Securing Water for All

Asia Water Week 2013

13–15 March • ADB Headquarters, Manila, Philippines

Researches on Smart Water Grid

CHOI, Gye Woon |Professor, University of Incheon, Korea

| Managing Director of National SWG Research Group

Contents

BASIN

1. Background of Smart Water Grid

1.1 Background In terms of water industry

1.2 Background changes on water resources

1.3 Background ICT based fusion water industry

BASIN

1.1 Background of SWG (in terms of water industry)

- **Requrement of stable-secured water resources to counter Climate Change & Urbanization**

Now AS-IS
- Secure additional source
- Enlarge facilities

Future AS-IS
- Alternative water resources
- High efficiency distribution

- **Stable supply of necessary water quantity and quality**

Now AS-IS
- Simple and lumped system
- Unique treatment system

Future AS-IS
- Distributed water supply
- Connected and user specified system

BASIN

1.1 Background of SWG (in terms of water industry)

Low energy consumption and High efficiency water resources facilities

Now AS-IS

- Too much water loss due to leakageEnlarge facilities
- Too much energy consumption for production and transportation

Future AS-IS

- High efficiency and High efficiency distribution
- Smart supply system

Paradigm Change of Global Water Industry

Now AS-IS

- Industries of separated process

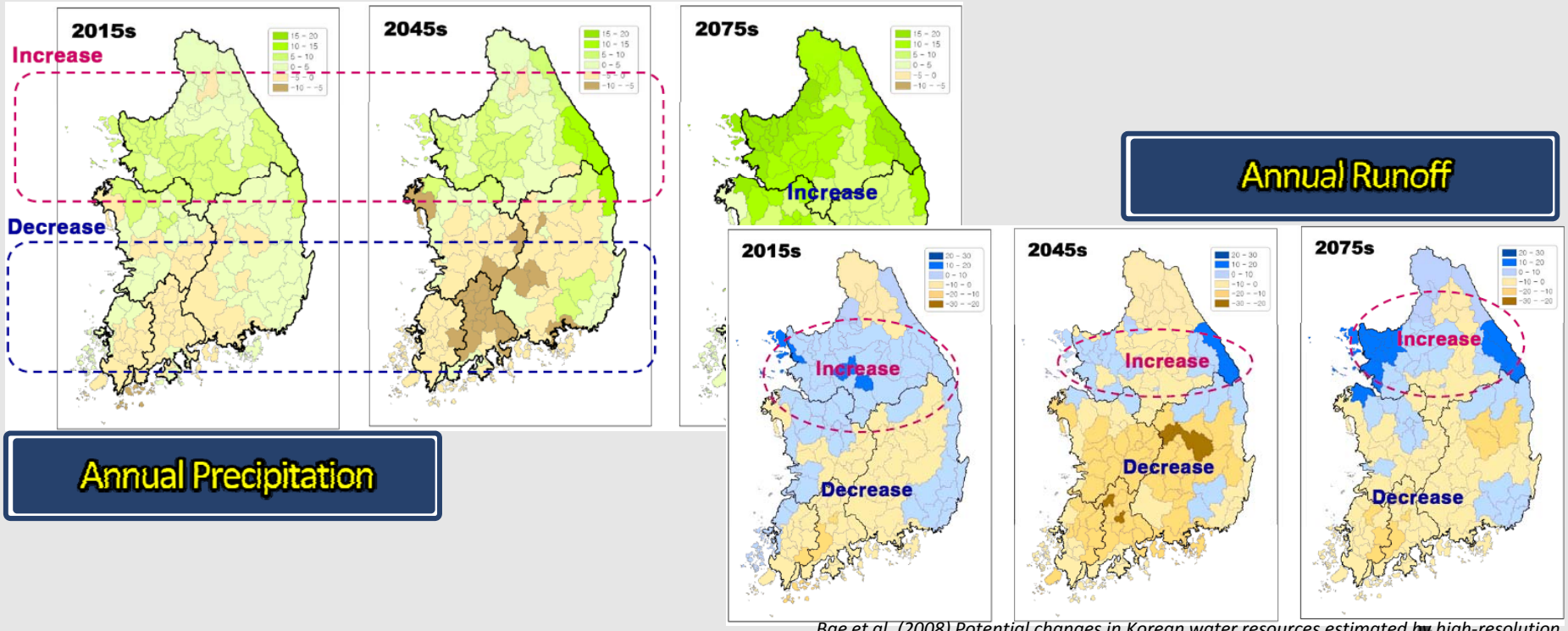
Future AS-IS

- Adapting ICT technology in water industry

ASIN

1.2 Background on SWG (changes on water resources)

Climate Change Impact on National Water Resource



Bae et al. (2008) Potential changes in Korean water resources estimated by high-resolution

