Master Planf of Four-River Restoration

August 18, 2009

MLTM

Headruarters of Four-River Restoration Project

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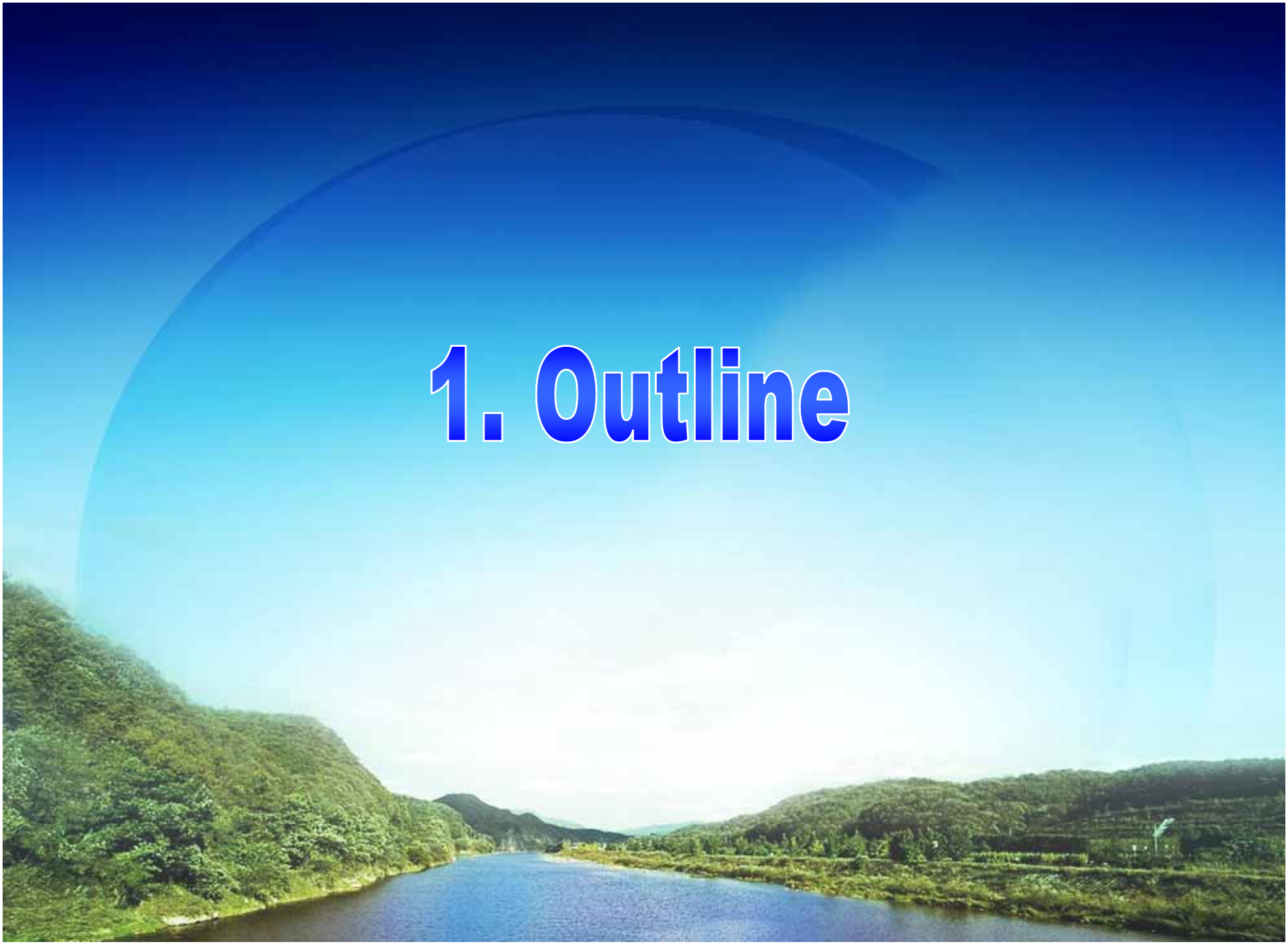

1. Outline

Vision	**Reviving Rivers, for New Korea!**
Object	Climate Change Coexistence of Nature and Humans Re-creation of National Land Balanced Development & Green Growth

Background

- Frequent Flood & Drought Due to Climate Change
  - Water scarcity of 1 billion m^3 in 2016
  - Annul flood damage US$ 2.3 billion, Rehabilitation US$ 3.5
- Deterioration of Water Quality & Ecosystem
  - Immoderate cultivation on floodplains
  - Aggravation of water quality owing to water scarcity in drought
- Inadequate Utilization of Riverine Area
  - Desolate areas or parking lots
  - Insufficient space for leisure & culture along rivers
- Domestic Economic Crisis
  - Increase of joblessness & slowdown in local economy

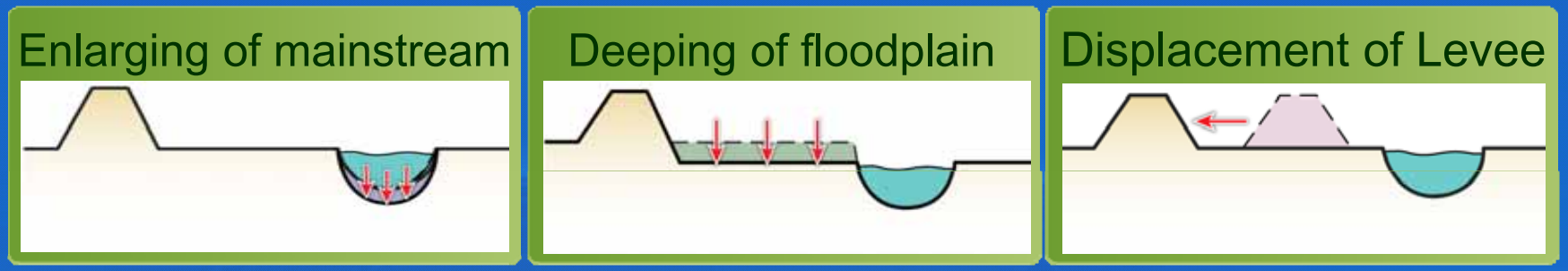
Project Scope

Project Group	Main	Mainstream of four rivers
	Direct-linked	Major tributaries & water quality improvement
	Linked	Utilization of riverine infrastructure
Temporal Scope	Main	Completed in 2011 (dams & reservoirs in 2012)
	Direct-linked	Completed in 2012
	Linked	Executed by yearly plan of each ministry
Spatial Scope	Han, Nakdong, Geum & Yeongsan Rivers Seomjin River & thirteen major tributaries of mainstreams	

Internal and External Case Study

Enhancement of Flood Control by Dredging

- "Room for the river (2006)" in the Rhine, the Netherlands



- Enlargement of channel cross-section by dredging in Yodo river, Japan

Versatile Utilization of Riverine Space & Ecological Restoration

- Eco-river of Taehwa River in Ulsan (2004)
- Comprehensive Development Project of Han Rivier (1982~1986)
  - Channel regulation of the reach of 36 km between Heanju & Amsa
    * Dredging amount: 69 million m^3 (1.9 million m^3/km)
  - Increased bio-diversity : fishes 42 → 71 Sp, birds 21 → 98 Sp (2007)

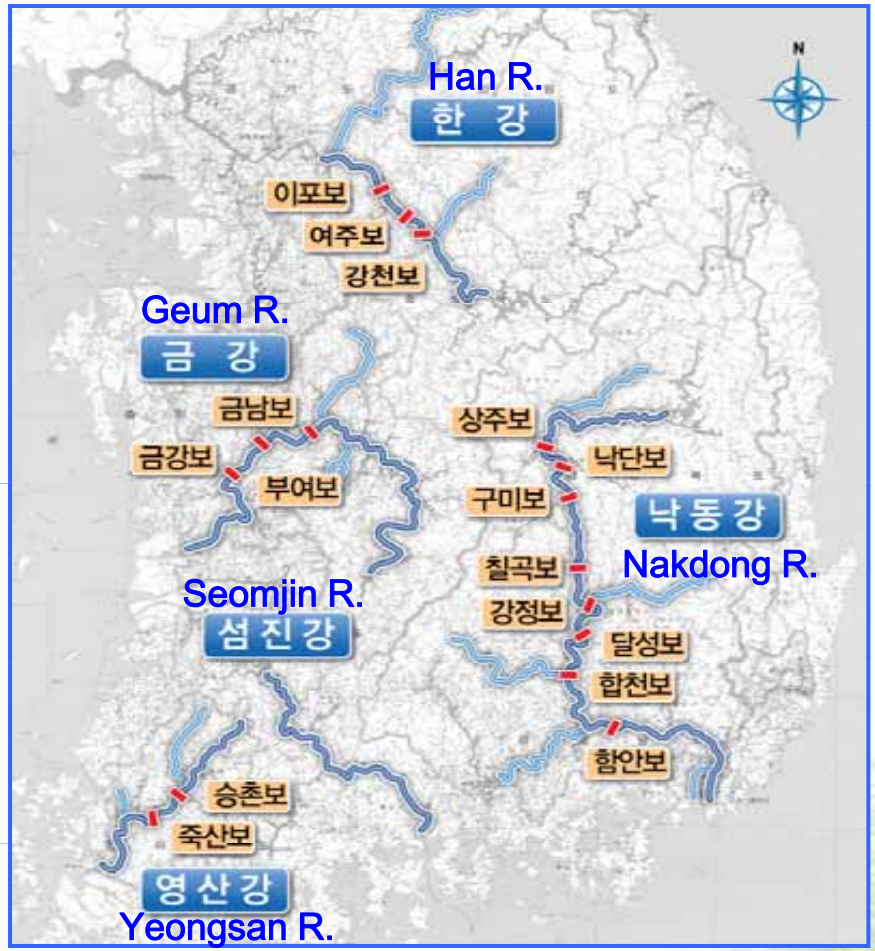
2. Planning by Objects


Core Tasks
Securing water
River-oriented growth of community
Protecting against floods
Creating complex space for resident
Improving water quality & restoring ecology

1. Securing abundant water resources in preparation for water shortage

Securing water supply of 1.3 billion m^3 for preparation of water shortage of 1 billion m^3 in 2016

Securing available water supply (0.8 billion m^3) by dredging & installing 16 weirs



- Used for many purposes such as stream maintenance water, etc.
- Operating in an organic manner by connecting them with upstream dams through IT
- Making them serve as landmarks considering the surrounding landscape

* Installing environment-friendly facilities such as fish way, ecological wetlands, etc.

Constructing landmarks by benchmarking excellent weirs

Hagestein weir in the Rhine, Netherlands

Gates closed

Gates opened

Design of weirs applicable to the domestic rivers

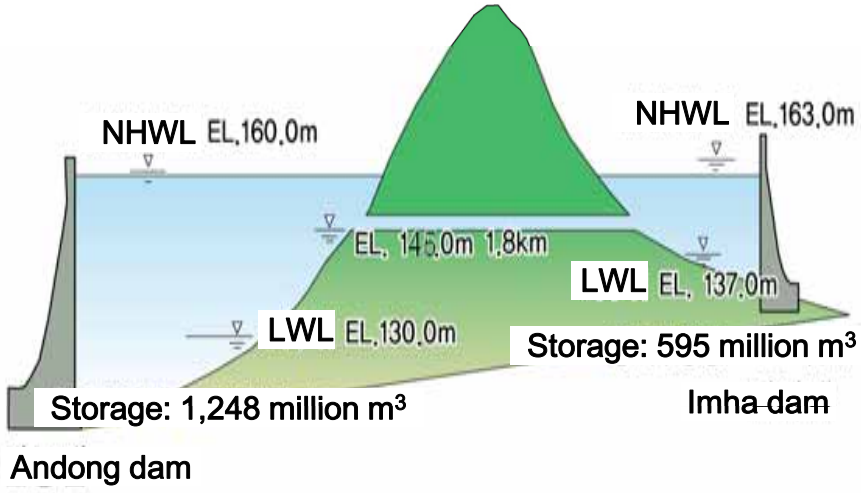
Weirs shall be installed within low-flow channel

Construction of small & medium sized multi-purpose dams

- Construction of Yeongju and Bohyeon dams in the Nakdong river watershed
- Connection of Andong-Imha dam (1.8km)

Yeongju dam

Connection of Andong-Imha dam

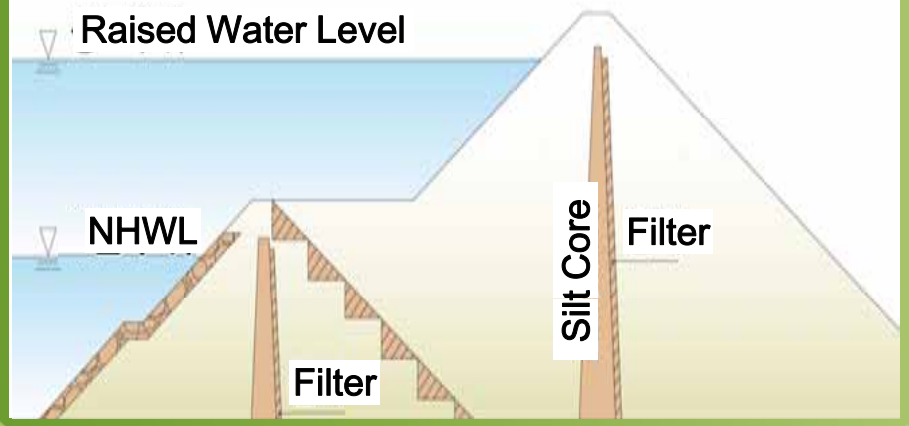


Raising the existing agricultural reservoirs (96 sites, 250 m^3)

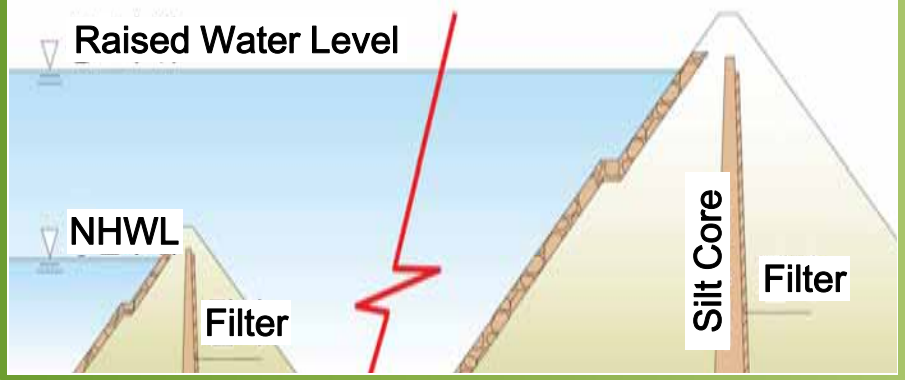
Screening the possible reservoirs for raising out of the 17,600 nationwide (322 sites above 10km^2 of watershed area)

The additionally secured reservoir storage shall be discharged intensively during low water season to improve flow duration.

Wedge raising



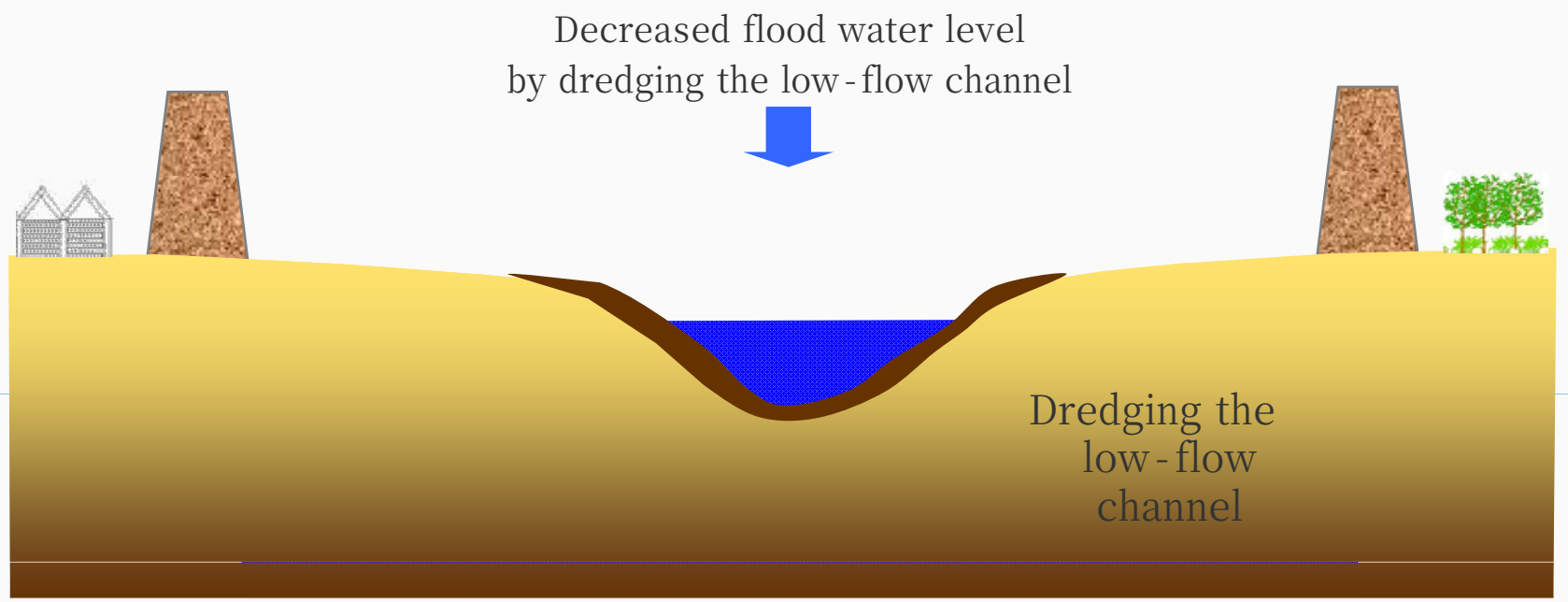
Additional raising



2. Preparing flood control measures for the prevention of flood damage

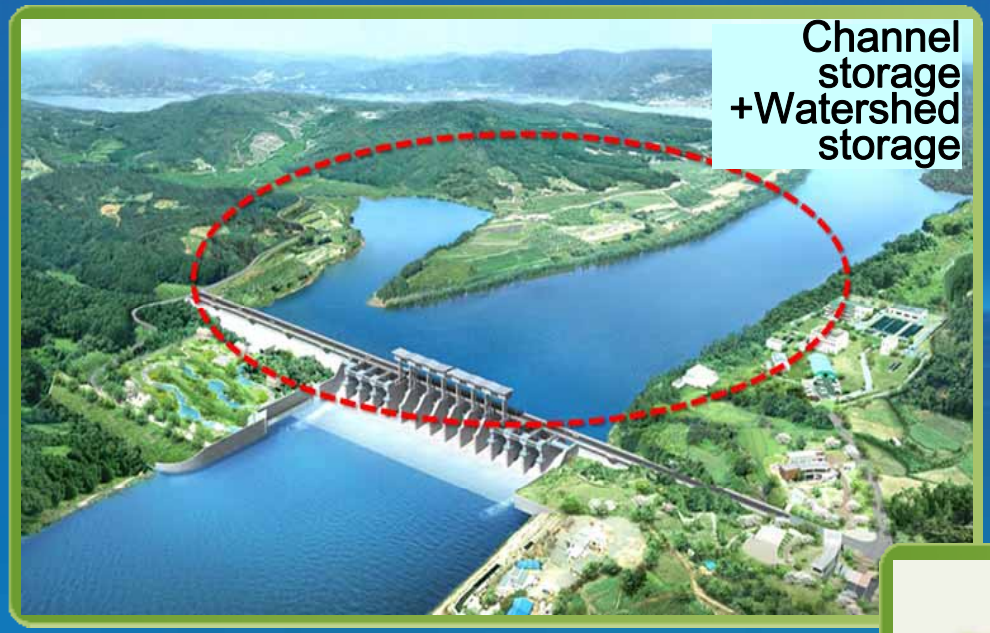
Increment of 920 billion m^3 of flood storage preparing the flood of 200-year return period

Lowering of flood water level (0.4~3.9 m) by dredging the deposited soil (570 million m^3)



- Using a new-concept flood control measure instead of the existing uniform method such as embankment raising

