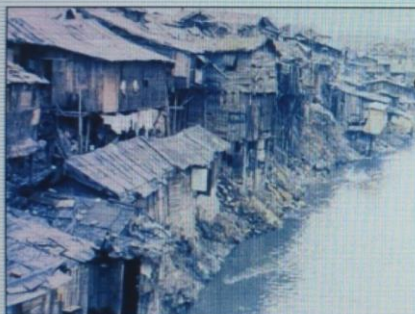


ประสบการณ์การแลกเปลี่ยนเรียนรู้การบริหารจัดการน้ำ จากต่างประเทศ : กรณีประเทศสาธารณรัฐเกาหลี

ASEAN SPECIAL TRAINING PROGRAM : SUSTAINABLE WATER MANAGEMENT

4. Economy & Water Development

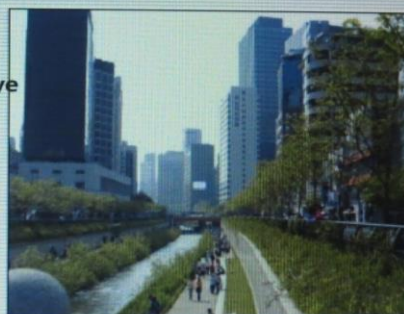
From hopeless country to modern industrial state



Initial stage of development

- Colonial rule and the Korean War
- Extreme poverty
- Seen as a hopeless country

Cheonggye
river



Economic performance of Korea

- Over 370 times increase in per capita GDP \$89 ('61) → \$33,200 ('13)
- Modern industrial state

สาธิต ภิรมย์ไชย
สำนักบริหารจัดการลุ่มน้ำโขง
กรมทรัพยากรน้ำ
19 สิงหาคม 2559

ลักษณะทางกายภาพ

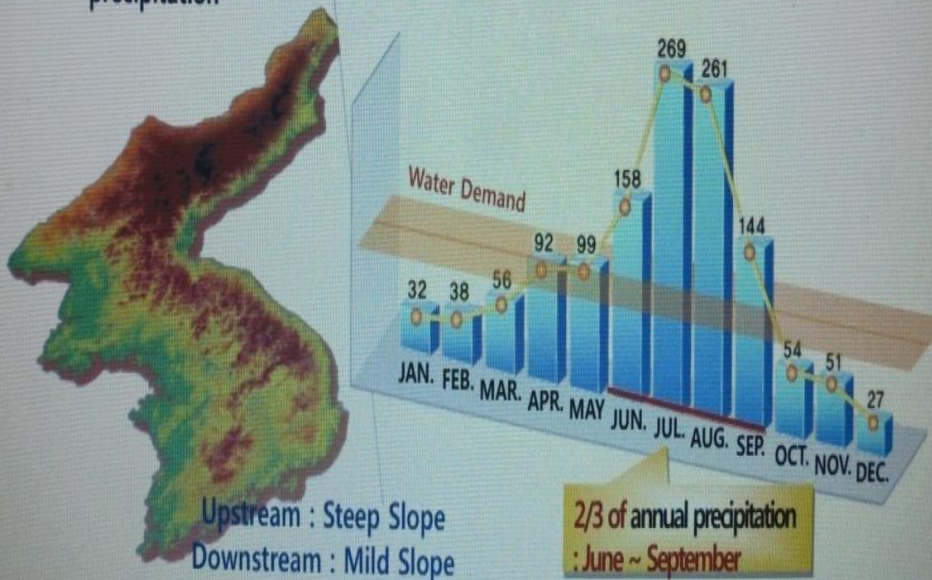
1. Water Resources in Korea

Water Resources Management Conditions

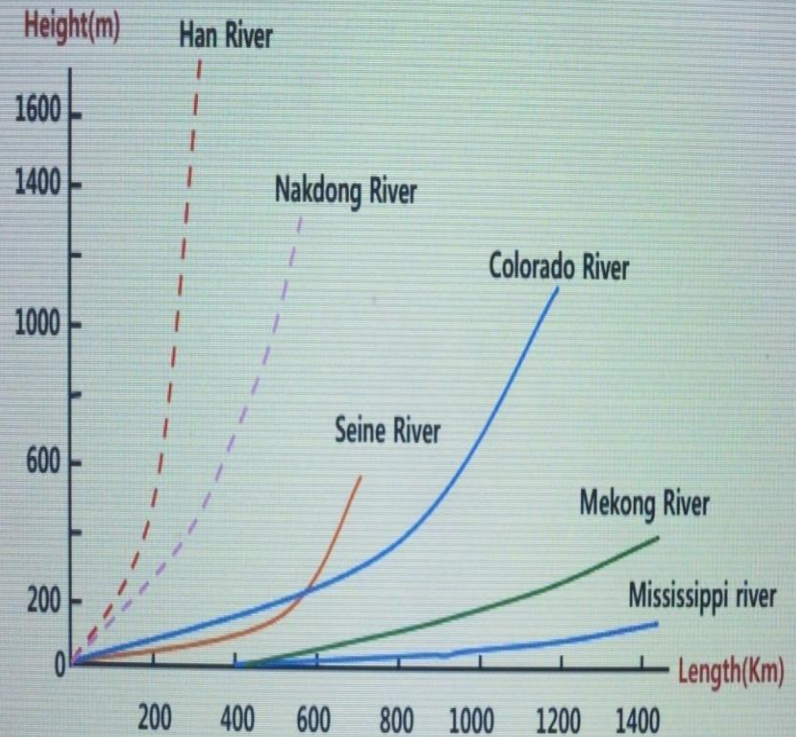
- 65% of mountainous area
- Rapid runoff during rainfall
- Low flow discharge after floods
- Heavy rainfall during the rainy season accounts for 2/3 of annual precipitation



Vulnerable to flood and drought



Characteristics of Korean rivers



Vulnerable to Flood(Short detention time, steep riverbed)

runoff to sea : flood season (2 days), normal times (a week)

การบริหารจัดการทรัพยากรน้ำ

1. Water Resources in Korea

Water Use Status

Total Water Resources
130(100%)

(unit : billion m³/yr)

River Discharge
75.3(58%)

Loss
54.4(42%)

Discharge during Floods
56.0(43%)

Normal Discharge
19.3(15%)

Discharge into Oceans
42.0(32%)

Utilization of River
10.8(8%)

Utilization of Dam
18.8(15%)

Utilization of Groundwater
3.7(3%)

