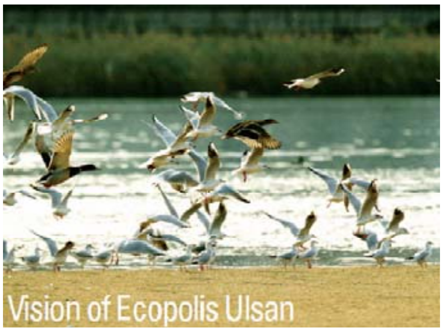


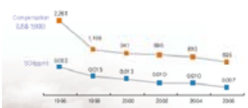
KWON, Changki
Ulsan Development Institute, Korea

- Industrialization and environmental issues

Since its designation as a Special Industrial Zone in 1962, Ulsan experienced rapid industrialization and urbanization process, riding the wave of the economy-first consciousness, which was the general trend of the time.
Although a great quantity of pollutants were emitted from large factories that had moved into the national industrial complexes since the 1970s, environmental pollution prevention facilities that properly treated pollutants were totally inadequate. Moreover, rapid industrialization took place amid a situation where awareness, laws and regulations, and institutional frameworks on environmental conservation were not properly in place. As a result, environmental pollution in Ulsan worsened with each passing day.

In 1981 annual average concentration of SO_2 in the air deteriorated to 0.057ppm and in 1991 the annual average biological oxygen demand(BOD) of the lower stream of the Taehwa River, an urban river that runs through Ulsan City, increased to as high as 11.7ppm.

At that time it was even difficult to breathe in downtown Ulsan due to the foul odor and smoke caused by air pollutants from industrial complexes. The Taehwa River turned into a river of death where fish died in mass volumes.



- Relocation of residents residing in pollution-affected districts

As air pollutants emitted from businesses in national industrial complexes spread into nearby residential districts, civil petitions were filed by residents residing in the vicinity of the industrial complexes requesting compensation and collective relocation. In 1985, under the instruction of the President, the government established a plan to relocate residents living in the vicinity of industrial complexes. Starting from 1986, 7,467 households in Ulsan and Onsan Industrial Complexes were relocated in a phased manner, costing US$393.2 million. The relocation was completed in 1999.

- Compensation for damaged agricultural crops

Pollutants released from national industrial complexes caused agricultural damage, such as decreased crop production in farming land in the vicinity of industrial complexes. Accordingly, businesses in the industrial complexes provided damage compensation to farmers in consideration of annual pollutant concentrations and emitted amounts. Agricultural damage compensation that was provided from 1967 to late 2006 totaled US$30.6 million and recently the amount of compensation has been declining with continued environmental improvement.

Environmental Organization

The environmental organization of Ulsan Metropolitan City has gradually expanded to respond to a variety of environmental issues. Starting from the "Pollution Prevention Section" of the "Health and Hygiene Division" in 1977, the environmental organization was expanded to become the "Environmental Management Division" in 1987. After the city was promoted to a metropolitan city in 1997, "Environment and Health Bureau" and "Waterworks Headquarters" were established to carry out environment and waterworks-related activities in a more efficient manner. In 1998, the Bureau was transformed into the "Environmental Affairs Bureau" in an organizational reshuffle. In order to address pending environment-related issues in the Ulsan region, the "Ulsan Regional Environmental Technology Development Center" was formed and the "Green Ulsan 21 Environmental Committee" was established to promote local agenda 21. In addition the "Research Institute of Health and Environment" was opened in 2000, offering a framework for scientific environmental administration.

(Table II-1) Expansion of the environmental organization

Environmental Pollution Monitoring Networks

For the purpose of measuring the environmental state of major spots of Ulsan City on an ongoing basis, monitoring networks are in operation for air, water, soil and noise.
"The Air Pollution Automatic Monitoring Network" has monitoring stations in 14 major spots under the jurisdiction of Ulsan City and monitors pollution levels of SO_2, particulate matter(PM10), NO_2 and O_3 on an ongoing basis.
"The Water Pollution Monitoring Network" has 64 monitoring stations in major spots, including rivers, water sources and lakes. They monitor trends of changes in water quality by comprehensively investigating water quality status in public water areas. Furthermore Ulsan City operate 50 "Noise Monitoring Network" and 87 "Soil Monitoring Network" to monitor noise and soil pollution level.

Environmental Committees

- Green Ulsan 21 Environmental Committee

The Green Ulsan 21 Environmental Committee was established in 1998 to implement the "Green Ulsan 21", a "local agenda 21" of the City. The Committee has five sub-committees and is comprised of 50 members, including the Chairman, from various sectors of society.
The Committee plans and implements a wide variety of action plans to promote environmentally sound and sustainable development. Its major projects include environmental education for citizens, environmental campaigns, organizing policy forums, operating an environment college for citizens, organizing environmental symposiums and workshops and operating a citizens' environmental monitoring group.

