Smart Water Management :

Its application and case

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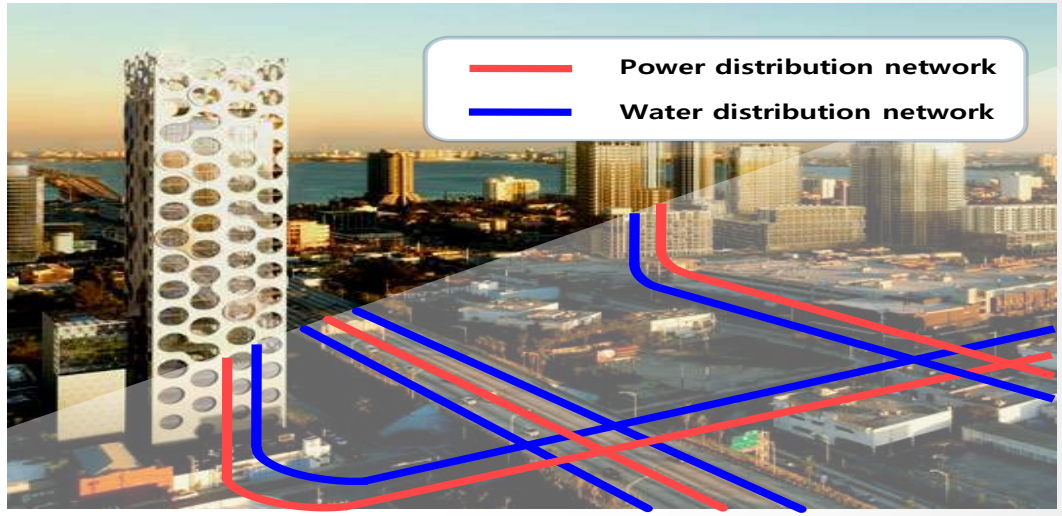
Water & Energy : Indispensable Resources for Human Beings

Water and energy are essential to our daily life in many ways.
Accordingly, fundamental infrastructures such as water and power distribution networks are crucial. Without them, there will be no civilization.

Water Energy



Source: J. Kim (2011)

Water Problem

5.3 billion

The number of people - two-thirds of the world's population - who will suffer from water shortages by 2025.

1.1 billion

The number of people worldwide - 1 in every 6 - without access to clean water

Climate Change : Another threat

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Climate change will cause three major crises in:

- Water security / Energy security / Food security

Climate Change

Water Security

Energy Security

Food Security

Introducing a new paradigm of water management combining advanced technologies such as ICT

Water and Energy Issues: How to Solve?

The world will need 55 percent more water and 70 percent more energy by 2050 to meet the demands of its growing population. To solve the energy crisis, the concept for "Smart Grid" has been developed.
But what about water crisis?

Energy Crisis

Water Crisis

Smart : Main Keyword in the 21th century

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Source: Frost & Sullivan

Smart Water Management

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Rapid changes in water industry paradigm and smart technologies

Present

- Single water source (dam or river)
- Long-distance & centralized management
- Concept of water hunting
- Government led (top-down)
- Stable & safe water supply
- Water source → Water pipe network → Customer
- Unit technology, offline

Future

- Multiple water sources (rainwater, underground water and sea water)
- Short-distance & decentralized management (urban unit, independence ↑)
- Concept of water cultivation
- People led (bottom-up)
- Clean water
- Water source ↔ Water pipe network ↔ Customer
- Fusion/conversion technology/real-time

