

# **Towards Integrated Solid Waste Management in Egyptian Small Cities: Quseir as a case**

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## **Abstract**

The main aim of an Integrated Solid Waste Management (ISWM) system is to secure a sustainable, environmentally sound and self-economically supported system. However, the implementation of ISWM requires careful consideration of a number of specific organizational and institutional aspects as well as good waste management practices. The objective of this study is to define and analyze site and regional requirements to implement an effective ISWM system in small Egyptian cities. These requirements have been analyzed with particular reference to Quseir city as a case. The research identifies a proposed ISWM system that can help Quseir to solve its municipal solid waste and C&D waste management problems. Further, this research builds upon Nordic experiences of such systems in the development of an operational model for Quseir and provides guidance for future work for a number of key stakeholders in Egyptian waste management .

## **Executive Summary**

Solid waste management is becoming a pressing environmental issue that countries are determined to resolve. Integrated solid waste management (ISWM) has been seen by many as an appropriate approach to handle solid waste management problem. ISWM concept aims mainly to secure environmentally sound and economically self-supported system.

This thesis contributes to solving the problem of municipal solid waste and construction and demolition waste (C&D) waste in Egyptian small cities. The requirements to implement an ISWM system in small Egyptian cities, with particular reference to Quseir city as a case, were analyzed.

This research was initiated through relevant literature review. Various factors and requirements to implement an ISWM system were identified. These requirements were classified into organizational and institutional aspects (e.g. policy, planning, regulation, financial and cost recovery, education and awareness, public participation), and waste management practices (e.g. waste sorting, collection, transportation, treatment etc.). This classification was used as a framework to analyze the problem of solid waste management in Quseir.

In order to put solid waste management in Quseir into a national perspective, this research first started with a description of MSW management in Egypt. This description provided an overview of problems of MSW in Egypt and C&D waste management problems. In this context, it was found that Egypt is missing most of the required elements to implement an ISWM on a national level. Further, it was found that, MSW management in Egypt faces a mix of institutional and organizational constraints, in addition to technical problems. For example, there is lack of MSW strategies on local and regional levels, lack of cost recovery of MSW service, weak legislation enforcement, limited involvement of private sector and limited public wariness, in addition to lack of adequate MSW scheme and sanitary disposal sites.

For C&D waste, it seems that the Egyptian government does not have a clear policy or strategy to deal with the C&D waste. There is no accurate estimation of the amount or the composition of the generated C&D waste. However, the most common C&D waste practices in Egypt, are littering and unauthorized disposal on roadsides, highways, or unoccupied lands

The Nordic countries have well developed systems to manage and handle their municipal solid waste and C&D waste. The relevant experiences of ISWM of some Nordic countries (Sweden and Denmark) were examined to determine if Nordic knowledge and information in addition to technology, can address some of MSW and C&D waste problems generally in Egypt and particularly in Quseir. For this purpose a description of ISWM systems in Denmark and Sweden were performed.

In the Swedish and Danish solid waste management systems, the ISWM concept is strongly adopted. The responsibilities and roles of municipal solid waste (MSW) management are well defined in the both systems. In both countries, the waste management policy and planning are performed by the Ministry of the Environment and its technical arm (Environmental Protection Agency) on a state level. However, the municipalities are obliged to prepare their waste management plans. These plans should be integrated with waste management strategy on the county level. The municipalities have the right to draw up their plans according to their conditions. These plans describe the quantities, compositions and handling of MSW. The enforcement of the legislation is one of responsibilities of municipalities. People are an important stakeholder and are for a large extent well informed and involved in the process.

In both countries, MSW service is introduced on a non-profit basis. However, waste management fees are based on a full cost accounting of waste management where, Polluter Pays Principal (PPP) is generally adopted in the two countries. Therefore waste management service providers are able to

recover cost. Further, the private sector is well involved in the process of MSW, especially in collection and transportation. Both of countries have well developed collection schemes for MSW

Source separation is a key element in the process of MSW management in Sweden and Denmark. In the Swedish model, enhancement of source separation comes mainly from the dissemination of information about benefits of source separation. In addition, it is made convenient for people to practice source separation. People can easily do source separation with little cost in terms of time and effort (e.g. providing the required bins for separation). In Denmark, source separation of MSW comes from legislation as well as the dissemination of information and awareness of the people.

In both models, they concentrate more on a combination of different municipal solid waste management practices, taking into account all the requirements and measures, to ensure environmentally sound and sustainable MSW system. Moreover, the various methods of MSW overlap and are mutually dependent on each other in the both countries. However, relying on a very expensive technology (e.g. incineration) is one of the main features of these two models. This technology is hard to afford by most of the developing countries. The main drivers for ISWM in Lund and Copenhagen come mainly from strong regulation (EU or national legislation) and the high public expectation for environmental standards, and the adoption of PPP

C&D waste management in Sweden and Demark are based on established policy frameworks. These policy frameworks aim to favour recycling of C&D waste and discourage landfilling. Further, they make use of a number of measures to enhance recycling. Most of these measures are market-oriented. However, in both countries source separation is a key element in integrated C&D waste management.

This research has then examined the SWM situation in Quseir. It was found that, Qusier city does not have adequate MSW system. The existing SWM system faces many constraints, such as institutional and organizational constrains, in addition to lack of good waste management practices (e.g. collection, transportation and treatment).

In Quseir, the organizational and institutional constraints included lack of SWM policy or strategy, lack of skilled staff, lack of cost recovery, limited public awareness and participation. Further, the inadequate MSW management practices were found such as: there insufficient MSW collection scheme and the use of uncontrolled dumpsite. However, it was found that, communication and cooperation among stakeholders is lacking and in some cases, there are potential conflicts between stakeholders. An additional issue with C&D waste is an apparent environmental problem in Quseir. The prominent method of C&D disposal was illegal dumping on roadsides practices were illegal dumping on roadsides.

To define a sustainable environmentally sound and economically self- supported model in Quseir, this research has looked at if there is any successful local model which could overcame the obstacles and barriers of implementing ISWM in small Egyptian cities. Nuweiba city is small Egyptian city in South Sinai Governorate at Egypt. Nuweiba has developed such ISWM system. The Nuweiba model is seen by many as one of the best practices of MSW. This model depends on source separation of MSW into two main fractions, organic and non-organic fraction. The non-organic fraction goes to transfer station, where a sorting process of recyclables takes places. The organic fraction go to local indigenous people( Bedouin) to use it as fodder for their animals. The recyclable are sold for dealers in Cairo.

The Nuweiba model has been examined to explore its suitability to be put in place in place. This model was found suitable for Quseir ISWM system with some modification. Also, it was found that the Nordic experiences of ISWM can contribute to support such proposed system. However, Nuweiba model is not without problems. It was identified that most of these problems are institutional and organizational, in addition for some technical and logistic constraints. These constraints must be avoided in any proposed SWM system in Quseir.

Based on information gained from analysis of the Nuweiba model and the experience of ISWM in Denmark and Sweden, the requirements for ISWM in Quseir have been identified and illustrated. This system depends mainly on source separation of MSW into two fractions, non-organic and organic. The organic fraction goes to Bedouin, while non-organic fraction goes for transfer station for sorting of recyclable. However, this system has defined the roles and responsibilities of the identified stakeholders to secure sustainability for such system. Further, it was concluded that Nordic experience can contribute to implementation of ISWM system in Quseir; through information transfer on how can Quseir implement its solid waste management strategy and action plan, as well as training of MSW staff. Also the Nordic experience can very helpful to develop a scheme of MSW collection and upgrading of dumpsite in Quseir.

Finally, for the C&D waste problem in Quseir, it was found that this problem needs a policy and national strategy which could help implement an integrated solution in Quseir. However, the Nordic C&D waste experience can be helpful for Egypt, to formulate its C&D waste policy and strategy. At present, the best practice of C&D waste management in Quseir is to use it as coverage for the uncontrolled dumpsite.







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# 1 Introduction

## 1.1 Background

In the last few decades, the problem of solid waste has been exacerbated by increasing waste generation worldwide. According to Agenda 21, this is due to rapid economic development, population growth, changing lifestyles and consumer habits. Subsequently, the cost of waste management has gone up dramatically. This called for a new approach to deal with the problem of solid waste. The Integrated Solid Waste Management (ISWM) concept as a new approach has been seen by many countries as an appropriate approach to handle the waste management problem. ISWM deals with the problem of waste from different dimensions, environmental, economical, social and institutional.<sup>1</sup> However, ISWM system aims mainly to secure sustainable environmentally sound and economically self-supported waste management system

The UN conference on environment and development (UNCED), held in Rio de Janeiro in 1992, emphasized on the importance of the integrated solution for the problem of waste management, which presents a unique opportunity to reconcile development with environmental protection. Further, the environmentally sound waste management must go beyond the mere safe disposal or recovery of wastes that are generated, and seek to address the root cause of the problem by attempting to change unsustainable patterns of production and consumption. This implies the application of the integrated life cycle management concept.”<sup>2</sup>

In most developed countries, the concept of the integrated solid waste has been well developed and adopted, while in most developing countries, it does not exist. However, in most of the developed countries a so-called waste management hierarchy has been adopted. The waste management hierarchy is a concept to promote waste avoidance and focus on prevention at source rather than end-of-pipe approaches. The Nordic countries have achieved a good experience in managing their solid waste problem, where the concept of ISWM is well developed and adopted.

In Egypt, with the growing population and development pressures, the problem of the solid waste has worsened considerably in both urban and rural areas.<sup>3</sup> Its negative manifestations on public health, environment and national economy are becoming quite apparent and acute.<sup>4</sup> It has estimated that the overall cost of environment degradation in Egypt is, LE 10-19 billion<sup>5</sup> annually which is representing 3.2-6.4% of GDP. However, the cost of environment damage due to the uncollected municipal solid waste has been estimated as 0.2% GDP. <sup>6</sup>

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<sup>1</sup> Beukering, P., Kumer, V., Sehker, M., & Gerlagh, R. (1999). *Analysis urban solid waste in developing countries: a perspective on Bangalore, India*. [Online]. Available: [www.Waste.nl/](http://www.Waste.nl/) [2004, May 24]

<sup>2</sup> United Nation Programme (UNEP). (2004) Agenda 21, chapter 21. [Online]. Available: <http://www.unep.org/Documents/Default.asp?DocumentID=52&ArticleID=69/> [2004, May 24]

<sup>3</sup> Hamaza, A. (2002). *Solid waste management in Egypt: National policy objectives, action plan and implementation problems: In privatization of solid waste management in Egypt: Lesson learnt from national and international experiences*. Rotterdam: IHS

<sup>4</sup> Bush, M. (2000). *Policies and Institutional Assessment of Solid waste management in Egypt*. Blue Plan Regional Activity centre. [Online]. Available: <http://www.planbleu.org/> [2004, May 4]

<sup>5</sup> LE1 equals 0.16 US Dollar

<sup>6</sup> World Bank Group. (2002). *Arab republic of Egypt cost assessment of environmental degradation*. [Online]. [http://lnweb18.worldbank.org/mna/mena.nsf/Attachments/Egypt+Costs+of+Env+Degradation/\\$File/Egypt+Cost+Env+Deg+Sector+Note+June+29,+2002+.pdf](http://lnweb18.worldbank.org/mna/mena.nsf/Attachments/Egypt+Costs+of+Env+Degradation/$File/Egypt+Cost+Env+Deg+Sector+Note+June+29,+2002+.pdf) [2004, August 4]

In 2000, the Egyptian Government established a national strategy for integrated municipal solid waste management (IMSWM). The goal of this strategy is to achieve an integrated sustainable system meeting the health, environmental and economic criteria. This is by embodying proper policies development, legislation, funding, institutions, human resources technological infrastructure and supportive public awareness.<sup>7</sup> However, the implementation of sustainable ISWM system in Egypt is still facing many constraints, where these constraints can be described as institutional and organizational, and technical constraints.

Construction and Demolition(C&D) waste is also one of the environmental problems in Egypt. Within increase the urbanization, the problem of C&D has aggravated in most of the Egyptian governorates. Unfortunately, C&D waste management is not of the priorities of the Egyptian Government, where there is no national policy or strategy of C&D waste management problem in Egypt.

In big Egyptian cities may be there is somehow kind of municipal solid waste management(MSW) while, in most of small Egyptian cities, the means of solid waste management include, informal scavenging by people, open burning and disposal in uncontrolled dumping sites.<sup>8</sup>

Most of the Egyptian small cities have no proper system for municipal solid waste management, as well as the Construction and Demolition(C&D) waste. This is due to the lack of proper infrastructure for collection, transportation and disposal of the waste. Moreover, there is no efficient cost recovery to facilitate improvements of the system.

The implementation ISWM system as a sustainable approach can be an effective option for these cities in addressing their waste problems. This approach looks at the MSW problems from different perspectives, economic, social and environmental. However, the integration of these entire dimensions in the waste management system might be hard to small Egyptian cities where, it needs for full participation of all the different stakeholders in the process of solid waste management.

## **1.2 Problem statement**

Within the small Egyptian city of Quseir, there is a will to work with formulation of a model for cost effective and environmentally sound waste management. An adapted version of a generic Integrated Waste Management System (IWMS) built upon experiences from countries (Nordic countries) with well developed waste management systems and adapted to local conditions offers opportunities to deliver both waste prevention; improved material recovery/reuse/recycling; and sound solutions for final disposal.

However, the ranges of typical challenges to the improvement of waste management in developing countries are found in this city, and in similar cities throughout the region. These include a lack of the suitable infrastructure for solid waste management; inappropriate existing waste management practices (collection, transportation, treatment, final disposal); a lack of capacity in local governmental institutions, and poorly developed institutional, and organizational structures (including legal frameworks) for solid waste management; poor cost recovery opportunities within existing taxation structures, and growing waste generation trends associated with development, tourism and general construction activities. Further, trends indicate that privatization of waste management activities in the region may lead to a reduction in flexibility, and even the risk of additional cost burdens being placed upon local authorities. However, C& D waste is also one of the environmental problems in Quseir.

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<sup>7</sup> Ministry of State for Environmental Affairs (MSEA). (2000). *The National strategy for integrated municipal solid waste management: A framework for action*. Cairo

<sup>8</sup> Bushra, M. (2000). *Policies and Institutional Assessment of Solid waste management in Egypt*. Blue Plan Regional Activity centre. [Online]. Available: <http://www.planbleu.org/>[2004, May1 4]



This C&D waste is arising mainly from the building of the nearby hotels. Most of the generated C&D waste goes to be dumped in an old Quarry which will be soon filled up. Further, C&D is very abundant problem in the region where it is dumped illegally along roadsides.

### **1.3 Purpose**

The study aimed to contribute to solve the solid waste management problem in the Egyptian small cities. Further, the study aimed to identify and document the key challenges to the development of an adapted version of a generic Integrated Solid Waste Management System (ISWMS) in Quseir, to develop a model for cost effective and environmentally sound municipal solid waste management system in the form of a ISWM system and thus to contribute to its future implementation. It is intended that the model should have generic components that allow it to serve as a model for ISWM in other small Egyptian cities in Egypt. Moreover, the study aims to include the problem of the C&D waste in Quseir as another environmental problem.

### **1.4 Scope and limitations**

The study focuses mainly on the municipal solid waste which comes from the households, hotels and the commercial establishments and, includes C&D waste. The study is limited to the Egyptian situation and focuses on Quseir as a case. However, the study examines the environmental knowledge and information, as well as the appropriate technology specifically in some Nordic countries (Denmark and Sweden), which may be useful in addressing the problem of municipal solid waste management, including C&D waste in Egypt. Further, this research looks at if there is any successful local model which could overcome the obstacles and barriers of implementing ISWM in small Egyptian cities

Although C&D waste is not usually considered as a municipal solid waste it has been taken into account in this study. This is because C&D waste represents a considerable environmental problem in Quseir, which arise from building the new hotels nearby the city in addition the innovations of the old building in the city. However, the study excludes some other waste streams, such as hazardous waste, electrical and electronic equipment (EEE), clinical and industrial waste etc.

### **1.5 Research question(S)**

To address this work the following research question will be addressed:

How should a model for ISWM for Egyptian small cities be formulated or shaped?

It is expected that the following sub-questions will need to be addressed during the conduct of the work in order to answer this question:

- How can Nordic environmental knowledge and information, as well as the appropriate technology be useful to address the problem of MSW, including C&D waste management in Egypt?
- What are the barriers and constraints for implementation an ISWM systems in Quseir?
- Are there any good examples in the Nordic countries or in Egypt to overcome these barriers?
- What specific local issues need to be addressed in Quseir in order to promote change?
- What are the sources of finance existing for implementing ISWM in the Egyptian small cities?
- How can an ISWM become self-financially supported in Egyptian small cities?
- What are the best practices for C&D waste management which could be applied in Quseir?

## **1.6 Research Methodology**

The concept of Integrated Solid Waste Management (ISWM) was used in order to identify the direction of the research and methodology. The concept of ISWM aims to implement a sustainable environmentally sound and economically self-supported waste management system. Subsequently, it aims to involve the entire stakeholders in the process of planning and implementation of such system.

The concept of ISWM is a very broad concept. So, the first step of this research was to formulate and define the requirements of implementation an ISWM system. These requirements were classified into organizational and institutional aspects. This classification was used as a framework to analyze the problem of solid waste management in Quseir.

In order to put Quseir in national level, the second step of this study was a review of the most recent and available literature on MSW management in Egypt. This was to collect the secondary data on MSW waste in Egypt. The main purpose of this step was to give overview of MSW and C&D waste problems in Egypt. Further, it aimed to identify the main constraints which hinder implementing ISWM on a national wide. From this step, an overview of MSW and C& D waste management problems in Egypt, has been identified

Based on the identified problems of the MSW and C&D waste management in Egypt, the third step has conducted to explore, if there is relevant experience from some Nordic countries, to address these constraints. However, the relevant experiences of ISWM of Sweden and Denmark were examined to determine if Nordic environmental knowledge and information in addition to technology, can address some of MSW and C&D waste problems generally in Egypt and particularly in Quseir. For this purpose a description of ISWM systems in Denmark and Sweden were performed.

This step has conducted by collection of the available primary and secondary data on the system of MSW and C&D waste in Denmark and Sweden. The literature review focused mainly on describing of integrated MSW models in the two countries; in addition to C&D waste management systems. In this context, many interviews were carried out in Denmark and Sweden. These interviews were either by personal interviews, telephone conference or emails. The interviews were aiming to identify the elements of ISWM in both countries. This step has provided overview of ISWM in Sweden and Denmark which may be relevant to the Egyptian situation.

The fourth step of this research has conducted through a description and analysis of MSW and C&D waste management problems in Quseir. This was by review the relevant literature about MSW management in Quseir. However, extensive interviews with many stakeholders were conducted in Quseir. The interviews aimed to describe MSW and C&D waste situation in Quseir, and to identify the barriers and obstacles of implementation an ISWM system. Further, it aimed to identify the main stakeholders, their roles, interests and constraints to be involved in an ISWM system. This step has given us an concrete picture on MSW and C&D waste problem in Quseir.

The fifth step of this research, aimed to look at if there is any successful local model which could overcome the obstacles and barriers of implementing ISWM in small Egyptian cities. Further, this step looked at if there are best practices for C&D waste management which could contribute to solve the problems C&D waste in Quseir. From this step, we found a successful SWM model in one of Egyptian cities. This model has been examined to identify, how it can be helpful to develop ISWM system in Quseir.

Finally, the collected information from the above steps has helped us to define the requirements for implementation an ISWM model in Quseir, and how it could be shaped. Further, to contribute to explain and solve the problem of C&D waste in Quseir

## **1.7 Thesis outline**

The structure of the thesis is as follows:

### *Chapter 1: Introduction*

This chapter gives the objective of the research, as well as the research questions used to address the objective. Further, the methodology of the research is outlined in this chapter.

### *Chapter 2: The concept of Integrated Solid waste management*

This chapter aims to formulate and define requirements of ISWM system, as an appropriate approach to handle the problem of solid waste management.

### *Chapter 2: The current situation of municipal solid waste management in Egypt*

This chapter deals with the current situation of the municipal solid waste management in Egypt. This chapter aims to give an overview of the situation of MSW in Egypt and include C&D waste.

### *Chapter 4: Relevant Nordic experiences of ISWM*

This chapter looks at some Nordic Experiences (Sweden, Denmark,) related to the municipal solid waste management and, include Construction/Demolition(C&D) waste. The chapter looks at the most suitable knowledge and information, as well as the appropriate technologies which may be relevant; to address MSW management and C&D waste problems in Egypt.

### *Chapter 4: The current situation of solid waste management in Quseir*

This chapter describes and analyzes the current situation of MSW and C&D waste in Quseir. Further, it explores the barriers and the obstacles of implementation an ISWM System in Quseir.

### *Chapter 6: Analysis and Modelling*

This chapter presents an analysis for the roles and constraints of identified stakeholders who are involved in MSW management in Quseir. Further, it presents and examines one of the most successful MSW models in small Egyptian city (Nuweiba city). This was because; this model could be very helpful to address the problem of MSW in Quseir. However, this chapter presents the requirements of implementation of ISWM model in Quseir. This was based on experiences gained from Nuweiba and relevant experiences from Sweden and Denmark. Further this chapter presents best practices of C&D waste management which could be applied in Quseir

### *Chapter 7: Conclusions and Recommendations*

This chapter concludes requirements of ISWM in small Egyptian cities. Further, it gives some recommendations for future improvement of MSW and C&D waste management in Egyptian small cities.



## 2 Integrated solid waste management concept

Looking up on the definition of sustainable development in Rio Declaration in 1992, the term of sustainable waste management has been defined. Sustainable waste management implies managing waste in a way which meets the needs of the present, without compromising the ability of future generations to meet their own needs of adequate waste management.<sup>9</sup> To achieve a sustainable waste management, an integrated waste management approach should be adopted. In deed, the sustainable SWM and Integrated SWM are in sense two sides of the same coin.<sup>10</sup>

According the UNEP International Environmental Technology Centre (UNEP-IETC)<sup>11</sup>, 1996, it is important to deal with solid waste management problem from an integrated perspective. ISWM concept secures the complete use of capacities and resources in the process of waste management. ISWM also, involves the public and informal (private and non-governmental) sectors in the waste management process. Moreover, ISWM approach helps to identify and select the low cost alternatives for waste management. However, Integrated Solid Waste Management (ISWM) is a widely used term and very broad concept. It has been defined by many. Tammemagi (1999) describes the ISWM as a system which employs all the possible waste management technologies-especially reduction/reuse/recycling and incineration in addition to landfills.<sup>12</sup> Further, White (2001) describes ISWM system, as a system includes waste collection and sorting, followed by one or more of the following options: recovery of secondary materials (recycling); biological treatment; thermal treatment and landfill.<sup>13</sup> Moreover, this system needs a flexibility to design, adapt and operate the system in ways which best meet current social, economic and environmental conditions (see Figure 1).

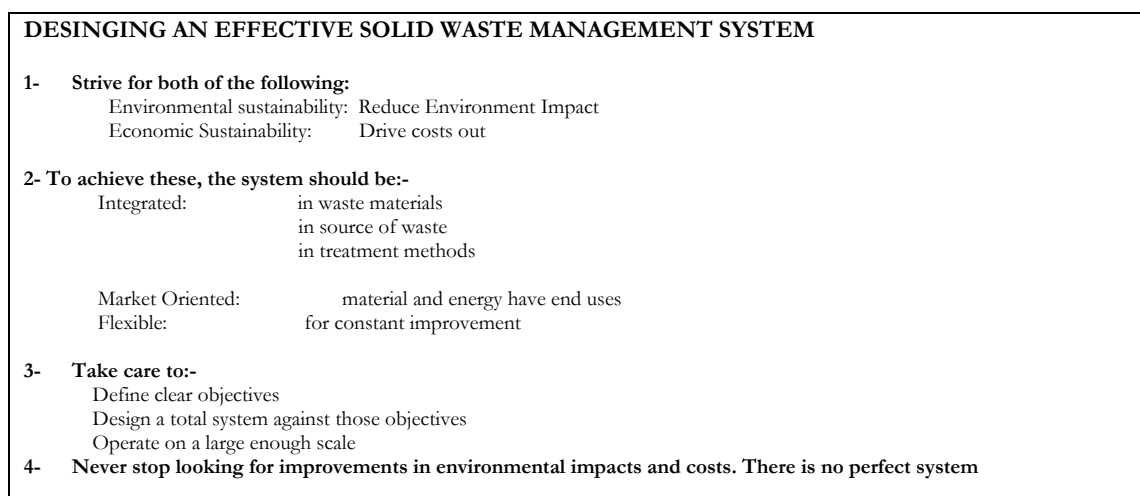


Figure 1 Requirements of an economically and environmentally sustainable SWM system

Source: adapted from (White, et al. 2001)

<sup>9</sup> Hickman, D., (2000). METAP regional solid waste management project: Current situation report. METAP: [Online]. Available: [http://lnweb18.worldbank.org/mna/mena.nsf/Attachments/Waste+Mgmt+Study+for+METAP/\\$File/Waste+Management.pdf](http://lnweb18.worldbank.org/mna/mena.nsf/Attachments/Waste+Mgmt+Study+for+METAP/$File/Waste+Management.pdf)/[2004, June 16]

<sup>10</sup> Klundert, A.& Anschutz, J. (1999). Integrated sustainable waste management: the selection of technologies and the design of sustainable systems is not (only) a technical issue. [Online]. Available: [http://www.waste.nl/docpdf/CP\\_iswm\\_1999.pdf](http://www.waste.nl/docpdf/CP_iswm_1999.pdf) / [2004, June 20]

<sup>11</sup> UNEP-IETC. (1996). International source book of environmentally sound technology for municipal solid waste. United Nation Environment Programme(UNEP), International Environmental Technology Centre(IETC).

<sup>12</sup> Tammemagi, H. (1999). *The Waste Crisis: Landfills, Incinerations and the Search for a Sustainable Future*. Oxford University Press. New York

<sup>13</sup> White, P., Franke, M. & Hindle, P. (1999). *Integrated solid waste management: a lifecycle inventory*. Aspen Publishers, Inc. Maryland

However, ISWM must be used to achieve specific waste management objectives and goals, and has flexibility to be evolved in response to new environmental regulation.<sup>14</sup> It is also important to understand the inter-relationships between the various actors which involved in such system where, this creates an integrated system which individual actors complement one another.<sup>15</sup>

The overall shape of any waste management system is identified by a package of factors. Wilson (1998) defined these as follows: operational demands, economic and financial factors, policy, management and institutional structure, legislation, and social consideration.<sup>16</sup>Figure 2 summarized these factors.