- Central part - precipitation increases, Southern part - precipitation decreases
- Rainfall probability increases due to local flash rainfall
- Drought area and drought intensity is increased continuously

BASIN

1.3 Background of SWG (ICT based fusion water industry)

- SWG Industry : ICT industry and infrastructure industry fusion in water industry
- SWG Technology : Integrated technology which will lead future water industry

Smart

Incubating ICT Industry

- Self-monitoring Technology
- Observation & Control Program Development and Operation Security & Communication Technology

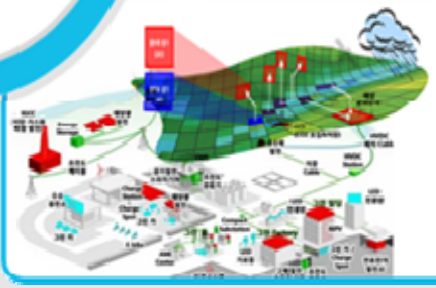
SWG

Water

Incubating Water Industry

- Overcome limitations of water resources and quality (f
- Secure and treat alternative water resources

Grid



Incubating Infrastructure Industry

- Network technology for water supply Interfacing and total technology

2. National SWG Research Project in Korea

2.1 Introduction

2.2 Budget

2.3 Outline of Research Contents

2.4 Research Contents

2.5 Expected Outcomes

BASIN

2.1 Introduction

Project name : Smart Water Grid (SWG) Research Group

- Supervision : Ministry of Land, Transport and Maritime Affairs (MLTM)
- Type : Research Project of Water Management
- Main Organization : Univ. of Incheon, Korea with involving from 50 institution

Vision : The best country on Water Welfareness until 2020

- Final Goal : To Establish ICT based water management infra-system with high efficiency
- Budget : Total 30 Million USD (20 Million USD from Gov.) during 4 research years
- Period : 26th of July, 2012 – 25th of July, 2016 (4years)

