AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING

Public Works Department

Optimization of Solid Waste Management in Rural Villages

A Thesis Submitted in Partial Fulfillment for the Requirements of the Degree of Masters of Science in Civil Engineering

(Public Works Dept. – Sanitary Engineering)

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DEDICATION

Many thanks and much appreciation are given to my parents for supporting my work and encouraging me to set up high goals of achieving my ambitions.

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STATEMENT

This dissertation is submitted to Ain Shams University, Faculty of Engineering for the degree of M.Sc. in Civil Engineering. The work included in this thesis was carried out by the author in the department of Public Works, Faculty of Engineering, Ain Shams University from 2011 to 2015.

No part of the thesis has been submitted for a degree or qualification at any other university or institution. The candidate confirms that the work submitted is his own and that appropriate credit has been given where reference has been made to the work of others.

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ABSTRACT

Name: Samah Anwar Soliman
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A financial analysis – based optimization model is applied for a municipal solid waste (MSW) management system in Desoq District, Kafr El Sheikh, Egypt with a population of about 0.5 million capita. **Centralized**, **Clustered** and **Decentralized** MSWM systems were studied. Thirteen different scenarios that take into account different levels of solid waste treatment including sorting, composting and waste to energy were studied. In the **Centralized**, **Clustered** and **Decentralized** systems, the minimum level of treatment should be sorting and composting in order to achieve the minimum financial deficit. The optimum system is the **Centralized** system with sorting and composting facilities and one landfill with financial deficit of (8) EGP/ton/d.

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Municipal solid waste (MSW) management represents a major challenge for urban and rural communities worldwide; and particularly in Egyptian rural villages where low attention and resources exist. Besides, MSW projects require bulky investments, so wise planning is essential to reach the proposed goal at minimum cost.

This study aims at the selection of the optimum method for MSW management in rural Egyptian villages, through the application of 13 MSW management scenarios representing different system configurations (**Centralized**, **Clustered** And **Decentralized**) and different treatment levels (sorting, composting and waste-to-energy). Desoq District, in Kafr El Sheikh Governorate is selected as a case study with a population of about 0.5 million capita.

The optimum MSW management system is selected on the basis of financial analysis including the capital cost of equipment and operation and maintenance cost including labor, transportation, fuel and electricity. The

minimum financial deficit is adopted as the criterion for the selection of the optimum MSW management system.

The results indicated that the optimum system is the **Centralized** system with sorting and composting facilities and one landfill with a minimum financial deficit of (8) EGP/ton/d.

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ABBREVIATIONS

SWM: Solid Waste Management.

MSW: Municipal Solid Waste.

MSWMS: Municipal Solid Waste Management System.

MPL: Modeling Programming Language.

MRF: Material Recovery Facility.

S: Sorting.

C: Composting.

RDF: Refuse Derived Fuel.