Need for more scientific & smart water management

Smart Water Management

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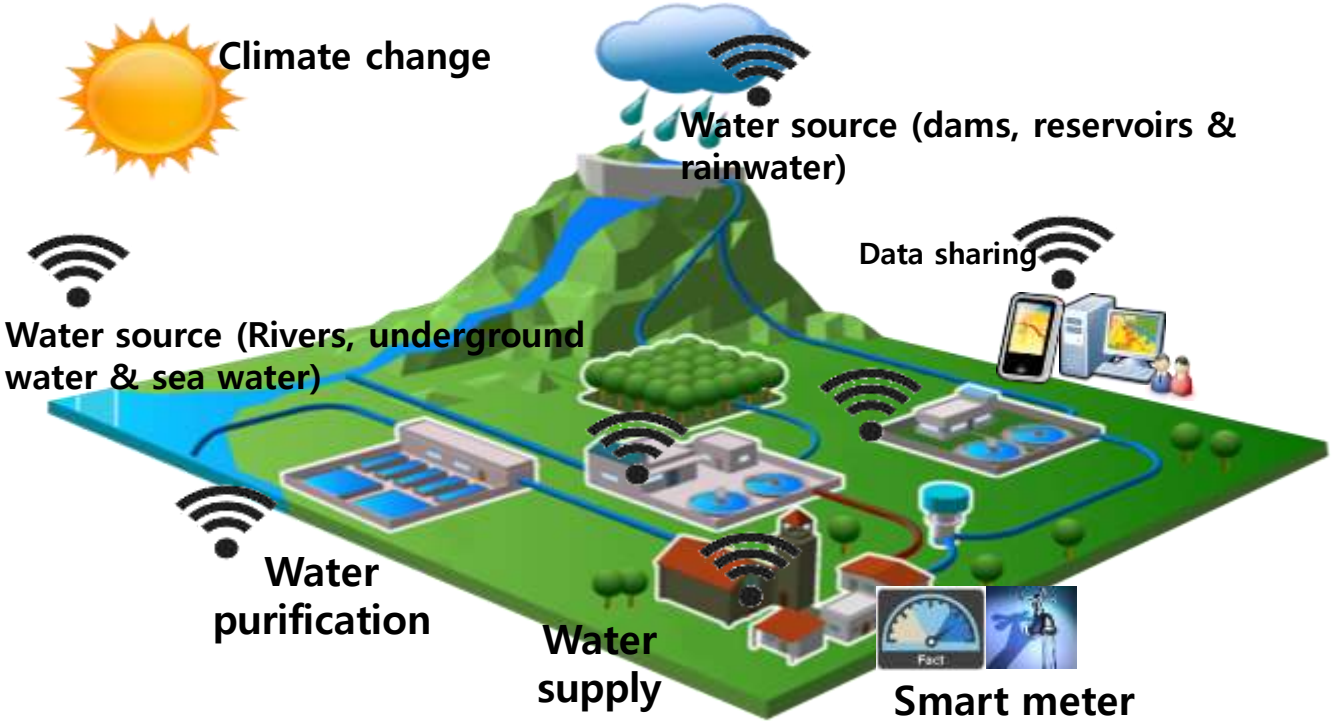
A total water management system that combines the qualities of previous systems with high-tech information and communication technologies to intelligently manufacture, distribute and manage water in real time as well as share information with customers.

Smart - Intelligent, ICT

Water Management



Dealing with climate change, resolving imbalanced water resources, & realizing water welfare

Seosan City Pilot Project (1)

