

K-eco's role for water quality conservation in Korea

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Introduction

Outline for water quality improvement endeavor in Korea

“Water quality accidents during Industrialization”

’89 : Heavy Metal Contamination

’91 : Phenol released in Nak-dong river

’94 : Organic solvent released in Nak-dong river

1980, Environment Agency (EA)

Korea Resources Recovery & Reutilization

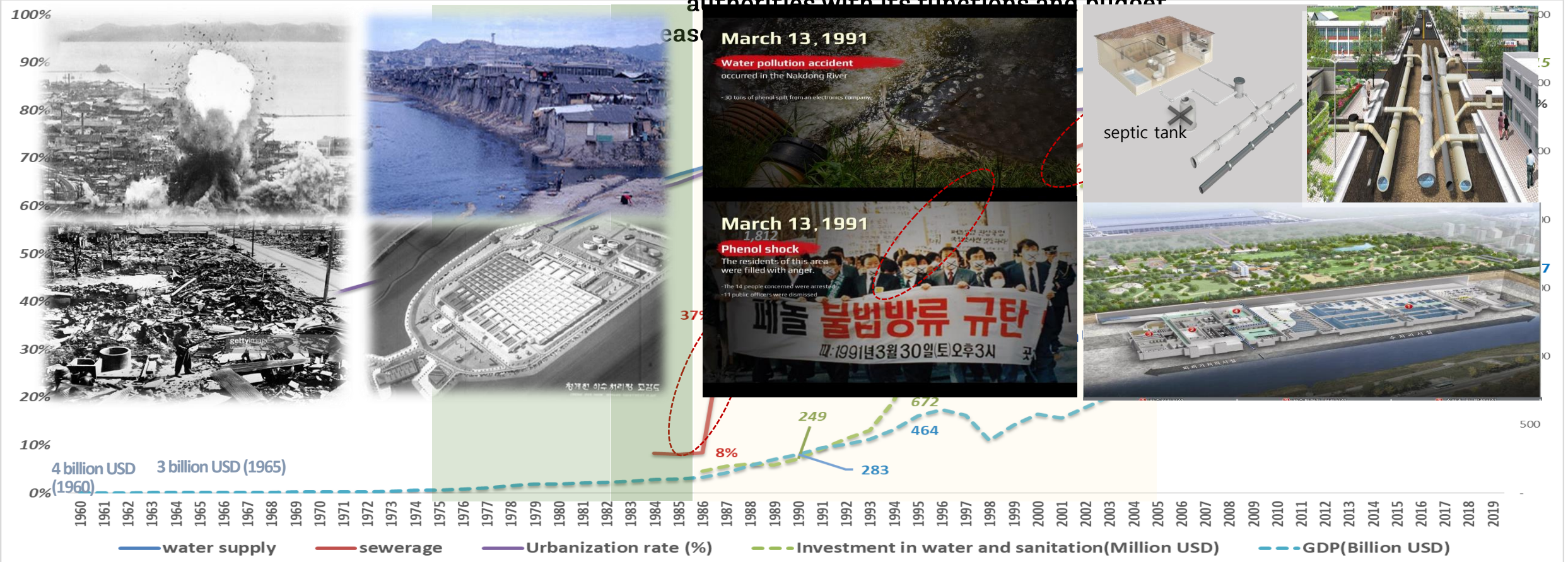
1987, *Environmental Management Corporation*

(Environmental Pollution Control Agency)
1994, EA was changed to the MOE. MOE was given



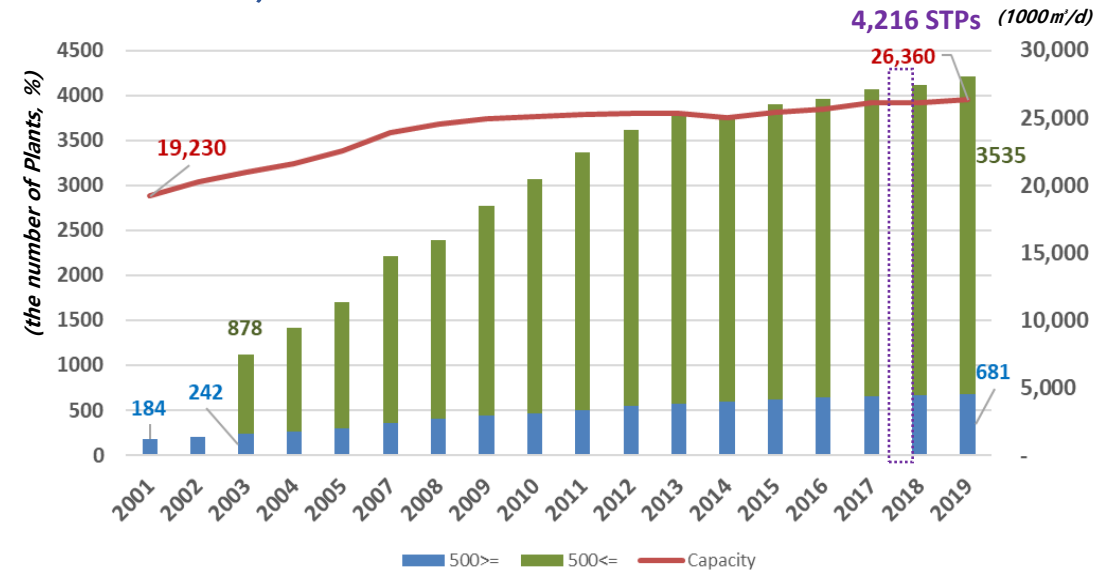
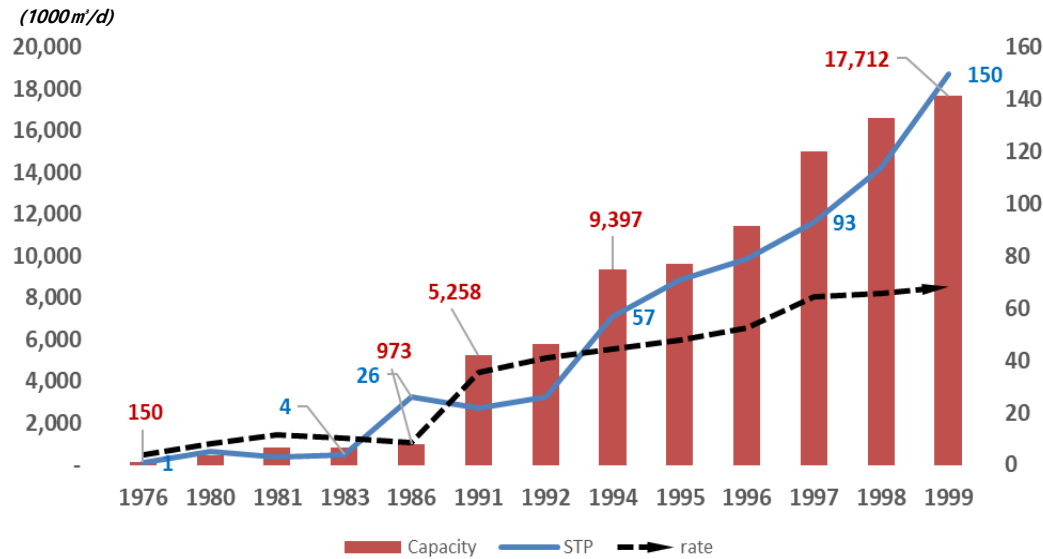
K-eco, 2010

