PART 3

CONCLUSIONS AND NEXT STEPS

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Innovation and technology are powerful tools necessary for bringing progress to society. Many of the comforts that people enjoy today are possible thanks to the products and techniques inconceivable only a few generations ago. Technologies and production techniques have radically changed in the last 200 years. While the degree of industrialization across the world has been very uneven, most countries have experienced large industrial developments at least from the mid-20th century or earlier. The 4IR, currently underway, consists in the fusion of mobile digital communication and information technologies (ICTs), supercomputers and robotics, and has had a massive impact on the economy and society, worldwide. Innumerable daily activities today are made possible by ICTs. Telework and online services have become daily routines for thousands of people during the recent COVID-19 pandemic, showing how necessary our reliance on ICTs for growth and development is.

As cities face large challenges regarding climate change, population growth, rapid urbanization and urban inequality and governance difficulties, **digital technologies and ICTs have given evidence of the contribution that they can make to sustainable development.** More concretely, in the water sector, smart technologies have shown their potential to assist with numerous challenges across geographic locations in both developing and developed regions. As well as a vigorous literature on the topic, the nine case studies of this report show how smart technologies have served to provide solutions to water scarcity, water quality deficits, aging infrastructures, deficient urban planning, and more. ICTs have assisted cities to reach policy objectives and international goals for urban development and societal well-being. They have given evidence of the successes that cities have achieved when implementing smart water solutions, the factors that have facilitated their implementation at the local level, as well as the limitations and the obstacles they face.

However, one of the main difficulties of extracting lessons from existing case studies on the use of smart urban technologies is that many of these initiatives have been concerned with slightly different dimensions of urban smart development. Some of them focus on tangible assets, such as ICT, technology, and hard (physical) infrastructure in services. Others pay attention to smart intangible assets, such as the role of ICTs in social, cultural, and human capital, well-being, knowledge, policy, governance, participation, innovation, economy, inclusion, and equity (Ahvenniemi, et al., 2017; Huovila, et al., 2019). When it comes to examining smart water solutions, we see that they have been applied to different water functions in cities (drinking water, water circulation, and wastewater) making it difficult to have an overall comparative view of how cities manage water resources. Relatedly, cities also differ in the type of indicators they employ to measure their performance; some of them account for the resources employed, whereas others are concerned with the effects of their policies or with the impact of the adopted measures. In this sense, the development of a city is understood and measured in different ways. This variation makes it difficult to compare what cities are doing and to understand what measures are most efficient and can be learned from.

For this reason, **developing a specialized and dedicated standard for Smart Water Cities is necessary.** Given the large role of water for the smart and sustainable development of liveable cities, a standard that pays specific attention to the management of these resources at the local scale is both

relevant and necessary. **A standard can define the central common aspects of smart, sustainable development, while also examining and comparing solutions in cities with different agendas, contexts, and needs.** Defining a standard for Smart Water Cities can go beyond self-proclamations of being a smart and sustainable city, and instead evaluate the urban performance and give a diagnosis of the status of water and water ICTs in urban settings. In addition, developing a standard can also assist cities in **setting targets and in monitoring performance over time.** This can aid cities in defining their priorities, give them guidance on the appropriate measures or combinations of measures for improving their performance, as well as contribute to its future policy decisions.

What is the best way to develop a global standard for Smart Water Cities? From the analysis of city case studies and the global standards and certification schemes, various lessons are drawn:

- First, **cities are places with singular economic, social, and environmental dynamics that deserve special consideration.** The examined standards and the case studies presented reflect the increasing attention that cities are receiving from developmental agencies and international organizations. A future Smart Water City standard will contribute to these efforts. The incorporation of sublocal entities (communities or sites) and the supralocal level (river catchment basin) are to be considered.

- Secondly, **Smart Water Cities are sustainable water cities.** A future global standard for Smart Water Cities needs to examine the technological solutions and whether they are environmentally sustainable, economically feasible, and socially equitable. Smart water cities indicators need to measure this threefold front.

