

# Climate Change Adaptation for Water Resources







# Research Necessities and Goals

## Research Necessities

### Climate Change is Fact

- The earth average temperature has risen 0.76 degrees during the 20th century.
- S & P declares the problem of climate change as a major item of sovereign credit ratings



### Water Resources are more Vulnerable to Climate Change

- Increase in frequency and intensity of extreme precipitation events
- Decrease of available water resources by climate change



### Enlargement of the Water Industry

- The 21 century is the era of blue gold
- The world's water market is expected to reach 1600 trillion, by 2020

293조 원  
대한민국  
한해 예산  
(2010년)



420조 원  
전 세계 정수화  
수자원 개발  
(2010년)



1600조 원  
전 세계 정수화  
수자원 개발  
(2015년 예상)



### Absence of Climate Change Adaptive Skills

- As per climate change adaptation index, Korea is underdeveloped country among OECD members



## Research Goals

### Final Goal

Development of national water resources management technology for climate change adaptation and its utilization to enhance global water resources industry

Flood protection standards and management techniques for hydraulic structures in response to climate change

Integrated system to evaluate vulnerability and establish adaptation strategies in a watershed considering climate change

Climate  
Change Adaption  
for Water  
Resources

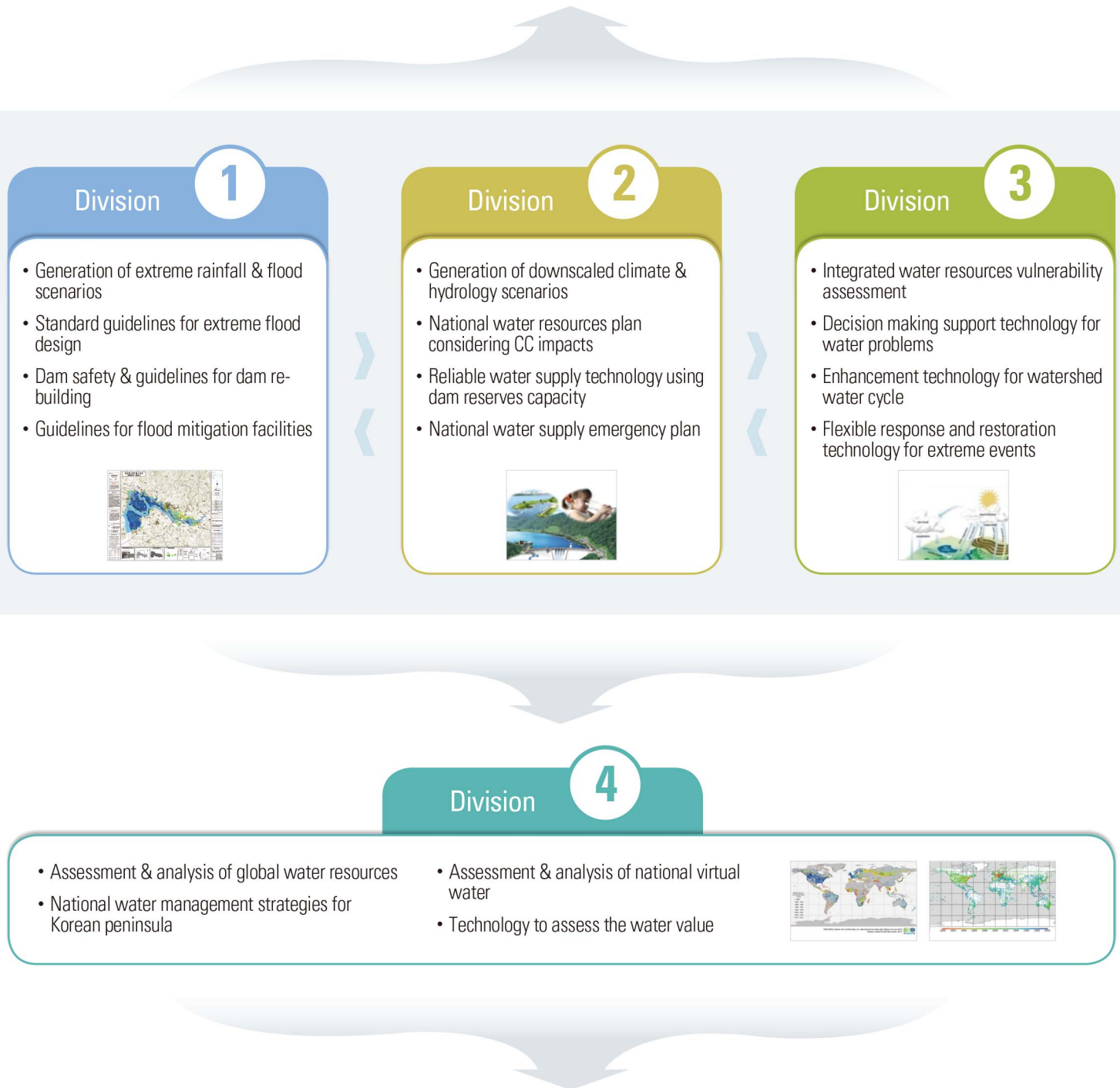
Development of reliable water supply technique in response to climate change

