Reducing Water Wastage

How IoT can play a pivotal role in managing water more sustainably

EVALAN

Introduction

Water is a finite resource. Without water, there is no life. With increasing consumption, pollution, and climate change, the water resources of future generations are endangered. A McKinsey report predicted that by 2030, global water demand will exceed viable resources by 40 percent. Change is needed now and digitization can play a significant role in this. Thanks to technology, it is possible to significantly reduce the water footprint. Using connected irrigation systems and smart water management in cities, water consumption can be adapted to climate change. Also, the industry must take measures for more sustainable water management. Sectors such as the chemical, textile, agri-food, livestock, and metal industries, have to make changes in their processes to optimize their consumption.

While the importance of reducing water consumption cannot be overemphasized, major efforts for sustainable water use and management are focused on developing new technology for cleaning and recycling.

In this whitepaper, we discuss four ways in which IoT can help to manage and use water more sustainably:

1. Wastewater Treatment

The amount of untreated wastewater is immense and has a major effect on sustainability. Industries continuously use freshwater as cooling and solvent to enrich the quality of their products. Directly exposing this used water to the environment can seriously intoxicate it. Combine this with poor recovery technologies, pollution and contaminants, environmental degradation, and potentially irreparable damage.

In addition, the problem of water scarcity is growing every year, and it makes sense to treat wastewater to meet the enormous need for this resource. Innovation is necessary to supplement these shortages and reduce the effect of untreated wastewater on the environment.

Recycling and recovering water

The long-term solution does not lie in drastically reducing water consumption but rather in innovative technologies and practices in wastewater management and treatment. A wastewater treatment system removes toxic and harmful waste from the water, reducing the risk of water pollution and the impact on the environment. This water can be reused for general and industrial purposes.

The recycling and recovery of water and its purifications are sustainable, safe, cost-efficient, and reliable methods to supply water for various purposes. However, this system faces some challenges, such as the inability to automatically optimize processes for varying water contamination and flow, the variation in chemical volume adjustments and water chemistry needs. IoT can serve as a tool to overcome these challenges.

Monitoring purification activities

IoT enables the concerned authorities to closely monitor the activities in the water treatment plant. IoT in water treatment uses the concept of smart sensors installed at various points in the water system. These sensors can monitor multiple parameters of water, such as temperature, pressure, and chemical composition. This data is sent to a platform where this data can be analyzed, and purification activities can be managed and automated.

Benefits of IoT in wastewater management

What are the benefits of IoT in wastewater management? First, IoT can help detect harmful chemicals in the water. Specific treatment processes can also be chosen using the insights obtained from the wastewater. The advanced analysis functions that are part of IoT solutions can recommend a range of suitable treatment processes

based on the concentrations of chemicals. This ensures that the processes in the treatment plants are optimized and that the operating costs are reduced. IoT also helps with equipment monitoring and detecting, or even predicting, equipment problems. This supports good maintenance of equipment and machinery, and ensures that the treatment process never stops due to a sudden failure.

In addition to excessive volumes of wastewater, leaks also play an important role in water wastage, and impact sustainability as well. IoT can support early detection and prevention of leaks. In the next chapter we take a closer look at IoT as a tool to detect and prevent leaks.

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2. Leak Detection

Water is at the heart of sustainable development. The need to protect and manage water resources is becoming increasingly important, with leaks and bursts from aging pipeline systems costing billions a year. On average, [85% of properties waste 35%](#) of their water consumption through leaks. At the municipal level, pipe leaks can account for [20-30% of total drinking water](#). The main reason behind water loss is that it is often difficult to find the cracks in pipelines where the water is leaking. IoT water leak detection technology can play an invaluable role for facility owners and operators in developing a comprehensive plan for mitigating water damage.

An example of how leak detection contributes to protecting the environment is in chemical leaks. Chemical leaks in production facilities affect sustainability and can lead to environmental pollution, affect worker safety and lead to high costs. The best treatment for this problem is to implement an IoT-based chemical leakage detection system. This system includes sensors that can provide early warnings to help prevent major chemical damage issues and prevent potential problems.

With IoT systems can be set up that monitor the pattern of the water flow and immediately detect when this flow deviates from normal patterns based on the data from the sensors. This leads to early detection of leaks and prevents water wastage, and helps improve a sustainable way of water management.

