

The 4th KARMI Conference

A Past and Current Path of Water Policy in Korea

December 4, 2021

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Gobiobotia brevibarba (MOE, 2009)



Photo : IJ Kim(2014)



A Modern Era of Republic of Korea : 1945-1990s

- Rapid Economic Development with Rapid Investment to overcome extreme poverty and little growth potential



“Three Hardships” on National Development

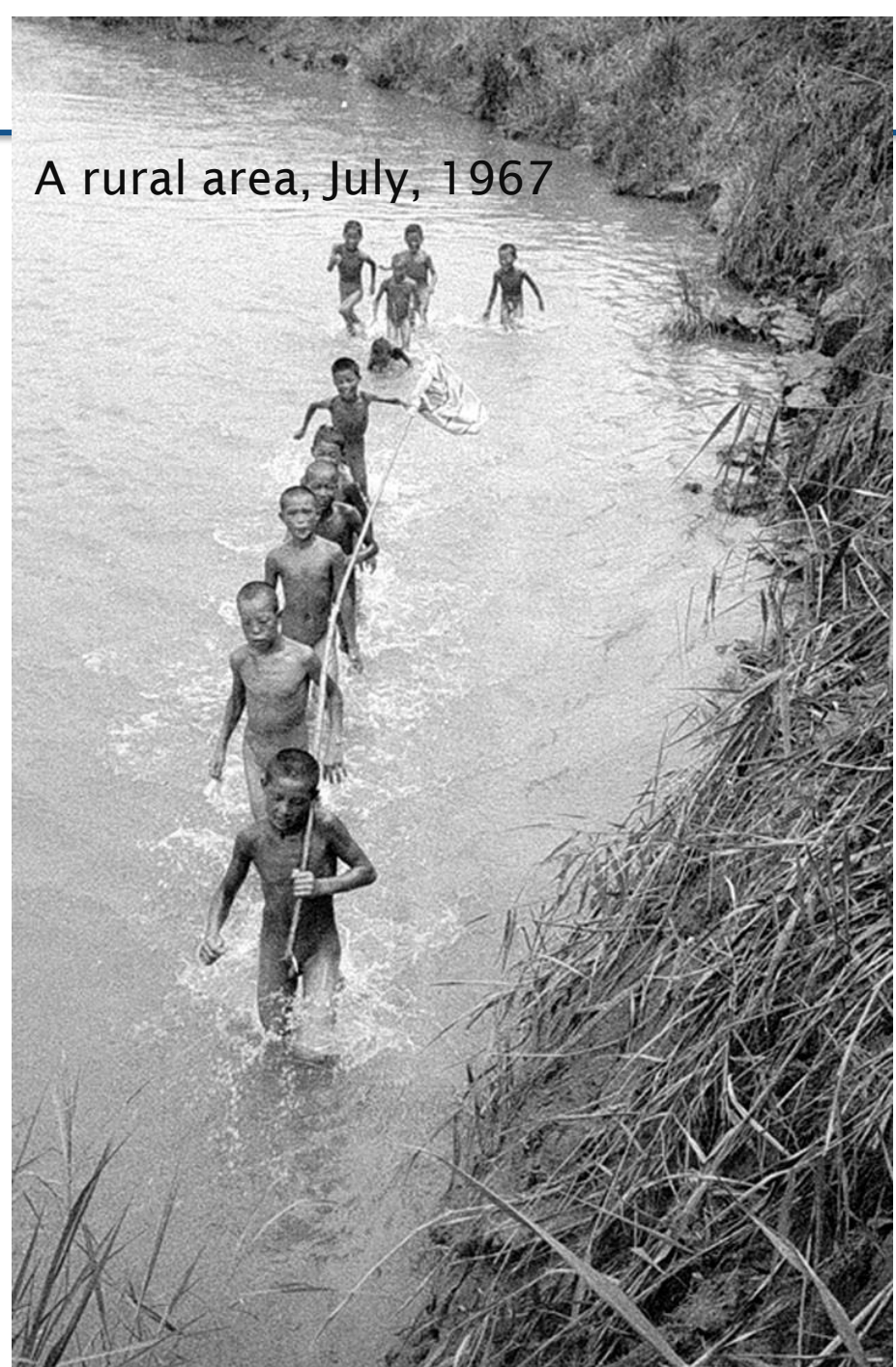
1. Colonial legacy: Japan's occupation (1910-1945)
2. Civil wars/internal conflicts: Korea War (June 1950~July 1953)
 - ❖ Casualty: >640,000(death), > 1.2 mil.(injured/missing)
 - ❖ GDP: -15.1%(1950), -6.1%(1951)
 - ❖ >42% of Industry in S. Korea was destroyed
3. Pervasive Extreme poverty
 - ❖ GNI per capita: \$67(1953), \$104(1963)
 - ❖ 40.9% of total population in absolute poverty in 1965
 - < KRW 20,000/month for urban household, <17,000 for rural
 - Other constraints from 1950s to 1960s
 - ❖ No economic engine for the country's development
 - ❖ Very high illiteracy
 - ❖ Big dependent economy on foreign aid
 - ❖ Bad public health: 77% of Helminth egg positive rate in young students
 - ❖ Little natural resources, not properly managed water resources → little sources to power





Jan. 8, 1951

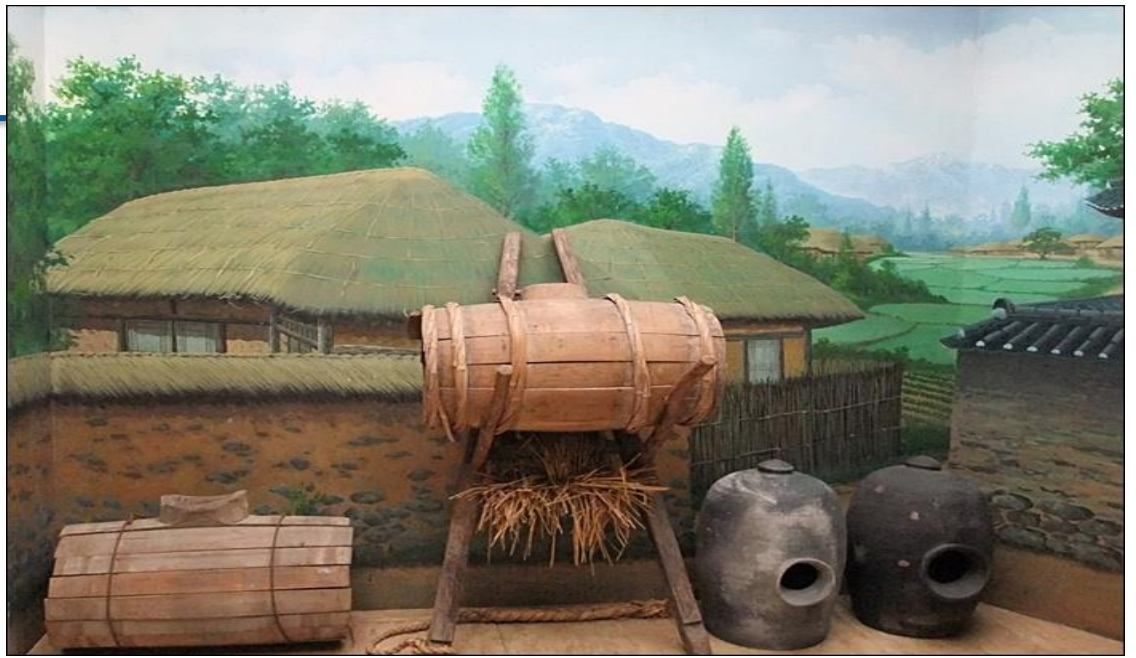
주최: WPF (사)월드피스자유연합, Host: The World Peace Freedom United Tel: 02



A rural area, July, 1967



Seoul, August, 1973



An aged Korean in line receives a bowl of hot milk and rice from volunteer workers at one of Seoul's nine feeding centers. Looking on (background left to right) George S. Murray and John P. Kott. Date: April 21, 1953. Photo Credit: US Army by Pvt John St. Dennis



6.25전쟁 당시 서울에는 8개의 음식물 배급소가 있었습니다. 유엔미사임중사령부 소속의 마린들이 감독하고 있는 동안 서울의 한 무상 음식물 배급소에서 중 서 있던 한 노인이 차례가 되자 따뜻하게 데운 우유와 밥을 받고 있습니다. 일자: 1953년 4월 28일

Overcrowded living quarters used by Korean refugees. This scene is a warehouse in Taegu, Korea. Nobody could guess this was a real scene in Korea during the Korean War. Date: January 11, 1952. Photo Credit: US Army by Cpl W. E. Netten



6.25전쟁 당시 피난민들의 임시 거처로 사용되던 대구의 한 창고. 오늘날 우리 젊은이들은 6.25전쟁 기간 동안 대한민국이 정말로 이런 모습이었는지 상상도 못할 것입니다. 일자: 1952년 1월 11일 자료: (사)월드피스자유연합



Women washing clothes in the charity town of the Cheonggyecheon which has grown up on the ruins of Seoul. We can see a steel battle helmet used as a water bucket which they might find at the ruins. Date: October 1, 1950. Photo Credit: US Army

서울소북 후 모든 것이 파괴된 폐허 속에서 급속히 생기기 시작한 청계천 밑에서 말라붙는 여인과 아이들의 모습입니다. 전쟁의 폐허 속에서 주운 철모를 물통으로 사용하고 있습니다. 일자: 1950년 10월 1일. 출처: (사)월드피스자유연합



Youngsters at the Happy Mountain Orphanage, Busan, Korea, gather round for their evening meal.

Date: December 17, 1951
Photo Credit: US Army by Cpl Leon W. Laubrick

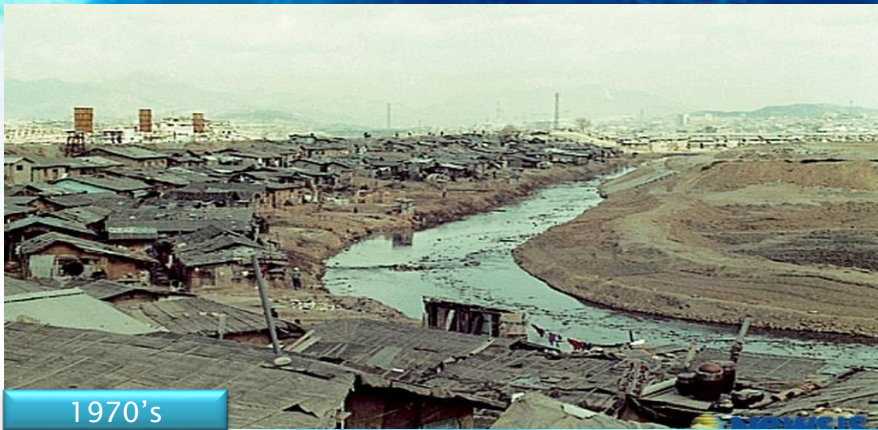
부산의 한 6.25전쟁 고아원에서 전쟁 고아들이 저녁식사를 하고 있습니다. 일자: 1951년 12월 17일 자료: (사)월드피스자유연합



