This material is shared as a learning resource to promote awareness and good practice in the provision, use and management of water resources for sustainable social and economic development and maintenance of African ecosystems.

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How Smart Water Management technology can contribute to SDGs

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Contents

1. Paradigm Shifts of water issues
2. Concept of SWM
3. Research framework
4. Case study – Paju Smart Water City
5. Conclusion
Securing proper water and stable allocation is the hot discussion topic to the whole global humanity.

Global Agenda
water crisis & water security

1970s ‘Water Quality’
1980s ‘Environment’
1990s ‘Water Crisis’
2000s~ ‘Water Security’

Smart Water Management
SWM for Better Water Management

Global challenges are integrally related to Water Management

Climate Change

Water-Energy-Food Nexus

Sustainable Development

Common subject for All

Smart Water Management
Concept of SWM

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

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

* ICT based real-time decision support system with using multi-directional water and information flows as well as diverse sources
Introduction of Research

- Analyze social, technological, economic, environmental, and political aspects of SWM
- Measure the level of SDGs implementation
- Identify the importance and role of SWM
Research Processes

Design STEEP-based Analysis Framework

Develop 5W-Track Analysis Framework

Develop SWM Comprehensive Performance Indicator System

Conduct SWM Case Analysis
Design STEEP-based Analysis Framework

[Background + Input]
- Politics
- Society
- Technology
- Environment
- Economics

[Output + Outcome]
- Economic Performance
- Environmental Performance
- Social Performance

[Impact]
- Economic Field
- Social-Economic effect
- Social-Environmental effect
- Environmental Field
Development of 5W Track Analysis Framework

- Developed on the basis of value chains like the comprehensive analysis framework, structured to produce results for 5 questions (5W) through the results of each domain
- Structuring SWM comprehensive analysis framework considering STEEP structure and SDGs goals
## SWM Comprehensive Performance Indicator System (1/3)

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<tr>
<th>Objective</th>
<th>Issue Category**</th>
<th>Indicator**</th>
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| Changes in social structure and recognition | Social | • Water supply population growth  
• Number of Job Creation in the water industry  
• Reflection degree of social needs  
• Quality-of-life Improvement  
• Comprehensive Evaluation Index (100 point Max) |
| Applied Technology | Technological | • Drinking rate of water  
• Rate of water purifier installation  
• Rate of water sales  
• Reduction of leakage quantity  
• Comprehensive Evaluation Index (100 point Max) |
| Rate of change of ecosystem about Water Management | Environmental | • Quality of water index*  
• Number (Kind) of Inhabitant  
• Kind of bird  
• Riparian Environment  
• Comprehensive Evaluation Index (100 point Max) |
| Changes (Effects) in economic structure/condition of the water industry | Economic | • Increasing number of water-related industry  
• Reducing social costs  
• The estimated amount of benefits  
• Consignment fee  
• Cost estimating of value  
• Market competition  
• Decreasing rate of Budget Waste in the water industry  
• Comprehensive Evaluation Index (100 point Max) |
| Policy and administrative changes about Water Management | Policy | • Number of legislation compared to developed countries  
• Number of National issues about water industry  
• Implementation ratio of water related policies  
• Comprehensive Evaluation Index (100 point Max) |
SWM Comprehensive Performance Indicator System (2/3)
Developed as STEEP-based core-sector-hierarchical structure of individual indicators
Five sector indicators, 16 small sector indicators, and 136 individual indicators
Five Core Expert Groups Review & Evaluation

- Experts’ survey to review the performance and effect of SWM.
Case Study

| Paju Smart Water City |
Smart Water City (SWC)

- Paju SWC is based on a combination of smart devices, smart solutions (technology), and smart services

**Smart Devices**
- Re-chlorination device
- Automatic flashing device
- Pipeline flushing device
- Pipeline diagnosis device
- Water quality sensors
- Smart meters

**Smart Solutions**
- Water-NET
  - water network monitoring system
- Remote leakage monitoring system

**Smart Services**
- Real-time water quality information system
- Reflecting consumer’s needs
Smart Water City (SWC) – Paju City

For healthy tap water supply and water quality’s reliability, adapt ICT techniques through all water supply process (Paju city)

Result

- Direct drinking Tap-water rate improved significantly (1.0% → 24.5%)
- Improve quality and service satisfaction of Tap-water (55.0% → 92.3%)
- Chlorine equivalent rate improved from 24.3% to 36.4%
- Significantly reduced Tap-water quality complaints (4.5 → 1.3 times/month)
Result | SWM Comprehensive Performance

**2016 SWM total score** 80.9

**SWM Comprehensive Performance on STEEP fields**

- Politics: 78.5
- Technology: 80.2
- Economics: 87.2
- Environment: 77.0
- Society: 81.7

**Four SWM Comprehensive Performance Levels**

1. **2016 SWM importance** 76.7
2. **2016 SWM compliance level** 84.6
3. **2016년 SWM satisfaction** 83.3
4. **2016년 SWM contribution** 79.0
Result | Contribution of Paju SWC to SDGs