- Environmental Conservation Advisory Committee

The Environmental Conservation Advisory Committee was established in 1997 to provide technical advice on environmental conservation in accordance with the provisions of Article 37 of "The Framework Act on Environment Policy". The Committee is chaired by the Vice Mayor of Political Affairs and is composed of 17 members from academia and environmental groups. It offers advisory opinions on overall aspects of environmental conservation, including the establishment of Ulsan City's basic environment plan and environment standards.

- Environmental Dispute Resolution Committee

The Environmental Dispute Resolution Committee was established in 1997 to resolve disputes arising from damages incurred by environmental pollution in a prompt and impartial manner, thereby conserving the environment and resolving health and property damages of citizens. The Committee is chaired by the Vice Mayor for Political Affairs and comprised of 9 members from academia, the legal community and experts.

- Drinking Water Quality Assessment Committee

The Drinking Water Quality Evaluation Committee was established in 1991 in accordance with "The ordinance of Ulsan City's Waterworks Monitoring Committee", and is comprised of 10 experts. The Committee conducts regular water quality tests on tap water and announces the results on the Internet and through the media. It offers advisory opinions on related areas, including water quality management technology.

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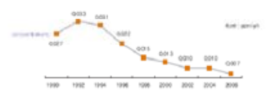
Air Quality

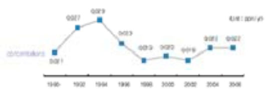
The amount of air pollutants released in Ulsan stood at 278,480 tons annually as of 2005, the second largest after Seoul City. It was investigated that most of the air pollutants were released in production and combustion processes. In order to reduce the amount of air pollutants, Ulsan City has pursued an eco-friendly fuel policy, which includes the use of low sulfur fuel oil. The city also implemented a voluntary environment management system that induces businesses to voluntarily reduce pollutants. As a result, concentrations of major air pollutants, such as SO_2, were lowered to similar levels to those of the nation's major cities or improved to more favorable levels. Yet, There some challenges that the city needs to respond to, these include increased nitrogen dioxide(NO_2) levels as a result of continued increase in the number of automobiles, particulate matter(PM10), rise in ozone(O_3) concentration, and the issue of reducing carbon dioxide(CO_2) emissions to cope with global warming, which is emerging as a global issue.

City	Total	SOx	NOx	TSP(PM10)	CO	VOC	NH3
Total	1,254,455	112,437	350,117	31,151 (24,109)	365,223	383,510	44,635
Ulsan	**278,480**	**59,136**	**63,205**	**15,152 (9,916)**	**32,591**	**82,828**	**25,507**
Seoul	363,047	8,030	107,257	4,487 (4,311)	161,873	75,970	5,409
Incheon	196,329	13,447	75,890	3,270 (2,728)	45,218	52,035	6,469
Busan	183,042	22,230	68,743	3,847 (3,206)	51,203	34,640	2,379
Daegu	123,106	4,885	41,552	2,760 (2,343)	38,251	31,470	2,259
Daejeon	62,475	1,532	21,396	944 (909)	23,674	13,738	1,130
Gwangju	48,009	1,05[illegible]	15,074	731 (699)	16,413	13,229	1,486

Ministry of Environment(2008)



City	Average	Ulsan	Seoul	Incheon	Busan	Daegu	Daejeon	Gwangju	[illegible]
SO_2 [illegible]	0.0058	0.007	0.006	0.007	0.005	0.006	0.004	0.004	0.02
NO_2 [illegible]	0.025	0.022	0.036	0.029	0.023	0.023	0.022	0.024	0.05
PM10 [illegible]	58	52	60	67	59	54	55	57	70
CO [illegible]	0.57	0.4	0.6	0.6	0.4	0.6	0.7	0.7	9.0
O_3 [illegible]	0.020	0.021	0.018	0.021	0.024	0.020	0.018	0.021	0.06



Water Quality

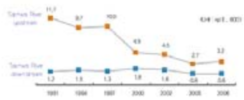
Ulsan City's domestic sewage amounted to 258,871㎥ daily as of 2006 and sewage per person amounted to 234.7 liter. As of 2006, 353,875㎥ of industrial wastewater and 851㎥ of livestock wastewater were generated everyday. As for water quality of the Taehwa River, Ulsan's major urban river, the upstream maintains first-grade levels and the downstream the third-grade levels. Thanks to successful implementation of water quality improvement projects, the water quality of the Taehwa River has been showing gradual improvement.

(Unit : ㎥/d)

Section	1997	1999	2001	2003	2005	2006
Total	638,368	593,881	655,558	623,261	581,859	613,597
Domestic sewage	270,412	244,039	241,334	253,504	257,033	258,871
Industrial wastewater	354,150	334,829	382,288	294,352	323,954	353,875
Livestock wastewater	1,804	1,383	997	738	872	851

(Unit : mg/L)

City	Watershed	River	BOD				
			Average	2003	2004	2005	2006
Ulsan	**Taehwa River**	**Taehwa River**	**3.0**	**2.7**	**3.2**	**2.7**	**3.2**
Seoul	Han River	Han River	3.9	3.3	3.7	3.7	4.7
Incheon	Han River	Gulpo Stream	10.1	8.0	13.2	11.3	7.9
Daejeon	Geum River	Gap Stream	6.6	6.6	6.9	6.0	7.0
Daegu	Nakdong River	Geumho River	3.7	3.3	3.7	4.0	3.9
Busan	Nakdong River	Nakdong River	5.0	3.8	6.6	4.3	5.2
Gwangju	Yeongsan River	Yeongsan River	10.1	6.9	10.5	12.2	10.6



