

What are the drivers to decentralize wastewater treatment systems? – A Swedish perspective

Ref # SWWS2018-XXXXXX

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Keywords: case study, decentralized sanitation, on-site treatment, small-scale, questionnaire

INTRODUCTION

Despite the general trend to centralize wastewater treatment, it is currently acknowledged that political, logistical and economic challenges will never allow for many rural, peri-urban and urban areas to connect and centralize their sewerage (Tchobanoglous and Leverenz, 2013). Some of the advantages of decentralized wastewater systems are related to reducing transport distances and volumes of water, as well as the decrease in demand for artificial fertilizers if nutrients are supplied from the wastewater to the farmland (Rittmann, 2013). The elimination of stormwater and other inflows that often overwhelm centralized systems, as well as the possibilities for implementing source-separation also make decentralized systems attractive (Tchobanoglous and Leverenz, 2013). Institutional setups and weak organizational models (Larsen et al., 2016) and users' behavior and acceptance (Brands, 2014), rather than undeveloped technology, have been identified as main sources of failure in the implementation and performance of decentralized systems. The economies of scale of decentralized systems are often regarded as a major drawback when compared to centralization (Brands, 2014), however it could be also seen as a key-strength as such systems are actually more flexible and have potentially lower costs per unit (Maurer, 2013). The need for flow equalization and the physical footprint of decentralized systems remain as inherent limitations (Tchobanoglous and Leverenz, 2013).

Although centralization is still the most common practice for improving decentralization systems, there are cases where decentralization is chosen even when the option to centralize exists. Multiple drivers are often responsible for the implementation of decentralized systems. The provision of sustainability showcases is one of the most frequent drivers found in the literature, followed by environmental protection and lack or limited access to centralized services (Sharma et al., 2013). Scarcity of resources, such as water and phosphorus, pollution and social environmental awareness are also recognized as potential drivers for innovation and regulation (Brands, 2014). Previous research recognizes that better understanding of decentralized systems and the drivers for their implementation are needed to if decentralized systems are to be more widely implemented with confidence and to develop mainstream acceptance in the water sector (Brands, 2014; Sharma et al., 2013). Hence, the aim of this study was to explore the presence of decentralized systems in Sweden and to identify the drivers and key factors that lie behind the decision-making process when opting for a decentralized approach.

MATERIALS AND METHODS

The methodology used is based on literature review and the elaboration and distribution of questionnaires to the approximately 290 municipalities existing in Sweden. Further interviews with specific stakeholders are also carried out.

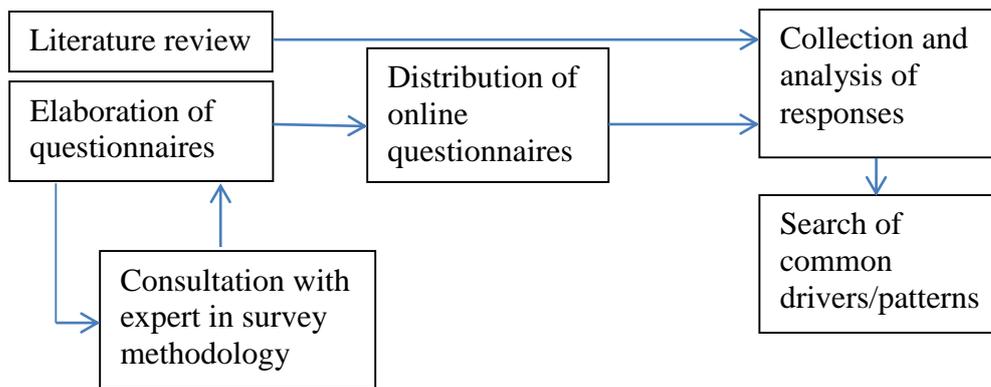


Figure 1. Methodology for the investigation of the drivers for decentralization.

The questionnaires are designed to identify the specific reasons that have led to the decision of implementing decentralization solutions in each case, as well as the barriers encountered in the process. The questionnaires are sent out online in one-event base to the responsible departments at each municipality or water utility. For this study, the decentralized systems are assumed to refer to community-type stand-alone systems where the wastewater is treated close to the point of generation, based on the definition provided by Tchobanoglous and Leverenz (2013). Moreover, the spatial scale of interest is set on distributed systems, which refer to development or satellite areas where the services are owned and operated by the municipal water utilities, instead of property holders (Sharma et al., 2013).

RESULTS AND CONCLUSIONS

The expected results will indicate the importance of probable drivers such as cost, quality of the receiving water bodies, local environmental goals and policies, farmers' interest in the recycling of the nutrients or lack of treatment capacity of the nearest wastewater treatment plant. Furthermore, differences in the occurrence of the drivers are expected to be found, e.g. depending on the geographical location of the municipalities or the presence of farmland where the nutrients could be reused.

The results will be compared to those reported from other countries, to gain a deeper understanding of the decentralization process and establish similarities and differences. Although the results are based on a Swedish context, the outcomes are applicable to other areas and especially to Northern countries with similar environmental conditions such as limited problems with water scarcity.

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