

# 1. CHAPTER I

## INTRODUCTION

### 1.1. MOTIVATION

The generation of solid waste is inevitable. It was not important in former times but it has become an issue as soon as people started to settle in communities. Ever since, SWM has been of great concern to municipal authorities worldwide. In the middle ages, badly managed waste was responsible for millions of deaths in Europe. In the 18th century, inappropriate waste management was the cause of the outbreak of diseases like the plague and cholera, which claimed more than 380,000 lives in Hamburg. Approximately 590 to 880 million tons of methane are released into the atmosphere every year, 90 % of the gases generated are due to the decomposition of biomass as a result of indiscriminate waste management, among other causes. Consequently, the ozone layer and the ecosystem are continually being destroyed. In short, today indiscriminate waste management is one of the biggest threats to ecosystems in the world. Cities, often overwhelmed by the continuous influx of new arrivals, have frequently been unable to keep up with the provision of basic services. Between one third and two-thirds of the SW generated goes uncollected, piling up on streets and in drains, contributing to flooding and the spread of disease. In addition, urban and metropolitan domestic and industrial effluents are often released into waterways with little or no treatment. [1] In order to achieve sustainable development, policy makers in Developing Countries have to cope with the above-mentioned issues. Indiscriminate solid waste management leads not only to the destruction of the ecosystem, but also to lower economic productivity, and thus to poverty. Consequently, proper Solid Waste Management (SWM) is crucial to the urban infrastructure in Developing Countries as it ensures environmental protection and safeguards human health.

Rapid urbanization in Developing Countries is threatening the environment and urban productivity. For that reason, adequate SWM is urgently required; otherwise economic development will become counterproductive. SWM represents one of the most outstanding challenges facing municipal authorities in Developing Countries as policy makers face great difficulties in addressing waste issues due to the lack of sound managerial instruments, planning tools, and last but not least, financial means. [1] These difficulties in turn create major solid waste problems, including lack of equipment and/or obsolete equipment, inadequate public funds, the open burning of waste, and so forth. In addition, there are other serious managerial problems such as inflexibility, low cost-recovery, poor organization, inadequate monitoring of systems, tight public budgets and non-enforcement of legislation.

It is difficult for municipalities to implement changes towards efficiency. The need for investment far outstrips the financial resources available from public budgets. Municipalities are not able to cope with the ever-growing generated waste. Accordingly, the challenge for Developing Countries in this decade is to ensure the sound management of the environmental implications of this growth.

Decision-makers in Rio De Janeiro when sustainable development was discussed for the first time on a very broad level during the Earth Summit (known as Rio Earth Summit) in 1992; agreed that sustainable SWM is the key to sustainable cities and consequently [1] to sustainable development. Whereas industrialized countries adopt principles like the hierarchy principle and the polluter pays principle, most Developing Countries are far behind. In brief, rapid urbanization, inadequate financial means and indiscriminate waste management in Developing Countries result in a vicious circle which must be interrupted.

Municipal solid waste has been inadequately managed for many years in Egypt. Egypt generated an estimated 20 million tons of municipal solid waste in 2009, and the amount of solid waste produced annually is growing at an estimated 3.4% per year. Waste collection systems have left large areas of towns and cities without service or under-served, and the majority of collected waste is dumped in facilities that lack any effective management. Composting, although widespread, has generally not been effectively implemented. Recycling activities have only been undertaken in some cities under unsafe and unhygienic conditions subjecting workers who participate in these processes to many risks. [2] The majority of dumping sites are unsafe and there are no preventive measures at these sites to prevent the self-ignition of waste. 50 - 60% of the waste composition is organic matter.

Challenges associated with the SWM sector are mainly related to systemic, institutional, and individual constraints within the government's overall system. The administrative structure in charge of waste management is complex, fragmented, and dispersed in numerous government agencies. It is known that the responsibility for Municipal Solid Waste Management (MSWM) in the central government of Egypt is dispersed among number of ministries. The Ministry of Local Development through Governorates and respective municipalities is responsible for the implementation of Municipal Solid Waste (MSW) activities either through direct implementation or through tendering to other entities. Except for Cairo and Giza Governorate, in general, Governorates lack a specialized unit that is entirely responsible for waste management. [3] The Ministry of State for Environmental Affairs and its technical arm the Egyptian Environmental Affairs Agency host a General Directorate for solid waste management. The mandate of this directorate is the formulation of policy directives and the provision of guidelines for proper management of municipal waste. The Ministry of Finance is responsible for approving budget allocations for operational costs.

