New Agenda in Water Management

Smart Water Management

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K-water

CONTENTS

Ⅰ. What does K-water do?

I -1. What does K-water do?

- **Established in 1967**

- **Government-owned company under MoE***

  * Ministry of Environment

- **Employees : Approx. 6,500**

  * Headquarter(5 divisions, 38 dept.)

  * 7 Regional Headquarters(20 dept.)

  * over 140 Regional Offices

I -1. What does K-water do?

K water

Water Resources Mgmt.

- Operating 33 dams
- Water security & Flood control

Water Supply

- Operating 33 bulk & 22 regional water
- 25m served people

Green Energy

- Hydro, tidal Power
- Capacity : 2,000 MW (Domestics & Overseas)

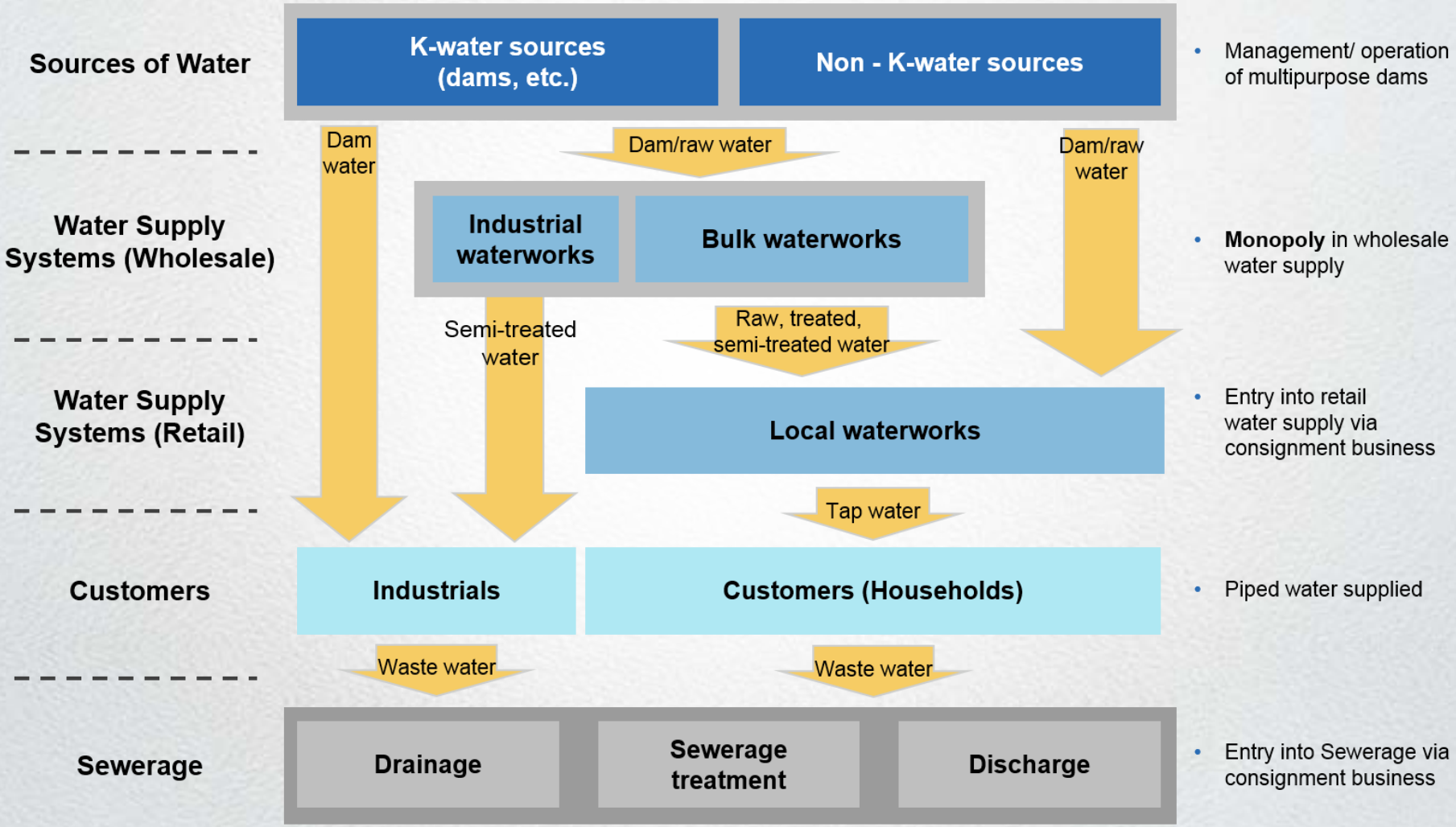
Urban Development

- Servicing 9 cities & industrial clusters
- Forming 4 Complexes

Ⅱ. Status of Water Management in Korea

Ⅱ-1. Water System in Korea

K-water plays an important and strategic public policy role in Korea's national water system



Ⅱ-2. Drinking Water Supply

Now, we are supplying water all around the country

✓ **33 Bulk Water Supply Systems**
- Capacity 18 Million ㎥/day

(47% of the total water supply facility capacity in Korea)

✓ **22 Concession Projects with Local Governments**

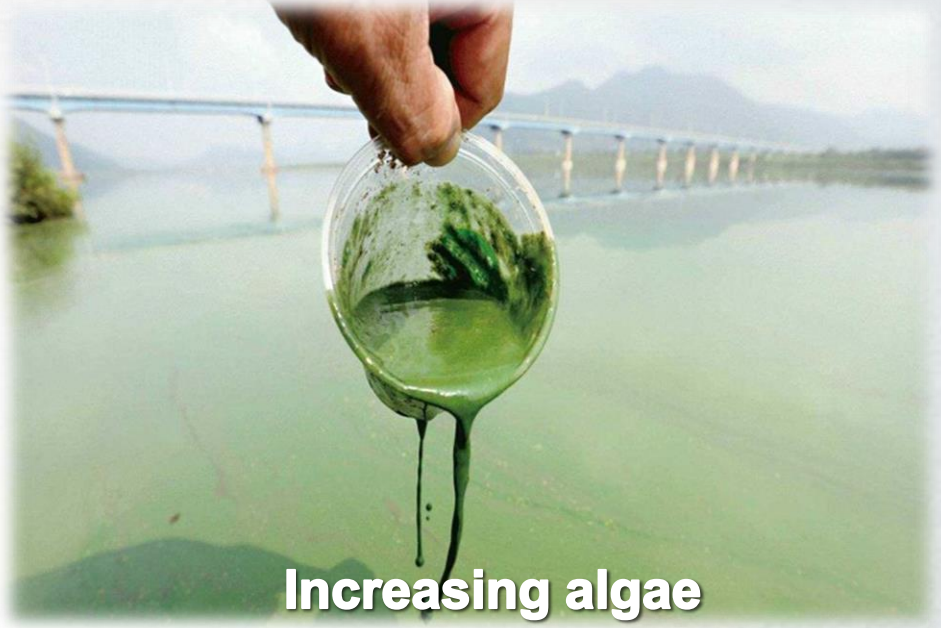
✓ **Operating regional water supply networks to provide water for major urban and industrial centers**

✓ **ICT-based Regional Integrated Operation**

Ⅲ. Water Crisis & Issue

Ⅲ-1. Water Issues in Korea


Extremely drought


Increasing algae


Aged infrastructures

Distrust of tap-water

Ⅲ-1. Water Issues in Korea

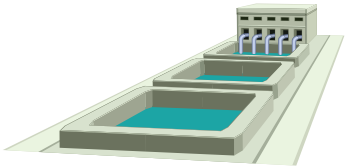
Deterioration of Water Quality

- Difficulties in water treatment due to increasing algae
  - ✓ Limited standard water treatment
- Frequent accidents of WQ caused by toxic substances
  - ✓ Phenol spillage, hydrofluoric acid, dioxanem etc.