Establishment of system for global water industry to support the domestic construction companies



# Research Contents and Schematic Diagram

## Enhancement of National Water Management Technology for Climate Change Adaptation



## System Development for Global Water Resources Industry based on CC Adaptive Technology





# Step-by-Step Research Contents

Step-by-Step Goals	Development of Climate Change Adaptation Technology for Water Resources (Phase 1)			Utilization and Operation (Phase 2)	
	1 <sup>st</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	4 <sup>th</sup> year	5 <sup>th</sup> year
<b>Division 1</b>  <b>Adaptation Technology for Extreme Floods</b>	Analyzing flood adaptive technology research considering climate change	Dam safety evaluation based on historical observation data	Constructing dam safety evaluation module and system	Developing evaluation technology for dam reconstruction	Developing execution framework of dam reconstruction
	Construction of database for river and watershed with respect to the flood	Evaluation of flood reduction capacity	Development of risk management strategies through flood control assessment	Flood risk assessment and the corresponding application strategies	Building integrated flood vulnerability assessment and response system
	Hydrometeorological data collection at sub-hourly temporal resolution	Generation of extreme climate change scenarios	Analysis of current facilities design standards	Revision of the criteria for extreme flood defense	Proposal of standards through verification and revision
<b>Division 2</b>  <b>Reliable Water Supply Technology</b>	Generation of IPCC AR5 climate change scenarios	Generation of climate and hydrologic scenarios for Korean Peninsula	Analyzing CMIP5 near-term experimental data and evaluating its hydrological usability	Development of a system for generating climate and hydrologic scenarios	
	Analysis of CC adaptation technology for stable water supply and demand	Development of an evaluation module for water supply capacity	Vulnerability assessment of water supply based on scenarios	Development of optimal coupled operation system on water supply facilities	Development of climate change adaptation strategies for water supply
		Development of dam operation model with reserves rate	Application and evaluation on the test-bed	Planning of cooperation dams with reservoirs in response to climate change	Establishment of dam operational standards and emergency plan
		Development of vulnerable assessment technology on water supply	Assessment of potential drought hazard map based on extreme drought scenarios	Development of drought management guidelines	Emergency plan to manage extreme water shortage
<b>Division 3</b>  <b>Adaptation Technology for Watershed Management</b>	Generation of climate and hydrologic scenarios for Korean Peninsula	Development of watershed soundness assessment index	Adaptation of the integrated water resources vulnerability index and construction of the test-bed	Expansion of integrated assessment system	Establishment of watershed soundness assessment system for unit watershed of Korea
	Constructing D/B related to watershed soundness assessment	Integrated water resources vulnerability assessment	Development of decision making support technology considering uncertainty	Verification of the effects for materialization of society	Design and expansion for effective materialization of society
		Development of technology for watershed water cycle	Software development and field application	Expansion of the test-bed	Guidelines and commercialization for improvement of watershed water cycle
		Prediction technology for Ecology, soil erosion and turbid water	Pilot operation for reduction of soil erosion and turbid water	Expansion of echo-hydrology, bed changes and soil erosion	Proposing eco-hydrological basin management plan
<b>Division 4</b>  <b>Adaptation Technology for Water Industry</b>	Construction of global D/B for water resources	Establishment of global land surface model	Establishment of water availability for each country	Development and evaluation of hydrologic analysis model	Development of information system for global climate/ hydrologic components
	Investigating climate change adaptation technology of water resources industry	Construction of North Korea water resources D/B	Analysis of climate change impacts on water resources in Korean peninsula	Analysis of climate change vulnerability on water resources in Korean peninsula	Development of execution framework for North Korea water resources adaptation
	Building a global water resources network	Analysis of characteristics for virtual water use	Analyzing usage of virtual water in Korea	Analyzing effects of introducing virtual water on water resources industry	Creating water resources industry strategy report based on climate change
		Development of technology for humanistic, social and economic valuation	Estimation of total water resources value in South Korea	Executing valuation of water resources with respect to climate change	Adaptation based on available future water resources





