

SHARING SOME EFFORTS FOR MITIGATING WATER-RELATED DISASTERS

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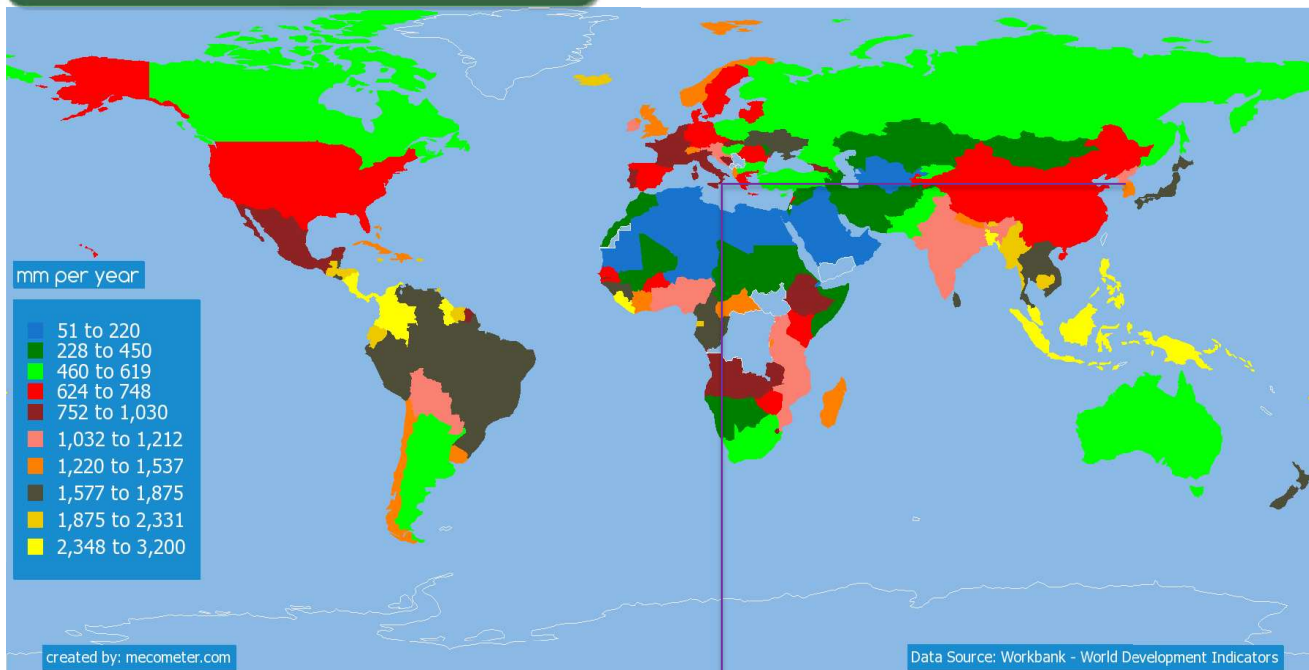
- 3 -

1. Water Resources in Korea



1. Water Resources in Korea

Global average yearly precipitation



Annual Precipitation



158%

Korea 1,277mm

>



Global 807mm

High population density

Possible Water use per capita



17%

Korea 2,629m³



Global 16,427m³

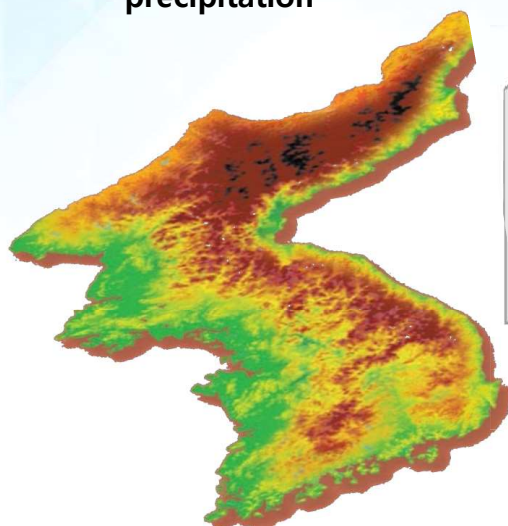
1. Water Resources in Korea

Unfavorable Conditions

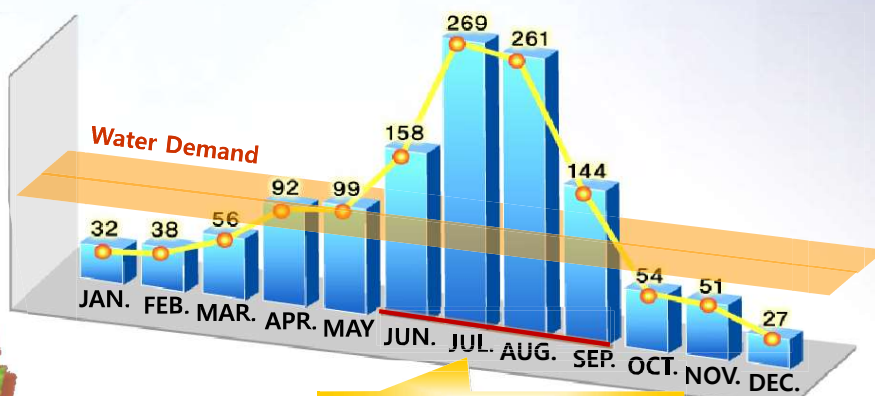
- 65% of mountainous area
- Rapid runoff during rainfall
- Low flow discharge after floods
- Heavy rainfall during the rainy season accounts for 2/3 of annual precipitation



Vulnerable to flood and drought



Upstream : Steep Slope
Downstream : Mild Slope



2/3 of annual precipitation
: June ~ September

Source : k-water

1. Water Resources in Korea

Water Use Status

Water Use Status

Total Water Resources
130(100%)

(unit : billionm³/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%

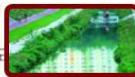
6%



Irrigation



Domestic



Instream



Industrial

Total Use
33.3(26%)

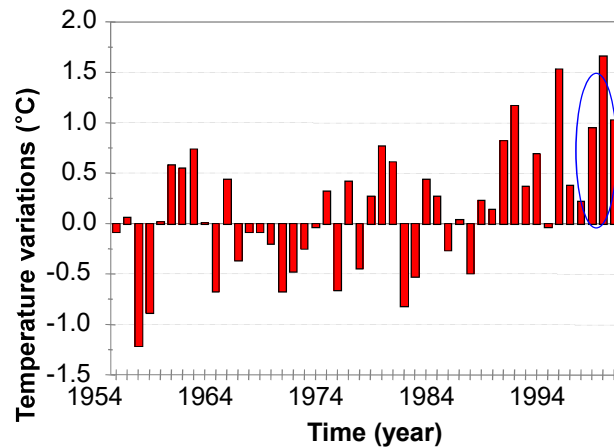
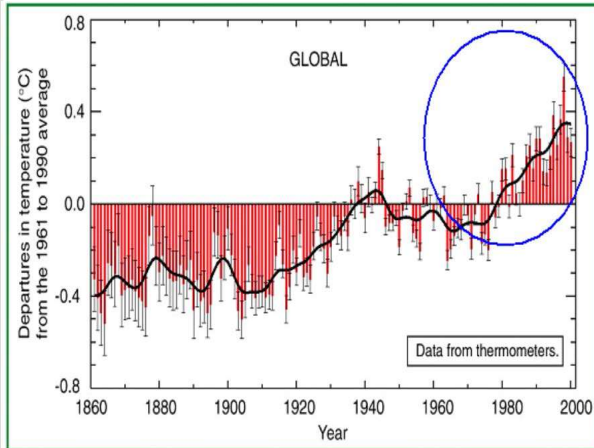
2. Climate Change in Korea



