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Four River Restoration and water resource management effort in Korea

Division I of Environmental Assessment
Lee, Jin Hee (Ph.D)

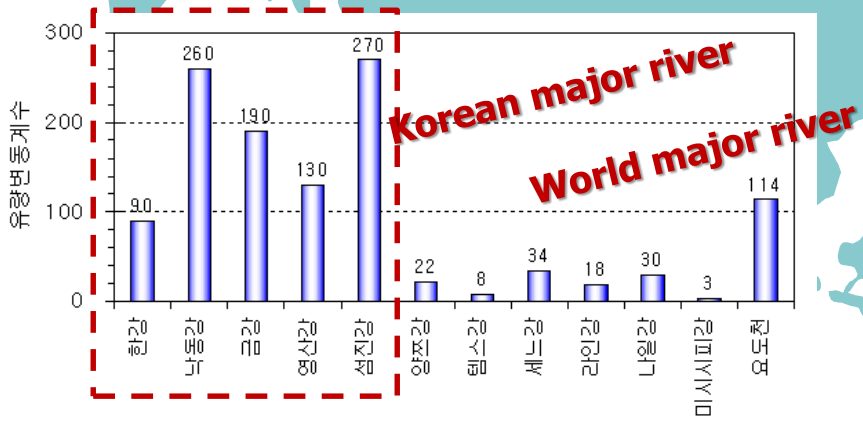
KEI Korea Environment Institute

Contents

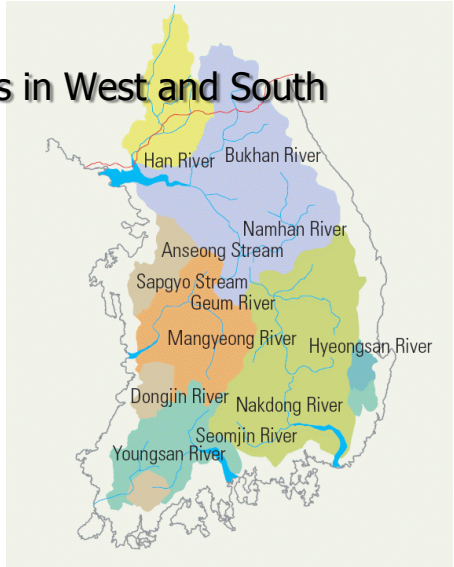
Water Management Issues in Korea

Overview

- Water resources in Korea
  - Annual average precipitation : 1,245㎜ (40% more than world average of 880㎜)
  - Annual average available water per capita : 2,591㎥ (12% of the world average 19,635㎥)
  - Rainfall in summer (June to September) : Two thirds of the annual precipitation
  - Flow fluctuation coefficient of Nakdong and Sumjin are absolutely high
  - Steep mountain slope range in East, curved shapes with wide alluvial plains in West and South



Flow fluctuation coefficient of rivers



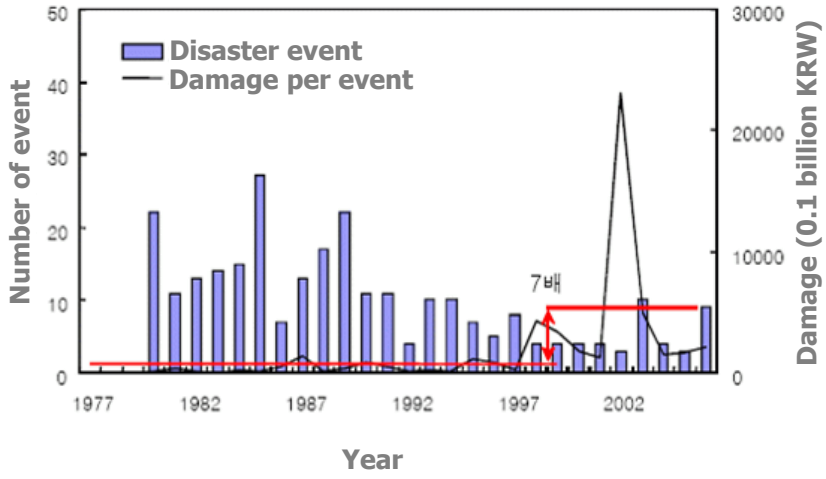
Water Management Issues in Korea

Flood

• Flood control project and flood damage

- Like most countries in East Asian Region, Korea suffers greatly from many heavy rain and typhoon
- Flood control effort decrease disaster events since 2000 but Flood damages per event are increasing

  → Many large flood control project were constructed between 1970s and 1990s
- The design flood for most levee protection is at most 100 year flood



