



In order to close nutrient cycles, many stakeholders must work together

May 5, 2022 | Carina Doll

Topics: Wastewater | Pollutants | Society

Eawag researchers Sabine Hoffmann, Kai Udert and Lisa Deutsch are committed to a sanitation and nutrient transformation. They use an example to explain why a transformation is needed and why collaboration with politicians in particular is a challenge.

[“Resources from the bowl are the key”](#) (in German: “Ressourcen aus der Schüssel sind der Schlüssel”) is the title of a discussion paper that Sabine Hoffmann, Lisa Deutsch and Kai Udert developed together with a transdisciplinary team from research, politics and practice. The authors focus on the context of Germany. The paper encourages sanitation and nutrient transformation and is aimed at decision-makers as well as practitioners and politicians. In doing so, it shows concrete options for action to advance the implementation of a sanitation and nutrient transformation.

Why should we question the current sewage system?

Kai Udert: Besides groundwater, water bodies are the most important drinking water resource and are used by humans in many ways (as transport routes, bathing waters, etc.). Today, wastewater treatment is designed to protect water bodies from direct pollution by organic substances, phosphorus and nitrogen and, for some years now, micropollutants. In addition to the protection of the aquatic environment, the central issue here is to avert dangers to human health from pathogens and other contaminants. The recovery of resources from wastewater is of secondary importance, and the current system has not yet been optimally and specifically designed for this purpose. The system is also reaching its limits in protecting water bodies from overloading with nutrients, as wastewater treatment plants only remove some of the nutrients from the wastewater and the rest ends up in the water bodies (see box for more information).

“Various companies already offer technologies for nutrient recovery from urine and faeces.”
Kai Udert

You advocate a sanitation and nutrient transformation to address the problems of the current system. What is meant by this?

Kai Udert: New approaches are needed that we can use to both prevent the spread of diseases but also close nutrient cycles. The sanitation and nutrient transformation aims to better integrate the management of domestic wastewater and provision of nutrients for food production. Besides urban water management, it is important to include agriculture in the concepts as a source of nutrient emissions into the environment and as a recipient of fertiliser.

In 2021, you prepared the discussion paper “Resources from the bowl are the key” on this topic. How did this come about?

Sabine Hoffmann: The idea came about after a meeting with the agricultural policy spokesman of the SPD parliamentary group. Ariane Krause from the Leibniz Institute of Vegetable and Ornamental Crops (IGZ) organised the meeting and invited researchers from different disciplines (including industrial engineering, process engineering, architecture, social sciences and agricultural sciences) and stakeholders from practice (including Goldeimer, Finizio and NetSan e.V.) to Berlin to exchange ideas on the topic of sustainable agriculture. After this first of a total of six meetings of the “Berlin Round”, the idea arose to write a discussion paper summarising the most important points of a recycling-oriented sanitation system – coupled with sustainable, regional and circular agriculture.

“We had to use the limited window of opportunity to bring our perspectives to politics and initiate steps towards implementation.”

Sabine Hoffmann

What is needed to implement the sanitation and nutrient transformation?

Lisa Deutsch: It is important that many things are considered together and implemented in a coordinated way. In the discussion paper, we show that certain factors for this transformation are already partly in place, including technical innovations, a large number of motivated players and a common vision. What is still lacking, however, is an unambiguous legal framework as well as pilot and lighthouse projects, for example. In some countries, for instance, fertiliser legislation needs to be adapted to allow the use of recycled fertilisers from human faeces. Pilot and lighthouse projects are needed so that people can get an idea of what “sanitation transformation” means. At the same time, the know-how for implementing such systems must also find its way into the training of a wide range of stakeholders, such as in sanitary technology or in the planning or engineering sector. It therefore takes an interplay of different entities and coordinated measures by many different players to make a sanitation and nutrient transformation possible.

Are technologies for resource recovery “from the bowl” already being used in practice?

Kai Udert: Yes. The focus here is on processes for nutrient recovery from urine. Various companies already offer technologies for this. Two processes have been developed at Eawag and one of them is being marketed by the Eawag spin-off Vuna. Another example is the process by the company Sanitation360, which was developed at the Swedish Agricultural University SLU.

Composting of human faeces for the production of fertiliser is also being investigated by various companies and in some cases is already being applied. However, these fertilisers are not approved in Switzerland or Germany due to hygiene concerns.

In order to create trust in the products and to ensure the quality requirements, quality standards are enormously important. In Germany, a standard (DIN SPEC 91421) was developed at the end of 2020 to provide guidelines for the quality assurance of recycled products from dry toilets. It is also important that companies, individuals and research institutes working on this topic network together and address open questions. One local example is the "Circular Sanitation Network Switzerland," or Valoo for short, which was founded in November 2021.

What needs to be taken into account in dialogue with policy-makers?