Natural Ecosystem

In an effort to restore the natural ecosystem damaged in the urbanization and industrialization processes, maintain balanced ecosystems and secure biological diversity, Ulsan City has designated and managed wildlife conservation regions and ecosystem and landscape conservation regions. In addition, with city park projects and ongoing afforestation projects, the city's park area has increased to 15.9㎢ and park area per person has also increased to 14.5㎡ from 12.5㎡ in 2002, reaching the nation's top levels.

Wildlife Conservation Regions

In a bid to maintain balanced natural ecosystems and prevent the extinction of species, Ulsan City has designated and managed a total of 5 wild conservation regions covering 3.760㎢ as of 2006.

Ecosystem and Landscape Conservation Regions

Ecosystem and Landscape Conservation Regions are the places that are deserved to be conserved as they are ecologically important with rich biological diversity and have beautiful landscape. In the 184,030㎡ of Mujechi Marsh in Mt. Jeongjoksan, Ulsan, there exist 257 flora and 197 fauna varieties. It was designated as an Ecosystem and Landscape Conservation Region in 1998 and has been managed as such ever since. The Mujechi Marsh is one of the 14 nationally designated Ecosystem and Landscape Conservation Regions.

Wetland Conservation Regions

Wetland Conservation Regions whose natural state preserves primitiveness and which are rich in bio-diversity, worthy of special conservation. The Mujechi Marsh, an Ecosystem and Landscape Conservation Region, is a mountain wetland which is a habitat for rare wildlife. It was designated as Wetland Conservation Region by the Ministry of Environment in 1999. The Mujechi Marsh was naturally created approximately 6,000 years ago and is the oldest marsh in Korea. It is known as an ecological treasure house with unique topographical and geological features, having great academic value.

City	Parks designated		Parks created		Park area per person		Creation ratio (%)	Remarks
	Number	Area(㎢)	Number	Area(㎢)	Designated(㎡)	Created(㎡)		
Average					23.35	8.93	40.87	
Ulsan	**393**	**42.95**	**225**	**15.94**	**38.94**	**14.45**	**37.12**	
Seoul	1,480	108.65	1,294	86.87	10.55	8.44	79.95	
Busan	455	54.57	323	18.40	15.10	5.08	33.63	
Daegu	633	78.88	366	26.11	30.55	10.38	33.96	
Incheon	609	61.56	348	22.44	23.27	8.48	36.45	
Daejeon	408	50.61	264	17.11	34.31	11.60	33.81	
Gwangju	460	18.51	257	5.77	13.15	4.10	31.18	

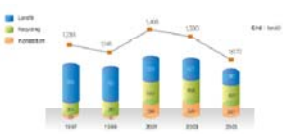
District	Designation	Location	Area(㎢)	Inhabiting birds
Total			3.760	
Jung-gu	Apr 17, 2003	Taehwa-dong	0.744	Egret, little grebe, pochard
Nam-gu	Apr 25, 2003	Samsan-dong	1.457	Black-headed gull, pochard, egret
		Seonam-dong	0.231	Mallard, green-winged teal
Buk-gu	Apr 10, 2003	Songjeong-dong	0.280	Mallard, gray heron, egret
		Myeongchon-dong	0.350	Gray heron, spot-billed duck
	Feb 17, 2004	Myeongchon-dong	0.618	Gray heron, spot-billed duck

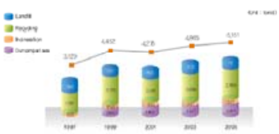
Waste

In Ulsan City, 10,000 tons of waste is discharged daily and is disposed of the form of landfill, incineration, recycling and ocean dumping. The generation of municipal waste has been decreasing with stringent implementation of recycling policy and waste separation. Recycling ratios of "industrial discharge facility waste" and "construction waste" have also reached 54% and 95%, respectively. In a bid to create a city of resource circulation, Ulsan City has been implementing a variety of policies to reduce waste generation, recycle resources and ensure safe disposal of waste.

(Unit : ton/d)

Section	1997	1999	2001	2003	2005
Total	7,037	8,946	9,054	9,557	9,975
Municipal waste	1,238	1,148	1,408	1,330	1,072
Industrial discharge facility waste	2,386	4,452	4,276	4,865	5,151
Construction waste	1,757	2,476	2,396	2,634	3,014
Designated waste	913	870	974	728	738





Waste disposal facilities

Municipal waste incineration facilities

In Ulsan City 2 incinerators with a capacity of 200 tons are currently in operation. These facilities started operating in May 2000 and their operation has been commissioned to the private sector. With recent increase in incineration quantities, an expansion of the incineration facilities is under way.