Water Management Issues in Korea

Flood

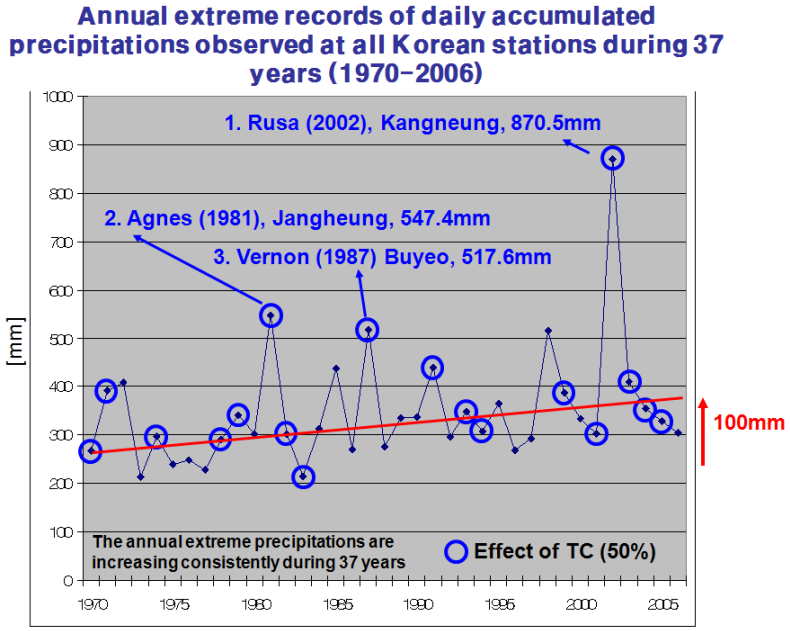
- Climate change and extreme event

- Due to climate change extreme event is expected to increase

  → The daily accumulated precipitation is increased by 100mm during the last 37 years

- Early 2000 record breaking typhoon attacks in Korea (Typhoon Rusa)

  → 870mm precipitation during a day : serious flooding and the property damage in 50 billion dollar



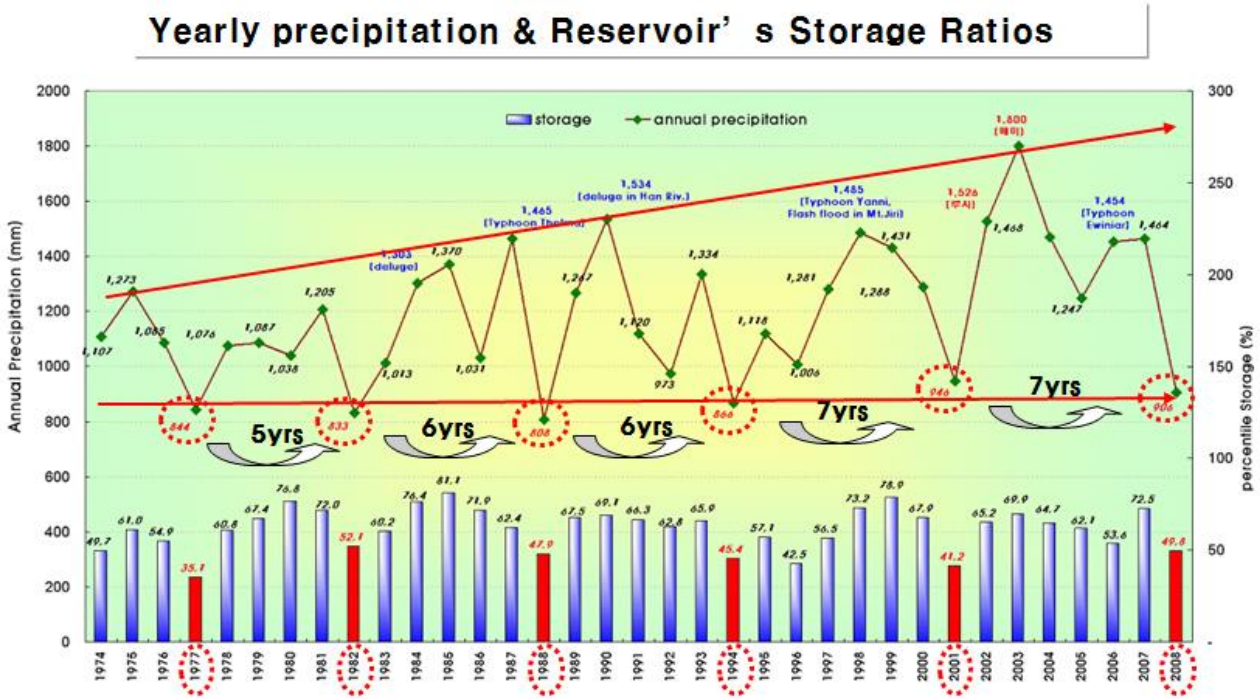
Typhoon Rusa

Water Management Issues in Korea

Drought

- Current Drought and Water Shortage

- Frequent(6 to 7 year periodic) drought in Korea cause the limitation of stable water supply.
- In winter and spring, drought cause the deterioration of water quality due to reduced instream flow

