Assessing Digital Water Governance Systems in Smart Cities

U. Stein*, D. Knoblauch*, B. Bueb*

Ecologic Institute, Pfalzburger Straße 43/44, 10717 Berlin, Germany

(E-mail: ulf.stein@ecologic.eu.com; doris.knoblauch@ecologic.eu; benedict.bueb@ecologic.eu)

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Introduction

Achieving sufficient sustainability in urban water management systems poses a major challenge for cities across Europe. The **Digital-water.city project** (DWC) aims to improve the performance of urban water integrated management by means of innovative digital technologies and data. The DWC project develops and validates 15 advanced ICT solutions to address a range of current issues in urban water management.

Accompanying governance research ensures that these digital solutions are not only developed successfully, but that they are also effectively implemented and actively used by end-users.
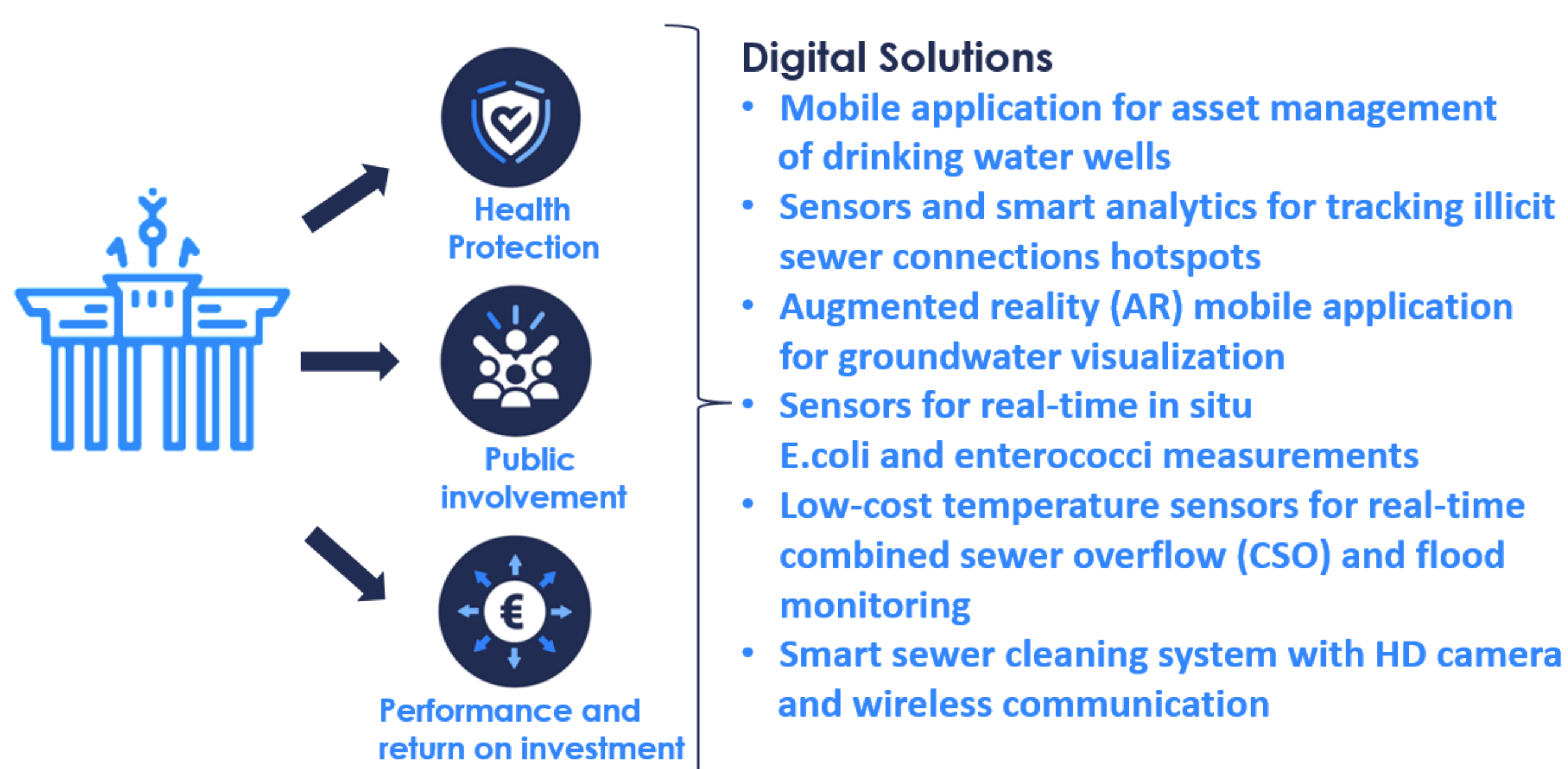
Digital Solutions
- **Mobile application for asset management of drinking water wells**
- **Sensors and smart analytics for tracking illicit sewer connections hotspots**
- **Augmented reality (AR) mobile application for groundwater visualization**
- **Sensors for real-time in situ E.coli and enterococci measurements**
- **Low-cost temperature sensors for real-time combined sewer overflow (CSO) and flood monitoring**
- **Smart sewer cleaning system with HD camera and wireless communication**