Municipal waste landfill facilities

Ulsan City has municipal waste landfill facilities in 3 sites and landfilling has been completed in 1 site, while landfilling is currently under way in 2 sites. The Seongam Landfill Site where landfilling is currently under way started operation in April 1994 and as of late 2006, the remaining landfill capacity was 356,186㎥ and landfill is scheduled to be completed by 2008, therefore landfill site expansion is currently under way.

〈Table Ⅱ-24〉 Status of municipal waste landfill facilities

Section	Landfill area (㎡)	Landfill capacity (㎥)			Remarks
		Total	Current landfill amount	Remaining	
Total	755,912 (511,890)	8,694,857	7,785,858	909,039	
Samsan	426,334 (275,612)	3,592,370	3,592,370	–	Use terminated
Onsan	41,315 (41,219)	197,277	197,277	–	Use terminated
	86,487 (51,500)	822,000	269,147	552,853	
Seongam	201,776 (142,663)	4,082,750	3,726,564	356,186	

※ ( ) refers to real landfill areas

Environmental Plan

Ulsan Metropolitan City established "the Mid-term Comprehensive Plan on Environmental Conservation", a master plan for its environmental policy, after it was promoted to the status of a metropolitan city. Based on the Plan, the city formulated legal plans by sector, including a basic plan to improve sewage, an city greening plan and a basic plan on waste disposal.
In addition, in line with the Ecopolis Ulsan Declaration in 2004, the "Ecopolis Ulsan Plan", which presented the future visions and directions of Ulsan's environment, was formulated, aimed at a transformation from a polluted city to an ecopolis.

Mid-term Comprehensive Plan on Environmental Conservation

In an effort to implement various environmental projects in a systematic and efficient fashion, Ulsan City established the 1st stage of the Mid-term Comprehensive Plan on Environmental Conservation as a six-year plan for 1998~2003. The 1st stage plan laid the foundation for the establishment of an ecopolis by investing US$921.6 million in 95 projects in 10 areas, including strengthening the foundation for environment management, natural environment conservation and water-quality conservation.

Major Categories	'98	Goals for '03	Goals for '08
• Improvement of air quality			
· SO_2(ppm)	0.019	0.019	0.006
· NO_2(ppm)	0.014	0.010	0.016
· PM10(μg/㎥)	65	53	45
• Improvement of water quality			
· BOD in the Taehwa River downstream(mg/L)	7.8	4.6	2.5
• Water supply and sewage management			
· Water supply rate(%)	84.2	90.4	95.4
· Sewage treatment rate(%)	45	65.5	90.0
• City parks			
· Parks designated(1,000㎡)	21,716	32,015	43,056
· Parks created(1,000㎡)	8,471	13,288	16,810
· Park area per person(㎡/person)	10.27	12.47	15.16
• Waste management			
· Municipal waste generation per person(kg/d · person)	1.03	1.30	1.10
· Municipal waste management			
– Landfill(%)	65.9	35.0	28.5
– Recycling(%)	33.2	40.7	48.0
– Incineration(%)	1.9	24.3	23.5

Ecopolis Ulsan Plan

Ulsan City established the Ecopolis Ulsan Plan in 2004 to create an ecopolis where people and nature, and the environment and industry can coexist and co-prosper. The basic direction of the Ecopolis Ulsan Plan is to create a world-class eco-city by creating a clean living environment, securing green space, conserving and restoring natural ecosystems and creating ecological spaces, and raising citizens' environmental awareness.

Based on the Plan, Ulsan City is investing US$1896 billion over a period of five years from 2005 through 2009 as a first phase, implementing 110 pilot projects in 10 areas, including air, water and green space.

Major pilot projects among the 110 projects include a project to introduce more natural gas-powered buses for air quality improvement; a sewage treatment facility expansion project and a natural river purification project for the Taehwa River in the sector of water-quality improvement; the Ulsan Grand Park project and urban wall surface afforestation project in the sector of green space expansion; Taehwa River ecological park project in the natural ecosystem conservation and restoration sector; and Ecological Industrial Park(EIP) project in resource saving and recycling sector.

Area	Item	2005	2010	Environmental standards	WHO standards
Air quality (ppm)	Sulfur dioxide(SO_2)	0.008	0.006	0.02	0.019
	Nitrogen dioxide(NO_2)	0.024	0.022	0.03	0.021
Water quality (mg/L)	Taehwa River upstream(BOD)	0.8	0.4	1.0	
	Taehwa River downstream(BOD)	2.7	1.5	3.0	
Green space	City park creation(㎢)	15.4	17.5		
	Park area per person(㎡/person)	14.0	15.6		
Waste	Municipal waste generation per person (kg/d · person)	0.99	0.92		
	Recycling ratio of municipal waste(%)	45.9	68.3		

Air Quality Management

In an effort to improve air quality, Ulsan City has implemented such policies as designation of special air conservation areas and an eco-friendly fuel policy. From the year 2000, the Voluntary Environment Management System was adopted whereby businesses voluntarily reduce air pollutants by setting target amounts of air pollutants. Recently, Ulsan City has been formulating climate change measures to actively respond to global warming.