1950's



1960's



1970's



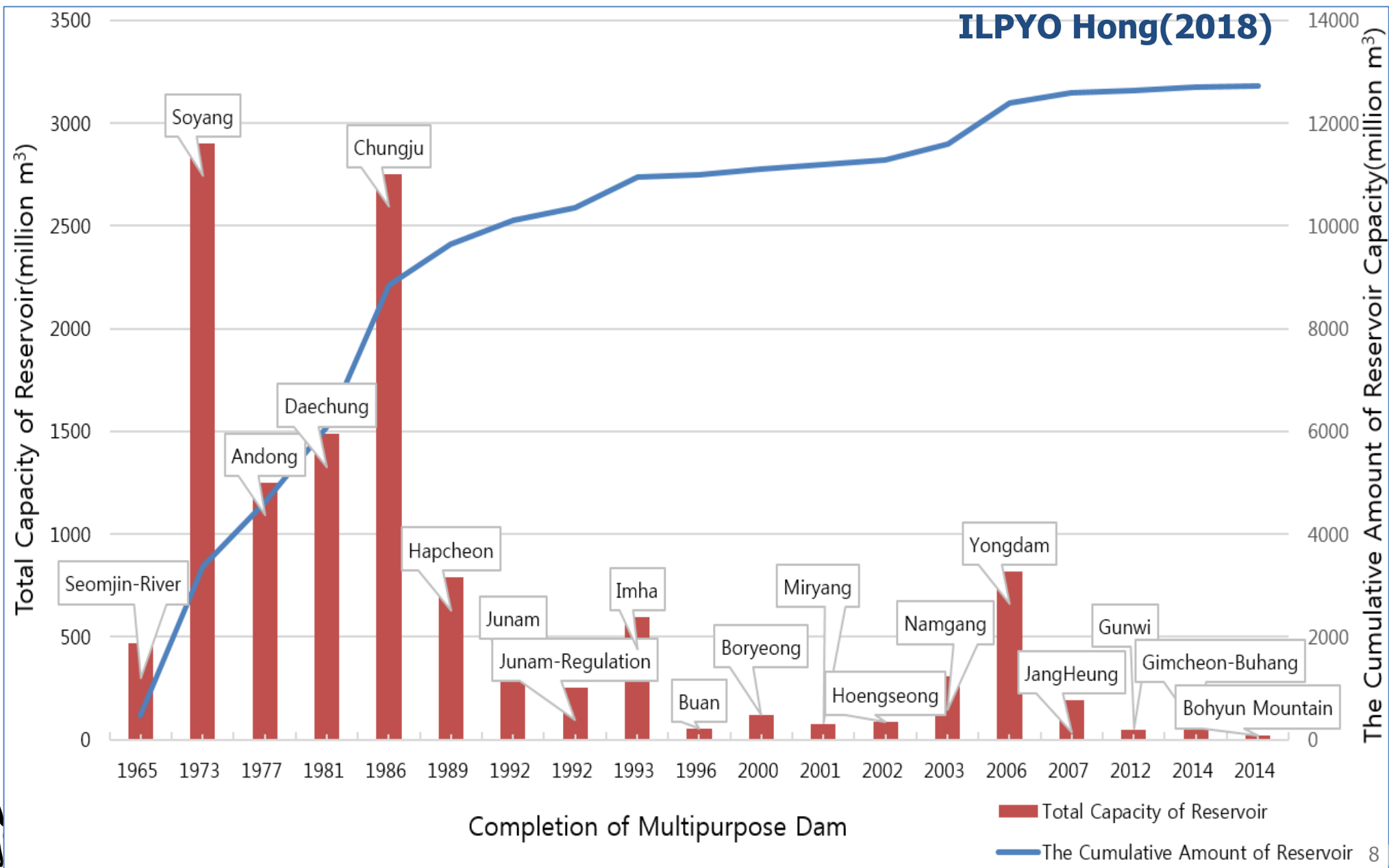
1980's



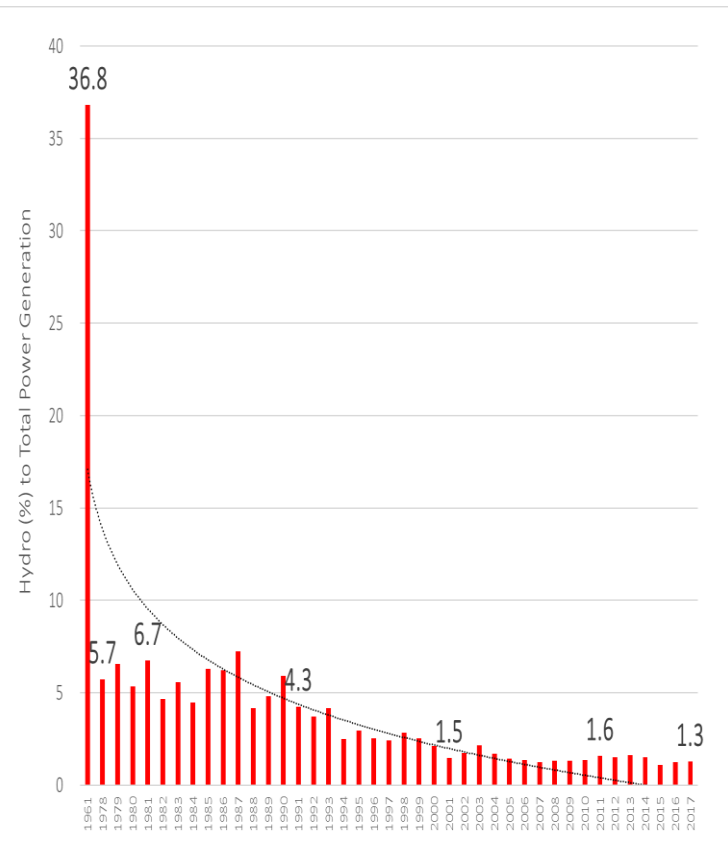
Cheonggae Stream (Current)



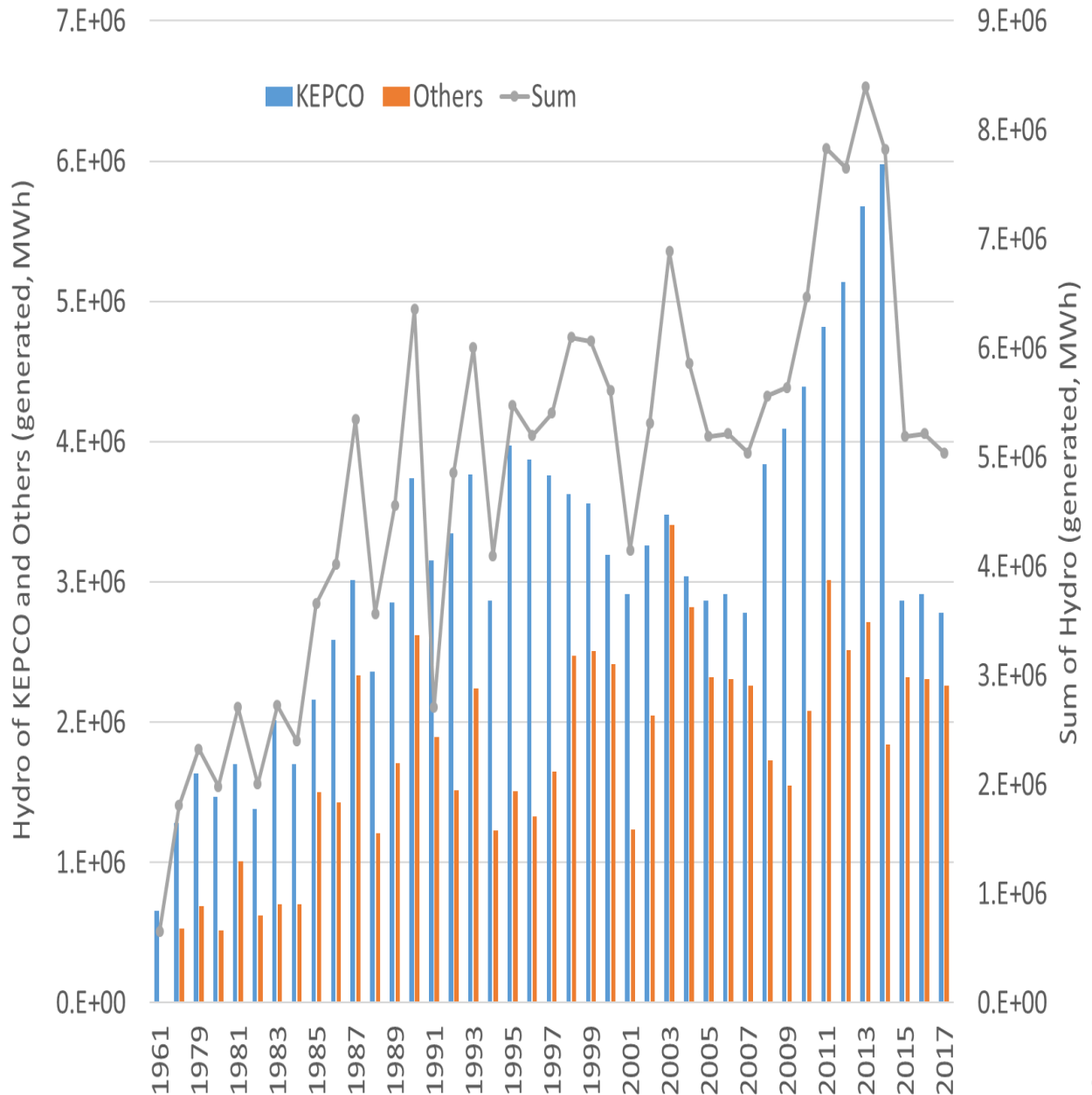
Constructing Multipurpose Dams



Trends in Hydro Power over 40 Years



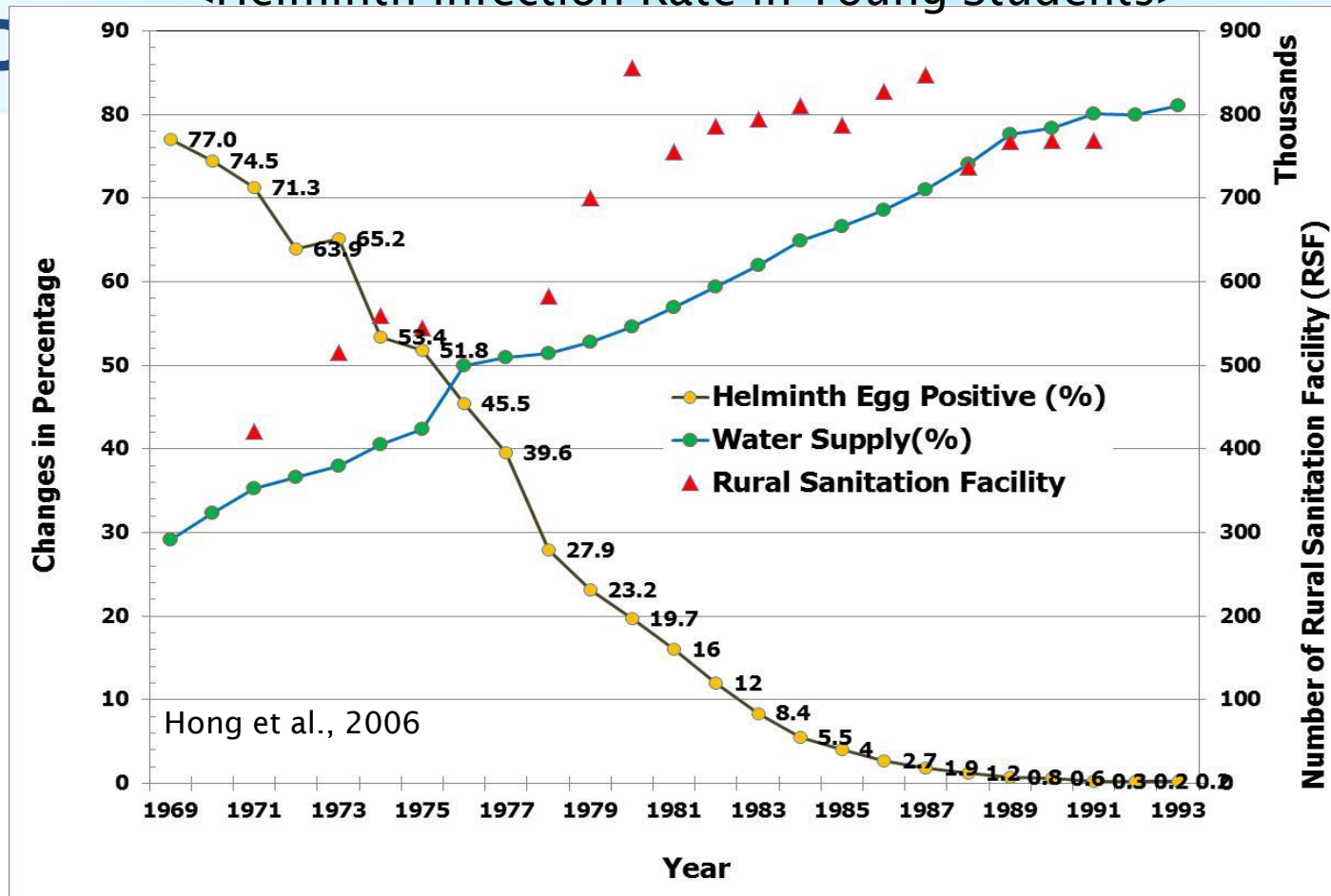
• Shared % of Hydro
36.8% in 1961
→ 1.3 % in 2017



