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THE ROLE OF DIGITAL TECHNOLOGIES IN WATER REPORTING

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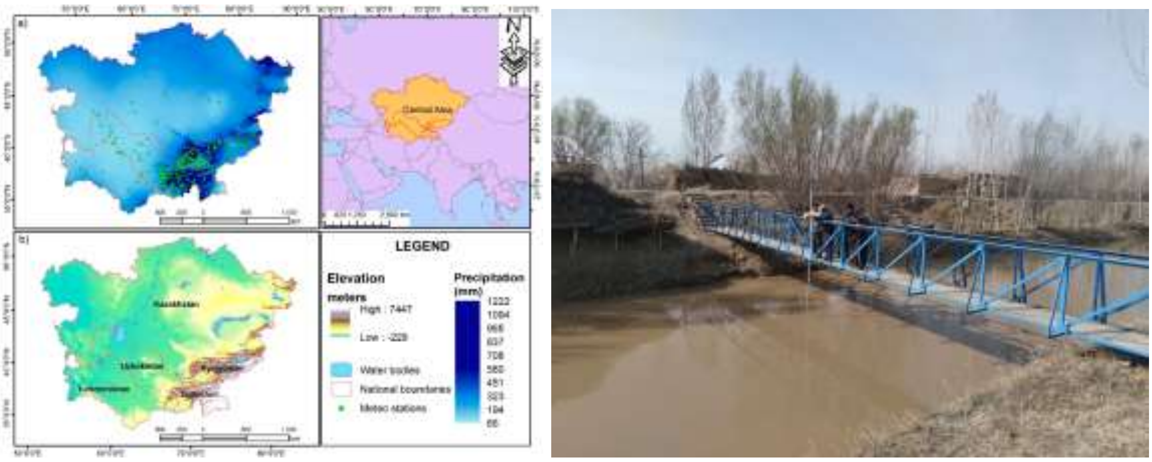
Abstract:

Water use for crop irrigation is at its maximum, accounting for about 70 percent of global freshwater withdrawals. Increasing demand for food, feed, fiber, and biofuels due to continued population growth will be addressed by expanding irrigated areas, especially in developing countries. However, there is increasing pressure to limit the water supply to irrigated agriculture and to produce more food with less water. Consequently, the search for water conservation/saving technologies/measures in irrigated agriculture has intensified. The International Commission on Irrigation and Drainage (ICID) launched its Global Water Save (WatSave) program in 1993 to promote and recognize water conservation practices worldwide. This article presents some innovative water conservation technologies/practices in some countries. It is clear that the successful upscaling of technologies to achieve greater water savings requires the combined efforts of policy makers, irrigation officials/managers, field level staff and farmers. The challenge is how to incorporate innovative technologies and management approaches into decision-making and long-term water management policy development. Exchange of ideas and communication between planners/decision makers, financial entities, scientists, local and regional authorities; establishing a mechanism for international cooperation and exchange of experience between higher education and research institutions and developing action plans to achieve practical results are some of the possible options.

Keywords: Smart water, irrigation systems, development, water shortage, ultrasonic sensor, water leveling, drip water.

Digital technologies offer unlimited potential to transform the world's water systems, helping utilities become more resilient, innovative, and efficient, and in turn helping them build a stronger and more economically viable foundation for the future. Exploiting the value of data, automation, and artificial intelligence allows water utilities to extend water resources, reduce non-revenue water, expand infrastructure life cycles, provide the basis for financial security, and more. The water sector's value chain links the environment and water resources to a utility, the utilities to their customers, and the customers back to their environment. From physical infrastructure to water quality to customer service and beyond, digital water can be integrated at every key point across the water cycle. There are many digital solutions that are part of a utility, and even more technology providers and start-ups which are facilitating their design, installation, and operation. Many of these solutions leverage the latest innovations seen across industries, advanced sensors, data analytics, blockchain integration, and artificial intelligence. Given the accelerating rate of innovation in these foundational technologies, below is a snapshot of the exciting innovations at this moment in time. Sensors, remote sensing, geographic information systems (GIS) technologies, and visualisation tools are becoming key elements to managing water resources at service area, watershed and regional scales. One of the problems facing the world community today is related to water. Factors such as various environmental conditions and climate change are increasing the value of quality environment. In particular, the demand for fresh water of agriculture is 70 percent of the world. Meeting this demand ensures food security and high crop yields. On the other hand, improper use of water resources, wasteful use will lead to reduced productivity or crop failure. In order to prevent such situations, modern developments in the network, continuous and accurate monitoring of the amount of water used in agriculture with the help of electronic devices are important.