- Designation of Special Atmosphere Watch Zone
- Environment-Friendly Fuel Policies

Fuel	Sulfur content	Enforcement Period
B-C oil	4.0% and below	Jan 1, 1971
	0.3% and below	July 1, 1999
Diesel oil	0.4% and below	Apr 11, 1991
	0.1% and below	Apr 10, 1996
Heavy oil	0.5% and below	July 1, 1997
	0.3% and below	July 1, 2001

- Distribution of natural gas-powered vehicles


Natural gas bus

- Voluntary Environment Management Agreement

In a bid to create a pleasant urban environment through enterprises' voluntary efforts to reduce pollutants, Ulsan City and businesses signed the Voluntary Environment Management Agreement. The agreement is a manifestation the commitment of companies to voluntarily prevent environmental pollution based on mutual trust and cooperation between the city government and businesses. The 1st stage Voluntary Environment Management System was signed in April 2000 for the first time.


Signing of the Voluntary Environment Management Agreement

- Environment mileage system
- Foul odor reduction policies
- Clean SYS

The Clean SYS is a remote monitoring system that monitors whether facilities emitting air pollutants and their prevention facilities are properly operating. In order to provide real-time measurement of air pollution for businesses emitting large quantities of air pollutants, as of 2006, 282 measurement devices have been installed in 128 factory stacks in 42 businesses.


Clean SYS

Voluntary Agreement on Energy Conservation

Companies with annual consumption of energy of more than 2,000 toe(ton of oil equivalent), including Hyundai Motor Co., Ltd., Isu Chemical Co., Ltd. and S-OIL signed "Voluntary Agreement on Energy Conservation" with Ulsan City from 1999 in a bid to conserve energy and reduce greenhouse gas emissions. Until 2006, 112 companies participated in the agreement, reducing energy consumption by 320,000 toe. There were 17 companies that participated by signing the agreement for the period between 2007 and 2011, which aims at reducing energy by more than 5%, based on the energy consumption as of 2006. It is expected that through the agreement 42,000 toe of energy consumption and 92,000 tons of carbon dioxide (CO_2) emissions will be reduced.

Greenhouse gas emission reduction at environmental infrastructure

Since October 2002, municipal waste landfill sites in Ulsan have been trapping methane gas generated in the landfill plants and sold it as a fuel to nearby companies, thereby not only preventing the gas emissions into the air, but also generating economic profits. Since September 2004, Yongyeon Sewage Treatment Plant has been trapping methane gas generated during treatment processes and sold it to nearby companies as a fuel. Meanwhile, a food waste resource facility scheduled to be operational in 2009 plans to produce bio gas of 13,800㎥ daily and use it as a fuel.

Dissemination of new & renewable energy

In an effort to disseminate new & renewable energy to reduce the use of fossil fuels, Ulsan City has been implementing such projects as those to build solar power generation facilities, district cooling and heating facilities, small hydro power generation facilities and waste heat recycling projects. Currently, Ulsan City houses 85 small solar power generation facilities, 9 solar water heating facilities and 5 district cooling and heating facilities, Solar power generation facility at Ulsan Grand Park, thereby contributing to the reduction of greenhouse gas emissions.


Solar power generation facility at Ulsan Grand Park

Dissemination of hybrid automobiles

In an effort to reduce air pollutants and greenhouse gas emissions, eco-friendly hybrid cars have been disseminated since 2004. As of A hybrid car 2007, 21 hybrid cars had been disseminated in Ulsan.


A hybrid car

Citizens' activities for greenhouse gas reduction

Citizens are also actively participating in responding to global warming. The Clean Energy Promotion Citizens' Forum and the Ulsan Chapter of Apartment Residents' Representative Meeting announced the declaration on voluntary reduction of greenhouse gases in September 2007 and decided to join greenhouse gas emission reduction efforts through action plans that include water-saving by 10%, energy-saving by 5% and voluntary restraints of using automobiles.


Declaration ceremony on greenhouse gas reduction

Meanwhile, in May 2005, the Clean Energy Promotion Citizens' Forum established "Citizens' Solar Power Plant No.1" with funds invested by 12 Ulsan citizens. The annual power generated by this plant is 3800kWh, which a household can consume for a year.
This electricity generated by the citizens' power station is sold to the Korea Electric Power Corporation(KEPCO), which in turn supplies the power to general households with charges.


Citizens' Solar Power Plant No.1

Water Quality Management

Water quality management is largely divided into sewage treatment, industrial wastewater treatment and river management. Ulsan City has been constructing sewage treatment plants and installing sewage pipes on an ongoing basis to treat domestic sewage released from households. In addition, in a bid to improve the water quality of the Taehwa River, the vital water artery of Ulsan, the city has established the Taehwa River Master Plan, implementing a variety of projects.

- Sewage treatment

Construction of sewage treatment plants

In order to treat domestic sewage, Ulsan City completed the construction of Hwaya Sewage Treatment Plant with a capacity of 32,000㎥/day in 1989 for the first time and since then five sewage treatment plants have been consecutively constructed. Thus, at present the sewage quantities of 596,600㎥ are safely treated daily.

