Fuzzy Based Decision Support Method for Selection of Sustainable Wastewater Treatment Technologies

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A Thesis Submitted in Partial Fulfillment for the Degree of Master of Science in Environmental Engineering and Management in the Jomo Kenyatta University of Agriculture and Technology.

2011

ABSTRACT

Inadequate decision support tools have lead to selection of inappropriate and unsustainable wastewater treatment technologies. There is therefore the need to develop tools that would improve decision making process in selection of appropriate wastewater treatment technologies. The broad objective of this research work was to develop a decision support method for selection of sustainable wastewater treatment technologies. The specific objectives were to investigate performance data for wastewater treatment technologies, develop a decision support method (DSM) for evaluating performance of technologies, and to validate the method. The decision support method was developed through evaluation of performance of wastewater treatment technologies against environmental and economic indicators. Fuzzy logic techniques were used in order to support decision making under uncertainty. The method was validated through a training tool in wastewater treatment known as ED-WAVE which was developed by a consortium of European and Asian countries. Also, independently collected data from three wastewater treatment plants in Kenya were used in the validation process. The Decision Support Method (DSM) relied on performance evaluation in order to rate wastewater treatment technologies. This was an improvement on existing decision support tools such as ED-WAVE that relied on retrieval of past performance data in order to arrive at a solution when a new treatment case was presented. Decision support method enabled performance of a single treatment unit within a treatment sequence to be rated. Also the overall performance of a treatment sequence could be rated through DSM hence allowing for any required improvements on performance to be incorporated in design. Through application of DSM, the performances of wastewater treatment plants in Nairobi, Nakuru and Thika were rated as "Good". Using DSM analysis, additional technologies that could

improve the rating of treatments plants in Nairobi, Nakuru and Thika from “Good” to “Excellent” were investigated. The Decision Support Method provided a more reliable method for wastewater treatment technology performance rating and hence selection as compared to ED-WAVE. Further improvements on the tool could be achieved through testing and validating more case studies and treatment sequences.