Porto's smart water management

How a digital twin transformed the city's water system

Porto, Portugal stands out among cities in Europe in its dedication to using cutting-edge technology to become more environmentally and socially responsible.

In 2020, Porto was selected by the European Commission to be part of the "Intelligent Cities Challenge," an initiative to support and transform 120 cities into smart and sustainable urban centers. One example of Porto's successes is its use of smart technology to improve its urban water system.

Aguas do Porto (AdP), the city's public water utility, is responsible for water supply, wastewater drainage and treatment, and stormwater treatment. As the company's hydraulic infrastructure grew increasingly complex, it needed a holistic, integrated, and sustainable way to access data and manage its water cycle, including to forecast flood risks and water quality issues, and improve decision-making and system resilience.

Aguas do Porto's digital twin

To do so, the city commissioned a group of vendors to create a single, smart water management platform called H2Porto. The consortium—which included Bentley, Aqualogus, A2O, and other partners—integrated all data sources, including geospatial information systems, real-time network sensors, household meters, laboratory, billing, work orders, and logistics into H2Porto.

This digital twin can model water levels based on real-world conditions and weather forecasts to predict flooding and other service-related problems. It allows for integrated real-time management of the water system as well as remote monitoring of networks and teams. H2Porto also includes an application for the provision of information to the public, allowing, for example, customers to receive notices when the utility needs to cut the water supply to a particular area of the city.

Quantifying the benefits

After its deployment, this smart technology generated immediate results on a range of metrics, including decreasing water service interruptions and sewer collapses, improving repairs and service connections, and boosting operating gains.

The platform also helped to increase the accuracy of data produced from sensor readings to nearly 99%—allowing for better decision-making, and, according to the utility, an increase in employee and customer satisfaction.

How H2Porto improved performance

WATER SERVICE INTERRUPTION	SEWER COLLAPSES	BURST PIPE REPAIRS	SEWER & SERVICE CONNECTIONS	OPERATING GAINS
22.9% ↓	54% ↓	8.3% ↑	45.5% ↑	23% ↑

A city that leads by example

Water management is not the only area of focus for Porto's city leaders. Filipe Araujo, vice mayor of Porto, champions the city's transformation into a sustainable city. Across all urban domains, he has a vision, and the SDGs provide a framework for his plans.

"When developing our environmental, digital, and other strategies we look at our assets and measure the impact on the SDGs," he said.

The city has initiatives around clean and affordable energy, social cohesion, mobility, waste recycling, digitization, and economic diversification. The pandemic heightened the importance of other areas that were affected during the crisis, such as food security.

Araujo sees public transport as the future for Porto, and he and his team work to ensure that it is inclusive and affordable. The city heavily subsidizes the cost of public transport, for instance, allowing children up to the age of 18 to ride for free. Part of the cost is being offset by carbon taxes.

"We are truly betting on changing the way people see public transport. We believe it will be the way people move in the city in the future," said Araujo.

With so many projects on his plate, the vice mayor sees his role as one that not only drives change within the government, but that also sets an example for—and motivates—the private sector. The city has special programs on entrepreneurship and works with a variety of incubators and start-ups. Mobilizing private investment is a key challenge ahead.

"To achieve our goals, we have to push on everything, and I would say inspire by example. The public sector has to have a strong message," said Araujo.

Porto's approach to digital innovation and the UN's SDGs

Has the skills and talent required to drive digital innovation	Has a formal process and procurement policies to identify and support the adoption of new technologies	Has an innovation hub to promote the adoption of advanced technologies across departments	Regularly monitors SDG efforts to ensure they stay on track	Has designated a department to take the lead on SDG governance and implementation	Has made the SDGs a higher priority since the pandemic

Providing clean and efficient energy

Porto gives clean and affordable energy high priority. Over 70% of the city fleet is comprised of electric vehicles. For its public buildings and facilities, Porto uses only renewable energy, from solar, wind, or hydroelectric sources. It is also promoting clean energy in homes. The city owns 13% of the buildings in Porto, most of which are social housing stock. It has an initiative to build and support "energy communities." These are associations of residents who come together to invest in and install solar panels across their neighborhood, thereby creating efficiencies and providing less costly energy in a more sustainable way.

Similarly, the city has a project to install solar panels on schools and other buildings, which will provide necessary energy by day. Batteries will be installed to capture some of the energy that can then be distributed and used at night.

The city is also renovating some of its existing buildings and housing stock to make them more energy efficient. In the last year, it invested more than €100 million to retrofit buildings, resulting in a 40% decrease in energy consumption in these properties. All new public buildings are being built with LEED certifications to ensure they are meeting the best sustainability standards.

Watch here

"Our work on sustainability is not rocket science. There is a business case. The city is a good laboratory for testing and is making a huge effort to be an example and show the private sector what is possible."

–Filipe Araujo, Vice Mayor, City of Porto