Aged Infrastructures

- Revenue rate 70% except advanced city
  - ✓ Loss of $433 million/year due to leakage
- Vast investment costs for aged-infra
  - ✓ Plan to invest $3.4 billion until 2030 for improvement

Unreasonable price



US$ 0.81/m³

< Production cost >

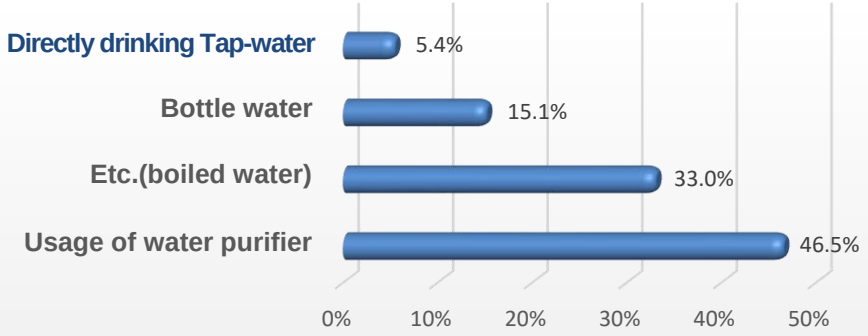
80.6%

US$ 0.65/m³

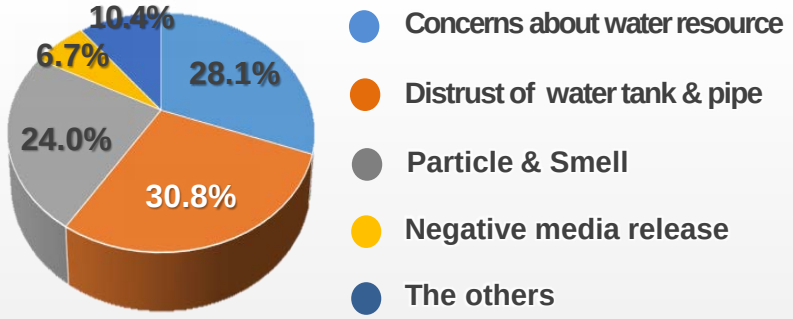
< Water rate >

Ⅲ-1. Water Issues in Korea

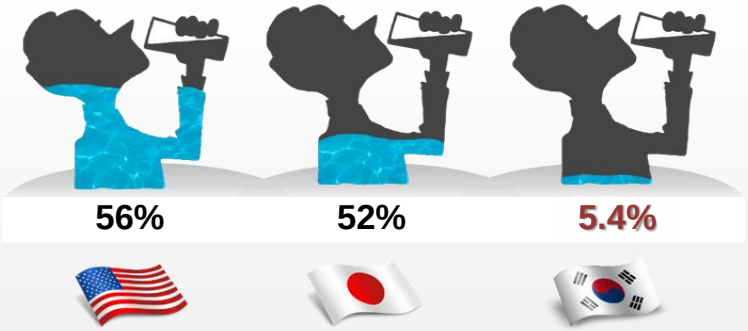
Kinds of water to drink



Reasons not to drink Tap-water



Comparison with advanced country



Increase of social costs

Social cost more than US$ 1.75 billion/year

Necessity of Smart Water Management

Ⅲ-2. Global Water Crisis

Water risk is a common challenge all human beings to manage

UN SDGs

6 goals relating to climate change and water management out of 17 SD goals

- Water and sanitation, cities, etc.

Paris Agreement On Climate Change

All nations should participate in after 2020

- Limiting global temperature increase to 1.5 degrees
- Committing all countries to submit all new NDCs(Nationally Determined Contribution) every five years from 2023

World Economic Forum (Global Risks 2016)

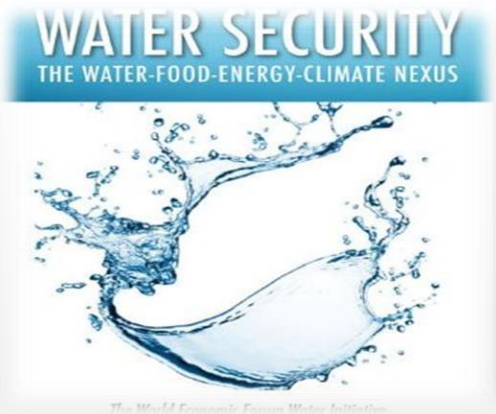
One of the biggest risks all nations are facing

Ⅲ-2. Global Water Crisis

Global challenges are integrally related to water management

Climate Change

Water-Energy-Food Nexus



Sustainable Development

SUSTAINABLE DEVELOPMENT GOALS

Smart Water Management Innovation

IV. What is SWM ?

IV-1. Water is SMART ?

"SMART" introduced in the early 1980s as a future-oriented concept to enable real-time detection and Effective reaction by using state-of-the-art sensors as well as computers

Introduction ('80s)

"Smart military supplies" And munitions

- applied to defense industry
- introduced to the public by taking the Gulf War opportunity

Spreading ('00s~)

Diverse industry "Smart phone", "Smart TV" as well as Smart SOC

- Electricity management(demand, supply)
- Intelligent transportation management system
- Ubiquitous education system

Adopted in Water (as of today)

Devices, Sensors, Network

- Bi-directional communication Technology
- Real – time surveillance and control technology
- Data analysis / evaluation technology
- Intelligent metering tech

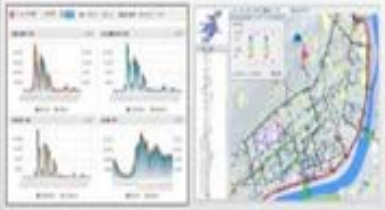
IV-2. Smart Water Management

Intelligent water management incorporation with ICT tech
To enhance water service efficiency from source to tap

Water Management + Smart (AT, ICT, Disruptive Tech.) = Smart Water Management

Smart Devices
- Real-time sensoring and metering
- Bi-directional surveillance /control
- Robot and diagnosis tools

Smart Solutions
- Integrated Flood control system
- Weather forecasting/analysis system
- Waterway operation system



Smart Services
- Big Data service
- Data sharing
- Reflection of consumer's needs