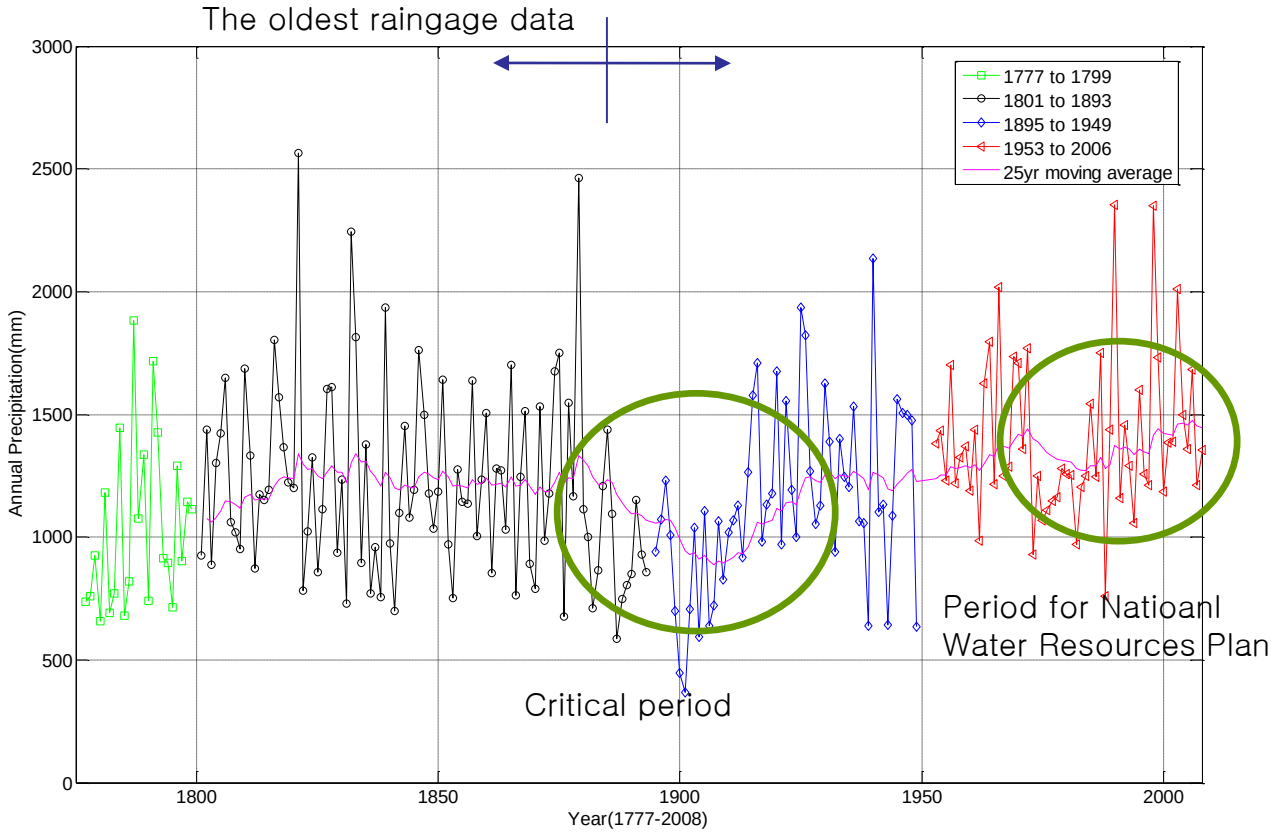


Water Management Issues in Korea

Drought

- Climate change and critical drought period

  - Water supply planning is based on anomalous period



Data from Lim & Chung(1992)

The oldest raingage

Water Management Issues in Korea

River environment

- Sediment deposits in river increase flood water level
- Flood plain is used agricultural land due to insufficient land (70% of nation is mountain region)

→ polluted by fertilizer and pesticides

- Intensive water use makes water quantity and quality problem during low flow season

