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Title	Going to scale with urine diversion in Sweden – from individual households to municipal systems in 15 years
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Going to scale with urine diversion in Sweden – from individual households to municipal systems in 15 years

In Sweden, urine diversion (UD) systems have been piloted and developed for more than 15 years. An estimate is that there are more than 10 000 porcelain toilets installed and that there are at least 10-15 larger systems for reuse of human urine in Sweden and most of these are managed by municipalities.

The first phase of urine diverting toilets took off in the early 1990s targeting single households and summer houses and a few ecovillages. The urine from these installations has either been reused on the premises or by a nearby farmer and the municipalities and authorities most often were not involved.

In the mid 1990s quite a few multi-storey buildings and projects in urban settings were built with UD. For some of these projects systems for reuse was established and municipal actors were involved, eg in Stockholm. R&D has been undertaken on these systems from household to reuse in industrial agriculture and technical, hygienical as well as socio-economic aspects have been investigated. Many of these findings were published in the report *Urine Separation – Closing the nutrient cycle* prepared by Stockholm Water Co.

The starting point for the next phase was the *Environmental Code* that came in 1998 in which human urine were considered as household waste for which the municipalities were responsible, and the *National Environmental Objectives* that among other goals stated that recirculation of natural resources (including nutrients) was to be favored.

As a result a major investment program focusing on the implementation of sustainable technologies in the municipalities was initiated. More than 20 municipalities used this to promote recirculating techniques, mainly UD-toilets, to single households and started to organize and build systems for transporting, storage and reuse of urine.

Today the recognition of the objectives of sustainable management of nutrients and the possibilities that the physical planning and environmental and legislation regarding gives the municipalities have created an enabling environment for closed-loop approaches such as urine diversion. This, together with the increasing knowledge of the effect on surface- and groundwaters that poorly functioning on-site systems have, has led to the development of strategic decisions and policies in many municipalities. The number of municipalities that declare that urine diversion and source separation should be favored and that it is a municipal responsibility to organize systems for reuse in agriculture are increasing. There are

even municipalities that have declared policies that all new houses to be built in and outside the urban settings shall use urine diversion or corresponding recirculating techniques.

The development from small-scale reuse to municipal systems for transport, storage and reuse will be covered in the paper. Discussions on the lessons learned and examples of systems in use will be presented as well as a discussion of the key-aspects and critical factors for urine diversion to go to scale in Sweden.