48%

23%

23%

6%



Irrigation



Domestic



Instream



Industrial

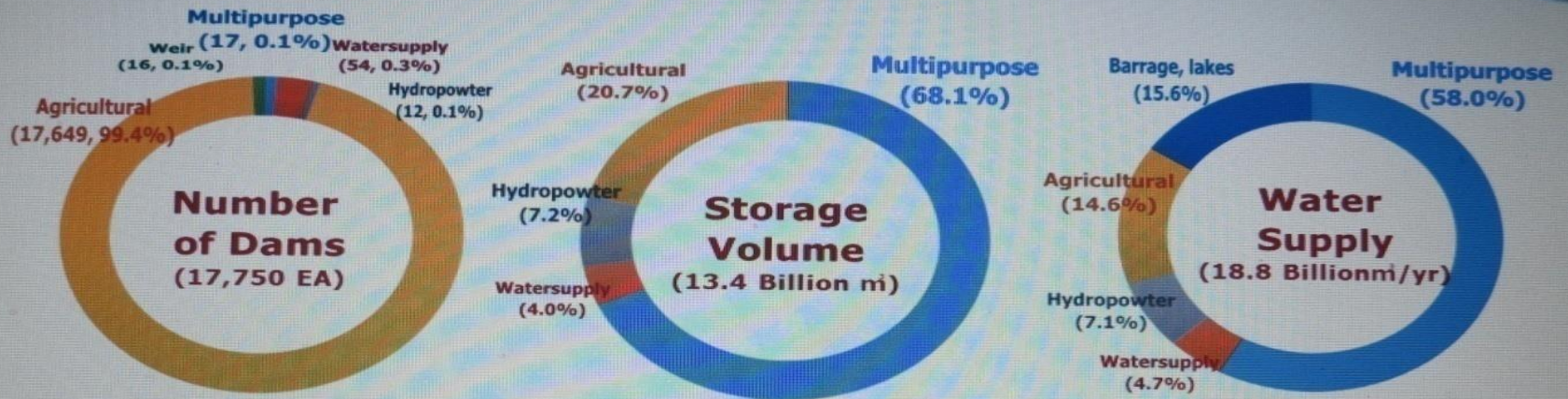
Total Use
33.3(26%)



การบริหารจัดการทรัพยากรน้ำ

2. IWRM Tech. of K-water

Dams of K-water



Roles of K-water : Operating 17 Multipurpose, 14 water supply, 2 flood control dams & 16 weirs

	Storage Volume	Water Supply	Flood Control Capacity	Hydro Power Generation
Korea	13.4 B m ³	18.8 B m ³ /yr	5.2 B m ³	1,750MW
K-water	9.3 B m ³	12.2 B m ³ /yr	4.9 B m ³	1,061MW
Percentage(%)	69%	65%	95%	61%

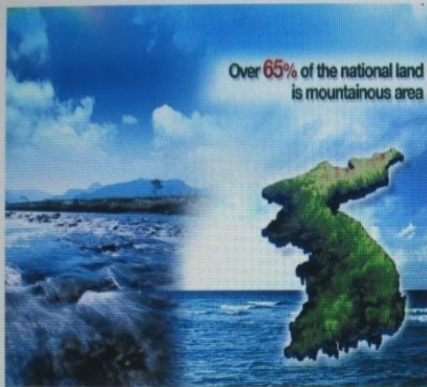
* K-water covers 48%(17.5 Million m³/day) of water works capacity of Korea (37.2 Million m³/day)

ประเด็นปัญหา

ข้อจำกัดทางกายภาพ

ผลกระทบที่สำคัญ

Difficulties on WR Management in Korea



Recent Flood & Drought Damage in Korea

Flood Damages (2002 Rusa, 2003 Maemi, 2006 Ewinia)

	Nation	Han	Nakdong	Geum	Yeongsan	Others
Casualties	689	167	126	38	26	332
Damage Amount (Billion KRW)	15,112	2,936	3,943	899	716	6,618

* Total flood damage: \$14 billion (2000-2010)

Drought Damages

Year	Damages
1994~1995	86 Cities & Counties (173,269 ha)
2001~2002	86 Cities & Counties (304,815 people experienced water supply restriction)
2008~2009	77 Cities & Counties (1,227 Villages experienced water supply restriction)

* Severe drought cycle after 1990 : 7 year ('94→'01→'08)

ประเด็นปัญหา

Current Water Issues in S.Korea

IWRM(Integrated Water Resources Management)

- Siloed management
 - Water Quantity/Quality, Central Government/Local G
 - Multipurpose Dam/Hydropower/Agricultural
- Loose management of underground water

Adaptation to Climate Change(Drought, Flood, etc)

- Water facilities be expanded with precipitation pattern change
- Environmental degradation by decreased flows from N. Korea
- Drought & Floods with irregular dam operation by N. Korea

Algae Bloom

- Absence of crucial factors(Total Phosphorus)
- Necessity for Restructuring of Agricultural industry sector
- Responsibility of water entities for pollution abatement

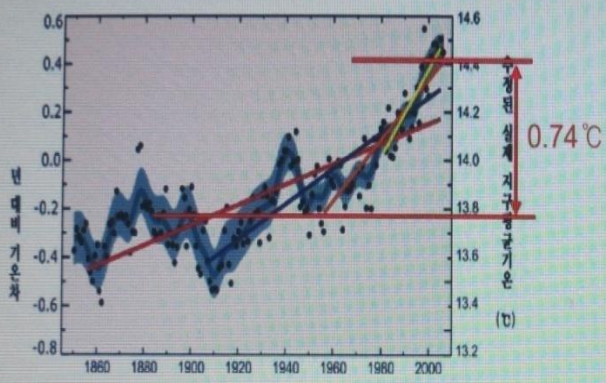
Water Pricing, Deregulation related to Water

- Low water pricing leads to deterioration of water facilities
- huge amount of subsidies given
- Regulations on activities in Dam Areas make them falling behind

