International Water Resources Association

IWRA

**Smart Water Cities: What are they?
How to measure and compare them?**

Interdisciplinary Forum on « Smart Water Cities »

**Centre for Water Technology and Policy
University of Hong Kong**

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Objectives for the session

1. **What are Smart Water Cities?**

   Related question: what features SWC have?

2. **How to examine and compare Smart Water Cities?**

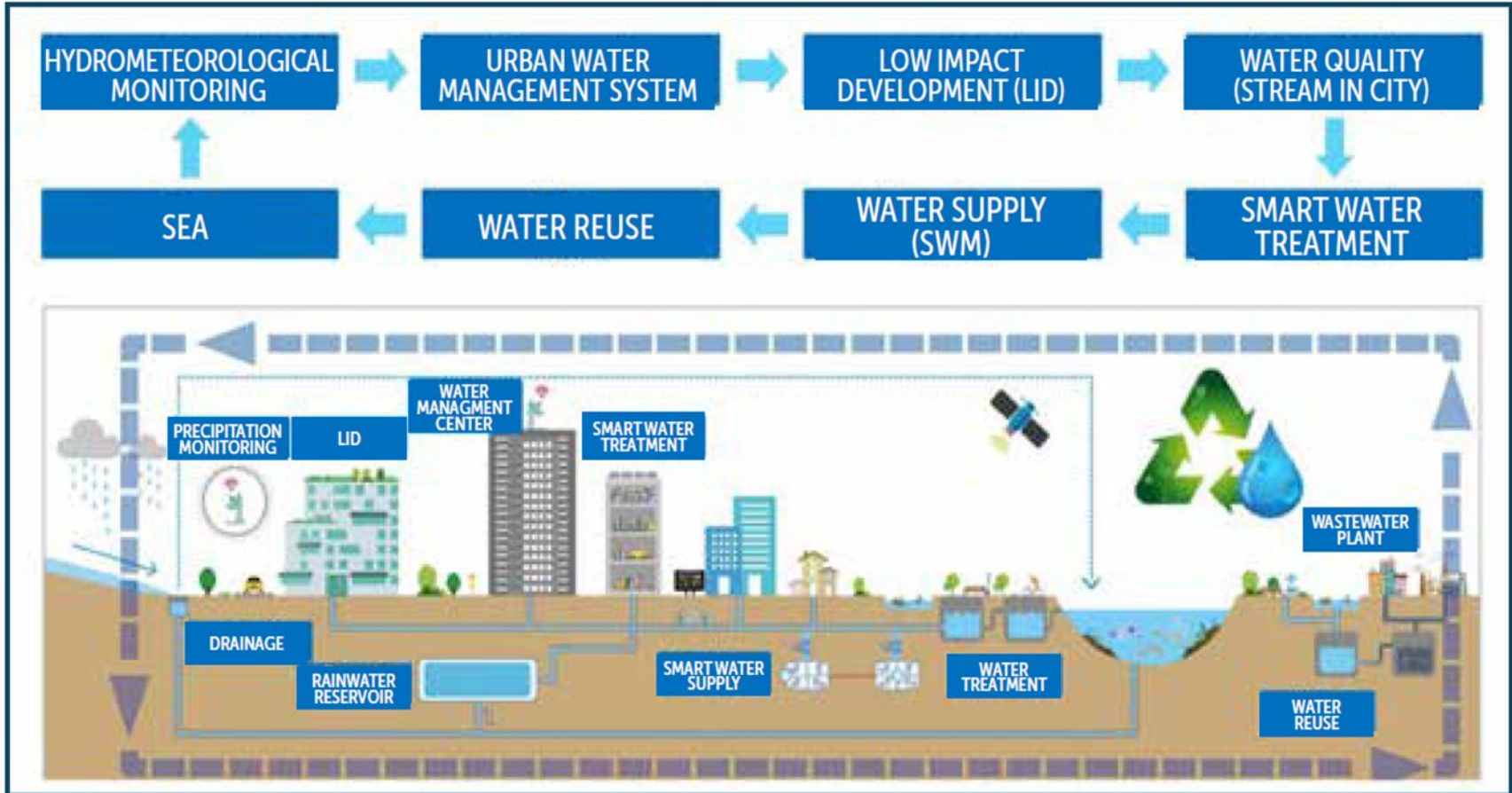   *Related question:* What challenges for their development?

