

Decentralised domestic wastewater treatment with a membrane bioreactor

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Centralised wastewater treatment – the way to follow?



Figure 1: WWTP Bern, Switzerland

Sewer systems and central wastewater treatment have a variety of advantages, however, there are some deficiencies:

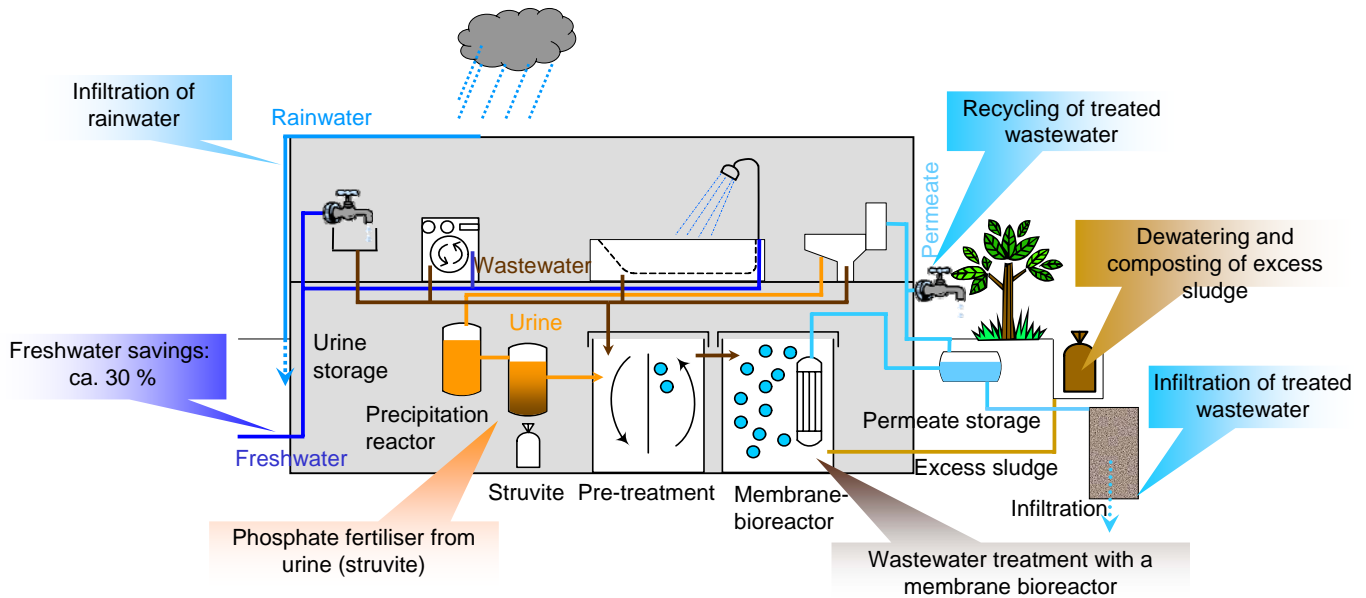
- Open nutrient cycles
- Combined sewer overflows
- Sewer leaks
- Costs (infrastructure)
- High water flows necessary

Decentralised wastewater treatment – the new way?

Many investigations have been conducted on decentralised wastewater treatment. However, is decentralised treatment an option for urban areas? There are a lot of open questions:

- Is there sufficient treatment efficiency and operation stability?
- Is it easier to recycle nutrients?
- Will energy consumption increase?
- Where are the ranges of application?
- What happens to the excess sludge?

Pilot project: Aquamin, Switzerland



First results: a selection

Effluent quality

If small-scale systems would replace the current, centralised systems, effluent loads must not be higher than today, otherwise negative effects on water bodies have to be expected. So the effluent concentrations from the pilot plant are compared to the values given by Swiss legislation, although influent concentrations in large-scale plants are lower due to dilution (extraneous water, rainwater) and degradation in sewers. The only critical parameter is total phosphorus. NoMix toilets with urine separation will be investigated as potential solution to recycle Phosphorus and reduce its concentration in the effluent

	Measured	Limit
Suspended solids	0	15
BOD	30 (COD)	15
DOC	10	10
NH ₄ -N	0.2	2
TP	12	0.8
N-Elimination	50-90%	-

Wastewater colour

The effluent has a yellowish colour. This is mainly an aesthetic problem, but it leads to an increased cleaning effort and, depending on the colour intensity to a higher water consumption, as toilet users may think that the previous user didn't flush.

Colour removal can be obtained by several techniques: ozonation, adsorption to activated carbon or ferric hydroxide or chlorination. Ozonation and adsorption seem to be the most economic ones.



Figure 2: The recycled wastewater shows a yellowish colour

Conclusions

The aim of the project is to investigate the practical, environmental, social and economic relevance of a decentralised wastewater treatment system on household level. From an economic point of view, highly sophisticated decentralised systems are certainly worth installing in rural areas, where long sewer systems are necessary. But it might also be an alternative for regions with water scarcity, as water consumption can be decreased by 30-40% or even more, if the effluent is used for irrigation. However, an economic optimum for the size of the plant needs to be found. Larger units, e.g. for apartment houses or small neighbourhoods are more favourable.