



Recycling water and nutrients? Yes, says the expert

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When there is a prolonged dry spell and local authorities call on residents to save water, questions immediately arise as to whether it would make sense to reuse more water and collect rainwater. In light of recent events, here are some answers from Prof. Kai Udert, Head of the Process Engineering Department at Eawag.

Kai Udert, you're conducting research at Eawag into water and nutrient recycling and are currently commissioning a system at your own home that treats wastewater and rainwater for reuse. Does this make sense in Switzerland?



At home, we collect rainwater and treat it to drinking-water standard. We will then use this water for everything except flushing the toilet and running the washing machine. For these two purposes, we use treated greywater – that is, slightly contaminated wastewater. The greywater is treated using existing technologies to ensure it is hygienically safe. The greywater comes from the showers, the bath and the washbasins. By using greywater, we can conserve rainwater and reserve it solely for uses that demand very high standards of quality.

"The more systems are installed, the more the costs per system will fall".

In Switzerland, we have plenty of water, but even here there are places where water conservation is already a priority. These include, for example, mountain huts, where water is becoming scarcer. We have installed the water treatment system in our own home to demonstrate that it is entirely feasible. The more systems are installed, the more the costs per system will fall, and the on-site use of rainwater and greywater also makes economic sense.

What are the biggest challenges if we want to continue along this path in future?

These are the costs of the systems, their reliability and the space they require. These points are linked to technological development. This is where we, as water and wastewater engineers, have a role to play. I am confident that we will find good solutions. There are already several products on the market. Another challenge is hygiene and safety. This requires close cooperation with the authorities, particularly with the water utilities.

Your own plant not only treats the water but also processes the separated urine – why is that?

We have installed the necessary pipework and the urine-separating toilets. The urine treatment system is due to be added in the coming months. The focus here is on utilising the nutrients contained in the urine rather than disposing of them.



He is convinced that his research can also be applied in everyday life: Kai Udert with the rainwater and greywater treatment system in his own cellar. (Photo: Nicole Ehrler)

The PSI, like Eawag a research institute within the ETH Domain, has just published a study promoting the decentralised production of ammonia as a fertiliser and fuel. What is your view on this idea?

Nitrogen is a critical resource for Switzerland because it is one of the most important components of fertiliser. It is therefore, in principle, to be welcomed that Switzerland aims to produce nitrogen fertiliser. However, it should be noted that we currently treat very large quantities of nitrogen resources in the form of urine as waste. Urine is discharged into the sewerage system along with the rest of the wastewater. On average in Switzerland, approximately 50 per cent of the nitrogen is removed at wastewater treatment plants to prevent it from causing eutrophication in water bodies. In other words: we are currently working to remove nitrogen so that it does not fertilize our rivers and lakes, whilst at the same time importing artificially produced nitrogen fertiliser to fertilise agricultural land.

"I don't think it makes much sense to go to great lengths to dispose of nitrogen from wastewater whilst at the same time importing artificially produced nitrogen".

It would actually make more sense to recover the nitrogen from urine and use it as fertiliser in agriculture. The Environmental Protection Act even stipulates that nitrogen must be recovered from wastewater if it is economically and technically feasible and benefits the environment. Technologies already exist today that are almost as cost-effective as wastewater treatment and the large-scale production of artificial fertiliser, and which have a better environmental footprint than current systems. If we promote these new technologies, we will not only have a 'Swiss-made' fertiliser but will also be doing our waterways a favour.

Do you see any opportunities to combine the PSI concept with the recycling of nutrients from wastewater?

Absolutely. We should exchange ideas to find the best way to combine these new technologies. Nitrogen fertiliser from urine alone cannot meet Switzerland's current total nitrogen requirements. It is important to involve the agricultural sector in the discussion as well. On the one hand, agriculture is the largest consumer of nitrogen fertiliser; on the other hand, it is also the sector where the greatest nitrogen losses to the environment occur.

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