“Three Hardships” on National Development

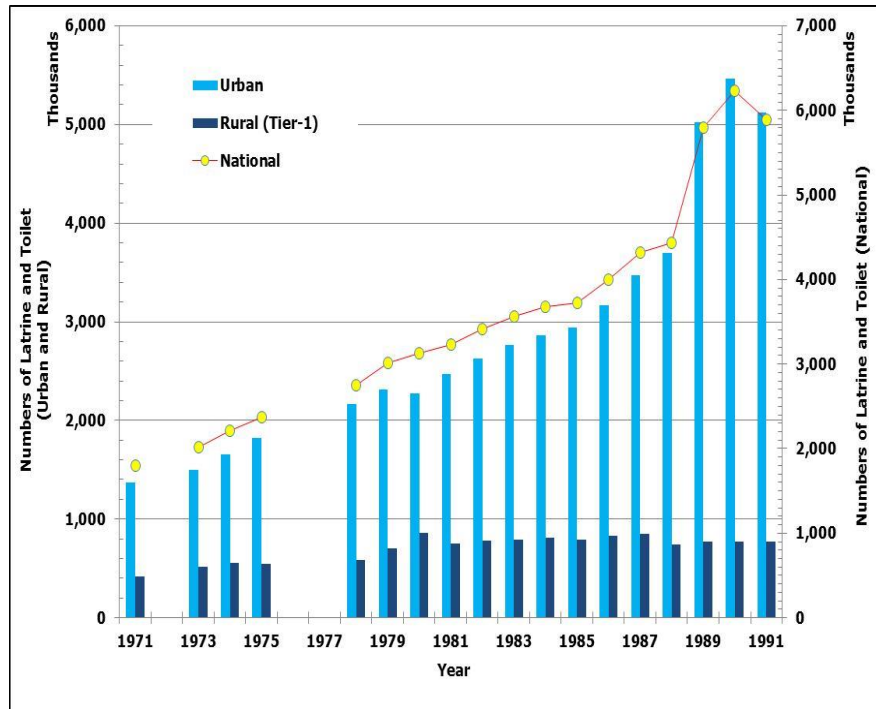
- Infection (Helminth) Rate that is related to water supply, basic hygiene & sanitation (feces and urine collection)
 - ❖ The rate in the young students dramatically decreases 71.3% (1971) → 19.7 % (1980)

<Helminth Infection Rate in Young Students>



Increased Sanitation Units, Remarkably

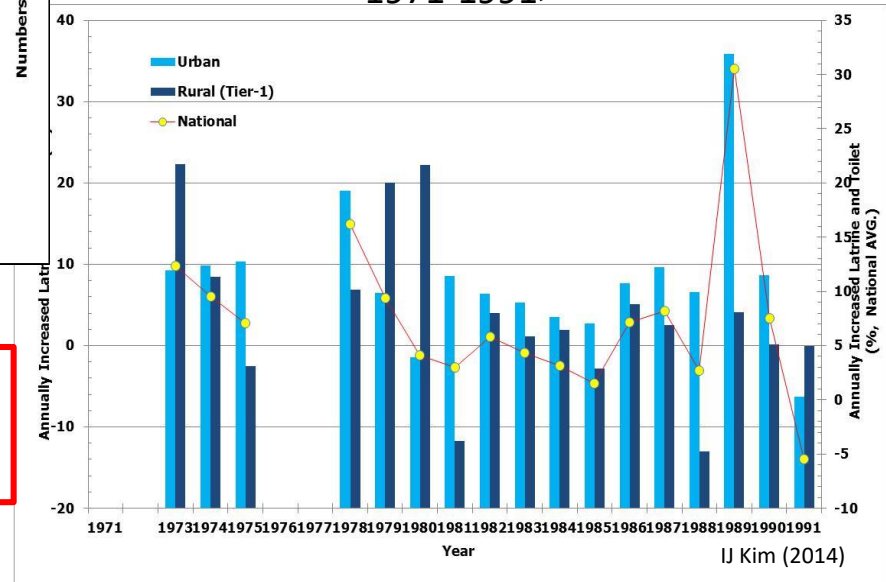
<Total Numbers of Sanitation Unit in the Country, 1971-1991>



← Gradual and rapid increase across the country
 ← Seemingly, rural sanitation is not good as in urban, but it also shows growing pattern in next slide even the population is decreasing. It is a visual/graphical impact.

- Note: Urban represents the 1st administrative areas (all city-levels), while **Rural Tier-1 represents the 2nd, or County-level (“Eup” in Korean)**. Tier-2 (Township-level or “Myeon” in Korean) need to be included for further comprehensive analyses standing for all rural areas.
- Data sources: Korean Statistical Information Service and others

<Annually Changed % in Sanitation Unit, 1971-1991>

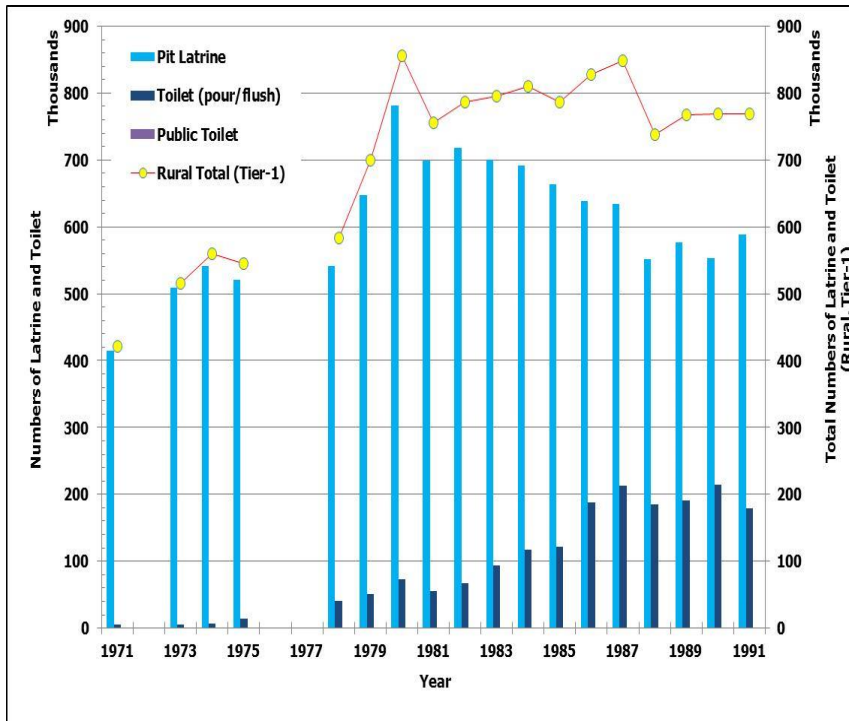


Remarkable increases year by year between 1971-1980, and 1986-1987 & 1988-1989 (Asia & World Olympics in Seoul). In some years(1973, 1979,1980), much higher in rural than in urban →



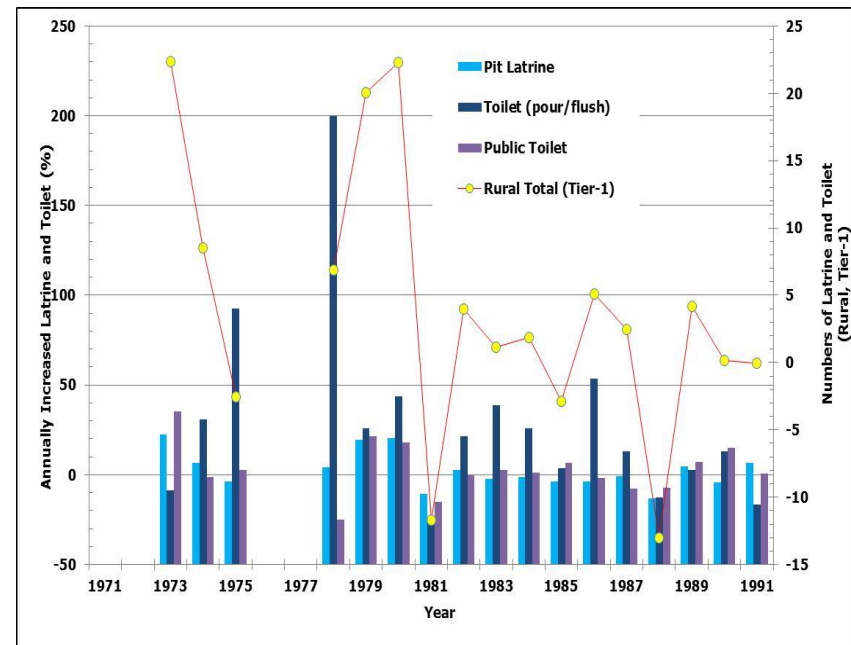
Latrine First, Toilet Second in Rural Sanitation

<Total Numbers of Latrine and Toilet in Rural(Tier-1), 1971-1991>



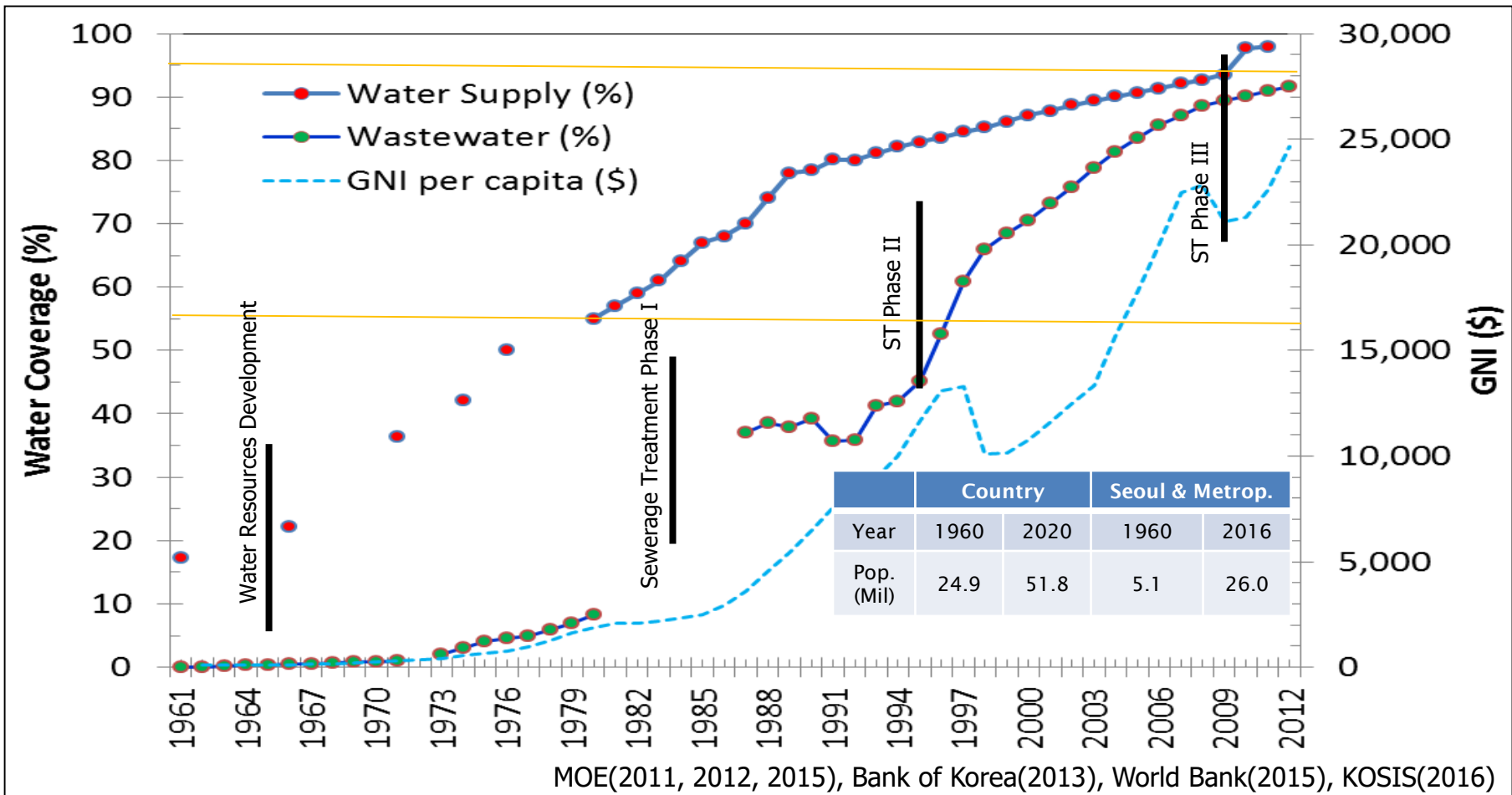
- ← Like urban, pit latrine in rural is also the largest type of majority throughout the years.
- ← After 1980, latrine decrease whereas toilet increases. The scale-up (toilet) started in early 1980s, but fast growing since 1985-1986.