Lisa Deutsch: Less is more. As researchers, we are used to explaining everything down to the smallest detail. But in doing so, we expect too much of other stakeholders, for example from politicians, and the actual core message is weakened. It is also important to connect to the other person's context and experience. That means, for example, that as researchers we cannot use our PowerPoint slides from the last conference for a meeting with politicians, but we have to create new ones. In addition, we have to adjust to the fast pace of day-to-day political business. For example, if a politician leaves briefly during your presentation for an important phone call, this has nothing to do with a lack of respect.

"As researchers, we are used to explaining everything down to the smallest detail. But in doing so, we expect too much of other stakeholders, and the actual core message is weakened."

Lisa Deutsch

Sabine Hoffmann: Part of the fast pace of this day-to-day business is that time windows for dialogue are very limited. It is therefore worthwhile to think carefully about the core messages and to formulate them clearly so that they can then be communicated in a comprehensible way in the short time available. It is also important to keep asking oneself which topics of one's own research could be relevant for policy-makers, which concrete solutions could result from this and what contribution could policy-makers make to their implementation.

What did you take away from this exchange for future transdisciplinary discussion panels and how will you continue?

Sabine Hoffmann: The limited time frames! The exchange with the agricultural policy spokesman of the SPD parliamentary group began in the final year of his parliamentary work. In the "Berlin Round", we were aware that we had to use this time slot before he leaves active politics to introduce our perspectives of a sanitation and nutrient transformation and to initiate the first concrete steps towards implementation. This is how the discussion paper came into

being, which has been fed into politics at the municipal, state and federal level via various networks.

Lisa Deutsch: You have to find yourself first, as in all new human relationships. So, you should not expect any big decisions or ground-breaking results in the first meetings. There also needs to be at least one person to continuously move everything forwards. In our case, it was Ariane Krause from the IGZ, who took the lead and invested a lot of time. She also knew how to mediate between different stakeholders and bring their perspectives together, so she brought the expertise for this integrative work.

Kai Udert: It takes a lot of patience to implement new sanitation concepts and many different stakeholders need to be involved. The exchange within the framework of the discussion paper was very helpful and I am now trying to implement some of the experiences in Switzerland.

The interview was conducted by Carina Doll, coordinator of the Water Hub project at NEST, Eawag.

The interviewees:

Kai Udert heads the “Source Separation and Decentralisation” group in the Eawag Process Engineering Department and is titular professor in the Department of Civil, Environmental and Geomatic Engineering at the ETH Zurich.

Sabine Hoffmann heads the “Inter- and Transdisciplinary Research” group of the Department of Environmental Social Sciences at the aquatic research institute Eawag and the Wings strategic research programme.

Lisa Deutsch works as a PhD student in the “Inter- and Transdisciplinary Research” group of the Department of Environmental Social Sciences at Eawag.

Nutrients in wastewater

Although around half of the nitrogen inputs into Swiss water bodies originates from agriculture, a third still comes from wastewater treatment plants (WWTP). Only about 50 per cent of the nitrogen from domestic wastewater is removed at these plants. [1] As this is not sufficient, a motion was submitted in 2020 calling for a rapid improvement. In some of our neighbouring countries, considerably more nitrogen is removed from wastewater, in Germany and Austria more than 80 per cent [2]. This high level of elimination raises new questions, because some processes require the addition of chemicals, for example.

Phosphorus must be recovered from wastewater, sewage sludge, animal and bone meal in Switzerland from 1 January 2026. If the process currently under discussion is used for this purpose, as much phosphorus could be recovered as is currently imported into Switzerland. However, the amount of chemicals and energy required is considerable.

[1] FOEN (2013) Nitrogen flows in Switzerland 2020. Material flow analysis and developments.

[2] DWA (2018). 29. Performance comparison of municipal wastewater treatment plants.

Hennef, German Association for Water, Wastewater and Waste (DWA registered association).

Cover picture: Sabine Hoffmann, Lisa Deutsch and Kai Udert in conversation (Photo: Eawag, Peter Penicka)

Original publication

Krause, A.; von Hirschhausen, C.; Schröder, E.; Augustin, F.; Häfner, F.; Bornemann, G.; Sundermann, G.; Korduan, J.; Udert, K.M.; Deutsch, L.; Reinhardt, M.L.; Götzenberger, R.; Hoffmann, S.; Becker-Sonnenschein, S. (2021) [Ressourcen aus der Schüssel sind der Schlüssel – Wertstoffe zirkulieren, Wasser sparen und Schadstoffe eliminieren. Diskussionspapier zur Sanitär- und Nährstoffwende.](#)



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<https://www.eawag.ch/en/info/portal/news/news-archive/archive-detail/in-order-to-close-nutrient-cycles-many-stakeholders-must-work-together>