Health Protection

Public involvement

Performance and return on investment

Figure 1: Berlin case study: objectives and applications

Methodology

Governance is conceptualized as a condition that structures action, rather than being the action itself. From this perspective, comparable actions may lead to different results, as the common political culture, motivations and resources of relevant stakeholders adapts to different settings.

The DWC project developed an **assessment framework for digital water governance** along five criteria of "governance qualities": context, extent, coherence, flexibility and intensity. [1,2] The framework addresses the following **research questions**:

1. What are governance conditions/modes at the different stages of the transformation processes that enable and facilitate the uptake of ICT solutions in urban water management?
2. What barriers hinder the uptake of ICT solutions?
3. What are favorable governance conditions/modes at the different stages of transformation processes that enable and facilitate public participation in innovation in urban water management?
4. Does the application of ICT solutions lead to (more) sustainable water management und under what (governance) conditions?
5. How open are the respective governance systems to learning processes? [1]

For each case study city, we used **a stepwise approach**:

1. Development of "policy matrices" which deliver a cursory overview on case specific ICT and water policies on local, national, and EU level.[3]
2. Identification of existing factors that enable or hinder the uptake of ICT solutions using the "governance assessment framework ".[1]

Results & Discussion

Berlin presents a solid water management framework that is laid out in binding provisions and proven business practices. It also counts with both national and local actors to transpose the European directives at the respective institutional levels.

Many policies follow the form of strategies and action plans rather than binding provisions. The German score in the Digital Economy and Society Index is higher than the EU average, since digitalization has become an integral component of company and institutional routines.

Nevertheless, the increasing amount of digitization programs and legislative schemes has not yet much impact on the water sector. A distinguished exemption is the case of cybersecurity risks for critical infrastructure, given that the law enforces water suppliers and wastewater facilities which apply ICT technology to conform with the up-to-date ICT security requirements.