<Annually Changed % in Latrine and Toilet 1971-1991>



Although the data in 1976 and 1977 is missing, 1970-1980 is the booming era of rural sanitation in Korea →
 This is the evidence IJ needed to look further at the New Village Movement in 1970s →

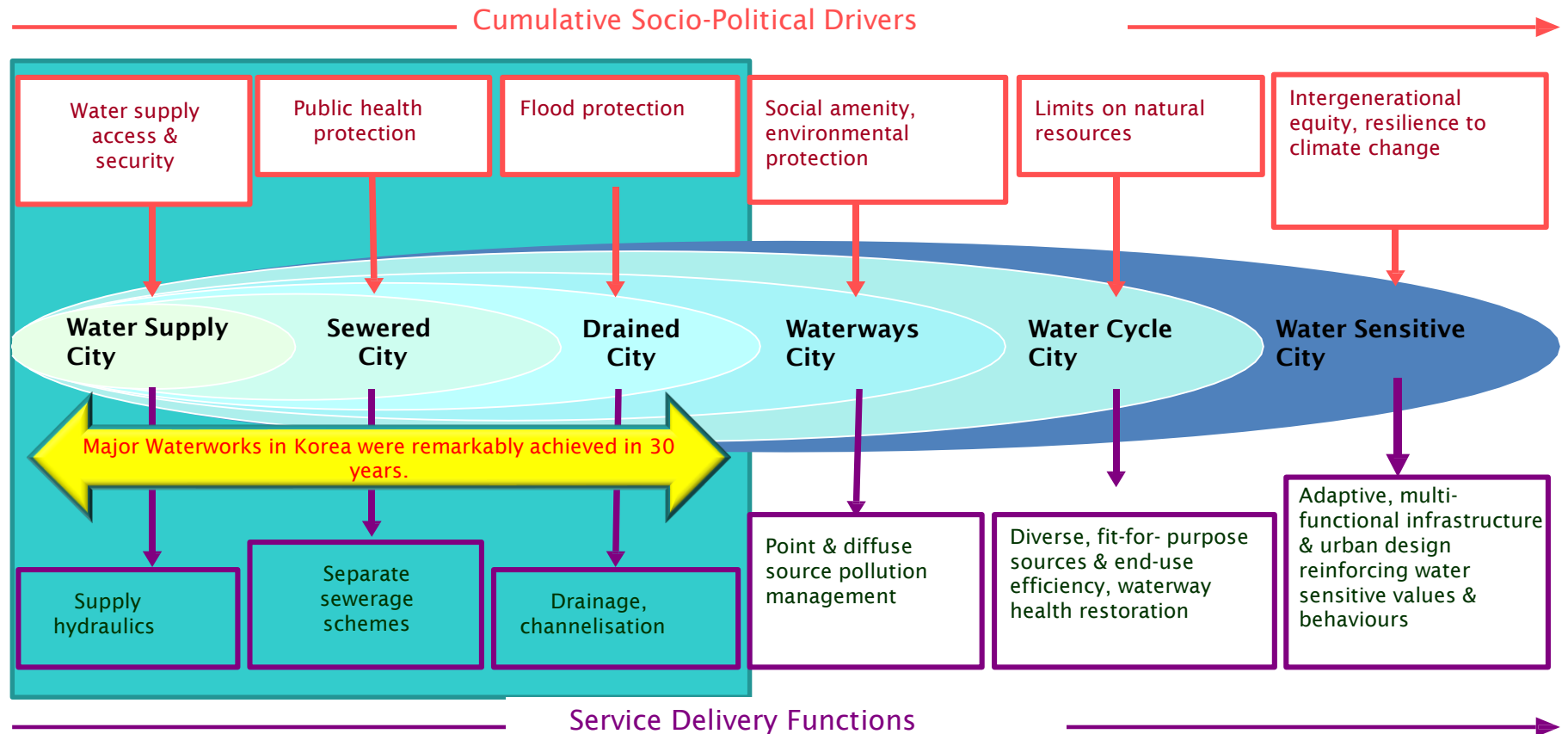
Economy and Water & Sanitation in Korea



- GNI per capita: USD 94 (1961) → 27,600 (2016) → 31,755 (2020)
- Water supply coverage: 17% (1961) → 98.9% (2016) → 99.3%(2019)
- Sewage treatment coverage: <2% (1961) → 93.2% (2016) → 94.3% (2019)
- Lowered flood risk after constructing multi-purpose dams and levees



(Urban) Water Transitions Framework



Modified from: Brown *et al* (2009), and Wong and Brown (2009)

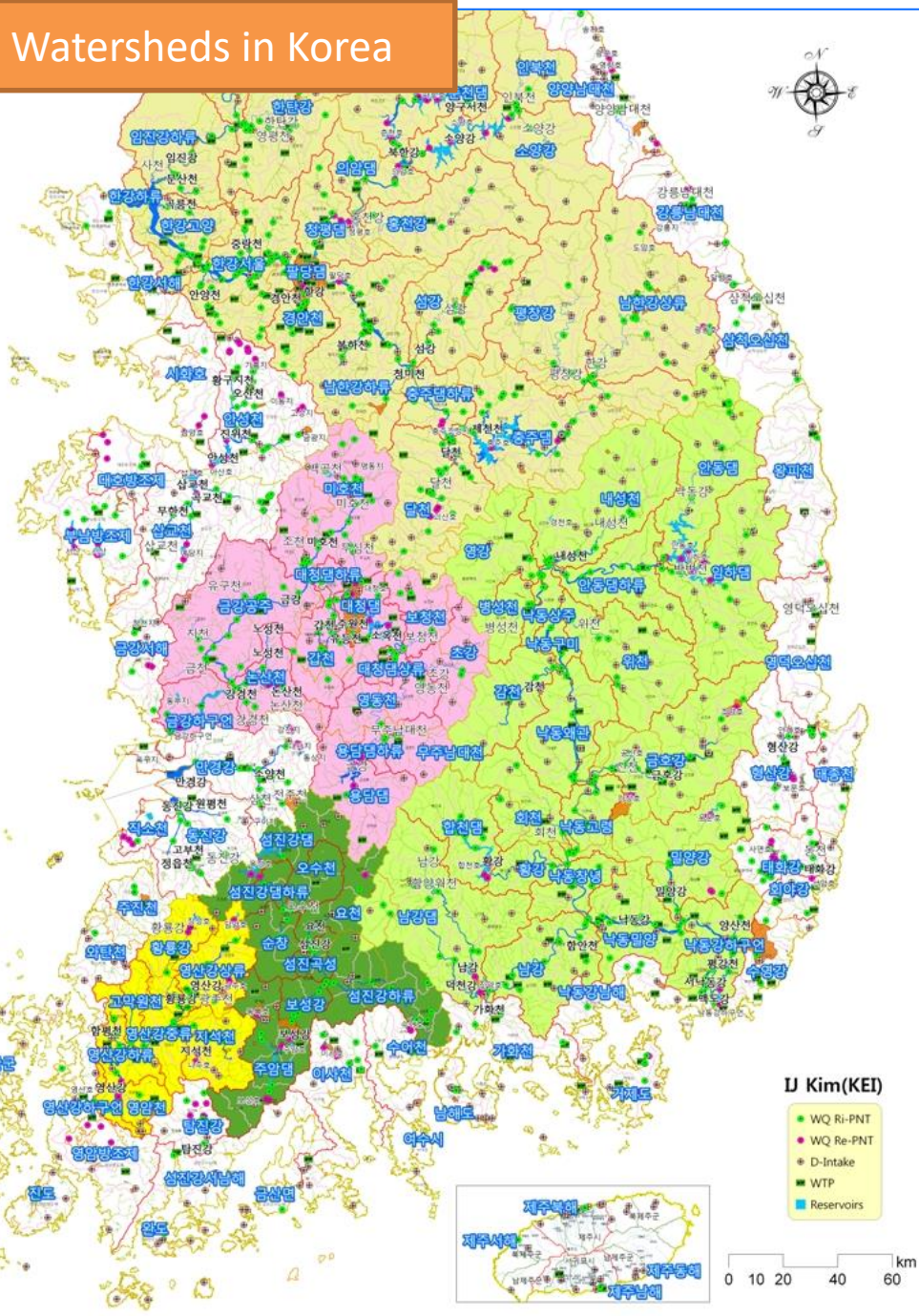


A Modern Era of Republic of Korea : 1990s-2010s

- *Moving forward to increase economic, environmental, and ecological sustainability in many sectors*
- *however, huge gaps in terms of policy incoherence and management inefficiency was continued in water sector*