The legal framework regulating MSWM in Egypt is multisided and falls under the jurisdiction of different ministries. There is no legislation dedicated to SWM. Legislation is instead in the form

of provisions within other laws. The most significant are Law 38 of 1967 and its subsequent amendments in Law 10 of the year 2005 and Law 4 of the year 1994 with its Executive Regulations. [4] Other laws pertaining to SWM includes Law 48 of the year 1982 regarding Nile River Protection (all these laws will be discussed in chapter 2).

In 2000, Egypt adopted a National Strategy for IMSWM (Integrated Municipal Solid Waste Management) which included the development and implementation of an integrated waste management system. [2] Within this National Strategy, a new cost-recovery initiative was introduced to provide sustained revenue for the financing of the privatization process. Privatization of SWM had occurred in a number of governorates in Egypt. However, the process faced many administrative problems in these governorates. Even after the private sector started working, the governorates which contracted an International Private Partner (IPP) have faced cultural problems that lead finally to the failure of the IPP (This will be discussed in chapter 2).

## **1.2. RESEARCH IMPORTANCE**

### **1.2.1. Academic Importance**

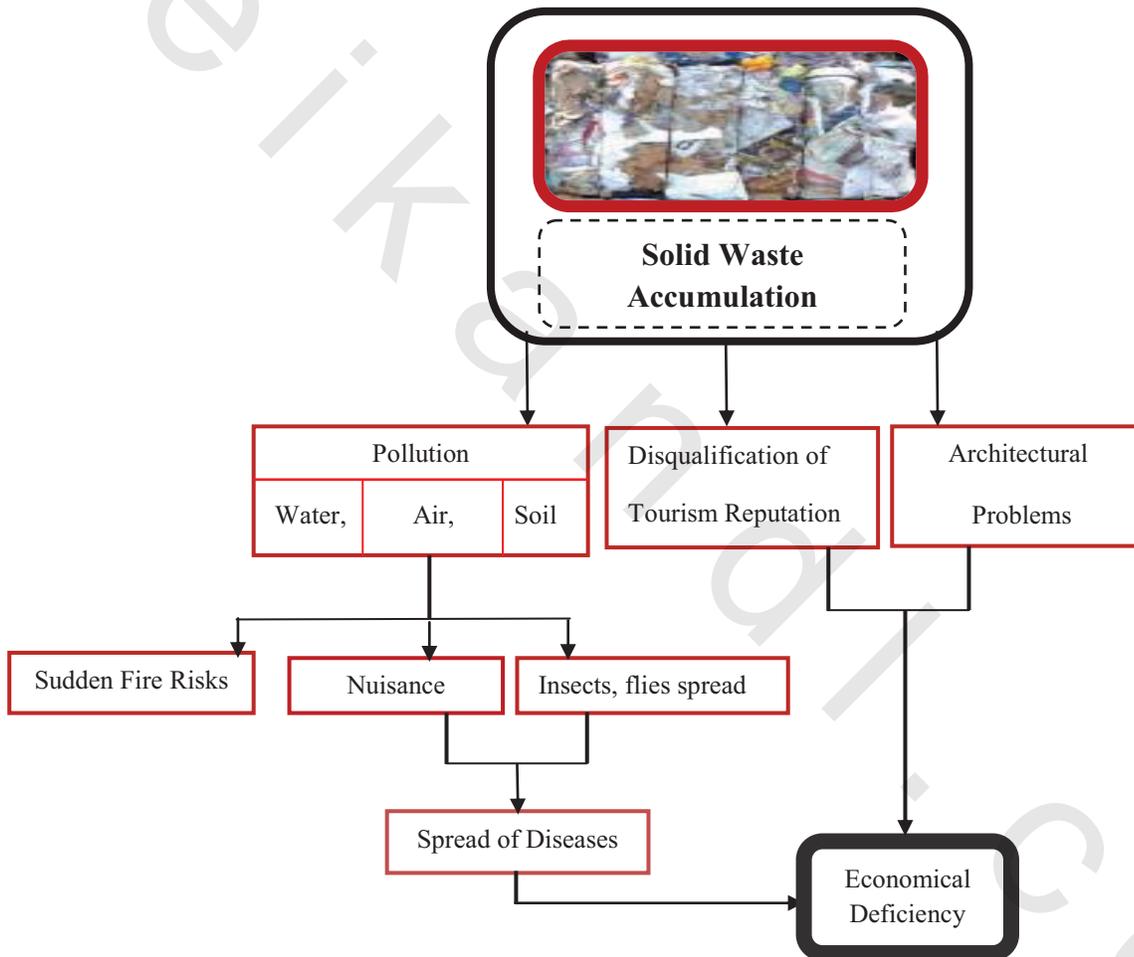
The academic importance of the search stems from its being evaluating the current Egyptian environmental situation regarding SWM generally and the case of Alexandria in particular.