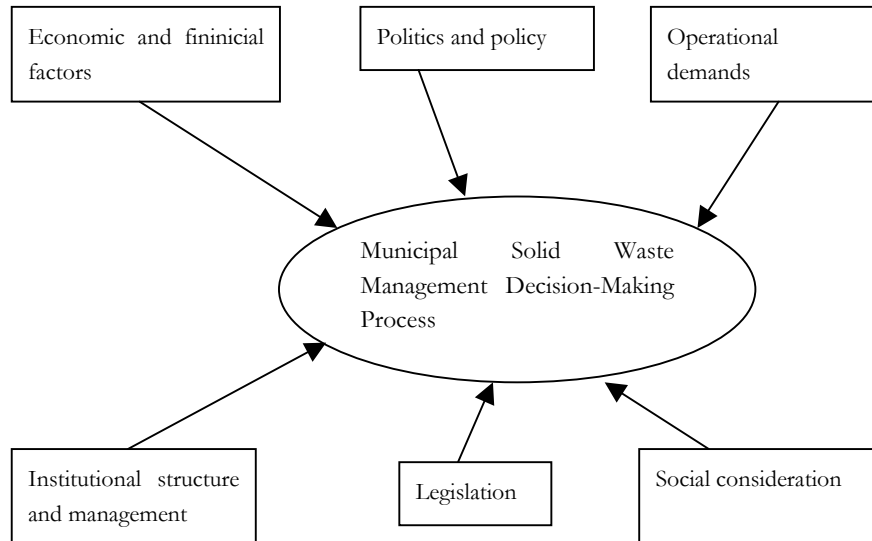


Figure 2 Factors influencing municipal solid waste Decision Making

Source Wilson (1998)

Wilson (1998) explained that any change taking place in SW management system will be strongly influenced by the existing system. Table 1 below presents in more details the factors influencing drawing up a system for municipal solid waste.

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<sup>14</sup> Tchobanoglous, G., Theisen, H. & Vigil, S. (1993). *Solid waste management: Engineering principles and management issues*. McGraw-Hill, Inc. New York

<sup>15</sup> Ludwing, C., Hellweg, S. & Stucki, S. (2003). *Municipal solid waste management: Strategies and technologies for sustainable solutions*: Springer Press

<sup>16</sup> Wilson, E. (1998). *Incorporating the environment into municipal solid waste planning: Life cycle inventory tools and the decision making process*. International work shop, Göteborg, Sweden. [Online]. Available: <http://www.entek.chalmers.se/~josu/abstracts.htm> / [2004, August 14]

Factors	Aspects related to the factor
Operational Demands/Constraints	<ul style="list-style-type: none"> <li>• Infrastructure and waste disposal security</li> <li>• Existing contracts and obligation</li> <li>• Location and demography</li> <li>• Waste stream composition and change</li> <li>• Available technology vs. Proven technology-linked closely with cost</li> </ul>
Economic and Financial Factors	<ul style="list-style-type: none"> <li>• Cost of current system and other options</li> <li>• BATNEEC(Best Available Technology/Not Entail Excessive Cost)</li> <li>• Local and Regional budget limitation</li> <li>• Available funding/ subsidies</li> <li>• Economic tools employed influencing the cost of waste management</li> <li>• Pricing system for waste services</li> </ul> <p>Secondary materials market</p>
Policy, Management, Institutional structure and legislation (International, National , Regional , Municipal)	<ul style="list-style-type: none"> <li>• International , national and regional legislation</li> <li>• Form of government</li> <li>• Local and regional policies and planning- strategy and vision</li> <li>• Institutional and administrative structure for MSW management</li> <li>• Socialist support: Public participation in the decision making process</li> <li>• Political support- NIMTOF(Not in My Term of Office)</li> <li>• Regulation and site specification</li> <li>• Mandated targets</li> <li>• Definition of municipal solid waste</li> </ul>
Social Consideration	<ul style="list-style-type: none"> <li>• Public participation and perception of waste management</li> <li>• Public resistance- NIMBY, LULU(Locally Unacceptable Land USE)</li> </ul>

Table 1 identified influenced factors influencing the MSW decision making process

Source: Wilson (1998)

In a holistic way, to implement of an ISWM system, the economic, environmental social and institutional dimensions concerning solid waste management should be taken in account.<sup>17</sup> However, the interactive aspect lies in the trade- off between these four dimensions. For example in certain situations, although recycling may be preferred from an environmental perspective, the economic costs

<sup>17</sup> Beukering, P., Kumer, V., Sehker, M.,& Gerlagh, R. (1999). *Analysis urban solid waste in developing countries: a perspective on Bangalore, India*. [Online]. Available: www. Waste.nl/[2004, May 24]

involved or the presence of institutional complications may be hinder recycling from being promoted in integrated SWM.

Based on the previous definitions of ISWM concept and the factors influencing design an ISWM system, it seems clear that any ISWM aims mainly to secure a sustainable environmentally sound and self-economically supported SWM system. However, implementation an ISWM could be seen as, it requires integration between two main aspects and requirements as follows:

- Institutional and organizational aspects
- Solid waste management practices

## 2.1 Institutional and organizational aspects

The institutional and organizational aspects are very important aspects to implement an ISWM system. These aspects are the tools to implement the policy of integrated solid waste management. These aspects aim to define the roles and responsibilities associated with implementation of an ISWM system. In another way, it aims to define the roles and responsibilities of all the stakeholders who are involved in the solid waste management process.

The involvement and participation of all the stakeholders is required to achieve ISWM system.<sup>18</sup> These aspects define clearly who has the responsibility to do the following elements: i) policy/planning, (ii) licensing and permitting (legal requirements), (iii) operation, (iv) monitoring, (v) enforcement, (vi) education and awareness, (vii) financial cost and recovery and (iiiv) administration.<sup>19</sup>

However, these elements should be well defined and well existed on the national, regional and local level. The clear delineation of these roles and responsibilities has been seen by many as a necessity for long-term delivery of adequate solid waste management services that are environmentally and financially self-supported. Further, well defined institutional and organizational aspects pave the way to effective involvement of private sectors, the Community Based Organizations (CBOs) and the Non-Governmental Organization (NGOs).

However, in most developing countries, these roles and responsibilities are not well defined. This leads in many cases to conflict between the different stakeholders involved in the process of waste management, and hinder implementation sustainable ISWM system<sup>20</sup>

## 2.2 Solid waste management practices

The solid waste management practices are the second aspects which are required for embodying an ISWM system. Broadly, the material flow stream of waste from generation to ultimate disposal comprises the following: generation, collection/ transportation, processing and disposal.

However, the solid waste management practices encompass the full range of activities for these streams from the generation to the final disposal.<sup>21</sup>

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<sup>18</sup> Ibid

<sup>19</sup> Hickman, D., (2000). *METAP regional solid waste management project: Current situation report. METAP.P9*: [Online]. Available: <http://lnweb18.worldbank.org/mna/mena.nsf/Attachments/Waste+Mgmt+Study+for+METAP/SFile/Waste+Management.pdf/> [2004, Jun16]

<sup>20</sup> Ibid

<sup>21</sup> Beukering, P., Kumer, V., Sehker, M., & Gerlagh, R. (1999). *Analysis urban solid waste in developing countries: a perspective on Bangalore, India*. [Online]. Available: [www.Waste.nl/](http://www.Waste.nl/) [2004, May 24]



According to Agenda 21, to achieve an environmentally sound waste management, a hierarchy of objectives and programs should be focused on as follows:

- (a) Minimizing wastes;
- (b) Maximizing environmentally sound waste reuse and recycling;
- (c) Promoting environmentally sound waste disposal and treatment;
- (d) Extending waste service coverage<sup>22</sup>

A waste management hierarchy of waste management has been developed and adopted by most of the developed countries. The waste management hierarchy is usually established to identify the key elements of an integrated solid waste management strategy. The hierarchy employs a strategy suggesting first prevention then reduction of waste, reuse, recycling, reclamation (material recovery), energy recovery and finally land filling as the least preferred disposal option.

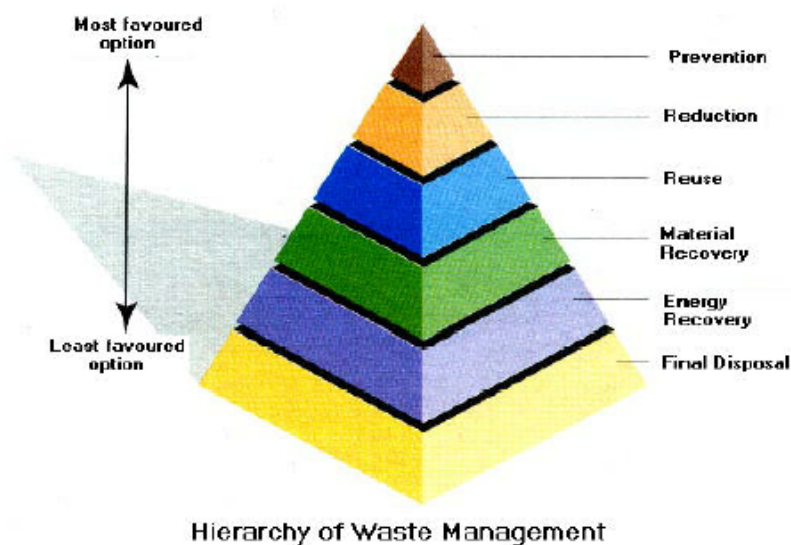


Figure 3 The goals of the waste policy in Europe

Source: Antadze, et al. (2004)

According to the European Topic Centre on Waste (ETC/W)<sup>23</sup>, prevention means eliminating or reducing the quantity of waste which is produced in the first place. Re-use means the use of a product on more than one occasion, either for the same purpose or for a different purpose, without the need for reprocessing. Recycling involves reprocessing of a discarded waste material to make it suitable for subsequent re-use either for its original form or for other purposes. Energy recovery can be done in a number of different forms including heat, high calorific -value gases, solid and liquid fractions. Landfilling is the least desirable option for the management of municipal waste. Sanitary Landfilling of waste has numerous potential impacts such as, production of leach ate and landfill gas, odours, flies, vermin and the use of land.

However, the concept of waste management hierarchy has been criticized by many. Beurkering (1999) argued that waste management hierarchy refers only for the environmental effects and not to the economic or social criteria. Further, the ranking may be correct in terms of environmental pressure for

<sup>22</sup> UNEP (2004). [Online]. Available :<http://www.unep.org/Documents/Default.asp?DocumentID=52&ArticleID=69/> [2004, Jun16]

<sup>23</sup> The European Topic on waste and Material Flow (2004). [Online]. Available : <http://waste.eionet.eu.int/> [2004, June16]

certain materials but not for all the materials and products.<sup>24</sup> Further, Rylander (2004) argues that the waste management practices should not rely only on one option; it should make use combination of methods of waste management such as recycling, material recovery, incineration and landfilling.

## **2.3 Summary**

This chapter aimed to formulate a definition of the integrated solid waste management concept (ISWM). Also, it aimed to lay down the main requirements of implementation of an ISWM system. It seems clear that any ISWM system needs well defined institutional and organizational aspects, in addition good solid waste management practices. However, the main aim of an ISWM is to secure an environmentally sound and economically self-supported solid waste management system.

Institutional and organization aspects in this study mean all the software aspects concerning the solid waste management. These aspects include: policy and planning aspects, legal and administrative aspects, financial and cost recovery aspects, awareness and training aspects. These all aspects should be well defined, to achieve flexibility of involvement of all relevant stakeholders in the process of solid waste management.

The solid waste management practices can call as hardware aspects. these aspects include sorting and collection of solid which followed by one of the treatment options (e.g. recycling, recovery, incineration and landfill).

In conclusion, integration between these hardware aspects and software aspects is required to implement a sustainable ISWM system.

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<sup>24</sup> Beukering, P., Kumer, V., Sehker, M., & Gerlagh, R. (1999). Analysis urban solid waste in developing countries: a perspective on Bangalore, India. [Online]. Available: [www.Waste.nl/](http://www.Waste.nl/) [2004, May 24]

### 3 Description of the current situation of solid waste management in Egypt

According to the National Waste Management Strategy, municipal solid waste defined as solid waste that, is generated by households or waste that is generated by industry, commercial establishments or institutions that are generally of the same type as is generated by households (e.g. cardboard, paper, plastics, etc).<sup>25</sup>

The problem of municipal solid waste (MSW) has been growing everywhere in Egypt. In essence, the solid waste (SW) problem emanates from the incapability of the existing management system to meet the needs of the whole Egyptian society for an acceptable level. <sup>26</sup>The waste management problem in Egypt is attributed to the lack of integrated and sustainable solid waste management approach.<sup>27</sup> The current situation of the municipal solid waste management in Egypt is described in the following sections.

#### 3.1 Institutional and organizational aspects

##### 3.1.1 Policy and planning

In Egypt, Ministry of state for Environmental Affairs (MSEA) and Egyptian Environmental Affairs Agency (EEAA)<sup>28</sup>, are responsible for drawing up the Egyptian environmental policy in coordination with other competent ministries and authorities. However, Egyptian Environmental Affairs has 8 Regional Branch Offices (RBOs) which coordinate with the different Environmental Management Units (EMUs)<sup>29</sup> in the regional governorates. However, the relation between RBOs and EMUs is specified by guidelines not by a law.

There are two kinds of solid waste management policies in Egypt: a written policy mainly to be found in laws and decrees and unwritten policy, which can be derived from sometimes and hoc-actions of decision makers and spending of the budget. In Egypt, there are two main policy documents on solid waste management. These two documents are the National Solid Waste management Strategy (2000) and the National Solid Waste Management Programme (2001). <sup>30</sup>

In 2000, the Egyptian government established a National Strategy for the Integrated Municipal Solid Waste Management (IMSWM). This strategy aims to address the problem of the municipal solid waste in Egypt, based on holistic and integrated approach. Moreover, it was meant to be a guiding document on solid waste management in Egypt. Hamaza (2002) claims, that it is very important to highlight the symptoms of the SWM problems, despite the fact that, it is clearly evident to everybody. The following set of generic problems has listed in the national solid waste management strategy.

- Lack of adequate physical infrastructure
- Mismanagement of existing infrastructure

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<sup>25</sup> Ministry of State for Environmental Affairs (MSEA) (2000). *The national strategy for integrated municipal solid waste: A frame work for action*. Cairo

<sup>26</sup> Ibid

<sup>27</sup> Hamaza, A.(2000). *Solid waste management in Egypt: National policy objectives, action plan and implementation problems*. In *Privatization of solid waste management in Egypt: lessons learnt from national and international experiences*. Rotterdam: IHS

<sup>28</sup> Egyptian Environmental Affairs Agency (EEAA). [Online]. Available : (2004). [www.eeaa.gov.eg/](http://www.eeaa.gov.eg/) [2004, June 20]

<sup>29</sup> EMUs is affiliated to jurisdiction of regional governorate

<sup>30</sup> Elkaial, A. (2004, July14). Personal Interview

- Lack of adequate human resources expertise and skills in the field of SWM
- Lack of integration and coordination amongst the concerned agencies and organizations
- Low public awareness
- Weakness in legislation and enforcement
- Limited monitoring and control mechanism over violators <sup>31</sup>

The National Waste Management strategy specified operational target for which the strategy for all governorates should actively meet, amongst these targets;

- Collection of coverage must exceed 60% for large villages 2005 and 70% by 2010
- Collection coverage must exceed 80% for capitals of governorates by 2005 and 90% by 2010
- Minimum of 80% by 2005 and 90% by 2010 of wastes disposed of to be via landfills as opposed to dumpsite
- 50 % of solid waste generated to be composted by 2005
- 20% of solid waste generated to be recycled by 2005
- 40% of solid waste by 2005 to be separated into wet and dry and hazardous components at source and 50% by 2010
- 5 % source reduction to be achieved by 2005 in reference to normal growth
- 100% cost recovery of waste management practices by 2005
- The level of funding to meet 0.35% of GDP by 2005

However, the strategy has been claimed by many that it is not more than description of what is already happening in Egypt and mainly from governmental side and, not supported by the different stakeholders.<sup>32</sup> Moreover, it is not clear how to carry out the targets which has depicted in the strategy.

On the other hand, Egypt has embarked on a program to upgrade its management of solid waste nationwide. In 2001, The Government of Egypt has initiated this national program for privatization of SWM. The program includes the privatization of solid waste collection, recycling, composting, and/or disposal on a governorate-by-governorate basis.<sup>33</sup> The programme, s main objective is to privatize SWM in all 26 governorates in Egypt, within two years, starting with urban and ending with rural areas.

The idea has been interpreted by governorates as a directive to contract out SWM with international companies. However, this programme has failed in most of governorates, including in the Red Sea

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<sup>31</sup> Ministry of State for Environmental Affairs (MESA) (2000). *The national strategy for integrated municipal solid waste: A frame work for action*. Cairo

<sup>32</sup> Centre for Environment and Development for the Arab Region and Europe (CEDARE). (2004). *Assessment of the solid waste management system in Quseir*. Cairo

<sup>33</sup> Ministry of state for Environmental Affairs (MESA). (2001). *Annual Report 2000-2001*. Cairo

Governorate.<sup>34</sup> This is because, there is still lacking the basic requirements for privatization, such as preparing for the bidding documents, contractual agreement.<sup>35</sup> Moreover, the tenders were prepared on the basis of insufficient and non-reliable information to the quantities of waste generated and the composition of waste.<sup>36</sup>

However, so far it has been successful in five governorates: Alexandria, Cairo, Qaliubeya, Aswan and Suez. In the majority of these cases foreign donors have supported the privatization process.<sup>37</sup>

Waste management strategy is essential requirement to put in place a sustainable waste management system. Although there is a national strategy for SWM, most of Egyptian governorates have no waste management strategies.<sup>38</sup> Further, most of Egyptian cities have no waste management plans. However, SEAM<sup>39</sup> project (British project working in Egypt) has formulated waste management strategies for a number of Egyptian governorates.

### 3.1.2 Legal aspects

Existing and enforcement of SWM regulations ensure that all appropriate steps are taken to minimize the impact of SWM on the environment and public health.<sup>40</sup> In Egypt, there are a number of laws and regulations that directly or indirectly relates to SWM .The principal law and regulations governing solid waste management in Egypt are Law Number 38 of 1967 on General Public Cleaning and its executive regulations (issued by Minister of Housing Decree Number 134 of 1968). The Environment Law (Law Number 4 of 1994) and its executive regulations (issued by Prime Minister Decree Number 338 of 1995) also, contain some provisions governing general solid waste management.

Law 38 / 1967 regulates collection and disposal of solid waste from residential areas, commercial, industrial establishments and public places. It imposes a cleanliness tax on all housing unit equivalent to 2% of the rental value.

According to Law 4/1994, local authorities are responsible for:

- Design sites for treatment, incineration and disposal of solid waste in arrangement with the Egyptian Environmental Affairs Agency (EEAA)
- Implementation the specification for solid waste containers and collection vehicles

There is also, Law 48 of 1982 which prohibits the dumping of SW in surface water streams or on their sides. There are no provisions to the sanitary landfill requirements, but the Egyptian Environmental

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<sup>34</sup> Khalaf, M.(2004, July15). Personal Interview

<sup>35</sup> Hamaza, A.(2000). *Solid waste management in Egypt: National policy objectives, action plan and implementation problems. In Privatization of solid waste management in Egypt: lessons learnt from national and international experiences.* HIS: Rotterdam

<sup>36</sup> Genena, T.(2002). *Privatization experiences in Egypt:: Ongoing practices and some lesson to be learnt .In Privatization of solid waste management in Egypt: lessons learnt from national and international experiences.* HIS: Rotterdam

<sup>37</sup> Centre for Environment and Development for the Arab Region and Europe (CEDARE). (2004). *Assessment of the solid waste management system in Quseir.* Cairo

<sup>38</sup> Jago, P. (2004, August 3). Personal Interview

<sup>39</sup> Support for Environmental Assessment and Management (SEAM). (2004).[Online]. Available: [www.seamegypt.com](http://www.seamegypt.com) / [2004, May20]

<sup>40</sup> Hickman, D., (2000). *METAP regional solid waste management project: Current situation report. METAP.* [Online]. Available: [http://lnweb18.worldbank.org/mna/mena.nsf/Attachments/Waste+Mgmt+Study+for+METAP/\\$File/Waste+Management.pdf](http://lnweb18.worldbank.org/mna/mena.nsf/Attachments/Waste+Mgmt+Study+for+METAP/$File/Waste+Management.pdf) / [2004, June 16]

Affairs (EEAA), has issued guidelines for these requirements. However, there is need, to strengthen the present SWM regulatory framework and secure their enforcement.<sup>41</sup>

### 3.1.3 Public awareness

Raising public awareness and education are very important tools in the process of integrated solid waste management. A well prepared and focused awareness campaign would have a marked impact on the effectiveness of the implementation SWM services.<sup>42</sup> In Egypt, there is a need to development and implement of public awareness initiatives concerning the environmental health impacts of inadequate SWM. These initiatives should focus more on presenting for people the available SWM options and the benefits and costs of these options, not only the need to improvement the SWM system.<sup>43</sup> Moreover, these campaigns should focus on changing the negative attitudes of people towards the scavengers and SW collectors.

However, the national program for public awareness regarding the environmental impact of SWM is still infancy.<sup>44</sup> Further, most of the current campaigns target people who do not have existing SWM service. However, the national program for awareness is still lacking the coordination and collaboration between the local authorities in addition to lack of funding.

### 3.1.4 Staff and equipment

One of the very apparent problems in the Egyptian SWM is the lack of the skilled-staff. Most of the municipalities have no well skilled staff for solid waste management. The inefficiency of their performance is due to a lack of funds for training, which is due to the shortage of cost recovery. In many, instance the municipalities depends on temporary staff more than on permanent staff.<sup>45</sup> Further, most of hired scavengers are illiterates and have very low salaries.

However, the SWM labour-related problems have seen by many as: lack of skilled staff, shortage of training, in addition to inefficient work due to lack of incentives and appropriate equipment. Further, in Egypt, only those with no other option in life apply for jobs as SWM labours.<sup>46</sup> However, the attitude of people against the scavengers and waste pickers is still bad attitude and must be changed. Such, social attitude prevents many of educated youth to participate and work in such jobs.

### 3.1.5 Finance

According the National Strategy for SWM, the current financial system of SWM in Egypt does not cover the costs of waste collection and disposal services carried out by the government, as represented by the municipalities. It is estimated that expenditure on solid waste management is 32 400 00 \$ per year. However, the funds for municipal solid services are provided from the following main sources

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<sup>41</sup> Ministry of State for Environmental Affairs (MESA) (2000). *The national strategy for integrated municipal solid waste: A frame work for action*. Cairo

<sup>42</sup> Genena, T. (2002). *Privatization experiences in Egypt:: Ongoing practices and some lesson to be learnt .In Privatization of solid waste management in Egypt: lessons learnt from national and international experiences*. Rotterdam: IHS

<sup>43</sup> Hickman, D., (2000). *METAP regional solid waste management project: Current situation report*. METAP: [Online]. Available: <http://inweb18.worldbank.org/mna/mena.nsf/Attachments/Waste+Mgmt+Study+for+METAP/SFile/Waste+Management.pdf> [2004, June 16]

<sup>44</sup> Bushra, M. (2000). *Policies and Institutional Assessment of Solid waste management in Egypt*. Blue Plan Regional Activity centre. [Online]. Available: <http://www.planbleu.org/> [2004, May 1 4]

<sup>45</sup> Ibid

<sup>46</sup> Hickman, D., (2000). *METAP regional solid waste management project: Current situation report*. METAP: [Online]. Available: <http://inweb18.worldbank.org/mna/mena.nsf/Attachments/Waste+Mgmt+Study+for+METAP/SFile/Waste+Management.pdf> [2004, June 16]

- 1) The governmental budgetary which is very small amount
- 2) A cleansing fund which represents 2% of the rental value of household and commercial activities
- 3) Foreign grants and loans.
- 4) Community participation to services provided on private basis<sup>47</sup>

### 3.2 MSW sources, generation rates and composition

There are big differences in Egypt between solid waste generation and the amount of reaching the final disposal sites.<sup>48</sup> This is because much of more of the waste arising is recovered, not least by scavengers, before it reaches the point of final disposal. However, the situation is made worse in Egypt as there is no weighting facilities at disposal sites and no tradition of waste sampling and analysis.<sup>49</sup>

According to the Egyptian National Environmental Action Plan (NEAP) (1992), 10 million tons of municipal solid waste arises annually in Egypt, of which 60% is from urban areas. However, there is estimation that the quantity of municipal solid waste generated annually is at about 15 million tons. However, MTAP<sup>50</sup> project has estimated that the annual municipal solid waste growth rate in Egypt is 1.5% per capita. According to that, it estimated that the projected total MSW generation will be 20 056 000 tons on 2010. According to the National Strategy for ISWM (2000), the MSW generation rate is about 0.3 kg per day per capita in the rural areas and about 1 kg per day per capita in the urban areas. MSW generation is roughly estimated at about 40 000 tons per day. The composition of the municipal waste is about 50-60% food waste, 10-20 % paper, and 1-7 % metals, cloth, glass and plastic. The remainder is basically inorganic matter and others. Table 2 shows the typical composition of the municipal solid waste in the Egyptian cities.

Table 2 the typical composition of the municipal solid waste in the Egyptian cities

Municipal Solid Waste composition	Percentage (%)
Organic	60
Paper	14
Plastic	5
Glass	3
Metal	3
Textile	2
Others	13
Total	100%

Source: METAP (2000)

<sup>47</sup> MSEA(2000), The national strategy for integrated solid municipal solid waste management – A frame work for action : p. 27 : Cairo

<sup>48</sup> Support of Environmental Assessment and Management (SEAM) project. (1999). *Solid waste management strategy: Governorate of Sobag-Egypt*. Entec.UK limited . [Online]. Available: <http://www.seamegypt.org/> [2004, May 31]

<sup>49</sup> Bushra, M. (2000). *Policies and Institutional Assessment of Solid waste management in Egypt*. Blue Plan Regional Activity centre. [Online]. Available: <http://www.planbleu.org/> [2004, May 1 4]

<sup>50</sup> Mediterranean Environmental Technical Assistance Programme.(2004). [Online]. Available: <http://www.metap.org/> [2004, May 31]

However, table 3 below shows the sources of the municipal solid waste in Egypt. It appears , that the main source of MSW is the households.

Table 3 sources of municipal solid waste in Egypt

Source	Percentage of total waste (%)
Household	64.3
Street Sweeping and green refuse	12.3
Commercial	14.9
Industrial	2.3
Educational	0.9
Hotels	0.7
Hospitals	0.09
Other	4.15
Total	100 %

Source: adapted from Bushra(2000)

### 3.3 MSW collection and transfer

According to the National Strategy for ISWM (2000), the collection efficiencies vary between about 30% in rural areas and small cities, to about 86 % in urban areas and large cities. There is estimation that, the collection and transportation efficiency is ranging between 15-65%. <sup>51</sup>Table 4 shows that the collection deficiencies of MSW vary considerably between high standard of living areas and poor and densely populated areas.

Although the responsibility of municipal solid waste management rests basically on the municipalities, half of the collected municipal solid waste is collected by Zabbaleen<sup>52</sup> (garbage collectors).