Intelligence

Mega city, water supply efficiency and energy consumption

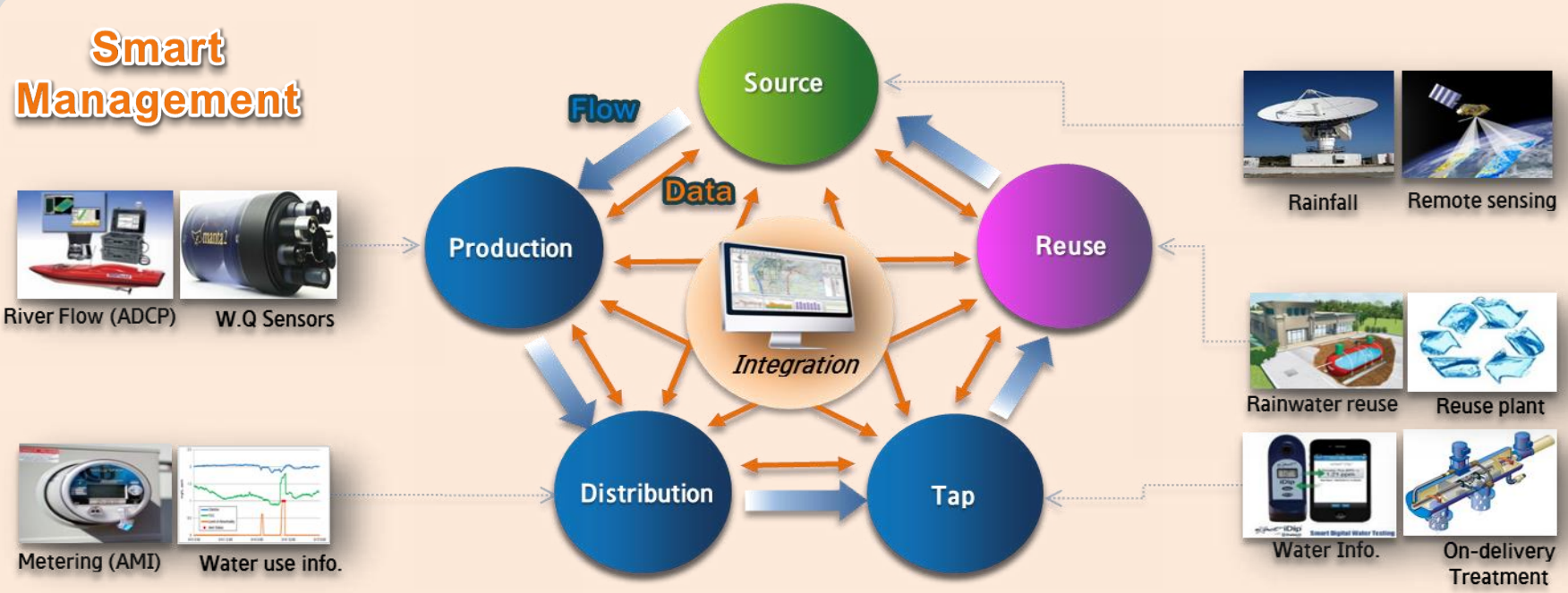
IV-2. Smart Water Management

ICT based real – time decision support with using multi – directional water and information flow as diverse sources

Traditional Management

- Getting feedbacks from users are not an option when water flows are in one direction

Smart Management



- With smart devices and solution programs, each water node can communicate and feedback the water information in terms of water quantity & quality

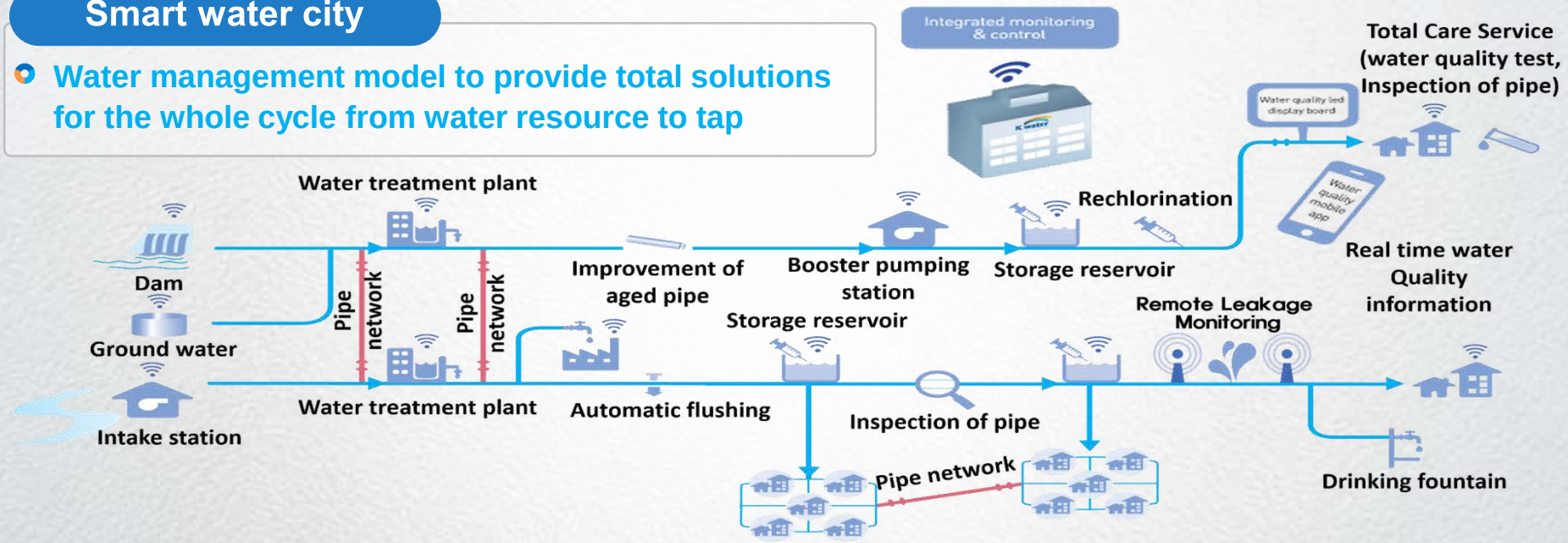
V . SWM Application

V -1. Smart Water City

- K-water's smart water mgmt. model focusing on **Water Supply**
- 2 pilot projects in **Paju** & **Goryeong**

Smart water city

- Water management model to provide total solutions for the whole cycle from water resource to tap



