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SMART CITY CHALLENGE 2025

City Challenge

Max 3 pages

send to smartcity@taltech.ee by Sept 30, 2025

Challenge Title – Intelligent Management of Sewer and Stormwater Networks

City/county and country: Tallinn, Estonia

Main contact from your city/county – Erkki Vaheoja, Head of Urban Environment Maintenance

1. What is the future urban challenge that would need a solution to?

- **Please describe the challenge of your city / county neighboring a city?**

Well-functioning sewers are critical to public health, clean water and urban safety — yet they tend to go unnoticed when they work reliably and attract attention only when problems surface. The challenge is to keep these hidden systems running under mounting pressure: ageing pipes, heavier storms and stricter pollution.

Sewage overflows and spills are a problem in every city and county. They are causing environmental pollution when sewage overflows reach rivers, lakes and seas. When sewer ruptures are occurring, they cause damage of property, traffic disturbances and are expensive to repair. Better sewer maintenance would make sewer management less costly, reduce its environmental impact and improve city environment.

However, for better planning, better data about the current condition of the sewers is needed. Currently, AS Tallinna Vesi, which owns and manages most of the sewer 2400 km network on Tallinn, manages to pressure-wash about 150-200 km of pipes and inspect about 45 km of pipes with a remotely operated camera. Most of the works planned on sewer networks is based on the estimates of the sewer condition by experts or are emergency repairs. Currently, emergencies (ruptured pipes, leaks, blockages) constitute about 30% of all maintenance work in the city.

Better sewer maintenance would require more frequent and better-quality data from the sewers. More data would help to build better models of sewer system and plan maintenance. Current reactive management of sewer networks could in the future be replaced by proactive management of sewer and water networks.

- **Which category your challenge is primarily in: safe city, happy city, and climate resilient city?**

Primarily, the challenges of sewer management are related to climate resilience and environmental concerns. As the climate change will increase the occurrence of storms and floods, overspills of sewer and stormwater networks are more likely to occur and they faster reach their capacity.

Indirectly, the challenges link to the ideas of Safe and Happy Cities. Sewer and water networks, part of the EU's critical infrastructure, stay invisible until they fail — when pollution, flooding or traffic disruption suddenly affect daily life.



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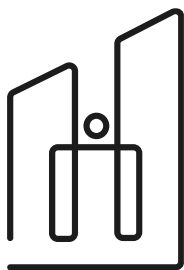


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- **Why is it important for your city to solve it? How big priority it is for you and why?**

The largely invisible sewer systems are fundamental urban safety nets. They protect people from disease and flooding, keep nature around cities alive, make public spaces pleasant, and build citizens' trust that their city is well run. That quiet reliability is one of the reasons cities with strong water infrastructure consistently score high in "liveability" and "happiness" rankings.

- **Is this a unique challenge/problem of your city, why or is this by your knowledge a challenge/problem that many cities have – which kind of other cities?**

Sewer networks are deteriorating elsewhere in Europe and in the rest of the world. In Europe, in average about 2% of the sewer system is inspected yearly, which means that the whole network of European sewers (roughly 3 million km) will take 50 years to inspect in average. Of course, in this timeframe, we cannot speak about proactive maintenance and evidence-based maintenance planning. Similar figures can be expected in other parts of the world. In Europe, the Urban Wastewater Treatment Directive has been reviewed and updated with EU Zero Pollution Act 2050 in mind, stating that pollution in air, water, and soil is reduced to levels "no longer considered harmful to health and natural ecosystems". New rules to better manage stormwater, combined sewer overflows, and urban runoff in cities are defined. The new directive will also require higher levels of system monitoring to evaluate environmental harm.

2. Innovation.

- **How have you solved that issue so far? Why aren't the present solutions good enough? Are there legal obstacles, which ones?**

With current technologies, around 2% of sewer network is monitored yearly in Tallinn. In average, similar figures are reported in other European cities. With this rate of inspection and monitoring sewer systems are mostly **managed reactively**: they are fixed when malfunctioning already happens and is large (spills in nature, floods on streets and properties, etc). With new regulations in Europe, water utilities are planning to install more sensors for sewer monitoring but the problems are that most of the sewer network is inaccessible for humans. Means for installing sensors into narrow pipes, where humans cannot access are needed. Remotely controlled camera systems are the best available technology for getting rich information about the pipe condition: deformation, leakages, blockages, illegal connections etc. However, those cameras can access mostly 100-200m meters from the entry point. Last but not least, all the water sector struggles with recruiting skilled workforce. Sewage works are exposed to harmful conditions: narrow passage with risk of fall and injury, expose to pathogens, work shifts at nights and weekends because then the reparation works disturb less the traffic. New technologies could make the work of sewage workers less dangerous and enduring but also reduce the need of manual work (e.g. if water monitors reduce the necessity to take measurements and samples). Thus, **if more information had to be gathered from the sewer infrastructure, new technologies, processes and sewer models are needed.**

- **What should be the main features, characteristics of the future solution to be potentially best for that challenge or problem?**

If 10 times more data could be gathered from sewer networks (and this includes parts of the network that are currently inaccessible) cities could move from reactive to pro-active maintenance of the sewer system. The condition of the whole pipe network can be mapped, and modelling would help to predict where the repair works should be scheduled before the damage happens. That would considerably reduce pollution by sewer overflows, traffic closures because of emergency repairs and damage to road and properties because of collapsing pipes.



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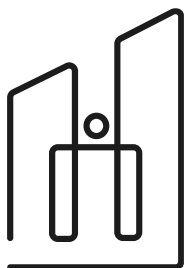


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3. Expected impact of your pilot solution.

- **What is the expected impact to your city environment you expect to see if the challenge gets solved?**

Reliably functioning sewer network and more cost-efficient infrastructure management because works can be better planned. Reduced pollution.

- **What is the expected impact to your citizens you expect to see if the challenge gets solved?**

A well-functioning sewer network is an invisible service. The best way the impact to the citizens can be described is that they do not notice how wastewater treatment is done.

- **What is the expected impact to your city governance you expect to see if the challenge gets solved?**

A data-driven, resilient sewer system would **shift city governance from reactive problem-solving to strategic asset management**. Officials could plan long-term upgrades, optimize budgets, and coordinate more effectively across departments (environment, infrastructure, mobility, health). Public trust would grow because disruptions, flooding, and pollution incidents would decrease and be communicated more clearly.

4. Piloting

- **Why would you be interested to become a piloting partner of a proposed solution to the challenge you are describing here? Describe shortly your capability to participate.**

Together with OÜ Utilitas, Tallinn City (Tallinna Linnakantselei) is the owner of AS Tallinna Vesi, the company owning and being responsible for sewer infrastructure in Tallinn. Tallinna Vesi and City of Tallinn already have a good cooperation with Tallinn University of Technology, e.g. the full model of Tallinn sewer system was recently modelled together with the university and is in use for maintenance and construction planning. **We are interested in gathering considerably more data to make the model more precise and hence, make the leap from reactive to proactive planning.**

We can participate in defining the user-requirements from a point of view of the municipality and infrastructure owner, help defining the technical specifications of the problem, offer user-feedback and testing facilities in Tallinn sewer network for testing new technologies.



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