#### UN 2023 Water Conference - ITU contribution

There are many ways in which ICTs can help address water-related development issues, including in the area of water management, for monitoring water resources and in the area of disaster management, such as floods, landslides and droughts. This section highlights different examples of the benefits of ICTs, including through the use of new, emerging and smart technologies.

### Smart water management in cities and communities

Cities and communities play an integral part in the availability and distribution of water resources and contributing to the preservation of biodiversity. Smart water management promotes the sustainable consumption of water resources through coordinated water management by the integration of ICTs products, solutions, and systems, to maximize the socioeconomic welfare of a society without compromising the environment. International standards such as Recommendations ITU-T Y.4550 – Y.4699¹ and ITU-T L.1500² lay the framework for implementing and designing smart water management in cities.

In addition to international standards published for cities and communities, the <u>United for Smart Sustainable Cities (U4SSC)</u> initiative has developed a set of international <u>key performance indicators (KPIs) for smart sustainable cities (SSC)</u>. The U4SSC KPIs establish the criteria to evaluate ICTs' and digital technologies' contributions to making cities smarter and more sustainable and to provide cities with the means for self-assessment. A key component of the programme includes indicators specifically addressing water in cities. KPIs include smart water meters, water supply ICT monitoring, draining/storm water system ICT monitoring, basic water supply, potable water supply, water supply loss, drinking water quality, water consumption, freshwater consumption. These types of indicators enable cities to implement ICTs into their water management practices.

### **Smart water metering**

The deployment of smart meters within an urban infrastructure enables remote accessibility of consumption data, which improves meter reading and billing, detection of leaks, illegal connections and tamper alerts. Customer and provider relationships are enhanced through increased communication, utilities can improve their tariff policies, and consumers can be equipped with options like online alarms in case of a leak or suspicious consumption or the possibility to change payment methods.

Smart metering also allows water utilities to provide clear water consumption information, which can help customers to track and control their water usage and identify immediate savings on their bills, thus enabling better distribution network and consumption planning due to its real-time monitoring capabilities. International standards Recommendation <a href="ITU-T F.747.1">ITU-T F.747.1</a> establishes the framework for sensor networks for supporting the requirements of smart water metering services.

# Smart water sensing

Effective water sensing and an early warning system are key to ensuring water resources safety and sustainable use. When there is a sudden abnormal change in water quality, the on-site monitoring units can detect this abnormality and the system can present early warnings as soon as possible and determine the measures to be taken based on the conditions so implementation of these measures can be done promptly. An advanced system can even give precautions based on the change of sensing data before any serious accidents happen. This kind of programme can lead to substantive benefits, as their actual cost is

<sup>&</sup>lt;sup>1</sup> ITU-T Study Group 20: Internet of things (IoT) and smart cities and communities (SC&C)

<sup>&</sup>lt;sup>2</sup> ITU-T Study Group 5: EMF, environment, climate action, sustainable digitalization, and circular economy

very low compared to the economic and social impacts of hazards, which are not detected early enough to undertake adequate actions.

International standards such as ITU-T Series L Supplement 15 help cities understand the requirements for water sensing and early warning systems, water parameters that should be used, and the different technologies for sensing water quality indicators in addition to early warning systems.

### 5G enabled smart water management

Fifth generation telecommunication technology has the opportunity to enable several smart water solutions. 5G can enable autonomous operation of infrastructures, massive connection of devices and the use of real-time data are going to make a difference in the way water is being monitored. It can also have a significant impact on improving the environmental efficiency of smart water technologies. ITU's focus group on environmental efficiency for artificial intelligence and other emerging technologies (<u>FG-AI4EE</u>) has developed guidance to support measuring and improving the environmental efficiency of IoT technologies, in particular, 5G connectivity in water management systems. These guidelines were developed to gain new understanding on the environmental impacts from the use of IoT and 5G to connect and enable further networked sensors and applications to manage water supplies and reduce water loss.

### Al for autonomous irrigation and more efficient use of water

Smart agricultural systems including autonomous irrigation are improving the efficiency of water use in farmlands. All systems can be deployed on robotic platforms to direct and control their work performing assistive tasks, such as targeted irrigation, application of fertilizers and pesticides, collection of fruits and transporting equipment around a farm among others. For example, with the guidance of All prescription maps, drone swarms can navigate themselves and releasing the correct amount of seeds, fertilisers, or pesticides precisely onto the target areas. Based on the data of an Al-powered All agricultural system in China, compared to indiscriminate spraying, variable rate application (VRA) helps reduce the use of pesticides by 60 percent as well as conserving agricultural water by up to 90 percent<sup>3</sup>.