Overview of Seosan City

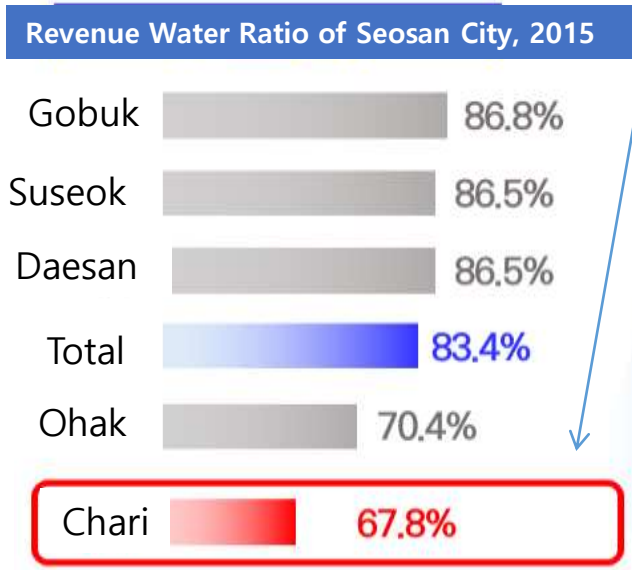
Status of Water Supply

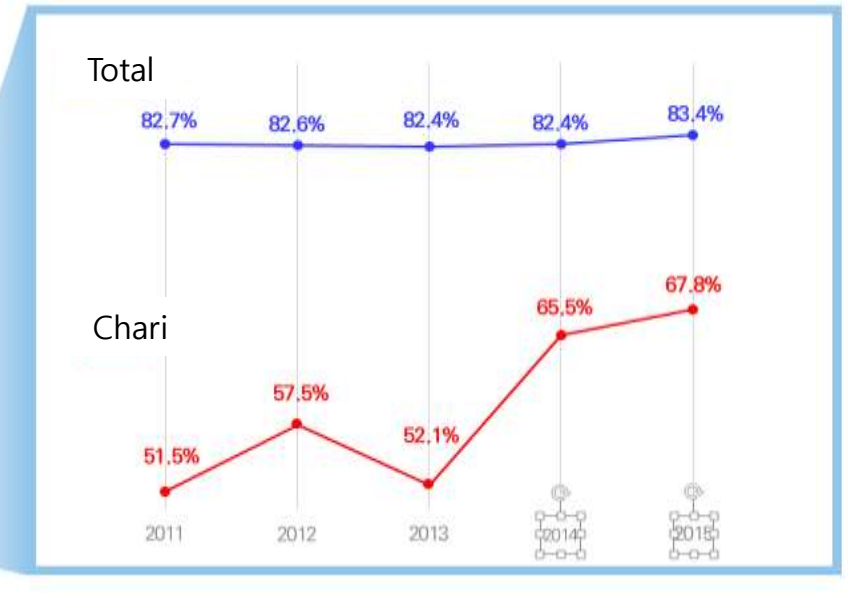
- Source : **Boryeong Dam Water** (80,700㎥/day)
- Supply population : 157,000ppl(Supply rate 91%)
- Supply/day : 50,300㎥/day

Status of Facilities

- Pipelines : 2,041km
- 10 Reservoir, 23 Booster stations
- 21,429 faucets

※ Additional 58 Village Supply Systems





Seosan City Pilot Project (2)

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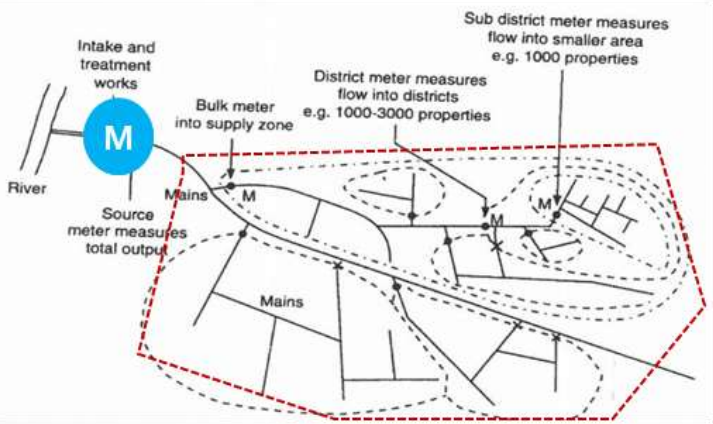
Construct 3~5 sub DMA in 1 DMA & Install smart meters

As-Is

- Flow rate & pressure mgmt. by 1 DMA

(1 Flow™ + general meter for customer)

- 500 ~ 1500 customer/DMA
- Monitoring Only 1 MNF
- NRW mgmt. by month

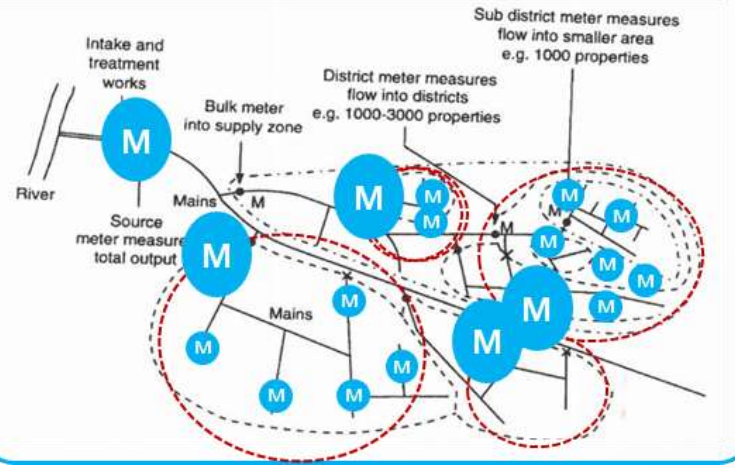


To-Be

- 1 DMA + 3~5 SDMA

(1 Flow™ +3~5 SM+ SM for every customer)