authorities with its functions and budget

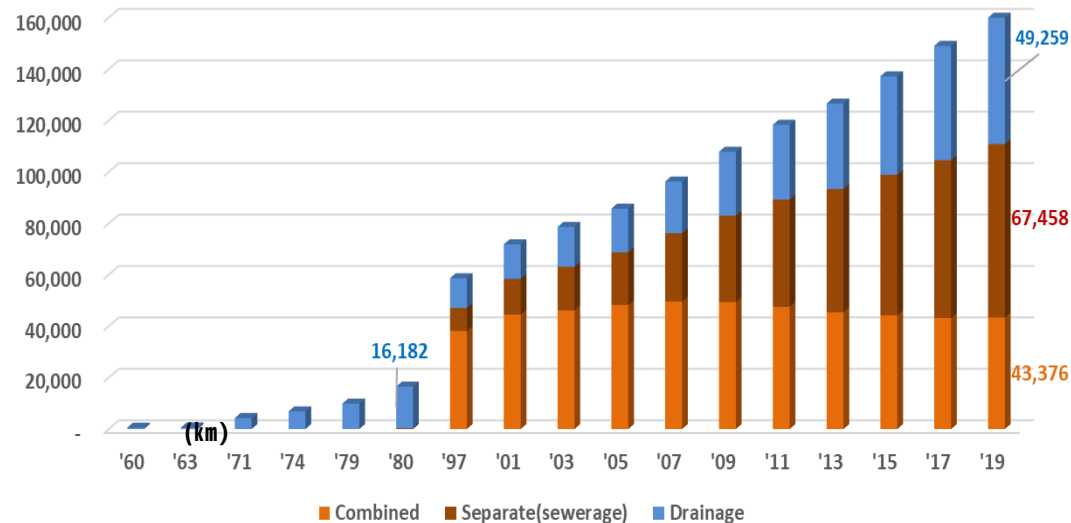


Introduction Sewerage status in Korea (2019)

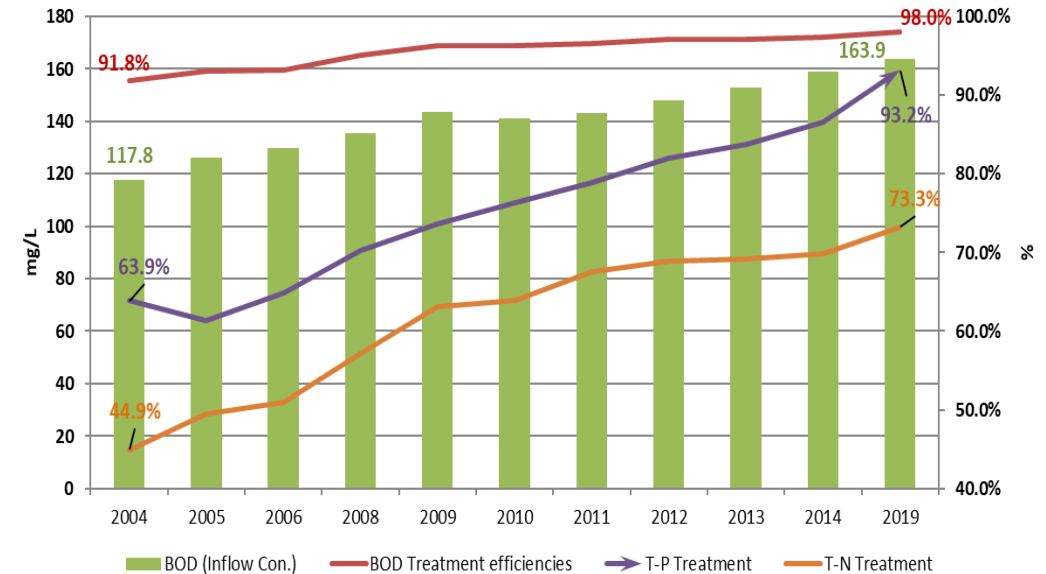
Sewage(municipal & households wastewater) Treatment Plants



Sewer(pipeline) Networks



Treatment efficiencies



Case

Brief history about sewerage management in Korea

K-eco has been providing policy supporting and implementing policies for the Ministry of Environment .