## ITU/WMO/UNESCO-IOC Joint Task Force – SMART Cables for Observing the Global Ocean

The ocean is key to understanding societal threats including climate change, sea level rise, ocean warming, tsunamis, and earthquakes. Because the ocean is difficult and costly to monitor, we lack fundamental data needed to adequately model, understand, and address these threats. One solution is to integrate sensors into future undersea telecommunications cables. This is the mission of the SMART subsea cables initiative (Science Monitoring And Reliable Telecommunications). SMART sensors would "piggyback" on the power and communications infrastructure of a million kilometers of undersea fiber optic cable and thousands of repeaters, creating the potential for seafloor-based global ocean observing at a modest incremental cost. Initial sensors would measure temperature, pressure, and seismic acceleration. The resulting data would address two critical scientific and societal issues: the long-term need for sustained climate-quality data from the under-sampled ocean (e.g., deep ocean temperature, sea level, and circulation), and the near-term need for improvements to global tsunami warning networks. A Joint Task Force (JTF) led by three UN agencies (ITU/WMO/UNESCO-IOC) is working to bring this initiative to fruition.

Using ICTs for Earth observation and geospatial data for water resource management

<sup>&</sup>lt;sup>3</sup> See <u>FAO-ITU Digital Agriculture in Action: Artificial Intelligence for Agriculture</u> (2021)

Some of the most commonly requested Earth observation datasets are for water resource management applications. ICTs are used for monitoring ecosystem degradation over vast areas and long-time periods with data including water extent, time series water detection, water quality, coastal change and water detection using radar. Water Observations from Space (WOfS), one of the first products developed by Geoscience Australia through the Data Cube, tracks the presence or absence of water from 1987 to the present day for all of Australia. This product is being used for flood risk assessment, agricultural water tracking, coastal change detection and even mangrove monitoring. It allows for better understanding of where water is usually or seldom present, and where flooding has been observed by satellite. It uses open standards and is designed to help both the government and private industry make informed decisions. Other examples including China's International Research Centre of Big Data for Sustainable Development Goals (CBAS) launched the SDGSAT-1 mission, which uses thermal infrared, low light-level and multispectral cameras to monitor parameters for land, oceans, the atmosphere, and human activities at a macro level. This rich data source increasingly informs studies on the consequences and impact of human actions on coastal areas, waterways, and other environments. Among other applications, SDGSAT-1 monitors sea ice fractures caused by rising temperatures in the coldest parts of the world.

## ICTs for water and disaster management

The world is continuously facing an increasing amount of climate related disasters, including droughts, floods and mudslides. Emergency telecommunications play a critical role in disaster risk reduction and management. Information and communication technologies (ICTs) are key to monitor the environment and water-related phenomena such as floods and droughts, analyze the information to deliver early warnings and alerts, and in the immediate aftermath of disasters by ensuring timely flow of vital information.

ICTs are widely used in all 4 stages of the disaster management cycle: mitigation, preparedness, response, and recovery, and are critical in water-related disasters. With the help of satellites, drones, and camera monitoring systems, disaster agencies can monitor water-levels for flood, drought, and tsunami predicting. Similarly, ICTs play an important role in response and recovery in the aftermath of disasters for relief effort, situational assessment and a recovery for better. For example, when severe flooding hit parts of Pakistan in August 2022, Japan's <u>Aerospace Exploration Agency</u> (JAXA)obtained precise images of how floodwaters were affecting different provinces.

Another important use of ICTs is in disaster warnings. ICT networks, services, and users are growing, and they offer more opportunities to deliver alerting messages to populations at risk. People may be reached through landline phones, TV and radio, mobile networks, and the internet —social media and mobile apps—, but also through the more traditional use of sirens.

By the end of 2021, ninety-five percent of the world population had access to a mobile broadband network, with mobile phones becoming ubiquitous (ITU, Facts and Figures 2021)<sup>4</sup>. In a growing number of markets, most adults now own a mobile phone. This makes mobile networks an increasingly important communication channel to deliver alerting messages and to contribute to the *UN's Early Warning for All initiative* which states that by 2027 every person on Earth is protected by an early warning system. One key advantage is that, using cell-broadcast technology, alerting messages over mobile networks are geolocated: warnings can reach all users at any time but will only be sent to those people located in a specified alerting area. Warning can also be adapted to specific user requirements, such as a certain language.

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<sup>&</sup>lt;sup>4</sup> By end of November 2022 ITU will publish mobile phone ownership figures.