Over the past 60 years, the Zabbaleen community was responsible for collection the municipal solid waste in Egypt. Zabbaleen collect the waste from the households in the big cities in Egypt. The Zabbaleen are contracted with individual households to collect all their wastes for about 5-10 EL<sup>53</sup> per month. They take the waste to their garbage villages where it is sorted into recyclables components: paper, plastics, rags, glass, metal and food. The food waste is fed to pigs and other items are sold to recycling centres. In Cairo, the Zabbaleen of Mokattam<sup>54</sup>, it is estimated that they collect and manage about 1 600 tons of garbage per day. Along with four other similar neighbourhoods, they manage one third of municipal waste, i.e. 3000 tons per day. (C.I.D, 2002)<sup>55</sup>

Table 4 the collection efficiencies of MSW

<sup>51</sup> Genena, T.(2002). *Privatization experiences in Egypt: Ongoing practices and some lesson to be learnt .In Privatization of solid waste management in Egypt: lessons learnt from national and international experiences.* HIS: Rotterdam

<sup>52</sup> Zabbaleen is an Egyptian term, meaning a group of people who collect MSW by door- to-door

<sup>53</sup> 1 Egypt Pound = 0.16 USA dollar

<sup>54</sup> Mokattam is a community of garbage collectors involved in the management of household solid waste

<sup>55</sup> Community and Institutional Development (CID) (2002). *Best practice related to the use of indigenous knowledge in development:* Cairo (unpublished document)



Governorate	Efficiency % of waste collected
Cairo	62.5
Giza	64
Qalubya	50
Gharbya	50
Alexandria	77
Aswan	41
Luxur	45
Red Sea	52.5
South Sinai	33.3

Source: MSEA (2000)

A micro-enterprise scheme was initiated in Mokattam (the largest garbage village) through a local NGO, the Association of the Protection of the Environment (A.P.E)<sup>56</sup>. The scheme eventually involved locally-made development to reclaim plastics, cloths, paper, aluminium and tin. However, Zaballeen community demonstrated and sustained waste reutilization levels among the highest in the world for many years.

In the rural areas in Egypt, there are still traditional practices for collection of waste the secondary material, principally (plastics and worn shoes). This is done by peddlers (*Sarribha*) who collect these wastes on an informal basis throughout Egypt, wherever the quantities available offer sufficient profit. Peddlers sell these items for the wholesalers who sell it for the recycling industries. In Cairo, the peddlers mainly deal with the zabbaleen community.<sup>57</sup>

However, waste segregation and separation practices are evident thought Egypt. Figure 4 below shows a simple illustration of typical urban system.

<sup>56</sup> The Association of the Protection of the Environment (A.P.E).(2002). [Online]. Available : <http://www.ape-egypt.com/> [2004, August16]

<sup>57</sup> Bushra, M. (2000). *Policies and Institutional Assessment of Solid waste management in Egypt*. Blue Plan Regional Activity centre. [Online]. Available: <http://www.planbleu.org/>[2004, May1 4]

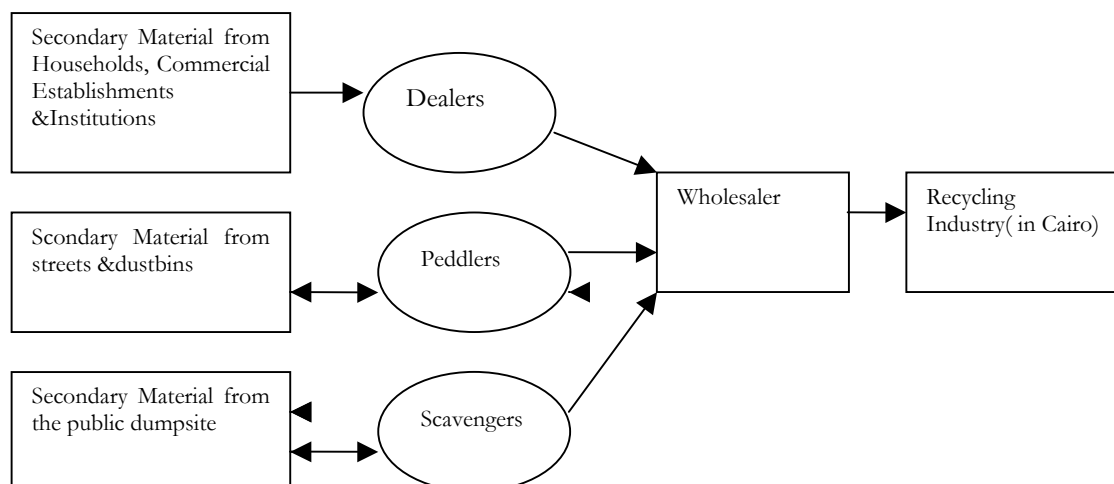


Figure 4 Flow of secondary materials in the city of Ismailia in Egypt

Source: SEAM (1999), based on EQI, (1994)

However, Zaballeen as an informal system now is facing many problems due to the process of privatization of SWM in the large cities in Egypt. In this system of privatization, the modalities of cooperation between Zaballeen and the private operators remain uncertain.<sup>58</sup>

According to National Strategy for ISWM, the existing systems of MSW collection in Egypt are as follows:

- Door-to-Door collection by zabbaleen or formal private sector which transported by mechanized vehicles.
- Communal collection of wastes in 2-3 m<sup>3</sup> containers which discharge in side or rear loading compactors
- Communal collection in 3-6 m<sup>3</sup> trailers, which are then tractor drawn to disposal sites.
- Kerbside collection in duper trucks or tractors-trailers.<sup>59</sup>

In Egypt, most of the MSW is mixed waste where, there is no existing source separation system for the municipal solid waste in Egypt. According to the national strategy for IMSW, Egypt lacks an adequate and sufficient scheme of collection of MSW.

### 3.4 Treatment and Disposal of MSW

Composting has seen as the most suitable treatment of MSW to be used in Egypt not only because it can generate substantial number of jobs and income but also, because it decreased the pressure on official dumps.<sup>60</sup> Moreover, compost as end-product, is considered an attractive product because of its

<sup>58</sup> Genena, T.(2002). *Privatization experiences in Egypt:: Ongoing practices and some lesson to be learnt .In Privatization of solid waste management in Egypt: lessons learnt from national and international experiences.* HIS: Rotterdam

<sup>59</sup> MSEA (2000). *The national strategy for integrated municipal solid waste: A frame work for action:* Cairo

<sup>60</sup> Huysman, M., El-Sherif, D., El-Hefnawi,A., Bribante&O.( 2002). *Public-private partnership in Egypt, In Privatization of solid waste management in Egypt: lessons learnt from national and international experiences.* HIS: Rotterdam

possible use as a soil conditioner for desert reclamation schemes. Increasing the number of the composting plants is one of the priorities of the National strategy for MSW management.

The high organic content of waste streams had led to centralized composting in some Egyptian governorates. In a 2003 report from Abt Association<sup>61</sup>, it is estimated that the numbers of composting facilities in Egypt, are about 50 facilities. However, most of these facilities have often been sustainable because of one or more of poor technology selection, inadequate capability to manage/operate/maintain equipment, inadequate cost recovery. Further, shortage in spare parts and high electricity consumption, have also identified as common problems in all the facilities

Most of the composting plants are accompanied by sorting of the recoverable materials (plastics, glass, metals) since most of the collected municipal waste is mixed.<sup>62</sup> Poor compost marketing experiences is still one of the major problems of these facilities, in addition to lack of skilled staff. However, there should be some supportive measures to encourage the market of the compost.<sup>63</sup>

Most of the recycling processes of the recyclables fractions of the MSW are carrying out by the Zaballeen system in Egyptian big cities. It is estimated that over 30% of the MSW is recycled by the Zaballeen (about 3000 ton/day).<sup>64</sup>

Table 3 shows the existing market for the recyclable fractions of MSW in Egypt. Although, there is potential market for the recyclables in Egypt, there is no concrete national strategy to encourage the recycling industry. However, a supportive set of measures should be developed by the national government to encourage the recycling industry.<sup>65</sup>

Table 5 typical recyclables market prices in Egypt

Commodity	Unit Value (El /ton)
Paper& Cardboard	220
Metal	350
Textile& Bags	50
Glass	60-160 <sup>66</sup>
Plastics	1600

Source: Adapted from MSEA (2000)

\* This table has been adapted, according to the current market prices of recyclables in Egypt

<sup>61</sup> Abt Association.(2003). *Evaluation of composting facilities in Egypt*. [Online]. Available: [http://www.dec.org/search/dexs/index.cfm?fuseaction=docsresults.dexs&Rec\\_no=126816&httpReferer=http://www.dec.org/world\\_env.cfm/](http://www.dec.org/search/dexs/index.cfm?fuseaction=docsresults.dexs&Rec_no=126816&httpReferer=http://www.dec.org/world_env.cfm/)[2004, September4]

<sup>62</sup> Hickman, D., (2000). *METAP regional solid waste management project: Current situation report*. METAP. [Online]. Available: <http://lnweb18.worldbank.org/mna/mena.nsf/Attachments/Waste+Mgmt+Study+for+METAP/SFile/Waste+Management.pdf/>[2004, June 16]

<sup>63</sup> Genena, T.(2002). *Privatization experiences in Egypt:: Ongoing practices and some lesson to be learnt* .In *Privatization of solid waste management in Egypt: lessons learnt from national and international experiences*. HIS: Rotterdam

<sup>64</sup> MSEA (2000). *The national strategy for integrated municipal solid waste: A frame work for action*.Cairo

<sup>65</sup> Huysman, M., El-Sherif, D., El-Hefnawi,A., Bribante&O.( 2002). Public-private partnership in Egypt, *In Privatization of solid waste management in Egypt: lessons learnt from national and international experiences*. HIS: Rotterdam

<sup>66</sup> This price is according to the type of the glass (colored, clear etc.)

In Egypt, the municipal solid waste is undertaken very largely through open dumpsites. Open dumping of the MSW is the predominant SW disposal method in most Egyptian cities. In general, there are no modern landfills in Egypt. However, GTZ<sup>67</sup> has implemented a small sanitary landfill for municipal solid waste in Aswan Governorate<sup>68</sup>. This sanitary landfill could be a benchmark to implement more landfills in Egypt. However, one of the main objectives of the national strategy for SWM is to increase the number of landfills. The existing dumpsite could be categorized as an uncontrolled landfill. These are not considered sanitary landfills where they do not fulfil the requirements of a sanitary landfill. However, there is no necessity to develop sanitary landfills all over Egypt; some of the existing dumpsites may be upgraded to controlled landfills.<sup>69</sup> However, a project called “Action Plan for Site Location and Development for the Design, Operation and Environmental Impact Assessment of Solid Waste Sanitary Landfills in Egypt Governorates”, is a project through the LIFE-Third Countries Program (Local Initiative Fund for Environment)<sup>70</sup>, which is sponsored by the European Community. This project has selected and proposed the most suitable sites for landfills in Egypt. This was mainly by Geographic Information Systems (GIS) technology.

At present, there are no landfill regulations or standards that provide a basis for compliance and monitoring, but national guidelines for these standards are being prepared by the Egyptian Environmental Affairs Agency (EEAA).<sup>71</sup>

## 3.5 Overview of C&D waste management in Egypt

### 3.5.1 Background

Construction and Demolition waste management is orphan in Egypt.<sup>72</sup> In Egypt, the construction and demolition waste is material that is produced in the process of construction, renovation or demolitions of structures.<sup>73</sup> The components of C&D debris include concrete, asphalt, wood, metals, gypsum, wallboard, and roofing.

C&D currently is one of the larger waste streams in Egypt without an effective management system.<sup>74</sup> The Egyptian environmental Affairs Agency estimated that the quantity of the C&D waste ([www.eeaa.gov.eg](http://www.eeaa.gov.eg)) represents 7% of the generated solid waste which is either disposed of in non-properly operated dumpsites or illegally dumped in vacant lands and along the roadsides.<sup>75</sup>

The construction and demolition waste has been addressed clearly in Article 41 of the Executive Regulation (Decree 338/ 1995) of the Law on Environment (4/1994). This article describes the responsibilities of the authorities granting the license for building or demolishing to indicate specific requirements in the license. Under Law 4/1994, local governments are granted authority to regulate the collection and disposal of C&D. Laws 106/1976 and 101/1996 allow local governments to include the

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<sup>67</sup> The Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH. [Online]. Available: <http://www.gtz.de/GTZ/> [2004, May 24]

<sup>68</sup> Aswan is an Egyptian governorate, located at the southern part of Egypt on the border with Sudan

<sup>69</sup> Genena, T.(2002). *Privatization experiences in Egypt:: Ongoing practices and some lessons to be learnt*. In *Privatization of solid waste management in Egypt: lessons learnt from national and international experiences*. HIS: Rotterdam

<sup>70</sup> LIAFE-Third. (2004). [Online]. Available: <http://europa.eu.int/comm/environment/life/home.htm/> [2004, May10]

<sup>71</sup> El Kaial. A., (2004, July14). Personal Interview

<sup>72</sup> Youseif. M.( 2004, July 29). Personal Interview

<sup>73</sup> EcoConServ. (2003). *Construction and Demolition waste management: Framework for action*. Egyptian Environmental Affairs Agency

<sup>74</sup> Egyptian Environmental Policy Program (EEPP).(2003). *Solid waste management privatization manual, chapter9*. Cairo

<sup>75</sup> Ministry of State for Environmental Affairs Agency (MSEA). (2001). *Annual report2000-2001*. Cairo

management of C&D through the permits required for construction activities. This law also allows local governments to collect a fee from contractors and owners to, among other things, provide or pay for C&D collection and/or disposal. Enforcement of these laws and regulations is primarily a local government responsibility. However, local governments are required to authorize disposal sites, to require clean-up of illegally disposed C&D, and to enforce C&D collection and storage requirements. Local governments are also responsible for the permitting and regulation of C&D activities within their jurisdictions.

### **3.5.2 C&D waste Composition and management in Egypt**

There is no accurate study on the composition of the C& D waste in Egypt.<sup>76</sup> However, according to the Egyptian Environmental Policy Program (EEPP), in most areas in Egypt C&D is composed of primarily non-organic materials such as dirt, rock, sand, masonry, concrete, metal, wood, and roofing materials..

In Egypt, obtaining accurate data regarding the quantity of C&D can be a difficult task.<sup>77</sup> Under the existing C&D management system, much of the waste material is left in piles at the project site. If the materials are removed it is usually to an empty lot or a roadside. Because this practice is in violation of existing laws and regulations, the parties involved may not be forthcoming with accurate information regarding collection and disposal practices. With the increase of the urbanization in Egypt, the generated quantity of Construction and Demolition waste is growing up. In Egypt, most of C&D waste goes for illegal dumpsites or left on the roadsides.<sup>78</sup>

## **3.6 Summary**

This chapter aims to give overview of the solid waste management (Municipal Solid Waste and C&D waste) in Egypt. It aims to define the barriers and obstacles which face implementation an integrated solid waste management system. This chapter clarifies that the problem of SWM in Egypt, is a mix of institutional and organizational constraints, in addition to technical problems. Figure 5 summarizes the problems of SWM in Egypt.

For C&D waste, it seems clear that the Egyptian government does not have a clear policy or strategy to deal with the C&D waste. There is no accurate estimation of the amount or the composition of the generated C&D waste. However, the most common C&D waste practices of in Egypt are to litter and dispose it of on the roadsides or highways or unoccupied lands.

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<sup>76</sup> Red Sea Sustainable Tourism Initiative (RSSIT). (2004). *Best practices for solid waste management*. Cairo

<sup>77</sup> Egyptian Environmental Policy Program(EEPP). (2003). *Solid waste management privatization manual, chapter9*. Cairo

<sup>78</sup> EcoConServ. (2003). *Construction and Demolition waste management: Framework for action*. Egyptian Environmental Affairs Agency

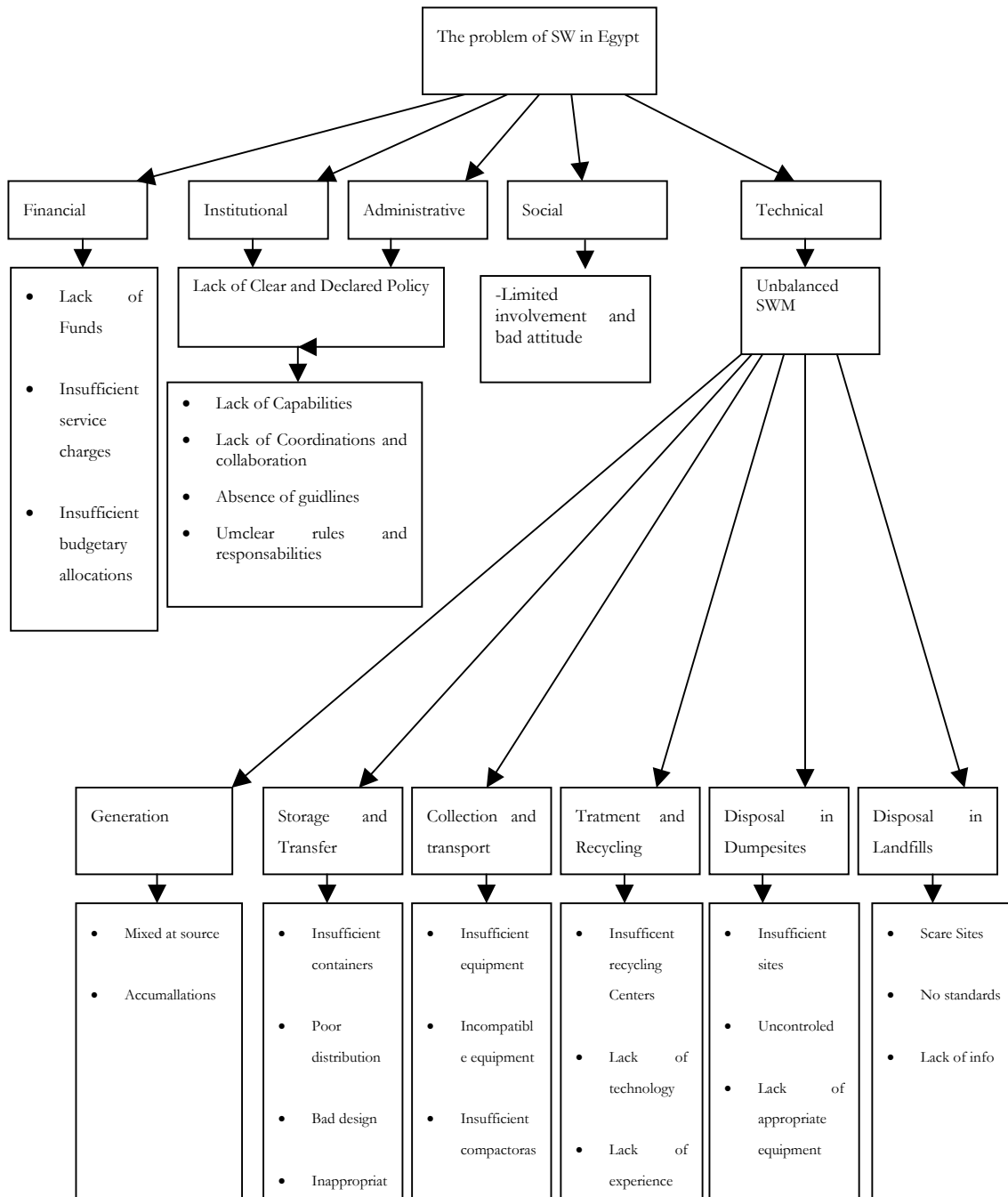


Figure 5 Problems of SW in Egypt

Source: Adapted from MSEA (2000)

## 4 Relevant Nordic experiences of ISWM

Waste is a major issue in every European country and waste quantities are generally growing. The waste prevention and recycling and raise the safety standards for final disposal are considered to be the most effective options for minimizing the environmental risks and costs associated with waste generation, treatment and disposal.<sup>79</sup>

In Europe, municipal solid waste is generating in large amount, and continues to grow. More than 306 million tons of municipal waste is generated in Europe every year. This equals 3.8 tons per capita per year.<sup>80</sup>

The construction and demolition waste is a growing problem everywhere in Europe. According to the European Environment Agency (2003), waste generated from construction and demolition, accounts for about 32% of all the solid waste generated in Europe. It is estimated that the total amount of the generated C&D waste is 180 million tons each year.<sup>81</sup>

The Nordic countries as many of the European countries have adopted integrated solid waste management. The Nordic countries are focusing on reduction of waste volumes through increased recycling and improved resource efficiency.<sup>82</sup> The next section will focus on exploring the potential experiences of integrated solid waste management system from some Nordic countries. We will focus on the municipal solid waste management system and C&D waste in Denmark and Sweden.

### 4.1 Overview of MSW in some Nordic Countries (Sweden, Denmark)

#### 4.1.1 Description of ISWM in Sweden

In Sweden, in 2002 the total quantity of municipal solid waste was approximately 4 172 200 tons. This means 476 kg per inhabitant per year.

According to the Swedish Environmental Protection Agency, 1999, In Sweden, each municipality is obliged to have a waste management plan which must contain information on waste quantities, the use of waste treatment methods, and the measures planned by the municipality to reduce the quantity and environmental impacts of waste. This plan forms the basis of the long-range work of developing an sustainable environmentally sound waste management. However, the municipalities have the freedom in designing their own plans, according to their local conditions. These plans are compiled to regional waste management plans by county authorities. Moreover, the municipalities, through their environment health protection committee, issue authorizations for smaller installations and carry out necessary enforcement.<sup>83</sup>

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<sup>79</sup> European Environment Agency.(2003). Europe's environment: the third assessment chapter7.[Online].Available: [http://reports.eea.eu.int/environmental\\_assessment\\_report\\_2003\\_10/en/](http://reports.eea.eu.int/environmental_assessment_report_2003_10/en/) [2004, May25]

<sup>80</sup> European Environment Agency.(2003). Europe's environment: the third assessment chapter7.[Online].Available: [http://reports.eea.eu.int/environmental\\_assessment\\_report\\_2003\\_10/en/](http://reports.eea.eu.int/environmental_assessment_report_2003_10/en/) [2004, May25]

<sup>81</sup> Symonds(1999). *Construction and demolition waste management practices, and their economic impacts: Report to DGXI, European Commission*. European Environmental Agency. [Online]. Available <http://europa.eu.int/comm/environment/waste/studies/> [2004, June26]

<sup>82</sup>Nordic Council of Ministers (2004). *Nordic environmental action plan2001-2004*. [Online].Available: <http://www.norden.org/start/start.asp?lang=6> [2004, June16]

<sup>83</sup> Audelius, B. (2004, June14). Personal Interview

In Sweden, municipalities are responsible for ensuring that municipal waste is transported to processing and that is recycled or disposed of.<sup>84</sup> Practically, the municipalities make use private contractors to collect the municipal solid waste. About 2/3 of the Swedish municipalities make use private contractors to collect the municipal solid waste.<sup>85</sup>

However, the obligation does not apply to waste that subjected to Extended Producer Responsibility (EPR).<sup>86</sup> EPR is a strategy aims to achieve a decreased total impact from the entire life cycle of the product.<sup>87</sup> In practice, EPR means that the producers are obliged to collect and take back their product at its end-of life. The aim of EPR is to reduce the amount the environmentally harmful products and enhance reuse and recycling options.

Bins are still the most common way to collect municipal solid waste in Sweden.<sup>88</sup> In most of the municipalities, each home has two bins one for refuse items and another for non-organic items.<sup>89</sup>

Some municipalities have introduced an optical sorting of different coloured bags and others have chosen a special containers for the biowaste.<sup>90</sup>

The recycle stations (near to the buildings) are very common system in Sweden. In these stations there are containers for paper and for packages of glass, plastic, metal and paper. Waste is collected every two weeks from the single family building and every week from the multi-families building.<sup>91</sup> The household in a single family home pays on average just under SEK1300 per year for collection every two weeks.<sup>92</sup> In Sweden, It is estimated that, the cost of collection and treatment of the municipal solid waste is about 500 SEK per person.<sup>93</sup>

The cost recovery is achieved in municipal solid waste management where the cost of waste management in municipalities is bore waste producers (e.g. householders).<sup>94</sup> The polluter pays principle (PPP) is generally adopted in Sweden. The main revenue for the municipal solid waste management comes from the collected fees from the households. In Sweden, there is no subsidizing for the waste management system. On the other hand, most of the public services in the field of municipal solid waste management are introduced on non-profit base.<sup>95</sup>

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<sup>84</sup> Swedish Environmental Protection Agency (SEPA).(1999). *Waste management: The Swedish experience*: Stockholm

<sup>85</sup> Hartlen,J.(1996). Waste management in Sweden. *Waste management*, 16, 5/6.385-388

<sup>86</sup> In Sweden, Producer responsibility is mandatory by law for packaging, waste paper, end- of-life vehicles tyres and electrical and electronic products as well.

<sup>87</sup> Lindqvist, T.(2000). *Extended producer responsibility in cleaner producer*. IIIEE Dissertations. Lund: IIIEE, Lund University

<sup>88</sup> The Swedish Association of Waste Management.(2004). *Swedish waste management 2003*. [Online]. Available: [http://www.rvf.se/m4n/\[2004, June10\]](http://www.rvf.se/m4n/[2004, June10])

<sup>89</sup> Gothe, Anna (2004, June19). Personal Interview

<sup>90</sup> The Swedish Association of Waste Management.(2004). *Swedish waste management 2003*. [Online]. Available: [http://www.rvf.se/m4n/\[2004, June10\]](http://www.rvf.se/m4n/[2004, June10])

<sup>91</sup> Ibid

<sup>92</sup> Gronholm, Raul( 2004, June9). Personal Interview

<sup>93</sup> SEK 1 equals 0.14 US Dollars

<sup>94</sup> Swedish Environmental Protection Agency (SEPA). (1999). *Waste management: The Swedish experience*: Stockholm

<sup>95</sup> Gronholm, Raul( 2004, June9). Personal Interview



The municipal solid waste in Sweden is currently around 10% composted, 20% landfilled, 30% recycled and recovered, and 40% incinerated with energy recovery.<sup>96</sup> In Sweden the main aim is to increase the recycling of solid waste and reduce the amount of waste going to landfill.

In 2002, all types of waste sent to material recycling have increased. Incineration with energy recovery is still the most common method to treat the municipal solid waste in Sweden.<sup>97</sup>

According to the EU Directive 1999/31/EC, member states were asked to set up a national strategy for the reduction of biodegradable waste going to landfill. The strategy shall ensure that in five year after 2001 the biodegradable municipal waste going to landfills must be reduced to 75% of the total biodegradable waste produced in 1995 (by weight).<sup>98</sup>

In eight years (2009) the amount should be reduce to 50% and in fifteen years (2016) to 35 %.( EEA.2003). On 1 January 2003, the tax on landfilled waste was raised to 370 SEK (almost 40 €) per ton.(RVF,2003). The tax is a state tax that means that all the revenues go to the state budget. It has risen by almost 50% since it was introduced in 2000.

In 2005, another ban will affect the possibility to use landfill as a disposal operation where the biodegradable municipal Solid waste, will not be allowed to landfills. The biological treatment is widely encouraged in Sweden and could be done either by anaerobic digestion or composting.

According to the Swedish Waste Association (2002), in 2002 about 10 % of the municipal solid waste underwent biological treatment and, it is expected to be doubled in few years. The source separation of the biowaste is a crucial factor to ensure high quality of the end-products of the biological treatment.

The separate collection of municipal solid waste in Sweden is quite successful. Increased information drivers have contributed to changing people's behaviour and motivating them to separate waste for recycling.<sup>99</sup> Moreover, it comes from the convenience for people. The convenience means that people can easily do source separation with little cost in terms of time and effort.<sup>100</sup> However, many municipalities have introduced differentiated waste collection fees in order to provide incentives to sort waste more efficiently and minimise the amount of waste.<sup>101</sup>The municipalities and waste disposal firms educate and inform the households in matters, such as source separation and home composting.<sup>102</sup> This enhances public participation in the process of municipal solid waste management.

