



## Faecal Sludge Management Seminar FSM2

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### Model-based performance evaluation of the collection of source-separated urine

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Urine-diverting dry toilets promise not only hygienic advantages but also offer the option to safely recover valuable nutrients that are highly concentrated in urine. A crucial factor thereby is the effective and cost-efficient collection of urine from a large number of distributed toilets. To design and optimize such collection and treatment networks, it is necessary to understand quantitatively the overall performance and cost of different technological and managerial options. Goal is to answer the following questions: How much urine can be made available for a treatment facility at a given location? How reliably can this amount be delivered? How can it be delivered most economically? What happens if the urine production in the catchment increases?

A mathematical model allows assessing such questions before a certain scheme is implemented. We, therefore, developed a modular model that can be applied to various combinations of geographical settings, technologies and business approaches. It considers the collection system from the households to the treatment as a hierarchically arranged series of tanks with variable volumes, and the possibility to overflow. To facilitate the understanding of the system, the model is as mechanistic as possible and contains stochastic as well as deterministic processes. It is programmed in the freely available open-source software R and can be accessed by text or Excel files.

In the presentation we will illustrate how the model can be used to analyse a specific system and to evaluate different technological and managerial options. The effect of number of vehicles, size of storage tanks or available information on the collection yield and the corresponding costs will be presented as well as how the analysis of the dynamic system behaviour allows a deeper insight and understanding of limiting processes. The model was applied to the collection of source-separated urine from the outskirts of Durban, South Africa, but it can easily be adapted to assess similar questions in the context of faecal sludge management.



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