→ instream flow protection and apply higher water quality standard

Cultivated area inside river corridor & sediment deposition

Instream flow protection required during low flow season

Water Management Issues in Korea

Remedy for the issues review

• Remedy for the issues

- Flood: construction of flood storage reservoir, enhancement of levee, restriction of development on floodplain, flood insurance, buyout flood plain
- Drought: construction of water supply reservoir, long distance conveyance and interbasin transfer, demand management(water efficiency, leak detection , recycling and reuse)
- Water quality(River environment): Control of point and non-point discharge of wastes, augmentation of streamflow during low flow season, restriction development on floodplain

• Policy option review

- Surface storage (environmental objection)
  - most of the cheapest, simplest and most accessible sites have already been developed
- Restriction development on floodplain, buyout, interbasin transfer
  - Resident's strong opposition, conflict between stakeholders
- Demand management (recognition of water as an economic resource), flow augmentation(new water demand), flood insurance(difficulty of institutional setting)

Four Major Rivers Restoration Project

Vision & Objectives

- Vision

  - Reviving Rivers for a New Korea

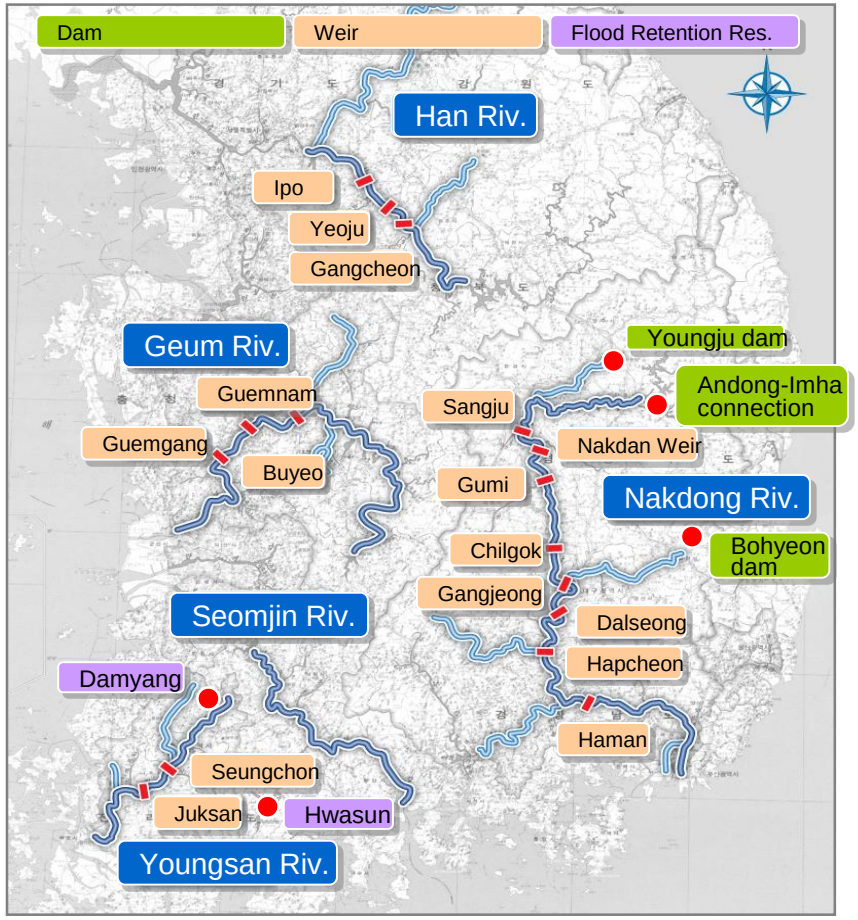
- Objectives

  - Comprehensive remedy for water issues in Korea including climate change
  - Coexistence of Human and Nature
  - Remodeling of River and Land for National Security
  - River Oriented regional development

→ More Focused on Adaptation Measures for Flood Control than the Aspects of Droughts or Ecosystem