SDGs Compliance Score, 84.6 (in 2016)

SDGs target Scores

SDGs Average | SDG 6.1 (Access to drinking water) | SDG 6.2 (Access to sanitation facility) | SDG 6.3 (Water quality improvement) | SDG 6.4 (Water use efficiency, Water supply) | SDG 6.5 (Water Resource Management) | SDG 6.6 (Ecosystem conservation) | SDG 6.a (International cooperation) | SDG 6.b (Local government degree of participation) | SDG 7 (Provide sustainable energy at the right price) | SDG 11.5 (Water related Disaster Reduction)
Conclusion

- Basic research for global sustainable use of water suggesting the introduction of SWM in the water management field

- Draws the level of implementation of SDGs as numerical value and performance result through study on SWM exemplary case.

- Low-cost SWM can be realized even in underdeveloped countries, and it will provide strategies and guidelines to encourage SWM application.
Thank you

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Case Study 2

Integrated Water Resource Management System
IWRM Project

Water Management Forecasting & Decision-Making Technologies

**WROC (Water Resources Operations Center)** functioning as a hub for IWRM practices

**Major Works**
- Remote Dam-weir management
- Weather analysis & prediction
- Flood control. Water supply
- Hydro power generating

**Result**
365 Days and 24 hrs., Water Disaster preparation and Integrating Dams and Weirs.
IWRM System for Local

- Implement to Local Governments
IWRM System for Abroad
In ALGERIA
Result | Contribution of IWRM System to SDGs

- **SDGs 평균**
  - SDG 6.1
    - (대수 접근성
      - 접근성 확보)
  - SDG 6.2
    - (수질 개선)
  - SDG 6.3
    - (물 이용 효율과 물품급)
  - SDG 6.4
    - (수자원 관리)
  - SDG 6.5
    - (제한적 개방과 참여)
  - SDG 6.6
    - (지방정부 참여와 지속 가능하며 에너지 제어)
  - SDG 6.6
    - (물 관리 제도)

- **Quality of life improvement**
  - SDG 6.1
    - 82.9
  - SDG 6.2
    - 91.8
  - SDG 6.3
    - 88.2
  - SDG 6.4
    - 82.1
  - SDG 6.5
    - 80.9
  - SDG 6.6
    - 83.3
  - SDG 6.7
    - 80.4
  - SDG 6.8
    - 83.7
  - SDG 6.9
    - 73.5
  - SDG 6.a
    - 91.8
  - SDG 11.5
    - 73.5

- **SDGs Compliance Score, 84.6 (in 2016)**
  - Social: 83.3
  - Politics: 83.3
  - Technology: 83.3
  - Environment: 81.3
  - Economic: 91.7

- **Indicators**
  - Water supply and efficiency: 83.3
  - Water-related ecosystem protection and restoration: 73.3
  - Water-related education and training: 73.3
  - Water-related infrastructure: 74.3
  - Water-related environment: 72.3
  - Water-related economic effect: 73.6
  - Water-related social effect: 71.1
  - Water-related political effect: 70.8
  - Water-related technological effect: 74.3

- **Legend**
  - Extremely Low level: 0.0
  - Low level: 16.7
  - Normal: 33.3
  - High level: 50.0
  - Comparative High level: 66.7
  - Extremely High level: 83.3
  - 100.0
What Korean have done
Pool country to Now

1960s: Planning
1970s-1990s: Construction
1990s-2000s: Digitalization
2010s ~: Intelligence

- Investigation & Long-term Planning
- Dams and water treatment infra.
- ICT convergence
- Pay more attention to scientific water mang.
- Global knowledge share & standardization

# of Water disasters

Lessons from past

3/8
Now we have Water Resources

Constructing 38 dams with hydro power plants

- Developing and managing multipurpose dams to prevent floods, provide water, and hydro power plants
- Building eco-friendly dams with minimal impact on surrounding ecology and boosting tourism of the neighboring areas

Developing and operating 38 dams, including the Soyang River Dam.

- Total Amt. of Water: 13,072 million m³
- Flood Controlled: 5,066 million m³
- Amt. of Water Provided: 11,672 million m³
- Amt. of Energy Generated: 1,047,000 kW

<Responsible for over 60% of all electricity generated by general hydroelectric plants in Korea>
• STEEP-based comprehensive performance analysis framework
• 5WTrack Analysis Framework
• SWM performance measurement system
  (1 composite indicator, 5 sector indicators, 136 individual indicators)
• 5 key areas Expert Group Overall assessment

- SWM technology, policy, industrial environment
- Water management paradigm change
- Exemplary case related to internal and external environment
- Background and Results of Exemplary case

- Analysis results using indicators
- 5WTrack analysis framework analysis results
- Results of 5 core expert groups
- SWM comprehensive evaluation result
- Differentiation and excellence of SWM
- SDGs implementation level (implementation level and results)
SMART WATER MANAGEMENT
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**What makes SWM different?**

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**What is the role effect of SWM?**

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