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<sup>96</sup>The Swedish Association of Waste Management.(2004). *Swedish waste management 2003*. [Online]. Available: [http://www.rvf.se/m4n/\[2004, June10\]](http://www.rvf.se/m4n/[2004, June10])

<sup>97</sup> In Sweden, Incineration with energy recovery is considered as a recycling process

<sup>98</sup> Antadze, N., Cristofaro, D., Hicks, Lloyd., & Abo Sena, A. (2004). *Waste management in the county of Iasi. Final report*. Lund: The International Institute for Industrial Environmental Economics

<sup>99</sup> The Swedish Association of Waste Management.(2004). *Swedish waste management 2003*. [Online]. Available: [http://www.rvf.se/m4n/\[2004, June10\]](http://www.rvf.se/m4n/[2004, June10])

<sup>100</sup> Fenech, M. (2002). *Understanding public participation in source separation of waste. Implications for the implementation of waste management policies with particular focus on Malta and Sweden*. Lund: International Institute for Industrial Environmental Economics

<sup>101</sup> The Swedish Association of Waste Management.(2004). *Swedish waste management 2003*. [Online]. Available: [http://www.rvf.se/m4n/\[2004, June10\]](http://www.rvf.se/m4n/[2004, June10])

<sup>102</sup> The Swedish Association of Waste Management. (2000). *Swedish waste management 2000*. Malmö

#### 4.1.2 Relevant Lessons from South Scania Region (Lund, Malmo)

South Scania is a region in the southern part of Sweden. The population in the south Scania region is about a half million inhabitants. Sysav<sup>103</sup> is a non-profit solid waste company owned by fourteen local authorities in the southernmost part of Sweden. Sysav's area of responsibility is the treatment and recycling of domestic and industrial waste within the south Scania part of Sweden.

Annually Sysav take care about 500 000 tons of solid waste. Sysav has established a system's view, called the "Ecocycle," for the flow of materials and energy in their operations and processes (see Figure 6). The Ecocycle is the cornerstone of Sysav,s work.<sup>104</sup> This Ecocycle demonstrates the hierarchy of waste treatment within Sysav. The plan of action as seen in the figure is:

1. Treatment or transport of hazardous waste
2. Waste is sorted and reused as much as possible (e.g. reuse of building construction materials).
3. Waste that cannot be reused is recycled back into raw materials.
4. Waste that cannot be recycled is used for energy recovery in the incinerator.
5. Non-combustible materials are restored to natural resources by biological treatment methods (e.g. composting) and energy is recovered (i.e. biogas from landfill).
6. Waste that cannot be used for the first five options is deposited in the landfill.<sup>105</sup>

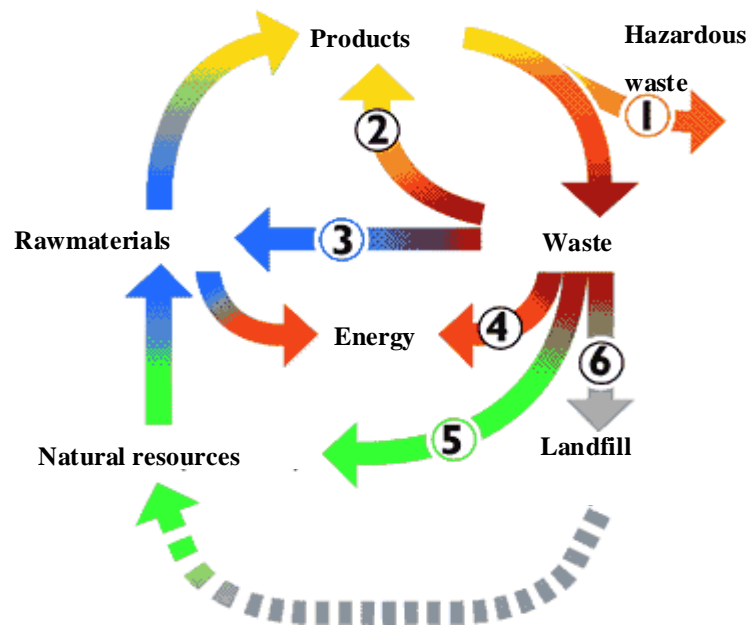


Figure 6 Sysav's Ecocycle

Source: Sysav (2004)

In the south Scaina region, the collection of municipal solid waste is the responsibility of the municipalities which in most of cases, they might make use the private companies to collect the

<sup>103</sup> Sysav stands of a South Scania Waste Company

<sup>104</sup> Sysav (2004). [Online].Available: <http://www.sysav.com/english/>[2004, June 20]

<sup>105</sup> Agnvall, D., Abo Sena, A., Besch K., Liu, K., Malti&M.(2004). *Strategic environmental management at Sysav: Final report*. Lund: The International Institute for Industrial Environmental Economics

municipal. There are no special services to the small cities. The big and small cities have the same level services.<sup>106</sup> Lund and Malmö are two main municipalities in the south region. In Lund, the population is about 100 000 thousands inhabitants. The households are given 190L bins, one for refuse<sup>107</sup> and another spilt container for glass and paper.<sup>108</sup>The municipality of Lund has planned to distribute a third bin for the biowaste<sup>109</sup>. Currently, it is optional to any household to ask for this third bin for the biowaste. The municipality aims to enhance the source separation for the biodegradable waste coming from households. This source separated biodegradable waste, leads to produce a good quality of end-products by biological treatment. The dissemination of information and awareness to the householders about the benefit from separation their organic waste, are crucial factors to increase the rate of separation.<sup>110</sup>

Further, Lund has a central recycling centre. The recycling centre is a large manned plant for receiving bulky waste, garden waste etc., and the people separate themselves their waste.<sup>111</sup> Lund has one of the SYSAV, s nine recycling centres<sup>112</sup>.

The recycling stations are widely distributed in Lund. The recycling station is a small unmanned place where packages and newspapers can be taken.<sup>113</sup> These stations are near to the buildings (high-rise households) or within the walking distance of the households. It is estimated that one recycle station for every 500 households. The recycling station needs only space to put the containers.<sup>114</sup>

All the household waste is transported to a transfer station. Lund has one transfer station. In the transfer station a process of emptying and sorting of the recyclables materials (which come from the recycling stations) takes places. The recyclables are sold directly to recycling companies.<sup>115</sup>The markets is a very crucial to sustain the process of collection and add revenues to the municipality to improve the service.

The wastes from households are then sent to the Malmö landfill and incineration plant. In the landfill, a pre-sorting process for the mixed waste, takes places. The combustible materials send to the incineration plant. The recyclables materials are handled by a small subcontractor. The garden and park wastes are placed in composting cell (Biocell). Some horse manure is added to activate the microorganisms that decompose the waste. It takes 3 years to produce good quality compost. Sysav practices the anaerobic digestion for the biowaste to produce biogas and digestate. For the past few years, it has been possible for plants producing compost or digestate from source separated biowaste to put on quality label on their products. In Sweden, the Association of Waste Management has developed a strict certification system for certification the end-products from the biological treatments. This certification system involves strict requirements of the entire handling chain from source separation to use.<sup>116</sup> These certification procedures ensure a good marketing for the end-products from the biological treatment. Moreover, it ensures environmentally sound impacts of these end-products.

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<sup>106</sup> Audelius, B. (2004, June14). Personal Interview

<sup>107</sup> According to RVF,2000 Refuse means consumer waste which can be placed in ordinary container

<sup>108</sup> Gothe, Anna (2004, June19). Personal Interview

<sup>109</sup> Ibid.

<sup>110</sup> Audelius, B. (2004, June14). Personal Interview

<sup>111</sup> The Swedish Association of Waste Management. (2000). *Swedish waste management 2000. Malmö*

<sup>112</sup> Recycling centers are centers where householders can deposit in all kinds of bulky waste such as cartons and cardboard, wood and

<sup>113</sup> The Swedish Association of Waste Management. (2000). *Swedish waste management 2000. Malmö*

<sup>114</sup> Kristensen, J. (2004, June19). Personal Interview

<sup>115</sup> Gothe, A. (2004, June19). Personal Interview

<sup>116</sup> The Swedish Association of Waste Management.(2004). *Swedish waste management 2003*. [Online]. Available: <http://www.rvf.se/m4n/> [2004, June10]

The compost and the digestate are used as soil improvers in garden, parks and landscaping. The rest of the households waste which are not suitable for recycling, incineration or composting, go to landfilling. The incineration plant has a very strict flue gas cleaning system. This is to ensure that the emitted flue gas is fulfilling the emission level values. However, the flue gas cleaning is highly cost system.<sup>117</sup> The landfill is a well designed sanitary landfill. It has fulfilled the required standards to prevent the negative impacts on the surrounding environment.

#### 4.1.3 Description of ISWM system in Denmark

The Danish Model for waste management is an integral system of waste prevention, collection and treatment.<sup>118</sup> In Denmark, household waste covers four waste types: domestic waste, bulky waste, garden waste and household hazardous waste.<sup>119</sup> In 2002, Denmark generated about 3 120 564 tons. This corresponds to about fifth of the total waste generation.

These waste types can be further divided into waste fractions such as paper and cardboard, bottles and glass, and food waste/other organic waste. <sup>120</sup>Municipalities are in charge of the practical administration of waste management. Moreover, all municipalities are obliging to survey waste amounts and draw up their waste management plans.

In Denmark, the municipalities are obliged by law to collect and treat the household waste. Further, the householders are obliged by law to source separate their waste.<sup>121</sup> Local authorities are in charge of establishing schemes for the collection and treatment of waste from households. Practically, most local authorities have chosen to contract out the collection of waste from households to private waste carriers.<sup>122</sup>

The collection scheme can be "collect" or "bring" schemes. In a collect scheme waste, is collected close to the household, typically with permanent collection bins and regular collection. A bring scheme is where householders bring their waste to drop-off containers located at central places in the municipality or to the municipal recycling centre.

Local authorities on an annual basis must determine a waste collection fee to be paid by all households. The fee must reflect all costs borne by local authorities relating to collection and treatment of waste from households (full accounting of waste management cost). However, the local authority must operate the system on a non-profit, "non-loss" basis (non-profit cost-coverage principle).<sup>123</sup>

In Denmark, the waste collection fee can have the form of either a fixed annual amount or a differentiated fee (e.g. "pay-as-you-throw"). In the latter case the householder pays according to container size, frequency of emptying or weight of waste. <sup>124</sup> The differentiated fee schemes have seen by many as a driver to promote waste prevention and recycling of municipal solid waste. However,

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<sup>117</sup> Gronholm, Raul( 2004, June9). Personal Interview

<sup>118</sup> The Danish Environmental Protection Agency (DEPA). (1999) *The Danish waste management plan 1998-2004*. [Online]. Available. [http://www.mst.dk/homepage/\[2004, Jun28\]](http://www.mst.dk/homepage/[2004, Jun28])

<sup>119</sup> The Danish Environmental Protection Agency (DEPA). (2004). [Online]: Available . [http://www.mst.dk/homepage/\[2004, June28\]](http://www.mst.dk/homepage/[2004, June28])

<sup>120</sup> Waste Centre Denmark (WCD). (2004). [Online]: Available. [http://www.wasteinfo.dk/\[2004, June28\]](http://www.wasteinfo.dk/[2004, June28])

<sup>121</sup> The Danish Environmental Protection Agency (DEPA). (2004). [Online]: Available [http://www.mst.dk/homepage/\[2004, June28\]](http://www.mst.dk/homepage/[2004, June28])

<sup>122</sup> Waste Centre Denmark (WCD). (2004). [Online]: Available. [http://www.wasteinfo.dk/\[2004, June28\]](http://www.wasteinfo.dk/[2004, June28])

<sup>123</sup> Ibid

<sup>124</sup> The Danish Environmental Protection Agency (DEPA). (2004). [Online]: Available. [http://www.mst.dk/homepage/\[2004, June28\]](http://www.mst.dk/homepage/[2004, June28])

there are certain environmental risks connected with such schemes, as some citizens dispose of their waste illegally, for example through burning or fly tipping.<sup>125</sup>

In Denmark, the annual municipal waste management fee is varied from one municipality to another. According to the Waste Centre Denmark, this is because, there may be differences in the range of services offered in the different municipalities. It is varied for single-family houses from around SEK 1 235 to SEK 3 600 per year.

However, there is no specific waste management service for the small cities in Denmark, but municipalities are obliged to prepare their own waste management plan. Further, the waste management services, cover the big and small cities and as well. In practice, the system of collection and transport of waste are the same everywhere.<sup>126</sup>

The principle of source separation is a key element of the Danish waste management model.<sup>127</sup> Source separation means that the waste generator (the householder) separates waste in different fractions with the purpose of separate collection of each fraction. The individual fractions are then either recycled or incinerated/composted.<sup>128</sup> Source separation can include separation of domestic waste in organic waste and residual waste and/or separate collection of paper/cardboard or glass.

In Denmark, the waste hierarchy is the basis for the prioritization of waste management options. According to this hierarchy, recycling ranks higher than incineration with energy recovery and landfilling ranks lowest. Recycling<sup>129</sup> is the highest ranking waste treatment form – it ensures better exploitation of resources in waste

In 1997 the Danish government introduced a ban on landfills of waste suitable for incineration. This led to shifting from landfilling to incineration. However, the landfill tax is amounted SEK 400 per ton. Incineration is better landfill but a long term perspective to recycle even more. (DEPA, 2004)

According to the Danish Environmental Protection Agency, in 2002, 59% of the households waste has sent for incineration, 31% for recycling, 7% for landfill and 3% for others. It is clear that the incineration still the most popular option for treatment of household waste in Denmark

The treatment of waste collected from households depends upon the different fractions of waste collected. Waste for recycling is treated at private or public plants, and waste for incineration is incinerated at plants owned and operated by the local council, private or inter-municipal waste management companies. Some incineration plants are owned by power generating companies

#### **4.1.4 Relevant lessons from Copenhagen city**

In 1998 a study by the University of Louvain-la-Neuve Business School<sup>130</sup> has done a study on the integrated waste management in Copenhagen city. It was found that Copenhagen city operates a truly integrated solid waste management system and all waste streams are collected separately and treated by using the appropriate technology.

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<sup>125</sup> Waste Centre Denmark (WCD). (2004). [Online]: Available. <http://www.wasteinfo.dk/>[2004, June28]

<sup>126</sup> Berntsen, K. (2004, June28). Personal Interview

<sup>127</sup> The Danish Environmental Protection Agency (DEPA). (1999). *The Danish waste management plan 1998-2004*. [Online]. Available. <http://www.mst.dk/homepage/>[2004, Jun28]

<sup>128</sup> Waste Centre Denmark (2004). [Online]. Available. <http://www.wasteinfo.dk/default.asp?side=743> / [2004, June30]

<sup>129</sup> In Denmark, incineration does not count as recycling.

<sup>130</sup> The University of Louvain-la-Neuve Business School. (1998). *Towards integrated management of municipal solid waste*. Report summery. Centre-Enterprise-Environment. [Online]. Available : <http://www.assurre.org/downloads/archive/7786c7e2-7bca-4bd2-abce-47e4f5fdb4f0.pdf>. [2004, June16]

In Copenhagen the municipal solid waste management is managed by a company called Copenhagen Landlords Cleansing and it is commonly known as R98. R98 is a solid waste management company owned by a private sector and the municipality of Copenhagen.<sup>131</sup> The municipality has representatives in the board of the company. The households are obliged by law to source separate their waste. The legislation and awareness to people play important role which makes the source separation of municipal solid waste is successful in Copenhagen.<sup>132</sup> R98 collects the organic and residuals waste from the households. Copenhagen has four recycling stations. In these stations, the public can deliver a range of waste materials. These stations accept plastic, paper, cardboard, wood, metal, construction and demolition waste (small volumes) and household hazardous waste.<sup>133</sup> However, there are neighbourhood kerbside collection containers which public can dispose of the recyclables in different containers. These containers also include containers for hazardous household waste. There are no transfer stations in Copenhagen<sup>134</sup>. All household waste (residuals) that is not recycles, send to incineration. Copenhagen has a two incineration plants with energy recovery. The incinerators cover the Copenhagen city with district heating schemes. There is continual improvement of the incinerators gas cleaning system to fulfil the emissions level standards. However, incineration technology is still a high and very expensive technology.

R 98 collects the recyclables from the different kerbside containers which are distributed through the city. Copenhagen has a large recycling centre, this recycling has a potential to treat 1 millions tones per year. The recycling centre accepts the collected park and garden waste where it has a central composting plant. The garden and park waste go to composting to produce good quality compost. All the collected food waste is processed into food pulp and send to large pig farm in a region calls Zealand.<sup>135</sup> The landfill is the last resort for the non-recyclable and non-combustible municipal solid waste. In 2003, Copenhagen city has consigned 7% of its municipal waste to landfill.<sup>136</sup> However, this sanitary landfill takes a part of the recycling centre.

#### 4.1.5 Summary

In the Swedish and Danish solid waste management systems, the ISWM concept is strongly adopted. In Sweden and Denmark, there is no specific SWM for small cities. All small and big cities almost have the same standard of services (e.g. collection, transportation). The responsibilities and roles of municipal solid waste (MSW) management are well defined in the both systems. In both countries, the waste management policy and planning are performed by the Ministry of the Environment and its technical arm (Environmental Protection Agency) on a state level. However, the municipalities are obliged to prepare their waste management plans. These plans should be integrated with waste management strategy on the county level. The municipalities have the right to draw up their plans according to their conditions. These plans describe the quantities, compositions and handling of MSW. The enforcement of the legislation is one of responsibilities of municipalities. People are an important stakeholder and are for a large extent well informed and involved in the process.

In both countries, MSW service is introduced on a non-profit basis. However, waste management fees are based on a full cost accounting of waste management where, Polluter Pays Principal (PPP) is generally adopted in the two countries. Therefore waste management service providers are able to

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<sup>131</sup> Ebjer, L. (2004, July8). Telephone Conference

<sup>132</sup> Ibid.

<sup>133</sup> The University of Louvain-la-Neuve Business School. (1998). *Towards integrated management of municipal solid waste*. Report summary. Centre-Enterprise-Environment. [Online]. Available <http://www.assurre.org/downloads/archive/7786c7e2-7bca-4bd2-abce-47e4f5fdb4f0.pdf>. [2004, June16]

<sup>134</sup> Berntsen, K. (2004, June28). Personal Interview

<sup>135</sup> The University of Louvain-la-Neuve Business School. (1998). *Towards integrated management of municipal solid waste*. Report summary. Centre-Enterprise-Environment. [Online]. Available : <http://www.assurre.org/downloads/archive/7786c7e2-7bca-4bd2-abce-47e4f5fdb4f0.pdf>. [2004, June16]

<sup>136</sup> Ebjer.L.(2004,July8).Telephone Conference

recover cost. Further, the private sector is well involved in the process of MSW, especially in collection and transportation. Both of countries have well developed collection schemes for MSW

Source separation is a key element in the process of MSW management in Sweden and Denmark. In the Swedish model, enhancement of source separation comes mainly from the dissemination of information about benefits of source separation. In addition, it is made convenient for people to practice source separation. People can easily do source separation with little cost in terms of time and effort (e.g. providing the required bins for separation). In Denmark, source separation of MSW comes from legislation as well as the dissemination of information and awareness of the people.

In both models, they concentrate more on a combination of different municipal solid waste management practices, taking into account all the requirements and measures, to ensure environmentally sound and sustainable MSW system. Moreover, the various methods of MSW overlap and are mutually dependent on each other in the both countries. However, relying on a very expensive technology (e.g. incineration) is one of the main features of these two models. This technology is hard to afford by most of the developing countries. The main drivers for ISWM in Lund and Copenhagen come mainly from strong regulation (EU or national legislation) and the high public expectation for environmental standards, and the adoption of PPP

## **4.2 Overview of C& D waste management in some Nordic Countries**

### **4.2.1 Background**

Construction and Demolition (C&D) waste give rise to considerable environmental impacts by the extraction of raw material, the use of energy in production process and the huge production of waste.<sup>137</sup> In Europe, C&D waste is a growing problem everywhere. Waste generated from construction and demolition activities, including the renovation of old buildings, accounts for about 32% of all the waste generated in Europe.<sup>138</sup> In the EU countries as a whole, it is estimated that the total amount of the generated C&D waste, is 180 million tons each year, only 28% of this waste is reused or recycled and the rest goes to the landfills.<sup>139</sup> Recycling of C&D waste has seen by many as the most appropriate environmentally option to reduce the amount of construction waste going to landfills. According to the European Environmental Agency (2003), many components of construction waste and demolition waste could be recycled and they have potential to replace up 10% of virgin raw materials. However, the recycling is a good solution to handle the construction and demolition waste but, it is important to create a market to the recycled materials to sustain the process of recycling of C&D waste. There are different driver forces to enhance the recycling of C&D waste. These drivers could be legislative, economic and awareness.<sup>140</sup>

The Nordic council of Ministers (NCM) was established in 1971. One of its priorities to enhance the cooperation in the environmental field issues between the members.<sup>141</sup>The Nordic council of ministers

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<sup>137</sup> Thormark, C. (2002). *Handling and Recycling Building- and Construction Waste*. Nordic Workshop 6-7 November in Stockholm. Report TemaNord 2002:553. Copenhagen. Nordic Council of Ministers

<sup>138</sup> European Environment Agency. (2003). *Europe's environment: the third assessment chapter7*. [Online]. Available: [http://reports.eea.eu.int/environmental\\_assessment\\_report\\_2003\\_10/en/](http://reports.eea.eu.int/environmental_assessment_report_2003_10/en/) [2004, May25]

<sup>139</sup> Symonds(1999). *Construction and demolition waste management practices, and their economic impacts: Report to DGXI, European Commission*. European Environmental Agency. [Online]. Available <http://europa.eu.int/comm/environment/waste/studies/> [2004, June26]

<sup>140</sup> Thormark, c. (2004, June29). Telephone Conference

<sup>141</sup> The Nordic Council of Ministers. (2004). [Online]. Available: <http://www.norden.org/start/start.asp/> [2004, June 25]

(Environmental sector) has five working groups.<sup>142</sup> These five groups are working on Sea and Air, Chemicals, Environmental Monitoring and data, and products and waste. The group of product and waste has 13 subgroups for different projects. Environmental adaptation of the building sector is one of these subgroups which is concerning about the environmental and waste issue within the building sector.

The Nordic countries have put priorities to recycling the C&D waste. In this context one of the tasks of the group is to increase the knowledge of the building sector regarding the use of resources, the handling of harmful components in building waste and to increase the utilization of building and construction waste.<sup>143</sup>

Most of the Nordic countries adopted the reuse and recycling of construction and demolition waste as the best practices to handle the problem of construction and demolition waste. In 2002, Denmark has more than 90% recycling for its demolition and construction waste.

The term C&D waste can cover a very wide range of materials. The most obvious categories could be:

- Waste arising from the total or partial demolition of building and /or civil infrastructure
- Waste arising from the construction of building and or civil infrastructure
- Soil, rocks and vegetation arising from land levelling, civil works and/or general foundation
- Road planning and associated materials arising from road maintenance activities.
- Soil waste arising from the construction of building <sup>144</sup>

According to the European Waste Catalogue (EWC), the Construction and demolition waste (including road construction) has been classified into the following categories:

- Concrete, bricks, tiles, ceramics, and gypsum based materials
- Wood, glass and plastic
- Asphalt, tar and tarred products
- Metals (including their alloys)
- Soil and dredging spoil
- Insulation materials
- Mixed construction and demolition waste<sup>145</sup>

However, in the Nordic countries the construction and demolition waste consists mainly of concrete, asphalt, stone and wood.<sup>146</sup>

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<sup>142</sup> Gíslason, Stefán.( stefan@environice.is).(2004, 21]June. Re: *Export of Nordic waste management experience to the Egyptian cities*. Email to Ali Abo Sena.( Ali.AboSena@student.iiiee.lu.se)

<sup>143</sup> Thormark, C. (2002). *Handling and Recycling Building- and Construction Waste*. Nordic Workshop 6-7 November in Stockholm. Report TemaNord 2002:553. Copenhagen. Nordic Council of Ministers

<sup>144</sup> Symonds(1999). *Construction and demolition waste management practices, and their economic impacts: Report to DGXI, European Commission*. European Environmental Agency. [Online]. Available <http://europa.eu.int/comm/environment/waste/studies/> [2004, June26]

<sup>145</sup> European Waste Catalogue (2004). [Online]. Available : <http://europa.eu.int/comm/eurostat/ramon/> [2004, June16]

<sup>145</sup> Audelius, B. (2004, June14). Personal Interview

<sup>146</sup> Danish Environmental Protection Agency (DEPA).(2004). [Online]. Available : <http://www.mst.dk/homepage/> [2004, June 26]



#### 4.2.2 Relevant experiences of C& D waste management in some Nordic countries (Sweden and Denmark)

In 2002, it is estimated that the construction and demolition generated in Sweden was 2 million tons and in Denmark was 3 million tons. In Sweden, from the construction and demolition waste, about 45% ended up in landfills, about 5% by incineration and 50% were recycled.<sup>147</sup>

According to the European Environmental protection Agency (2003), in 2002, Denmark has consigned for recycling up to 90% of the generated construction and demolition waste.

Sweden and Denmark have used some measures to influence the management of construction and demolition waste. Table 6 demonstrates some of these measures.

Table 6 Measures of C & D waste management in Denmark and Sweden

Measure	Sweden	Denmark
1. Restrictions or bans on disposal	Combustible wastes are banned from landfills from 2002, and organic wastes will be banned from 2005.	<ul style="list-style-type: none"> <li>No explicit ban,</li> <li>Municipalities are obliged by law to assign C&amp;D waste which cannot be recycled, but which can be burned, to incineration</li> </ul>
2. Mono landfill (for possible future recovery)	Yes	<ul style="list-style-type: none"> <li>For limited waste streams.</li> </ul>
3. Other environmental or planning controls	<ul style="list-style-type: none"> <li>A demolition plan must be lodged before buildings are demolished. This must address hazardous waste streams in particular</li> <li>Demolition must be supervised by a suitably qualified person.</li> <li>Counties and municipalities issue waste plan.</li> </ul>	<ul style="list-style-type: none"> <li>C&amp;D waste centres need licenses.</li> </ul>
4. Taxes (landfill and others)	<ul style="list-style-type: none"> <li>A tax on aggregates (gravel) already exists.</li> <li>A landfill tax</li> </ul>	<ul style="list-style-type: none"> <li>Landfill and incineration tax since 1987.</li> <li>Lower rates for incineration.</li> <li>The extraction of gravel is taxed.</li> </ul>
5. Subsidies	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>No direct subsidies</li> </ul>
6. Positive waste planning measures	<ul style="list-style-type: none"> <li>The National Road Authority has a target of 90% for recycling road materials by 2000.</li> </ul>	<ul style="list-style-type: none"> <li>National targets must be acted on by local authorities</li> <li>Municipalities are responsible for ensuring that sufficient treatment capacity is available</li> </ul>

<sup>147</sup> Thormark, C. (2002). *Handling and Recycling Building- and Construction Waste*. Nordic Workshop 6-7 November in Stockholm. Report TemaNord 2002:553. Copenhagen: Nordic Council of Ministers

7. R&D support	<ul style="list-style-type: none"> <li>• A large number of projects</li> </ul>	<ul style="list-style-type: none"> <li>• Large number of projects</li> </ul>
8. Pilot support and demonstration schemes	<ul style="list-style-type: none"> <li>• Several Substantial projects</li> </ul>	<ul style="list-style-type: none"> <li>• Several substantial projects</li> </ul>
9. Voluntary Agreement(VA)	<ul style="list-style-type: none"> <li>• National VA covers better practices, reduced landfilling and certification of C&amp;D waste specialist.</li> </ul>	<ul style="list-style-type: none"> <li>• National VA on selective demolition involving demolition contractors</li> </ul>
10. Education and training	Specific C&D related courses are widely available.	<ul style="list-style-type: none"> <li>• Specific C&amp;D waste management training courses are offered</li> </ul>
11. Advisory services	<ul style="list-style-type: none"> <li>• Two services available</li> </ul>	<ul style="list-style-type: none"> <li>• Two main national private sector services Conventional market for C&amp;D products</li> </ul>
12. Waste exchange	<ul style="list-style-type: none"> <li>• Internet-based exchange available.</li> <li>• Local authorities will advice on upcoming demolition projects</li> </ul>	<ul style="list-style-type: none"> <li>• Conventional market for C&amp;D products</li> </ul>
13. Other measures	<ul style="list-style-type: none"> <li>• Some producers operate return system</li> </ul>	<ul style="list-style-type: none"> <li>• Some local authorities give preference to recycled C&amp;D waste.</li> </ul>
Most effective measure(S)	Combination of measures	<ul style="list-style-type: none"> <li>• Combination of measure but landfill and incineration tax most significant</li> </ul>

Source: Adapted from Symonds (1999)

In Sweden, C& D waste management is a free market<sup>148</sup>. Demolition permits are generally required for all buildings. According to the Swedish Environmental protection Agency (1998), in 1996 voluntary producer responsibility has been initiated by some construction companies, consultants and architects, building material manufacturers and land lords.