Four Major Rivers Restoration Project

Outline of Project



Project Summary

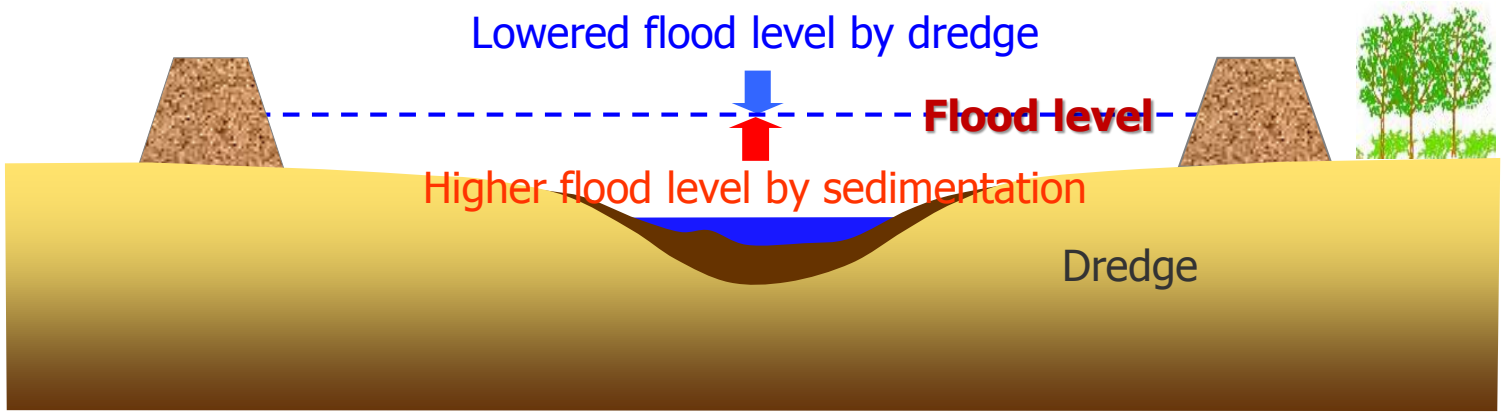
- Dredging : 520 million ㎥
- Weir : 16
- Bank Reinforcement : 620 ㎞
- New Dam : 2
- Reservoir connection: 1
- Flood retention Res. : 2
- Heightening existing dam : 96
- Eco-stream : 929 ㎞
- Practicing TMDL

Four Major Rivers Restoration Project

Flood control

- Improvement of flood control capacity (920 million ton)
  - Enlargement of flood control capacity
    - Dredge of sediment, lower flood level (570 million ton)

      Han-river : 50 million ton, Nakdong-river : 440 million ton, Geum-river : 50 million ton, Youngsan-river : 30 million ton
    - Construction of dams, reinforcement of dam body, construction of flood control pond (350 million ton)
  - Reinforcement of old levee (640km) for safety
  - Extension of estuary barrage in Nakdong-river and Youngsan-river for rapid drainage of flood.
  - Lowering flood water level in main stream by 0.6~3.9m



Four Major Rivers Restoration Project

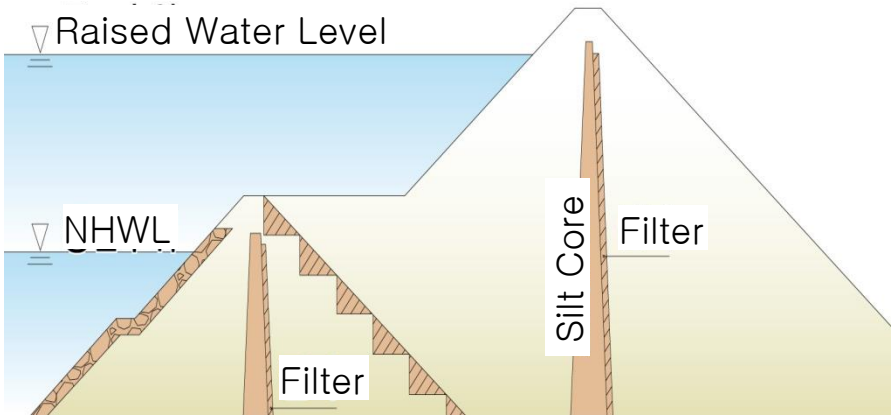
Securing water supply

- Improvement of water resource (1.3 billion cubic meters(ton) /yr)
  - **Securing 80 million ton/yr** through dredge and 16 environmental friendly weirs

    Han-river (3 weirs) : 40 million ton/yr, Nakdong-river (8 weirs) : 670 million ton/yr,

    Geum-river (3 weirs) : 50 million ton/yr, Youngsan-river (2 weirs) : 40 million ton/yr
  - **Securing 25 million ton/yr** through the construction of multi-purpose dams

    Youngju-dam, Bohyun-dam etc.
  - **Securing 25 million ton/yr** through the reinforcement of old agricultural dam body



Four Major Rivers Restoration Project

Water Quality

- Water quality improvement

  - Construction of **1,007 sewage treatment plants**

    Distribution rate of sewerage : 82%(2006) ➔ 91%(2012)

