waste	1.70	5.06	5.66	11.5	1.1
Soil	0.20	1.50	3.11	22.3	7.6
Service	0.04	2.58	6.79	50.1	10.1
Total	5.92	20.84	28.30	13.4	3.1

Source : 21st Century Environmental Technology Development Plan, 1997, NIER, Korea

The industry remains essentially small businesses (70% have capital under 1 million USD). They are essentially focusing on end-of-pipe technologies.

²⁸ http://eng.me.go.kr/docs/common/common_view.html?idx=35&av_pg=1&mcode=10&classno=15

Reference and data sources

References are noted as footnotes in the text. In addition, the following documents and web sites have been consulted:

European Commission, 2004: Overview of Existing Environmental Technologies Evaluation/Verification Programs

http://ec.europa.eu/environment/etap/pdfs/overview_env techno verification.pdf

OECD (forthcoming), Review of Korea's Innovation Policy

United Nations, 1999: Compendium on Energy Conservation Legislation in Countries of the Asia and Pacific Region

<http://www.unescap.org/esd/energy/publications/compend/cec.htm>

Ministry of Environment, 2005: Korea Environmental policy Bulletin, Issue 2, Volume III, 2005

http://www.kei.re.kr/04_publ/pdf/others/KEPB2005_2.pdf

Web sites : <http://www.iea.org/Textbase/pm/>