Remote sensing/imaging technologies such as satellites and drones, used separately or together, provide data for mapping water resources, measuring water fluxes and utility asset management. Data from such technologies can better prepare water resource managers and utilities for incidences of heavy storm water flow (e.g., altering operations to prevent sewage overflow), indicate when conservation practices should be enacted during periods of drought, and ensure all treated water is delivered to customers. In addition, satellite data can be used to provide water quality data (e.g., turbidity, algal blooms, etc.) and hydrological forecasts, which, when used in conjunction with in situ measurements, allow utility operators to prepare for and react to water quality issues and other challenges.



Picture 1. Watering issues: Elevation, precipation and quality of water, detecting water spending in central asia

Irrigation plays an important role in the economies of Central Asia. In most areas crops must be irrigated because of the region's arid climate. While some areas have been irrigated for centuries, Soviet central planning created many irrigation and drainage schemes during 1950–1980. Huge schemes were constructed to irrigate desert or steppe areas and hundreds of thousands of people moved to the areas to work in agriculture. From 1970 to 1989 (the end of the Soviet period) the irrigated area expanded by factors of 150 percent and 130 percent in the Amu Darya and Syr Darya basins respectively (World Bank, 2003). If irrigation water is not strictly controlled, there is a high probability that fresh water will mix with groundwater in years of high water. Therefore, it is necessary to constantly control the amount of water available in each irrigation network. Carrying out this process using traditional methods leads to an increase in the cost of the crop and a large amount of labor is spent on this process. This electronic equipment is distinguished by its compactness, program in Uzbek language, dispatching service, monitoring features and low cost. For this reason, an agreement was reached to install 172 of these devices and start providing services to the region. Today, water monitoring devices are necessary not only for Khorezm region, but also for other regions. In this case, the use of water measuring and control devices, and digital technologies in general, will give good results.

The use of electronic devices in the continuous monitoring of changes in the amount of water in irrigation networks creates an opportunity to obtain accurate information and save water. For this purpose, ultrasonic transmitters (sensors) were used to study the decrease of the amount of water in the irrigation networks as a result of consumption during the flow, and how much water reaches the end of the channel. In this case, the sensors are placed in the middle of the channel, above the water. As a result, the distance between the water levels is determined, and a conclusion is made about how much the amount of water in the channel is decreasing. The data measured by the transmitters are sent directly to the internet server. Through the data, it is possible to determine the amount of water in each irrigation network and whether they can use water pumps or not enough water for this.

New and existing sensors, both fixed and mobile are being used to provide near real-time data on water quality, flows, pressures and water levels, among other parameters. Sensors can be dispersed throughout systems to aid daily operations by optimising resource use (e.g., chemical use for water treatment), detect, diagnose and proactively prevent detrimental events (e.g., pipe bursts, water discoloration events, sewer collapses/blockages, etc.), and provide useful information for preventative maintenance and improved longer term planning for water utilities (e.g., by helping to prioritise repairs and replacements for aging infrastructure). Likewise, sensors can provide evidence for pipe corrosion and alert home owners and utilities when water quality standards are not being met. In addition, smart meters record customer water usage, providing a clear picture of water consumption and conveying data to both consumer and utility, allowing for improved water management. Based on this, in order to monitor the volume of irrigation water in the conditions of Khorezm region, we tested the water level and consumption measurement equipment developed by our center at the water measuring post 53 of the Kulovot canal belonging to the Amudarya irrigation canals department in Khanka district. This area was not chosen as a test site for nothing. Because farming in Khorezm is done entirely by irrigation. There is no dry land. Also, water reserves in the oasis are not the same every year.

If irrigation water is not strictly controlled, freshwater is more likely to be added to the runoff during years of high water levels. Therefore, it is necessary to constantly monitor the amount of water available in each irrigation network. This process, which can be carried out using traditional classical methods, leads to an increase in the cost of the product, which in turn consumes a large amount of labor. This allows the use of electronic devices, accurate data and water savings to constantly monitor changes in the amount of water in irrigation networks. To do this, we used ultrasonic sensors to study how much water was flowing towards the end of the canal, as the amount of water in the irrigation network decreased as a result of flow along the canal. These sensors are placed in the middle of the channel above the water. Determining the distance between the sensors and the water level allows us to draw conclusions about how much water is reduced in the canal. The sensors send the measured data directly to the website. Through the website, we can determine the amount of water in each irrigation network and whether they can use water pumps or not have enough water to use. In summary, in the Khorezm region, irrigation networks are very weak.

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