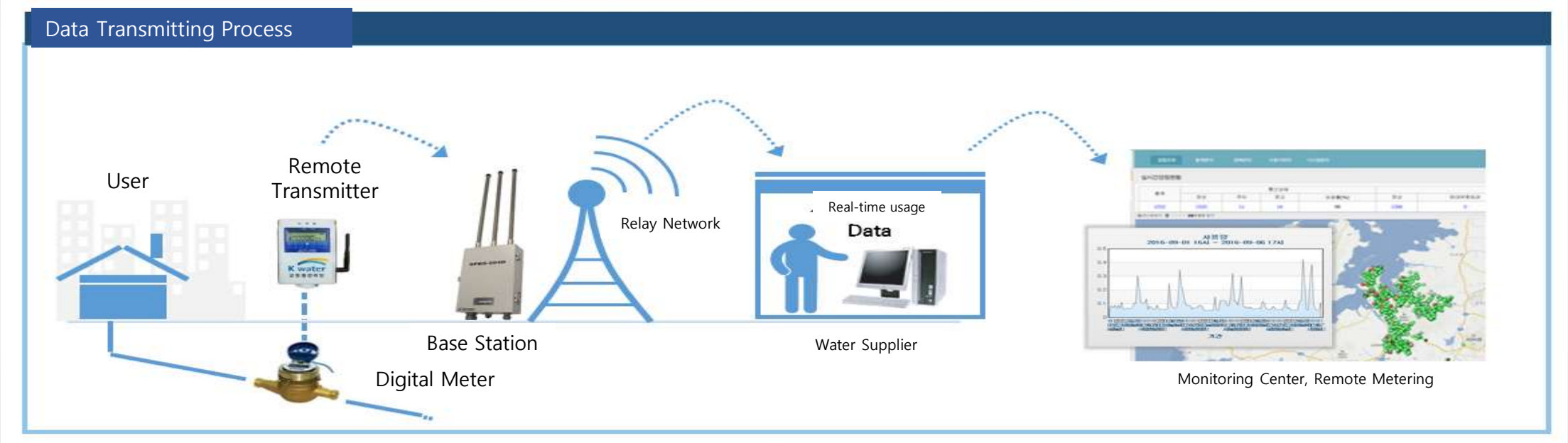
- about 300 customer/SDMA
- Hourly base monitoring by SDMA
- Daily base NRW mgmt.



Seosan City Pilot Project (3)

Smart Metering System

A Technology transmitting water usage data of consumers through Digital Metering and Informational Communication Technology on a close to real-time basis instead of manual metering.
The system enables remote metering and leakage detection



✓ Metering data is collected hourly, sent 4 times a day

✓ Several options including a paging network can be suggested based on telecommunication conditions

Seosan City Pilot Project (4)