2. Climate Change

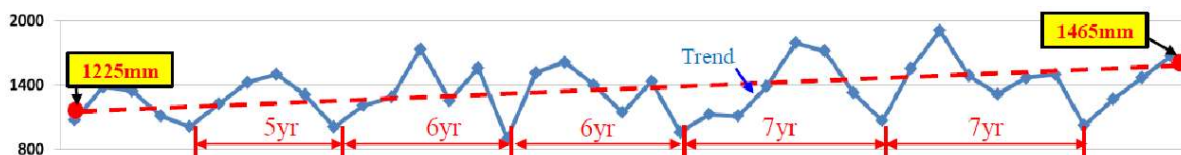
Global Warming

- Temperature increased by **0.6°C** during the past 140 years (global average)
- The average temperature in Korea increased by around **1.5°C**

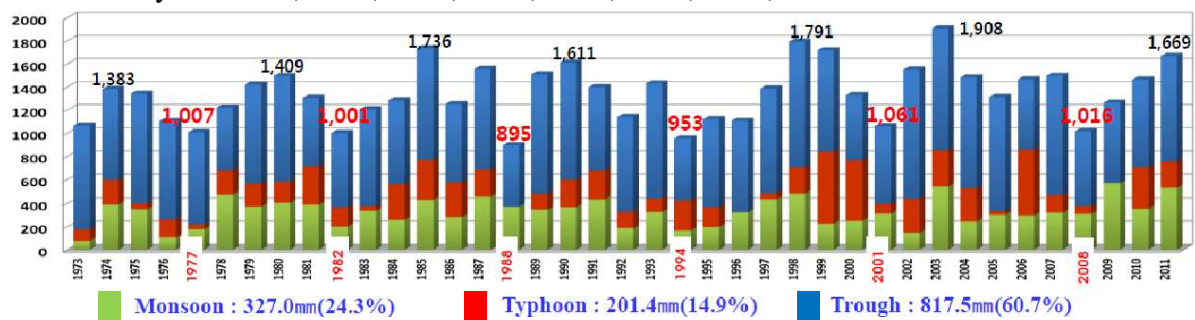


2. Climate Change

Frequency of Drought and Flood

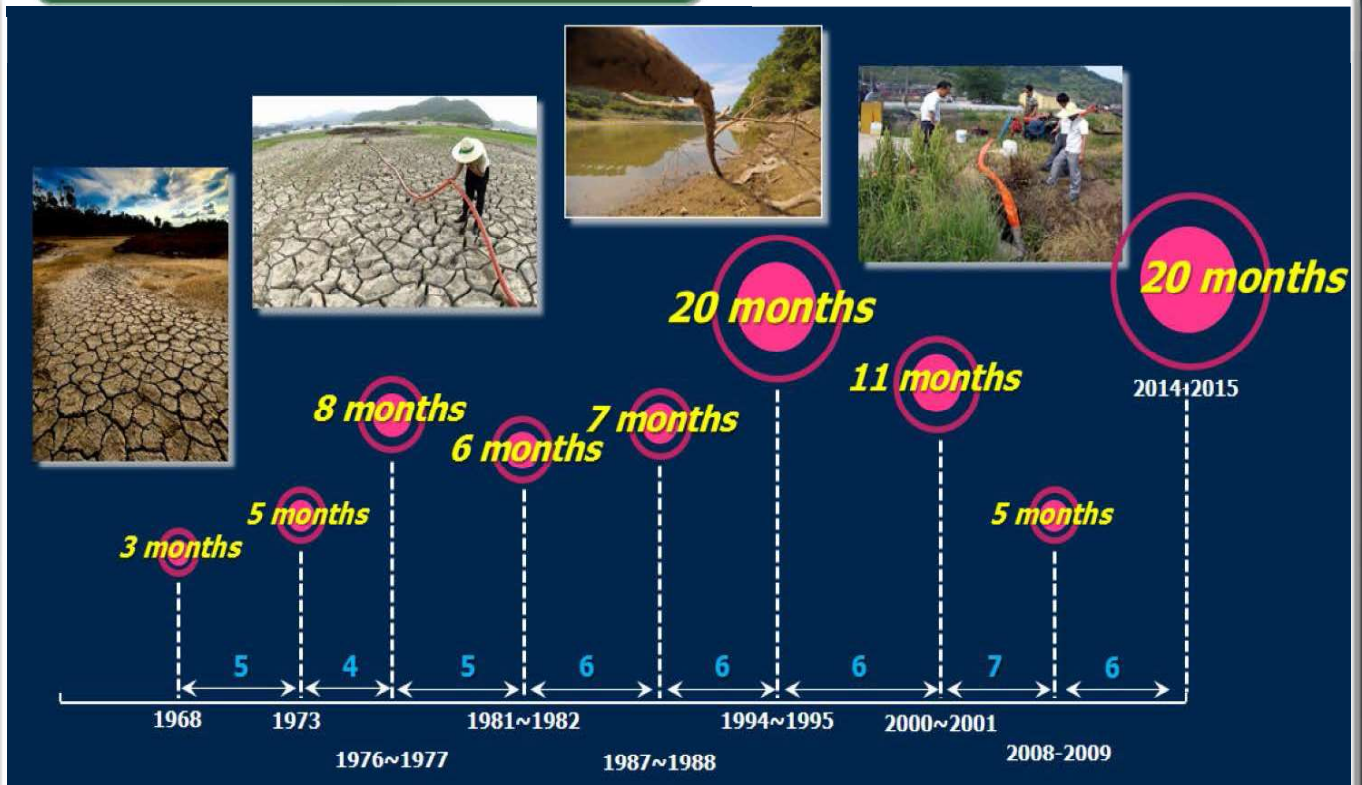


- Annual rainfall continuously increases at an approx. rate of 16% due to climate change
- Also, since 1970s, drought occurs every 5~7 years, and recently **every 2-3 years regionally** such as years 2001, 2005, 2008, 2009, 2012, 2014, 2015, 2016.