Economic development (~1960s)		Economic High-growth (1962~1979)		Economic Moderate-growth (1980~ 2000)		Member of DAC in 2010 (2001~ 2010)	Present (2011~)
1st Generation		2nd Generation		3rd Generation		4th Generation	5th Generation
Combined sewerage system		Removal of Organic matters		Removal of Nutrients (N, P)		separate Sewer System	Removal of micro hazardous matters
		Combined sewerage system		Removal of Organic matters		Removal of Nutrients (N, P)	separate Sewer System
				Combined sewerage system		Removal of Organic matters	Removal of Nutrients (N, P)
						Combined sewerage system	Removal of Organic matters
							Combined sewerage system
GNI “ \$65 in 1955		Highest economic growth 14.8% in 1973		Economic Growth -1.7%~9.1%		GNI “ \$28,180 in 2014	GNI “ \$32,115 in 2019

- Initial focus on sewage treatment : Fast conveyance of raw sewage to water body
- Industrialization & Development & Urbanization caused water pollution .
 - Need to treat sewage before discharging → Need to remove organic matters
- Need to improve river water quality → Reinforcing effluent standard (Nutrients: N, P)
- Needs for better living → Need to introduce separate sewer system
- Needs to control Hazardous substances in Wastewater → Introducing TU(toxic unit) standard
 - : Target – 82 facilities receiving hazardous matters such as metal mining, dyeing facility

Case

Brief history of STP's effluent standard in Korea

Overview : MoE declared a revising effluent standard in advance in order to give enough time for developing relating technology and installing facilities.

Act	Year	BOD (mg/L)	COD (mg/L)	SS (mg/L)	T-N (mg/L)	T-P (mg/L)	Number of Coliform(/ml)	Toxicity (TU)	Applied from
Environmental Pollution Act	1964	20~150	-	70~200	-	-			
Water Quality Conservation Act	1978	30		70					
Water Quality Conservation Act	1991	20	50	20	120	8			1996.1.1 ~
	1993	20	40	20	60	8			1996. 1.1 ~
Sewerage Act	2001	10~20	40	10~20	20~60	2~8	3,000		2008. 1.1~
	2008	10	40	10	20~40	2~4	3,000		2012. 1.1~
	2010	10	40	10	20~40	2~4	3,000	1	2011. 1.1~
	2011	5~10	20~40	10	20~40	0.2~4	1,000~3,000	1	2012. 1.1~
	2020	5~10	15~25	10	20	0.2~4	1,000~3,000	1	2021.1.1~

Effect

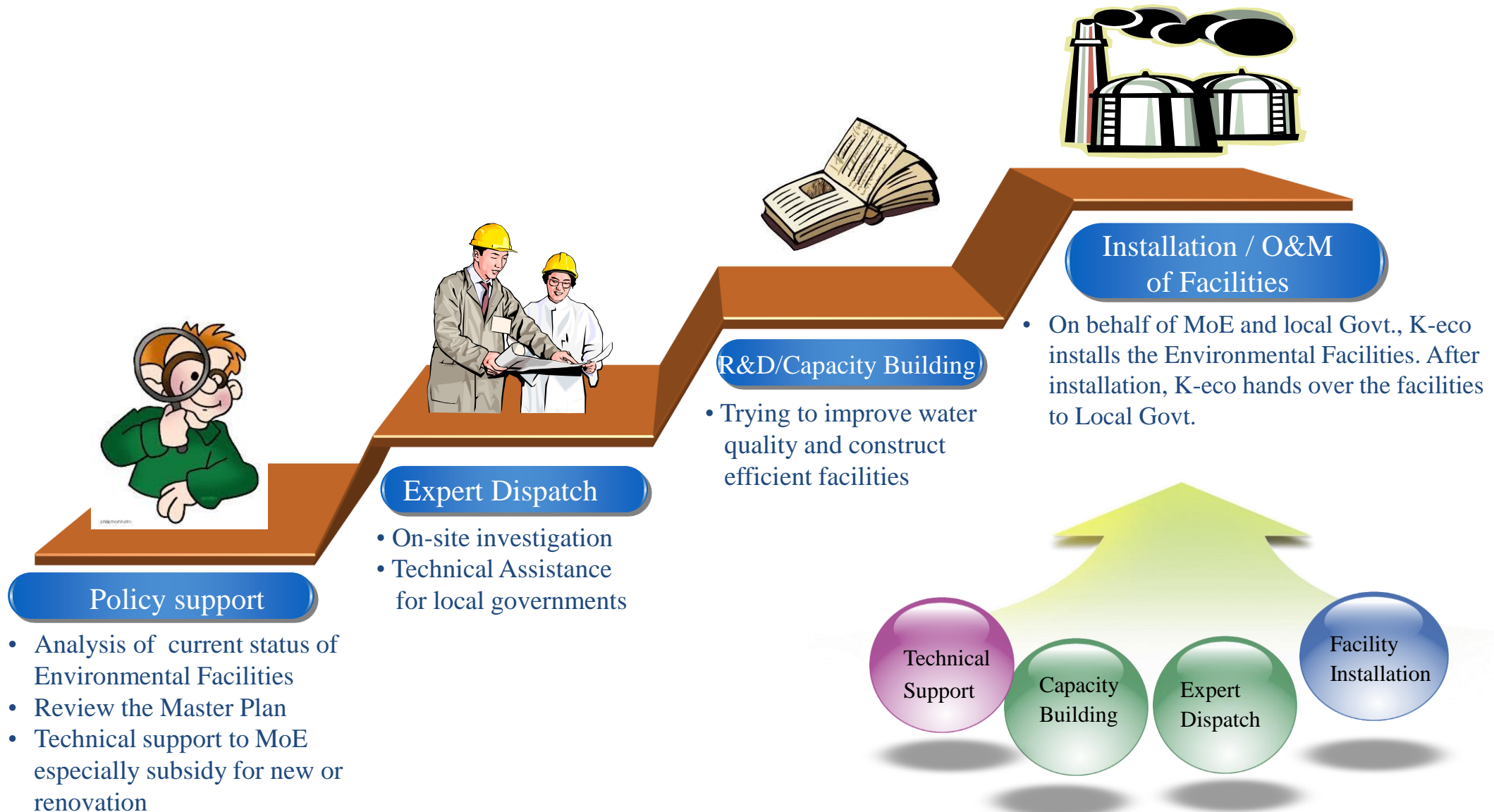
Localization of STP 's Process & Create Large Scale Environment Market