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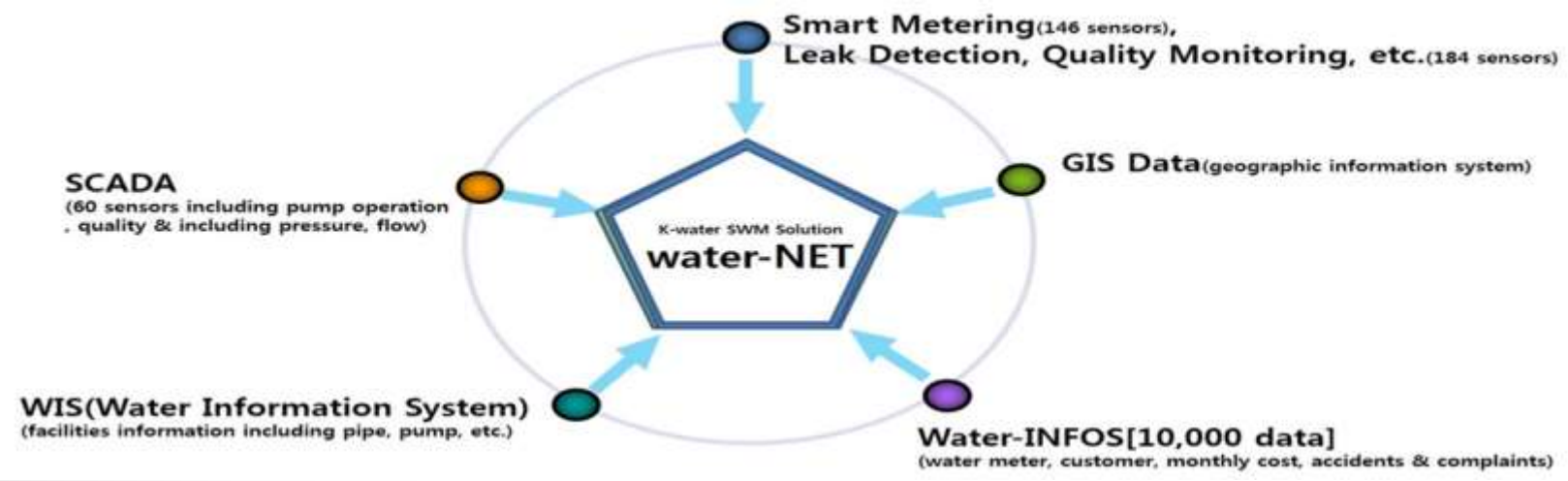
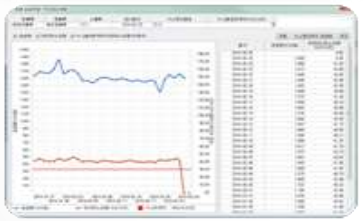
Smart Solution : water-NET, K-water's key tool to manage water networks

✓ Network analysis, leakage, NRW, pressure, risk & quality mgmt.
based on approx. 110,000 real-time data from SCADA, GIS, Etc.

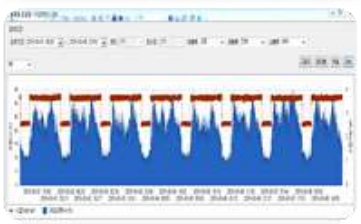


Network Analysis



Leak Monitoring

NRW Mgmt.



Pressure Monitoring

Risk Mgmt.

Water Quality Mgmt.

Seosan City Pilot Project (5)

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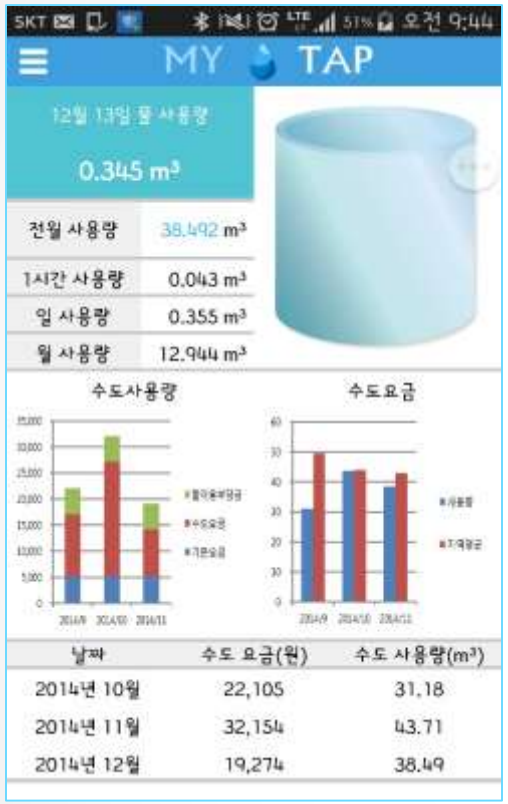
Smart Services : Mobile Applications

Water Diary



To inform hourly & daily water usage, fares, etc.

Water Care

To show water quality at main points in the water supply network

Water Community

To manage bi-directional notices & a complaint board

Outcomes of SWM (1)

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Leakage detection and analysis (Leakage inspection focusing on 3 small DMAs, 7 leakages repaired)

Revenue ratio	A1	A2	A3	A4	A5	A6
'16.July	87%	73%	92%	84%	58%	50%
'16.Aug.	89%	86%	91%	87%	69%	78%
'16.Sep.	95%	90%	88%	97%	88%	89%
Effect		↑ 17% Repair 3/3			↑ 30% Repair 2/2	↑ 39% Repair 2/2