   ***Need for a comprehensive instrument
   to evaluate Smart Water Cities***
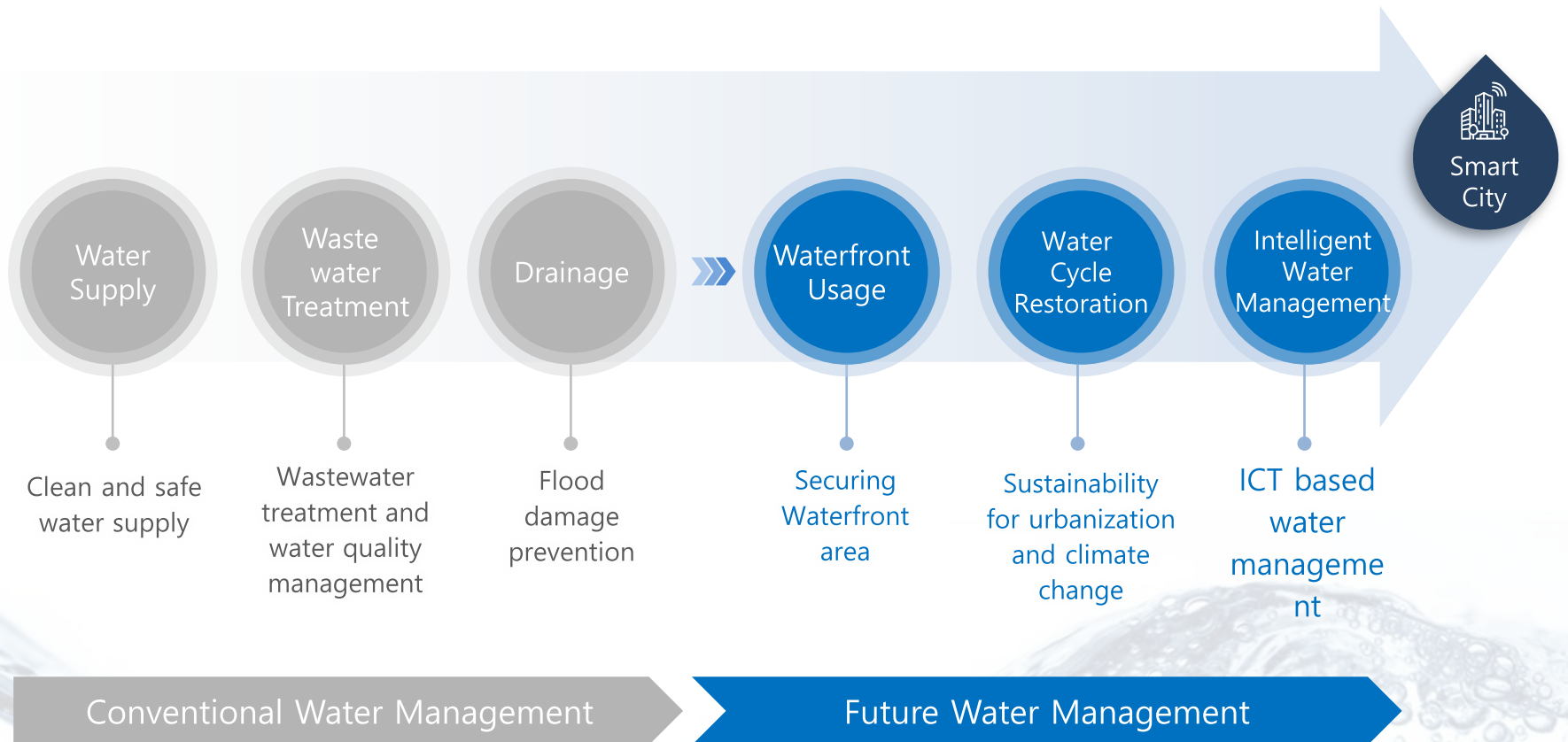
Definition of Smart Water City

- A Smart Water City is a sustainable city with intelligent water management for all.