Advances in IoT sensors and wireless connectivity have dramatically reduced the cost of collecting, storing, and analyzing data from specific equipment, such as pumps or valves. For example, by installing leak detection sensors in high-risk areas in a building or factory, facility managers are alerted at the very first sign of a leak so that they can take immediate corrective action. Given the potential costs of water damage to homes or commercial properties, IoT water detection systems also offer a good return on investment.

More sustainable water management with IoT

Leak detection technology is becoming increasingly important in water supply networks for sustainable water management and the global supply of clean water. Sensors are used to [measure vibrations](#), pressures, flow rates and in some cases even sound waves.

Predictive Maintenance

IoT contributes to decision-making by predicting the future possibility of water leakage. Predictive maintenance can lead to precautionary measures, saving large amounts of water loss and preventing damage to machines and goods. By deploying IoT technology for predictive purposes, managers can make informed decisions, protect their assets from harm and increase their ROI thanks to the many use cases that arise from installing such devices and systems.

Monitoring water quality is also an important part of the sustainable management of water systems. In the next chapter, we will take a closer look at measuring qualitative parameters in water and how this contributes to a more sustainable world.

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3. Monitoring Water Quality

Water pollution is one of the biggest threats to sustainability. To guarantee a safe supply of drinking water, the quality must be monitored in real-time. Real-time water quality management is an important aspect of any sustainable society. The traditional way of monitoring water quality is through staff taking measurements with instruments and logging the data. These manual methods are not only time-consuming and cost-intensive – but they also present challenges. Errors can be easily made when water quality is measured manually. In addition, the quality of the data decreases due to inaccurate and faulty measurements. Measuring manually takes a lot of time and effort and is, therefore, neither efficient nor cost-effective. Staff should receive training to prepare them for taking measurements on-site.

The water quality must be continuously monitored and improved, with quality problems detected at the earliest possible stage. Water quality assessment and monitoring is essential as it helps to identify potential environmental issues due to detecting the spread of pollutants on time. Monitoring water quality with IoT offers an excellent solution for this.

Smart sensors measure multiple parameters

IoT systems provide a continuous stream of real-time water quality data to various municipal authorities to improve water resource management.

Below are examples of [measurable water quality parameters](#) with smart sensors:

1. Chemical Oxygen Demand

2. Biochemical Oxygen Demand

3. pH

4. Dissolved Oxygen (DO)

5. Turbidity

6. Electrical Conductivity

7. Temperature

8. Oxidation Reduction Potential

9. Salinity

10. Total Nitrogen

11. Total Phosphorus

Benefits of IoT systems in monitoring water quality

The advantage of IoT in monitoring and assessing water quality is the possibility to monitor the quality in real-time. The status of water quality can be accessed at any time. IoT also provides automatic measurements, reducing the need for manual measurements and data logging. These IoT systems help valuable human resources to increase their productivity and eliminate human errors in data logging and calculations. IoT has led to the use of adaptive

and responsive systems in water quality monitoring. These smart systems can warn authorities or staff of imminent danger, such as out-of-spec conditions or excursions.

**Monitoring water quality: Agriculture**

As an essential resource for plant growth, water quality [is crucial in agricultural activities](#) and has a significant impact on the productivity and efficiency of agricultural ecosystems.

Whether you are talking about vertical farming, precision farming, greenhouse farming, hydroponics, or any other agricultural practices, one thing is clear: technology, and in particular IoT, has proven to be valuable in creating favorable conditions for plant growth. The growth of plants can be hindered by the presence of certain factors in the growing environment. IoT water sensors can be used to monitor a variety of variables. The result: farmers can maximize crop growth and increase their production capacity.