Enhance independence rate on machinery => O&M can be done by domestic companies



Role of K-eco for Water Quality Management in Korea

A Policy Supporting and Implementing Organization under the Ministry of Environment





Good Practice 1 – Policy supporting by providing technical review on MP

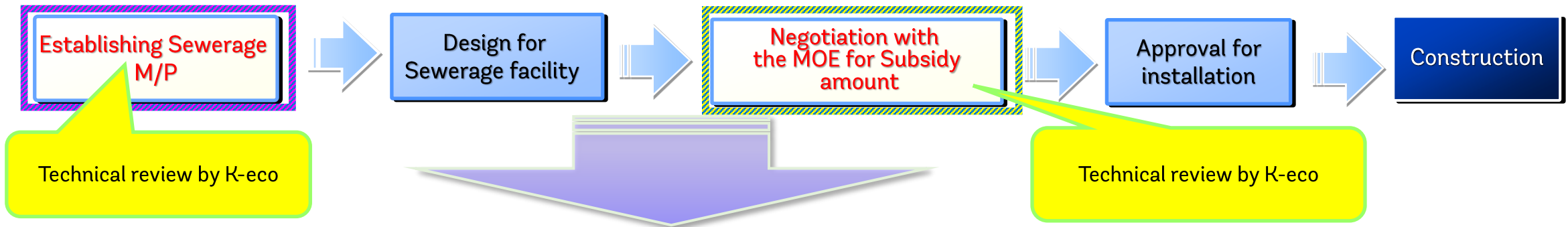
A Policy Supporting and Implementing Organization under the Ministry of Environment

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When local govt. establishes a Master Plan for Sewerage system, each local governments shall be approved it from the Ministry of Environment according to Sewerage Act- Article 3, 5 and 6

Enforcement Decree of the Sewerage Act Article 3 –(2)

Where the MoE intends to approve a master plan for sewerage maintenance or any amendment thereto pursuant to Article 6 of the Act, if deemed necessary for reviewing related technical matters, the MoE can hear opinions of the Korea Environment Corporation established under the Korea Environment Corporation Act



Goal : trying to achieve planned water quality of rivers or watershed

- Trying to establish an efficient and systematical Master plan on sewerage facility
- Trying to use a confined budget efficiently

(6) When a Mayor/ Province Governor intends to issue a public notice pursuant to paragraph (2) or grant authorization pursuant to paragraphs (3) and (4) concerning the public sewerage system that he or she plans to install with a subsidy from the State, he or she shall consult in advance with the Minister of Environment about the raising and spending of funds necessary for the installation thereof, as prescribed by Presidential Decree.

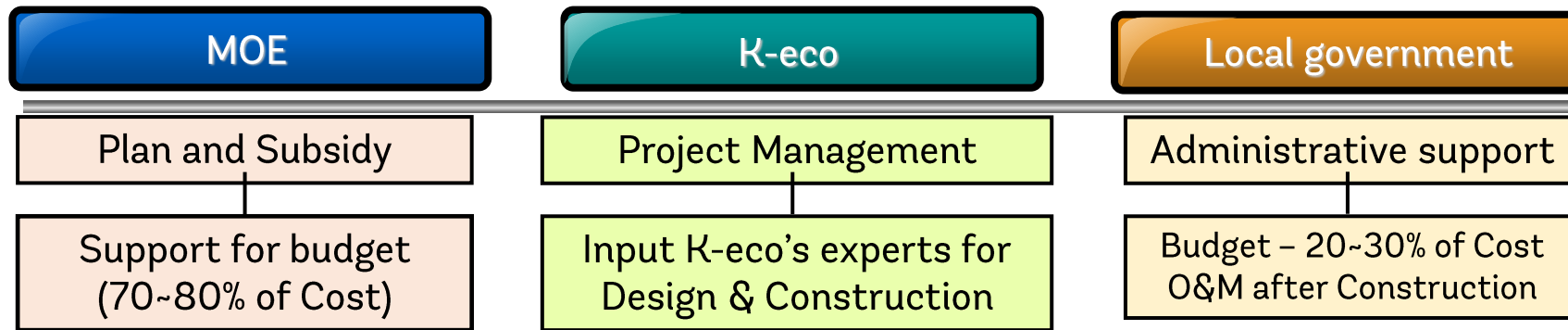


Good Practice 2 – Project Management for Large scale Sewerage Expansion Project

Project Summary

- Introduce River Basin Management & Expand Sewerage Facilities
- Project** was planned out by MOE and carried out by K-eco and 37 local governments for improving and conserving water quality in 4 major river basins.

