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VUNA: Nutrient harvesting from urine

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The eThekwini Municipality has installed 75,000 urine-diverting dry toilets (UDDTs) to provide sanitation for poor neighbourhoods in peri-urban and rural areas. The main goal of this initiative was to simplify the treatment of faecal matter: after dehydration the volume of the faeces is strongly reduced and most of the pathogens are killed. So far, the urine has only been separated to prevent moistening of the faeces. Now, the new VUNA project (www.vuna.ch), funded by the Bill and Melinda Gates Foundation, aims at making use of the high nutrient content of urine in order to promote sanitation. By giving the nutrients in urine a value, the project team envisages to improve toilet usage and hygiene. Furthermore, eutrophication and resulting environmental damage can be avoided, if urine is prevented from reaching water bodies.
The project is a collaboration of the Swiss Federal Institute of Aquatic Science and Technology (Eawag), eThekwini Water and Sanitation (EWS), the University of KwaZulu-Natal (UKZN) and the Swiss Federal Institute of Science and Technology Zurich (ETHZ). The research pursues three major objectives:
Develop urine treatment technology: Pilot-scale reactors have been developed in Switzerland and South Africa. A struvite precipitation reactor achieves approximately 95 % of phosphorus removal from urine. However, only a small part of nitrogen (5 %) and none of the potassium or sulfate contained in urine are recovered. Another process achieves complete nutrient recovery via partial biological nitrification and subsequent evaporation. The project not only aims at developing new technologies, but also at optimizing and operating the reactors in the field in order to minimize the required costs and maintenance
Optimize a network of tanks and reactors: As experienced in preceding research projects, high costs for urine collection are the main barrier for efficient nutrient recovery from urine. The collection interval, the location and the size of tanks and reactors have to be chosen wisely to minimize these costs. In the VUNA project, field trials are combined with computer simulations to develop an optimized urine collection scheme.
Define the socio-economic boundaries: The investigations on urine collection are complemented with economic studies that compare varying collection patterns. Evaluated parameters include: collection frequency, collection volumes, willingness of the toilet users to drop off collected urine at a community collection point, or the effect of cash or in-kind incentives on urine contribution. Simultaneously, social acceptance of urine collection and reuse is studied to customize a public awareness campaign, which aims at improving toilet usage.

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