〈Table Ⅱ-13〉 Sewage treatment plants

Name	Construction	Capacity(㎥/d)	Treatment methods
Total		596,600	
Hwaya	1989	32,000	Conventional activated sludge process
Yongyeon	1995	250,000	〃
Onsan	1997	150,000	〃
Hoeya	1997	4,600	Contact oxidation process
Eonyang	2004	60,000	DNR
Bangeojin	2005	100,000	B3 system

Domestic sewer pipe connection project

Domestic sewer pipe connection project refers to a project that separates sewer pipes from rainwater pipes to enable only domestic sewage released by households to be transported to sewage treatment plants for treatment. From 1995 to 2006, total project cost of US$42 million was injected to carry out the project for 43,964 buildings, thereby blocking river pollution via domestic sewage from the source.


Domestic sewer pipe connection project

- Industrial wastewater treatment

TMS

The TMS(Tele-Monitoring System), an automatic water quality monitoring system, is a system that remotely monitor whether facilities emitting water pollutants and pollution prevention facilities are operating properly. As of 2006, the system was installed and operational at 55 wastewater treatment plants of 42 companies.
Ulsan City plans to install the TMS even at sewage treatment plants with treatment capacity of 100,000㎥/day in 2008, thereby providing support for smooth operation of sewage treatment plants.

Construction of Yongam Wastewater Treatment Plant

Ulsan City has been constructing Yongam Wastewater Treatment Plant with a treatment capacity of 85,000 ㎥/day from 2007 to 2009 to treat wastewater released from petro-chemical industrial complexes.
When the plant is complete, industrial wastewater, which has until now been treated in individual factories, will go through advanced treatment in the wastewater treatment plant, a public treatment facility, thereby making great contribution to preventing pollution off coastal waters and reducing financial burdens of enterprises.

- The Taehwa River Master Plan

Basic concepts

Ulsan City established the Taehwa River Master Plan in 2005 to transform the Taehwa River, the arterial life source of Ulsan citizens, into an ecologically healthy and safe river by systematically restoring the river.
The Master Plan is a plan to create a cleaner, safer and friendlier Taehwa river for citizens by injecting total project costs of US$400.4 million over a period of 10 years from 2005 through 2014.

Its main projects are divided into four areas, namely, the creation of a safe and clean Taehwa River; creation of an ecologically healthy Taehwa River; creation of a Taehwa River friendly and close to citizens; and the creation of a Taehwa River with a history and future. Key projects based on short- and long-term plans by areas are currently under implementation.

Achievements

As of 2007, eight projects had been completed among the 48 projects of the Taehwa River Master Plan, including the construction of the Eonyang Sewage Treatment Plant, the creation of natural revetments and sedimentary sludge dredging from the Taehwa River. There are currently 23 projects under way.

Through the implementation of the Taehwa River Master Plan projects, the water quality of the river has been gradually improving, while waterfront spaces along the river have been transformed into recreational areas for citizens.
As a result, salmon, which had disappeared due to water pollution, have started to return to upper reaches of the river for the first time in 40 years, also otters, known to live only in clear water, have been discovered in the river. Furthermore, bamboo forest at the riverside has become the nation's largest habitat for egrets, with 4,000 egrets of 7 species inhabiting in the river.


Salmon


Otter


Egret

Since 2005, an annual swimming competition has been held in the Taehwa River with improved water quality and water quality improvement of the river has been broadcast in the media, boasting the scenic Taehwa River, reborn from a river of death, nationwide.


Taehwa River swimming competition

Conservation of Natural Ecosystem

The goal of Ulsan City's natural ecosystem policy is to create a "life community where people and nature coexist". To this end, the city is implementing city afforestation projects such as the development of the Taehwa River ecological park and Ulsan Grand Park, as well as restoration of Sericin Swallowtail Butterfly(Sericinus telamon) and the introduction of a wildlife management policy to secure biological diversity.

- City Greening Projects

Buffer green zone project

The buffer green zone project is a project that creates green spaces in the vicinity of national industrial complexes to prevent the spread of pollutants released from the industrial complexes. It was started in 1989. The project plans to create green zone of 5,207,000㎡ by the year 2020. As of 2006, green zone of 630,000㎡ had been created.

City park project

In response to the decrease in city green space following urbanization and industrialization, Ulsan City will be creating city parks of 7,200,000㎡ in 6 locations, including Ulsan Grand Park and Boksan Park by 2012.

Ulsan Grand Park

The Ulsan Grand Park completed in April, 2006 is the nation's largest urban ecological park of 3,640,000㎡ equipped with various facilities, including Butterfly Pavilion and Environment Pavilion.
It is even bigger than the Central Park of 3,401,000㎡ in New York.
Ten years have been spent for the project and total project costs of US$152 million have been invested among which US$102 million was funded by SK Corporation, one of Ulsan-based leading companies.
The investment was made to provide urban relaxation space for 1.1 million Ulsan citizens as part of the company's corporate social responsibility to return company profits to society.