- A Smart Water City improves the quality of life of citizens by solving existing urban water problems based on various technologies and ICTs *throughout the urban water cycle.*

Urban water cycle

Smart Water City

Water Supply	Waste water Treatment	Drainage	Waterfront Usage	Water Cycle Restoration	Intelligent Water Management
Clean and safe water supply	Wastewater treatment and water quality management	Flood damage prevention	Securing Waterfront area	Sustainability for urbanization and climate change	ICT based water management

Smart City

Conventional Water Management → Future Water Management

Case study analysis

CITY	Country	Region	Type of City			Type of Challenge Addressed
			Population	New or Existing Urban Development	Economic Development	
Algarrobo	Spain	Europe	Urban Settlements	Existing	High-Income Economy	Water Scarcity
Busan Eco Delta City	Republic Of Korea	Asia & The Pacific	Medium Size City	NEW	High-Income Economy	Inadequate Urban Water Planning
Ciudad Juarez	Mexico	North America	Medium Size	Existing	Upper Middle Income	Aging or Insufficient Infrastructure
Heredia	Costa Rica	Latin America & The Caribbean	Urban Settlement	Existing	Upper Middle Income	Deficient Water Quality
Hong Kong	China	Asia & The Pacific	Large City	Existing	High-Income Economy	Inadequate Urban Water Planning
Mumbai	India	Asia & The Pacific	Megacity	Existing	Lower Middle Income	Aging or Insufficient Infrastructure
Nakuru	Kenya	Africa	Small City	Existing	Lower Middle Income	Water Scarcity
New York City	USA	North America	Large City	Existing	High-Income Economy	Flood Risks
Ningbo	China	Asia & The Pacific	Large City	Existing	Upper Middle Income	Flood Risks

		Solutions		
		Conventional technology	Smart technology	Governance reform
Water Challenge	Aging/insufficient infrastructure (Ciudad Juarez)	Network renewal	1. Smart meters 2. Pressure control valves 3. An advanced metering infrastructure (AMI) to read meters and sensors continuously 4. A Cloud software platform	Master plan Raising finances → modification of bill structure Capacity building Monitoring
	Deficit water quality (Heredia)	Drinking water treatment plant	1. Introduction of new patented technology in sediment phase 2. Introduction of Supervisory Control and Data Acquisition (SCADA)	Capacity building Financial capacity: introduction of water tariff Flexible technology

Two approaches

- Comprehensive approach to smart water cities:
  - From planning to implementation
  - Longer timeframes
  - More ambitious, more demanding to implement

