Title: Research Council of Finland/ FIRI 2024 – 2026: Holistic Utilization of Wastewater-Based Surveillance – Wastewater as an Indicator of Public Health (TAU-WBS)

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Keywords:
Biomarkers, organic substances (pharmaceuticals), pathogens, public health, wastewater-based surveillance (WBS)

Abstract
Wastewater surveillance enables the identification of health and lifestyle markers from the entire population served by a given wastewater system (Daughton, 2018; Rice & Kasprzyk-Hordern, 2019). The expansion of the wastewater-based method has led to wastewater-based epidemiology (WBE), water fingerprinting, and wastewater chemical information mining (SCIM). For example, we have shown that determining SARS-CoV-2 RNA in wastewater is a cost-effective and non-invasive public health surveillance measure (Länsivaara et al., 2024a) and that the method is suitable for monitoring other health indicators as well (Lehto et al., 2023; Lehto et al., 2024; Länsivaara et al., 2024b). Building upon the successful COVID-19 monitoring, the European Commission has proposed systematic wastewater surveillance for several public health parameters. The markers end up in wastewater mainly through human excrement.

The project is the first multi-omics study to reveal the connections between metagenomes, proteomics, chemicals in wastewater, and diseases in the population and provide the first insight into the proteome profiles present in Finnish wastewater. This should enable us to find single or combinations of markers that predict early disease emergence. When there is a lot of analyzed data, intelligent predictions can be made about the trends that wastewater microbes and harmful substances follow. We create algorithms that can be used to produce prediction models for the prevalence of diseases. The output of the research infrastructure is a parameterized model, predictions based on wastewater data, and register data. **As part of the service provided by the research infrastructure (RI): Analysis in the mass spectrometry core facility.**

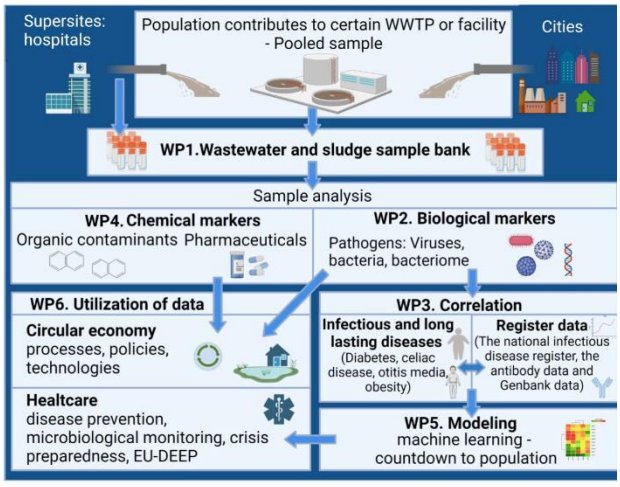

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Figure 1. Surveillance of the Urban Gut.