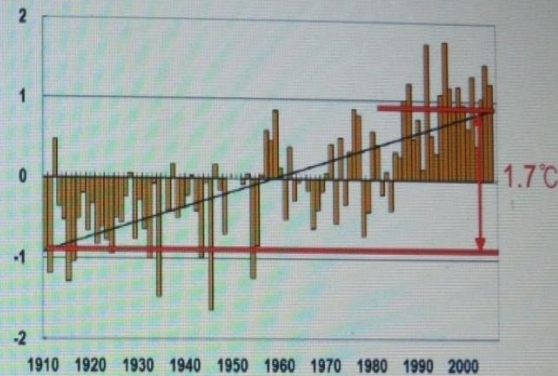
การเปลี่ยนแปลงสภาพภูมิอากาศ

Climate Change of Korea

2 times more than the Global Warming

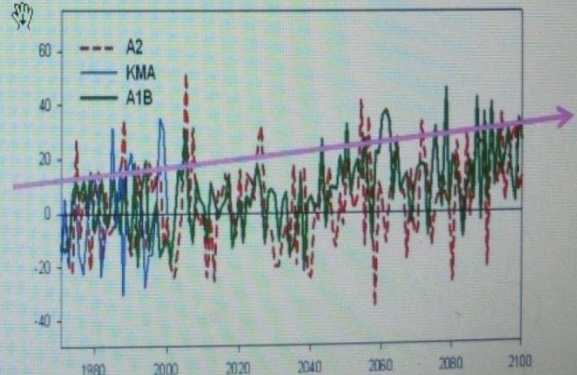
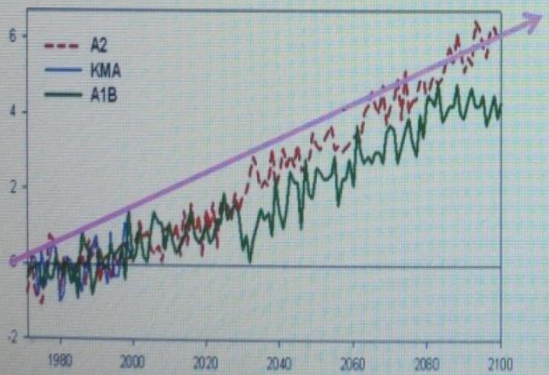


[Change of Global Mean Temp.]



[Change of Mean Temp. of Korea]

In 100 years : Temp. 5°C ↑, precipitation 17% ↑



(Source : KMA, Institute)

อุณหภูมิสูงกว่า
ค่าเฉลี่ยโลก 2 เท่า

- อุณหภูมิสูงขึ้น 5 องศาเซลเซียส
- ฝนเพิ่มขึ้น 7 %

การเปลี่ยนแปลงสภาพภูมิอากาศ

Unusual weather change in S.Korea

[Heavy snow] Heaviest since 1937



[Localized torrential] Never experienced situation



[Cold wave] Coldest waves for 100 years



[Drought] Regular restriction on water supply



นโยบายและแผนการจัดการทรัพยากรน้ำ

Water Resource Development History

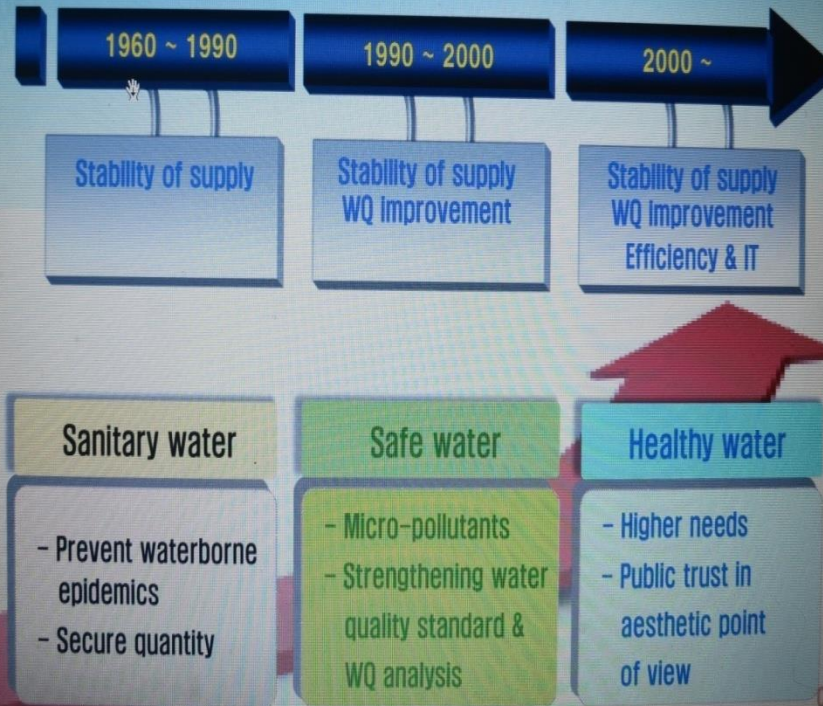
- In the 1960s, systematic water irrigation and flood control policies that pursued comprehensive water resources development solved basic water problems
- In the 2000s, water policy focus was changed due to water management paradigm shift
 - * Water development by irrigation and flood control → sustainable water management including river environment

Section	1960s	1970s	1980s	1990s	2000s
Policy	Comprehensive water resources development was started	Comprehensive water resources development was settled	Comprehensive water resources development was advanced	Eco-friendly water management was begun	The base for eco-friendly water development was established
Main content	<ul style="list-style-type: none"> . Enactment of the River Act . Setting-up of development plan 	<ul style="list-style-type: none"> Construction of multipurpose dams and metropolitan water supply facilities 	<ul style="list-style-type: none"> . Comprehensive Han River development . Estuary dams construction 	<ul style="list-style-type: none"> . Legislation of river environment . Pilot projects for development of ecological rivers 	<ul style="list-style-type: none"> . Development of ecological river . 4 rivers restoration . Gyeong-in Ara Waterway

นโยบายและแผนการจัดการทรัพยากรน้ำ

Water Supply Business

Change of Water Supply Policy



1-3. Main Contents

Contents of Plan

- Planning period : Target year - 20 yrs. later, phases with 5-yr term
- Target area : 161 cities nationwide, All of Multi-regional & Industrial WSS

Future Demand-Supply Forecasting

- Studies on Basic Data
- Forecasting water demand by cities
- Studies on water supply systems and capacity
- Demand-supply Forecasting
 - surplus/shortage estimation

Infrastructure Management

- Countermeasures against water shortage
 - supplying surplus water from other systems
 - new system development
 - enlargement of municipal water supply systems
- Improvement of deteriorated facilities
- Systems interconnection

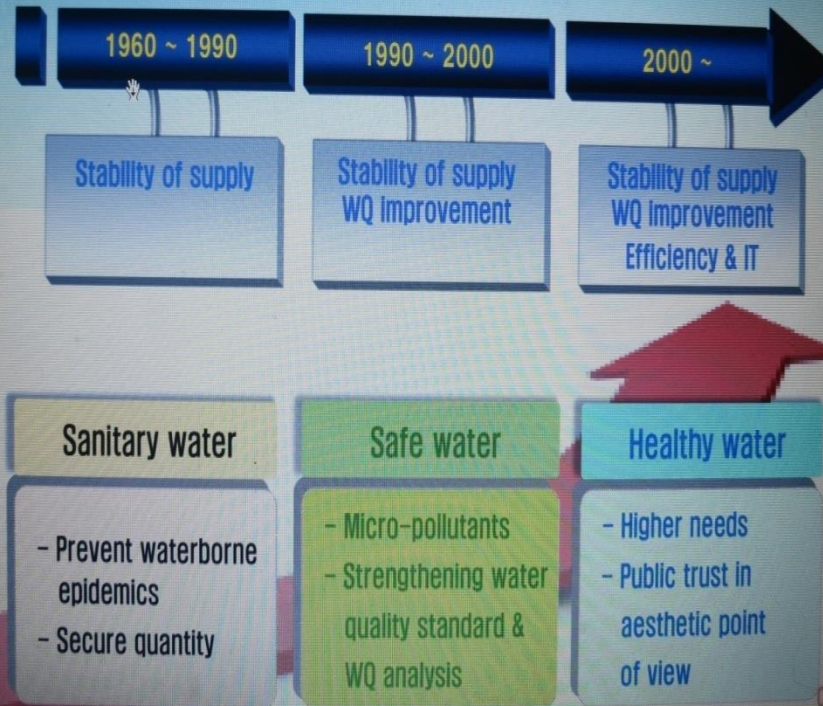
O&M, etc.