- Piecemeal, incremental approach to smart water cities:
  - Restricted to an area of the city
  - Renewal and retrofitting of existing infrastructure
  - Shorter timeframes
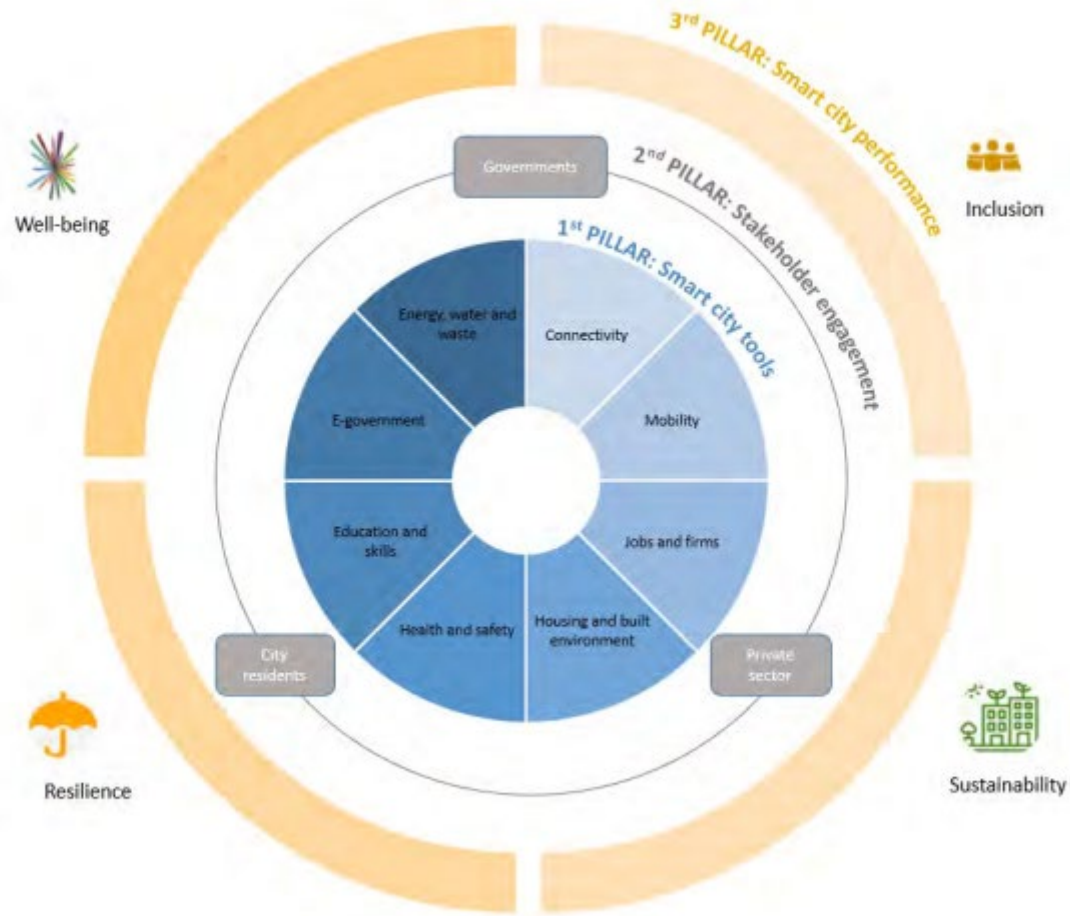 - Less ambitious, more flexible, less smart?
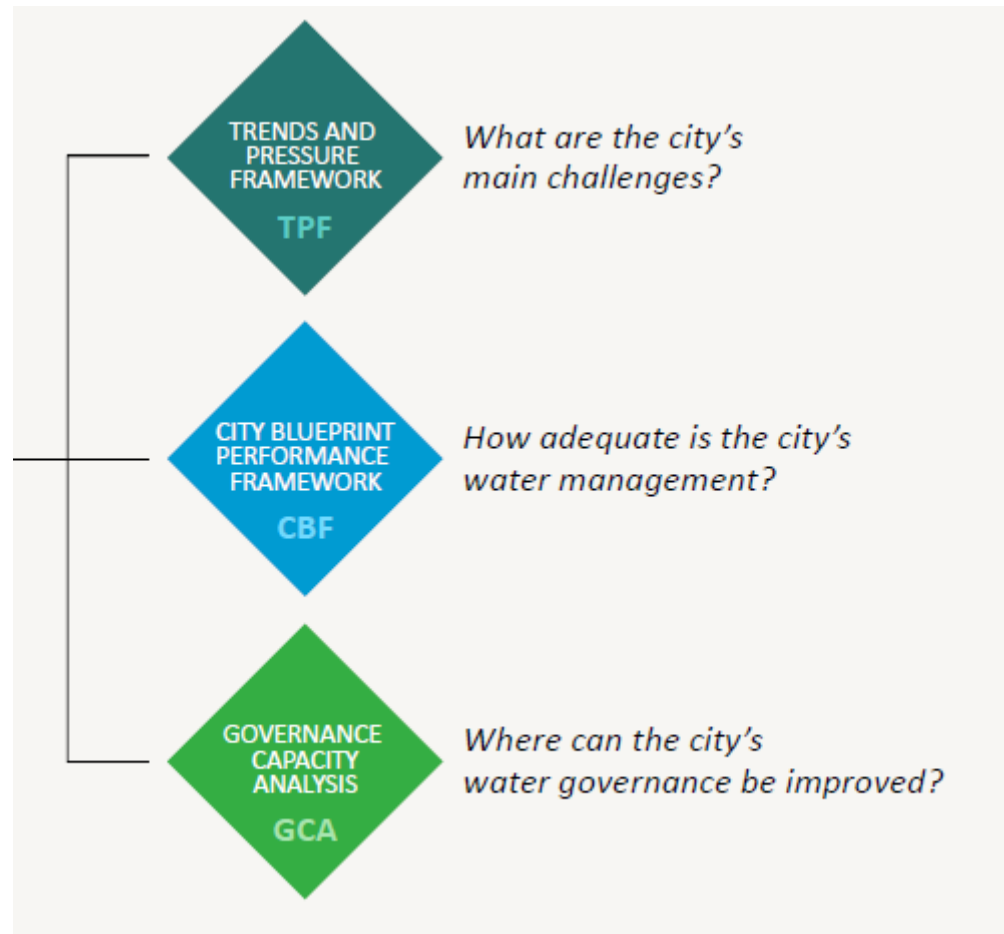
How to measure SWCs?