In 1998 a law on demolition plan has come to force.<sup>149</sup> Under this law, it is obliged to introduce a demolition plan for the local authorities. The demolition process could not be started before the demolition plan has been agreed and permission is given. The plan should give information on the type and size of the building, its main construction and materials and the calculated amount of waste, given in different fractions. Most importantly, it is must clearly state whether there are any nominally harmful building materials their amount and location and the way they will dismantled, handled and taken care as waste. The plan must also name the person responsible for the quality and site control of the demolition waste. However, the action plan aimed to increase the recycling of the demolition and construction waste and sorting at source and approved the waste handlers.<sup>150</sup>

As the marketing for the recycled materials is a crucial point to sustain the recycled material from demolition and construction, the association of Byggigen was founded in Sweden ([www.byggigen.se](http://www.byggigen.se)).

<sup>148</sup> Audelius, B. (2004, June14). Personal Interview

<sup>149</sup> Thormark, C. (2002). *Handling and Recycling Building- and Construction Waste*. Nordic Workshop 6-7 November in Stockholm. Report TemaNord 2002:553. Copenhagen. Nordic Council of Ministers

<sup>150</sup> Swedish Environmental Protection Agency (SEPA).(1999). *Waste management: The Swedish experience*. Stockholm

Bygggen is a computer based market to facilitate the contacts between costumers and the sellers of the reused building materials.

In Sweden, the main drivers to increase the recycling are the taxes on the landfill and legislation on C&D waste management<sup>151</sup>. However, good sorting is prerequisite for good recycling and recycled materials of high quality. In Denmark, the construction and demolition waste is defined as waste generated in connection with new building developments, renovation and demolition works.<sup>152</sup>

In 2002 Denmark has consigned 92% of the construction and demolition waste for recycling, 2% for incineration and 6% for land filling.<sup>153</sup>By law, source separation of C&D waste, is mandatory for all construction and building projects which arise more than 1 ton waste.<sup>154</sup> All the municipalities in Denmark assign concrete, tile and in some cases asphalt from reprocessing and demolition plants for recycling. Local authorities with no crushers plant nearby store the concrete, tile, asphalt in gravel pit or landfill in view to a crusher when stored amount are sufficient. Tiles, concrete and asphalt are the largest fractions of demolition and construction waste. They are reprocessed upon crushing either a stationary or mobile crusher.

Crushed tile, concrete and asphalt materials are primarily sold from recycling plants. In Denmark no problem with marketing of the recyclable demolition and construction waste. It is organized in line with marking of the virgin materials. The taxes on landfill and incineration are the main drivers to encourage the recycling of the construction and demolition waste.<sup>155</sup> Further, tax on extraction of gravels also, is a very supportive tool to encourage recycling.

#### 4.2.4 Relevant Lessons from South Scania Region (Lund, Malmo)

As large amount of material from building and renovation work can be recycled and re-used, they are source separated well. In 1996, Sysav Company started a program to help the construction companies in its region to handle their C&D waste. In the south Scania region, there are five big construction companies and, Sysav has contacts with four of them. This program called Byggretur-Sysav. <sup>156</sup> The program aims to provide the construction companies in South Scania region with information on how to sort their C&D waste on site. Byggretur also aims to find market for the reusable and recyclable materials of C&D waste. SYSAV offers a special training for the buildings companies, it mainly on how C&D waste at the building site should best be sorted and source separated

Gronholm (2004) reports, on site, C& D wastes are sorted out in many skips, and hazardous waste should be removed first from the C&D waste (e.g. insulators, painting cans, etc.). However, the following fractions are mainly sorted in different skips

- Concrete
- Asphalt
- Garden and park waste.

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<sup>151</sup> Thomark,C.( 2004,June29). Telephone Conference

<sup>152</sup> Danish Environmental Protection Agency. (2004). [Online]. Available : <http://www.mst.dk/homepage/> [2004, June 26]

<sup>153</sup> Danish Environmental Protection Agency. (2004). *Waste statistics2002*. [Online]. Available : <http://www.mst.dk/homepage/> [2004, June 26]

<sup>154</sup> Danish Environmental Protection Agency. (2004). [Online]. Available : <http://www.mst.dk/homepage/> [2004, June 26]

<sup>155</sup> Symonds(1999). *Construction and demolition waste management practices, and their economic impacts: Report to DGXI, European Commission*. European Environnemental Agency. [Online]. Available <http://europa.eu.int/comm/environment/waste/studies/> [2004, June26]

<sup>156</sup> Gronholm, R. ( 2004, June14). Personal Interview

- Combustible waste( wood , plastic )
- Scrape Metal
- Gypsum

These fractions then go for processing at Sysav treatment plants. For concrete, metal is removed out from it, and then it crushed to be used again. SYSAV has cooperation with a nearby quarry company which has knowledge and equipment which can be used to crush. The crushed concrete could replace gravel in the roads. Otherwise, it can be used to pavement the bikes paths and roads. Asphalt is shredded and reused as a raw material again.

The garden and park wastes go to composting at biocell in the landfill. These wastes are put in piles and composted for three years to produce good compost. The untreated and painted wood is shredded and it is sold as a domestic solid fuel. The scrap metal goes to recycling plant for metal which it is used to make new metal.

Gypsum if the gypsum is clean and dry it can be used by the gypsum industry however it is often dirty and wet and has to avoid getting it in combustible waste skip.

However, Sysav has a sorting plant for mixed C&D waste. This sorting plant is taken a part of the landfill in Malmö. In the sorting plant, concrete and reinforcement iron-bars are dealt with for example, as well as the recovery of material suitable for fuel.<sup>157</sup>

In Malmö, Sysav together with Malmö Community have started a recycled building materials store. Here professionals as well as private persons can usually find what they are looking.<sup>158</sup> Moreover, Sysav introduces a service of collection for free the reusable fractions from the construction and demolition waste; it fixes and sells them through the internet ([www.byggigen.se](http://www.byggigen.se)).

#### 4.2.5 Lessons from Copenhagen City

According the Danish Environmental Protection Agency (DEPA), Copenhagen Recycling Centre (KMC) was inaugurated in May 1996. The centre covers an area of approximately 1km<sup>2</sup>. It comprises of five different waste treatment facilities. Among these facilities, there is C&D waste treatment facility.

A private company called (RGS90 A/S) operates the treatment plant of demolition and construction waste. RGS90 A/S treats C&D waste at several locations in Denmark, but the main activities takes place at KMC site.

According to the Copenhagen Recycling Centre (KMC)<sup>159</sup>, 2004, the plant receives annually about 400 000 tons of C& D waste from Copenhagen city. This waste basically consists of concrete, tiles, asphalt and wood as well as other fractions of C&D waste. Most of the waste is separated before arrival either, by the waste producer or at recycling and civic amenity sites. However, the centre receives also the mixed waste. In 2004, around 83% of C&D waste is crushed and used to substitute natural gravel, primarily in road construction, 12 % is incinerated and 5% is land filled.

The main purpose of the centre is to crush C&D waste.<sup>160</sup> The recycled materials from the C&D waste goes again to the construction sites. On the other hand, there is saving for transport where the trucks

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<sup>157</sup> SySav.(2004). [Online]. Available : <http://www.sysav.se> / [2004, June 26]

<sup>158</sup> Gronholm, R. ( 2004, June14 ). Personal Interview

<sup>159</sup> Copenhagen Recycling Centre(KMC). (2004). [Online]. Available : <http://www.miljoe.kk.dk/> [2004, July6]

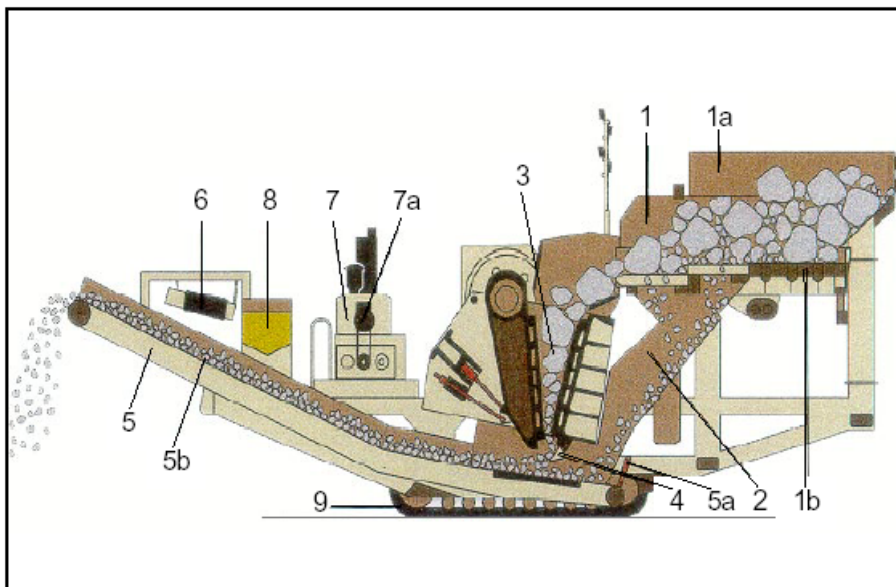
<sup>160</sup> Ibid

come full of C&D waste fractions and go back full with the recycled materials. The centre produced mainly crushed concrete, crunched mixed asphalt /concrete, and crushed mixed concrete and bricks.

The combustible materials such as wood cardboard, paper and plastic are sorted. Moreover, gypsum, metals, plate, glass are separated into different fraction into different containers. However, the crushed concrete and asphalt debris is used for road construction purposes. Iron and metals is recycled through scrap dealers while, clean wood is shredded and used in manufacture of sand blasting agents. The untreated wood goes for incineration and the other recyclables go for different recycling centres.<sup>161</sup>The recyclables are sold at price that is 10-15 % below the price of the virgin materials, this is to be competitive. The recycling plant includes the following three process lines:

- Crushing plant for bricks, asphalt and concrete
- Equipment for manual sorting of mixed C&D waste
- Soil screens

Figure7 below shows a cross section of C&D waste mobile crusher. The crushing process begins with an excavator equipped with a pair of hydraulic shears, a so-called pulverizor which pre-crushes large members to 250 mm size with separation of long reinforcing bars are removed. A front end loader fills the fragmented concrete, masonry or asphalt rubble into feeding device which passes the material on impact crusher to reduce the size to 32mm and the fragments pass over a belt conveyer where a vibrating process takes places to separate the fragments with 32 mm size.<sup>162</sup>



1- Feed hopper with extension(1a) and gizzly feeder(1b)

<sup>161</sup> Copenhagen Recycling Centre(KMC). (2004). [Online]. Available : <http://www.miljoe.kk.dk/> [2004, July6]

<sup>162</sup> Lauritzen, K, Hansen, T. (1997). *Recycling of construction and demolition waste1986-1995*. Danish Environmental Protection Agency: Copenhagen

- 2- By pass chute
- 3- Jaw crusher
- 4- Plate protection plate
- 5- Main conveyer with hydraulic controls (5a) and reinforced belt (5b)
- 6- Magnetic separator
- 7- Engine Unit with generator(7a)
- 8- Fuel and oil tanks
- 9- Tracks

*Figure 7 Cross section of a jaw crusher mounted on a mobile chassis with associated equipment*

*Source: Symonds (1999)*

#### **4.2.6 Summery**

C&D waste management in Sweden and Demark are based on policies framework. These policy frameworks aim to favour recycling of C&D waste and discourage landfilling. Further, these policy frameworks make use a number of measures to enhance recycling. Most of these measures is market-oriented measures. However, in both countries source separation is a key element in an integrated C&D waste management.

## 5 Description of solid waste management situation in Quseir

Most of the Egyptian small cities have no proper system for municipal solid waste management, as well as the construction and demolition waste. This is due to the lack of proper infrastructure for collection, transportation, treatment and final disposal of the waste. Further, there is no efficient cost recovery to facilitate improvements of the system.

Quseir is a small Egyptian city. It affiliates to the Red Sea governorate. It locates on the cost of the Red Sea. It has a wonderful coral reef coast. Quseir consider one of the oldest Egyptian cites. It is about 140 km at the south of Hurghada city, the capital of the Red Sea governorate. Quseir has about 45 000 inhabitants and covers 33 km<sup>2</sup>. Quseir has desert climate. The majority of people in Quseir are engaged in fishing activities and some manual professions. Some of them work in the field of phosphate mining. Although the tourism industry is a growing activity in Quseir, a small number of populations are engaged in the field of tourism. This is because most the people do not have such skills to work in the tourism field (e.g. language, experience etc.).<sup>163</sup> The problem of the solid waste management is one of the challenges which faces. This especially after increase the tourism visits to the city. In the next sections, the solid waste management system in Quseir will be described.



Figure 8 Map of Egypt shows the location of Quseir on the Red Sea coast

<sup>163</sup> Gad, M.(2004. July18). Personal Interview

## 5.1 Institutional and organizational aspects

### 5.1.1 Policy & planning

No explicit written policy or strategy for SWM exists at local level in Qusier. For the Red Sea Governorate, USAID prepared a SWM strategy document but it has never been used because it was prepared by external experts and not owned by the governorate.<sup>164</sup> In a report to the Centre for Environment and Development for the Arab Region and Europe (CEDARE) (2004), the implicit policy at Qusier city council level seems to consist of the following:

- The highest priorities are clean streets
- Private companies to be used to minimize work of the municipality
- Local companies are favoured because their tendency to hire local labour.
- Low household fees for waste collection
- Waste sorting and animal feeding is only allowed at the dumpsite<sup>165</sup>

Moreover, there is no target (e.g. for collection coverage, recycling), no long term plans and only limited data about the solid waste that can not be used for planning.

According to the head of the Environment Unit in Quseir, solid waste management tasks are divided over three departments: Environmental Unit, Cleansing & Sanitation department, Fleet management & Maintenance department. Further, there are three committees at city level are somehow involved in solid waste management:

1) *Environmental Committee*

This committee resorts under the city hall and consists of the mayor, the head of Environmental Unit and staff responsible for Quarries, Protectorates and Industrial Safety. The main responsibility of the committee is to do inspection visits for industrial and tourist establishments. They also inspect the state of cleanliness in the city.

2) *Committee of the Environmental and Engineering department*

This committee visits all schools in Quseir twice a year to inspect the state of cleanliness and building as well as the sanitation for water

3) *Committee of the city council and Health directorate.*

This committee consists of representative from different directorates and departments in the city (Environment, Health, and Trade & Supplies). The committee visits the market area and the public hospital and other places. It reports to the mayor their observations

### 5.1.2 Legal aspects

There are two levels of regulations that govern the solid waste management system in Quseir, the national level regulations and the local regulations. The main regulations which are governing the solid waste in Egypt are law no. 38 of 1967 on general public cleansing and its executive regulations (issued

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<sup>164</sup> Madian, S. (2004, 27July). Personal Interview

<sup>165</sup> Centre for Environment and Development for the Arab Region and Europe (CEDARE). (2004). *Assessment of the solid waste management system in Quseir*. P.18: UWEP



by Minister of Housing Decree No. 134 of 1968). In addition to, there is the environmental Law (Law no. 4 for 1994) and its executive regulations (issued by Prime Minister Decree No. 388 of 1995). (See chapter 2)

In addition to the previous two laws, Quseir has few local regulations are existing in the field of solid waste management. The Red Sea governorate has a specific regulation which prohibits the use of plastic bags on diving and fishing boats. This is because; these bags cause damage to the coral reefs in the coastal area.<sup>166</sup> . There is another regulation stipulates that herds of animals mainly owned by Bedouins and tribes people are not allowed to enter the city. These herds cause disturbance for traffic and increase the littering in the city.

According the head of Environmental Unit, the most important violations of environmental regulations concerning the solid waste management are, garbage burning, throwing garbage in the streets and vacant lots, unregulated disposal of construction debris and, storage of wastes in residential areas.

According to Article 11 of Law 38/1967, there is host of employees are responsible for enforcement the law. In practice in many cases either the mayor, the head of the village or the person responsible for the environmental unit enforce law 38/1967.

### 5.1.3 Staff

According to the city council, the total number of employees working in solid waste management and sanitation in Quseir is 63. This number represents 21% of all employees of the city council. Table 7 shows the numbers of employees as well as their status (temporary or permanent)

*Table 7 numbers and status of employees in solid waste and wastewater management in Quseir*

Department	Position	Number	Permanent	Temporary
Environment	Head of department	1	1	-
	Supervisors	5	3	2
Cleansing	Supervisors	4	-	8
	Workers	21	2	19
Sanitation	Supervisor	1	-	1
	Worker	1	-	1
Fleet/Maintenance	Head of department	1	1	-
	Maintenance supervisor	1	1	-
	Drivers	20	-	20
	Mechanics	4	-	4
<b>Total</b>		<b>59</b>	<b>8</b>	<b>51</b>

*Source: Quseir city council, 2004 and CEDARE, 2004*

Table 7 shows that the number of permanent employees of MSW is very limited and most of the employees are temporaries where the permanent employees account for 8 and the temporary employees are 51

<sup>166</sup> Gad, M. (2004, 18 July). Personal Interview

#### 5.1.4 Education and skills

Regarding the education and skills, only the head of the Environment Department seems to have received various kinds of training. According to the head of Environmental Unit, most of these training courses were mainly conducted by some regional donors-funded projects which work on environmental management (e.g. USAID funded projects). However, there is no training department for civil services nor are there job descriptions for the staff working on solid waste management.<sup>167</sup> Most of the operational staff seems to lack the required know-how to properly manage solid waste. For example, most workers and scavengers have no any idea about handling of MSW or the hazardous municipal waste. Moreover, most of scavengers and workers are illiterates.



*Figure 9 MSW collection in high-rise buildings in Quseir city*

*Photo by Ali Abo Sena*

Figure 9 shows that the scavengers and workers do not have any protective gears and they handle MSW in non-proper way, even one of them is sanding up inside the vehicle to compact the waste by his bared feet.

#### 5.1.5 Salary levels

The salaries of permanent employees in SWM are centrally determined in Cairo. They range from LE 110 to approx. 400 LE per month, excluding benefits such as pension, health insurance and end-of-services allowance. On the other hand, the temporary workers receive very low wages. Supervisors and drivers receive about LE 6 per day, while workers LE 7per day. The workers and scavengers get more than the drivers and the supervisors where, they already do all the work. However this is for the Egyptian standards is very low.

#### 5.1.6 MSW collection equipment

Quseir city has a good MSW collection vehicles fleet. Table 8 shows a list of the solid waste collection vehicles belonging to Quseir city council. It seems clear that Quseir city council is reasonably well equipped for collections and transportation of MSW. Most of these equipments are quiet new with

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<sup>167</sup> Shareif S. (2004, 20July). Personal Interview

excellent status. However, according to the head of Fleet and Maintenance Department, high consumption of fuel and lack of drivers are major problems which face them.

Table 8 Solid waste management equipment in Quseir

No.	Vehicles type	Capacity	Fuel	Model	Status
1	Tipper Nasr	6 ton	Diesel	1993	Good
2	Cleansing vehicle Nasr	6 ton	Diesel	1993	Good
3	Cleansing vehicle Nasr	7 ton	Diesel	1990	Good
4	Cleansing vehicle Ventum	3 ton	Diesel	1998	Excellent
5	Cleansing vehicle Mitsubishi	3 ton	Diesel	2000	Excellent
6	Ghazal	0.5 ton	Petrol	2001	Excellent
7	Ghazal	0.5 tons	Petrol	2001	Excellent
8	Cargo Nasr	3 tons	Diesel	2001	Excellent
9	Mitsubishi	4 tons	Diesel	2002	Excellent
10	Mitsubishi	4 tons	Diesel	2001	Excellent
11	Trailer for El-Hamraweyn	4 tons	Diesel	2001	Excellent
12	Tractor for El-Hamraweyn village	4 tons	Diesel	2001	Excellent
13	Tractor for El-Hamraweyn village	4 tons	Diesel	2001	Excellent
14	Loader				
15	Bulldozer				
16	Grader				
17	Mechanical sweeper				
18	Tractor and winch for containers				

Source: adapted from CEDARE, 2004

### 5.1.7 Financial aspects and cost recovery

In Quseir, source of revenue of SWM is mainly transfers from the central government. However, local Cleansing fund exists and, it has the following sources of revenues

- 2% cleansing fee collected from all tenants (2% of the rent , in practice this account LE9-10per household per year )
- Monthly solid waste management fees form some hotels
- Fines form non compliance.

According to the head of the Environment Unit, fines was used to go to the Cleansing Fund at city council level, but since the beginning of 2003, it goes to the Environmental Protection Fund (EPF) at the Egyptian Environmental Affairs Agency (EEAA).

Table 9 Revenues from MSW management in Quseir in the fiscal year 2003-2004

Revenue Sources	LE	% of total
<b>Central government transfers:</b>		
Investment plan (allocated for purchase equipments)	120 000	25%
Salaries permanent staff	175 000	37%
Uniforms, tools	15000	3%
Operational costs	33 000	7%
<i>Sub-total</i>	<b>343 000</b>	<b>72%</b>
<b>Governorate funding:</b>		
Service fund	50 000	11%
<i>Sub-total</i>	<b>50 000</b>	<b>11%</b>
<b>Local source funding :</b>		
Cleansing fee (2%)	40 000	8%
Hotel fees	25 000	5%
Fines	3 000	1%
Other	12 000	3%
<i>Sub-total</i>	<b>80 000</b>	<b>17%</b>
<b>Total</b>	<b>473 000</b>	<b>100%</b>

Source: Quseir City Council, 2004 and adapted from CEDARE, 2004

The Environmental Protection Fund (EPF) is used to fund the non-profit projects which aim to improve environmental situation in Egypt.<sup>168</sup> However the fines only represent about 1% of the revenue to the cleansing fund at Quseir.<sup>169</sup> This reflects that that the fine of non-compliance is very low. According to the Head of Environmental Department, fine of non-compliance with environmental law ranges from LE50 to LE100.

Table 9 shows above that SWM revenues in Quseir are mainly coming from the central government and local governorates and, it is represents 83% of all the revenues. On the other hand, the local source of funding represents only 17% of the revenues.

Table 10 below shows that by far the largest cost item for solid waste management is labour. It is about 65% of all the expenditures. However, it is clear that budgets for solid waste management are limited and that expenses mainly covered through transfers from the central government.

<sup>168</sup> Egyptian Environmental Affairs Agency (EEAA). (2004). [Online]. Available : [www.ecaa.gov.eg/](http://www.ecaa.gov.eg/) [2004, July26]

<sup>169</sup> Shareif, S. (2004, 20July). Personal Interview

Table 10 expenditures on Solid waste management in Quseir in the fiscal year 2003-2004

Expenditures	LE	% of total
Investment plan (purchase equipment) <sup>170</sup>	120,000	% 25
Salaries permanent staff	175,000	37%
Wages temporary workers	130,000	28%
Uniform, tools	15,000	3%
<b>Operational costs:</b>		
Fuel and Lubricants	9,000	2%
Maintenance(spare parts)	24,000	5%
<b>Total</b>	<b>473,000</b>	<b>100%</b>

Source: City Council of Quseir, 2004

It is appears from comparing the two tables (table 9 and table 10), that the local revenues from SWM in Quseir are 17% of all the expenditures. These local sources of fund even not enough to cover the wages of the temporary workers. Where, the wages of the temporary workers represent 28% of the expenditures. Therefore, the cost recovery of MSW management does not exist any more.<sup>171</sup>

In 2004, the governor of the Red Sea has issued a decree<sup>172</sup> to increase the cleansing fees collected from the householders, tourism establishments and commercial and public establishments. According to this decree, the cleansing fees for households will rise from LE 3 to EL 4 per month and it will be EL per 5vroom per month for the hotels, and LE 10per month for commercial establishments.

This new contracts may be will increase the revenues to the city council. The city council has also introduced a tender for franchise to make use the dumpsite. An entrepreneur has taken a franchise against about LE 3 500 per year. This amount will be added to the cleansing fund in Quseir.

<sup>170</sup> The investment paln must be spent on purchasing new equipment otherwise, it must go back to the central government

<sup>171</sup> Mostafa, A. (2004, 24July). Personal Interview

<sup>172</sup> Decree No. 47 of 2004

## 5.2 Source of MSW and rate of generation

In Quseir, the municipal solid waste comes mainly from two sources, the households and the tourist-related establishments such as hotels, resorts and diving centres.<sup>173</sup> The hotels and households are considered the largest solid waste producers in Quseir.<sup>174</sup> Quseir counts 13 Hotels, both local and international, 5 hotels within the city boundaries and 8 hotels outside these boundaries (up till 30 km of the city). According the city council, the hotels can be classified as follows: Unclassified: 5, Three stars: 2, Four stars: 3, Five stars: 1 and under classifications: 2

It is estimated that, the total number of beds in hotels and resorts in Quseir is 2112. CEDARE (2004) has estimated that each guest generates 2.3 kg per guest per day or 49 hotel waste tons per day in total. However, the tourism in Quseir is a seasonal business. By taken into account the seasonal variations, it is estimated that the daily production of hotel waste will be 34 tons per day.<sup>175</sup> Table 11 below shows the typical composition of MSW of hotels in Quseir. It appears that, hotels MSW components are mainly organic waste (64%) and cardboard (12%).

Table 11 Typical composition of the hotels solid waste in Quseir

Type of waste	Average(% weight)
Organic waste	63.7
Plastic	4.0
PET bottles	3.8
Glass	4.4
Iron& tins	3.2
Paper	4.8
Cardboard	12.0
Wood	2.7
Other	1.4
Total	100.0

Source: CEDARE(2004)

It is estimated that the quantities of household waste are 2.4 kg per household and 0.4 kg per person.<sup>176</sup> According to the city council data, there are 7000 residential units in Quseir. It means that, 17 tons of households municipal waste is generated per day. Table 12 below shows the typical composition of municipal solid from householders in Quseir.