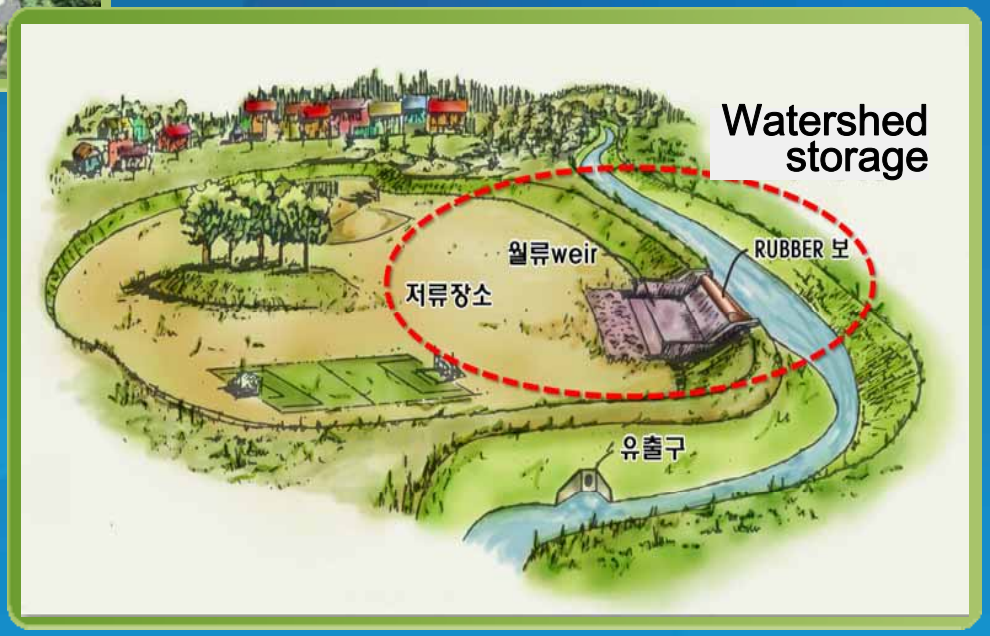
Installing flood control reservoirs & retention ponds (50 million m^3)



Flood control reservoir (2 sites)

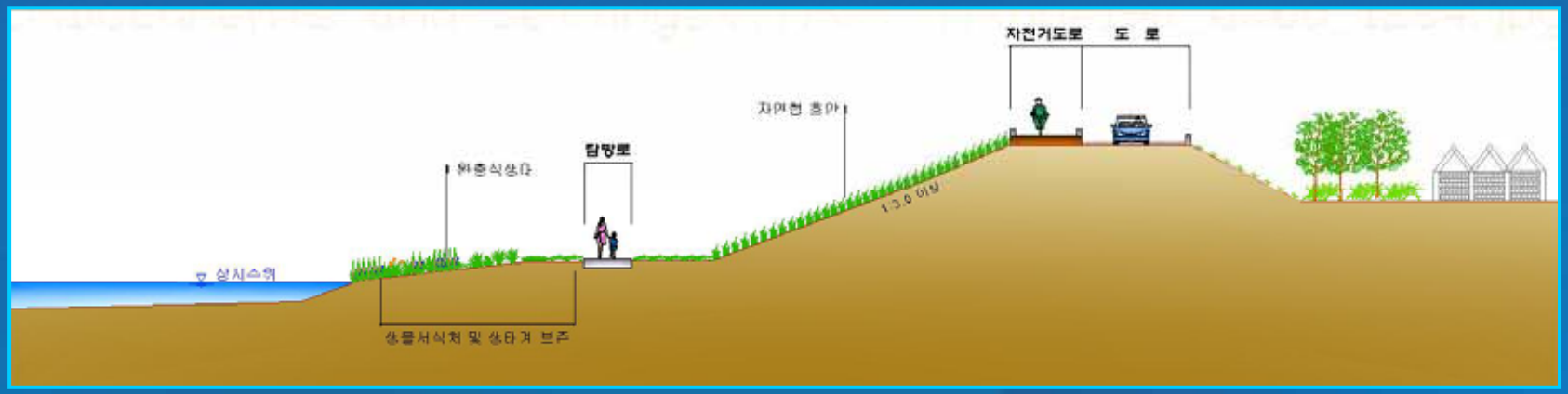
Space for enhancement of stream ecology in ordinary time