Ulsan Grand Park

A building planted with vines

One million vine planting project

The one million vine planting project is aimed at purifying the air and easing the urban heat island phenomenon. A greener city will thus be created by planting vines such as Ivies and roses on the surfaces of desolate urban cement walls.
Ulsan City plans to plant 1 million vines in 39km section of 29 cement walls, including government offices and apartments by 2010 and as of 2007 there were already 543,000 vines planted.

The Taehwa River Ecological Park

The Taehwa Ecological Park Project is a project to conserve and restore the 3km Bamboo Forest and transform the river site into an ecological river, thereby providing a pleasant waterfront space for citizens.
The 1st stage project was completed in December 2004 with a budget of US$3.87 million. The bamboo forest around the Taehwa River was improved and convenient facilities for citizens were constructed, such as a bamboo forest bathing site and a walking path, transforming the Taehwa River into a space where citizens can enjoy.
The 2nd stage and 3rd stage projects plan to spend US$69.3 million in an area of 702,116㎡ along the Taehwa River to create a nature learning center and a bamboo learning center.

Taehwa River Ecological Park

• Conservation of the natural ecosystem

Strengthened management of wildlife

In order to protect wildlife, Ulsan City is implementing various projects such as feeding animals in winter time, management of wildlife on the verge of extinction, the restoration of damaged ecosystem and conservation and restoration of indigenous biological species.
In addition, the Wildlife Medical Rescue Center(WMRC) was established in Ulsan Grand Park in 2007, greatly contributing to the more effective management of wild animals, promotion of bio-diversity and raising citizens' awareness of natural environment conservation.

Restoration of The Selcin Swallowtail Butterfly

Ulsan City and Hyundai Motor Co., Ltd. pushed ahead with a project to restore the Selcin Swallowtail Butterfly(Sericinus telamon) in Ulsan as a three-year project from 2005 to 2007.
The butterfly called Gyorinyeong(unabi) lives in Korea from spring to fall and it was thus named so as its long tail looks like silk fabrics.
The project of restoring the butterflies, whose numbers have fallen drastically recently, almost to the brink of extinction in Ulsan, contributes to the promotion of regional bio-diversity.

Selcin Swallowtail Butterfly

Waste Management

The direction of Ulsan City's waste management is being shifted from disposal of waste such as landfill and incineration, to waste reduction and recycling policies. In order to create a resource recycling society, Ulsan is implementing various policies such as imposing obligation on businesses to recycle their waste and reduce packaging waste, volume-based waste fee system and regulations on disposable products. In addition, a project to build an eco-industrial Park(EIP), which recycles by-products of businesses as raw materials, is also under way.

• Waste reduction and recycling policies

In accordance with measures to restrict generation of industrial waste in terms of 'The Waste Management Act,' of August 1995 and 'Industrial Waste Reduction Guidelines,' announced in December 1996, generation of waste and disposal volume is being reduced by improving procedures from waste generation sources, such as product manufacturing process and conducting recycling.

Volume-based waste fee system

The volume-based waste fee system is a policy aimed at restricting waste generation and promoting waste separation for recycling by making waste generators pay for the expenses to waste disposal in accordance with waste volume. Citizens are obligated to put domestic waste in standard plastic garbage bags and tie and place them in trash containers or in front of their entrances at designated times, when garbage collection vehicles pick them up.
The system has been implemented since 1995 and domestic waste volumes showed slight increase from 1999 to 2001, yet after 2002 they started to decrease. The recycling rate, which stood at 33.2% in 1999, sharply increased to 45.8% in 2005.

Standard plastic garbage bag

Regulations on the use of disposable products

Ulsan City regulates 28,220ea of 2099 businesses, including restaurants, wholesale and retail businesses and bathing houses to restrain the use of disposable products and not to provide them free of charge.
In order to efficiently crack down on businesses for violations of restricting disposable goods and instill a sense of awareness among violators, the city has been implementing a report reward system, since 2004 which offers reward money of US$20~150 when one reports a violating businesses.

Policy on recyclable waste

Citizens are obligated to separate recyclable wastes such as paper packs, glass bottles, metal cans and agricultural waste from other domestic waste. In the case of collective housing, recyclable wastes should be placed in separation storages or containers installed in apartment complexes at designated days, while in the case of detached housing areas recyclable wastes should be placed in front of entrances or designated storage containers at designated days. Separated recyclable waste is collected and transported to recyclable waste sorting facilities where they are separated according to type for recycling. Following this, they are sent to the Korea Environment and Resources Corporation(KOMACO) and private recycling businesses where they are produced into recycled products. As of 2006, Ulsan City operates 4 recyclable waste sorting facilities and 2 recyclable materials trading centers to promote waste recycling.

Recyclable materials Trading Center

Recyclable waste Sorting Facility

• Food waste reduction and recycling policies

Businesses obligated to reduce food waste

Businesses obligated to reduce food waste are those which are obligated to recycle food waste. As of 2006, there were 2,328 such businesses in Ulsan. The city government carries out guidance and inspections twice yearly to monitor the implementation of the obligation to reduce food waste and provide guidance to businesses, while producing a database of business operation for management.