OECD Smart Cities Measurement Framework

Figure 2. OECD Smart City Measurement Framework

Source: OECD.

City BluePrint approach

Parameters / Measurement framework	Key indicators	Strengths	Limitations	Overall assessment
OECD Smart City Measurement Framework	• Degree of digitalisation and digital innovation • Impact of digitalisation • Stakeholder engagement	• Smart indicators • Measures impact of technologies on wellbeing	• Water is one amongst many elements • No urban water cycle	Useful for smart indicators, BUT No urban water cycle
CITY BluePrint approach	• Sustainability of urban water management • Urban water governance	• Measures starting point and point • Comprehensive on sustainability (link to energy and biodiversity) • Focus on governance	• No analysis of certain phases of urban water cycle (precipitation, use of water amenities) • Limited on digitalization	Gives context on urban challenges BUT Limited on smart cities and urban water cycle

# Lessons learnt

✔	Smart cities are sustainable
✔	Smart includes both conventional technologies and ICTs: Meeting needs and quality of life are central objectives
✔	Governance matters
✖	Focus on drinking water and sanitation → not other areas of the urban water cycle
✖	Scarce focus on smart technologies
✖	Limited understanding of governance
✖	Limited understanding of future scenarios

Smart Water City standards
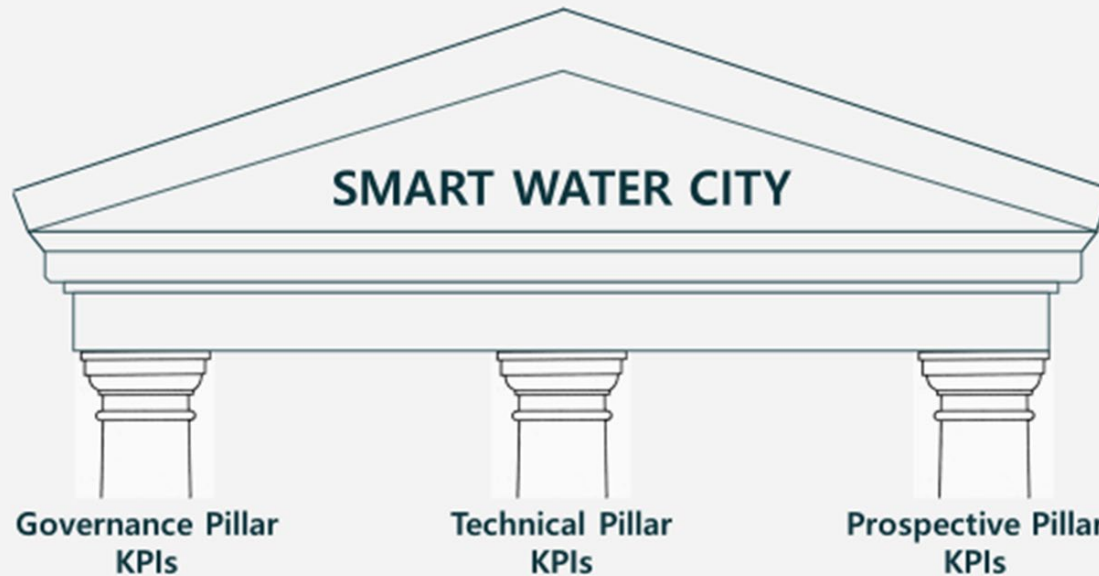
Governance and Prospective pillar