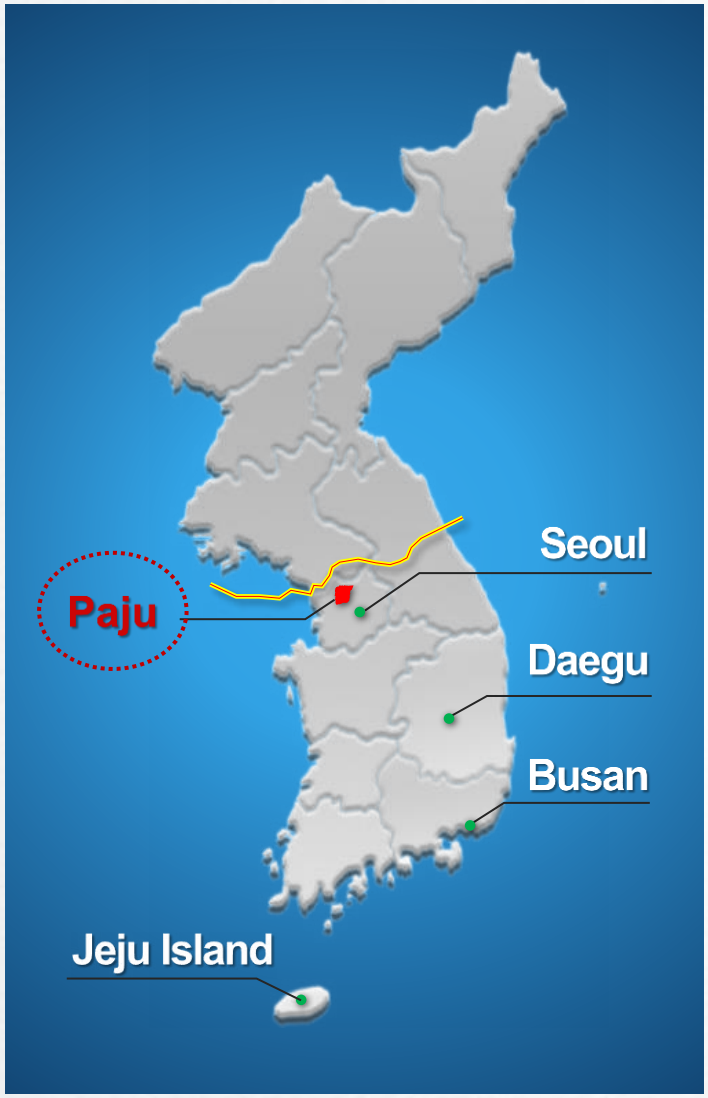
Stable Water Supply

Healthy Water Production

Thorough Management of water Supply System

Consumer-Oriented Service

V -2. SWC in Paju – Pilot site

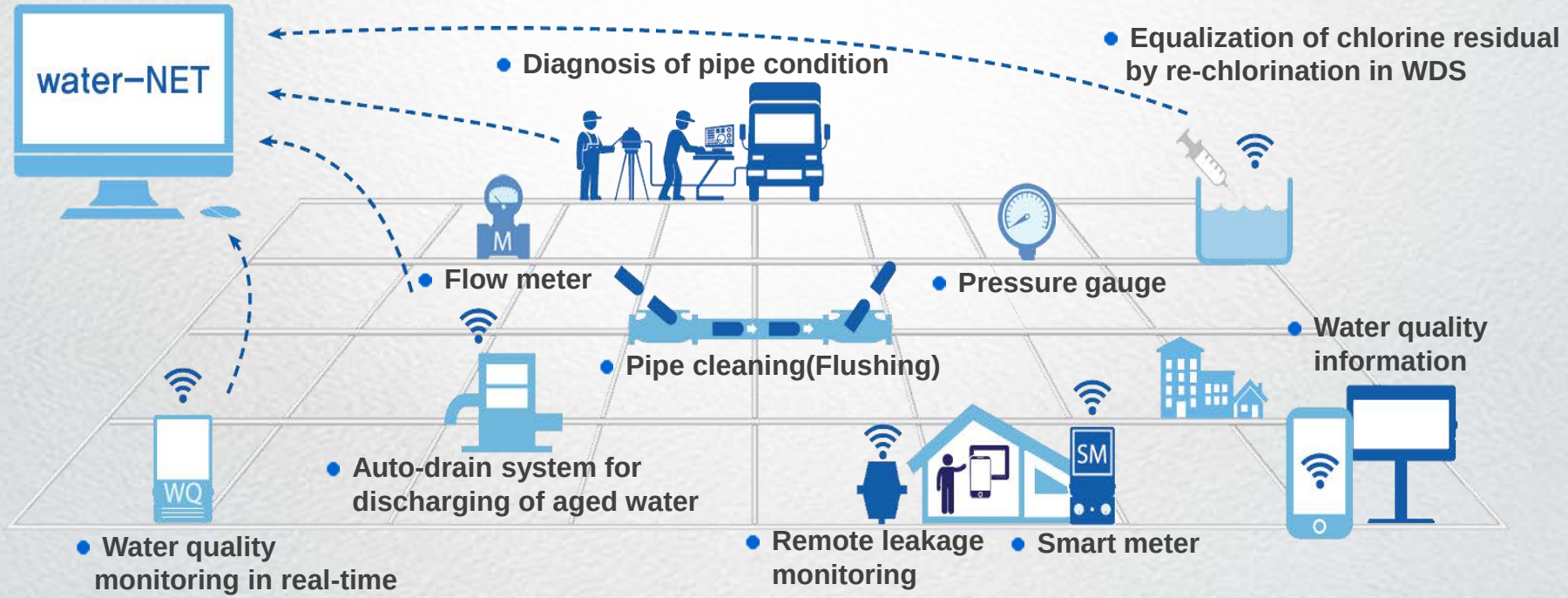


Overview of SWC pilot site

- ✔ Location : The middle west of Korea
  - Border areas nearby DMZ
- ✔ Population / Area : 420,532 / 672.47㎢
- ✔ Regional characteristic
  - The mixed type of urban and rural area
- ✔ Water source : 2 (Han River, Im-jin River)
  - (Han River) Water quality is good and manageable
  - (Im-jin River) Raw water is poor WQ by high ammonia conc. during dry weather(or winter season)
- ✔ Water treatment : Advanced water treatment (219,000㎥/day)
- ✔ Water supply rate / Revenue rate : 96%/ 86.3%
- ✔ Pipeline length / Reservoir : 2,072km / 33EA

V -3. SWC in Paju – Smart Technologies

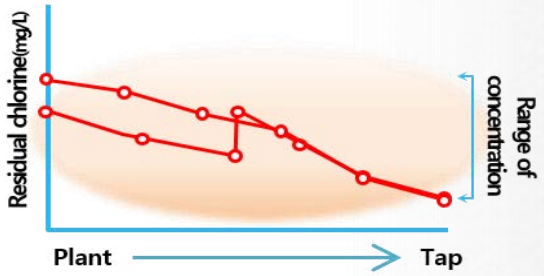
- Real-time water quality monitoring for analysis & control
- Equalization of chlorine constantly in water distribution system
- Discharge of aged water & deposited material to prevent WQ deterioration
- Provision of real-time WQ information by electric board & mobile APP