- Protection & Development of Water Sources
- Management of water quality & demand
- Improvement of O&M
- R&D Plan
- Diagnosis & Informatization
- Institutional improvement
- Financing plan

นโยบายและแผนการจัดการทรัพยากรน้ำ

Water Supply Business

Change of Water Supply Policy



1-3. Main Contents

Contents of Plan

- Planning period : Target year - 20 yrs. later, phases with 5-yr term
- Target area : 161 cities nationwide, All of Multi-regional & Industrial WSS

Future Demand-Supply Forecasting

- Studies on Basic Data
- Forecasting water demand by cities
- Studies on water supply systems and capacity
- Demand-supply Forecasting
 - surplus/shortage estimation

Infrastructure Management

- Countermeasures against water shortage
 - supplying surplus water from other systems
 - new system development
 - enlargement of municipal water supply systems
- Improvement of deteriorated facilities
- Systems interconnection

O&M, etc.

- Protection & Development of Water Sources
- Management of water quality & demand
- Improvement of O&M
- R&D Plan
- Diagnosis & Informatization
- Institutional improvement
- Financing plan

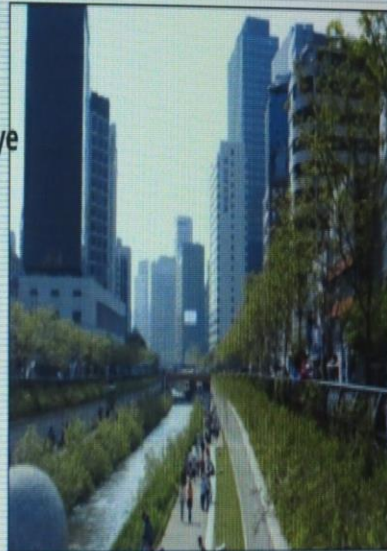
ทรัพยากรน้ำในฐานะตัวขับเคลื่อนเศรษฐกิจ

4. Economy & Water Development

From hopeless country to modern industrial state



Cheonggye river



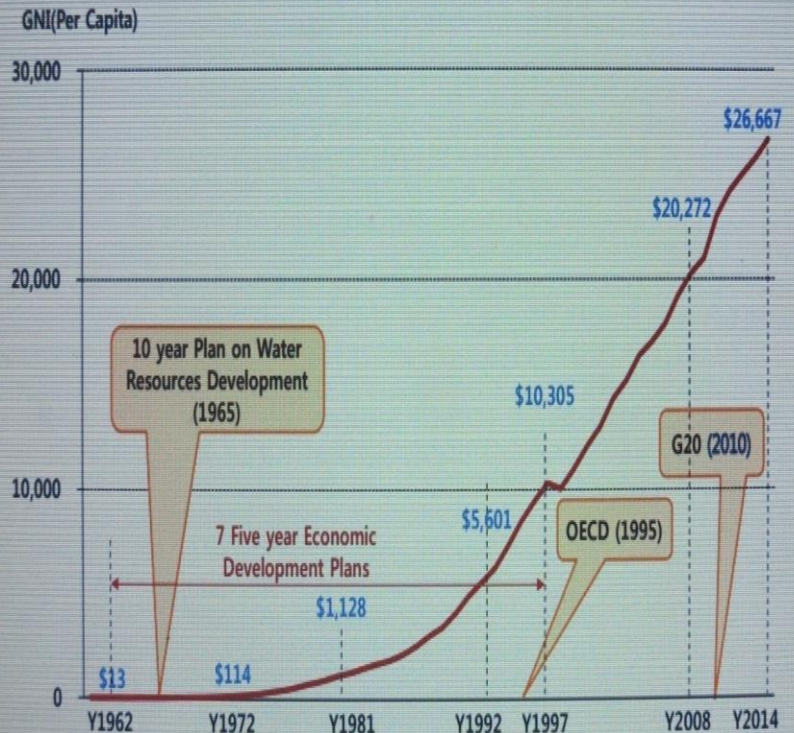
Initial stage of development

- Colonial rule and the Korean War
- Extreme poverty
- Seen as a hopeless country

Economic performance of Korea

- Over 370 times increase in per capita GDP \$89 ('61) → \$33,200 ('13)
- Modern industrial state

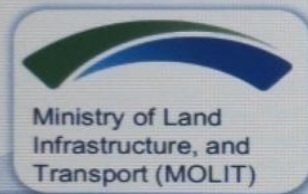
Water Development with Economic Development



หน่วยงานที่รับผิดชอบทรัพยากรน้ำ

Water Management Organizations

- Water management is divided into irrigation, flood control and water quality management
- Each organization has a role according to the functions and characteristics (water quantity and quality are managed separately)



Ministry of Land
Infrastructure, and
Transport (MOLIT)



Ministry of
Environment (MOE)



National Emergency
Management



Ministry for Food,
Agriculture, Forestry
and Fisheries



Ministry of Knowledge
Economy

- Dam, rivers
- Multiregional water supply system
- Underground water
- Water-front areas development

- Sewage waste water treatment facility
- Water and sewage (Local water supply)

- Small rivers

- reservoirs for agricultural use

- Hydro power generation dams

- MOLIT is in charge of water quantity(irrigation, flood control), MOE is in charge of water quality