Minimum flow during night of A5 DMA

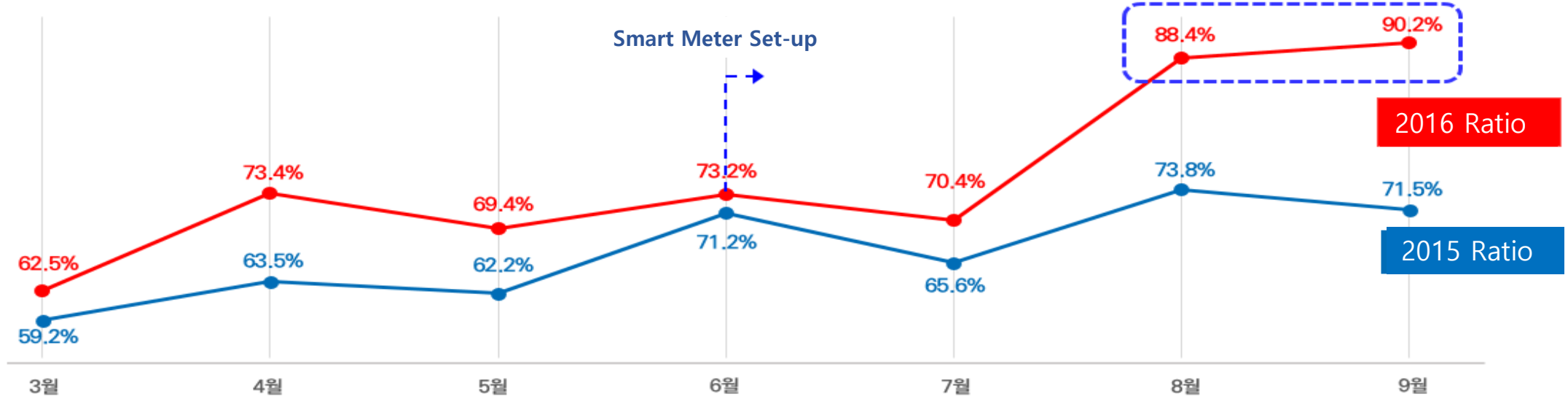
Minimum flow during night of A6 DMA

Outcomes of SWM (2)

Revenue Water Ratio has been improved to 90% after applying Smart Metering in June, 2016.
(Increased by 20% compared to first half of 2016, by 19% compared to the same month of the previous year)

Comparison of the Revenue Water Ratio of Chari region, 2015-2016

Ratio	March	April	May	June	July	August	September
2015	59.2%	63.5%	62.2%	71.2%	65.6%	73.8%	71.5%
2016	62.5%	73.4%	69.4%	73.2%	70.4%	**88.4%**	**90.2%**
Improvement	3.4%	9.9%	7.2%	1.9%	4.8%	↑ 14.6%	↑ 18.7%