  - Construction of **353 treatment plants of TP**

    95% removal rate ➔ Prevention of algal bloom

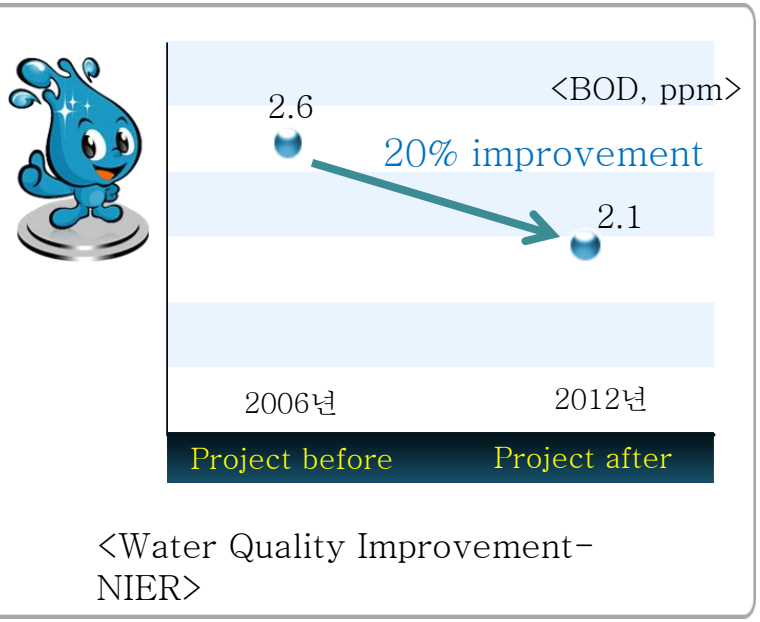
  - **Reinforcement of discharge standard**

