Sensors shed light on combined sewer overflows

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A Berlin sewer © KW Berlin

Combined sewer overflows are a challenge in urban water management. Work in Berlin and Sofia is harnessing digital technologies so that utilities can better manage these assets, as part of the wider Digital-Water.City project.

The number of combined sewer overflows in an old city, such as those in Europe, can easily be in the hundreds. They impact local surface waters when they operate during rainfall events or if the sewers become blocked. Often utilities have limited knowledge about these assets, yet they need information on them to provide a basis for operational, maintenance and investment decisions.

A project under way in Berlin and Sofia is using innovative low-cost temperature sensors as part of a digital approach to give greater insight into the combined sewer overflows (CSOs).

The approach is based on the idea that rainfall brings water of a different temperature, which can then be measured to assess when and for how long an overflow operates.

Dr Nicolas Caradot is project manager at Kompetenzzentrum Wasser Berlin and is the scientific coordinator for the wider, three-and-a-half-year Digital-Water.City project, which is now approximately at its mid-point. This covers 15 different technologies in all, and brings together 24 partners, from Europe and Israel.

Caradot explains that development and preliminary testing of the temperature sensor was carried out over the last year or two. This year, full scale testing is being carried out in the two cities.

He sees that the project is addressing two main challenges. One is to show the technology can operate in the harsh environment of sewers, ensuring there are not problems with things such as clogging or drift in measurements. The other is to understand the accuracy of the sensor and how the data can be used in decision making. Although the technique does not measure the volume of

decisions about retrofitting changes to the network, and help calibrate hydrodynamic models, Caradot says.

"We use hydrodynamic models to simulate flow and water quality in the sewer network. With this new information, we can make a kind of distributed calibration of the model. If we can do that, we can be much more precise," he says.

Caradot sees therefore that the approach can help operationally, prompting responses to overflows where there is a sewer blockage. It can help with strategic planning, providing greater insight into which overflows are the most problematic, or improving the accuracy of models used in scenario testing. It can also be a reporting tool, so that utilities can inform regulators about when overflows have occurred.

Digital options

The wider Digital-Water.City project is supported by €5 million in funding from the EU Horizon 2020 programme. It features 15 technologies across the urban water space. In each case, the aim is to deliver practical solutions.

"We have some solutions which are very innovative, sometimes very intuitive, that we really want to test and prove," says Caradot. He is also excited by the opportunity to apply these in some major European cities. "We are working directly with major European utilities – Berlin, Paris, Copenhagen, Milan, Sofia – and they are really keen on testing and implementing these solutions, and are learning from each other."

Connected themes

The digital technologies in Digital-Water.City span artificial intelligence, smart sensors, augmented reality, cloud computing, decision-support systems, open data platforms, robotics, and mobile technology.

The stated objectives of Digital-Water.City cover health protection, performance and return on investment, and public involvement. There are also three cross-cutting aspects to the project, covering governance, cyber security, and the commercialisation of the technologies.

Caradot illustrates these aspects with the project under way in Paris, which combines governance and public involvement. An early warning system is being developed to estimate river water quality and communicate with the Parisians to inform them of when it is safe to swim.

This means that the project cannot only focus on the technical development of the tool. "There we really need help to be sure that we collect the political expectation of all the stakeholders and that we follow a procedure to make a solution that will be accepted," explains Caradot.

On cyber security and interoperability, Caradot says: "We are very excited because we are testing the FIWARE platform." He describes this as a standard architecture for a smart city, offering the opportunity to connect the different data sources. EU interest in this option is indicated by the fact that the platform is being tested by a cluster of five projects of which Digital-Water.City is part. The aim is to gather experience of working with the platform. "It is very important because we have many sources of data and we will be a bit lost without this crosscutting activity. We would have some solutions which are isolated," says Caradot.

On commercialisation, Caradot comments: "This is key because, at the end, the goal is not just to

temperature sensor, for example, was developed with different scientific partners. "This is something that is not commercialised now," he says. "The clear objective is that, at the end of the project, we can sell this service to other municipalities."

Not a research project

The technologies are being implemented at full scale in the utilities. "At the end of the day, the utilities test the solutions themselves. They have their hands on it and can give feedback on their experience," says Caradot.

He explains that the project involves making a careful assessment of benefits across different indicators. He says that the end aim is to have a solution on the market, feedback on the experience with its experience of operation and maintenance, and a clear assessment of the benefits that can provide give information on the potential for others.

Caradot sums up an important focus for Digital-Water.City: "This project is not a research project – it is an innovation project." •

Keith Hayward

More information

https://www.digital-water.city/

https://www.fiware.org/