Basic Concept of SWM

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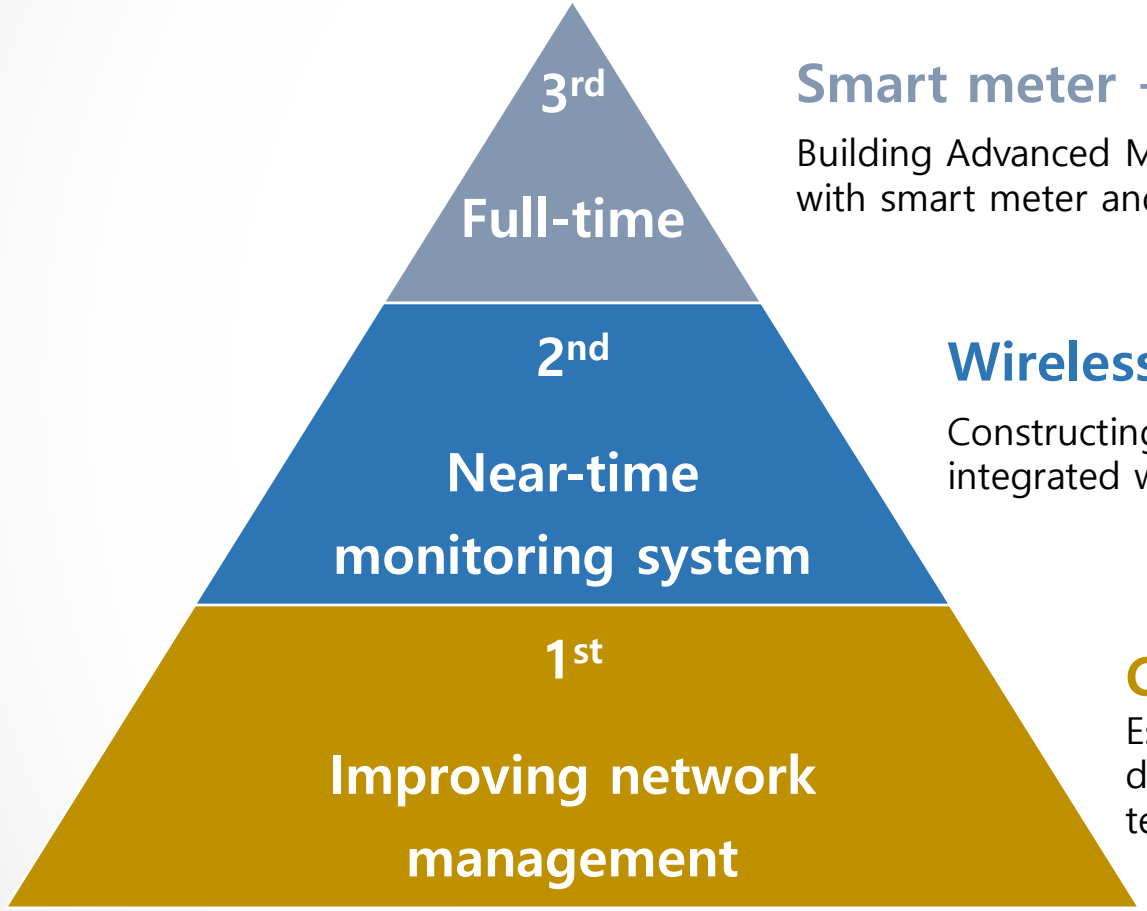
Suggesting 3-step Framework for other Countries



Smart meter + User Interface

Building Advanced Metering Infrastructure with smart meter and pressure meter

Wireless Sensor + User Interface

Constructing near-time monitoring system with integrated wireless sensors in DMA

Construct DMA(&flow meter)

Establishing DMA(District metered area) and digitalize main data of water network with a technical training and support program

1st Step

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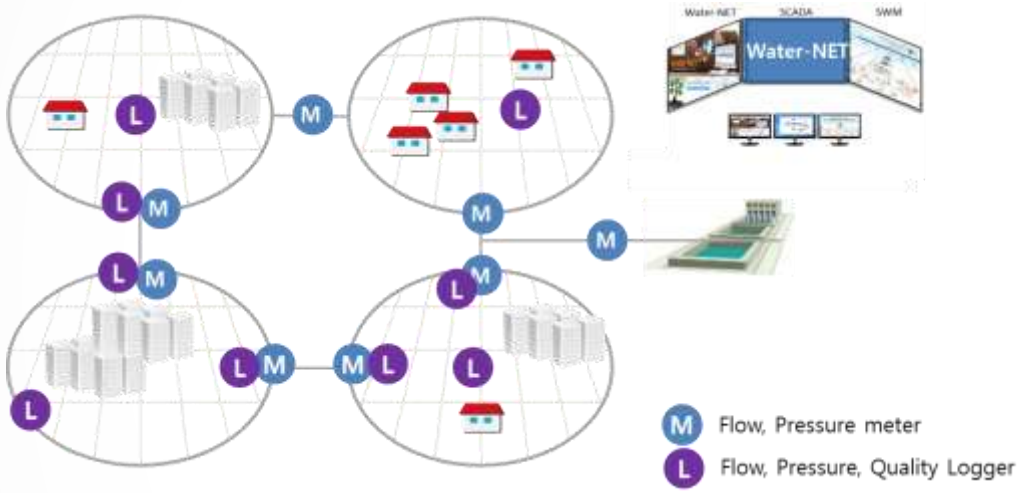
Focus on countries operating basic facilities

Improving network management



Establishing **DMA** and building a **water network model** and **D/B** by digitalizing data

Installing minimum meter(logger type) and sensor considering technical and economical issues in local area