องค์กรและความสัมพันธ์การจัดการทรัพยากรน้ำ

Related Organizations

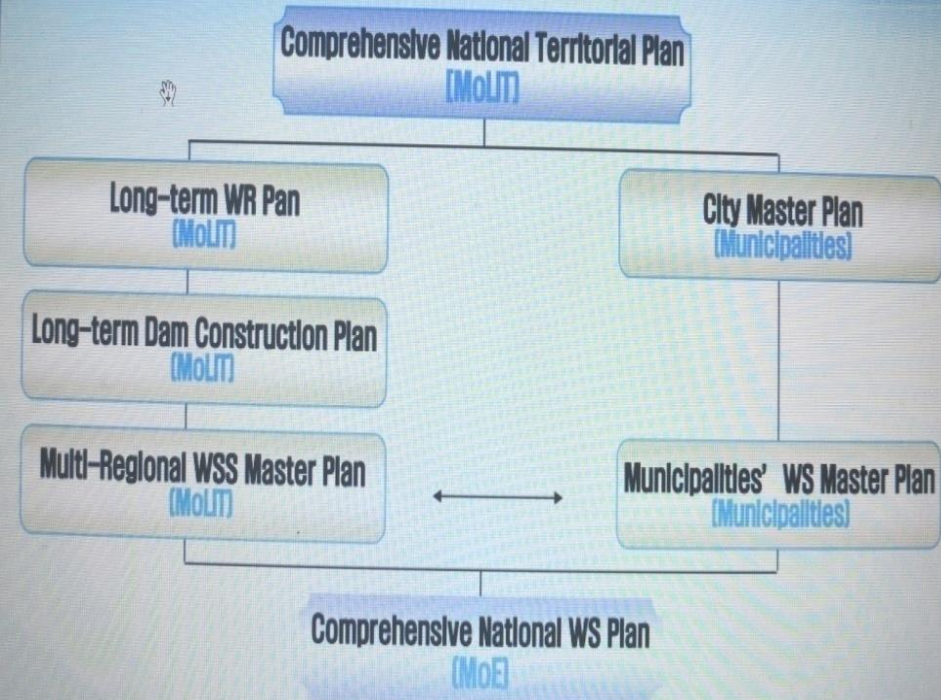
Relationship Between Related Organizations

- Establishing WS Plan → Individual Project Approval → Impelmentation



Related Plans

Relationship Between Related National Plans



การบริหารจัดการน้ำโดย K-Water

K-water overview

- Now (Governance)

Total Water Service Provider



Water Resources
Development



Water Supply
& Sewage System



Clean Energy
Generation



Water Front
City Construction



Research &
Development

- **Established in 1967**
- **100% government-owned corporation under MoLIT***
 - * Ministry of Land, Infrastructure, and transportation
- **Employees : Approx. 4,300**
 - * 1 headquarter, 8 regional headquarters
 - * about 400 staff are working in water supply business

การบริหารจัดการน้ำโดย K-Water

1. Water Resources in Korea

- WMC, K-water

HUB of Water Management in Korea



Hydraulic Structures

- 33 dams
- 16 run-of-river weirs
- 25 hydropower plants
 - * 78 generators (1,061MW)
- 446 Gauging Stations
- 186 Warning Stations

Main Works

- Precipitation Forecast
- Real-time Hydrological data Management
- Hydraulic structure operation (Flood Control, Water Supply Hydro Power Generation & Water Quality Management)
- Research & Development



การบริหารจัดการน้ำโดย K-Water

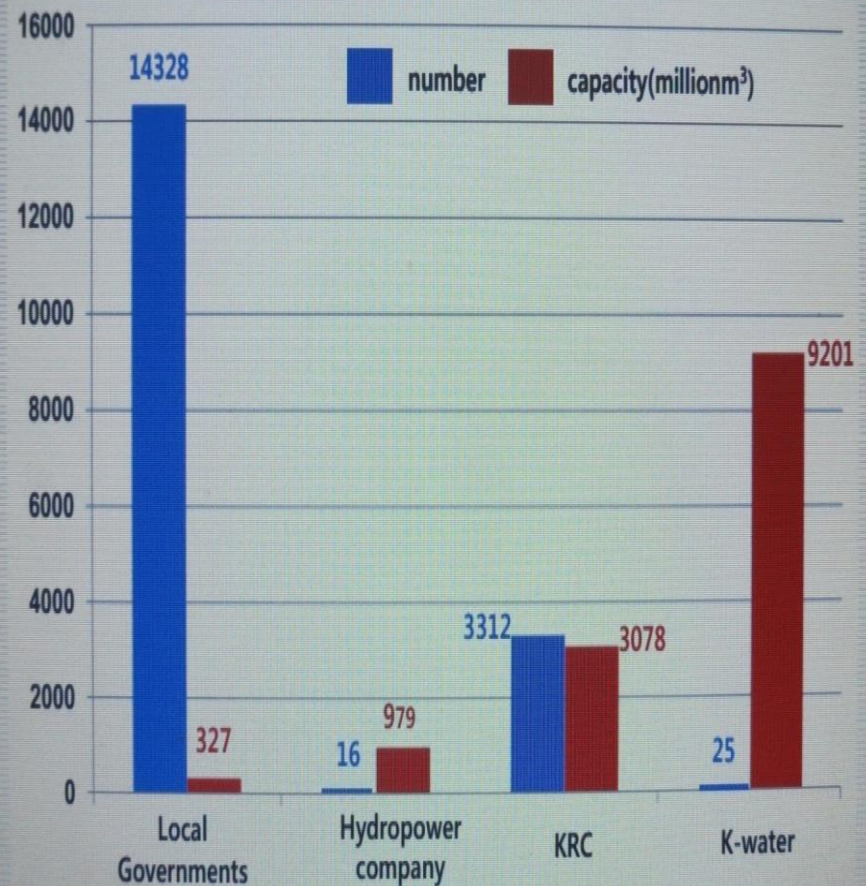
I. Water Treatment Facilities

Current State of K-water Water work

- Multi Regional waterworks
 - 34 facilities, water supply capacities are 13,769 thousand m³/d
 - Pipe lines : 3,978km, The number of WTP is 40 place.
- Industrial waterworks
 - 13 facilities, water supply capacities are 3,693 thousand m³/d
 - Pipe lines : 1,025km, The number of WTP is 8 place.
- Local waterworks
 - 21 cities, water supply capacities are 1,252 thousand m³/d
 - Pipe lines : 16,170km, The number of WTP is 45 place.