2. Climate Change

Frequency and Magnitude of Drought



Source : Prof Joo-heon Lee

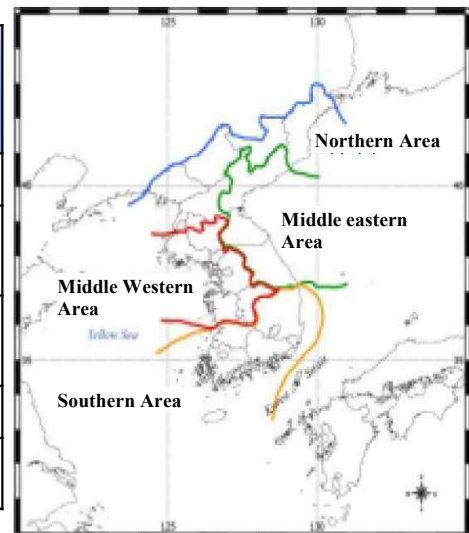
2. Climate Change

Changing Climatic Zones

- **Past: Monsoon Climate → Now: Subtropical Climate**
(Changes expected in vegetation, fish stocks, ecosystem)
- Climate for 20% of territory will change by 2100

Region		Changing forest (temperate zones ⇒ <i>subtropical zones</i>)
Vegetation	South (temperate)	34.99%
	Middle west (temperate)	16.18%
	Middle east (temperate)	3.16%
	North (frigid zone)	3.11%
Fish	East and west Sea	Subtropical

※ Source : KEI (Korea Environment Institute, 2003)



3. Water-Related Disasters



3. Flood Disasters in Korea

Extreme floods in Korea



3. Drought Disasters in Korea.

Extreme droughts in Korea



3. Global Flood Disasters



3. Global Flood Disasters

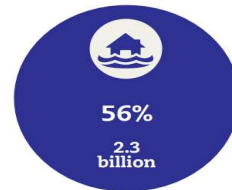
Flood characteristics in the world

THE HUMAN COST OF WEATHER RELATED DISASTERS
1995-2015

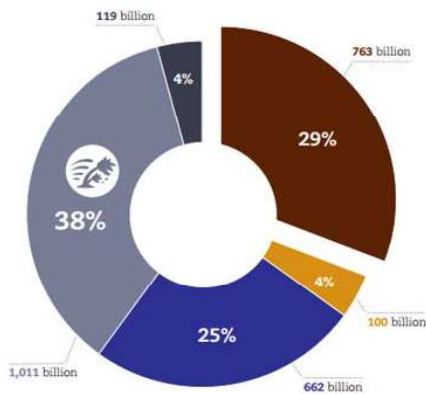
UN Report – Between 1995 and 2015, Flood Disasters Affected 2.3 Billion and Killed 157,000

Centre for Research on the Epidemiology of Disasters
CRED

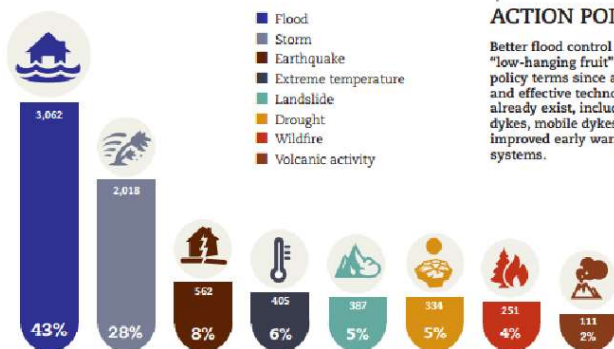
UNISDR
The United Nations Office for Disaster Risk Reduction



Breakdown of recorded economic damage (US\$) by disaster type (1995-2015)



Percentage of occurrences of natural disasters by disaster type (1995-2015)



ACTION POINT

Better flood control is one "low-hanging fruit" in DRR policy terms since affordable and effective technologies already exist, including dams, dykes, mobile dykes and improved early warning systems.

3. Global Flood Disasters

Flood characteristics in the world

15 Countries Account for 80% of Population Exposed to River Flood Risk Worldwide



The top 15 countries with greatest population exposed to river flood risk are either least developed or developing countries, which are the most vulnerable to natural disasters and climate change.

Annual Expected Population Affected by River Floods (millions)

NOTE: An average country-wide flood protection level was assigned for each country based on the country's income level. 2010 population data was used in the analysis.

wri.org/floods

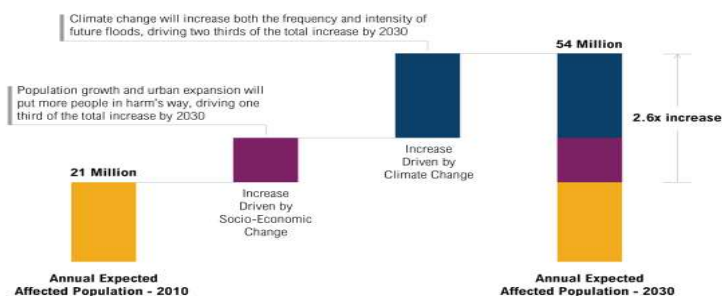
Sources: World Resources Institute 2015; Wiseman, H.C., et al., 2013; Ward, P.J., et al., 2013.

WORLD RESOURCES INSTITUTE

People in least developed and developing countries are more vulnerable to flood risk

The flood victims are expected to be increased in future due to the impact of climate change

River Floods Affect 21 Million People on Average per Year 2.6-Fold Increase Expected by 2030, Driven Primarily by Climate Change



NOTE: An average country-wide flood protection level was assigned for each country based on the country's income level. The analysis assumes continued current socio-economic development trends (SSP2), severe climate change (RCP8.5), and no additional flood protection introduced by 2030.

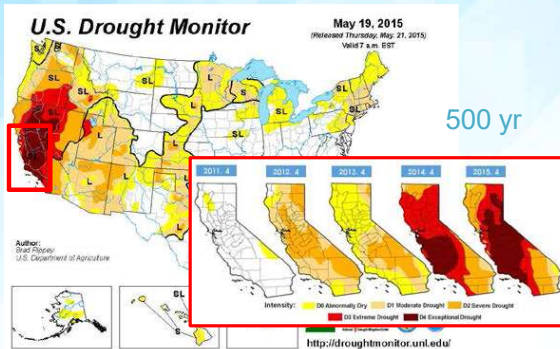
wri.org/floods

Sources: World Resources Institute 2015; Wiseman, H.C., et al., 2013; Ward, P.J., et al., 2013.

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3. Global Drought Disasters

U.S California(2012~2015)



500 yr

More than 3 billion USD damage,
More than 10 thousand people lose jobs



Thailand (2015)