Volume-based food waste fee system

The volume-based food waste fee system is a policy to encourage citizens to reduce food waste volume by charging citizens for food waste handling costs according to volume.
Ulsan City has been implementing separated collection of food waste since April 2003 and plans to implement the volume-based food waste fee system from 2008 to reduce and recycle food waste even further. In the case of collective housing, food waste fee is US$0.02 per liter.
Separately collected food waste is transformed into resources (compost and feed) in food waste treatment facilities. As of 2006, there were 5 food waste treatment facilities and a facility to produce bio-gas out of food waste is scheduled to be constructed in 2009.

• Eco-Industrial Park (EIP)

Ulsan City was selected as a model city to establish an eco-industrial park and for five years from 2005, the 1st round projects are being implemented.
The eco-industrial park project is to establish a network for industrial coexistence pursuing zero-emissions by recycling industrial by-products such as waste, waste heat and wastewater as raw materials for other businesses, thereby improving the quality of the environment and enhancing competitiveness of industrial complexes. Until 2006, the project participated by 14 companies including SK Corporation and Samsung Fine Chemicals produced economic spin-off effects worth more than US$27 million.

Converting landfill site gases into fuels

Ulsan City and SK Corporation jointly constructed a methane gas(CH4) recycling facility at domestic waste landfill plants at the cost of US$5.5 million. The methane gas(CH4) collected from the facilities has been supplied to nearby businesses at low cost, thereby contributing to reduction of greenhouse gases and recycling of waste gases.

Recycling of industrial wastewater

Samsung Fine Chemicals has recycled highly-concentrated organic industrial wastewater by supplying it as feed for microbes at Onsan Sewage Treatment Plant. It led to an annual budget reduction of US$1 million and prevention of environmental pollution.

Public-Private Environmental Governance

Participation by citizens and businesses has played a vital role in Ulsan City's achievements of environmental improvement. The public-private environmental governance with the joint participation of the city government, citizens and businesses, has been established to transform Ulsan into a world-class eco-city by conducting various projects starting from a project to revive the Taehwa River.

• Corporate activities to improve the environment

Corporate investment to environmental improvement

Corporate environmental investment is mainly made to improve outdated pollution prevention facilities and establish an eco-friendly production system. Companies invested a total of US$3,766 billion from 1995 to 2006.

Status of Corporate environmental investment

US$1 million

Section	Total	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06
Amount	3,767	296	544	270	270	162	165	210	451	323	347	412	296

One Company, One Stream Reviving Campaign

The 'One Company, One Stream Reviving Campaign' is an example of enterprises' voluntary cleaning activities to revive streams. In 2006, 540 sessions of environmental purification activities by companies took place, drawing the participation of 17,270 corporate workers and collecting 650 tons of garbage.

• Citizens' activities to improve the environment

Citizens' Taehwa River revival campaign

In order to revive the Taehwa River, the arterial life source of Ulsan citizens, voluntary citizen environmental monitoring group has been set up and in operation. The citizens' environmental monitoring group comprises 3~4 person monitoring teams who examine the state of the river and monitor environmental pollution activities. Citizens participating in the monitoring group are proud to play their part in preserving the environment of the Taehwa River and act as a focal point for the river revival campaign to develop into a pan-citizens' movement.

Citizens monitoring water quality of Taehwa River

Environmental education for citizens

Civic environmental groups offer environment education and seminars and environmental campaigns for citizens throughout the year, thereby enhancing citizens' environmental awareness and expanding their participation in environmental conservation activities.

International Environmental Cooperation

In an effort to boost international environmental cooperation, Ulsan City is implementing environment policy training programs and organizing various international conferences.

• Environmental policy training programs

Ulsan City is promoting two programs associated with inviting foreign public officials and providing training for them. One is the KOI Program jointly undertaken with the Korea Local Authorities Foundation International Relations(KLAFIR). Foreign government officials work with government officials of Ulsan City and research the city's environment policy. The program started in 2007 drew participation of environment officials from Jakarta, Indonesia.

KOI Korea Presentation

Another training project 'International Environmental Policy Training Program' is a program that invites environmental officials from emerging industrial cities in Asia.
In 2007, 13 government officials from 11 countries participated in the program, carrying out policy training with themes on various environmental programs following urbanization and industrialization and countermeasures.

International Environmental Policy Training Program

• International conferences

International Eco-cities symposium

In order to better understand international environmental trends and exchange experiences on sustainable development, Ulsan City has been organizing international conferences on various environmental themes.
In February 2007 the city hosted the 'International Eco-cities symposium' to seek ways to create environment-friendly eco-cities for sustainable development.
Ulsan City hosted "Tripartite Director General Meeting on 050 among Korea, China and Japan", "15th Northeast Asian Conference on Environmental Cooperation", "TEMM Sound Material-Cycle, Circular Economy, 3R Seminar" in March, 2007 and "The 3rd Meeting of the OSAEG Environment Group" in June, 2007.

MANY THANKS!