Retention ponds (4 sites)



Reinforcing superannuated levees & expanding drainage gates

Reinforcement of superannuated levees (620km)



Reduction of flood water level (0.3~1.1 m) and quick flood drainage

Work
Expansion of drainage gate at Nakdong estuary
Expansion of drainage gate at Yeongsan estuary

Guide levees

Confluent area of Geumho river to Nakdong river

- Installation of guide levees :
  3 sites in Nakdong river

3. Improving the Water Quality and Restoring Ecosystem

Improvement of water quality

- Improvement of water quality for four-river
  - Systematically controlling 34 tributary-estuaries causing high levels of pollution
  - Newly establishing the stream environmental standards for COD and TP
  - Advancing the standards for releasing at the basic environmental facilities

  - Implementing the TP Total Water Pollution Load Management System
  - Expanding 644 sewage treatment facilities
  - Reducing non-point pollution

- Environment Management under construction

  - Establishing of the Integrated Water Pollution Prevention Center
  - Interception of industrial waste water
  - Disposal of dredged soil

Restoration of ecosystem

- Providing habitat for wildlives
  - Restoring ecological rivers (Province-class river : 91 sites)
  - Fostering substitute habitat
  - Fostering ecological wetland
  - Installing fish way
- Installation of close-to-environment river structures
  - Installing nature-observatory
  - Introducing close-to-environment facilities
  - Constructing close-to-environment movable weirs & drop structures
- Building a research basis for aquatic habitat
  - Proliferating the endangered fishes
  - Surveying for aquatic health
  - Mapping the ecosystem of four rivers

Restoring ecological rivers and creating a river eco-belt

Clearing the farmland such as removing the vinyl greenhouse

Creating ecological rivers and restoring urban streams, etc., along 929 km of river area

Reducing non-point pollution by creating river eco-belt

4. Creating Complex Space for Residents

Creating leisure space

Constructing bicycle roads connecting the upstream and downstream areas (1,728 km)

- Building a nationwide network connecting major national roads and local roads

Creating pedestrian lanes, in-line skating area, water leisure sports facilities, etc

Improving access to the waterfront

Addressing the problem of disruption of space caused by road, bank, etc.

Reinforcing the connection between river and urban area

Green pedestrian path, Underground road

Waterfront-urban area network

Utilizing water space in a variety of ways

Utilizing the water space as a space of residence and economic activity

Creating a waterfront landmark

Developing architectural design and theme in harmony with the waterfront

Recreating a waterfront city

Waterfront landmark

Waterfront architecture in harmony

Utilizing water space in a variety of ways

Creating a dynamic space within the urban area

- Various activity spaces and banks, shore protection with smooth slope, etc.

Creating nature-friendly, waterfront space

- Preserving the natural environment near rivers, creating observatory facilities, resting facilities, etc.

Pedestrian lane, Bicycle lane, etc.

Nature-style waterfront space

5. River-oriented Regional Development

Improving branch rivers
River-oriented regional development

- Comprehensive maintenance
- Preparation against floods with 100~200-year return periods
- Project on "Making Beautiful River Villages"
- Central government 8 sites, then local government 23 sites

Reviving the four rivers with a cultural theme

- Cultivating the functions of culture and sightseeing
- Specialized package sites for culture and sightseeing
- Activating riding bicycles and creating leisure-sports complex
- Creating river culture combining culture & art

Developing waterfront near reservoirs

- Stabilization of vallies & increasing water resources
- Making noted places linking with urban & rural areas
- Making thematic place from local native resources

Activating the green growth industry

- Integrate river information system
- Clean IT sensor
- Digital tour system
- Robots for environment management
- Solar & Hydro-power generation

3. Core Porject Each River

Han River – Flood control, ecosystem restoration and recreation

Han River

Water — Increase of water supply : 50 million m^3

- Weirs (3 sites, 40 million m^3)
- Agricultural reservoirs (12 sites, 10 million m^3)

Flood — Increase of Flood control capacity : 90 million m^3

- Dredging: 50 million m^3, reinforcing levee : 131 km
- Retention ponds (2 sites, 30 million m^3)
- Agricultural reservoirs (10 million m^3)

