

Structured Approach for Comparison of Treatment Options for Nutrient-Recovery From Fecal Sludge

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Abstract

The aim of this study is to present a structured approach for comparing possible nutrient-recovery fecal sludge (FS) treatment systems in order to support transparent decision-making. The approach uses a multi-dimensional sustainability assessment of treatment technologies for nutrient recovery from FS, using a typical case of Kampala City, Uganda. A synthesized list of 22 treatment technologies was prepared from literature. This list included wastewater treatment technologies, which could be adapted to treat fecal sludge, and established fecal sludge treatment technologies that are available or potentially applicable in Kampala. Based on the local situation, the list was reduced to eight possible options, which were carried forward into a multi-dimensional sustainability assessment that incorporated input of stakeholders. The technologies included in the final assessment were optimization of the existing system, lactic acid fermentation (LAF), composting, vermicomposting, Black-Soldier Fly (BSF) composting, ammonia treatment, alkaline stabilization and solar drying. Optimization of the existing system performed well against the set criteria and is a recommended short-term solution. This will require e.g., adding narrower screens to remove more trash from the incoming sludge and respecting storage times prior to selling the sludge. To maximize the agricultural value of the recovered product, while respecting the need for safe reuse, a combination of technologies becomes relevant; the use of a combination of BSF, and subsequent ammonia or alkaline treatment of the remaining organic fraction would allow for maximized safe nutrient recovery and can be the aim for long-term sanitation planning in Kampala. The results of this process provide supporting information for a discussion of trade-offs between stakeholder groups as part of a decision-making process within a larger planning context.

Keywords: sanitation, resource recovery, multi-criteria, sustainability assessment, decision-support, wastewater