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4. Water Conservation

Conserving water is one of the top concerns at a time when environmental conditions are deteriorating at an alarming rate. Due to the widening gap between the shrinking water availability due to climate change and the increase in population growth, water conservation is becoming increasingly necessary.
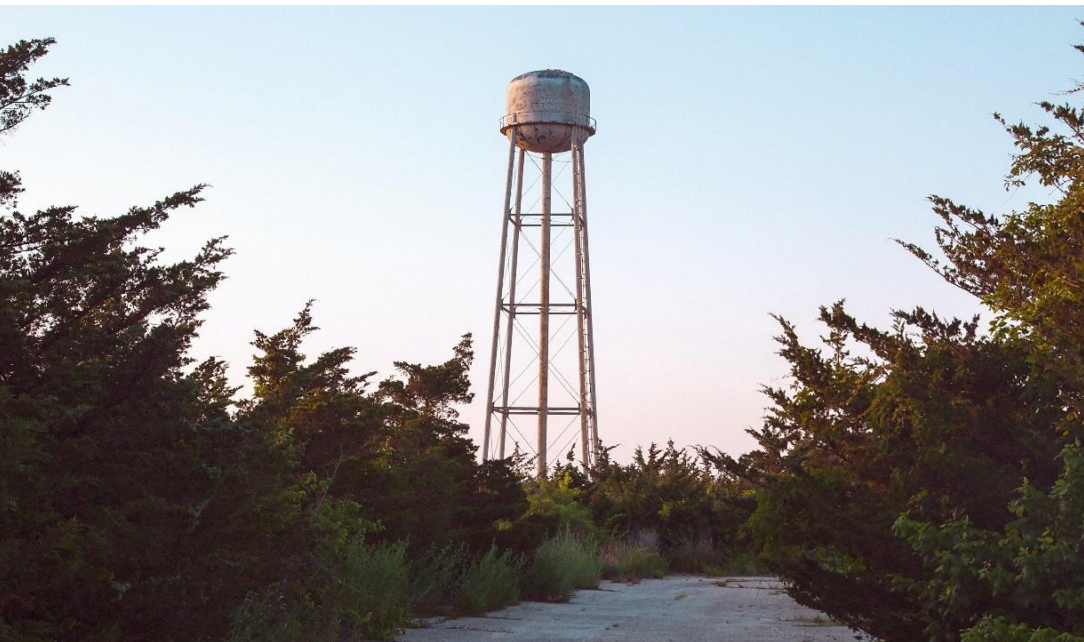
The depletion of freshwater resources in many areas of the world and shifts in water availability due to climate change have created a need for innovation in water collection and conservation. Some areas will experience drought and depleted water resources and be subject to mandatory conservation measures, such as those imposed in California in 2015 during a multi-year drought. Other areas will experience increased rainfall and with it the need to capture and recycle rainwater to manage freshwater resources. IoT technologies offer opportunities to help cities use and conserve water more efficiently and effectively.

Sensors measure water levels in reservoirs and tanks

IoT can be used to ensure better management and conservation of water resources. Integrating sensors and equipment specifically designed to monitor the water level present can be integrated into reservoirs and overhead

water tanks. Using these sensors, the water levels in reservoirs and tanks can be sent to cloud platforms at regular intervals and used to calculate and display the daily use of water. The process of measuring the water levels in reservoirs, analyzing this data and making this visible can help taking better decisions about the need for conservation of water.

Insight into the water system

An IoT platform provides real-time insight into the water system and makes it possible to make smart decisions without delays. Problems can be detected earlier and failures predicted so that no damage is caused. If the water system needs maintenance, the IoT sensors inform when maintenance is due. Managing water more efficiently and thereby reducing water consumption also will require an alternative to conventional water meters that measure the quantity and quality of water. As we continue to experience the effects of a dry climate on a growing population and increased water consumption, IoT helps conserve, protect, monitor, and intelligently manage [one of our most valuable resources](#).

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Wrapping it up

Using water consciously has become a necessity. IoT water management solutions help the industry, governments, and consumers achieve sustainability and efficiency goals. This whitepaper highlights how IoT can help improve wastewater treatment, detect leakages faster, prevent pollution by monitoring water quality, and conserve water more effectively. In addition to these four use cases, IoT can be applied to several other water management issues, ranging from tracking the surface water level to monitoring the reliability of dikes and measuring sewage systems.

Smart water management with IoT improves the transparency of all processes in the water supply chain, generating significant insights to identify or even predict problems and respond immediately to minimize damage. These processes can be fully automated with IoT and help industries and governments make data-driven decisions and become more proactive. Smart water management with IoT is no longer seen as just a source of savings and increased efficiency, but as a means to achieve several environmental goals, including reduction in carbon footprint, pollution, and essential water conservation. Now is the time to take decisive action to improve the way we manage this finite natural resource.

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About Evalan

Evalan is a fast-growing and innovative development and engineering partner in the field of the Internet of Things. We cover the complete IoT stack and work in close collaboration with our customers on remote monitoring, sensor, and telemetry solutions in the industry, real-estate, healthcare and government sectors. We develop devices, sensors, data management systems, data processing algorithms, cloud applications and user interfaces for different platforms. We serve around 100 clients, ranging from large multinationals to government departments to hospitals and small technology companies.

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