Effectiveness

Efficiency

Trust and engagement

- Clear allocation of roles

- Adequate scale

- Coordination

- Capacity

- Water data

- Financial resources

- Sound water management regulatory frameworks

- Innovative water governance practices

- Integrity and transparency

- Stakeholder engagement

- Trade-offs management

- Regular monitoring

OECD Principles on Water Governance

Technical Pillar

Urban Water Cycle
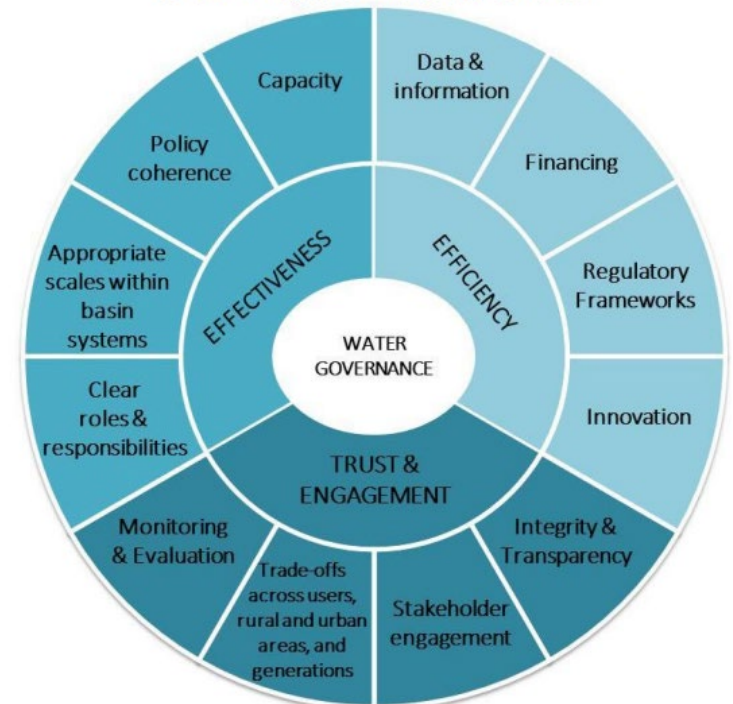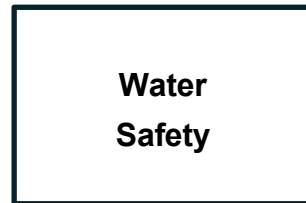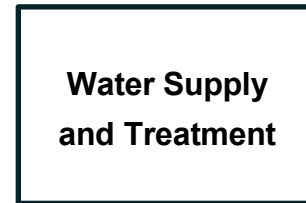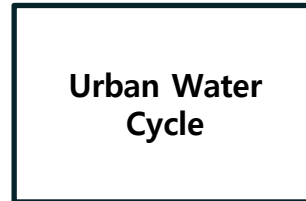
- **Precipitation**
- **Surface & Groundwater**
- **River Stream**
- **Amenity Water**

Water Supply and Treatment

- **Drinking Water**
- **Sewage Water**

Water Safety

- **Flood**
- **Drought**
- **Potential Risk**

Recap and conclusion

1. Smart Water Cities are of great topicality, but concept remains vague

2. Enormous variations in smart water solutions, thus difficulty to compare them

3. Need for a robust framework to guide & measure progress of Smart Water Cities

Thank you!

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