Structure of Project and Roles of stakeholders

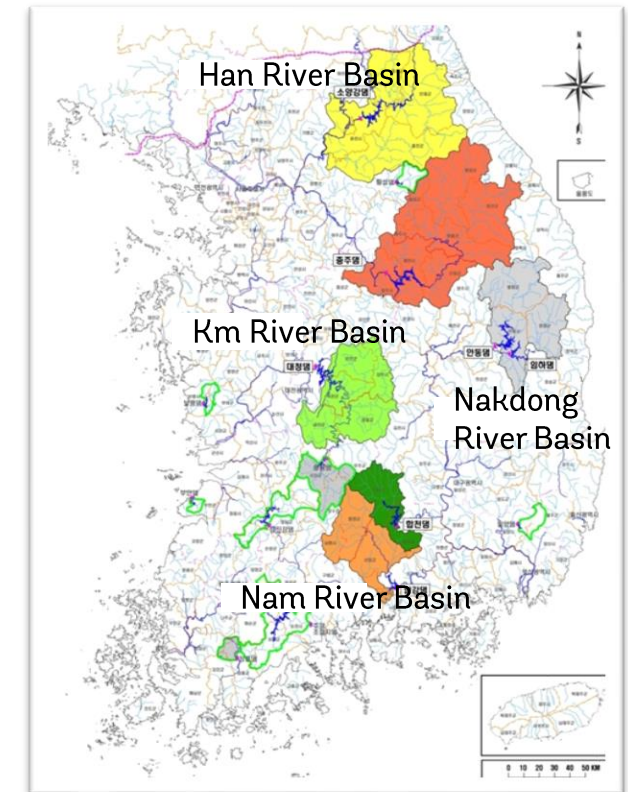


Pilot Project for Rehabilitation of existing Sewer line around Paldang Dam (2001~2015)

: 9 cities-1,714km, House-connections,80,197ea, 1.19 Billion USD (≒1,334Billion KRW, \$1=1,120 KRW)

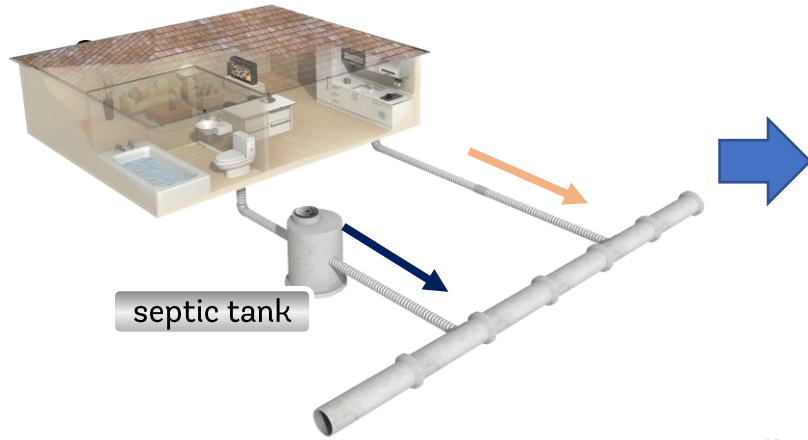
Sewerage Expansion Project in upstream area of dams (2005 ~ 2011)

- Target : 7 dams - 28 municipals [located in upstream area of Dam]
- Cost : 1.21 Billion USD (≒ USD1,350 Billion KRW)
- Quantity : 526 STPs, Sewer 1,747km, House-connections 68,858 ea
- Effect : Coverage of sewerage from 32% to 75%



Effect of pilot project in Han river Basin and Sewerage Expanding below Dams

Efficient collecting and transporting polluted water to STPs by introducing separate



Installation of house connection and Closure of septic tank



Change to separate sewer system

Improvement of the water quality of stream



<Before>



<After>

Restoration of river and Creating riverside park



<Before>



<After>



Good Practice 3 – PPP Projects for expanding Sewerage Facilities

Based on the experience of conducting large scale sewerage projects, K-eco has been carrying out sewerage PPP projects since 1998.

■ BTO cases – STPs, WWTPs and Water Reuse projects

	Sum	Road	Seaport	Railway	Environment	Etc.
Cases (%)	216 (100%)	83 (38.4%)	18 (8.3%)	9 (4.2%)	77 (35.7%)	29 (13.4%)
Total cost (Trillion KRW)	70.1	41.5	6.9	13.3	5.7 (≒ 5.1billion USD)	2.7

■ BTL cases – Sewer projects

	Sum	School	Sewer line	Military House	Railway	Etc.
Cases (%)	435 (100%)	220 (50.6%)	94 (21.6%)	71 (16.3%)	4 (0.9%)	46 (10.6%)
Total cost (Trillion KRW)	27.2	9.4	6.9 (≒ 6.2 Billion USD)	5.6	4.0	1.5