- Thirdly, **smart city solutions are tailored to local circumstances.** Future Smart Water Cities standard needs to pay attention to and deliver solutions for the diverse circumstances faced by cities across the world. They need to tailor smart proposals to local conditions. Smart water solutions will be responsive to the diverse features of cities, including the size of the city, its rate of urbanization and growth, the status of its infrastructure, its economic development, etc. Implementing smart solutions does not necessarily have to be associated to expensive devices and equipment, nor do smart solutions need to be accessible only to economies capable of affording large expenses in infrastructures, running costs, and maintenance. A Smart Water Cities standard and certification scheme needs to account for these variations.

- Fourthly, **good governance of urban water resources is necessary for Smart Water Cities.** Defining water performance indicators and measuring and collecting water data needs to accompany an assessment of the allocation of policy roles and responsibilities and the presence (or lack thereof) of sufficient coordination across levels of government and policy sectors. The adoption of smart water solutions depends not only on technological prowess and capabilities in a city, but also on other aspects related to institutional frameworks and policy decisions. In this sense, the existence of an appropriate governance framework is just as important as physical infrastructure. The Smart Water City standard will serve its purpose better if the gathered

information feed into the design, implementation, and evaluation of projects and policies.

• Fifthly, **the establishment of a Smart Water City standard and certification scheme is not an end but a means for better, more sustainable, smarter, water resources and water services management.** Hence, the standard needs to be adaptable to the existing circumstances as well as to future situations and upcoming technological developments. A future Smart Water Cities standard and certification scheme is an instrument that needs to be revisable and regularly updated. In doing so, it will ensure that it is adjusted to more ambitious targets when they are feasible, while responding to potential drawbacks and difficulties.

Next steps

With the publication of the present report, Stage 1 of the Smart Water Cities project "Identifying Smart Water Cities" concludes, and Stage 2 "Developing Standards" begins–as of January 2022. **The objective for Stage 2 is to define a standard and certification scheme for Smart Water Cities which will help to examine, measure, and compare urban water performance across time and in different cities around the world.** Such standards will serve to examine Smart Water Cities as defined here–i.e. sustainable cities with contactless and intelligent water management for all.

Following the findings in this first report, the development a Smart Water Cities standard involves a comprehensive examination the different functions of water in cities that looks at **the role of water at different stages of the urban water cycle.** KPIs will be developed to assess water performance at each of these stages and to examine the role of existing and potential ICTs to guarantee and improve the management of water resources at the local level.

In addition to the evaluation of the urban water cycle, the standard will account for the sustainability of the urban water system. A smart city does not only employ ICTs, **but also ensures the sustainable management of urban water resources.** Thus, a future Smart Water Cities standard will develop indicators that measure environmental sustainability, social inclusivity, and economic performance.

In this sense, the framework for a future Smart Water Cities standard, which is to be fully defined in Stage 2 of the Smart Water Cities project, can already be seen to consist of three main pillars:

1. **Technical pillar,** which examines the role of conventional water technologies and ICTs at different stages of the urban water cycle. This pillar will measure the effects of human intervention in water services provision and urban ecosystems, as well measure how water technologies can improve local urban water resources management.

2. **Governance pillar,** which will be concerned with the institutional and regulatory set-up for the management of the urban water system. This

pillar will account for elements such as the distribution responsibilities and coordination, business models for water services provision, participatory mechanisms, monitoring and oversight practices;

3. **Prospective pillar,** which is concerned with the potential development of a sustainable growth city under changing circumstances. This pillar will assess future trends and how they can impact urban water systems. Attention is to be paid to changes in urban features (e.g., demographic/social, industrial/economic, and physical/environmental changes), financial conditions (financial independence, water-related investment) and future investment value (e.g., historical, cultural, geomorphological attractions).

In addition to this three-pillar framework and the KPIs for each pillars evaluating urban water resources management, Stage 2 of the Smart Water Cities project will develop the guidelines and instructions that cities will follow to use the KPIs adequately. An accreditation procedure for a future certification scheme for Smart Water Cities around the world will be detailed.

This new phase of the project will involve the participation of water researchers from different disciplines: hydrogeology, engineering, social sciences, and law, but also professionals with hands-on experience with these topics at the local and regional administration and government, in public and private companies, and in non-governmental organizations. IWRA, K-water, and AWC invite interested professionals and organizations to get in touch if they wish to learn more.