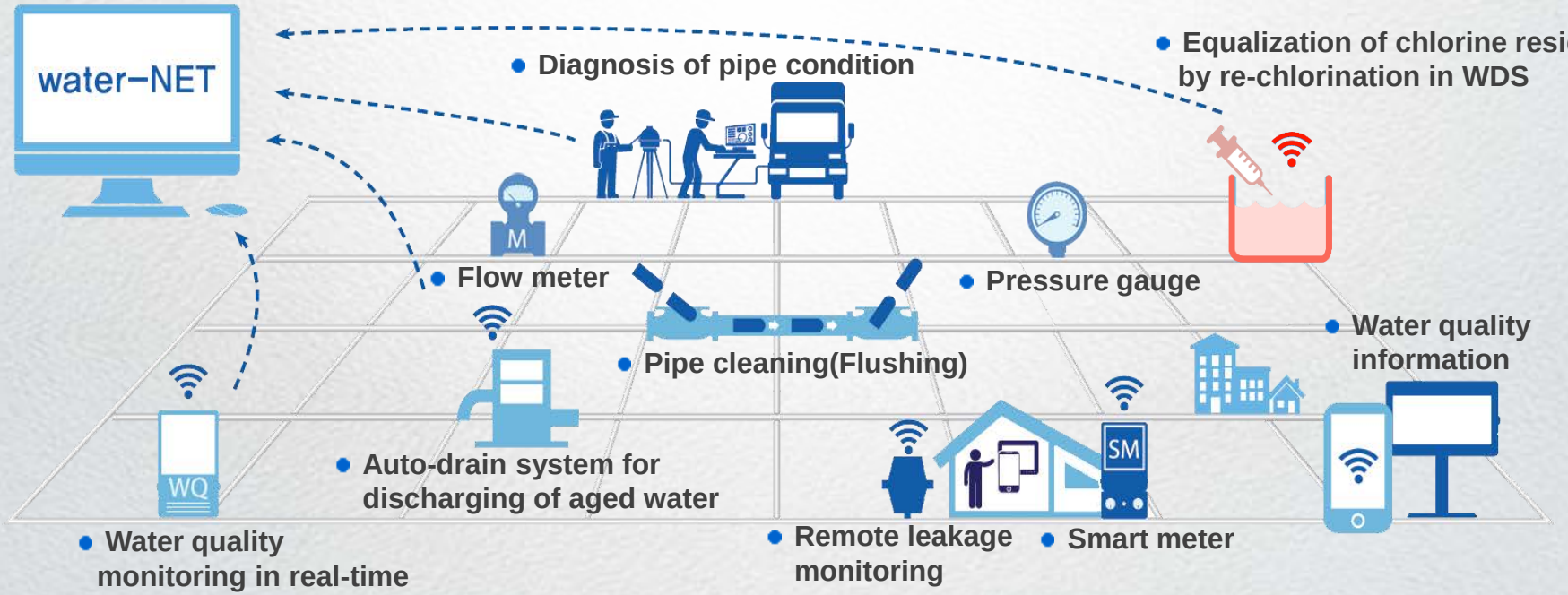


V -3. SWC in Paju – Smart Technologies

Re - chlorination

- Implementing re-chlorination of reservoir, chlorine conc. is equalized within WDS
- Splitting injection point of chlorine taste and odor of tap water are improved



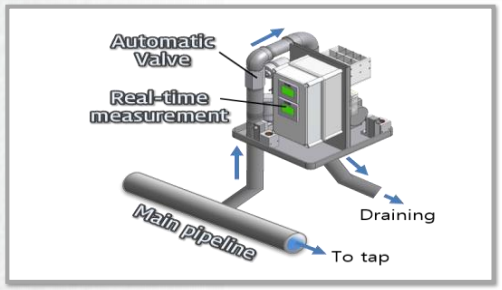


V -3. SWC in Paju – Smart Technologies

Automatic flushing device

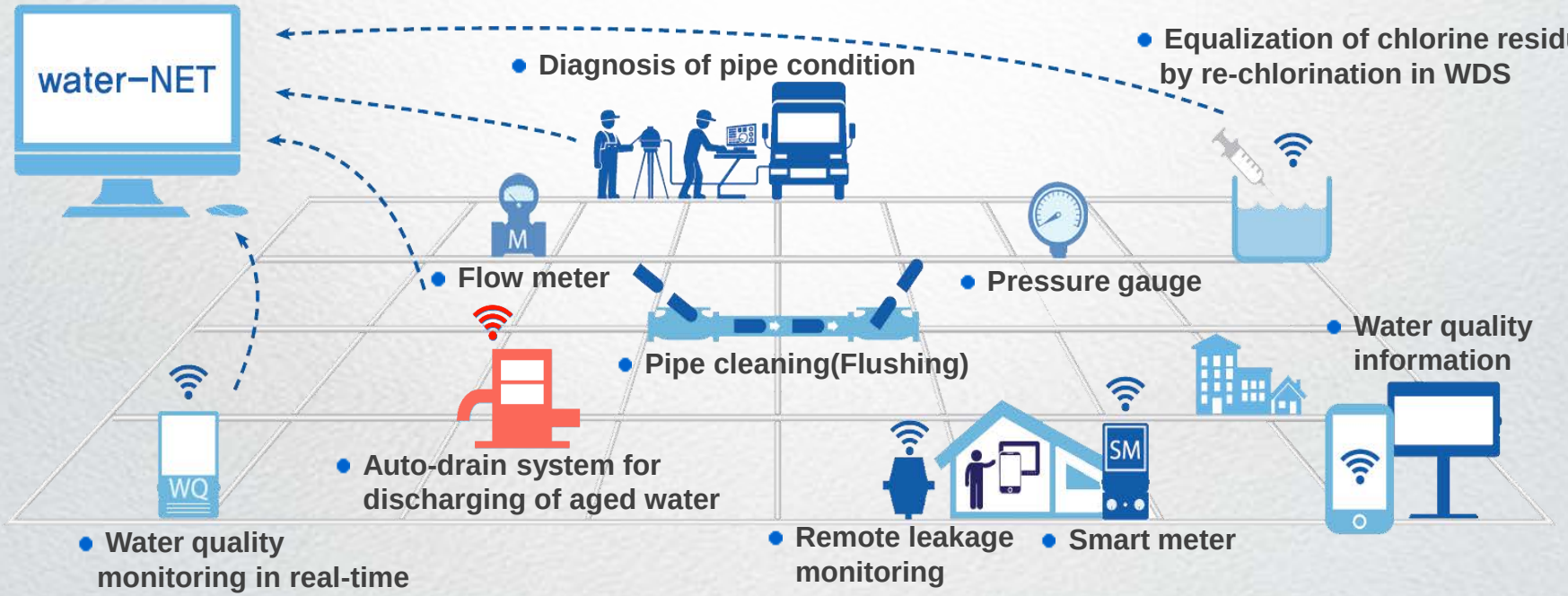
- When the WQ is out of normal range, a contaminated water is discharged automatically

Measuring real-time WQ



Standard exceeded, valve open

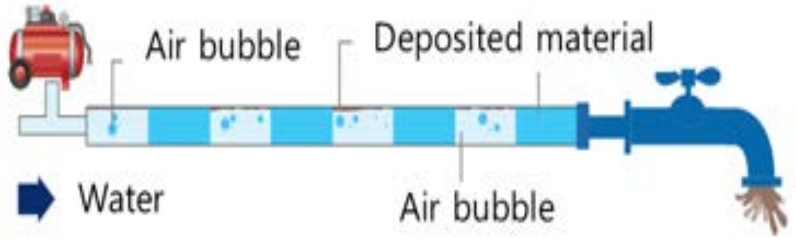
Discharge of aged water

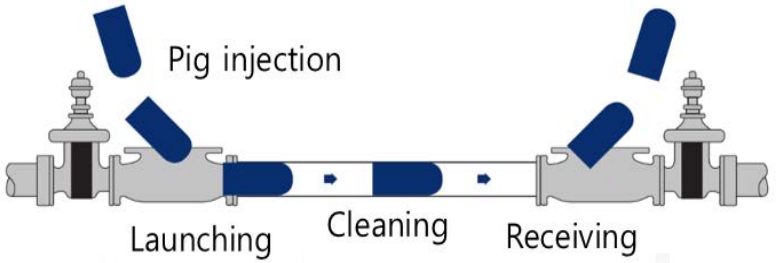


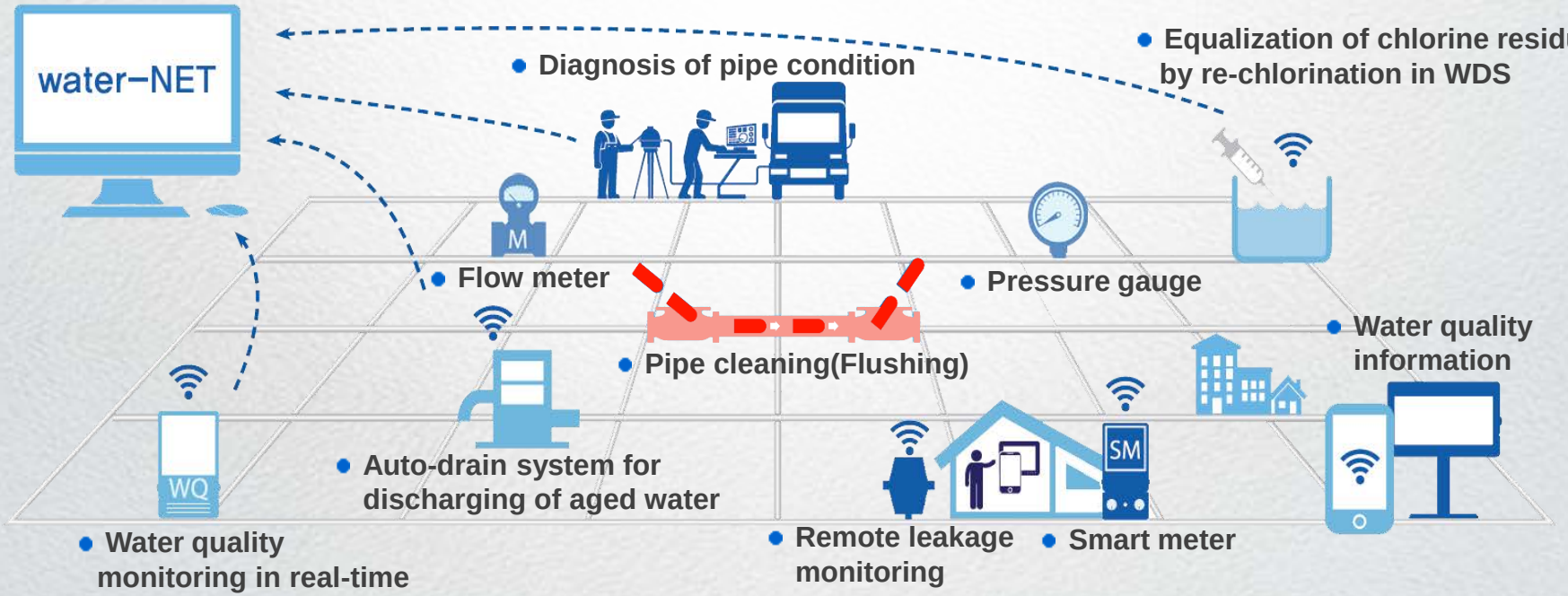
V -3. SWC in Paju – Smart Technologies

Pipeline flushing

- Flushing is used in the WQ complaints area to prevent a discoloration accident
- Two methods are applied in the pilot project : Air scouring & Sponge PIG



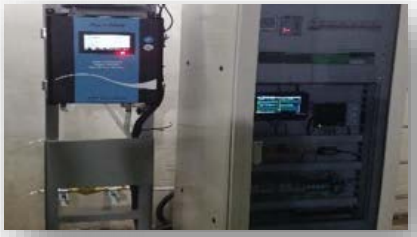


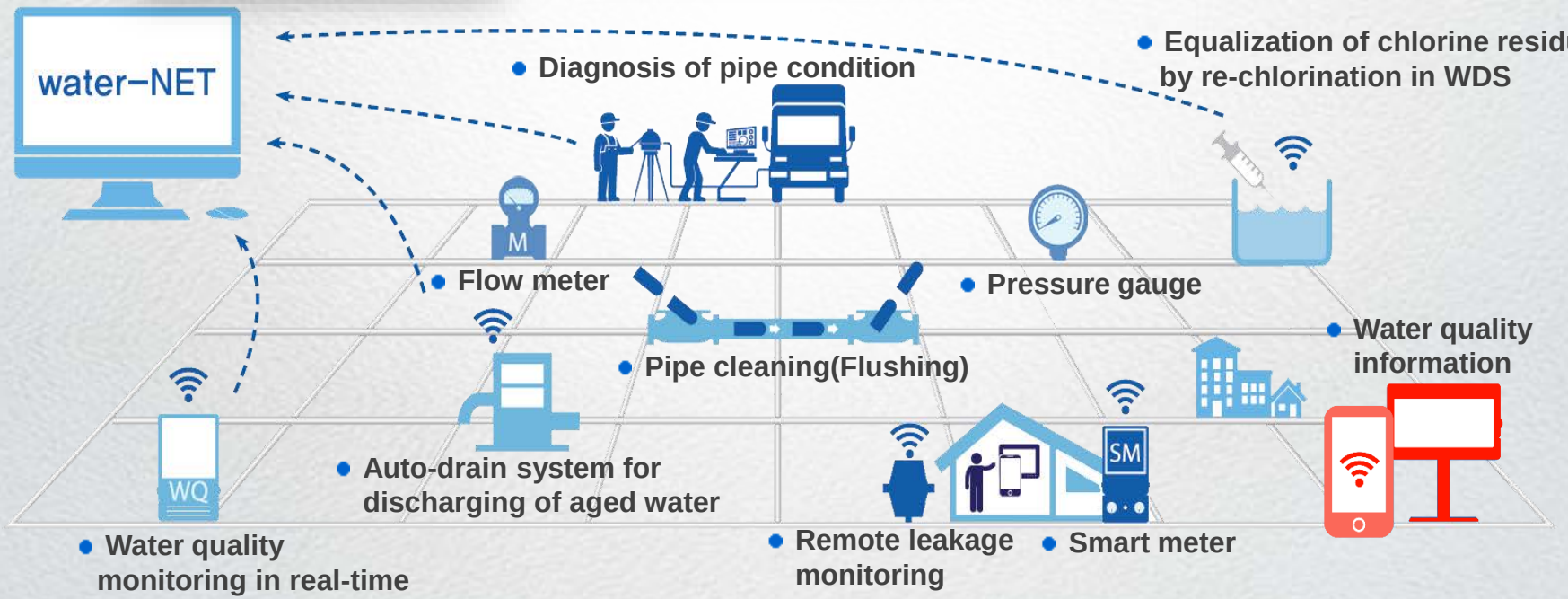


V -3. SWC in Paju – Smart Technologies

Providing real-time WQ information

- Water quality sensors are installed in major monitoring points
- Electronic board shows water quality information measured in WDS
- Mobile application provides real-time water quality information to consumers

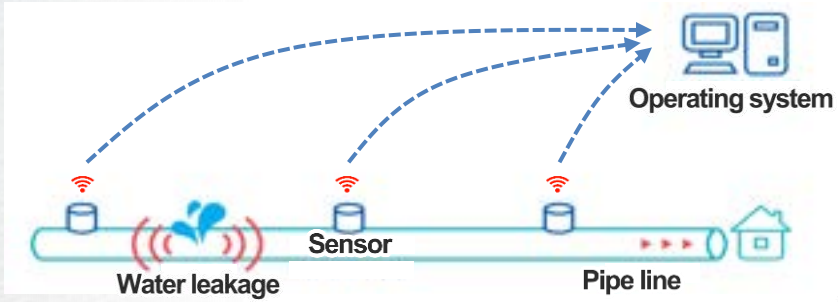




V -3. SWC in Paju – Smart Technologies

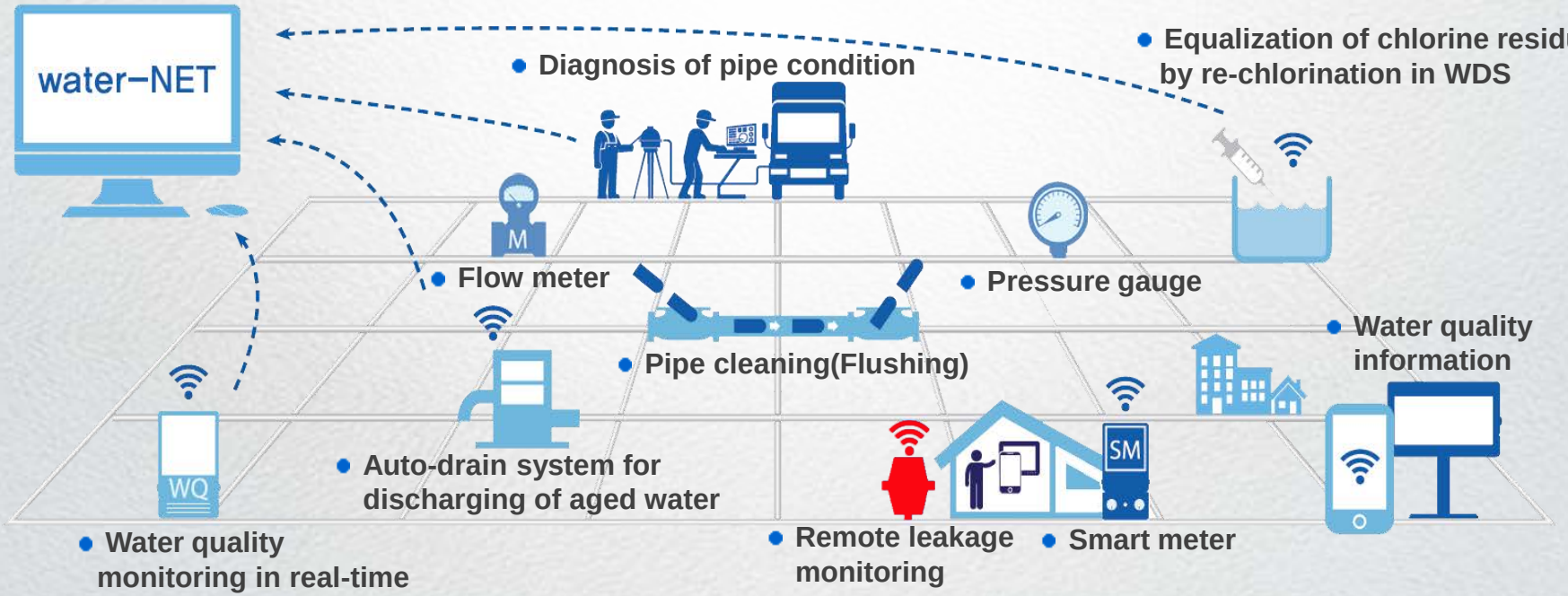
Remote leakage monitoring system

- Remote sensors detect vibrations caused by leakage and monitor water leakage through analyzing frequency, amplitude, etc.



< Leak detection sensor >

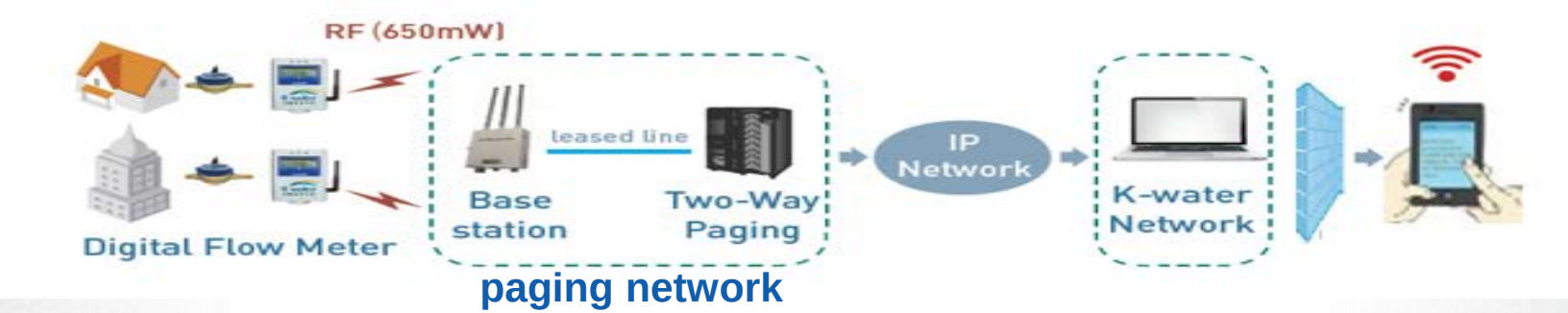
< Operating system >

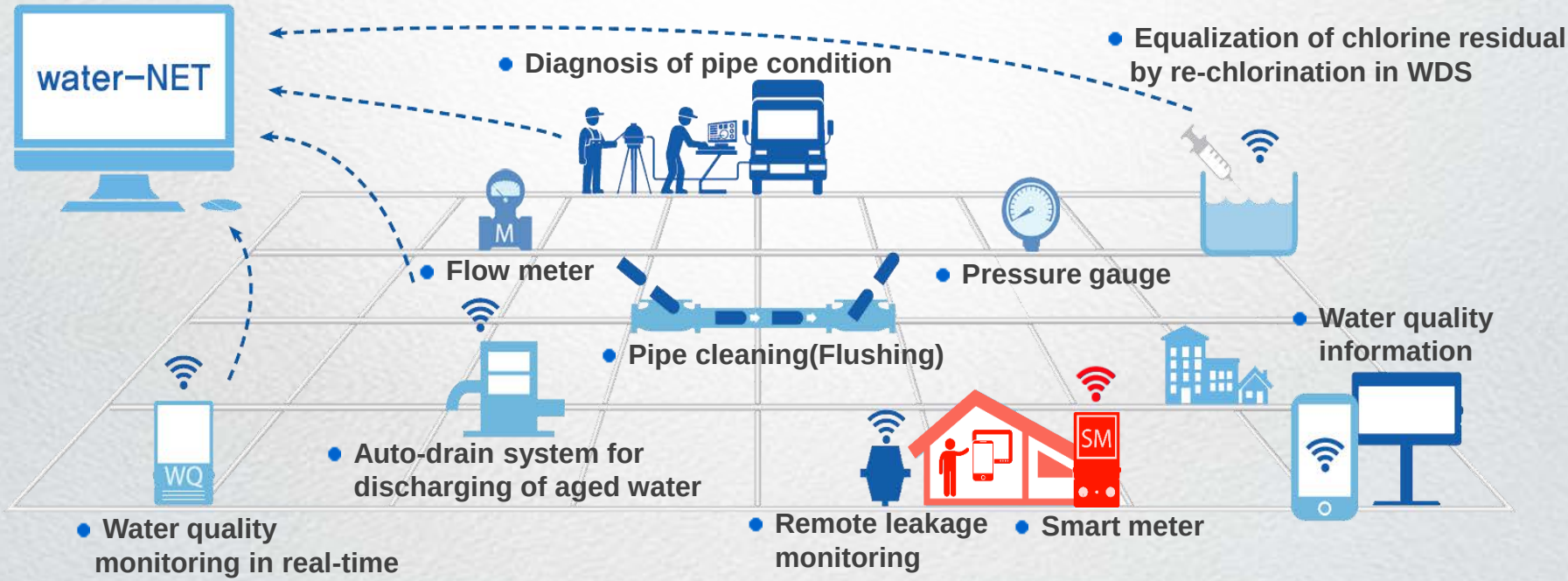


V -3. SWC in Paju – Smart Technologies

Smart meter

- Leakage monitoring and pressure management can be done through collecting hourly flow data from smart meters installed at

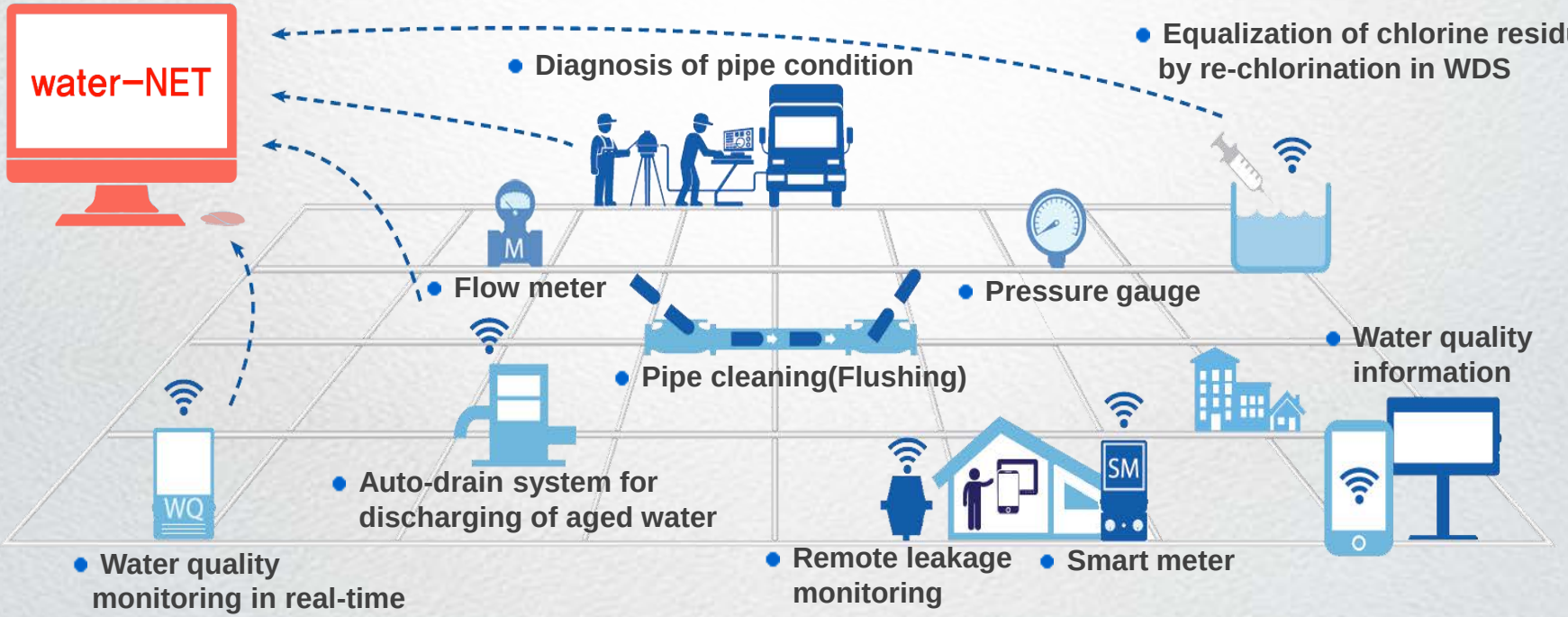




V -3. SWC in Paju – Smart Technologies

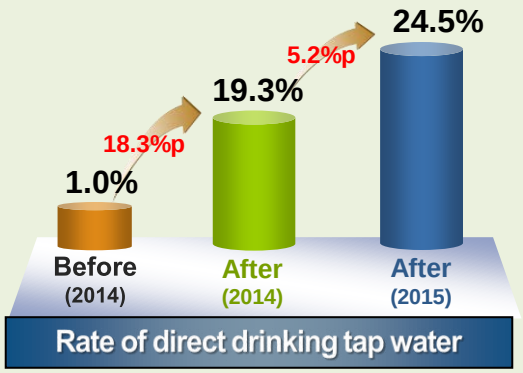
Water-Net

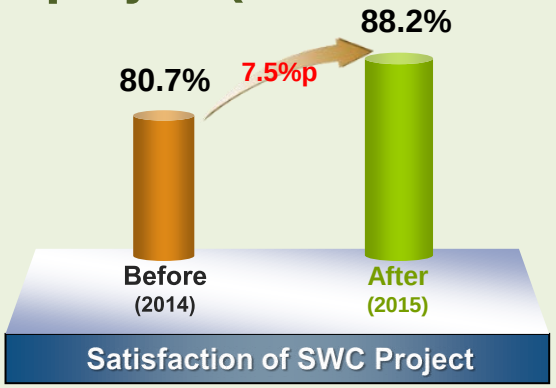
- **Supporting decision-making for stable water supply from water treatment plant to consumers based on GIS & sensors**



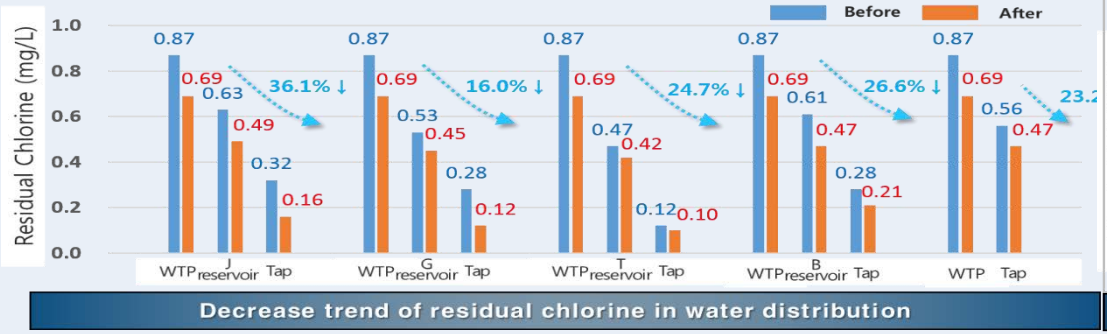
V -4. SWC in Paju - Outcomes

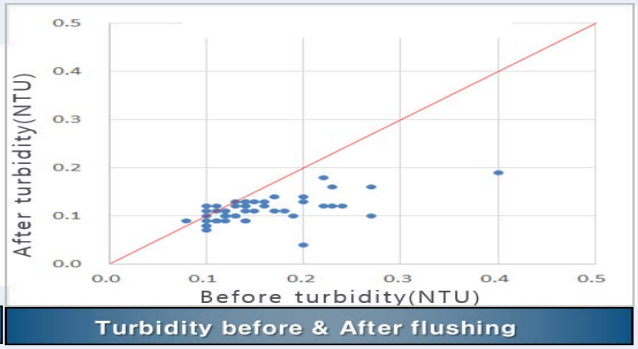
- **Increased rate of direct drinking tap water (1.0% → 24.5%)**
- **Satisfaction improvement of SWC pilot project (80.7% → 88.2%)**





- **Water quality improvement in water distribution**
  - Decrease of chlorine service range by splitting injection point (16.0~36.1%)
  - Decrease turbidity of tap by support aged-indoor pipe flushing






Thank You!
K water