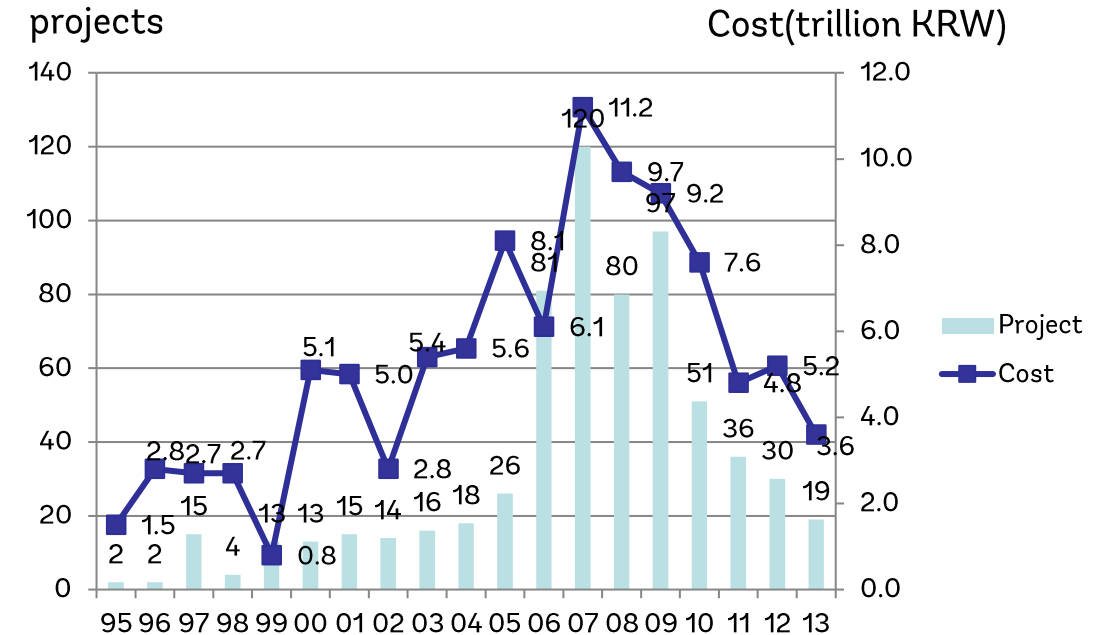
■ BTO cases(STPs)

	1999	2000	2001	2002	Total
STPs (m3/d)	2 STPs (77,000)	5 STPs (239,000)	9 STPs (135,600)	6 STPs (286,200)	22 STPs (737,800)
Total cost (Billion KRW)	88.2	236.2	140.2	507.3	971.9 (≒ \$ 868 M)
Project Cases	2	5	7	5	19

■ BTL cases(sewer line)

	05	06	07	08	09	10	11	12	Total
Length (Km)	1,205	3,511	1,539	1,539	730	200	187	129	9,040
Total cost (Billion KRW)	1,000	2,307	1,307	1,151	638	222	173	129	6,927 (≒ \$ 6.2 B)
Project Cases	17	29	15	15	10	4	2	2	94

Statistics Graph of PPP





Good Practice 4 – Real Time Water Quality Monitoring System on STPs and WWTPs

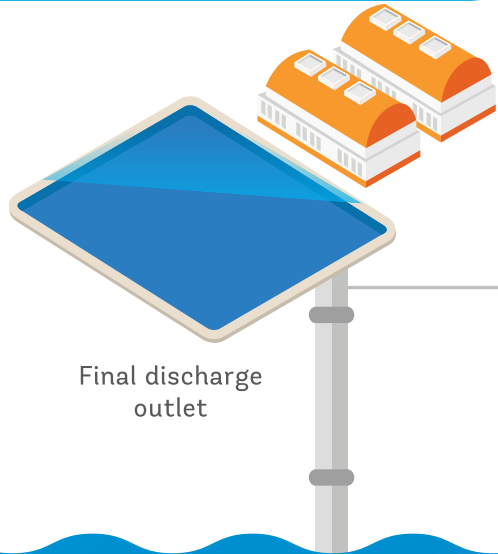
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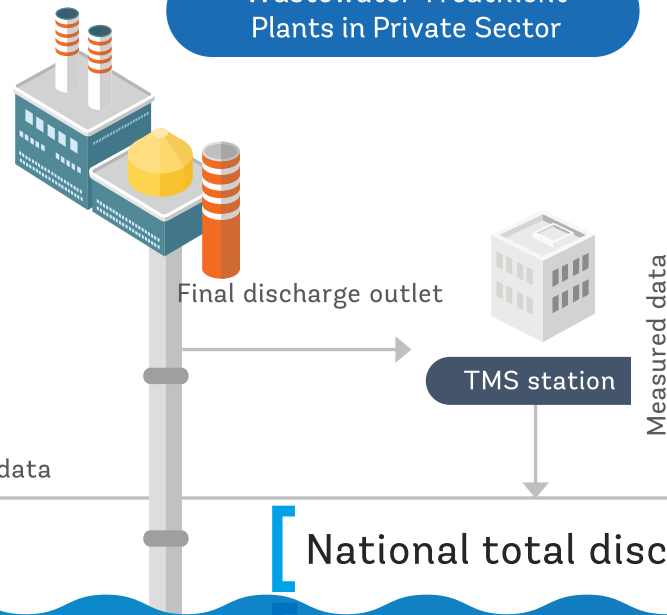
Around-the-clock real-time, remote monitoring system

for monitoring the effluent water quality from Sewage and Wastewater Treatment Plants of the capacity over 500 m³/day

Sewage and Wastewater Treatment Plants in Public Sector



Wastewater Treatment Plants in Private Sector



Control Center



Ministry of Environment

River Basin (Regional) Environmental Offices & local governments

Sewage and wastewater treatment plants

National total discharge quantity ☒ 23.33 million m³/d

Quantity monitored by TMS ☒ 22.14 million m³/d 94.9%

Real-time monitoring of **94.9%** of treated water nationwide

Water TMS Installation Status in Korea

Nationwide

Public sewage treatment facilities

622



Public wastewater treatment facilities

146



Wastewater Discharging facilities

288

(including 1 prevention facility)

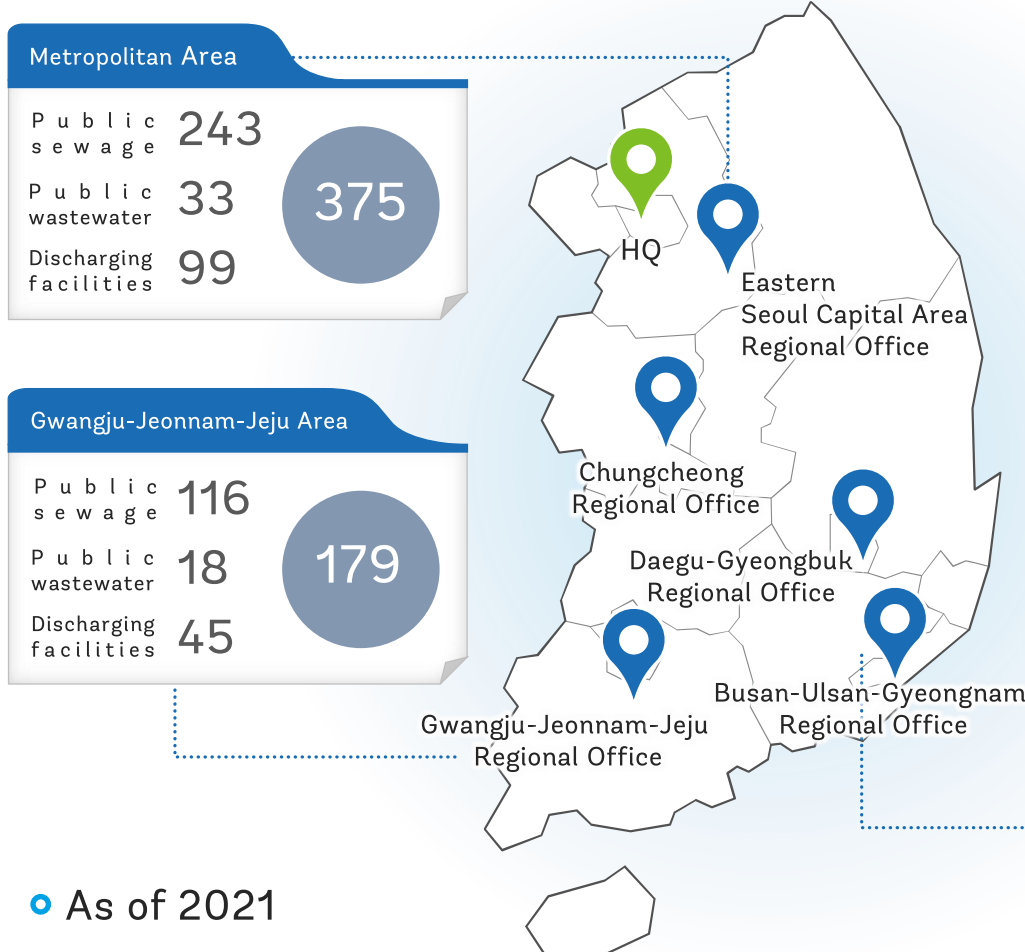
1,056

Amendments to the Water Quality and Ecosystem Conservation Act (Act, Enforcement Decree, and Enforcement Rule)

- Public sewage: applied to over 700 m³/d
- Foundation for administrative fine for exceeding the effluent standard

Establishment of Integrated Water Control Center

- Attaching CCTV to all Water TMS stations
- Introduction of TOC Water Quality Standard
- Disclosure of pollutant emission status



As of 2021

Measurement Items

- ☒ pH, TOC/COD, SS, T-N, T-P

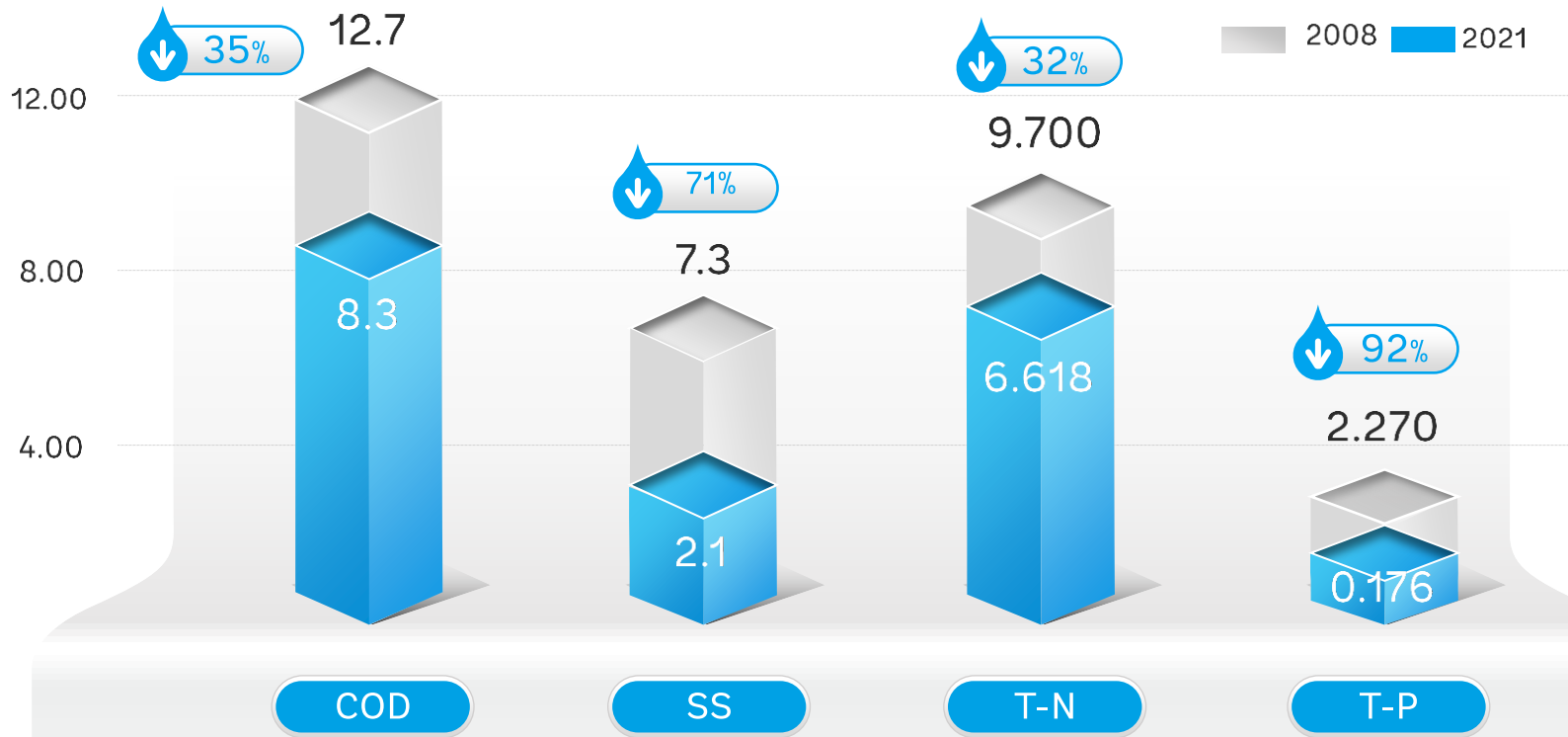


- A Sample collecting tank / pH, SS measuring instruments
- B Automatic sampler
- C T-N, T-P measuring instruments
- D TOC(COD) measuring instrument
- E Data logger

Auxiliary Facilities

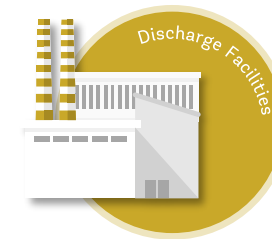
- ☒ Flow meter, power meter, automatic sampler, data logger

Effects of Water TMS on Lowering Pollutant Concentrations



Administrative Agencies

- ✓ To provide feedback data to environmental policies
- ✓ To eliminate irrationality by scientific based monitoring methodology



Discharging facilities

- ✓ Try to meet the effluent standard by alarm service
- ✓ Easy to operate the facility by monitoring the water quality in real-time



Environment

- ✓ To prevent water pollution accidents
- ✓ To improve river water quality by managing discharged water quality

Reduction of water pollutant concentrations by approximately **58%** compared to the pre-installation concentrations in 2008

Experience and Lessons

Harmony

- ◆ Consensus among Stakeholders
 - Central & Local Gov & Residents
- ◆ Upstream & Downstream Area
- ◆ Protection vs. Development

Localization

- ◆ Water Treatment Process
- ◆ Material & Machinery
- ◆ Pursuing Stable O&M

Quality Control & Assurance

- ◆ Importance of QC in Piping Work
 - Reducing Leakage in Water Supply and Infiltration/Inflow in Sewerage
- ◆ Introduction QA system in STP
 - Set Target before Bidding
 - 3~6 months for test-run & final Q/A

Experts and Financial Sources

- ◆ Establishment of Experts Institution
 - R&D, National Project Implementation
 - Dispersing Relating Technology, QA/QC
 - Monitoring Water Quality and Analysis
- ◆ Securing Financial sources
 - Sewerage expanding projects are needed a huge amount of budget compared to water supply projects

Future Collaboration

Collaboration with WB and Clients countries with K-eco for using KGGTF

- K-eco's good practices such as Tele-Monitoring System for monitoring water or air quality can be applied to partner countries.
- K-eco has been collaborating with WB team to improve the environment in Jordan. (waiting the selection result)

Using Korea's Green ODA fund or Knowledge Sharing Program

- Korean Government has been trying to share Korea's experience and good practices with partner countries since 2004.
- One of KSP programs is to collaborate with MDBs including WB.
- WB & K-eco collaborated to carry out the feasibility study for constructing a sanitary landfill at Atyrau in Kazakhstan in 2016.
- Based on the KSP-WB collaboration result, we can develop a Green ODA project in environment area.

Sharing K-eco's experience with Partner countries

- Many partner countries have visited K-eco to improve and conserve the environment during last 30 years.
- K-eco has been sharing with WB teams and partner countries K-eco's experiences and practices.
- K-eco is always welcome to visit K-eco to learn Korea's good practices.!!!

Thank You for Attention



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