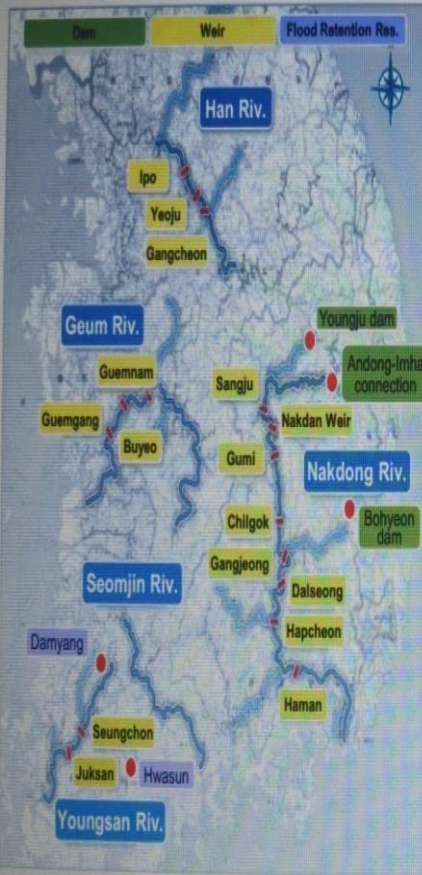
Number and capacity of dams in Korea



โครงการฟื้นฟูแหล่งน้ำ แม่น้ำ 4 สาย (4 Rivers Restoration Project)

Multi –functions & Integration

Outline of River Restoration Project

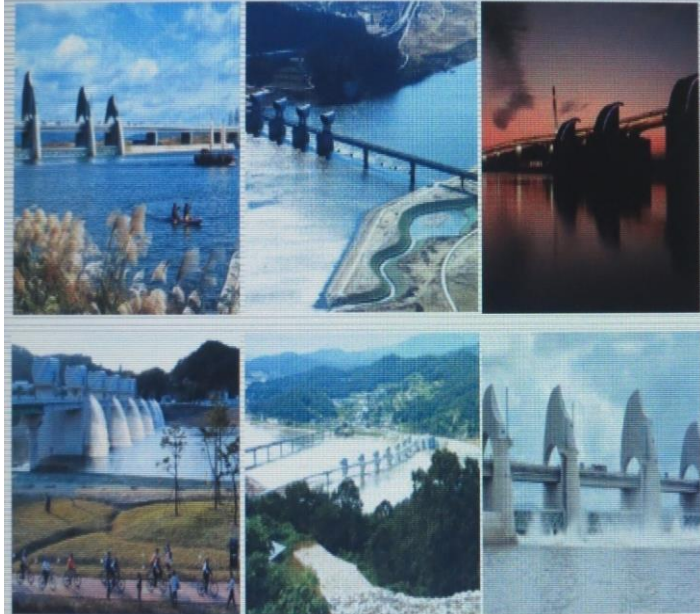


Project

- ✦ dredging : 0.57 billion m³
- ✦ weir : 16
- ✦ Bank Reinforcement : 620 km
- ✦ Dam : 3
- ✦ Flood retention Res. : 2
- ✦ Embanking Agr. Res. : 96
- ✦ Small sized Hydro-power : 16
- ✦ Eco-stream : 929 km

Project period: 2009~2012, Budget: 20 billion US\$

Water and Green Growth 2009~2012



The Positive Effects

- Flood Control
- Enhanced Water Security
- Improved Water Quality
- Ecological Restoration
- Eco-friendly Waterfront Development
- Green Energy for Green Growth

■ Flagship projects : 4 Major Rivers Restoration Project

ผลกระทบ (Impacts)

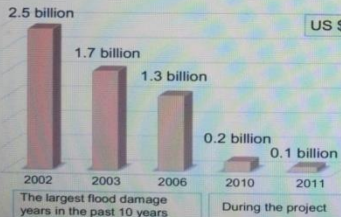
ลดผลกระทบน้ำท่วมลง 90 %

ระดับน้ำในเขื่อนเพิ่มขึ้นเฉลี่ย 1.77 เมตร (ฤดูแล้ง)

Effects of the Project : Flood control

- Record-Breaking rain during the rainy season (June 20~July 17, 2011)
 - Rainfall of over 640mm for 20days (2.5 times more than the yearly average)
- ➔ But, decrease in Flood W.L by Dredging (avg. 2~4m ▼)

The flood damage drops by 90%

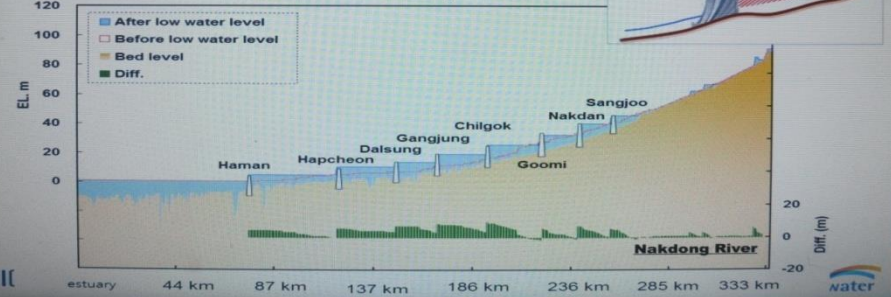


Effects of the Project : Securing water

Water Level Rise during the Dry Season

- Avg. rise of 1.77 m in 4 Major River Main channel
 - Han 0.6m▲ , Nakdong 3.1m▲ , Geum 1.1m▲ , Yeongsan 2.1m▲

<Water level rise on the dry season>



เพิ่มน้ำต้นทุน

Effects of the Project : securing water

Security Storage for Water Supply

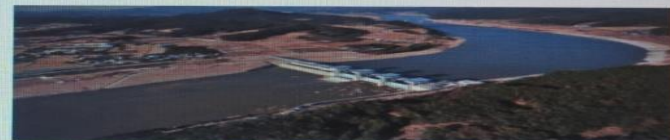
- Total storage : 630 million m³ at 16 weirs in the 4 Major Rivers
 - Han: 34 M m³, Nakdong: 514 M m³, Geum: 45 M m³, Yeongsan: 35 M m³



Nakdong



Geum



โครงการฟื้นฟูแหล่งน้ำ แม่น้ำ 4 สาย (4 Rivers Restoration Project)

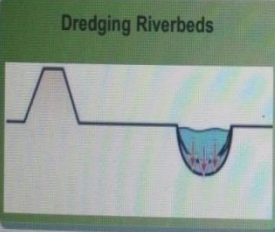
เพิ่มน้ำต้นทุน/ป้องกันน้ำท่วม

คุณภาพน้ำ

Securing water storage space for water supply & flood control

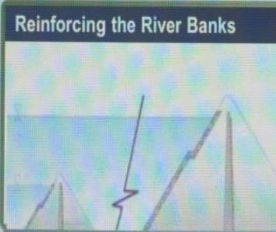
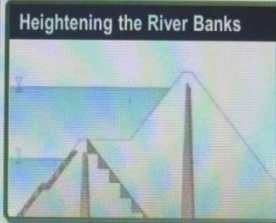
• 1.3 billion m³ for water supply, 0.92 billion m³ for flood control

Constructing 16 weirs and Dredging



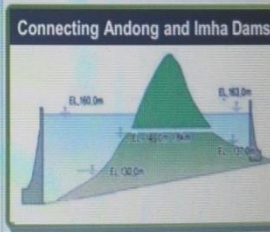
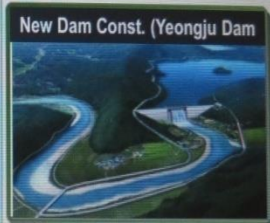
Secure 800 million ton

