# Digitalisation in wastewater management: - Dystopia or panacea?

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**What developments do urban water researchers and professionals see as important – or worthy of scepticism? A pioneering horizon scan conducted by Eawag scientists indicates that, for this community, digitalisation is a particular concern – in a positive and negative sense. In this interview, Frank Blumensaat, an environmental engineer at ETH Zurich and Eawag, discusses the opportunities and risks it creates in the urban water field.**

**Cashless payments, online maps for navigation, photo sharing on social networks – digitalisation has become an integral part of our everyday lives. But it's much less well established in urban water management. Why is that?**

*Frank Blumensaat*: Urban water management has traditionally been regarded as a conservative sector. The long planning horizons alone mean that changes are rather slow to take effect – which isn't necessarily a disadvantage. But, at the moment, new developments appear almost daily in the digital world, so it seems impossible to pursue them all – either in research or in practice. The constant flood of innovations may be a source of inspiration, but it can also have a paralysing effect, leading people to avoid the topic of digitalisation altogether.

Determining what developments are worth pursuing is one of the tasks of research. The aim should be to provide objective information on real advances, but also on the limits of new developments, to demonstrate how they work in practice (based on examples of implementation), and to involve all stakeholders in decision-making processes.

**How could urban water management benefit from digitalisation?**

Digitalisation makes hidden processes visible. Today, people still climb into manholes to inspect sewers. That's not just labour-intensive and costly, it also only gives you a snapshot of current conditions. That's why nobody really knows exactly what's going on underground – for example, during a dry spell or when stormwater backs up in a sewer during heavy rainfall. But a network of sensors wirelessly transmitting data to the surface can show us precisely when and where a sewer starts to overflow. We've set up a wireless sensor network **[1]** of this kind in a demonstration project in Fehraltorf near Zurich. The local authorities have already benefited from this, because our continuous monitoring has shown that the expansion of capacity of a sewer section – already planned – is not necessary.

If sensor networks and smart data analysis in future give us a better idea of where bottlenecks exist, or where existing systems are overdimensioned, that could help to improve the management of wastewater flows and save us millions on renovation work.

**In a time of climate change, don't we need to add extra capacity as a precaution? Climate scenarios predict more intense precipitation in the future.**

The sewer system is not essentially designed to drain all rainfall. But shifts in the climate will clearly require modified, more flexible drainage schemes. However, simply increasing capacity across the board is not effective from an urban drainage viewpoint and would also impose higher follow-on costs on future generations. But digitalisation can help us to decide whether and where we require additional capacity in a sewer or can make different use of stormwater at a particular site. A digital network with robust sensor systems and efficient wireless transmission would also be appropriate for the management of these decentralised facilities.

**You've mentioned that digitalisation also makes what happens underground visible for the general public – how does the wastewater sector benefit from this?**

With this new transparency, we can raise public awareness of the topic of wastewater. That means the public is more likely to support budgetary decisions on the maintenance of water infrastructure or the protection of natural waters. And we can measure the benefits much more effectively than in the past. Digital technologies thus help us to demonstrate that investments actually lead to improved drainage and better pollution control. Today, the outcome of construction projects is frequently not assessed.

**Whenever a lot of data is collected, the question of cybersecurity and data protection also arises.**

In our survey, cybersecurity was indeed among the highest-ranking topics with regard to the most feared developments. Young scientists in our department recently published a study focusing on the risks of digitalisation in urban water management **[2]**. Among other things, wastewater data provides information on people's habits – for example, when somebody is at home, how much water they use at different times, and even highly sensitive information such as what medicines or drugs are used in a household. Such data has to be securely transmitted, and the public must be informed transparently about how this data is used. And, above all, the information needs to be protected from unauthorised access by third parties.

One opportunity for urban water management is that we can learn from other sectors. We don't need to repeat the mistakes made in, say, medicine where – especially in the early days – patient data was not handled with the necessary care. In many sectors, people are only now beginning to develop standards, even though digitalisation is already far advanced. We can and should start this work now, before it has really taken off in our sector.

**It's interesting that one topic highlighted in your survey has very little to do with digitalisation.**

That surprised us too. When asked which topics require further research, respondents most frequently mentioned the impact of wastewater on aquatic ecosystems. Developing a better understanding of the cause-effect relationships between engineered systems and aquatic ecology is an age-old question. Evidently, we're not yet able to provide a satisfactory answer. This shows that, despite the hype around digitalisation, we mustn't forget about basic research; in particular, to address these transdisciplinary questions, we need to collaborate more closely in future with aquatic ecologists, chemists, data scientists and urban planners.

The starting point for the online horizon scanning survey was the question: "What are emerging topics related to data that are not yet widely known to water professionals and could have substantial effects on the monitoring and/or management of urban storm- and wastewater systems?" Responses were received from around 300 academics and professionals, mainly from Europe and North America. This was the first time the global urban water community had been consulted in an effort to identify current trends and future developments.

**Publications**

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