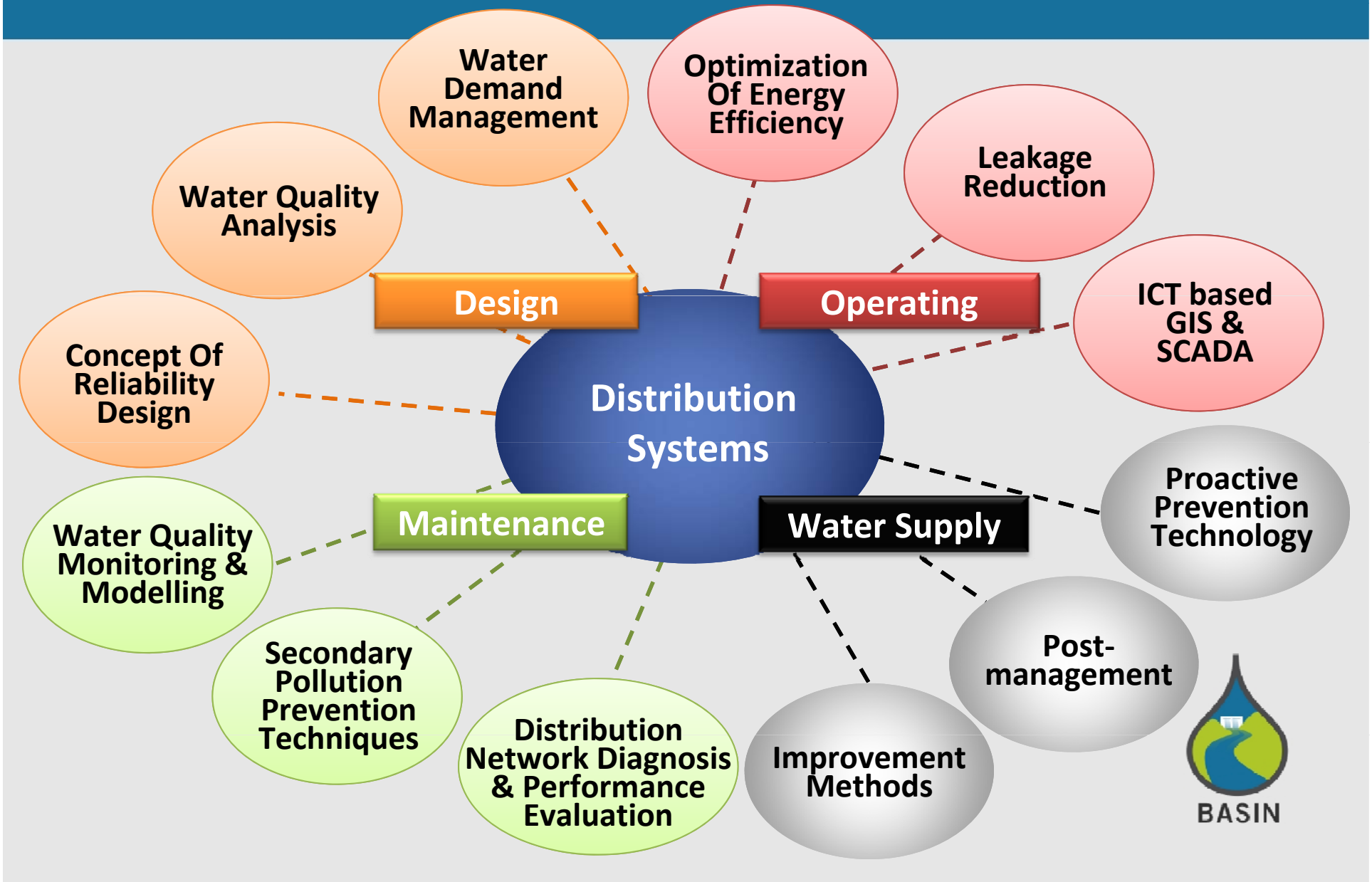
2.2 Budget

Total 30 Million USD (20 Million USD from Gov.) during 4 research years

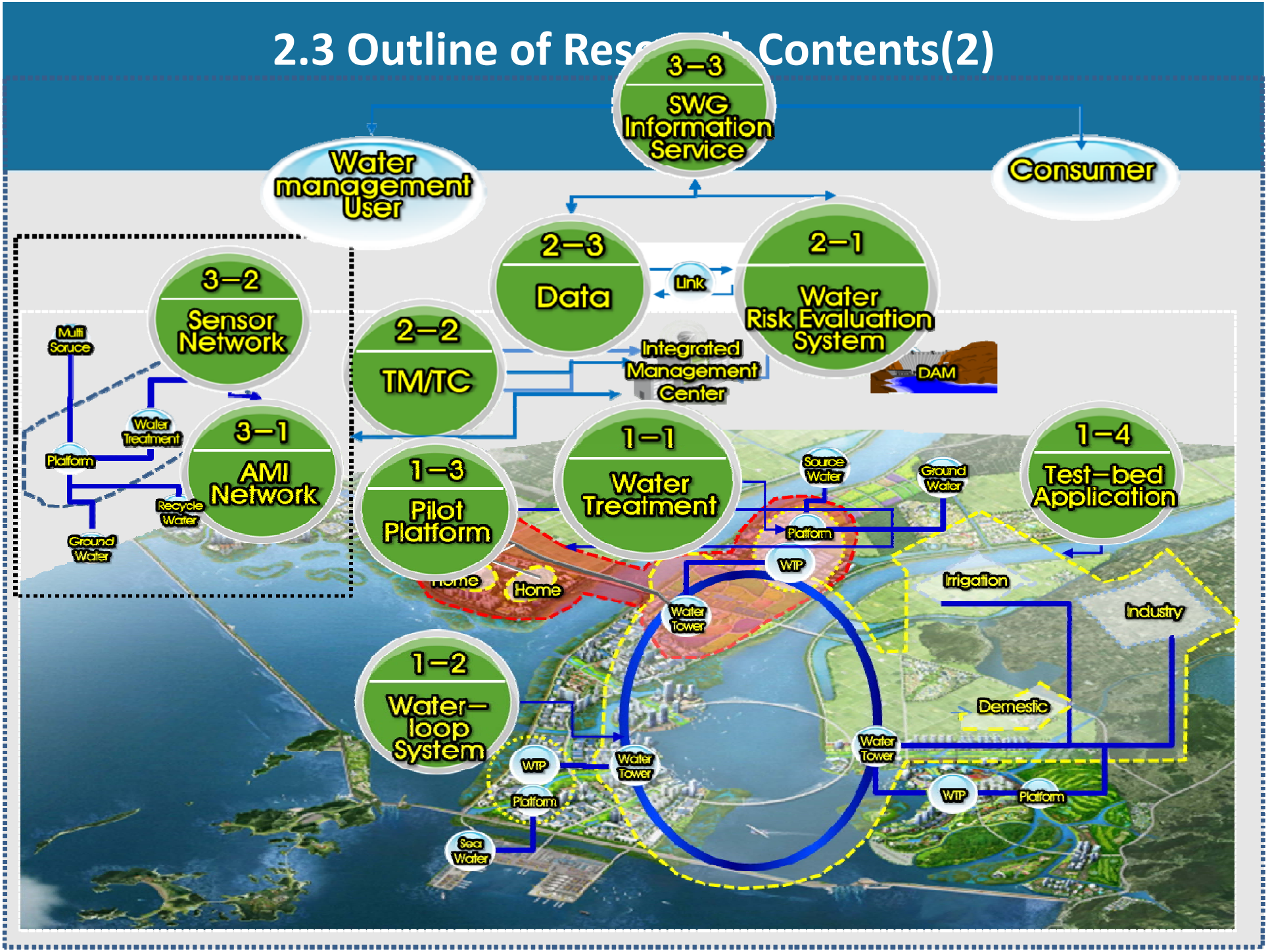
(Unit: 1,000 ₩ which is approximate 1 USD)

Research Year	Investment from Gov.	Matching fund			Total
		Cash	Goods	Sub-total	
1st year	471,000	24,000	150,000	174,000	645,000
2nd year	6,500,000	415,000	2,179,000	2,594,000	9,094,000
3rd year	7,430,000	446,000	2,416,000	2,861,000	10,291,000
4th year	8,379,000	479,000	2,667,000	3,145,000	11,524,000
Total	22,780,000	1,364,000	7,412,000	8,774,000	31,554,000