Watersheds in Korea

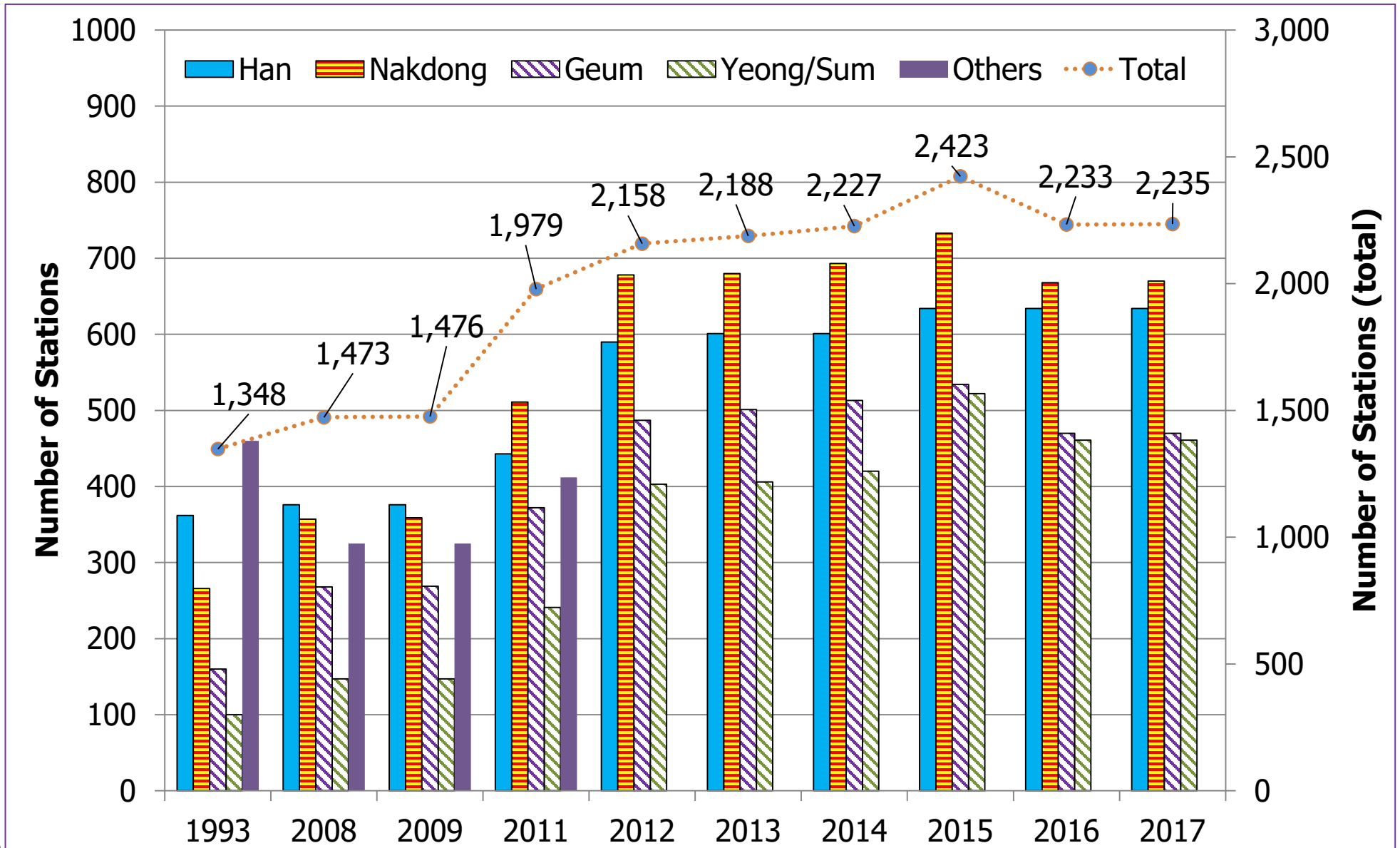


<Monitoring Station (current)>

Theme	Numbers of Station	details	
Metrology	572	1 st grade	
Water level/flow	1,025	4,657 by 2029	
Water quality (incl. sediment)	1,949	River: 688 Resv.: 200 Irrig.: 955 Sed.: 326 Automatic: 70 Other: 106	
Biological (official since 2017)	3,883	River: 3,035 Resv.: 180 Est.: 668	
Radioactive	90	River: 77 Resv.: 13	
Water intake	504		
Water treatment	490		
Sewerage treatment (>500m ³ /d)	681(2019)	625(2015)	
Sewerage treatment (<500m ³ /d)	3,535(2019)	3,282(2015)	
Ground water	Level (national)	668(2020)	985 by 2030
	Quality	3,353(2017)	2,667(2010)

Water Quality Monitoring (WQM) in Korea

65.8% increased

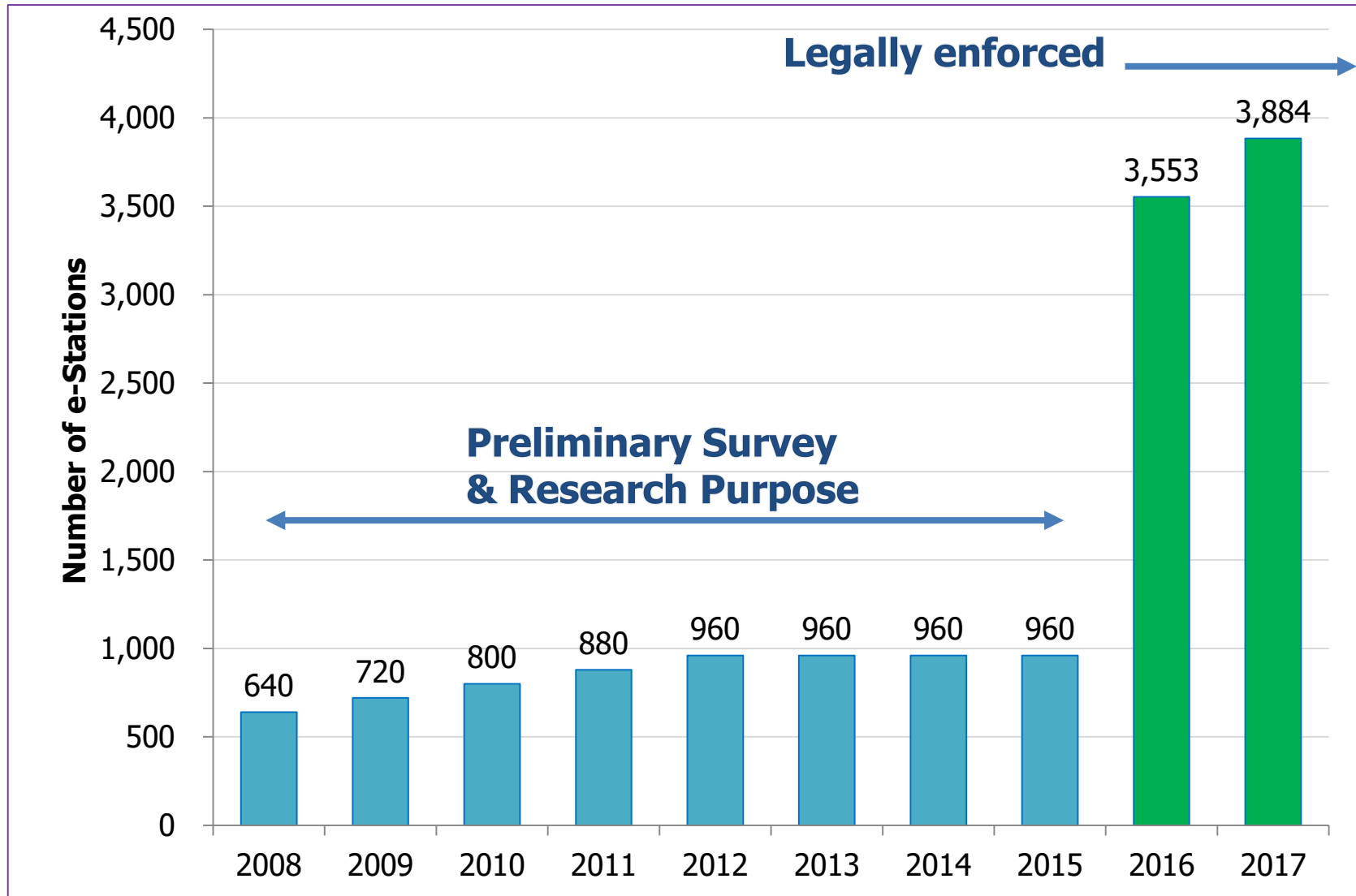


All-listed Parameters in WQM

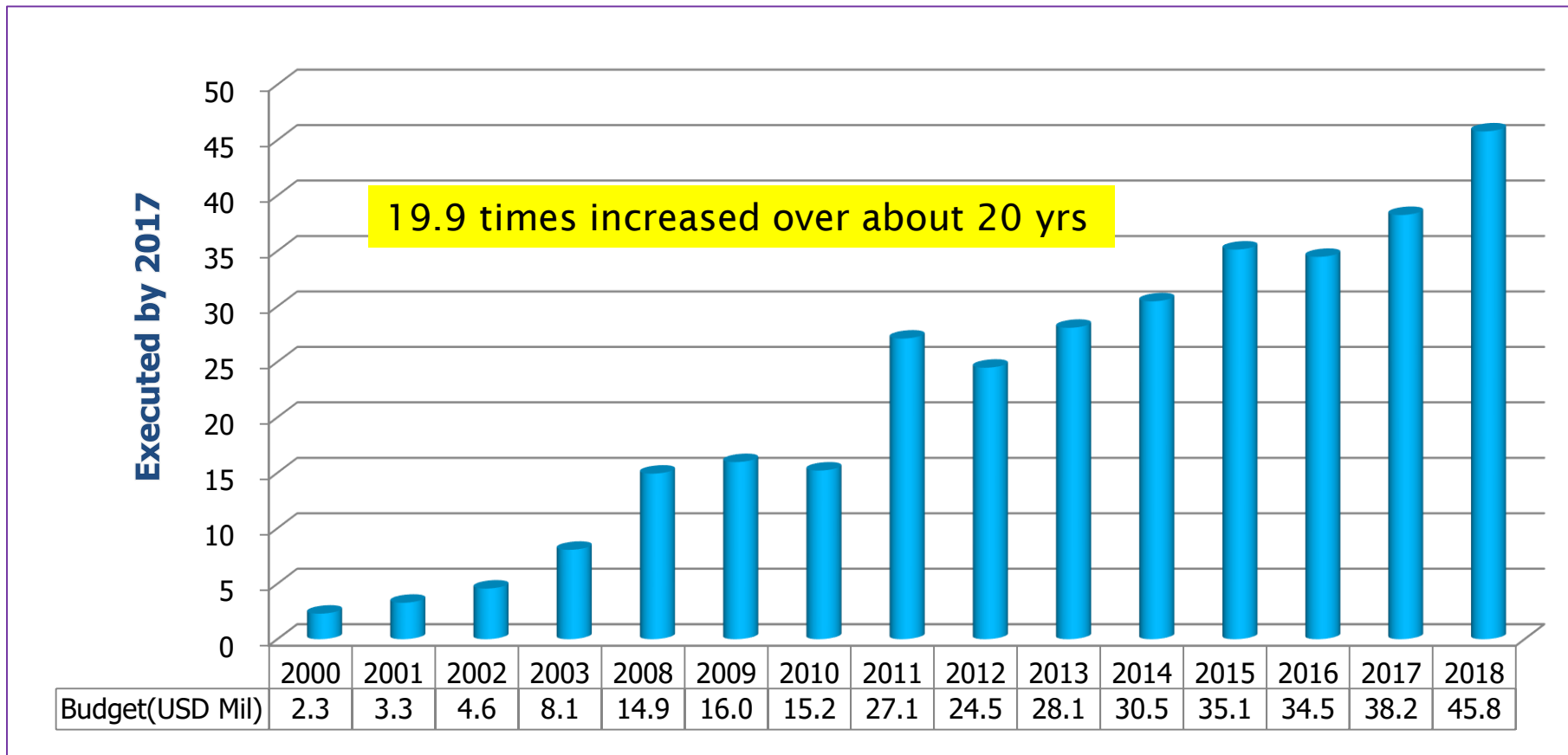
Date	Parameters	Sum
1993	pH, DO, BOD, COD, SS, t-coliform, T-N, T-P, Temp, Phenols, EC, Cd, CN, Pb, Cr+6, As, Hg, ABS, PCB, Turbidity, Organo-phosphorus, Cl-, N-hexane, Soluble Mn, TCE, PCE	27
2008.1.18	(added) NH ₃ -N, NO ₃ -N, e-coliform, DTN, DTP, PO ₄ -P, Chl-a, CCl ₄ , 1,2-DCE, DCM, Benzene, CHCl ₃ , TOC, Cu, Zn, Cr, F, Color, Soluble Fe	45 (+18)
2009.4.20	(added) Sb, DEHP, TSS	48 (+3)
2013.5.30	(added) real-time(EC, PCB, turbidity, VOCs(9)), eco-toxicity(daphnia, fish, micro-organism, etc) sediment(PCBs(10), PAHs(16), DDTs(6), VOCs(12), Al, CODsed, SRP, Li, Ni, particle, water content, carbon weight)	112(+64) (real-time & sediment monitoring)
2013.6.24	(added) 1,4-dioxane	113 (+1)
2014.7.1.	(added) CH ₂ O, HCB	115 (+2)
2015.7.20	(updated) sampling method for sediment	
2016.4.1	(added) radio-active (Ba, Se, ¹³⁴ Cs, ¹³⁷ Cs, ¹³¹ I)	120 (+5)