# Expected Outcomes

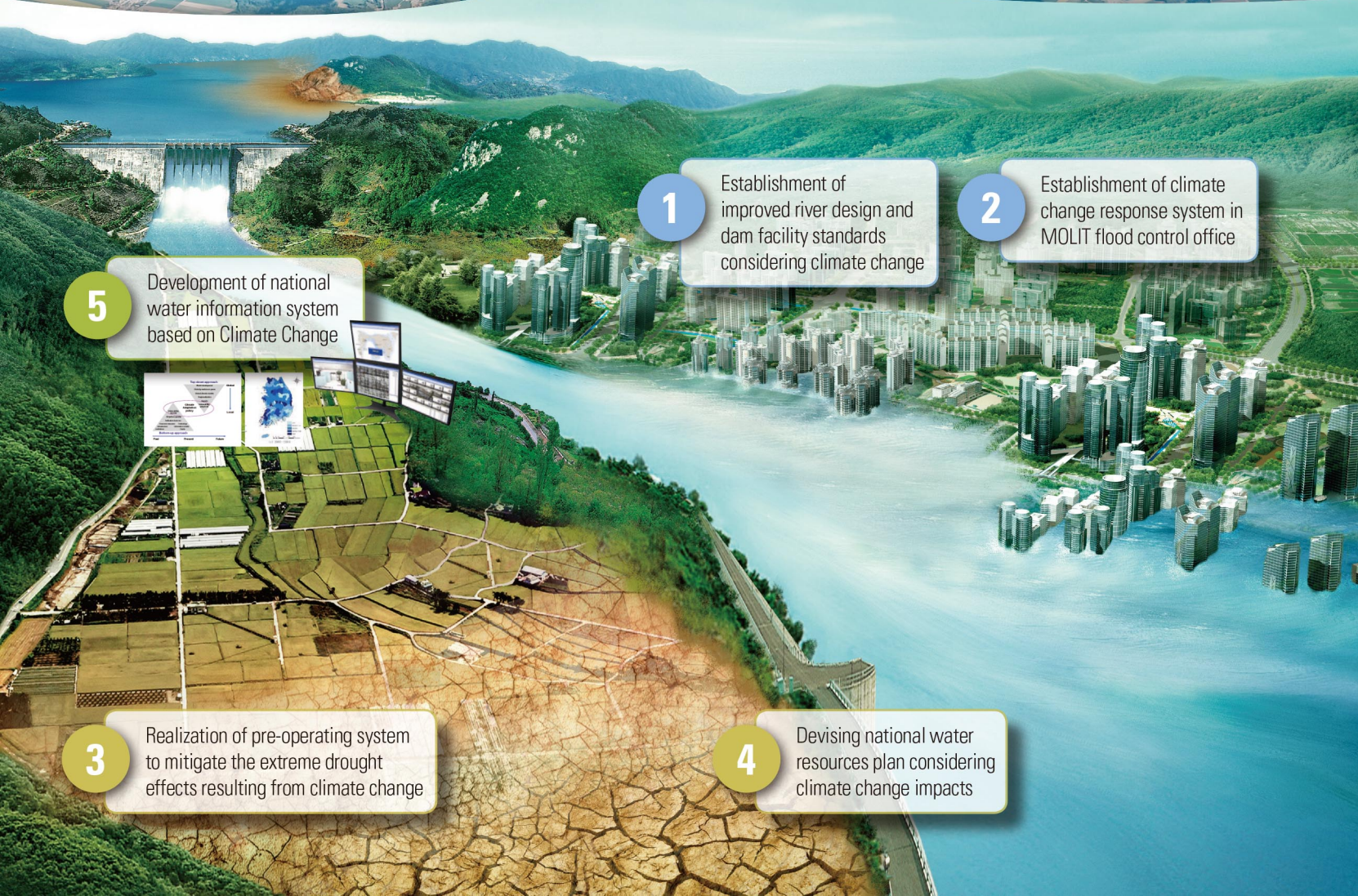


6

Global Atmos./ Surface  
/Hydro./Ground D/B

7

Establishment of system  
for global water industry  
to support the domestic  
construction companies



1

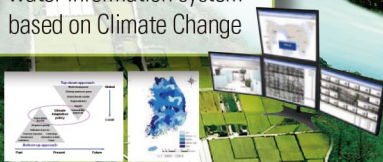
Establishment of  
improved river design and  
dam facility standards  
considering climate change

2

Establishment of climate  
change response system in  
MOLIT flood control office

5

Development of national  
water information system  
based on Climate Change



3

Realization of pre-operating system  
to mitigate the extreme drought  
effects resulting from climate change

4

Devising national water  
resources plan considering  
climate change impacts





# Expected Effects and Utilization

## Expected Effects

- **Technical** : Climate change adaptation technology improvement compared to the current leading countries 53~70% → 80~88%
- **Economic** : Response to climate change adaptation strategy with minimum cost
- **Social** : Ensuring water safety through climate change adaptation

## Utilization