Co-work with local engineer with the **technical training and support program**

Main Objective of 1st Step

Water network analysis, Monthly NRW management(water audit)

2nd Step

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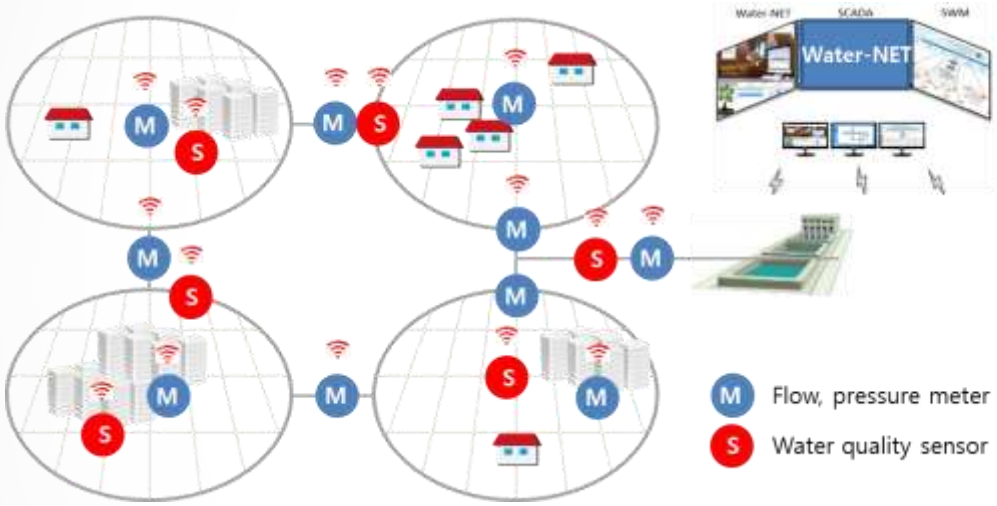
Focus on countries requiring operation system for sensors

Near-time monitoring system



Upgrade water network with **wireless sensors and meters**

Install more meters and water quality sensors at main pipe and big customer

Operating **monitoring system** based on **near-time**(hour interval) for low power design

Main Objective of 2nd Step

Water network analysis, Daily auto leak detection with minimum night flow analysis

3rd Step

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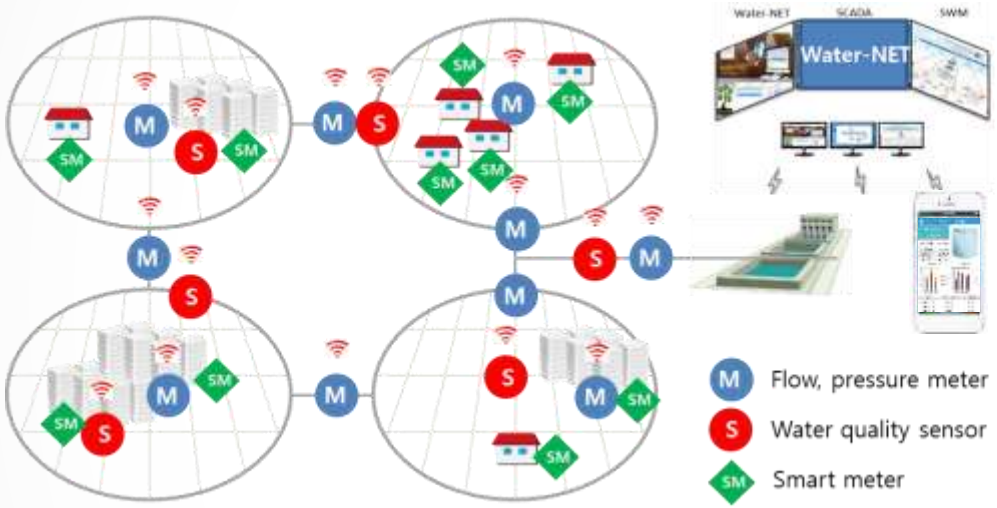
Focus on countries requiring SWM with smart meter

Smart water management



Establish Advanced Metering Infrastructure **(AMI)**

Install Smart Meters on every tap and provide information to customer (**smart phone app**)

Remote control main valve and upgrade to real-time monitoring system

Main Objective of 3rd Step

Real-time water network analysis, NRW management, auto leak detection with smart meter


Thank you