A New Measure : Aquatic Ecosystem Monitoring



National Budget for WQM and AEM



Source: MOE, National Assembly

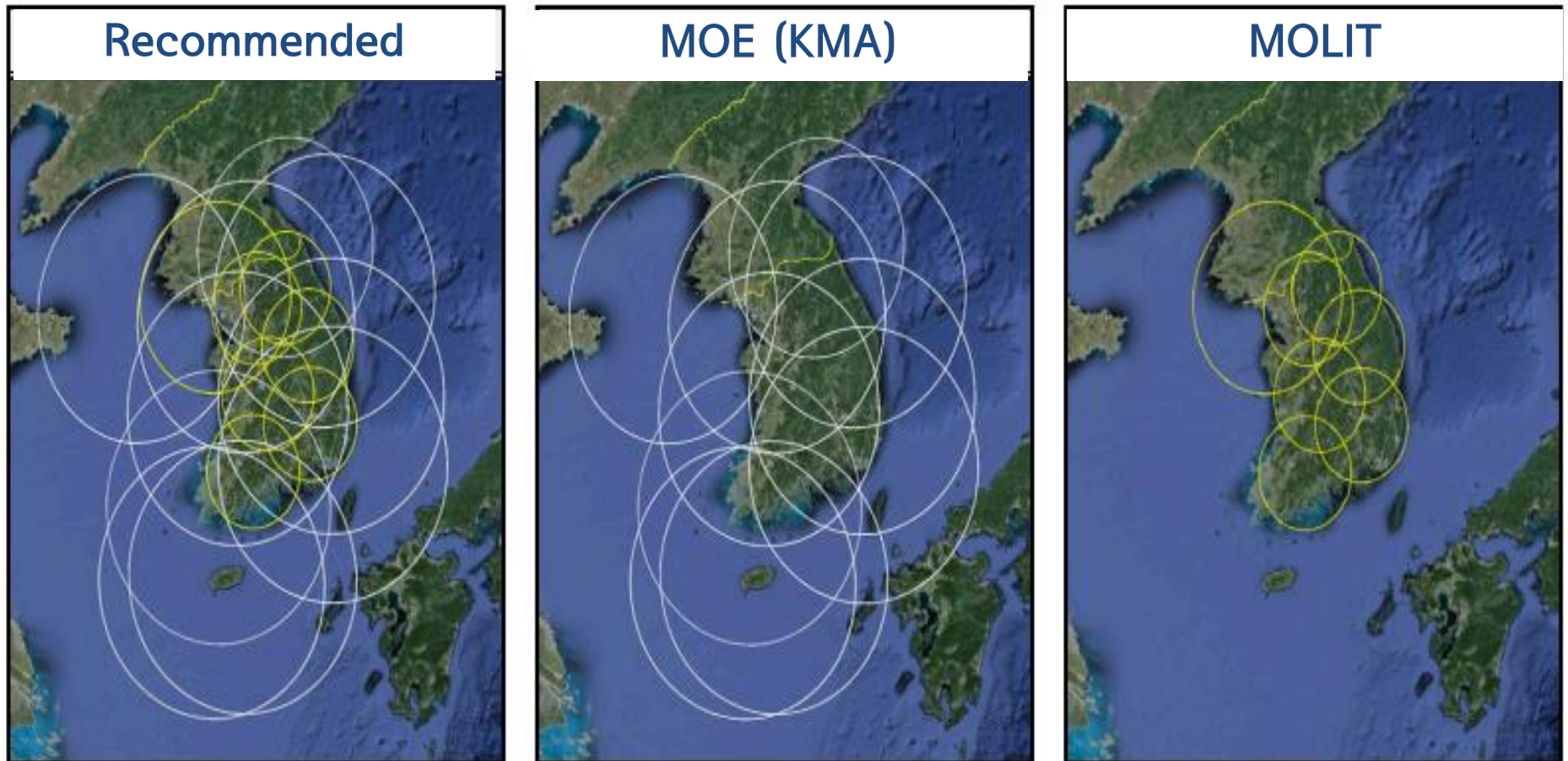
- 2001~ : Real-time (automated) Water Quality Monitoring
- 2008~ : TMPL Monitoring (in part of 1st Phase)
- 2011~ : TMPL Monitoring of 2st Phase
- 2012~ : Sediment Monitoring (integrating)
- 2015~ : Radioactive material monitoring
- 2016~ : Aquatic Ecosystem Monitoring

**<Integrating Water Information>
RainDrop 2 TapDrop**



Water Information System : MOE (KMA) and MOLIT

Precipitation & Mereology Data from Radar



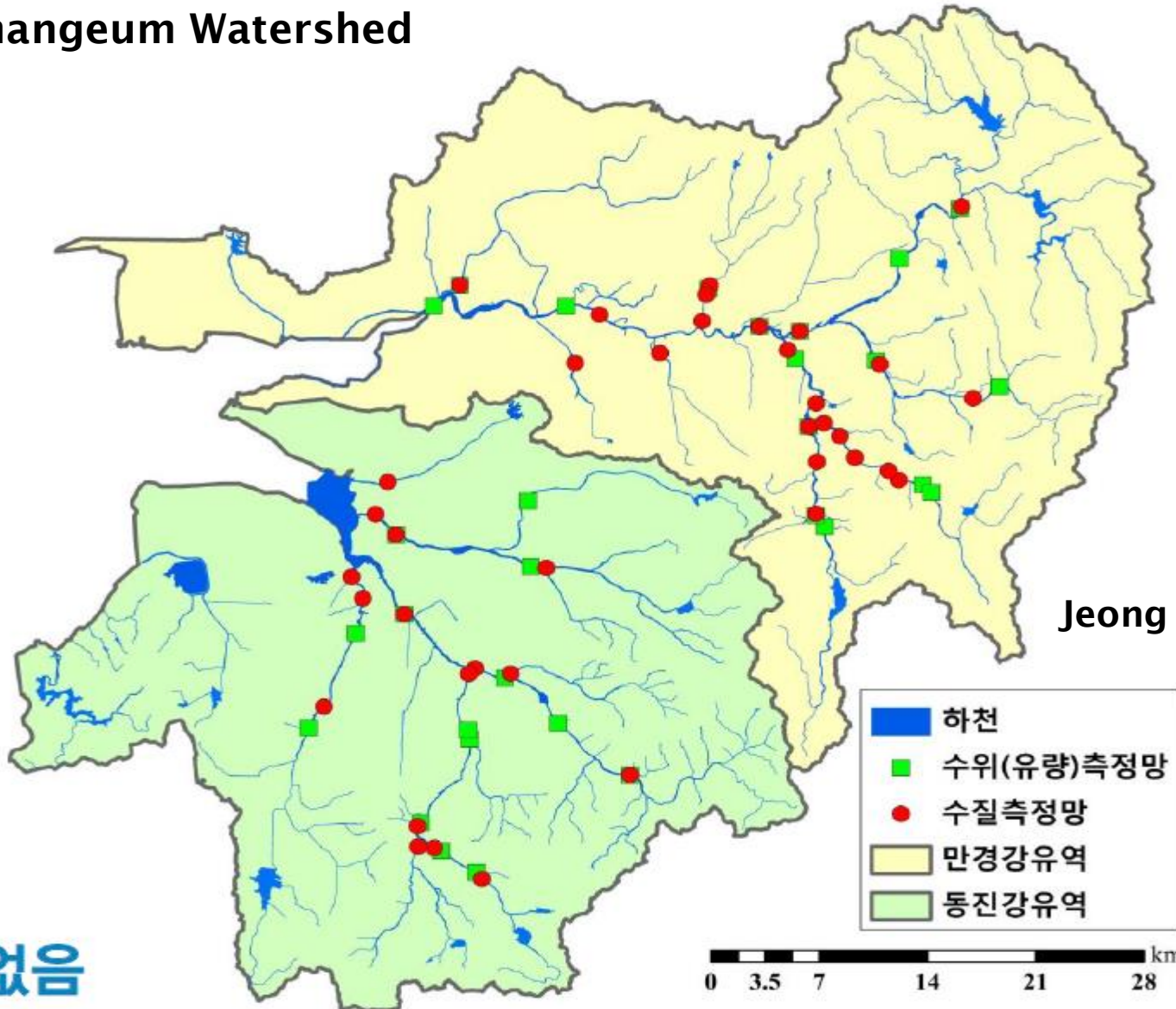
자료: 기상청 및 국토교통부 제출자료 재구성

Same Data from Same Devices, but Operated by the different ministries

National Bureau of Audit (2014)

Separated Water Stations for Quantity and Quality

Saemangeum Watershed



Jeong et al. (2017)

없음



Regional Water Supply vs. Local Water Supply

Water Supply Facilities : Intake and treatment facility

Year & Facility		2007	2008	2009	2010	2011	2012	2013	2014	2015	Avg.
Intake Capacity (10 ³ m ³ /d)	Local	19,594 ⁶⁸³	19,845	19,839	19,242	19,700	19,615	19,692	19,666	18,709 ⁵⁶²	19,544
	Regional	17,424 ⁴⁶	17,200	17,682	17,682	17,462	17,462	17,489	17,553	13,882 ³⁰	17,093
Intake (%)	Local	53.4	48.6	51.6	53.1	49.5	49.6	49.4	50.1	53.1	50.9
	Regional	50.1 ⁵²²	49.6	49.5	53.5	55.6	56.9	58.7	58.8	58.3 ⁴⁶²	54.6
Treatment Capacity (10 ³ m ³ /d)	Local	21,691 ³³	21,318	21,516	21,136	21,132	20,221	20,352	20,325	19,973 ³⁷	20,852
	Regional	6,764	7,015	7,369	7,772	7,648	7,428	6,816	6,816	6,851	7,164
Treatment (%)	Local	55.0	56.1	55.4	56.7	57.3	59.8	59.5	60.0	61.6	57.9
	Regional	51.6	51.8	50.4	51.1	54.3	56.4	63.3	65.3	67.3	56.8
Leakage(%)		12.8	12.2	11.4	10.8	10.4	10.4	10.7	11.1	10.9	11.2

- The percentages of Intake Facility for Regional and Local by 2015 were still lower than 60%.
- The percentages of Treatment Facility for Regional and Local since 2014 or 2015 were slightly higher than 60%



River Restoration Projects : Overlapped

- MOLIT was focusing on flood management mainly, while MOE on water quality & ecosystem restoration → significant lack of coordination

Dangjin Stream
(USD 5 M in total)



After

Yesan Stream
(USD 3.5 M in total)



After

Bogang Stream
(USD 6.8 M in total)



Onyang Stream
(USD 3.6 M in total)



If river projects of MOE and MOLIT were combined, estimated benefits would be more than **USD 6.35 Bil..** (IJ Kim et al, 2017)

Huge incoherence and inefficiency in water policy and investment (supply, treatment, green-infra, weather radar) was identically found.

