

Section Sciences et Ingénierie de l'environnement Design Project 2022 (semestre de printemps)

Proposition n°31

Urine Diversion as one step towards sustainable sanitation: how can nutrient valorization be implemented?

Partenaire externe

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Descriptif du projet

Urine Diversion is the practice of keeping human urine separate from the rest of the wastewater stream. This is typically done using a urinal or specialized toilet that is connected to a urine storage tank. Urine contains most of the plant nutrients found in human waste. The motivation for urine diversion is to recollect nutrients at the source thereby removing nutrient and micropollutant loads of wastewater treatment plants and make them available as nutrients for agriculture.

Although the potential of urine diversion and collection at the source is nowadays broadly recognized. Its application at a full scale faces several challenges such as appropriate urine separation devices, toilet user perceptions, a lack of legal boundary conditions and a lack of knowledge and experience for an operation and maintenance scheme at the scale of an urban settlement.

To overcome the first challenge EOOS together with Laufen has developed an innovative urine diversion flush toilet, called SAVE. The same design, based on the teapot effect has also been recently adapted in a dry design. The SAVE toilets can be installed at large scale in urban areas. The dry design can be used in combination with feces composting and provide a viable and safe onsite sanitation solution in areas where there is a lack of sewers or water and where wastewater volumes need to be kept low due to constraints for emptying and transport (e.g. mountainous areas, large scale humanitarian camps).

To test the toilet design in a real context and to further research solution for the operation and maintenance challenge, two of the SAVE toilets and one of the dry adaption have been recently installed in 4 person family home at Wissmannstrass 6, 8057 Zürich.

Objectif et buts

The general aim of this work is to better understand the options that exist to treat and reuse urine collected at the Wissmannstrasse 6 in Zürich. The specific objectives are to:

1. Characterize the urine production (rate, concentration, etc.)
2. Review possible treatment and valorization technologies of different levels of development.
3. Compare the expected logistics and costs of two to three possible treatment and valorization scenarios.

Descriptif taches

The activities carried und this project could include to:

1. Analyse the existing system and make estimations on urine quantities and dilution rates
2. List possible treatment options and compare them regarding relevant feasibility criteria.
3. Sketch out in more detail two to three possible urine treatment and valorization scenarios indicating each necessary step in the value chain including, if necessary, transport or storage.
4. Compare the scenario regarding expected logistics and costs
5. List addition key evaluation criteria and means of quantification (e.g. expected investment and operation costs, direct and indirect CO2 emissions, operation and maintenance requirements, technology readiness level, legal constraints, etc.)
6. Optionally evaluate the two to three scenarios regarding the additional criteria.

Divers

The language for project communication and reporting is English.