

# Developing a toilet with a built-in water recovery system

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**Reinventing the toilet – this is the ambitious goal being pursued by an interdisciplinary team led by Eawag. The end product of the project is to be a toilet which collects source separated urine and faeces for further treatment, while recycling used water on site..**

The way in which urine, faeces and wastewater are managed and the resources required for these processes are largely determined by the type of toilet used. For example, the lavatory now widely established in industrialized countries calls not only for large quantities of flushing water, but also an elaborate sewer system and centralized wastewater treatment. Thus, for all the advantages it offers in terms of sanitation and human health, the "water closet" has certain major drawbacks. These are so significant that solutions based on waterborne sewage systems and centralized treatment plants are not sustainable for many parts of the world. At the same time, particularly in countries of the South, rudimentary privies – and inappropriate emptying of cesspits – are frequently associated with poor hygienic conditions. Inadequate sanitation also puts pressure on ecosystems and scarce freshwater resources.

## **Comeback of the pit latrine**

One promising approach involves urine-diverting pit latrines, such as those increasingly being constructed with the aid of various development agencies in Nepal and elsewhere. As well as providing health and environmental benefits, these make it possible for urine to be treated, rather than seeping into the ground; valuable resources (e.g. phosphorus, nitrogen and potassium) can thus be recycled as fertilizers for local use. In a project currently underway in Durban (South Africa), Eawag and local partners are investigating the conditions required for sustainable operation of a system of this kind – in both process engineering and socioeconomic terms.

## **A little water goes a long way**

A disadvantage of the urine-diverting dry toilet, however, is that no water is available either for flushing or for the user's personal hygiene. But hand washing after urination or defecation is a crucial element in efforts to combat infectious diseases. This problem is now to be tackled by an interdisciplinary team led by Eawag and comprising process engineers, EOOS-designers (Vienna/AUT) and experts on sanitation in developing countries. As well as separating urine and faeces at source, the "advanced toilet" is also to recycle used water on site so that, with minimal replenishment, adequate supplies are available both for personal hygiene and for cleaning the surface of the toilet. The membrane filtration process used for water treatment is to operate without external power supplies. A pump for conveying treated water to a storage tank above the toilet is to be driven solely by toilet users' weight.

## **Investigating transport, treatment and social aspects**

The project is concerned not only with the development of a new toilet, but also with the question of sustainable transport and treatment of bodily wastes. The researchers will also examine whether the best solution is offered by toilets which are private, shared (i.e. used by several families) or public – bearing in mind that in many areas public toilets are shunned by women, who wish to avoid contacts with or harassment by men

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