    of sewage treatment plant **for the source water**

    BOD : 10 ➔ 5 mg/l, TP : 2 ➔ 0.2mg/l

  - **Removal of vinyl greenhouses**

    Non-point pollution source reduction

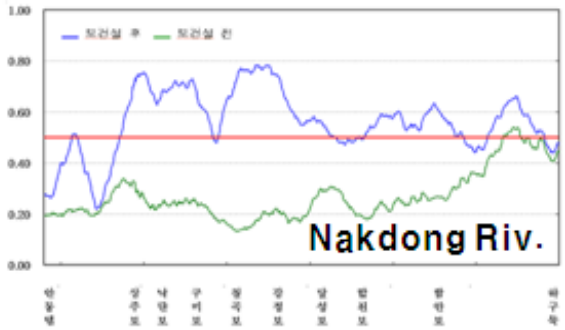


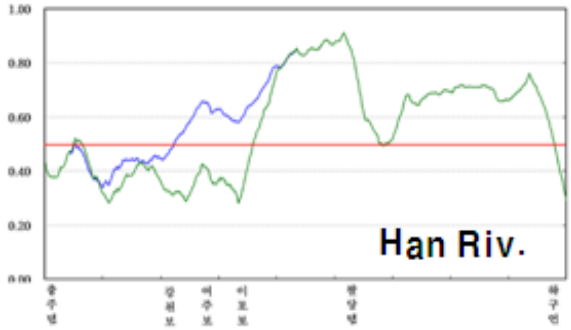
<Water Quality Improvement- NIER>

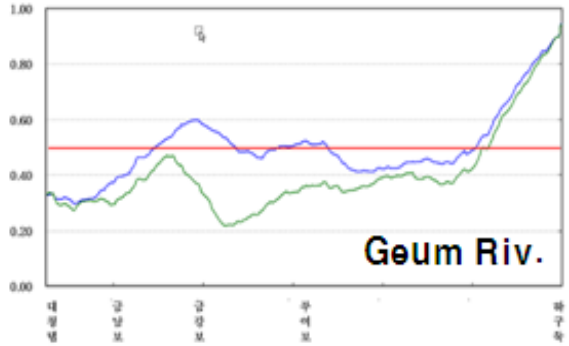
Four Major Rivers Restoration Project

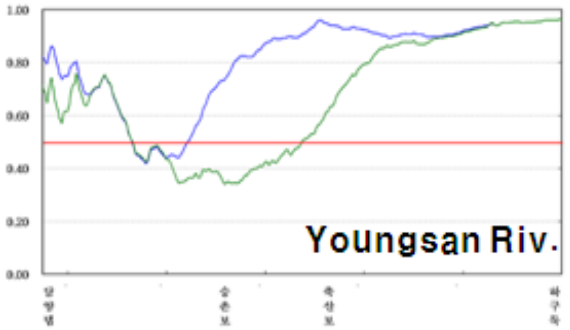
Amenity of water front

- Ratios of water vs. river surface









- Han Riv. : 0.6
- Nakdong Riv. : 0.8
- Geum Riv. : 0.8
- Youngsan Riv. : 0.6

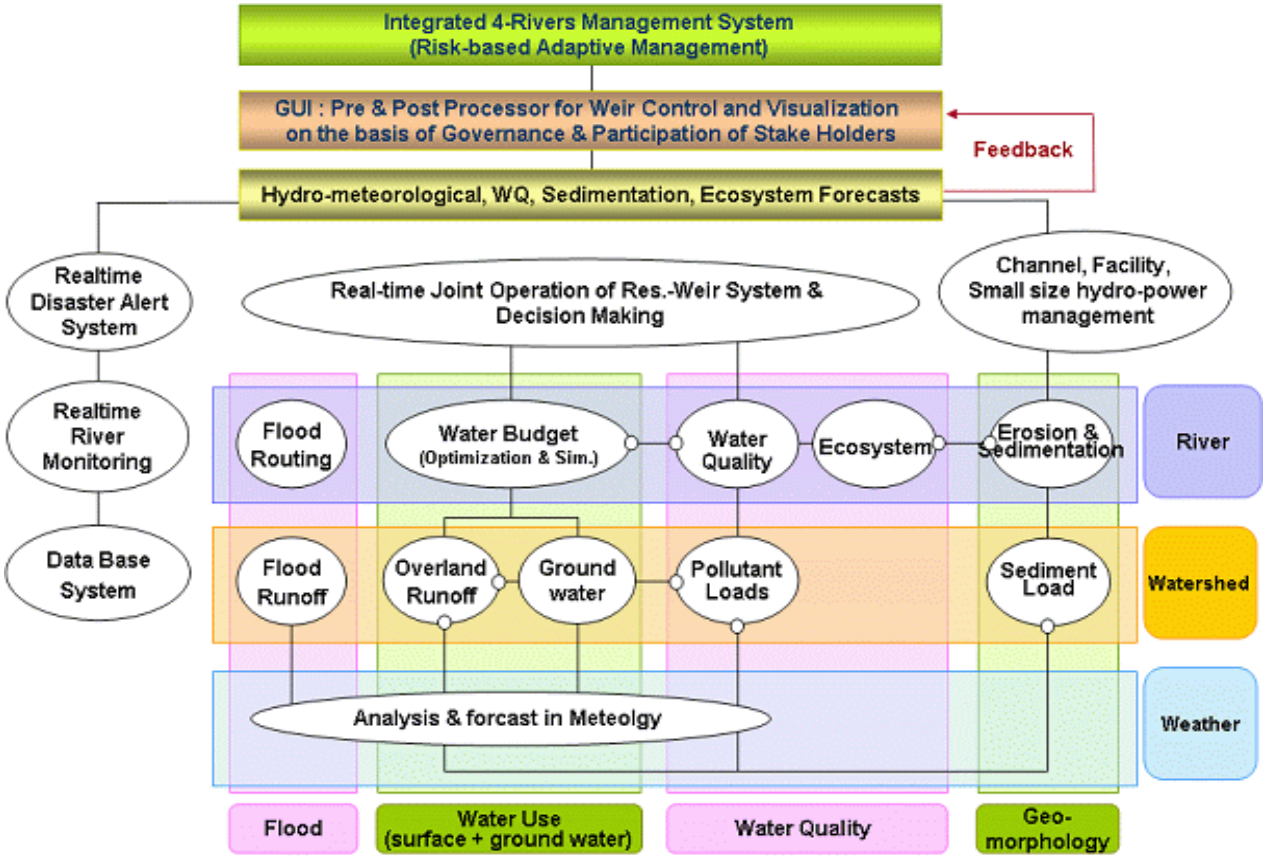
Before 4MRRP

After 4MRRP

Four Major Rivers Restoration Project

Toward Integrated Water Management

- Construction of comprehensive water management model



- More complex and controlled water management model in watershed level is required
- Multi-stakeholder involvement
- Water quality vs. quantity
- Surface water vs. groundwater (conjunctive manner)
- Flood control vs. water supply
- Complex water allocation system with reservoir/weir operation