The importance of the proposed search is build upon the following:

- i. This search recognizes the already done efforts in Egypt to handle the solid waste.
- ii. This search is a combination between studies that concerns Environmental Engineering field alone and others concerned with Quality field through the usage of different Quality Improvement Techniques and Tools throughout the methodology of the analysis of the problem in Egypt generally, Alexandria Governorate especially and in the development of the appropriate solution.
- iii. Most of the studies conducted in the SWM have mainly focused on the undone efforts while in this search there is an appreciation to all the done efforts and deriving the solution depends on using these efforts not neglecting them and starting from scratch.
- iv. The problem analysis in this search uses the Basic Quality Improvement Chart Steps thus providing a comprehensive methodological model of analysis displaying the various types of quality tools each in its suitable place despite the noticed that the current approaches to waste management do not usually follow a specific methodological thinking approach [4], they just highlight the main problems of MSWM.

### 1.2.2. Practical Importance

SWM is gaining importance all over the developed and developing nations as the adverse effects of poor MSWM are increasing rapidly and also the resources it is associated with are demanding more and more attention. [5] The adverse effects of poor MSWM can be noticed as nuisance, pollution potential, unhygienic conditions, disease spread .....etc. though the following figure 1 represents a block diagram that summarizes all the side effects of poor SWM systems on all the surroundings and its most significant result which is economic deficiency.



**Figure 1, the Side Effects of Poor SWM**

Though the practical importance of this search is therefore based on the following:

- i. The Egyptian government is already obliged to number of environmental legislations, strategies and protocols to maintain and enhance its environmental quality [6] of course considering MSWM; Though Egypt's environment is still suffering from this particular reason MSW.
- ii. There are lots of positive efforts are already done in Alexandria Governorate regarding the MSW as it is Egypt's second largest city and as a Mediterranean coastal city gains more concerns due to domestic and international Tourism. [7] Unfortunately all these positive efforts resulted in a short life success duration that lasted for almost only 10 years. This successful duration was rewarded by many trophies during the successful period of Veolia Environmental Services, then in the last 2 years for Veolia, duration of inadequate service replaced that successful one and finally after Veolia a complete failure stage has taken place and till now failure is obviously recorded on the streets of Alexandria. [8] This current situation forces some questions that this search will try to answer and analyze their causes:
  - a. What were the reasons of Veolia's success in the first 8 years?
  - b. What caused the failure at the end for Veolia?
  - c. Can't a fully Egyptian model managed by Egyptians provide a more durable successful system with much more improved results and benefits?
- iii. Most of the searches done in this field have concentrated on only a phase of the waste collection chain while this search discusses all the phases of the waste collection chain. This search suggests an appropriate, applicable, economic and environmentally safe solution [9] for MSWM in Alexandria Governorate.

### **1.3. OBJECTIVES OF THE STUDY**

The goal is to manage municipal solid wastes in Egypt in a manner that meets as far as possible the public health requirements, environmental concerns and the expectations of the citizens but yet can be afforded and also can turn waste into a national resource through proper final treatment.

The specific objectives of this search:

- i. To discuss all the phases of the waste collection chain in Egypt.
- ii. To prioritize SWM problems those are taking place among different cities in Egypt.
- iii. To identify root causes of SWM problems in Egypt especially in Alexandria.

- iv. To develop SWM appropriate practical solution based on the most cost-effective and environmentally appropriate technology choices especially applicable to Alexandria Governorate.
- v. To deal with and treat solid waste as a national resource to the local economy not as an expenditure of money.

#### **1.4. STRUCTURE OF THE STUDY**

Chapter 1 introduces the search and identifies its importance and objectives.

Chapter 2 demonstrates what the municipal solid waste is and the different means of managing it along the Egyptian history, how it evolved and how it has developed.

Chapter 3 evaluates and assesses the whole current Egyptian situation regarding the SWM via SWOT analysis to emphasize the picture.

Chapter 4 presents the situation of Alexandria, the 2nd capital of Egypt, towards SWM as the case study of the search.

Chapter 5 summarizes the conclusions of the search and suggests points for future research.