IJ Kim (2008)

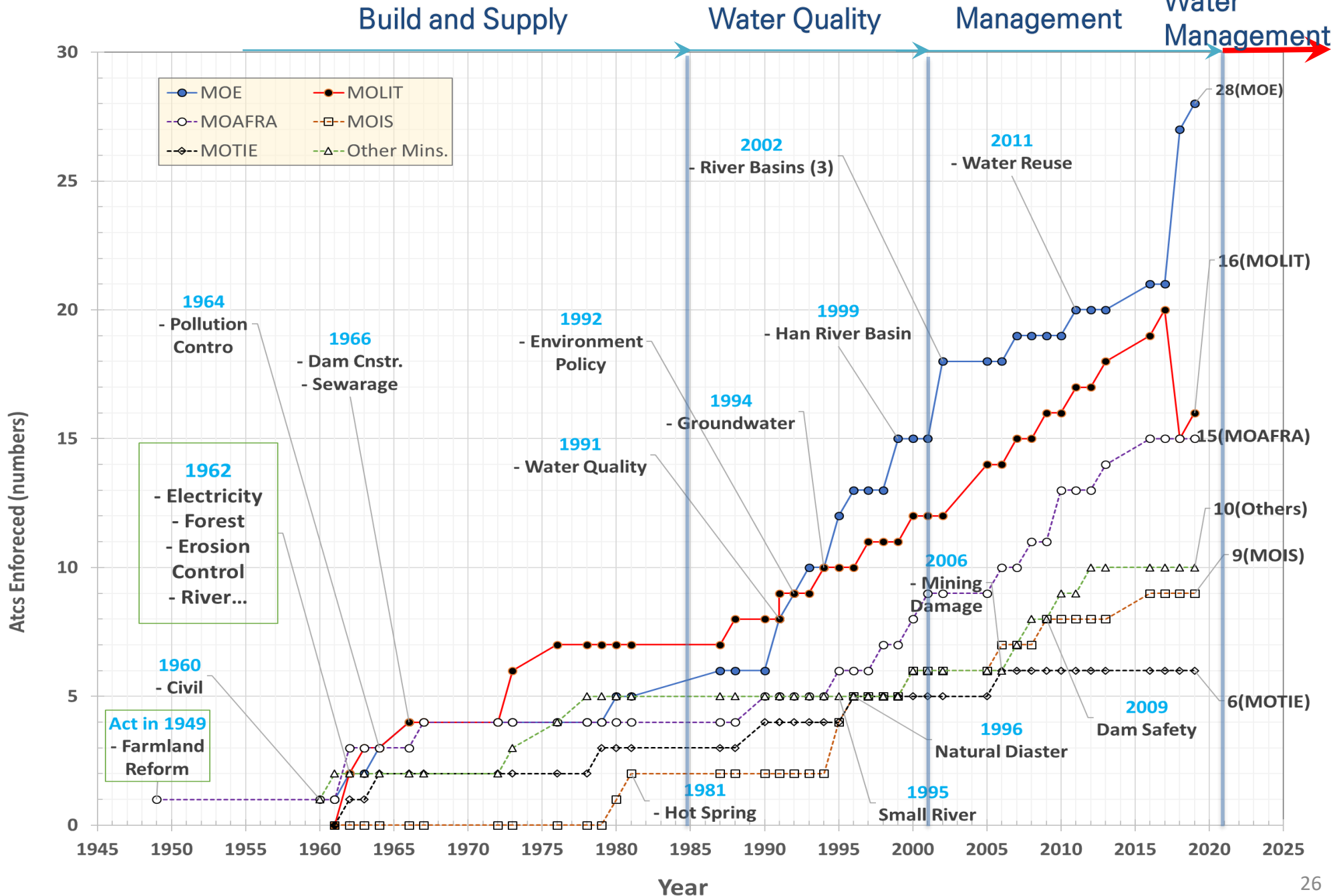


16 Weirs in 4 Major-Rivers (Project)



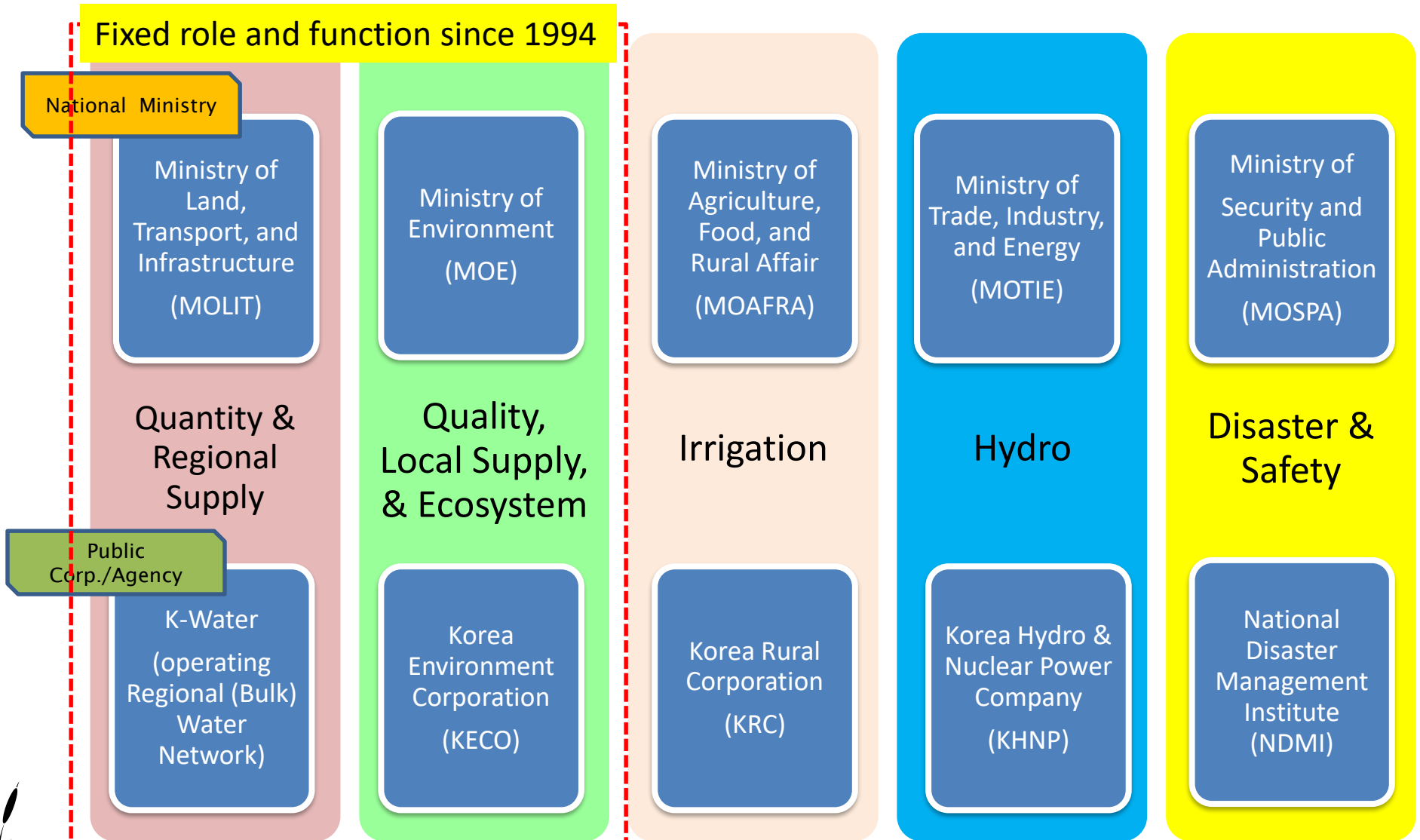
- **Total investment : USD 22 Bn including dredging, weir, detention reservoir, m.p. dams, and fish ladder, etc**
- **Installing Hydro-Power Generators for all 16 weirs (In-stream Type)**
- **Capacity of Hydro-Power Generation : 275 GWh in total (15,000~30,000 MWh)**

Water-related Acts in Korea



Water Ministries in Korea (Past)

- *Heavily fragmented institutional arrangement* in Water Sector → Lack of Coordination



Water Plans : MOE and MOLIT (before the Reform)

Plans		Periods
MOE	National Environment Plan	2016-2035
	National Water Environment Management Plan	2016-2025
	Basin Water Environment Management Plan	2016-2025
	Watershed/Catchment Water Environment Management Plan	
	National Nonpoint Source Pollution Management Plan	2012-2020
	National Waterworks Management Plan	2016-2025
	National Sewerage Management Plan	2016-2025
	Basin Sewerage Management Plan	(2013-2030)
	Goundwater Quality Management Plan	2013-2021
	National Water Reuse Plan	2011~2020
	Riparian Zone Management Plan	(2014-2018)
	Total Pollution Load Management Plan	Phase 3
	Water Environment Monitoring Plan	Annual
MOLIT	Naitonal Land Develeopment Plan	2011-2020
	River Maintenance Plan	-
	National Water Resources Management Plan	2001-2020
	River Basin Water Resources Manamgent Plan	Under reievw
	Hydrological Suvery Plan	2011-2020
	Long-term Dam Construction Plan	2012-2021
	Goundwater Management Plan	2012-2021
	Regional Waterworks Plan	2015-2025

A Beginning Future of Water Reform since May 2017

- *Part I : Better Democracy the nation dreams*
- *Part II : Water and Politics*
- *Part III : Cornerstone in Policy : Laws and Plans*







(Former) Senior Secretary of Civil Society

Administrative Order, May 22 2017

- 1) Auditing 4 Major River Project
- 2) Performing Water Reform (required to revise Government Organization Acts)





Debate and Fight
Expertise was like skin color.



Revising the Government
Orgazniation Act was failed
in the National Assembly,
July 20, 2017.



- Debate and Fight
- Lawmakers : trouble-maker, negotiator, and key-maker



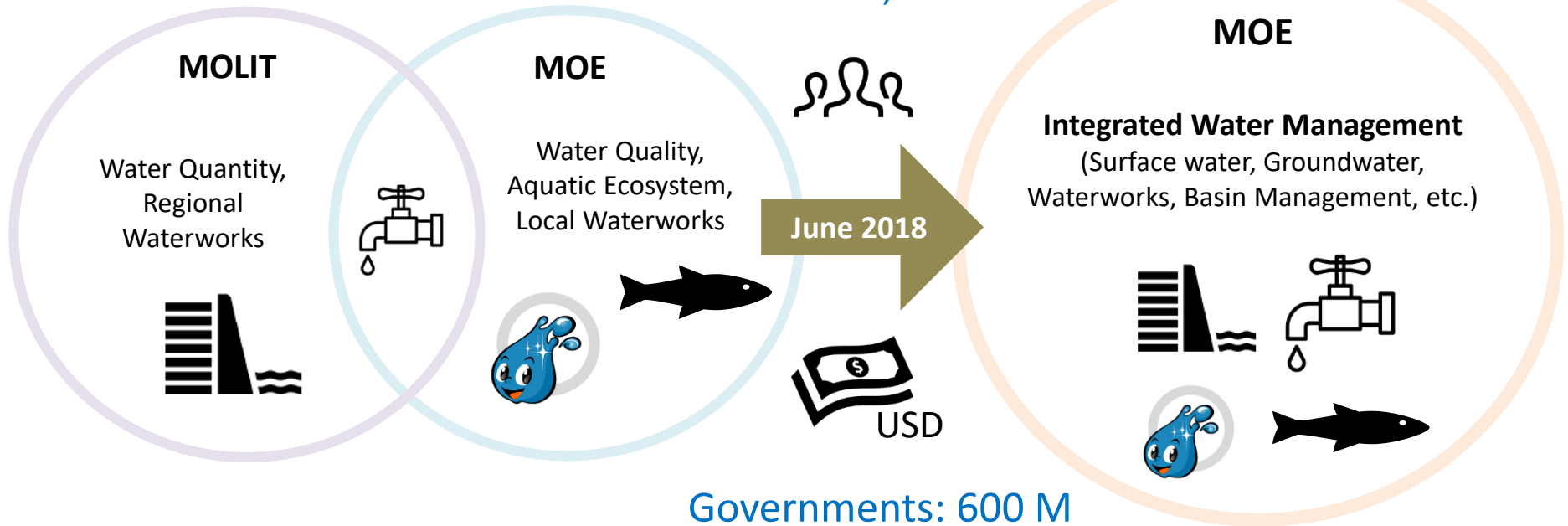
- Agreed on the government proposal of water reform, but not fully, May 18, 2018
- The National Assembly passed the Three Acts, May 28, 2018.
- Government Structure Act
- Water Framework Act (new)
- Water Technology and Industry Act (new)

National Water Reform in Korea (June 8, 2018)



“1st Governmental Reorganization in Water Sector **since 1994**”

Governmental : 188 Officials
Kwater : > 6,000 Staffs



Governments: 600 M
Kwater: > 10B

Source: Kang (2020)

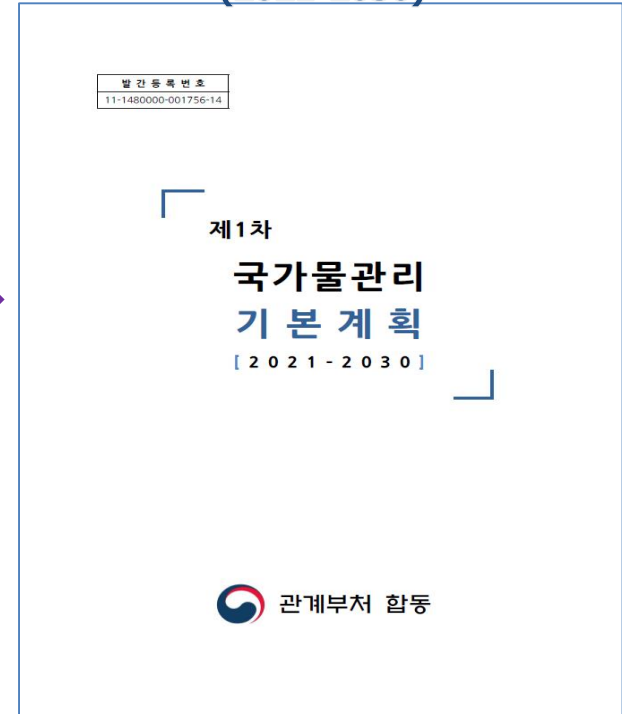


The Water Framework Act

The 1st National Water Plan (2021-2030)

Chairs: The Prime Minister and a Public Expert

Presidential Water Commission



4 Basin Plans are under development by June 2022

Chairs: The Environment Minister and a Public Expert

Water Commission Support Secretariat

(Planning/Operation Team, Deliberation Support/Communication Team, Four River Basin Water Commissions Support Teams)

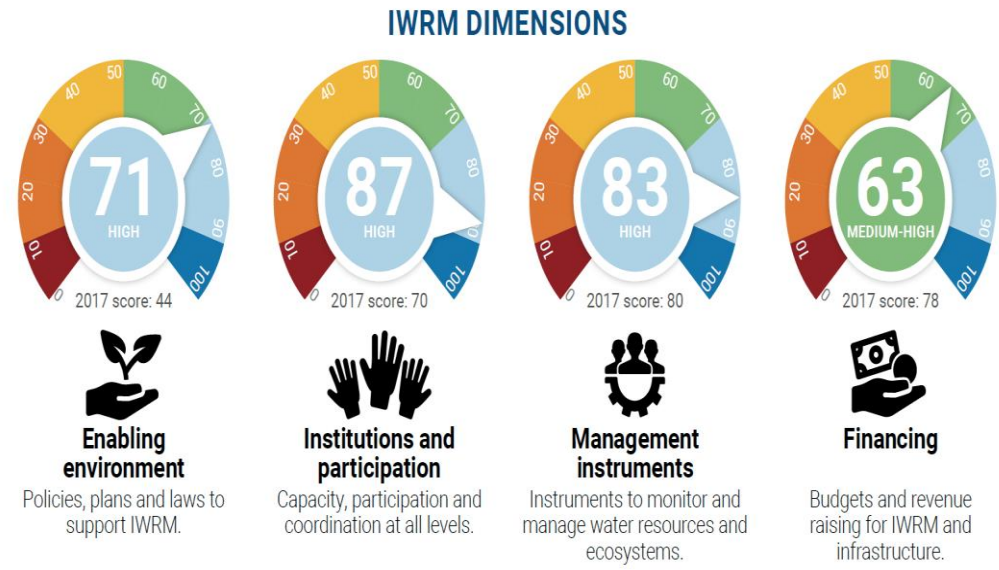
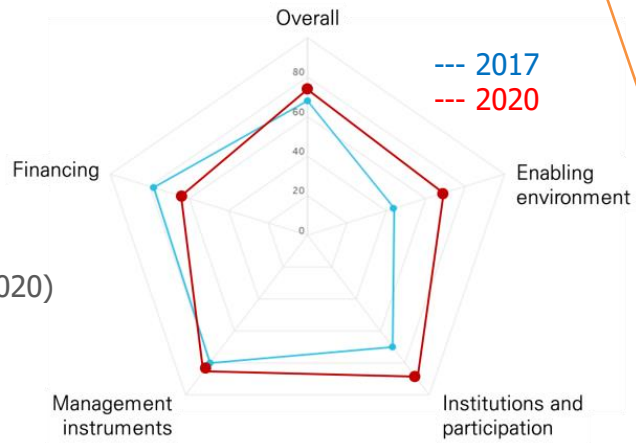
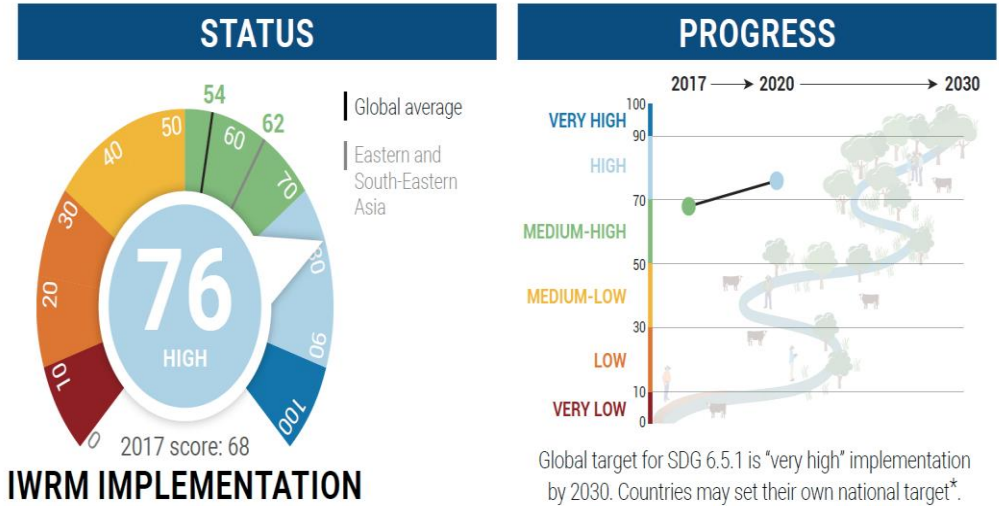
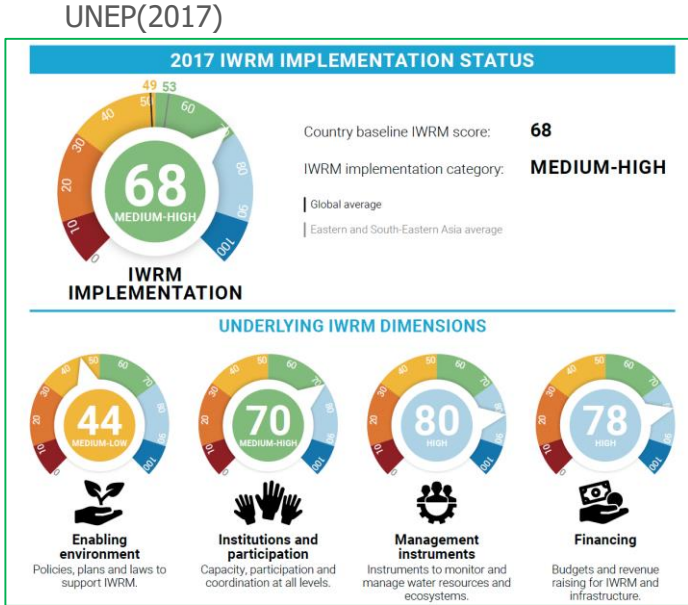


Source: Kang (2020)

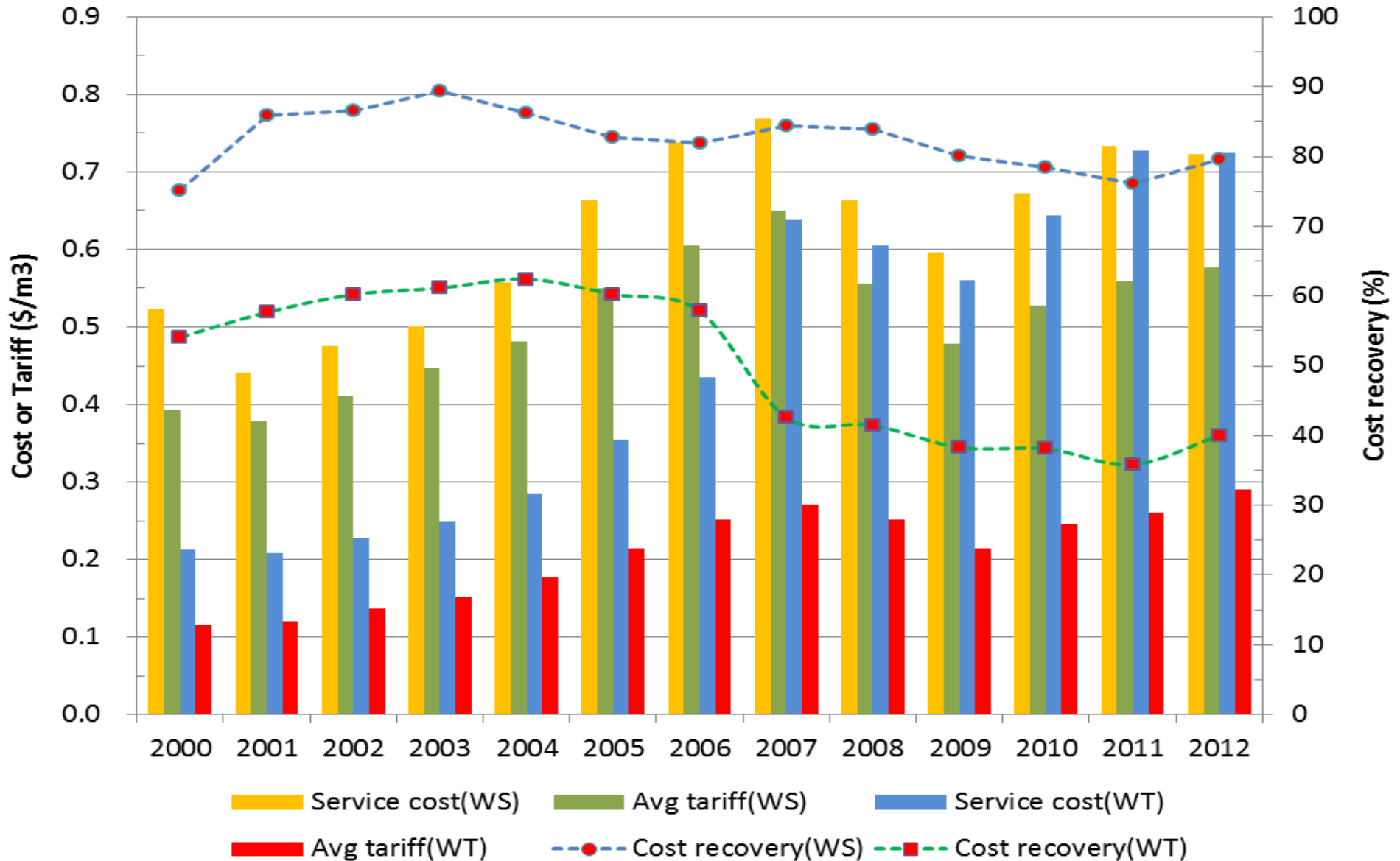
Measuring Integrated Water Management

SDG 6.5.1. (Korea, 2017 vs. 2020)

UNEP(2021)



On-going Challenges : Water Financing & Efficiency



Lessons and Conclusions

- Rapid Economic Growth in Korea was able because of timely suitable investment and great efforts on water development including multi-purpose dams, water supply, sewerage treatment and so on.
 - however, restoring water environment (water quality and aquatic ecosystem), which was disturbed by rapid development, was not easily and effectively performed.
- Since 1994, governmental institutional arrangement was not changed, but heavily fragmented, while policy incoherence and management inefficiency hinder sustainable water management or integrated water management (IWM).
 - More than 80 Water-related Acts amongst 5 Ministries were enforced.
 - At least 62 types of water plans were legally implemented.
- In order to make the Water Reform initiated by the National Leader successful, integrating, reducing, and coordinating water-related acts and plans is underway for transforming water innovation in Korea.



A top-down view of approximately ten hands of various skin tones, all holding small green seedlings with dark soil. The hands are arranged in a circle, creating a sense of unity and collective effort. The background is dark and out of focus.

There is **Opportunity** in Crisis

THANK YOU