2.3 Outline of Research Contents(1)

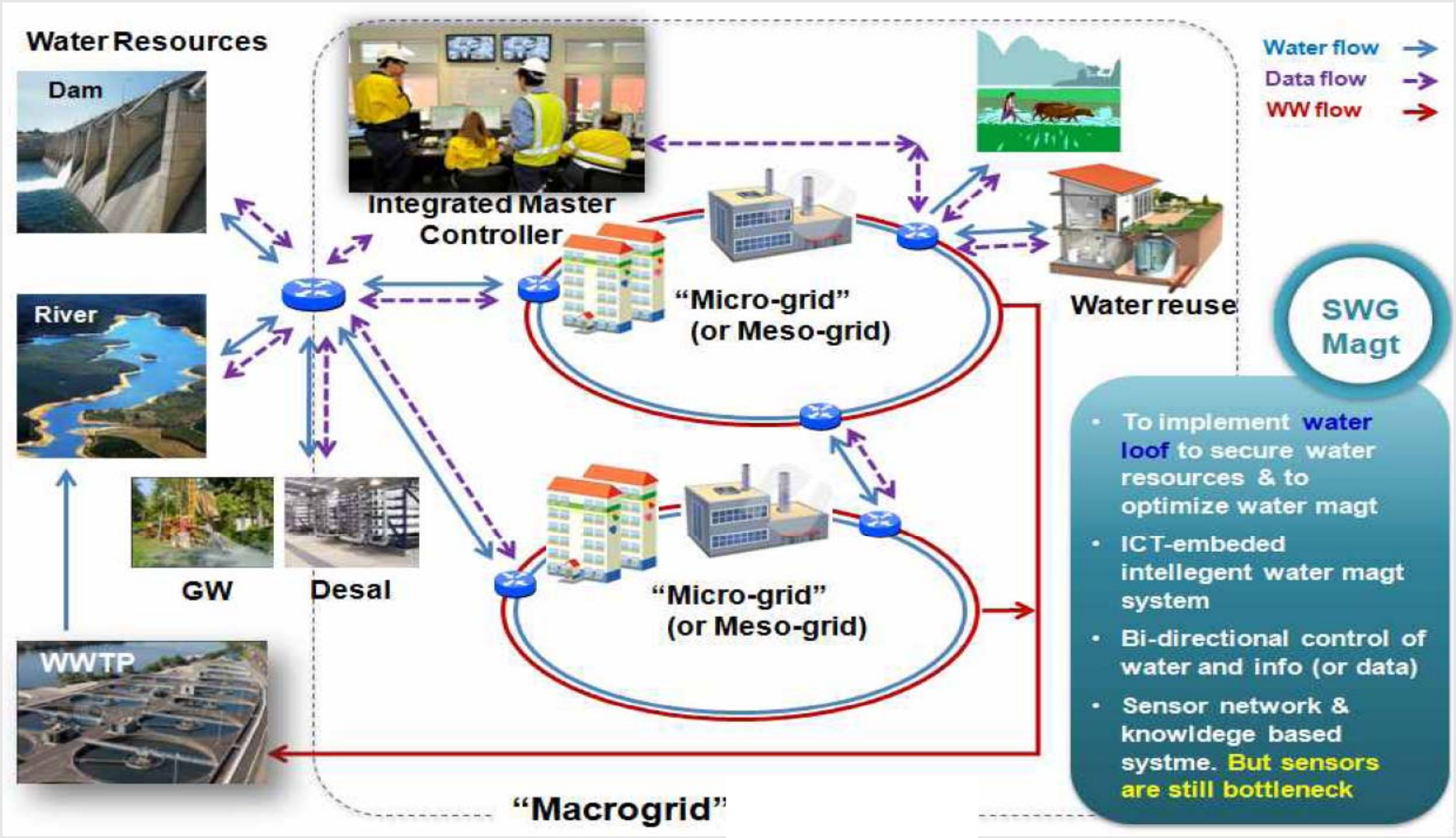


2.3 Outline of Res Contents(2)



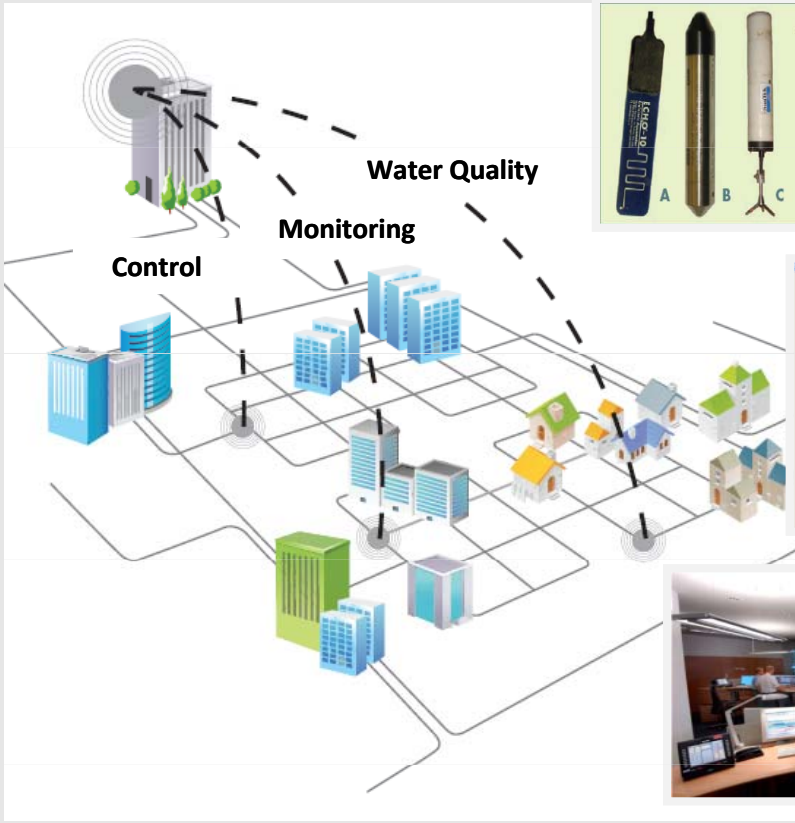
2.4 Research Contents(1)

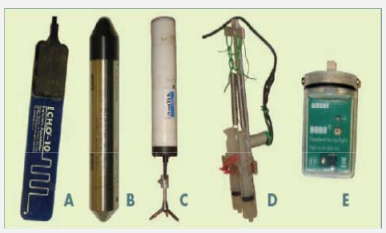
Blending Platform



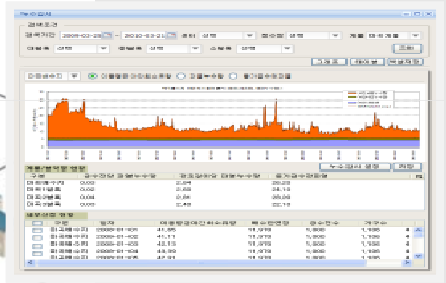
2.4 Research Contents(2)

Monitoring & Control using ICT Technologies





Pipe Network
High-Tech Sensors



Automatic Detecting
And Real Time Data
Analysis System

Integrated Operation
System
(For Emergency)

BASIN

2.5 Expected outcomes (1)

D/B & Programs

- SWG Information Management D/B
- SWG Decision-making (DSS) for a unified integrated operating program
- SWG T/B for applying design program
- State and the city's water shortage assessment program
- Remote monitoring and control program
- Water information services program
- Water Loop operating program
- Fully designed water treatment program

Apply the selected combine packages to the targeted areas:
(National, regional, and country size)

BASIN

2.5 Expected outcomes (2)

Technical Design & Guidelines/Manuals

- Usage of technology components during the construction phase
- Decentralized / centralized water loop operating technology
- Water supply due to climate change impact assessment
- Verify the efficiency of facility(water supply and demand)'s automation and commercialization
- Water supply control automation HW
- For water resources monitoring and management, and on-site sensor adaptive self-supporting high-performance
- Low-powered, compact, lightweight, multifunction smart multifunctional gauge