Embanking the Existing Agricultural Reservoirs (96)



Secure 250 million ton

Constructing New Dams (2)

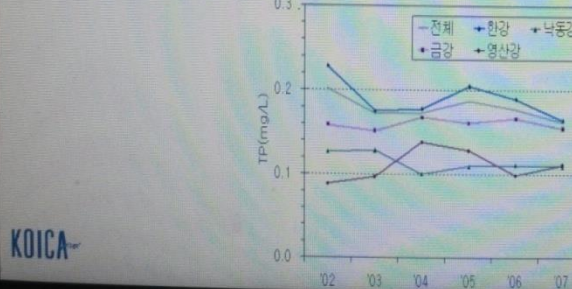
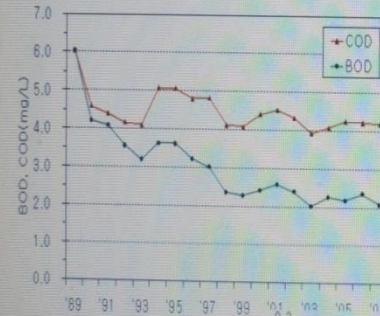


Secure 250 million ton

Water Quality Problems

Water Quality in 4 Major Rivers before the Prj.

- BOD → (continuously improved)
- COD ↑ (most reaches do not meet water quality standard of 5mg/L)
- TP ↓ (0.16~0.20mg/L) Eutrophic condition according to OECD standard



พื้นที่ลันทนาการ

Effects of the Project : Improving quality of life

Improving People's Quality of Life

- Creation of new areas for **leisure activities**
 - Sections of auto-camping : 1,531
 - Total length of bike path : 1,592km
- River-oriented space development (Area 130km²)



KOICA

K water

ฟื้นฟูระบบนิเวศ

ปรับสภาพภูมิทัศน์

Case Study - Cheonggye Stream in Seoul



1970s ~ 1990s

2006

KOICA

water

KOICA

water

Ecological Improvement

Fishes (4 to 25)

Birds (6 to 36)

Insects (15 to 192)

Plants (62 to 308)



KOICA

water

water

คุณภาพน้ำ

Mission and Vision



Mission

- To provide the high quality analysis services

Vision

- To be the best lab in the world for water quality testing
⇒ Global leader in water quality and water safety

Major Goals

Water Analysis

- Analyze 300 items
- Pool of 500 items

Technical Support

- Certified laboratory
- Soil & water quality

Research

- Method development
- Provide water policy

5

K-WISH 500 for water quality(2016)



- Analyze 300 items from 500 Pool
incl. legal & K-water's candidates contaminants in drinking water

85 items
Insurance of
Safety
on tap water

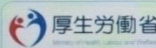


415 items
Improvement of
people's reliability

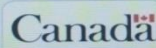
Examples of other tap water quality analysis centers



US-EPA
111 items



Japan
118 items



Canada
110 items

9

มาตรฐานระดับโลก

Certifications



Internationally Certified with ISO/IEC standards

- 2003. 5, Internationally Authorized Testing Agency
 - About 70 Countries certified the results
- 2008. 11 and 2013. 6, Selected as an outstanding agency
- 2009. 11, Internationally Authorized Accreditation Agency
 - The highest agency with operating proficiency testing (PT)
- 2014. 11, 93 participants from 25 countries



Domestic Certifications

- Drinking Water Quality Inspecting Agency (1998)
- Soil-related Specialized Agency (2002)
- Virus Inspecting Agency (2003, No. 1 Domestically)
- Protozoa Inspecting Agency (2004)
- Standard Reference Data Center for Water Quality (2014)
- Accuracy of Environmental Measuring Device Inspecting Agency



11

คุณภาพน้ำ

History of Water Preferences



Changes in "water preferences" over the past few decades

60~70's
(Sanitary water)



80~90's
(Safe water)



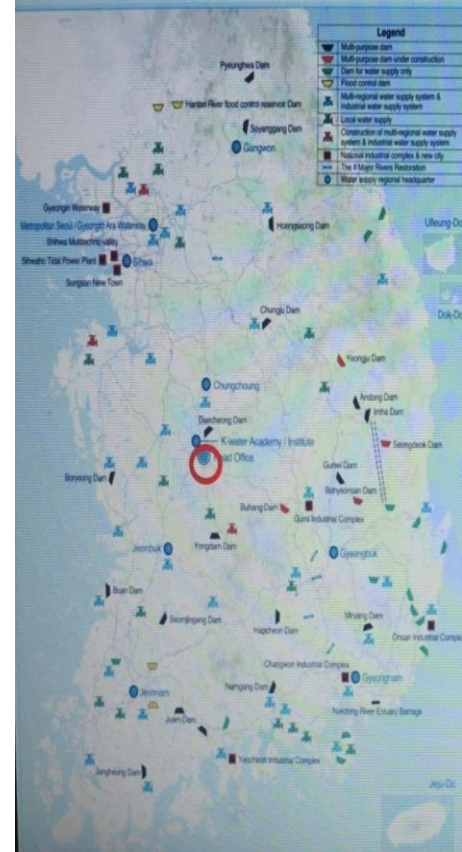
2000 ~
(Tasty water)



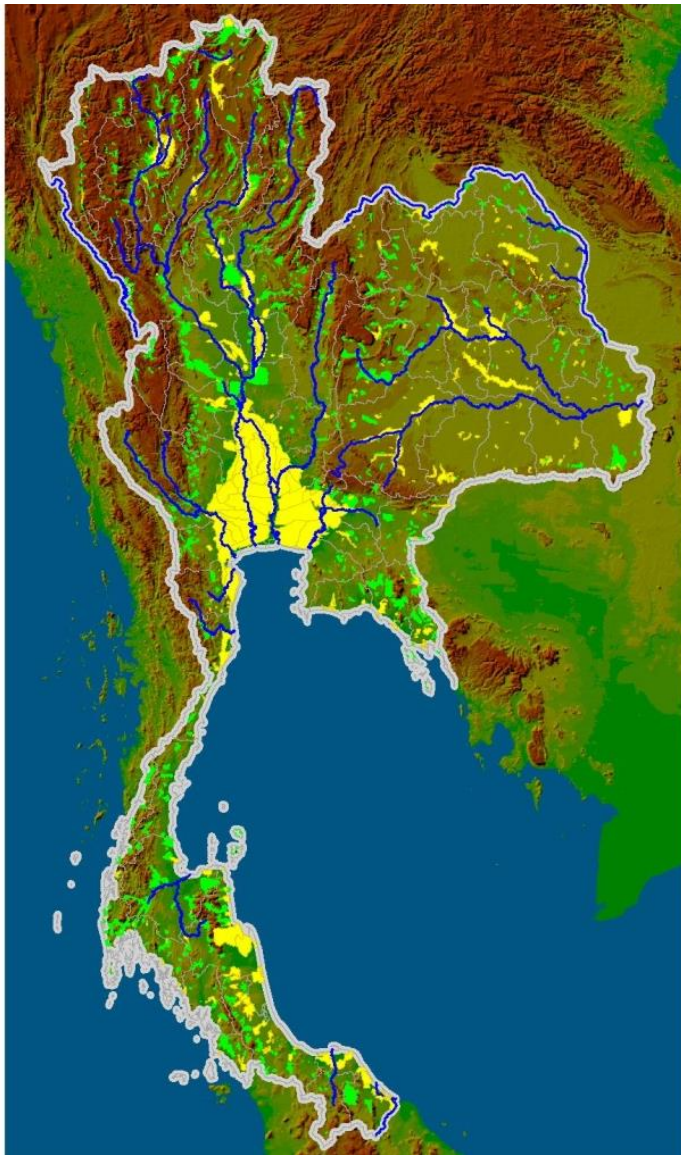
2014 ~
(Healthy water)