Berlin's increasingly digital agenda leaves room for the application of ICT technologies in water management. But, at the moment, there is no sectorial focus, which opens space for the potential of digital solutions for water.
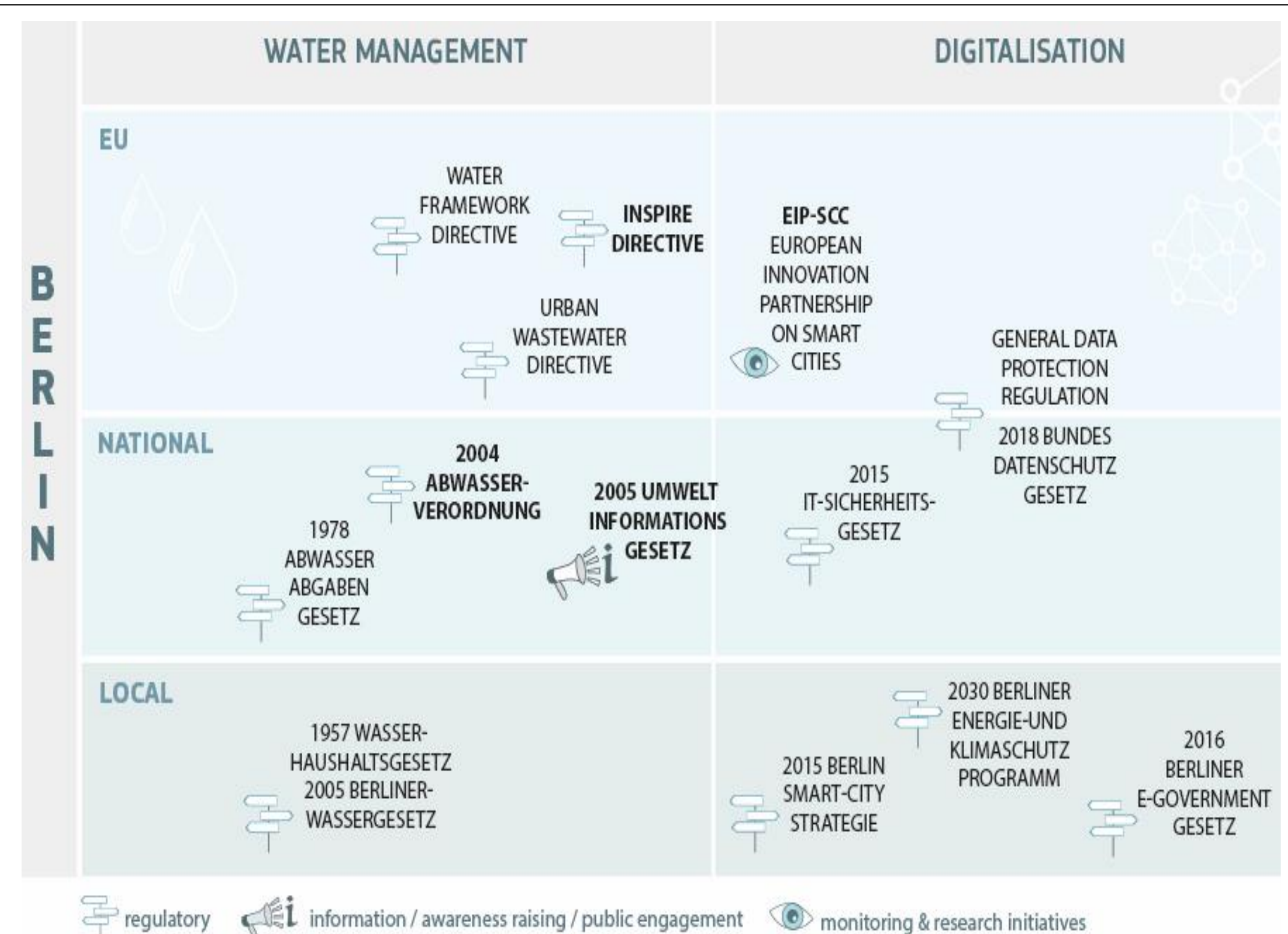
Figure 2: Berlin case study: policy matrix [3]

Conclusion

- The **governance assessment framework** was successfully applied and validated in several large European cities. The scope extends beyond the boundaries of the DWC project.

- **Digitalization in the water sector in Berlin** finds itself in its early stages as well as the city's regulatory, social and economic framework. Relevant observations, however, can be seen in the enhanced regulation and subsequent operations in the two macro-policy domains of water management and digitization. Thanks to the higher degree of regulatory certainty provided by EU legislation and the obligations of transposition into national laws, cities today are dealing with a more comprehensive set of provisions. European directives comprehensively regulate the water cycle with regards to groundwater exploitation, quality standards, wastewater treatment, reuse of water resources, bathing water quality and others. Meanwhile, the process of digitalization has brought unprecedented disruption, thus stimulating a comparable regulatory activity.

References

[1] Knoblauch, D., Bueb, B., Stein, U., and Herb, I.. (2019). DWC - Guiding Protocol For the Assessment of Digital Water Governance Systems with Particular Focus on Favourableness to Innovation. (v0.1.0). DOI 10.5281/zenodo.3983017.

[2] Bressers, H., de Boer, C., Lordkipanidze, M., Özerol, G., Kruijf, J., Farusho, C., Lajeunesse, I., Ramos, M. H., Kampa, E., Stein, U., Tröltzsch, J., Vidaurre, R., Browne, A. (2014). Water Governance Assessment Tool. With an Elaboration for Drought Resilience. DROP Governance Team. DROP INTERREG project.

[3] Knoblauch, D., Felicetti, L., Stein, U., Bueb, B. et al. (2020). Policy Matrix - Screening of Digital, Data and Water Policies (v0.1.0). DOI 10.5281/zenodo.4320526.