- Overseas Exporting Micro Smart Water Grid Package Product

SIN

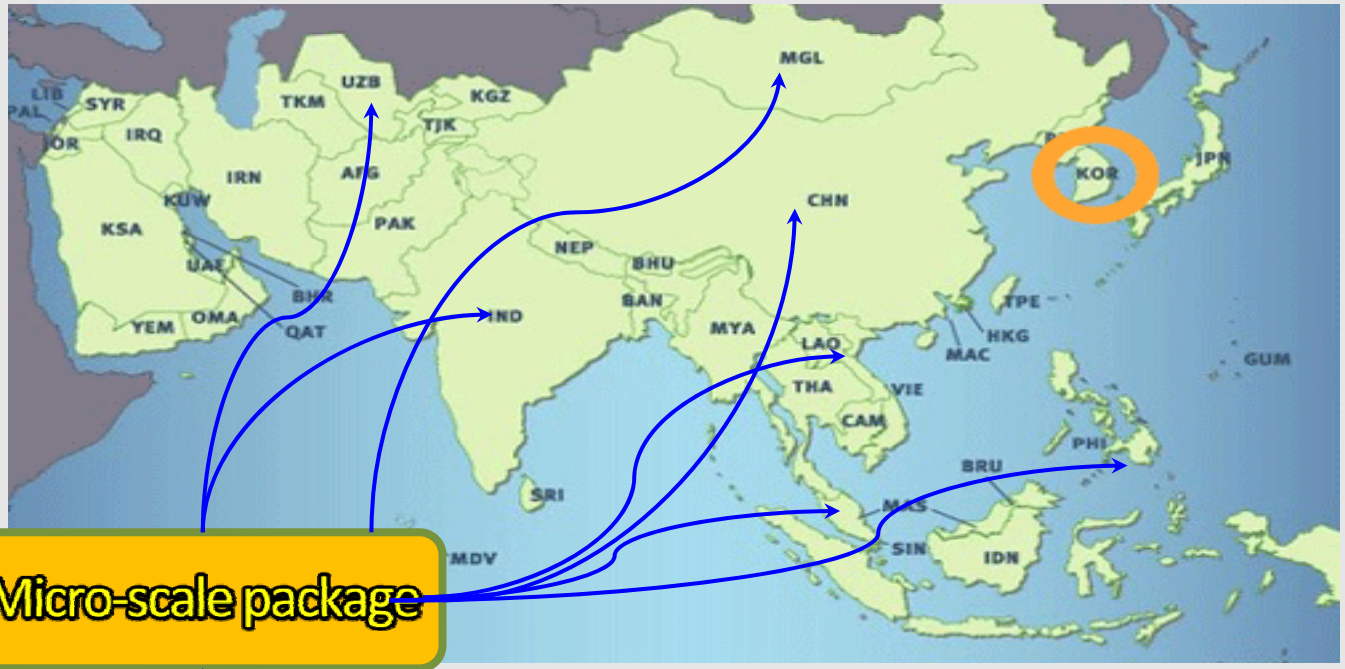
2.5 Expected outcomes (3)

Target package for each scale

Integrated Control Center	Integrated Center	Control Room
-Centralized control utility program package - Macro-scale process (whole) - Macro-scale water loop	-Integration centers for the program package -Meso-scale processes (whole) -Meso-scale water loop	-Control utility program package -Micro scale processes (whole) - Micro scale water loop

2.5 Expected outcomes (4)

Business package for Application in Asian Water Market



- Micro Program Package
  - Micro SWG D/B
  - Decision-making
  - supply and demand reduction assessment
  - Water treatment
- Remote monitoring and control technology
- Water production /distribution process
- Water Information Service
- SWG sensors and instruments

BASIN

3. Summary

BASIN

3. Summary(1)

Water has a direct impact on food, energy and economic growth security challenges, which the world economy will face in the future.

- And in order to have **proper management** and use of water resource, we have to understand the **complex relationships between climate change, water and energy** is critical in order for governments to put in place effective and efficient water and energy management policies

- It is important to note that ICT has an enabling role in the implementation of smart water management policies.:
  - ✓ It can bring enormous benefits to water authorities in terms of:
    - i. **mapping and monitoring** of natural water resources, aquifer recharge
    - ii. **forecasting** river flows
    - iii. **advance warning** in water related emergency situations such as flooding.

BASIN

3. Summary(2)

- The use of **sensor networks** and **Internet communications** combined with **GIS** tools will be having an important role in the future as it enables **efficient management** of:
  - **water distribution network**
  - **water quality** in agriculture and landscaping sectors where it can reduce water consumption and wastage.
- **Smart metering** technologies will play an important role in:
  - **measuring water consumption** in real time,
  - **identifying leaks** at the consumer level
  - getting consumers more conscious about their **water usage**.
- **SMART Water** has a lot of potential to offer to water authorities for the future and could be **new standardisation for water management** for the governments.
- Furthermore, the applied technology can compare well with the actual place according to its own specificity, the **Micro-scale** package will also be applied in the **developing countries**.

BASIN