40 yr

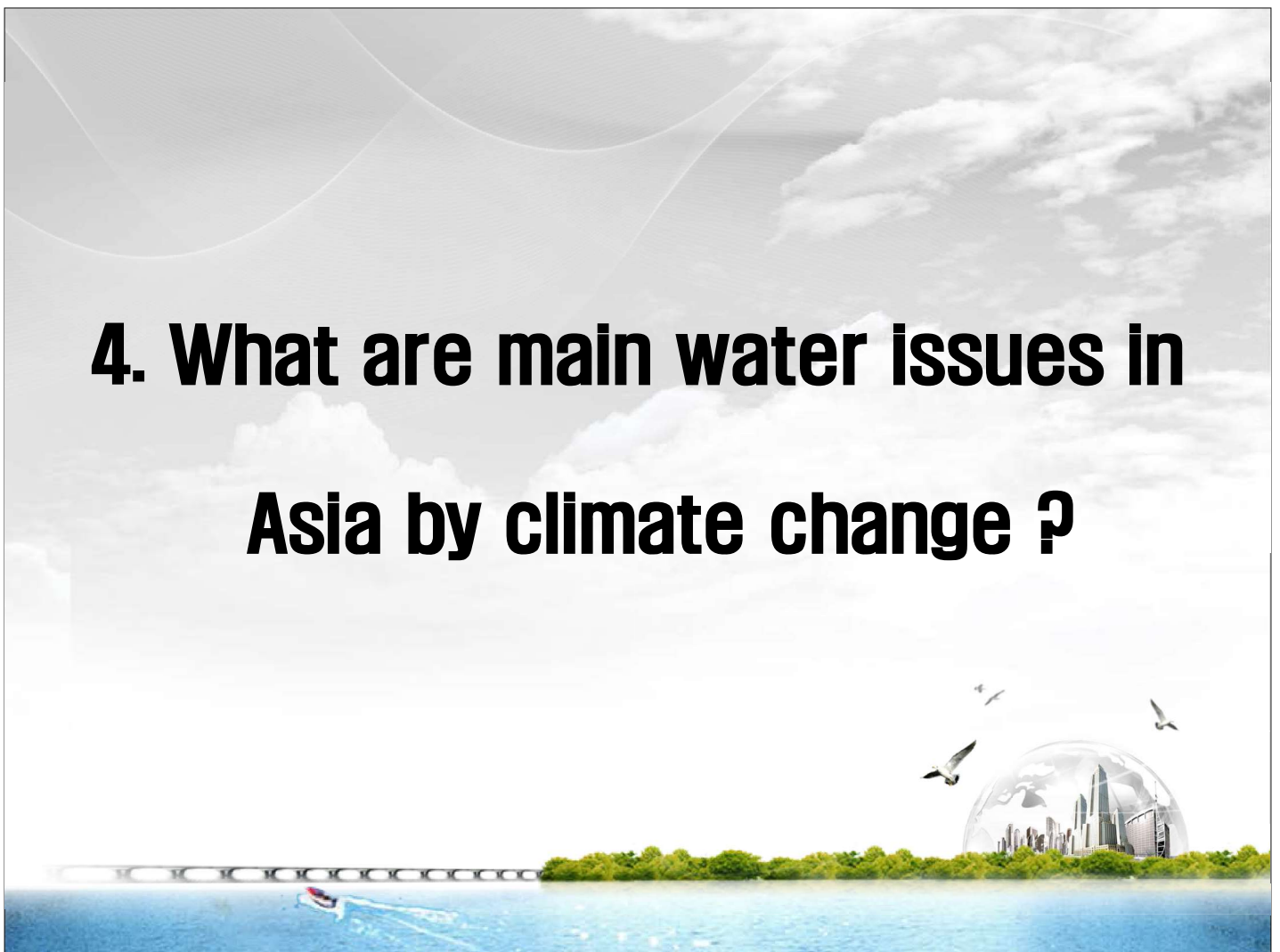


China (2012)