K-water's Water Quality Analysis System



- K-water has about 80 WTPs
 - Multi-regional : 37 WTPs
 - Regional : 46 WTPs
 - Analyzes items on a daily and weekly basis only
- K-water has 6 certified labs (Regional analysis office)
 - Each lab has at least 6 technicians
 - Analyzes items on a monthly basis
- K-water has 1 WQRC (Water Quality Research Center)
 - About 40 technicians
 - Analyzes 250 items



Action Plan : **Capacity Improvement on Water Resources Restoration:** **A Case of Thailand**

Presented by

SATIT PHIROMCHAI & NITTIPHAN TRONGKARNDÉE

Department of Water Resources

5 August 2016

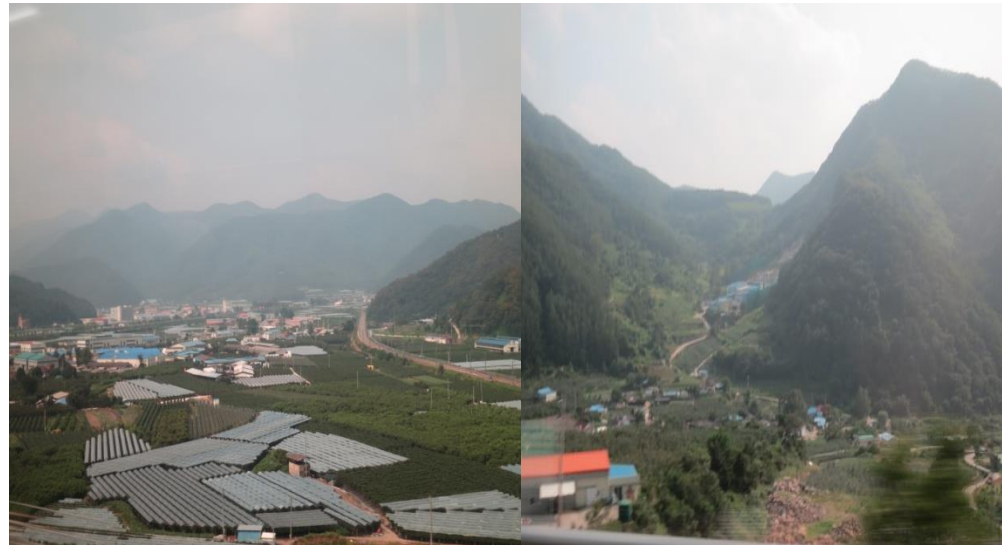
K-Water Academy

9 Target group

- 15 Junior and Mid-level Engineering staff at Central and regional offices
- 5 Representatives from River Basin Organizations with engineering background

20 People

การเรียนรู้ประเพณี วัฒนธรรม มิตรภาพ และเทคโนโลยี

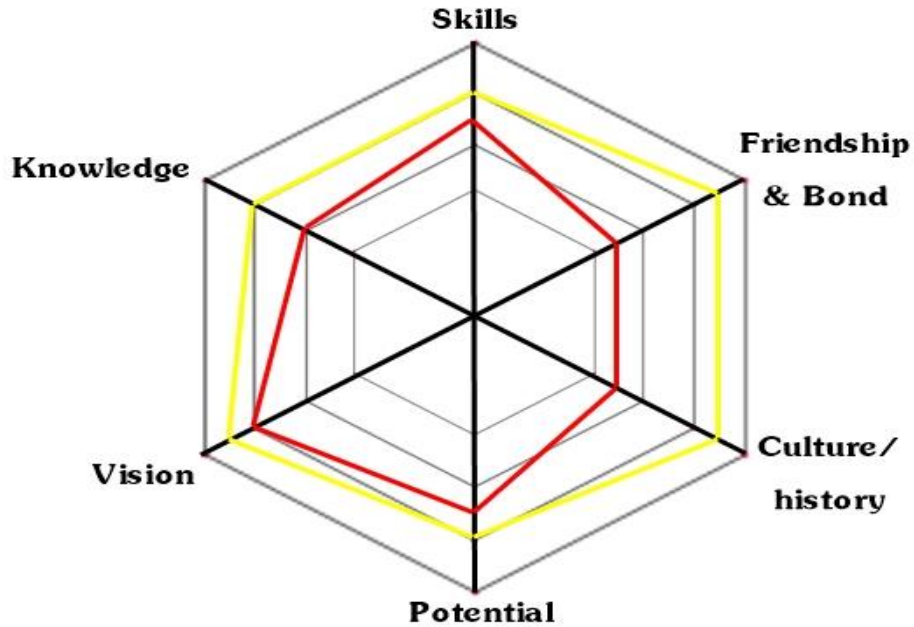


การเรียนรู้ประเพณี วัฒนธรรม มิตรภาพ และเทคโนโลยี



การประเมินตนเอง

Spider web based self-assessment



— Before
— After



สรุปการเรียนรู้จากประเทศเกาหลี

- ภาวะผู้นำ วิสัยทัศน์ที่กว้างไกล
- หลายหน่วยงานเกี่ยวข้องกับการจัดการน้ำ มีการแบ่งภารกิจที่ชัดเจน
- การบริหารจัดการอย่างเป็นระบบ ตั้งแต่ต้นน้ำ กลางน้ำ และท้ายน้ำ
- มีการวิจัยและการพัฒนาด้านเทคโนโลยีที่ชัดเจน ต่อเนื่อง และนำไปใช้
งานได้อย่างแท้จริง (Dam, Water supply, treatment and
quality reservation and conservation)
- กรอบยุทธศาสตร์ นโยบายและแผนที่ชัดเจน
- การพัฒนาคน



ขอบคุณครับ