Water quality & ecosystem

- Sewer treatment facilities : main (55 sites), local (91 sites)
- Non-point source management : eco-retention ponds (16 sites)
- Restoration : Eco-river (193 km), tributary (22 sites) & urban stream (5 sites)

Complex space — Bicycle road : 305 km

Local development — River regulation : 84 sites, 480 km

Nakdong River – Flood control, water supply & ecosystem restoration

Nakdong River

Water — Increase of water supply : 1.02 billion m^3

- Weirs (8 sites, 0.67 million m^3)
- Agricultural reservoirs (31 sites, 0.1 billion m^3)
- Small & medium sized dams (3 sites, 0.25 billion m^3)

Flood — Increase of Flood control capacity : 90 million m^3

- Dredging: 440 million m^3, reinforcing levee : 335 km
- Yeongju dam (80 million m^3), agricultural reservoirs (50 million m^3)
- Guide levee (3 sites), drainage gates at estuary

Water quality & ecosystem

- Sewer treatment facilities : main (74 sites), local (238 sites)
- Non-point source management : eco-retention ponds (23 sites)
- Restoration : Eco-river (407 km), tributary (13 sites) & urban stream (1 site)

Complex space — Bicycle road : 743 km

Local development — River regulation : 148 sites, 862 km

Geum River – Local development linking with Baekje cultural heritage

Geum River

Water

Increase of water supply : 110 million m^3

- Weirs (3 sites, 50 million m^3)
- Agricultural reservoirs (30 sites, 60 million m^3)

Flood

Increase of Flood control capacity : 100 million m^3

- Dredging: 50 million m^3, reinforcing levee : 117 km
- Agricultural reservoirs (50 million m^3)

Water quality & ecosystem

- Sewer treatment facilities : main (63 sites), local (133 sites)
- Non-point source management : eco-retention ponds (9 sites)
- Restoration : Eco-river (199 km), tributary (8 sites) & urban stream (1 site)

Complex space

Bicycle road : 248 km

Local development

River regulation : 94 sites, 588 km

Waterway Restoration : 67 km

Yeongsan River – Flood control & water quality improvement

Yeongsan River *(including Seomjin River)*

Water
Increase of water supply : 120 million m^3

- Weirs (3 sites, 40 million m^3)
- Agricultural reservoirs (23 sites, 80 million m^3)

Flood
Increase of Flood control capacity : 120 million m^3

- Dredging: 30 million m^3, reinforcing levee : 37 km
- Flood control reservoirs (2 sites, 9 million m^3)
- Retention ponds (1 site, 11 million m^3)
- Agricultural reservoirs (70 million m^3), drainage gates at estuary

Water quality & ecosystem

- Sewer treatment facilities : main (15 sites), local (127 sites)
- Non-point source management : eco-retention ponds (37 sites)
- Restoration : Eco-river (130 km), tributary (5 sites)

Complex space
Bicycle road : 432 km

Local development
River regulation : 41 sites, 211 km

Waterway restoration : 80 km


4. Expected Effects

Korea – Emerging as one of the world's advanced countries in water management

- Fundamental solution of water shortage and flood damage
  - Increasing the available water supply and flood control capacity
- Improving the level of national leisure culture and quality of life
  - Providing cultural, resting, and exercise space for residents
- Creation of sound ecosystem, improvement of water quality and river restoration
  - Improving the rate of "good water"
- Enhancing the prestige of the nation as a global leader in water management
  - Disseminating the experience and technology attracting water-related international organizations
- Activation of the regional economy through the Green New Deal Project
  - Job opportunities for 340,000 persons expected including the effect of production inducement amounting to US$ 3.3 billion

5. Investigation Plan

Investigation plan

Main — $14 billion

MLTM	River regulation, dams, detention ponds : US$ 11.3 billion
MIFAFF	Agricultural reservoirs, drainage gates : US$ 2.3 billion
ME	Water quality improvement : US$ 0.4 billion

Direct-linked — $ 4.4 billion

MLTM	Seomjin River, major tributaries : US$ 1.4 billion
MIFAFF	Agricultural reservoirs : US$ 0.2 billion
ME	Water quality improvement : US$ 2.8 billion

Linked — Yearly performance according to the plan of each ministry


Thank you so much
for your attention!
Headquarters of
Four-River Restoration Project