60 yr

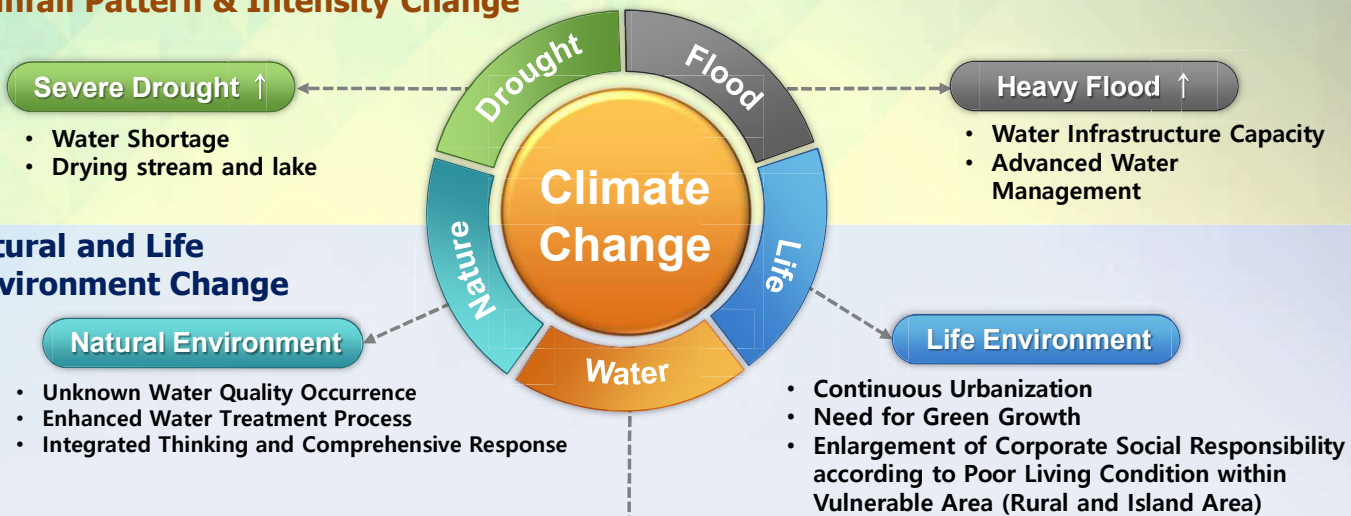


4. What are main water issues in Asia by climate change ?



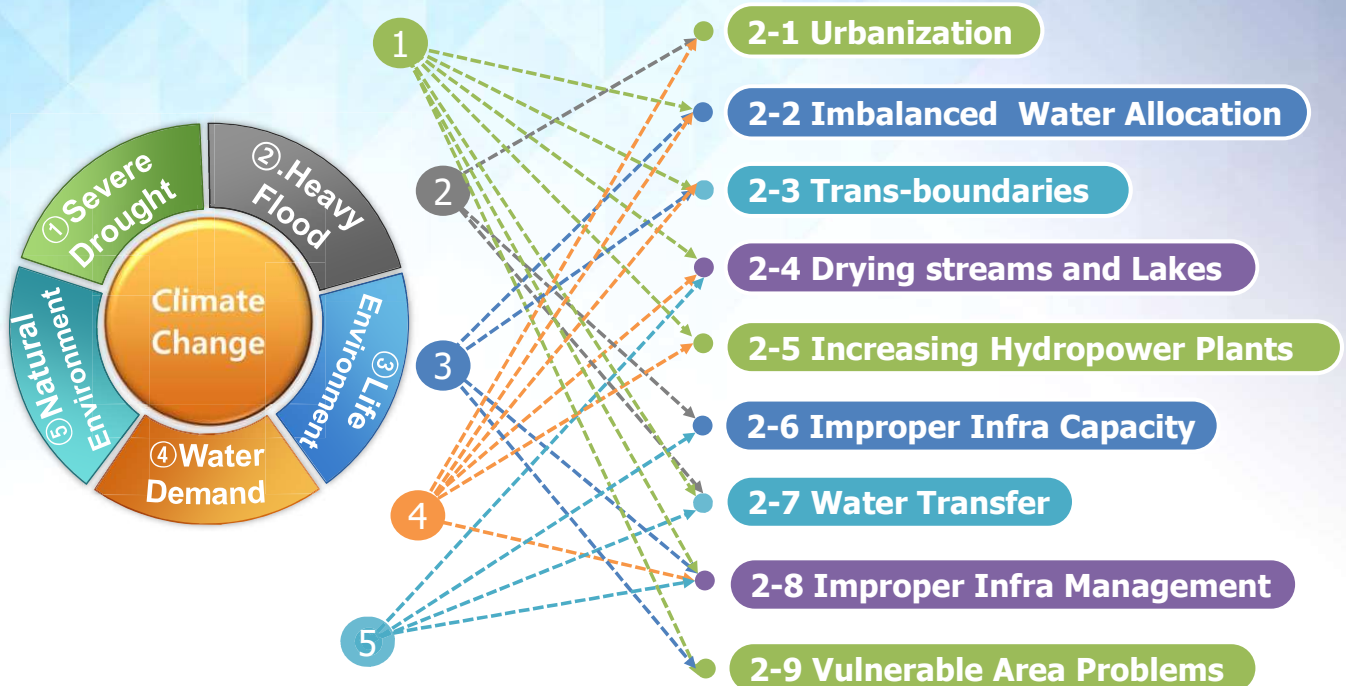
4. Water Environment by Climate Change

Rainfall Pattern & Intensity Change



Source : AWC

4. Climate Change – Common Water Issues



4. Major Common Issues of Asian Water Problems (1)

2-1. Urbanization



- Serious water quality problems and insufficient water infrastructure

2-2. Imbalanced Water Allocation

- Imbalance of Water allocation according to limited water resources and/or limited water supply



2-3. Trans-boundaries



- Increase of water conflicts at trans-boundaries caused by industrialization

2-4. Drying streams

- Increase of drying streams and lakes according to the lack of rainfall and/or excessive usage (Aral Sea, Central Asia Region, Etc.)



4. Major Common Issues of Asian Water Problems (2)

2-5. Increasing Hydropower Plants



- Water conflict increase caused by continuous construction of hydro power plants

2-6. Improper Infra Capacity

- Changes for acceptance of water infrastructure capacity according to increment of living standard and flood intensity increase



2-7. Water Transfer



- Necessity of enhanced water transfer and water storage capacity

2-8. Improper Infra Management

- Limitations on the ability of the management of existing infrastructure



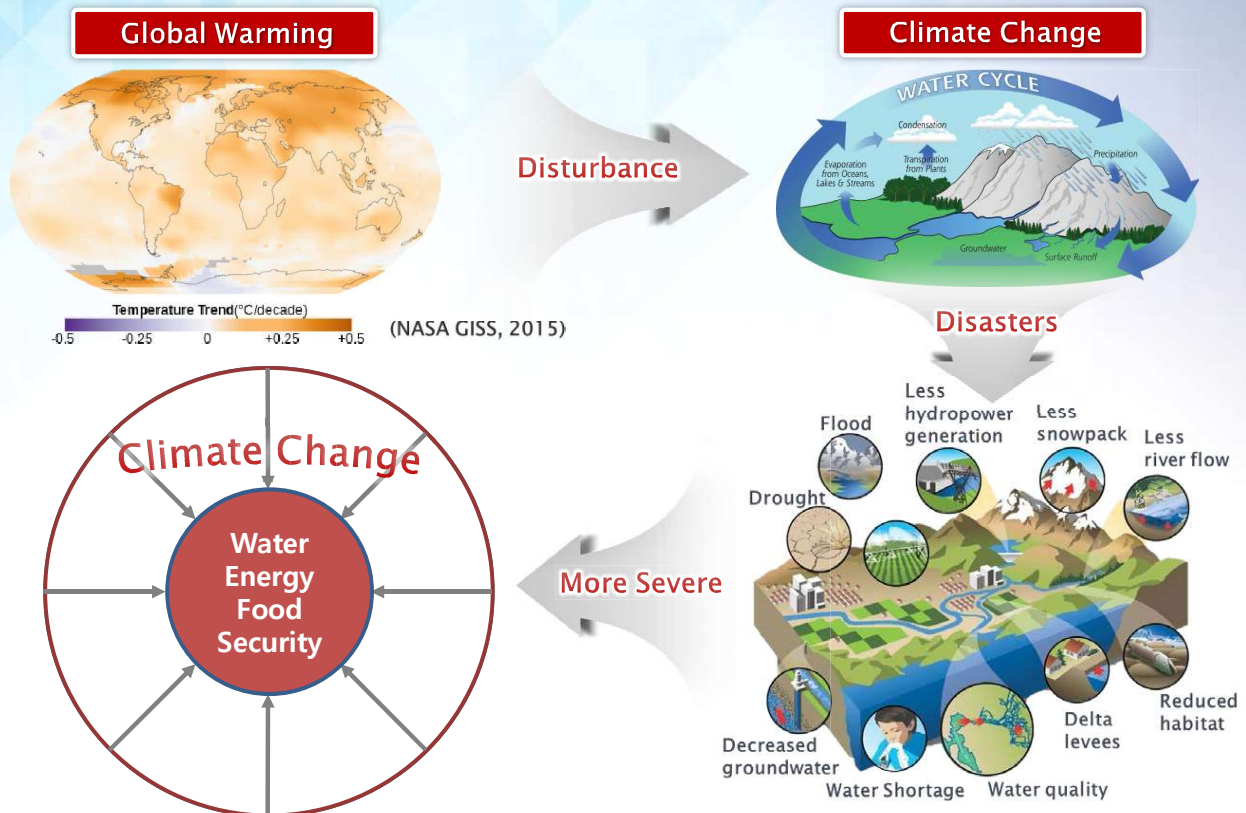
2-9. Vulnerable Area Problems



- Increasing demand for settlement of water shortage problems within vulnerable area

4. Impact of Climate Change

Climate Change and WEF Security



4. W-E-F NEXUS



Nothing can take the place.. **"Water Resources"**

2009 The United Nations Conference on Sustainable Development

4. IWRM

Integrated Water Resources Management

Efficiency

- Integrated planning based on watershed
- Green energy generation using water resources ↑
- Real-time water circulation monitoring ↑
- Investigation of catchment characteristic ↑
- Upgrade and share water management technology
- Review water supply & flood control capacity of hydraulic facility
- Dam & river flood control ability ↑

Equity

- Secure water resources for coastal & mountainous village
- Flood disaster management project in tributary
- Rearrange water allocation considering environment
- Diversify water resources (Desalination, Rain reservoir, etc.)

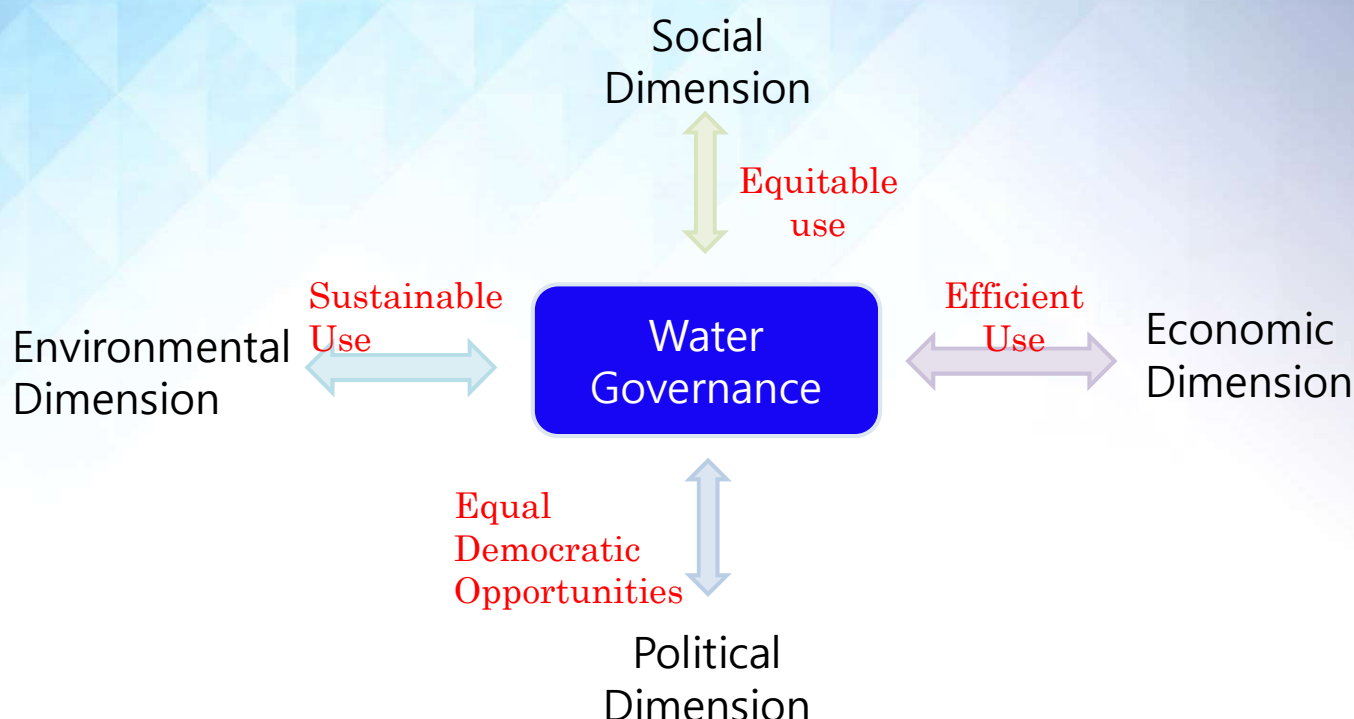
Sustainability

- Prepare climate change
- Enhance safety management for old facilities
- Connect land use & water management
- Integrate pollution source management

- Reestablish dam operation rule
- Establish water management basic law
- Rearrange water right & cost
- Water related regulations ↓
- Joint committee for each river basin

Source : k-water

4. Water Governance



👉 Effective water governance would seek a good balance among these four dimensions

5. Example of Governance : Asia Water Council (AWC)



5. Asia Water Council was Born in Bali

- ✓ 1st General Assembly Held in Bali, Indonesia 24th-26th March, 2016
- ✓ Hosted by AWC Indonesia, K-water and AWC Secretariat
- ✓ Over 300 Participants from 26 countries including 15 founding members



5. Mission & Vision

Mission **Asia's Sustainable Development with Smart Water**



Vision

- Setting Asia's water issues at the top of global agendas
- Promoting Asia's sustainable development by solving water problems

Action Tools

- ✓ Application of Smart Technique for water
- ✓ Asian way of IWRM for natural conservation
- ✓ Smarter risk reduction for Water Security



Action platform

- ✓ Cooperative Action Platform equipped with Priority of Implementation (PFI) and Water Project (WP)

Action Goals

- ✓ Common prosperity
- ✓ Achievement of SDGs

5. Governance – Bureau



Acting President

- ✓ Dr. Shie Yui Liong
- ✓ National Univ. Singapore
- ✓ Singapore



Vice President

- ✓ Dr. Somkiat Prajamwong
- ✓ Secretary General, ONWR
- ✓ Thailand



Vice President

- ✓ Mr. Zhi Guang Liu
- ✓ Consul, Ministry of Water R.
- ✓ China



Vice President

- ✓ Dr. IR. Firdaus Ali
- ✓ President, Indonesian Water Institute
- ✓ Indonesia



Vice President

- ✓ Dr. Philippe Gourbesville
- ✓ CEO, @qua
- ✓ France

5. Governance – Board Members



Ministry of Public Works
And Housing in Indonesia



Ministry of Land, Infrastructure
and Transport in Korea



Ministry of Agriculture
And Cooperation in Thailand



Ministry of Water
Resources in China



Ministry of Environment And
Green Development in Mongolia



Ministry of Energy
and Mines in Laos



Ministry of Water Resources
and Meteorology in Cambodia



Daegu Metropolis



Royal Irrigation
Department in Thailand



Metropolitan Waterworks
And Wastewater Authority



Institute of Water
in Indonesia



Indonesian Association of
Hydraulic Engineers



K-water



Korea International
Cooperation Agency



Tokyo City
University



Tropical Marine Science
Institute in Singapore



Water Resources Regulation
Committee in Mongolia



Korea Rural Community
Corporation



Institute of Global
Environmental Strategies



China Institute of Water Resources
and Hydropower Research



Asian Institute of
Technology in Thailand



@qua in France



Global Water Partnership
In Central Asia and Caucasus



UN FAO



Korea Water Forum

5. Special Committees



Strategy & Policy

A system how to convince decision makers to initiate the solutions identified



SWMI

Integrated Water Management
Model Covering the Entire Water Cycle



Standardization

A system to enhance the effectiveness of water
management by introducing global standard



Water-Energy-Food Nexus

Networking place for private sectors
to implement the solutions initiated



Water-Aid Program

A program to aid people in Asia suffering from water
poverty and water disaster



Water Education

A program to disseminate best practices and knowledge
in water, targeting officials in developing nations



Knowledge Base & Dissemination (Asia Water Insight)

A report to allow people to recognize the water status and challenges in Asia

5. Water Project Business Forum

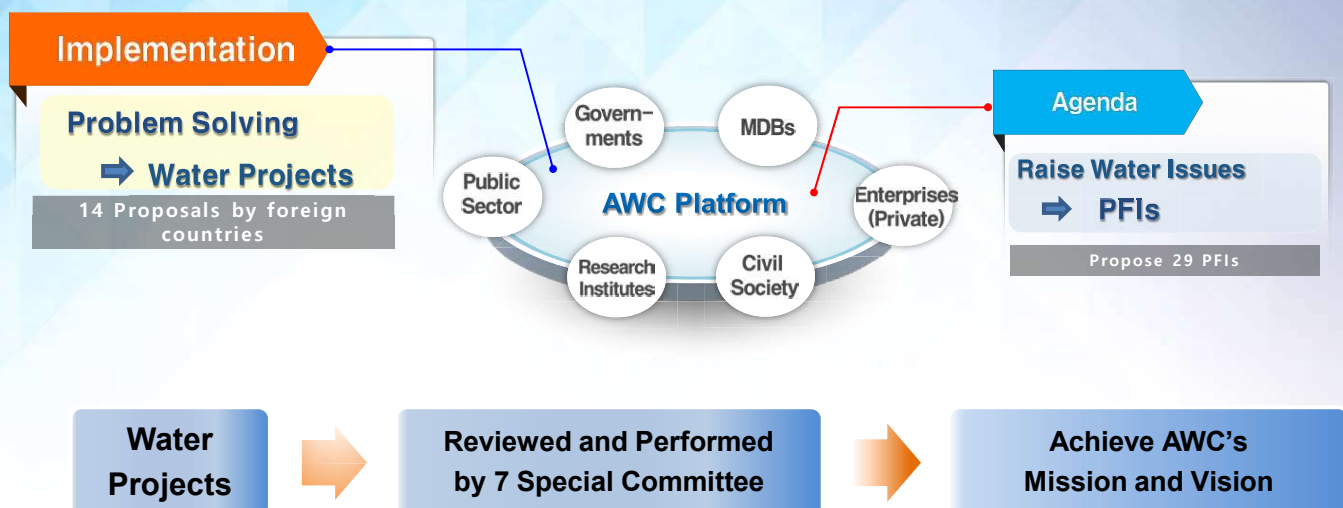
Bringing Solutions to Life



- ✓ The Water Project Business Forum will bring in actors of water solutions including national and local governments, public corporations and MDBs
- ✓ Arena for discussing practical implementation of solutions for issues that will be discussed in the Asia Water Issues and commitments from the Asia to World Statement

Water Project

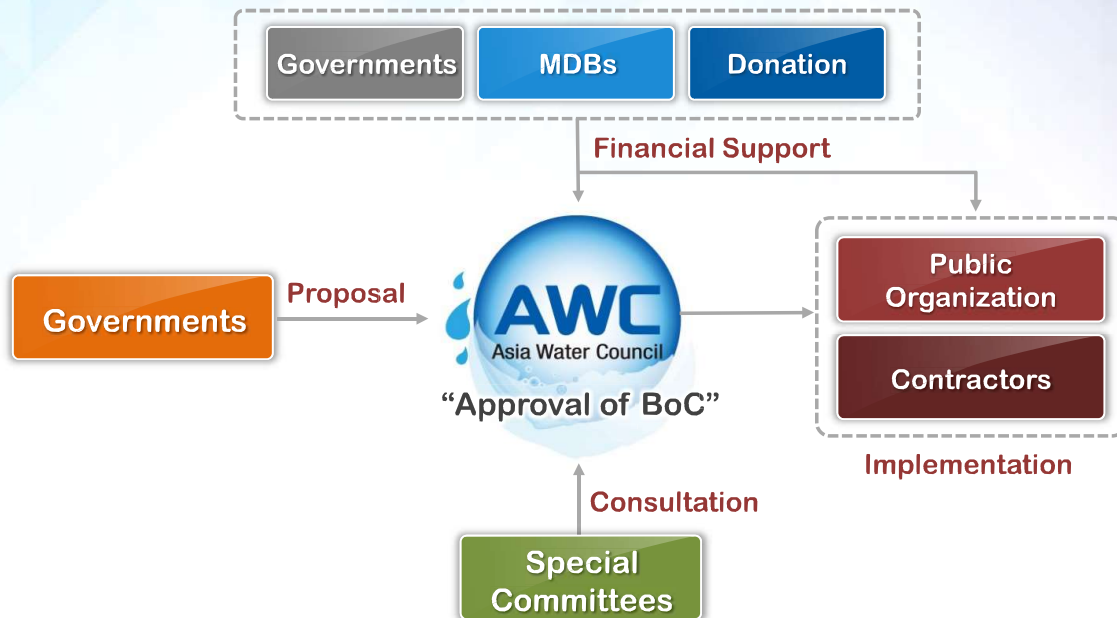
5. AWC's Water Projects



- ✓ Aiming at **producing distinctive and visible results** of the activities of the regional cooperation
- ✓ **Planned and managed in cooperation with AWC's all seven special committees** with their competent members who have insightful knowledge and abundant experiences.

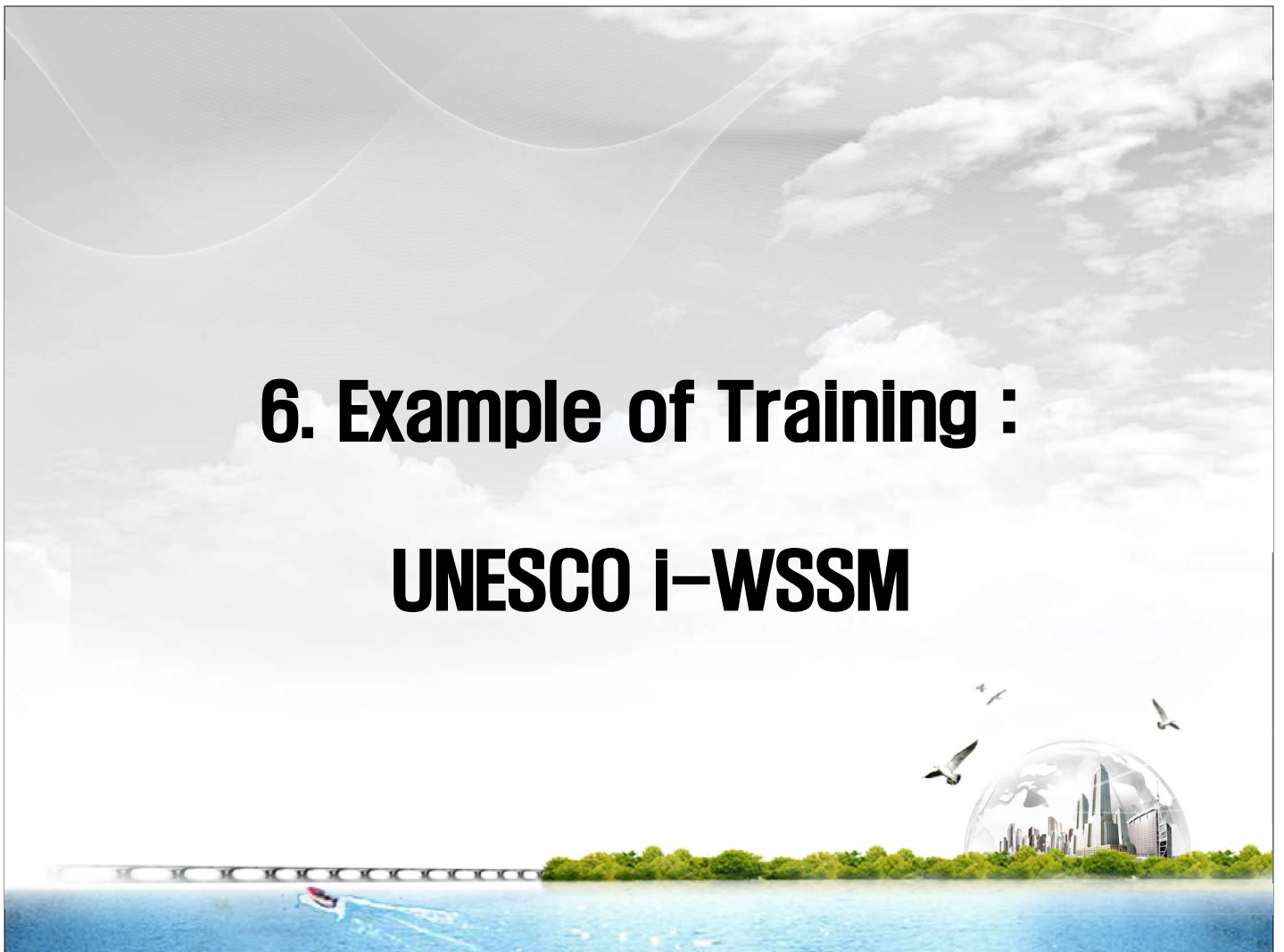
5. Implementation strategy for Water Projects

- ✓ Special committees consist of global competent experts participate the WPs
- ✓ Selecting criteria: Applicability, Implementation management, Expected outcomes
- ✓ Catalyzing challenge acknowledgement, conception and feasibility studies, etc.



6. Example of Training :

UNESCO i-WSSM



UNESCO i-WSSM

International Centre for
Water Security and Sustainable Management under the auspices of UNESCO



6. UNESCO i-WSSM

OBJECTIVES

RESEARCH

Integrated Problem
Solving Research
System



EDUCATION & TRAINING

Case & Field-Oriented
Education & Training
Program



INFORMATION

Globally Networked
Hub for Sharing
Water Information



6. ACTIVITIES

Research Activity



- ✓ 8th World Water Forum side event: "Green Transition for Enhancing Water Security for All" (with WWC, P4G, and Nautilus)
- ✓ Publishing Global Water Security Issues(GWSI)
- ✓ Implementing International Collaborative Study on Water Security & Sustainable Growth
- ✓ Establishment of Integrated Global Water Network Database

Education and Training



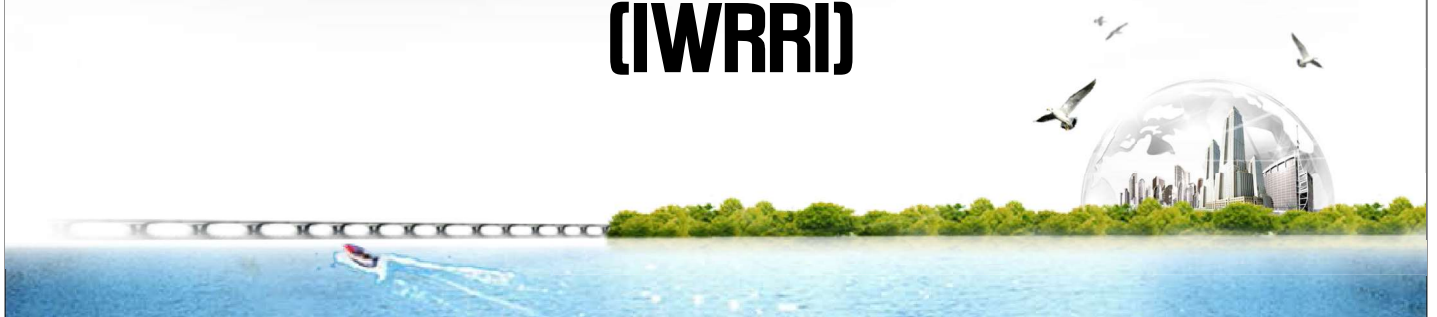
- ✓ Knowledge & Experience Sharing Programme of Korea Water Resources for Central and South American Officials & IDB
- ✓ **Global Technical Exchange** in Floodplain Modeling and Shared Vision Planning (44 participants from Asia, Middle East and Africa)
- ✓ Workshop for Specialist on Smart Water Management in Central Asia
- ✓ On-site Diagnosis Programme for Cambodia

Information Platform



- ✓ 23rd IHP Council Meeting & 26th IHP-AP Regional Steering Meeting
- ✓ High-level international conference "Water for sustainable development", 2018-2028
- ✓ Korea International Water Week 2018
- Promotional Booth and Water education booth for students
- ✓ 11th Korea-Central Asia Cooperation Forum
- an Efficient Use of Water Resources in Central Asia

7. Example of Education and Research: INTERNATIONAL WATER RESOURCES RESEARCH INSTITUTE (IWRRI)



7. VISION AND GOALS OF IWRRRI



Excellent Water Resources Services Provider

- Serving as a **center of experts** in the water resources field.
- **Solving water resource problems**, and providing better education, research, planning and community services.
- **Assisting public and private interests** in the context of conservation, development, and use of water resources.

Professional Training and Collaboration



Research



Planning

Community Service



7. INTERNATIONAL COLLABORATION



Representative of Korea



KOREA WATER
RESOURCES ASSOCIATION

Vice president



Korea National
Committee on Large Dams

Vice president

ICOLD-APG

General Secretary



CHUNGNAM NATIONAL UNIVERSITY The Ceremony of Signing MOU

November 6, 2013

International Water Resources Research Institute



More than 14 world leading institutes from 12 countries



International Water Resources Research Institute (IWRII)

THA2019 CONFERENCE
January 22-25, 2019

INTRODUCTION & VISION

- International Water Resources Research Institute (IWRII) aims to promote education, innovation, leading research, high technology, and public services provided by experts and researchers together with international partners from around the world.
- IWRII signed MOU with 38 institutes and 15 countries since the institute was established in April 2011.

Director : Kwansue Jung (ksjung@cnu.ac.kr)
Vice Director: Minwoo Son (mson@cnu.ac.kr)

Address: Chungnam National University, Daehak-ro Yuseong-gu, Daejeon, Republic of Korea
Webpage: <http://hydros.kr/en/>

HISTORY & ACTIVITY

HISTORY

- 2011. 04 Establishment of International Water Resources Research Institute
- 2012. 7th International Symposium
- 2013. 8th International Symposium
MOU with institutes and research centers of 8 Asian Countries
- 2014. 9th International Symposium
Korean Representative of Global Water Partnership
MOU with National Polytechnic Institute of Cambodia
International Interaction Seminar
MOU with institutes of 4 countries
Establishment of Center for Water Problem of Korean Peninsula affiliated with IWRII
- 2016. MOU with institutes of 1 country
- 2017. 10th and 11th International Symposium
- 2018. 12th International Symposium
Capacity building workshop for ITC of Cambodia
MOU with institutes of 7 countries

ACTIVITY

- 2017 International Symposium (December, 21-25, 2017)
The 11th International Symposium on Climate Change and Sustainable Development in Asia -Water Resources Management and Upstream Monitoring
- 2018 International Symposium (July, 8-12, 2018)
The 12th International Symposium on "Climate Change and UAV Application on Floods and Droughts in Asia Region" and The 2nd China-Japan-South Korea Water Science Research Forum
- Capacity building workshop for ITC of Cambodia (July 30 - August 12, 2019)

RESEARCH

Research Group

Identification of Vulnerable Region in Choryang Creek Basin to Soil Losses by the Relation between Local Slope and Drainage Area

8. Conclusions

Climate change is not the problem of one country but all of countries around world. It means we need to collaborate together to solve the problem. The followings are something we have to think about for effective collaboration in Asia.

- 1. Governance** for effective process
- 2. Education and Training** for capacity building
- 3. Identify and prioritize water problems** to solve the problem
 - Integrating SDG 6 but localizing, Transboundary approach
- 4. Innovative and creative financial strategies** for impletation
 - MDBs, Green Climate Fund, JICA, KOICA, etc
- 6. Not talking and planning any more, but Implementation**

Thank you for your kind attention!