Conclusion

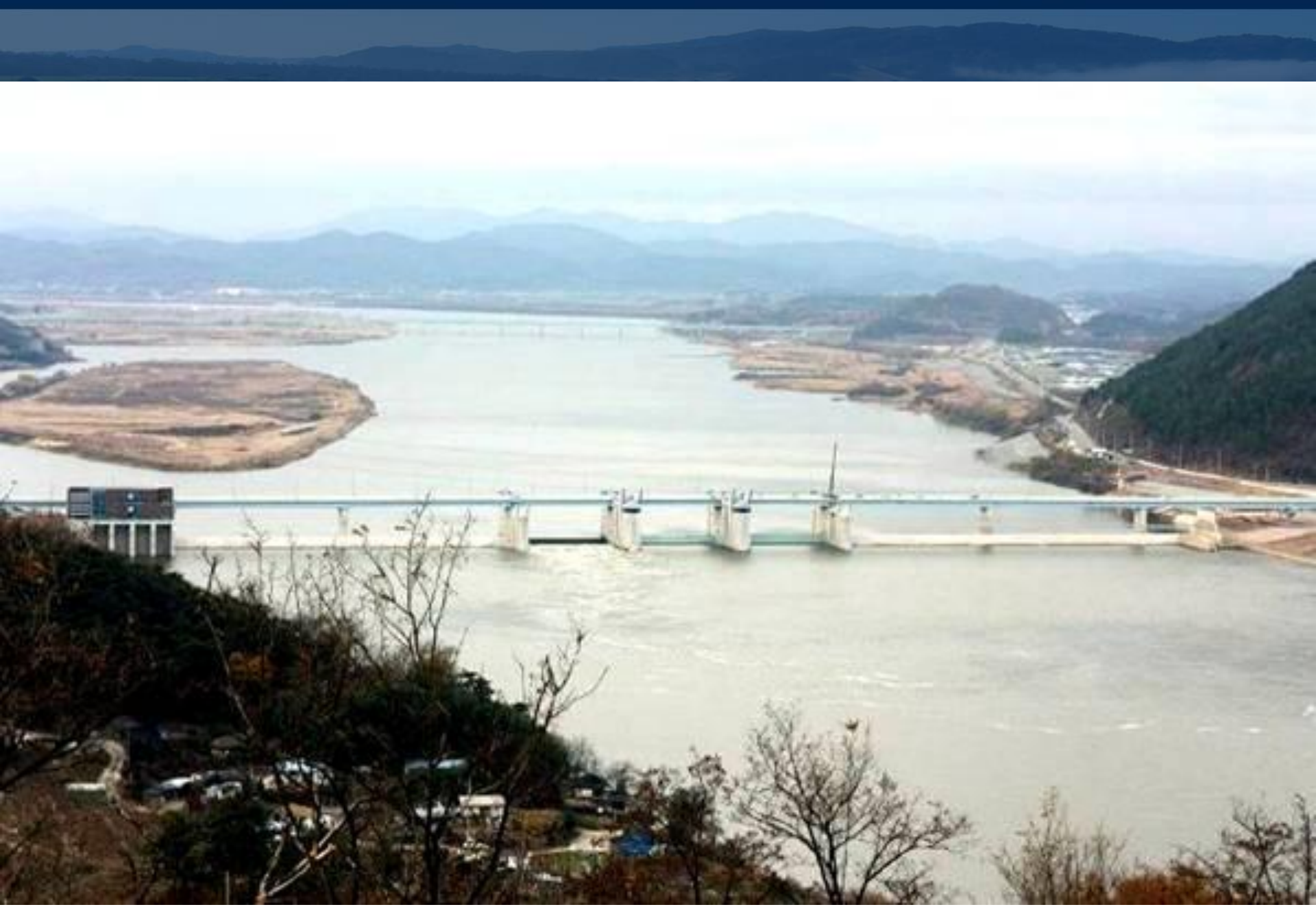
Water issues in Korea and Four River Restoration Project

- **Water management issues in Korea is categorized into three main groups**
  - Flood, drought(water shortage), water quality(river environment)
- **The cost-effective remedy for these issues is difficult to find, due to environmental objection, stakeholders'' opposition, institutional barrier**
- **Korean government released four river restoration project for water security**
- **The process of policy-formulation and implementation on the four river restoration project based on Multi-stake holder consultative process**
  - The office of National River Restoration as a leading agency with the Ministry of Land, Transport and Maritime Affairs, the Ministry of Environment, the Ministry of Culture, Sports and Tourism, and the Ministry of Agriculture, Fisheries and Food
- **The Project aimed at**
  - Comprehensive solution of securing water and mitigating flood
  - Improving the level of culture and quality of life
  - Creation of sound ecosystem, improvement of water quality
  - Enhancing the national prestige in water management
  - Activation of the regional economy

Conclusion

Toward Integrated Water Management

- **Advanced technologies and new setting of institutional frameworks policies needed**
  - Who's going to be in charge of management of water?
  - One government agency can control everything?
  - Multi-stakeholder involvement
- **More complex and controlled water management model in watershed level is required**
  - Complex water allocation system with reservoir/weir operation
  - Systematic approach for flood forecasting and warning system implementation
- **Climate change adaptation need to be involved with integrated watershed-scale collaborations**
  - Water resources planning should be modified to incorporate not only the latest trends observed but also the full range of climate variability such as drought records from long historical records



Question & Answer

Thank You !!