<sup>173</sup> CEDARE (2004). *Assessment of the solid waste management system in Quseir*. Cairo

<sup>174</sup> Sharif, S. (2004, 20 July). Personal Interview

<sup>175</sup> CEDARE (2004). *Assessment of the solid waste management system in Quseir*. Cairo

<sup>176</sup> CEDARE (2004). *Assessment of the solid waste management system in Quseir*. Cairo

Table 12 shows that, the most significant components of households waste are organic waste (58%), Cardboard (12%) and plastic (10%). About 4 % of household waste consists of ash which comes from the traditional bread ovens that are still used in many houses in rural Egypt. The category “Others” consists of material such as broken pottery, wood, shoes and slippers.

*Table 12 Typical composition of the household solid waste in Quseir*

Type of waste	Average(% weight)
Organic waste	58
Plastic	10
PET bottles	1
Cardboard	12
Paper	3.5
Glass b	4.2
Textile	1.7
Iron& tins	3
Dust, ash, etc	4.1
Other	2.5
Total	100.0

*Source: CEDARE( 2004)*

### 5.3 Collection and transportation of MSW in Quseir

In Quseir, by the law, the responsibility of collection MSW is imposed on the city council. According to City Council of, the city council collects the solid waste from households, hotels, kerbsides scheme, in addition to sweeping and cleaning of main streets. Clean Home organization is a small local enterprise. According to the head of Environmental Department, Clean Home collects municipal solid waste from less than 50% of the households in city, some nearby hotels and some commercial establishments.

This is against a monthly fee. Clean Home organization distributes 12 to 13 plastic bags per month to each household and, it buys these bags either in Cairo or Hurghada (the capital of red Sea Governorate). The price of these bags is included in the monthly fee.<sup>177</sup>Clean Home then transports the collected MSW waste to the uncontrolled dumpsite. Clean Home Organization employs 4 supervisors who also collect fees, 2 drivers and 6 workers and, it has closed truck/ van and pick-up truck (rented). The capacities of two vehicles are 3.5 tons<sup>178</sup> per day. Azzam (2004) reports that, collection vehicles do not have the possibility for tipping of MSW, and this requires using more workers. However, both households and hotels are claiming that, introduced service is not regular service. Further, hotels claim that, Clean Home does not have the required equipment to introduce good services for the hotels.<sup>179</sup> However, Qusier city has a lack in the dustbins nearby the households and the trash cans in the streets.<sup>180</sup>Even, the existing bins are small and not suitable to receive the generated municipal waste. There is also lack in the bins near to the commercial establishments.

<sup>177</sup> Azzam, G. (2004, July22). Personal Interview

<sup>178</sup> Notice that, it estimated that the generated MSW from households is 17 tons per day.

<sup>179</sup> Elmalwany, H. (2004, 19 July). Personal Interview

<sup>180</sup> Azzam, A. (2004, 21July). Personal Interview

Figure 10 below shows that, bins are very hard to be emptied by workers. Also it explains that there is accumulated municipal waste around the full bins.



Figure 10 MSW bins in Quseir

Photo: by Ali Abo Sena( 2004)

## 5.4 Treatment and Disposal of MSW in Quseir

The collected municipal solid waste from the hotels and the households then transported to the uncontrolled dumpsite in the desert. The transportation is performed by the City Council and Clean Home Company. This dumpsite is located about 10 km from the centre of Quseir city.

According to the Head of the Environment Unit, the dumpsite covers area about 6000 m<sup>2</sup> and it is proposed to be used for the coming 15 years. The dumpsite is uncontrolled dumpsite. Moreover, the dumpsite is located in a groundwater area where there are three nearby fresh water wells. An entrepreneur has got a franchise to use the dumpsite against an annually fee amounted EL 3500 per year. The entrepreneur makes use some individuals to sort the recyclables from MSW.

Recyclables sorting takes place in the dumpsite. The individuals sort the coming MSW to different fractions: plastic, PET bottles, metal cans, glass, cardboard and dry rice. In the dumpsite, there is a manual compactor to compact and bale the sorted recyclables.

Bedouins sort food waste (mainly bread and vegetables) to feed their animals. However, the working conditions are unsanitary and inadequate in the dumpsite. For example, there is no facility like water or sanitation or electricity. The individuals and Bedouins are working for hours in the burning sun. They do not use gloves or masks or any protective gears.

According to RSSII (2004), there are possibilities to do in hotel composting. But this idea is not favoured by all the hotels. This is because; the Red Sea region already has an arid weather and lack of water. This could lead for more contamination and offensive odours. Further in Qusier, there is no sewage treatment system and, most of hotels treat their sewage wastewater. The treated wastewater then is used in irrigation of gardens.





*Figure 11 Uncontrolled dumpsite in Quseir*

*Photo: by Ali Abo Sena*

Figure 11 shows uncontrolled dumpsite in Quseir. This dumpsite attracts rodents, flies and insects that may be carriers of infectious diseases that put individuals and pickers at risk. Moreover, Burning of waste at the dumpsite is usually done by the individuals to reduce the volume of waste. This is substantial and contributes to outdoor air pollution in Quseir.

According to the dumpsite entrepreneur, it is estimated that the dumpsite receives 900 tons per month. This amount differs from the generated MSW in the city. Where in Egypt as a developing country, much of the generated waste is recovered before it reaches the dumpsite; this is done not least by scavengers.

## **5.5 Overview of C&D waste problem in Quseir**

The C&D waste problem is deemed to be one of the environmental key problems in Quseir. With growing the tourism activities in Quseir, the process of construction and innovation of building has increased dramatically.<sup>181</sup> Indeed, the construction and demolition waste is environmental problem not only in Quseir but in the Red Sea region.<sup>182</sup> At this time, no quantitative studies have been conducted to determine the amount and composition of C&D waste generated on the Red Sea coast.<sup>183</sup> In Quseir there is no accurate data about the amount of generated C&D waste or its composition. According to the Red Sea Sustainable Tourism Initiative (RSTTI), 2004, there are many methods have been conducted in developed countries but due differences in building styles and construction waste, they are not applicable to the Red Sea Coast. However, RSTTI has done a qualitative classification to the C&D waste on the Red Sea coast to the following:

- Basic construction waste like sand, gravel, bricks and concrete
- Waste generated from Excavation of Foundations; and
- Other construction materials such as wood paints, fibreglass, tile, reinforcing steel and other metal

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<sup>181</sup> Shareif, S. (2004, July21). Personal Interview

<sup>182</sup> Shalaan, I. (2004, July29). Personal Interview

<sup>183</sup> Red Sea Sustainable Tourism Initiative (RSTTI). (2004). *Best practices for solid waste management*. Cairo

According to RSTTI (2004), C&D waste are characterized by a very little organic matter and low compressibility and, most of the components of C&D waste are recyclables, although they have low intrinsic value.



Figure 12 C&D waste on roadsides in Quseir

Photo: by Ali Abo Sena

In Quseir city the generation of C&D comes mainly from the construction of new buildings, innovation or demolition of the old buildings. The city council has issued decree that imposed each contractor to transfer their C&D to quarries around in the city and it imposed strong fines on who strike or trespass this decree.<sup>184</sup> Although, the Environment Unit has the responsibility to monitor and enforce this decree, the problem is coming from the free riders which come at the night and throw away their C&D waste at uncontrolled vicinities on the roadsides out the city.<sup>185</sup> However, Quseir city has no plan, how they will deal with the problem of C&D waste after filling up the old quarries inside the city. The recent quarry is about to be filled up in few months and they have to allocate another place.

However, the problem of construction and demolition waste is aggravated at the edge of the boarder of the city which is located out the jurisdictional zone of the city. The construction waste comes mainly from building the new hotels and the tourism villages near to the boarders. The Jurisdiction in this area is belonging to the Tourism Development Agency (TDA) where it has only the right to enforce the law in this area. These new hotels take their construction permission and licence from TDA. However, TDA has no office in Quseir. Moreover, there is no coordination between TDA and Quseir city council. This is because, there is conflict between the TDA and the Red Sea Governorate and almost there is no communication.<sup>186</sup> On the other hand, TDA has not exerted any effort to enforce the hotels of the tourism villages to handle their C&D waste in environmentally friendly way.

According to the Head of the Environment Unit, the main environmental problem which associated with C&D construction waste in the region is that these wastes block the natural routes of runoffs in the desert. These routes take the runoffs to the Red Sea. This affects seriously on the environment of the marine habitats in the coral reef region. This is because; these runoffs carry natural nutrients to the coral reef.

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<sup>184</sup> Mekashet, M. (2004, July17). Personal Interview

<sup>185</sup> Shareif, S, (2004, July21). Personal Interview

<sup>186</sup> Shalaan, I. (2004, July29). Personal Interview



*Figure 13 C&D waste accumulations inside Quseir City*

*Photo: By Ali Abo Sena, (2004)*

## **5.6 Summary**

This chapter aimed to give overview of MSW management and C&D waste management situation in Quseir. It was found that, Quseir city does not have adequate MSW system. The existing SWM system faces many constraints, such as institutional and organizational constraints, in addition to lack of good waste management practices (e.g. collection, transportation and treatment).

In Quseir, the organizational and institutional constraints included lack of SWM policy or strategy, lack of skilled staff, lack of cost recovery, limited public awareness and participation. Further, the inadequate MSW management practices were found such as: there insufficient MSW collection scheme and the use of uncontrolled dumpsite. An additional issue with C&D waste is an apparent environmental problem in Quseir. The prominent method of C&D disposal was illegal dumping on roadsides practices were illegal dumping on roadsides.

## 6 Analysis and modeling

### 6.1 Identification of the main stakeholders of MSW in Quseir

Based on the conducted interviews, this study has identified the main stakeholder involved in municipal solid waste management for Quseir city. Figure 14 below, shows the identified stakeholders which are as follows:

- The National Government
- The Red Sea Governorate
- The Red Sea Sustainable Tourism Initiative (RSSTI)
- Tourism Development Authority (TDA)
- The Department of protectorates in the Red Sea, Quseir office
- Quseir city council
- The elected council
- MSW collector (local small enterprise)
- Entrepreneur of the dumpsite
- Bedouin
- Hotels and Diving Centres
- Householders and commercial establishments
- Tourists
- Thee local NGOs in Quseir

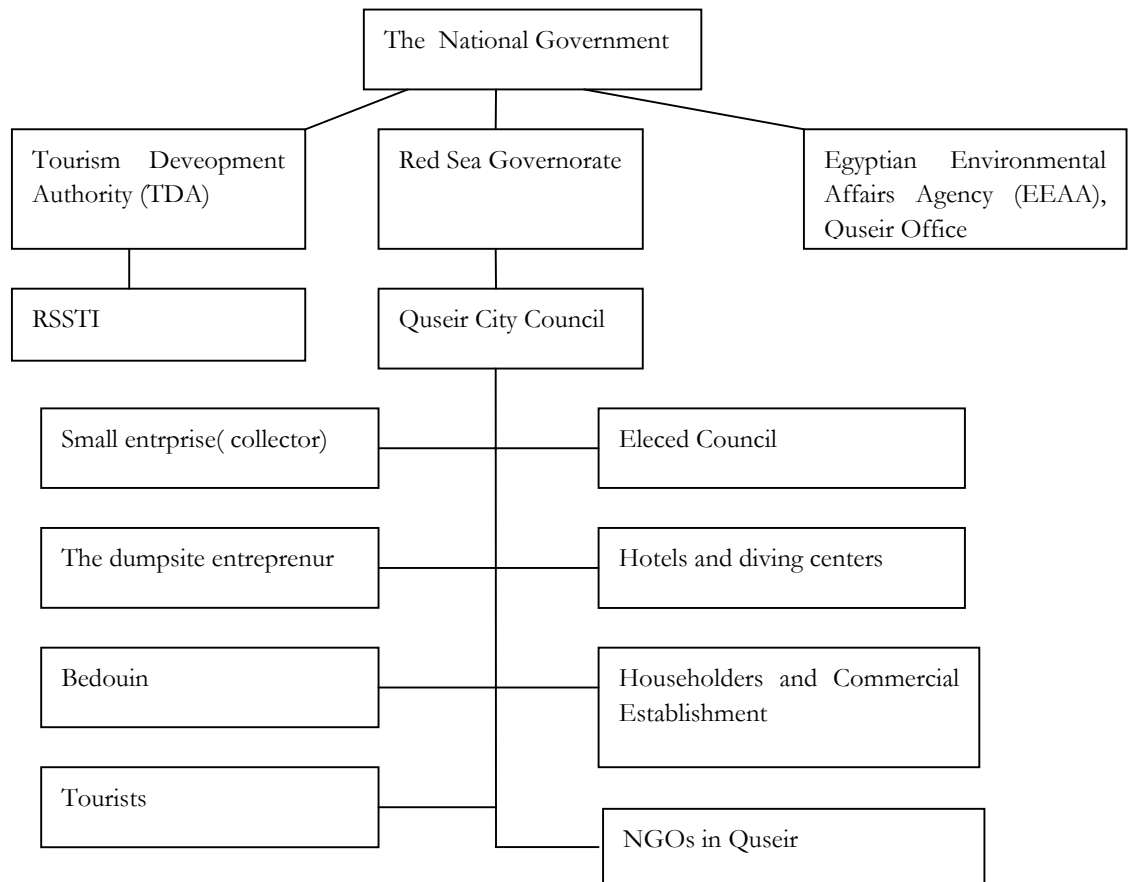


Figure 14 Stakeholders of SWM in Quseir

The National Government is not one entity. It consists of different ministries and agencies with their own policies, laws and decrees. These laws, decrees and policies influence the decision making concerning the waste management in Quseir.<sup>187</sup> The most important ministries are the Ministry of state for Environment (MSEA), the Ministry of local development. In addition, there are the Egyptian Environmental Affairs Agency (EEAA) and the Tourism Development Agency (TDA).

The Red Sea governorate is a main stakeholder who influences on the waste management in Quseir. Red Sea Governorate is the provisional authority, supervising the Quseir city council. It situated in Hurgahada, 145km north of Quseir. The General Directorate of Environment Management Unit (EMU) at Hurgahada supervises the Environment department at Quseir.

The Red Sea Sustainable Tourism Initiative (RSSTI) is a USAID funded project (1999-2004), it supports the Tourism Development Authority (TDA), hotels and tourist resorts to develop the coastline of the Red Sea in a sustainable manner. TDA is an independent authority and, it does not affiliate to the governorate of the Red Sea. However, TDA is responsible for issuing licences for most of the tourism establishments in the region (e.g. hotels, tourism villages, etc.)

The Department of Protectorates in the Red Sea is a regional office to the Egyptian Environmental Affairs Agency (EEAA). The main regional office is located at Hurgahada. However, the department of protectorates has an office in Quseir. According to the head of the office, the main task of this office is to manage the nearby national protectorates. However, EEAA has opened its new office in Quseir because, there is growing in the tourism activity in the city.<sup>188</sup>

Quseir city council is the executive governmental authority, in charge of public services such as, solid waste collection and disposal of solid waste. The mayor is the head of the city council. However, the city council is responsible for enforcement the national and regulations which govern the SWM in its Jurisdictional area.

The elected council of Quseir city consists of 24 members who are elected every 5 years to present the population in Quseir.<sup>189</sup> One of the main responsibilities is to approve the budget prepared by the executive city council. However, the elected council is affiliated to the Ministry of Local Development ( MoLD).

The informal sector is represented in the solid waste management in Quseir by a small scale enterprise. This is a local small organization called Clean Home Company. Clean Home organization collects MSW from householders by door to door against a monthly fee (LE4) in Quseir. Further, it collects MSW from some nearby hotels.

An entrepreneur who sorts and sells solid waste at the dumpsite is one of the main stakeholders in the process of municipal solid waste management in the city. The entrepreneur has franchise to use the dumpsite. The entrepreneur is hiring about 15 individuals to sort recyclables at the dumpsite.

Bedouin families who are living near to the dumpsite are one of the main stakeholders. They help the individuals at the dumpsite in sorting waste to different fractions. Bedouins take organic waste (vegetables and breads) and use it as fodders for their animal.

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<sup>187</sup> CEDARE (2004). *Assessment of the solid waste management system in Quseir*: Cairo

<sup>188</sup> Gad, M. (2004, 18July). Personal Interview

<sup>189</sup> Aish, A. (2004, 18July). Personal Interview

Householders are main stakeholders in MSW management in Quseir. Quseir has 7000 residential units and about 45 000 thousands inhabitants. Households generate about 17 tons municipal solid waste per day.

Hotels and their diving centres are considered as main generators for the municipal solid waste in Quseir. They generate more than 30 tons municipal solid waste per day.

Tourism is a rapidly growing industry in Quseir. It is estimated that 40 000 tourists visit Quseir per year and the number in increase.<sup>190</sup> The tourists are also main stakeholders in the waste management system in Quseir.

Quseir has four local NGOs: the Heritage Preservation Society, the Environmental Protection Organization and the Women's Association, The Muslims youth association. These NGOs are mainly funded by the Egyptian Social Fund for Development (SFD), the Ministry of Social Affairs, USAID and Wallenberg Charitable Trust. For example, The Heritage Preservation Association (HPA) was initiated and funded by a Swedish organization called Carpe Vitam (<http://www.carpevitam.se/>).

## 6.2 Stakeholders Analysis

Implementation of an ISWM system requires integration and cooperation among all the stakeholders who are involved in process of MSW in Quseir.

Stakeholders who are involved in the solid waste management system in Quseir have different areas of overlap and differing roles. Further, most of them have constraints which hinder implementing of an integrated solid waste management system in Quseir. This section aims to analyze and identify the roles of those different stakeholders. Moreover, it aims to examine the relation between all those stakeholders as follows:

The National Government is a main stakeholder which draws up the general policy for solid waste management in Egypt. Practically the Ministry of State of the Environmental Affairs and Egyptian Environmental Affairs Agency (EEAA) are responsible for laying down the environmental policy in Egypt. Nowadays, Egypt has initiated a program for Privatization of solid waste. This program aims to involve the private sector in the process of SWM. The national strategy is built up on, that the principle of PPP should be applied in all the governorates.<sup>191</sup> The privatization has seen by many that it is the ideal solution for solving the problems of MSW in Egypt. However, the privatization process needs some requirements to be implemented and unfortunately, Egypt needs to know-how to do privatization.<sup>192</sup> It appears that the process faces organizational and institutional obstacles more than technical problems.<sup>193</sup> Mr. Mekashet(2004), the mayor of Quseir, claim that the national government want to privatize the solid waste management in all the Egyptian cities, but many can not afford it or not attractive for SWM companies. For, example, Quseir tried to perform a full privatization but, the company which offered the tender asked for about LE 63 000 per year which, Quseir can not afford.<sup>194</sup>

The Governorate of Red Sea is a main stakeholder in the waste management system in Quseir. The governorate is responsible for formulating a strategy and policy for solid waste management in the region. However, the governorate has no clear policy or strategy for solid waste

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<sup>190</sup> CEDARE (2004). *Assessment of the solid waste management system in Quseir*. Cairo

<sup>191</sup> Elkaial, A.( 2004, 14July). Personal Interview

<sup>192</sup> Coad, A. (2004, 15 July). Personal Interview

<sup>193</sup> Jago, P.( 2004, 3August). Personal Interview

<sup>194</sup> Mekashet, M. (2004, 17July). Personal Interview

management.<sup>195</sup>Further, in 1998 a strategy for MSW in the governorate has been formulated by Tellus Institute (<http://www.tellus.org/>), but this strategy is never be used.<sup>196</sup> . The most striking thing is that, currently he Egyptian Environmental Policy Program (EPPP), a program funded by USAID, is conducting a survey to implement a new strategy to the Red Sea region.<sup>197</sup> The Red Sea was one of the governorates which tried to privatise its SWM, but this program did not succeed. This was because the bids were very high. Moreover, most of the cities have no data about the compositions or the quantities of their MSW.<sup>198</sup>It appears clear that, the Environment Management Unit (EMU) in Hurghada, lack the skilled-staffs even on the top management. For example, the head of EMU was a major in the army and, has not good background on the environmental management.

RSSTI is a project funded by USAID. One of its objectives is to create models and manuals for hotels and tourist resorts on environmentally sound practices (e.g. solid waste management). The tension between the authorities in the Red Sea area has identified as an important obstacle to implement an integrated solid waste management.<sup>199</sup>For example, TDA has conflicts with the Governorate of Red Sea. TDA is an important stakeholder where, it has link with most of the hotels and tourism villages. In Qusier, there is no any kind of connection or coordination between TDA and the city council.<sup>200</sup>

The EEAA's office in Quseir is important stakeholder which has the capacity to participate effectively in the process of solid waste management. Mr. Gad, the head of Quseir office, reports that , although their main task is managing the nearby protectorates, they can participate in any awareness campaign for SWM in the city.

The city council is responsible for the regulatory and local policy issues concerning the municipal solid waste. The city council is the decision maker on the solid waste management in Quseir. The city council has no real policy or strategy for the municipal solid waste.

The city Council has the responsibility to sweep the streets and collect the municipal solid waste from the households where not covered by the local contractor. The mayor of Quseir emphasizes that the main interest of the city council, is to have a clean city. However, it appears clearly that the cost recovery of MSW does not exist in Qusier. This is considered as one of the major problem in Quseir. According to the head of the environment in Quseir, the main interest of the city council to make use a private sector or Non-governmental Organization to manage the MSW system in Quseir. Mr. Sharif sees that the role of Quseir city should be only monitoring and enforcement of the regulations where, this is coincides with the national policy of privatization the solid waste management sector.

Based on the interviews, the major obstacles which hinder the city council from playing its role in ISWM, can be seen a high turnover of the staff who are involved in the process of solid waste management. Further, the staffs who are responsible for MSW are mostly temporary workers. According to the head of the cleansing department, the scavengers have a very low salary and they do not have ability to have paid vacation. Most of those scavengers come from a nearby governorate called Quena. Also, the people have a bad attitude against them. The fleet and maintenance department at the city council does not have problem in the vehicles but it has shortage in the drivers. Further, the city has council does not has the right to put down their requirements to vehicles. The city council receives vehicles but most of them either not appropriate to be used in Quseir or consume large

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<sup>195</sup> CEDARE. (2004). *Assessment of the solid waste management system in Quseir*: Cairo

<sup>196</sup> Madian, S. (2004, July27). Personal Interview

<sup>197</sup> Youseif, M.( 2004, July31). Personal Interview

<sup>198</sup> CEDARE (2004). *Assessment of the solid waste management system in Quseir*: Cairo

<sup>199</sup> Shalaan, I. (2004, July29). Personal Interview

<sup>200</sup> Shareif, S.(2004, July22). Personal Interview

amount of fuel.<sup>201</sup> However, one of the main problems face the city council, is the uncontrolled dumpsite which is located in underground water area and lack of the equipment to improve the dumpsite management.

The Clean Home Organization could be described as small scale enterprise, as it is owned by local contractor. It has franchise to collect municipal solid waste from households, some hotels in Quseir and some hotels near Quseir. However, Clean Home has no capacity to collect the municipal solid from the householders or hotels. Its capacity only is 3.5 tons per day. Further, It does not have the appropriate vehicles to collect the municipal solid waste. Clean home have two vehicles, one is without tipping mechanism and the one, is a tricycle which is too small with a weak structure. Clean home company is still working as a voluntary system and dealing with scattered customers.<sup>202</sup> The problem of fees collection from the householders and lack of skilled workers, have been seen by Mr. Azzam the owner of the company as major problems. Mr. Azzam reports that only 50% of the householders pay the monthly fee. On the other hand, householders claim that Clean Home does not introduce regular services.<sup>203</sup> Clean Home Organization is hiring some workers; those workers have no experience with the waste management and do not have any training on the solid waste management. Most of the hotels have terminated their contact with Clean Home. This is because, it does not introduce regular collections, and it does not have the capacity to fulfil the requirements of the hotels.<sup>204</sup> Moreover, most of hotels claim that, Clean Home brings bad image to tourists where, workers handle MSW in non-environmentally and healthy sound.

The entrepreneur in the dumpsite is one of the main stakeholders in the process of municipal solid waste management in Quseir. The entrepreneur has a franchise to use the dumpsite. This franchise is annually renewed according to a tender.<sup>205</sup> The franchise to use the dumpsite is only one year and this does not encourage anyone to invest in this dumpsite.<sup>206</sup> A sorting of the coming municipal solid waste is carried out in the dumpsite. The sorting is done by some individuals who are hired by the entrepreneur. The individuals do their work without any protection gears.

The dumpsite is uncontrolled dumpsite and unfenced one. It is located in underground area, nearby some fresh waster wells. The residuals from the sorting of the waste are scattered everywhere. Moreover, the dumpsite always has open burring accidents.<sup>207</sup> According to the dumpsite entrepreneur, the sorted recyclables are delivered to recycling factories in Cairo. In the dumpsite, Bedouin families help the individuals to sort the recyclables. This is due to take the organic waste (vegetables, bread residuals), to feed their animals. This prevents camels from roaming in the city<sup>208</sup>. This is seen as a positive thing by the city council as it.

Hotels and their associated diving centres are considered as generators of municipal solid waste. Some of the hotels are doing source separation for their waste. Elmalawany (2004) reports that, this is because; some hotels want environmentally sound practices and image to distinguish themselves from other hotels. However, the investment in environmentally sound practices gives the hotels high returns of waste reduction and energy saving.<sup>209</sup> Most of the Hotels claim that no separate collection of waste

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<sup>201</sup> Abdelmonam, M. (2004, July). Personal Interviews

<sup>202</sup> Azzam, A. (2004, July21). Personal Interview

<sup>203</sup> Khader, N. (2004, July19). Personal Interview

<sup>204</sup> Fathalah, I. (2004, July20). Personal Interview

<sup>205</sup> Shareif, I. (2004, July22). Personal. Interview

<sup>206</sup> Ibrahim, A. (2004, July25). Personal Interview

<sup>207</sup> Mekashet, M. (2004, July17). Personal Interview

<sup>208</sup> Ibrahim, M. (2004, July25). Personal Interview

<sup>209</sup> Shalaan, I. (2004, July29). Personal Interview



nor recycling in Quseir.<sup>210</sup> However, the illegal dumping in the desert and the sea affects on the growing tourism activities in the city. This indeed affects directly on the hotels. However, some of the diving centres claim that, there is no good campaign to raise the environmental awareness of tourists. However, using plastic bags on the board of yachts has seen as a major problem of diving centres.<sup>211</sup> Mr. Gad(2004) reports that these bags kill the coral reef where, it takes many years to be dissolved. There is a decree of Red Sea Governorate to forbid using plastic bags on the board of cruises. Mr. Mekashet (2004) reports that, most of these plastic bags spread from the dumpsite and reach the coast of coral reef. Mr. Shalaan (2004) claims that, forbid of using plastic bags, seems to be hard to be enforced. The solution of this problem could be resolved by separately collection of these small plastic bags at the source. However, there is now a market for these plastic bags which could be recycled again.<sup>212</sup>The dealers in Cairo start to order these bags for recycling.<sup>213</sup> However, based on interviews, it seems clear that, the new system for charging SWM service of hotels is not fair.<sup>214</sup> This is because; occupancy percentage is variable during the year. However, Mr Shareif (2004) claims that hotels generate more than half municipal solid waste in Quseir and they are willing to pay

Tourists could be considered as an important actor in the process of the solid waste management in Quseir. Although, they are not involved in Decision making concerning MSW, but they have effect on waste management process in Quseir. However, tourists considered as generators for solid waste. Most of the tourists, who are interviewed, claim of lack trash cans where they wake and at the commercial establishments (e.g. shops, restaurants). They emphasize that, they need a clean city and no disturbance during their vacation.

The households and the commercial establishments are also considered as main generators for municipal solid waste. The householders do not do source separation at the source.<sup>215</sup> Mrs. Khader (2004) claims that, this is because; there is lack of environmental awareness for the householders. The irregular collection of the municipal solid waste has seen by most of the householders as a main problem. Moreover, it is obvious that there is a lack in the trash cans and the waste bins nearby the households. Even the used bins are small and not suitable for the daily generated waste. Moreover, the emptying of these bins seems to be hard for the workers. However, Mrs Khader (2004) reports that, householders are not involved any more in the decision on the solid waste management For example the city council is going to set up a new fee on the waste management. Most of the people do not know about this new fee system which, will intend to be on the electricity bill. This fee will be LE 5 per months for householders, LE 10 per month for the commercial establishments and LE 5. In Quseir, most of the commercial establishment are very small enterprises, the fee will rise up dramatically from LE 3 to LE10 per month and, this is considered as a high fee. <sup>216</sup> The decree of increase the solid waste management fees is a Red Sea governorate decree and, not a local decree.<sup>217</sup> However, it seems clear that most of the householders and commercial have no enough environmental awareness.

Quseir has four NGOs and their main activities, are awareness-raising for schools, beach cleanups campaigns. These NGOs have no concrete experience in the field of waste management system. For example Quseir Heritage Preservation Associations (HPA), lacks a concrete program to implement and

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<sup>210</sup> Fathalah, I. (2004, July20). Personal Interview

<sup>211</sup> Gad, M.( 2004, July 18). Personal Interview

<sup>212</sup> Elshoaa, A. (2004, July26). Telephone Conference

<sup>213</sup> Ibrahim, A. (2004, July25). Personal Interview

<sup>214</sup> This system charges LE 5 per room per month from each hotel

<sup>215</sup> Khader, N. (2004, July19). Personal Interview

<sup>216</sup> Shareif, S. (2004, July22). Personal Interview

<sup>217</sup> Hemdan, M.( 2004, July25). Personal Interview

manage a system for solid waste management. The fund is common problem among the different NGOs in Quseir.<sup>218</sup> However, it seems clear that the concept of the NGO does not clear even in the top management in the Red Sea governorate.<sup>219</sup> This means, that most of the public authorities are still treat NGOs as a group of profiteers, not a non-profit organizations<sup>220</sup>

The elected council in Qusier officially has role to monitor executive council of Qusier and approve the budget. In practical, the elected council has no such strong role, where it politically assigned . The main interest of the elected council is to ensure cheap SWM services for the municipal solid waste.<sup>221</sup> It seems that far away from the reality. For example, the elected council did not play a role in fixation the new fee system. It is just informed by the decree which has done by the governor.<sup>222</sup> However, the elected council who expected to representative to residents faces problem of the tension between its role as governmental decision maker and its role as intermediary for citizens to keep services affordable.

In conclusion, it appears clear that the relationship between the different stakeholders involved in the MSW in Quseir, are poorly developed and mostly one way. Most of the stakeholders in Quseir operate without knowing much about the other stakeholders. For example the householders do not have an idea how the dumpsite look like, and how individuals are working there. However, the householders themselves are not involved in the process of making decision on SWM in the city. Further, there is potential conflict between the local NGOs and do not have good cooperation or coordination. This could because; the city council would like to support Quseir Heritage Preservation Society to set up transfer station in Quseir, although it lacks know-how skills of SWM. Further, there is no cooperation between Tourism Development Authority and Red Sea Governorate. This hinders any ISWM in the region. This is because; TDA is an independent authority and has a strong link with most hotels in the region where, it issues licences and permissions of work for them.

It appears that, the kinship relations are very important in Quseir and this reflects on the waste management system. For example, Clean Home organization is owned by Mr. Galal Azzam who, is a relative to the Cleansing Department supervisor .This facilitate to Clean Home to work based on a gentlemen agreement with the city council.

### **6.3 Modeling for ISWM in Quseir**

To contribute to solve the problem of the municipal solid waste in Quseir a scenario for ISWM model has been assessed. This Scenario is based mainly on a local Model which has been put in place a small Egyptian city called Nuweiba. In addition to the relevant experience of ISWM in Sweden and Denmark.

However, Nuweiba Model has seen by many as a successful SWM Model which could be put in place in most Egyptian small cities. For example, this model has seen by the United Nation Human Settlements Programme (UN-HABITAT)<sup>223</sup> as one of the best practices in improving the living environment.

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<sup>218</sup> Mansour, F. (2004, August1). Personal Interviews

<sup>219</sup> Khader, N. (2004, July 19). Personal Interview

<sup>220</sup> Iskandar, L. (2004, July15). Personal Interviews

<sup>221</sup> Aish, A.(2004, July24). Personal Interview

<sup>222</sup> Shareif, S. (2004, July 22). Personal Interview

<sup>223</sup> United Nation Human Settlements Programme. (2004). [Online]. Available : <http://www.miljoe.kk.dk/> [2004, July6]

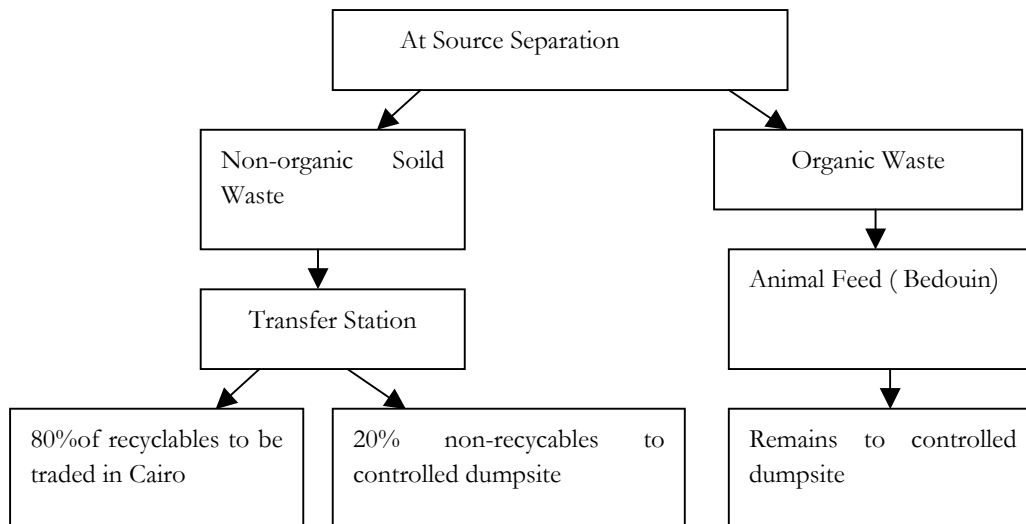
In the following sections, will provide a description for the Nuweiba model, analyse the model and discuss how it might be useful for any ISWM in Quseir. Further, how the Nordic experience can contribute and what modifications should be done.

### 6.3.1 Description of Nuweiba Model

Nuweiba is a small city in the South Sinai governorate. Nuweiba is located on the Gulf of Aqaba . The city has about 7 thousand inhabitants. The city has unique Model of solid waste management. This model is mainly based on the Zabaleen system in Cairo.<sup>224</sup> According to Dr. Iskander, the Managing Director of C.I. D<sup>225</sup>, the aim of Nuweiba model was to design and implement an environmentally sound and economically self-supported SWM system in Nuweiba.

The system is aims to achieve the following:

- To implement at source separation of the municipal solid waste into organic and non-organic through training of residents, hotels staff, tourists and commercial establishments;
- To collect of the waste separated;
- To channel organic waste to serve as a food for animals in keeping with the request of indigenous Bedouins
- To transport the non-organics to a sorting transfer station or Material Recovery Facility(MRF)
- To process plastic, paper, cardboard, glass and metals
- To direct the processed output for trade in Cairo and other centres for eventual recycling;
- To dispose the remaining non-recyclable components into dumpsite<sup>226</sup>



<sup>224</sup> Iskander, L. (2004, July15). Personal Interview

<sup>225</sup> Community and Institutional Development is a Egyptian consultancy which executed Nuweiba model.[Online]. Available : [http:// http://www.cid.com.eg/](http://www.cid.com.eg/) [2004, June16]

<sup>226</sup> Best Practice Database. (2003). Sustainable *tourism development through integrated urban development: Nuweiba, Egypt*. [Online]. Available :<http://www.bestpractices.org/cgi-bin/bp98.cgi?cmd=detail&%20id=20745&key=Eppyfgjkbkfdag/> [2004, June16]

Figure 15 The Nuweiba MSW model

Source: C.I.D (2004)

Hemaya<sup>227</sup> is the local NGO which selected to manage this project in Nuweiba. It undertook all legal aspects of its institutional relationship with the municipality after drafting a contract setting after drafting a contact setting the terms of and conditions between the two parties.

The contract requisites that, Hemaya perform the services of collection, transportation, disposal, recovery, recycling while the municipality provides association with land for setting up transfer station at an annual rental free charged for Hemaya.

A grant from Egyptian Social Fund for Development (SFD)<sup>228</sup> funded the construction of the Transfer station and the expenses incurred by the project in the first year.

Source separation is the main concept of the Nuweiba model but is based on transfer of the experiences of Zabaleen system in Cairo.<sup>229</sup> The project began in Nuweiba with a door-to-door awareness campaign about the concept of at source separation into two components: organic and non-organic. Moreover, the campaign has included the hotels and tourism establishments.<sup>230</sup> The campaign has done by youth from the Association of Protection of the Environment (APE). APE (<http://www.ape-egypt.com/>) is one of the pioneers NGO in solid waste management in Egypt. The aim of the campaign was to explain why we do source separation and know- how to do source separation. Residents place two cans their kitchen. People simple throw away their waste into two containers. This campaign was funded C.I.D, Amoco Oil Company and The European Union's protectorates department through the Egyptian Environmental Affairs Agency (EEAA).<sup>231</sup>



Figure 16 Sorting of recyclables in Nuweiba transfer station

Source: Credit RSSTI (2004)

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<sup>227</sup> Hemaya stands of protection in English

<sup>228</sup> SFD is an Egyptian organization affiliates to the Cabinets of Ministers which funded the non-profit projects in Egypt

<sup>229</sup> Iskander, L. (2004, July15). Personal Interview

<sup>230</sup> Elshoaa, A. (2004, July26). Telephone Conference

<sup>231</sup> Best Practice Database. (2003). *Sustainable tourism development through integrated urban development: Nuweiba, Egypt*. [Online]. Available : <http://www.bestpractices.org/cgi-bin/bp98.cgi?cmd=detail&%20id=20745&key=Eppyfgjkbkdfdag/> [2004, June16]

The non-organic waste only arrives at the station and is loaded on a central conveyor belt where workers sort it to its different components: paper, cardboard, plastic, glass, and metals.<sup>232</sup> According to the head of the transfer station, Hemaya collects 8-10 tons per day. 80 % of the collected inorganic municipal waste goes for processing at the transfer station and the remaining 20% goes to the dumpsite. Hemaya employs workers for collection and transfer station operation. In addition, Hemaya rents truck owned by Bedouin drivers. Recently, after almost five years, Hemaya has bought a truck to collect the municipal solid waste. The waste is collected in separate trucks: one for organic and one for non-organic. All the workers are well educated. Most of them have Diploma of the technical high school. So, it is easy for them to communicate with people and convince the others. However, the station generates monthly revenues which supported its operation. The cost recovery is more than achieved. Moreover, additional profits are directed the beautification of Nuweiba.<sup>233</sup>



*Figure 17 processing of recyclables in Nuweiba transfer station*

*Photo: Credit of R.SSTI (2004)*

Table 13 shows the typical prices of recyclables in Nuweiba city and it reflects the prices of recyclables in Egypt. Table 13 shows that the price of one ton of PET bottles is LE 2500, this because there is a growing market for exporting the crushed PET bottles.<sup>234</sup>

*Table 13 Typical recyclables price at Nuweiba city*

Recyclables	Price(EL/ton)
PET bottles	2500
Plastic	1600
Cardboard and paper	420
Glass	160

<sup>232</sup> Iskander, L. (2004, 15 July). Personal Interview

<sup>233</sup> Best Practice Database. (2003). *Sustainable tourism development through integrated urban development: Nuweiba, Egypt*. [Online]. Available : <http://www.bestpractices.org/cgi-bin/bp98.cgi?cmd=detail&%20id=20745&key=Eppyfgjbkdfdag/> [2004, June16]

<sup>234</sup> Ibrahim, I. (2004, July25). Personal Interview

Dry rice for fish aquacultures	350
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Source: Elshoaa( 2004)

The workers receive a percentage of the revenue each year, in addition to a good salary (about SEK 700 per month). The work condition in the station is very good and convenient to the workers. Moreover, they have their safety equipment. Hemaya managed to sign garbage collection contracts with close to thirty hotels and cafeterias in Nuweiba.

The collection and transportation services for the various waste generating sectors in Nuweiba: hotels, residential unit, cafeterias, restaurants, supermarkets, commercial and institutional establishments. The transportation is regular and one time per day , sometimes the hotels request two daily collection.<sup>235</sup>

El Shooa( 2004) reports that, the transfer station has been equipped by all the required equipments for compacting, crushing and baling the recyclables. These equipments have been bought from The Association of Protection of the Environment (A.P.E) at Cairo. All the used technology in the transfer station is locally made up. The plastic is crushed in the transfer station; the tin, aluminium, paper and cardboard are compacted and the glass sorted into hole and broken pieces. All these items transported to Cairo on trucks that ordinary come to the Sinai with merchandise and go back empty.

### 6.3.2 Analysis of Nuweiba Model

The Nuweiba model is a good model could be put in place in Quseir. However, it appears that this model needs some modifications and requirements to be applied in Quseir. Based on the interviews, Nuweiba model has some obstacles and barriers to be more sustainable and integrated. These obstacles could be defined mainly as institutional and organizational obstacles; in addition some technical obstacles exist. These obstacles could be described as follows.

Hemaya (the NGO which runs the system) has a conflict with the city council which still deals with Hemaya as a profit private company not as an NGO.<sup>236</sup> The city council as a main stakeholder in SWM does not appear understand what it means to be an NGO.<sup>237</sup> So, there is mistrust between the two parties.

Another obstacle faces Hemaya, is that its contract with the city council should be renewed every year and this makes a lot of conflicts with the city council and, bargaining most takes place every year. Further, Hemaya does not own the land of the transfer station and this affect on the sustainability of the project where, the change in management of the city council always leads that it must enter into new negotiation with the new mayor.<sup>238</sup> However, according to the law of the ministry of local development, it is not available to give franchise to Hemaya more than three years, after that this contract must be renewed annually.<sup>239</sup>

Another logistics obstacle is that, the cost of transportation of the recyclables to the dealers in Cairo is very expensive. However, the amount of the recyclables does encourage investing in a recycling project, because Nuweiba is a small city and generate a small amount of recyclables. Currently, Hemaya NGO does not collect the municipal solid waste from the households. The mayor has contracted with a private sector company to collect for free from the households. The city council has contacted with a private company to collect waste from the households.

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<sup>235</sup> Elshoaa, A.( 2004, 26July). Telephone Conference

<sup>236</sup> Ibid

<sup>237</sup> Iskandar, L.(2004, July15). Personal. Interview

<sup>238</sup> In the last five years three mayors of Nuweiba, have been changed

<sup>239</sup> Shaalan, I. (2004, July29). Personal Interview

The council city pays the cost of this service, where in Nuweiba householders do not pay fees for waste management service. However, this new private company is considered as a competitor to Hemaya. Before, Hemaya was collecting municipal solid waste from the households for free but, because a conflict with the city council, it is now forbidden to collect from the households. These events make it clear that institutional framework should be defined strongly to secure the survival of such model.

On the other hand, the main technical problem which faces Nuweiba model is the upgrading the dumpsite which is still uncontrolled dumpsite. However, Elshoaa (2004) reports that, the amount which goes to the dumpsite is a very small amount. This facilitates management of the dumpsite at low cost and in environmentally sound practice. Fencing the dumpsite and cover it continuously, secure environmentally sound dumping.

However, this model has overcome most of the problems which hinder implementation integrated solid waste management in the Egyptian cities (e.g. cost recovery, staff education and skills, public awareness, etc.). In addition, it created jobs for local youth in collection, sorting activities of recyclables. Moreover, it is mainly based on using a local technology at the transfer station.

### **6.3.3 ISWM Model in Quseir**

Nuweiba model in an improved form seems to be good model to be generalized in most of the small Egyptian cities. Despite some faults, this model was very successful in dismantling most of the barriers and the obstacles which face implanting ISWM system in Egyptian small cities. Although, this model faces some of the obstacles, it appears to be environmentally and economically self-supported model. This could be a very suitable model to be applied in Quseir with some modifications to address the weaknesses described above in Nuweiba model. However, the Nordic experience can support implantation such model in Quseir.

Based on Nuweiba experience and the relevant Nordic experience of ISWM, Quseir might implement its own ISWM model. The pillars of an proposed ISWM should rely on the following:

- Source separation of MSW into Organic and Non-organic fractions
- Separate collection of MSW from households and hotels
- Sorting of non- fractions at central transfer station.
- Deliver of organic fraction for Bedouin as fodders for their animals
- Deliver of non-recyclable fractions to controlled landfill
- Deliver of recyclables for recyclers in other governorates.

However, there are some requirements should be delineated to perform such ISWM system. These requirements could be classified to institutional and organizational requirements and good waste management practices (e.g. good collection, transportation and disposal). These requirements will be described as follows:

#### ***Institutional and organizational requirements for ISWM in Quseir***

As we discussed before, Quseir city council has no policy or strategy or plan for MSW management. This should be laid down first to define the objectives of SWM. This strategy should integrate with a regional strategy of MSW of Red Sea governorate. Unfortunately, Red Sea governorate itself does not have a clear SWM strategy. It seems clear that, Red Sea governorate would like to privatize SWM

services, without looking at if privatization is good solution or not. Further, the governorate does not have enough Know-how skills to do assessment of privatization process.

In Sweden and Denmark, municipalities are imposed to design their SWM plans and strategies in integration with the regional SWM plan. These plans should be according to their local condition. However, this is missing in most of the Egyptian governorate.

In Sweden and Denmark, SWM services are introduced on non-profit base. So, it suggested that, the proposed model should be channelled through an NGO, which has a good experience and staff which could manage the project in Quseir on a non-profit base.

Unfortunately, most of NGOs in Quseir do not have the enough experience to carry out such a project. They have to be trained first to be able to do that. For example, Quseir Heritage Preservation NGO intends to manage this project, but it lacks know-how skills and the funding to do.

This NGO made use the private consultancy office which has supported Nuweiba model before and they are looking for funding to proceed. They do not modify it any more; even they did not try to define the obstacles which face the model in Nuweiba.

However; a somehow partnership between the City council and the selected NGO should be established. This partnership must define clearly the roles and responsibilities of the selected NGO and Quseir city council in any proposed ISWM. Further, the selected NGO should involve and make use the existing SWM system (such as the collectors and dumpsite individuals, entrepreneur etc.). This local system has some experience and must be used. For example, the entrepreneur of the dumpsite has a good connection with the recyclers and Dealers in Cairo and other governorates. This experience could be used for marketing the recyclables

Further, it should be granted the land and infrastructure areas for long time, even ownership could be also considered. This will give sustainability for the project. This may require changing the law of land franchise, which gives only the right to informal sector to make use the public land for not more than 3 years.

The source separation is the backbone of this proposed Model in Quseir. However, a source separation campaign should be arranged based on the experience from Nuweiba staff. The Women's Association NGO in Quseir can play an important role in this campaign where the woman in the Egyptian context is the person who is responsible for the house. The regional office of EEAA can participate in this campaign for the households and the hotels.

However, households must also be provided the incentives to do source separation. In Sweden, the main identified factors for enhancement of source separation are the awareness and convenience to people (e.g. providing good appropriate collection system), while in Denmark; they are awareness and requirements of law that people have to separate their waste. It seems clear from the interviews that the hotels in Quseir are very willing to do source separation. Even some of them have already started to do source separation. Also, the hotels expect irregular collection service and separated collection for their waste. Some of them have experience in Source separation and they can offer some kind of training to householders (especially women).

Based on the interviews, it seems clear that, involvement of people in the process of planning enhance the sustainability of any SWM project. However, the city council and the elected council should arrange, and encourage for all the stakeholders to sit together to select the best way to proceed. However, an unbiased, neutral qualified moderator is required to write a proposal to bring all the stakeholders together to conduct and design a win-win project concept and relation among all the stakeholders. The assignment of this mediator could be through a donor organization.



The kinship plays a very important role in Quseir. So, it is very important that all the workers should be from the city itself. However, the awareness campaign should also focus on encouraging the youth in Quseir to participate by working in this project; where there are still social obstacles prevent them from participating in the waste management work. However, in Nuweiba, they dismantled these obstacles by giving the youths 50% of the revenues and a high salary. Creation of jobs will be one of the benefits of this model, and secure its sustainability.

The workers (scavengers and garbage collectors) in the city council as most of them are temporary could be recruited and retrained for the new project in order to improve their situation and involve them in process of collection. This will save the money which goes to the temporary workers from the Cleansing Fund. However, based on the interviews, it was clear that the budget which allocated for temporary scavengers in Quseir does not go totally to recruitment of scavengers. For example some of employees are recruiting as scavengers but in reality he/She works as desk office job. This is because, there is annually budget for recruitment new scavengers at the cleansing department. However, The awareness campaign should emphasize on the role of scavengers and SWM workers, this could change the behaviour and attitudes of people towards them. In Nuweiba model, most of the workers are well educated, and has good skills for public awareness.

Based on Nuweiba model, it seems possible a cost recovery could be achieved and high revenues can be gained. This is because high revenues should be available from selling recyclables and user fees. However, the role of the city council could be only monitoring and enforcement. Moreover, the city council will be involved in collection the fees from the hotels and the householders which will be then turned to the NGO.

The fees will be collected on the electricity bill. According to the head of the electricity directorate in Quseir, the city council will make use the electricity bill's collectors, to collect SWM fees from the householders and hotels. In Sweden and Denmark, fees' charging is base on a full cost accounting of SWM service. This full cost accounting of SWM should be laid down by the city council. This will be very helpful either in SWM planning process or inform different stakeholders about the cost of SWM.

However, to avoid any conflict a percentage of this revenue should go to the city council. This will provide revenue to the city council to improve its staff skills and departments which are involved in the solid waste management. This can built the trust between the NGO and the city council, and this a problem which has been identified in the Nuweiba city. The Nuweiba city council believes that Hemaya (NGO) is a profit making company, that gains a lot of money and the city council does not gain any more.<sup>240</sup>

### ***Requirements for good waste management practices for ISWM in Quseir***

The City of Quseir does not have a good scheme for collection of MSW. A good system for collection should be put in place and established in Quseir. The proposed system could be based on the running collection system in Sweden or Denmark.

There are two kind of collection system might be done in Quseir. The first is based on the bins system. In Quseir, there are two kinds of areas, low rise building area (old city) and, high rise buildings (new parts of the city). The bins could be used in the area of low rise buildings in Quseir. In the high rise buildings, a simple system of the recycling stations could be effective. In Sweden, the term "recycling station" means unmanned station, where there are containers for paper and for packages of glass, plastic, metal and the people bring their separated waste to it.

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<sup>240</sup> Elshoaa, A. (2004, July26). Telephone Conference

They are located within walking distance for the people. However, the design of this station should be modified to be suitable for the situation in Quseir. So, it could be a station with only two containers for organic and non-organic waste. This could prevent the accumulation of the solid waste and facilitate the process of collection. The accumulation of MSW has identified a major problem in Quseir. This is because, the arid weather of Quseir accelerate the decomposing of organic waste. This attracts flies, rodent, in addition of offensive odours emission. The container of the trucks should be separated in order to tip the organic and non organic waste separately. At present, the city does not have a good kerbside system, this should be improved by increase the number of trash cans inside the city. Quseir city council has a good fleet of equipments and trucks but hasn't enough drivers. A possibility of renting some of these cars to the NGO should be discussed.

The transfer station could be designed based on Nwueiba experience. Moreover, all the required equipments which will be used in processing the recyclables are available in Cairo. By some technical assistance from Nwueiba transfer station staff, the technical specification and the order of this equipment could be done. Moreover, a technical training could be conducted by Nuweiba staff.

One of the technical requirements to implement of an ISWM system in Quseir is the upgrading of the dumpsite. The dumpsite is presently uncontrolled one. It is located at 10 km of the city and it is a source for contamination to the underground water in the area. The dumpsite could be upgraded based on an experience of Aswan Governorate sanitary landfill. Aswan is a governorate located to the west of the Red Sea. It is not so far from Quseir. Aswan has implemented a small sanitary dumpsite by assistance from the German Agency for Technical Cooperation (GTZ)<sup>241</sup>. This experience could be transferred to Quseir city. However, in Sweden and Denmark, it appears that have a good experience could contribute in implementation and running of sanitary landfills.

Figure 18 below shows a suggested ISWM system for Quseir. Figure 18 also summarise the roles and responsibilities of different stakeholders to secure a sustainable municipal solid waste system in Quseir.

However, the implementation of the Nuweiba model required an initial financial support and this one of the obstacles which needed to be resolved to start the program. We can say that most of the problem could be institutional and organizational structure. The initial funding for such model should be secured, to work towards improvements and initiate that model. Appendix (3) shows some possibilities for funding such model.

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<sup>241</sup> The Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ).( 2004). [Online]. Available : <http://www.gtz.de/english/> [2004, July25]

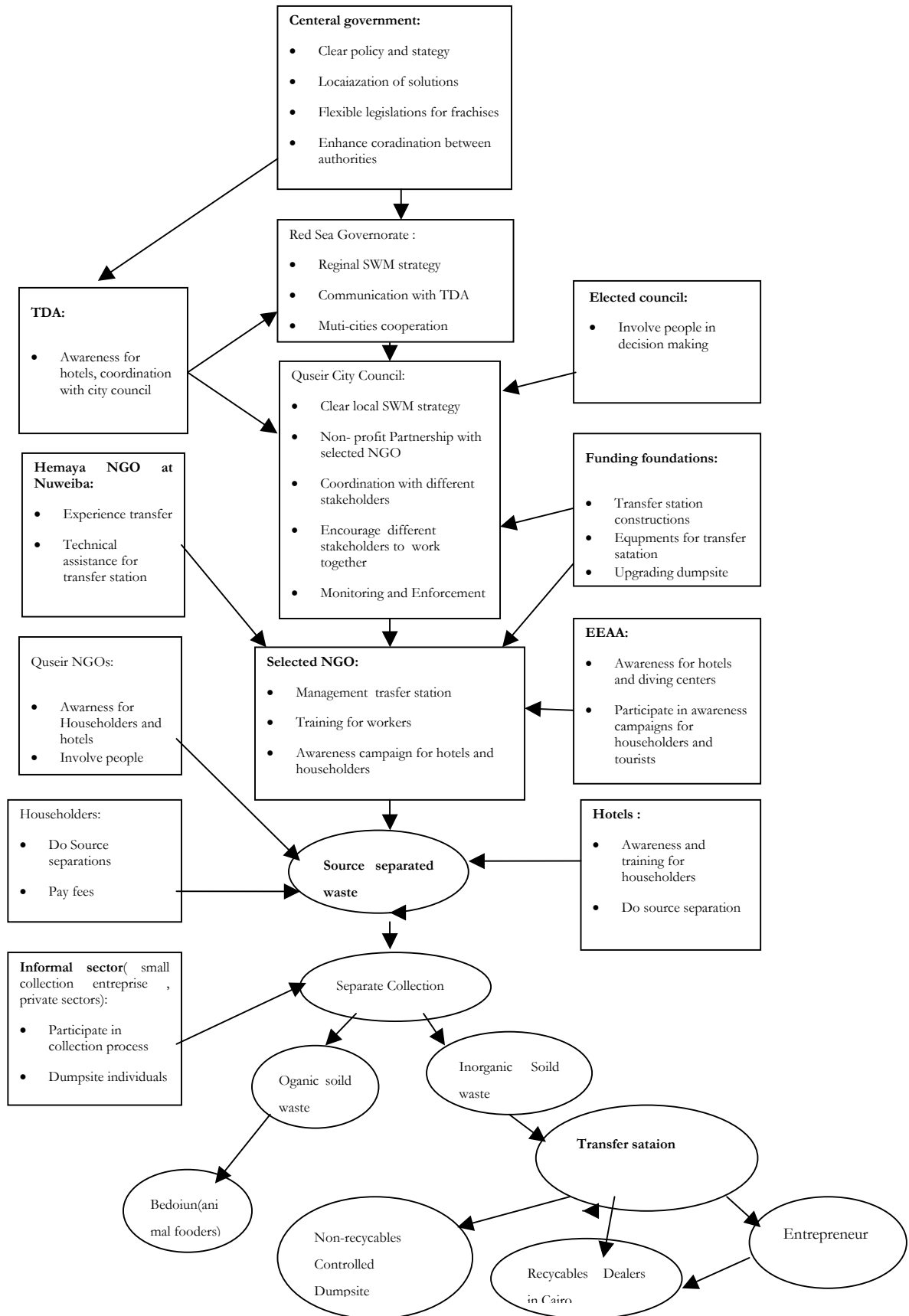


Figure 18 Roles of different stakeholders in an ISWM Model in Quseir

### ***Further proposed modification to the proposed ISWM in Quseir***

However, a possibility of joint company between the municipality of Quseir and a close city called Safaga could be another option to adapt the Nuweiba model. This company could be responsible on managing proposed ISWM in Quseir, instead of NGO in the previous discussed system.

Safaga is a small city located about 40 Km from the north to Quseir. The city has the MSW management problems. As joint company based on Sysav model could be a good option. Sysav Model could offer a good example to be implemented in the Red Sea region. The Sysav model should be adapted to be suitable to the situation in Quseir and Safaga.

Sysav is owned by 14 municipalities. In Copenhagen, there is a joint company (private-public company) is responsible about MSW waste management in the city. This company managed by a private company (R, 98) which owns 58% of the shares of the joint company, while the municipality of Copenhagen owns 42% of the shares. Further, the both joint companies in the south Scania region and Copenhagen are non profit companies. This type of partnership could be achieved, if these cities come together and try to constitute a joint company responsible for Solid waste management in the two cities. However, there are a number of institutional and organizational barriers exist. It must be the responsibility of the Governorate to bring them together to resolve such institutional and organizational obstacles.<sup>242</sup> However, it appears that in Egypt the public-private partnership is not well defined, even on the nation level. Even Quseir tried to privatize its MSW service but, it was offered expensive bidding.

However, this kind of partnership can secure a large amount of MSW waste. The collected waste then could be transferred to a large transfer station. This could secure large volumes of recyclables which could underpin a recycling project in the region with much improved scale economics, rather than sending recyclables for processing in Cairo. Further, upgrading a big sanitary landfill could be an economically effective to the two cities rather than one in each municipality.

## **6.4 C& D waste management In Quseir**

### **6.4.1 Problem analysis**

It seems clear that Egypt does not have adequate policies concerning the management of C&D waste. According to the head of the General Directorate of SWM at the Ministry of State for the Environmental affairs (MSEA), the C&D waste management is not one of their priorities. However, implementation adequate policy and strategy is required to find the integrated solution for the accumulating volumes of C&D in Egypt. This will help the regional governorates and municipalities to formulate integrated solution.

Sweden and Denmark have good policy frameworks for C&D waste management. These policy frameworks make use of many measures to enhance recycling of C&D waste and reduce the amount of C&D going to landfill. These two policy frameworks could be good pointers to Egypt to define its own policy, tolerated to the Egyptian situation.

In the Red Sea Governorate, the growing tourism activities have led to increase in the process of the urbanization in the Governorate. The Red Sea Governorate does not have a strategy to deal with the accumulated piles of C&D waste. The illegal dumping of C&D is the most common C&D waste

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<sup>242</sup> Shareif, S. (2004, July22). Personal Interviews

management practices in the region. The absence of a strong enforcement of the law in an addition to the absence of a practical solution leads to aggravation of the problem.

In Quseir, there is no estimation for the amount of the generated C&D waste in the city. According to the head of the Environment Department, there is not a suitable system to utilize C&D waste and, the prominent C&D waste practice is disposed of it.

Currently, the problem of the C& D waste has seen in Quseir as a lack of appropriate place for disposal. Most of the proposed sites are away from the city and do not have enough capacity for long time. So, the cost of transportation will be very high. This will lead us to another problem that, Quseir has shortage of vehicles and equipment needed to transfer the waste from the city. This is because; C&D waste needs special trucks and vehicles to be transported. However, this leads to the illegal dumping and throwing the C&D waste on the road side, because it is cheaper to the contractor to have a small fine rather than paying a high cost to transport their waste outside the city.

However, the C&D waste problem is more aggravated on the border of Quseir city, where huge piles of C&D waste is accumulated on the roadsides. According to the head of the Environmental Department, these accumulations are located under the Jurisdiction of the Tourism Development Authority (TDA), and this is independent authority and has no office in Quseir. Further, TDA has a conflict with the Red Sea Governorate, and there is no communication between the two authorities. However, improvement of communication is highly required to control the illegal dumping of C&D waste in Quseir.

#### **6.4.2 Best practices solution for C&D waste in Quseir.**

The C& D waste problem seems to be a regional problem in the Red Sea region. In Quseir, it appears impossible to achieve an integrated solution without a national and regional solution to the problem.

However, the Red Sea Sustainable Tourism Initiative (RSSTI) has conducted a study on the C&D waste in the Red Sea. This study recommended using the C&D waste as a coverage layer in the public dumpsite. In Sweden, Sysav make use the equipment from a near mining company to crush the concrete to use it again in pavement of the roads in the landfill. In Denmark, the recycling centre in Copenhagen makes use a mobile crusher to crush C&D waste (e.g. concrete, asphalt, bricks, etc) and use it again. However, the main components of the C&D waste in the Red Sea cities are concrete and bricks.<sup>243</sup>

Based on these options of solutions, a good solution at the moment for Quseir could be proposed. The C&D waste could be used to cover the dumpsite. However, based on the Copenhagen recycling centre, a mobile crusher could be good idea not only for Quseir but also for the nearby cities to crush their C&D waste (mainly concrete and bricks). Otherwise, there is a phosphate mining company in Quseir which could help in renting out some of its equipment to crush C&D waste and also their experiences. However, this need to create a market for this crushed material which is not available at the moment.

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<sup>243</sup> Red Sea Sustainable Tourism Initiative (RSSTI). (2004). *Best practices for solid waste management*. Cairo

## **7 Conclusions and recommendations**

### **7.1 Conclusions**

The integrated solid waste management concept has been seen by many as the most suitable approach to handle the problem of solid waste management in many regions around the globe. ISWM system aims mainly to secure a sustainable environmentally sound and self-economically supported system. However, implementation of ISWM requires some organizational and institutional aspects, in addition to good waste management practices (e.g. good collection scheme, transportation and treatment).

In 2000, the Egyptian government established an ISWM strategy. This strategy aims to secure a sustainable solution SWM in Egypt. However, it was found that there are many constraints still face implementing an ISWM system in Egypt. These constraints have been seen, as institutional and organizational constraints, in addition to technical constraints.

In Egyptian big cities may be there are somehow kind of SWM management systems. However, in most Egyptian small cities there are lacks of such adequate SWM systems.

Quseir is an Egyptian small city that has a problem with solid waste management. It has been showed that, the existing solid waste management system does not satisfy the expectations of the different stakeholders in the city. The city is looking for a proper system which should be environmentally sound and economically self-supported. However, the growing tourism activities in Quseir, has given it incentives to improve its solid waste management system.

It was found that, the problem of solid waste management in Quseir is a combination of institutional and organizational problems, in addition to lack of good waste management practices (e.g. good collection, transportation and final disposal). This study has been found that Quseir city council has no clearly defined policy or strategy for solid waste management. Further, there is a lack in skilled and well trained SWM staff. It was apparent that, there is limited public awareness and limited participation of public in decision making. Further, it has been showed that, cost recovery of SWM service, does not exist in Quseir. However, it was found that, Quseir lacks adequate MSW collection scheme. Additionally, it has been showed that, dumping of MSW is the prominent MSW practice in Quseir. Quseir has uncontrolled dumpsite, where is located 10 km of the city centre in underground water area. In the dumpsite, a process of recyclables sorting takes place by an entrepreneur. This dumpsite is posed risk on health and environment.

In Quseir, it was found that, the relation between different stakeholders, who are involved in SWM system, was mostly in one way. Further, it was found that, there are potential conflicts between some of them. However, implementation of an ISWM in Quseir requires dismantling and addressing all these previous constraints.

This study has showed SWM system in another small Egyptian city called Nuweiba. Nuweiba has formulated an environmentally and economically self-supported model to manage its municipal solid waste. This model has been seen by many as one of the best practices in the world. This model is totally running by a local NGO called Hemaya. However, the system is not a new model in Egypt but it is adapted from the Zabaleen model which for more than 60 years has run the solid waste management in Egypt's big cities.

The Nuweiba model depends on source separation of the municipal solid waste into organic and non-organic fractions. The organic fractions go to the Bedouin which are used it as fodder for their animals. The non-organic fractions go to a transfer station where a process of sorting recyclables takes places. This transfer station is equipped with locally made technology. The sorted recyclables are then

sent to dealers of recyclables in Cairo. The revenue from selling these recyclables, in addition to the monthly collected SWM fees, covers and exceeds the cost of the waste management service.

It was found that, the Nuweiba model could be helpful to improve SWM system in Quseir where, it has dismantled most of the barriers which face implementation of ISWM in small Egyptian cities.

However, it was found that Nuweiba model is not without problems. This study showed that, Nuweiba model has some obstacles which hinder it to be more sustainable. It was found that most these obstacles are institutional and organizational constraints. However, these constraints have been identified to be avoided in any proposed ISWM model in Quseir.

This study has showed that the Nordic countries have well developed Integrated Solid Waste Management system (ISWM). Further, it has been showed that, the main drivers for ISWM in the Nordic countries are coming mainly from strong regulations, in addition high expectations from different stakeholders for good SWM system. It was found that, the Nordic experience of ISWM can be a very helpful to support any proposed SWM model in Quseir.

In Denmark and Sweden, municipalities are obliged to put in place their own SWM strategy based on their local situations. This is a very important concept which is still missing in most of the Egyptian cities, and it is even missing on a regional level. Also, it has been found that, SWM service in Denmark and Sweden is introduced on non-profit basis. This should be taken into consideration for any system in Quseir. Further, the Public-Private Partnership (PPP) examined in Lund and Copenhagen, appears to be well developed. Unfortunately, this kind of partnership is still unclear and not well formulated in Egypt. However, the experience from the waste management system in the South Scania region and Copenhagen city could be used to modify Nuweiba model. For example, the collection system in the two cities (Copenhagen and Lund) could help implementation a good collection scheme in Quseir. However, it was found that source separation of MSW is main element of the ISWM system in Denmark and Sweden. It was found that, Egyptian cities are required to adopt source separation as main component of any ISWM system. Further, the concept of managing of the sanitary landfills in Sweden and Denmark could be helpful to upgrading the dumpsite in Quseir. However, it has showed that, transfer of the Nordic knowledge and information of ISWM is more suitable and helpful to Egyptian small cities than technical issues.

Based on the experience gained from Nuweiba Model experience, and relevant experience from ISWM systems in Sweden and Denmark, a proposed MSW model in Quseir has been shaped. This model is simply depending on source separation of MSW waste into organic and non-organic fractions. The organic fraction goes local Bedouin as fodders for their animal and non-organic fractions for processing in a transfer station. The revenues mainly will come from monthly SWM fees and selling of recyclables. However, it was found that all the competent stakeholders have roles and responsibilities to sustain such model. This roles and responsibilities have been identified for each stakeholder. However, this study has suggested that this proposed model could be run by local NGO on a non-profit basis. However, Quseir tried before to make use a private sector company to be responsible for the SWM service in the city, but it was found to be hard for a small city to afford the high bidding of such private service. However, private sectors are promoted to participate in collection of MSW and marketing of recyclable. This could be done through cooperation and coordination with a private sector.

C&D waste is another growing environmental problem in Egypt. C&D is mainly arising from construction of new buildings, demolition and renovation of old building. However, this study has showed that, Egypt has no clear policy or strategy to manage its C&D waste. Subsequently, it was found that, Egypt has not accurate estimate of its generated C&D waste or the compositions of such waste. Further, it was found that, the prominent C&D waste management practices, is illegal dumping on the roadsides.

In the Red Sea Governorate, the problem of C&D is growing everywhere with increase urbanization in the governorate. Most of the C&D waste in the Red Sea Governorate is mainly coming from the building of the new hotels nearby the cities. It has been showed that, it is common to find huge piles of C&D waste on the main roadsides in the governorate. However, there is no good estimate to the amount or composition of the generated C&D waste in the region or the composition of it.

In Quseir, the main source of C&D waste comes from construction of the new building or hotels, in addition to the renovations of the old buildings in the city. It was found that, the generated C&D waste goes to an old Quarry which is about to be filled up in few months. Then the city council will have to find another dumpsite for the C&D waste. However, it was found that the, problem is more serious on the edges of Quseir city. This is because; there are huge accumulations of C&D waste. These accumulations are arising from building of nearby hotels. Further, it was found that, Quseir city council has no right to enforce law in this area where, it is belonging to the jurisdiction of Tourism Development Authority (TDA). TDA is an independent organization belongs to the ministry of tourism. Further, it was found that there is a conflict between the Red Sea Governorate and TDA which hinders coordination and cooperation between them.

However, this situation is complicated somewhat, as any solution to this local problem must be found at a regional level. Further, in Egypt, absence of national policy or strategy for C&D waste problem has not prioritized it, despite its clear impact.

This study has showed that, Sweden and Denmark have policy frameworks for managing, C&D waste. These policy frameworks make use a number of measures to enhance the recycling of C&D waste, reduce landfilling of C&D waste. These policy frameworks, in addition to Nordic C&D waste management technology, can be used to help Egypt to formulate its C&D waste policy and strategy. Further, it was found that, the recycling technology for C&D could be also very helpful, not only for Quseir but for whole the region.

At present, it was found that, the best practice to handle C&D waste is to use it as coverage to the dumpsite in Quseir. However, it was found that Quseir city council does not have suitable equipment to transport this kind of waste, as transportation of such waste needs special heavy trucks. On the hand, Quseir city council has equipment to transport the municipal solid waste, not C&D waste.

## **7.2 Recommendations**

Implementation of a sustainable ISWM in Quseir is the responsibility of many stakeholders, who are involved directly or indirectly in the process of solid waste management in Quseir. Those stakeholders are represented on national, regional and local levels. However those stakeholders have different roles to support an ISWM system in Quseir.

### ***National Government***

At the National level, the national government should encourage the regional governorates and municipalities, to establish their own regional strategies. These strategies should be formulated according to their local conditions. These strategies should contain information on waste quantities and composition, the use of waste treatment methods, and the measures planned by the municipality/governorate to reduce the quantity and environmental impacts of waste. Further, the national government has responsibility to improve communication between different stakeholders on the regional level. For example, In the Red Sea Governorate, the national government has the responsibility to improve communications between TDA and Red Sea Governorate. This will help implementation of ISWM in Quseir where, TDA has a good link with all the hotels in the region. This can be achieved by coordination and cooperation between Ministry of State for Environmental Affairs, Tourism Development Authority and Ministry of Tourism.



This study has showed, there is a growing market of recyclables in Egypt. The National Government should encourage of adaptation of recycling technologies on regional level. This strongly requires a clear policy for enhancement of recycling activities. Delineation of clear institutional and organizational measures of recycling activities would encourage involvement of private sector. Moreover, such recycling activities will strongly support any ISWM on regional levels. Subsequently, it will support ISWM system in small cities which mainly depend on revenues from selling recyclables to cover SWM cost. However, this needs a further concrete feasibility study based on environmental and market oriented dimensions.

### ***Regional Governorate***

At the regional level, Red Sea governorate should formulate its own solid waste management strategy; this will help Quseir to formulate its strategy and SWM plan. This could be achieved by transfer experience from some nearby governorates which have already put in place their SWM strategy. Further, Red Sea governorate should make use the previous studies on MSW in Red Sea region. However, this study has showed that small cities do not have such possibilities to draw up their own waste management plan. Giving more possibilities for small cities to formulate their SWM should be strongly committed and supported at regional level.

However, this also should be accompanied by training for SWM staff on how to make SWM plan. Further, Red Sea governorate has another important role to enhance cooperation between different cities to manage their SW. This can lead to more integrated solution for solid waste management problem in Red Sea region. For example, if there is cooperation between two or more neighbour cities, this could lead to design a one ISWM for these cities. This can lead to reduce the cost of SWM service. For, example these cities can use one dumpsite rather than a dumpsite in each city. Further, this Multi-cities cooperation system can have one large transfer station for sorting and processing of recyclables. This transfer station will encourage adaptation small scale recycling enterprises in the region. However, such multi.cities cooperation needs to be committed and enforced by the Red Sea governorate. Moreover, it needs further study on the quantities, composition of MSW in the different cities of Red Sea region.

### ***Stakeholder Hearings and Synergy Workshops***

In Quseir, the city council and elected council have the responsibility to bring together stakeholders to be involved in the process of solid waste management. Moreover, the city council should define clearly the roles and responsibilities of each stakeholder in any proposed SWM system. Further, city council should allocate a place for the transfer station and, ownership of this land by the selected NGO, should be discussed. The responsibility of Quseir city council can be monitoring and enforcement of environmental laws, in addition of collection of SWM fees and, sweeping and cleaning of main streets. However, Quseir City Council needs well skilled staff; this will contribute to execution its tasks.

### ***NGOs***

Quseir city council has tried before to privatize its SWM system. This was not successful because high bidding of offered private sector. However, in Quseir, opportunities exist for NGOs to manage an ISWM system. At present, the local NGOs lack know-how skills to run any proposed SWM system in Quseir. These skills could be transferred from Hemaya NGO in Nuweiba. This study has showed that there are potential conflicts between different NGOs in Qusier. These NGOs should come together and try to find a somehow of partnership in the process of solid waste management. Moreover, the selected NGO must involve the existing system (e.g. collectors, individuals of dumpsite, etc.) in the proposed SWM system. For example, the entrepreneur has good experience with recyclables marketing. The selected NGO can make use this entrepreneur for marketing of its recyclables. Based on the interviews, it was found that, Quseir Heritage Preservation Association (HPA) is willing to run any

ISWM in Quseir. They already started to contact the consultancy office which supported Nuweiba model. Further, they tried to find fund for their project but, they could not secure the required fund.

### ***Donor organisations***

Donors have opportunities to support such system. Donors can financially support the infrastructure of the project, training of staff and the awareness campaigns. Moreover, they can assign a mediator to lay down a developed proposal for a solid waste management system in Quseir. This proposal must emphasize on dismantling all the organizational and institutional obstacles, in addition to technical obstacles which can hinder the sustainability of such project.

This study has showed that, a SWM strategy for Red Sea Governorate, have been developed five years ago by a donor agency. However, this strategy hasn't been used. Red Sea Governorate needs to develop its SWM strategy. Donor's organizations can contribute to implement such strategy with taken into consideration two points:

- Looking at the previous strategy and examine what has been done and what is need to be completed
- Transfer experience from nearby governorates who already have put in place their SWM strategies

However, it has been showed that, donors can play important role in financing a study on adaptation of recycling activities in the region. Adaptation of recycling technologies can contribute to secure a sustainable and self-economically supported SWM system in small cities (e.g. Quseir) of Red Sea region. Moreover, it will create much of jobs which will reflect positively on the local society.

### ***C&D Waste Management***

In Quseir, a local solution for C&D waste seems to be hard. The problem needs an integrated solution on the national and regional level. This should be done through formulation a clear policy and strategy to handle C&D waste. This policy and strategy should be formulated on the national level. However, there is lack of information on quantities and composition of generated C&D waste in Egypt. Further there is lack of information on the stakeholders who are involved in C&D waste management. The Donor organization can play important role in financing a study to lay down a national strategy for C&D waste management

## **7.3 Suggestions for further research**

It was found that, most sorted recyclables in the Red Sea region, are delivered to recyclers in Cairo. Further, the cost of transfer such recyclables is quiet expensive where, in some cases it represents more than 60% of its price value. Adaptation of recycling technologies in Red Sea region is required to be taken into consideration, where it will support financially any integrated solid waste management system in the small cities. Moreover, adoption of recycling activities will create more jobs for local people.

However, there is missing of knowledge and information on the opportunities and barriers of adaptation such recycling technologies in the region. There is a need for an integrated study on the options for enhanced recycling activities in the region. The Red Sea governorate lacks skilled staff and required financial resources to achieve such integrated study. This study could develop a framework for enhanced recycling strategy, and develop an implementation plan for pilot recycling plant in the region. However, this study can explore the requirements to involve the private sector in such recycling activities. These least requirements can be the organizational and organizational requirements, in addition to technical requirements.

C&D waste management is very apparent problem in Egypt and needs to an integrated solution. Egypt does not have a real policy or strategy to handle C&D waste problem. Integrated solution of C&D waste problem in Egypt needs formulation a clear policy and strategy on the national level. This will give opportunities to address the problem on regional and local levels. Unfortunately, there is missing in information, knowledge and technology to lay down such strategy or policy. However, a further research is strongly required to formulate such policy and strategy on the national level. This research should develop measures to achieve such strategy and define the role of different stakeholders.

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## **Abbreviations**

APE Association of the Protection of the Environment

C&D Waste Construction and Demolition Waste

CEDARE Centre for Environment and Development for the Arab Region and Europe

CBO Community Based Organization

CID Community and Institutional Development

DEPA Danish Environmental Protection Agency

EEPP Egyptian Environmental Policy Program

EEAA European Environment Agency

EEAA Egyptian Environmental Affairs Agency

EMU Environmental Management Unit

Environmental Assessment and Management

KMC Copenhagen Recycling Centre

GIS Geographic Information Systems

ISWM Integrated Solid Waste Management

MSW Municipal Solid Waste

MSEA Egyptian Ministry of State for Environmental Affairs

METAP Mediterranean Environmental Technical Assistance Program

NEAP Egyptian National Environmental Action Plan

NGO Non-governmental Organization

PPP Polluter Pays Principle

RVF Swedish Association of Solid Waste Management SEAM Support for

RSTTI Red Sea Sustainable Tourism Initiative

RBO Regional Branch Office

SEPA Swedish Environmental Protection Agency

TDA Tourism Development Authority



USAID United State Agency for International Cooperation

WCD Waste Centre Denmark

## Appendix1: List of Interviewees in Denmark and Sweden

Organization	Date	Person(s) being interviewed /questioned	Role description	Interviewer	Topic	setting
SYSAV	9-June, 2004	Raul Gronholm	Advisor-Sysav recycling	Ali Abo Sena	C& D waste management in Sweden( South Scania)	Meeting
SYSAV	11-June , 2004	Raul Gronholm	Advisor-Sysav recycling	Ali Abo Sena	Municipal Solid Waste Management in Sysav region	Meeting
RVF	14-June, 2004	Bo Audelius	Head of department of solid waste collection and transportation	Ali Abo Sena	The system of municipal solid waste management in Sweden	Meeting
Lund Municipality	19-June, 2004	Anna Gothe	Head of Environment department	Ali Abo Sena	- The Municipal Solid waste management system in Lund  - C&D waste management	
COWI company at Denmark	28-June, 2004	Kresten Bernsten	Solid Waste management specialist	Ali Abo Sena	The municipal solid waste management system in Denmark  - Municipal Solid waste management in the Egyptian low income cities.	Meeting
Lund University	29-June, 2004	Catarina Thormark	PhD in Construction and Demolition waste management		C&D waste management in the Nordic countries (Denmark and Sweden)	Telephone Conferenc e & Email
Nordic council of Ministers	22-June, 2004	Stefan Gislason	Environmental officer	Ali Abo Sena	Municipal solid waste management projects in the Nordic countries	Telephone

Copenhagen Recycling Centre	1-July, 2004	Jens Nejrup	Head of the centre	Ali Abo Sena	The process of recycling in the Copenhagen recycling Centre	Email
Kalmar University	2-July, 2004	William Hogland	Professor of Solid waste management	Ali Abo Sena	MSW in the low income cities in the developing countries	Emails & Telephone Conferences
Copenhagen Municipality	4-July, 2004	Lena Ebjer	Environmental officer	Ali Abo Sena	MSW in Copenhagen city	Telephone Conference

## Appendix 2: List of Interviewees in Egypt

Organization	Date	Persons(s) being interviewed/ Questioned	Role description	Interviewer	Topic	Setting
Egyptian Environmental Affairs Agency (EEAA)	14-July, 2004	Amin ElKaial	Head of the general directorate of municipal solid waste management	Ali Abo Sena	National Strategy for ISWM, Barriers and obstacles of ISWM in Egypt.	Meeting
Centre for Environment and Development for the Arab Region and Europe (CEDARE)	14-July, 2004	Maha Akrouk	Programme Manager	Ali Abo Sena	Assessment of solid waste management in Quseir	Meeting
National Programme for Privatization of Solid Waste Management (NPPSWM), GTZ project	15-July, 2004	Adrian Coaid	Program consultant	Ali Abo Sena	Privatization of SWM in Egypt	Meeting
Community and Institutional Development (CIA) and The Association for the protection of the Environment, (APE) (NGO)	15-July, 2004	Liala Iskander	General Manager of CIA and Board member of APE	Ali Abo Sena	-The Nuweiba model for municipal solid waste - Zableen model in Cairo - Role of NGOs in SWM	Meeting
NPPSWM, GTZ project	15- July 2004	Maha Kallaf	MSW expert	Ali Abo Sena	-Privatization of MSW in Egypt , The sanitary landfill of Aswan Governorate in Egypt	Meeting
Quseir City Council	17-July, 2004	Mohamed Mekashet	Mayor of Quseir	Ali Abo Sena	-Solid waste management problem in Quseir -Privatization Issue of MSW - C&D waste in Quseir -Joint Company for municipal solid waste in Red Sea region -Nuweiba model of MSW management	Meeting
Protectorates department, EEAA, