Smart Water Technologies of K-water, Korea

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K-water Introduction
K-water (Korea Water Resources Corporation)

- Established in 1967
- Responsible for Total Water Resources Management in Korea
- State owned Water company
- Organization
  - Headquarters (5 divisions, 31 dept.)
  - 4 Regional Headquarters
  - 75 Regional Offices
- Employees : 5,296 (‘17)
- Total Assets : 20 billions USD (2016)
- Revenue : 3.4 billions USD (2016)
K-water Business

Total Water Service Provider

Water Resources Mgmt.
- Operating 33 dams
- Water security & Flood control

Water Supply
- Operating 34 bulk & 22 regional water
- 40% of total supply

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

Urban Development
- Service 9 cities & industrial complexes
- Construction of 4 Complexes
Smart flood & drought management system

K-water has integrated monitoring and control system of Multi-purpose dam, river dam, ground water well
For the optimized flood and drought management
Integrated Water Supply System

K-water has an integrated monitoring and control system of Multi regional water supply system (WTP, Pumping Station)
Now, focusing on higher water quality service
K-water has signed consign contract with 22 local water supply companies for the improvement of water supply system, especially for NRW management.
Renewable Energy & Smart City

- Development, operation and management of renewable energy
  - Floating solar power system, Water thermal energy
- Design and construction of smart water city with innovative techs
Overseas Projects

- PPP, O&M, ODA projects for water management and hydropower
WB project with Uganda (2018)

- A diagnostic analysis report on the needs of Water Resources Institute in terms of institutional set up, training courses, infrastructure and set up

<Required TOR>

- Design of course modules that are to be delivered on either face to face and online basis
- Needs and configuration of Information and Communication Technology equipment and facilities of the institute determined.
- Courses offered by various institutions in South Korea evaluated and those that can be adopted for Uganda identified
- Key recommendations for operationalization of the Water Resources Institute made
- Short, medium and long term plan to operationalize the Water Resources Institute
Smart Water Tech Transfer Projects
- Case Study in Vietnam
What is SWM Technology?

SWM is to achieve the improvement of productivity, safety and efficiency using smart water technology.

*Water Management* + *Smart Technology* = *Smart Water Management*

**Smart Devices**
- Smart Sensor and Measurements
- Smart Telecommunication Device
- Smart Diagnosis Device

**Smart Solution**
- Flood Analysis System
- Intelligent Pipe Network System
- Smart Energy Saving System

**Smart Service**
- Decision Support
- Provide Information
- Improve Efficiency
K-water Smart Technology
- Water Treatment Plant -

- (KPI) Water quality service, Cost efficiency, Work Efficiency
- Technology: Process automation, Water quality monitoring and control, Advanced disinfection, Smart asset management, Smart diagnosis

- Smart Automation
- Water Quality Control
- Advanced Disinfection

- Smart Asset Management
- Smart Drainage Treatment
- Smart Diagnosis
K-water Smart Technology
- Water distribution system -

- (KPI) Energy Efficiency, NRW, Residual chlorine, Maintenance cost
- (Tech) Optimized Pump Scheduling, Leak detection, Energy Diagnosis, Smart Block Analysis, Smart Pipe Inspection, Residual Chlorine Control
Case Study of SWM in Vietnam
- NRW Management in Vietnam -

MOU with water related organizations in Vietnam
To implement SWM pilot project on March 2018

- MONRE, NAWAPI (National Centre for Resources Planning and Investigation)
- MOC, VWSA (Vietnam Water Supply and Sewerage Association)
- MOC, NBWSSC (Ninh Binh Water Supply and Sewerage Company)
- MARD, MARD DWR (Ministry of Agriculture and Rural Development, Directorate of Water Resources)
1st Pilot Project with NAWAPI
- Smart Ground Water Monitoring System -

Smart ground water monitoring system
Conducted with NAWAPI of MONRE

- **Title**: Smart Ground Water Monitoring System Pilot Project
- **Objective**: Smart ground water management technology transfer with 3 Smart ground water monitoring devices installed and training
- **Cost**: 60,000 USD (Funded by Korean government)
  - 3 Smart devices has been installed and technical consulting etc.

<table>
<thead>
<tr>
<th><strong>K-water</strong></th>
<th>Supervision of project and technical consulting</th>
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<tbody>
<tr>
<td><strong>SMEs</strong></td>
<td>Installation devices, training for usage</td>
</tr>
<tr>
<td><strong>NAWAPI</strong></td>
<td>Collaboration of pilot project, Civil Works</td>
</tr>
</tbody>
</table>
**2nd Pilot Project with VWSA, NBWSSC**

- Smart Leak Detection System and Water Treatment Unit Technology -

**Smart water facility technology transfer to reduce water loss with VWSA, NBWSSC**

- **Title**: Smart Water Facility Technology Transfer Pilot Project
- **Objective**: Smart water facility technology transfer with 5 types of smart device installation and technical consulting
- **Cost**: 180,000 USD (Funded by Korean government)
  - 90 Leak detection sensors, water quality measurements, valve actuator, ultrasonic water flow-meter installed and technical consulting for NRW management

**Minimum Night Flow of DMZ D1 has been reduced**

40 m³/h (July) ➔ 20 m³/h (Aug) ➔ 10 m³/h (Nov)
Pilot Project with Philippines
- Smart Water Energy Nexus -

Floating solar power system pilot project with Santa Fe Island in Philippines

- **Title**: Smart renewable energy pilot project with floating solar power system
- **Objective**: Development of 50kW floating solar power system with Santa Fe island in Philippines suffering from water and energy scarcity
- **Cost**: 170,000 USD (Funded by Korean government)
  - Floating solar power system, solar panel, ESS

Santa Fe city could get a clean energy production benefit as much as 45,600 USD a year
## Suggestive Points of Vietnam Case

<table>
<thead>
<tr>
<th>Category</th>
<th>Points</th>
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<tbody>
<tr>
<td>Appropriate Technology</td>
<td>- Each country has his own water characteristics and condition&lt;br&gt;- Some technologies have to be adapted to appropriate level&lt;br&gt;- Appropriate Smart Water Technology is necessary</td>
</tr>
<tr>
<td>Customization, Localization</td>
<td>- No A/S and customization, No sustainable satisfaction&lt;br&gt;- Local agent, distributor, partner are mandatory&lt;br&gt;- Customized technology and commercialization is important</td>
</tr>
<tr>
<td>Sustainable Tech Transfer</td>
<td>- Technology transfer process is necessary for sustainability&lt;br&gt;- National Standardization, Development of training Infrastructure and Program, Pilot Project with localization etc</td>
</tr>
<tr>
<td>BIZ Model For Financing</td>
<td>- 17 World Bank Projects are on Active (4,168 mill USD)&lt;br&gt;- New business model is necessary for further financing&lt;br&gt;- Performance based model, PPP model are highly recommended</td>
</tr>
</tbody>
</table>
Open Innovation in Water Sector
- Innovative technologies and performance
Open Innovation in Water Sector

- IoT, AI
- Smart Sensor
- New materials
- Bio-tech
- Drone

Industry 4.0

More than 200 of SMEs and Startups based on Innovative Technologies in water sector, Korea

- Accelerating
- Scale-up
- Reference

R&D, Test-bed, Technology transfer, Consulting, Investment etc.
Angel Swing is a drone data solution company that makes accessible and affordable drone data service in Asia.

- Usability (~3GB), simple and easy-to-use platform
- Specialized in data visualization with various data types on 1 page
- Based on web and cloud computing
- Empowered data analysis with accumulated data and hands-on experience, computer vision, and AI.

**CONSTRUCTION**
- Ground Survey
- Infrastructure Construction

**ENVIRONMENT**
- Riverside Monitoring
- Environmental Monitoring

**URBAN PLANNING & MANAGEMENT**
- Insurance
- Spatial Information of Local Area
- Safety Management

*Project histories in Korea, Nepal, Norway, and Indonesia since 2015*
Wastewater Treatment

- Non-clogging micro filtering system (NCFS) based on semiconductor lithographic tech ⇒ no backwash, constant filtration efficiency, resist to chemicals, wide range temp.
- High efficiency and economic operation cost for wastewater and livestock sewage treatment than common depth filter
- Performance verified on 3 sites of K-water (Wastewater and River)
Arsenic Remove System

- Electrocoagulation-Adsorption hybrid process for Arsenic
- High efficiency for As(III) and As(IV), other metals (Fe, Al) and bacteria
- No pretreatment using additional chemicals
- Low-power and modular design ⇒ wide range of capacity
- CAPEX $50K, OPEX $3K/y for 24m³/d

<table>
<thead>
<tr>
<th>#1. Adsorption</th>
<th>#2. Membrane (R/O)</th>
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<tbody>
<tr>
<td>Simple, need specific adsorbent and pre/post pretreatment, low efficiency high conc.</td>
<td>High efficiency, pretreatment for fouling</td>
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<tr>
<td>CAPEX $16K~138K OPEX $1.5K</td>
<td>CAPEX $135K OPEX $10K</td>
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Bong-Hwa, Korea (12m³/d)  
Gum-San, Korea (12m³/d)  
Hanoi, Vietnam (24m³/d)
GSIL is an IoT company focuses on safety, providing real-time information to all users via integrated safety management system to the fields

Collaborated with engineering and construction companies in Korea
Water Treatment

- Smart, reasonable, low-price of UV water disinfection device (LADIS)
  - stand-alone and adaptive considering water storage circumstance of user
- Replaceable SODIS (Solar Water Disinfection) for equatorial countries
- Ready to mass production, supply undeveloped countries via UNDP since 2020
Thank you !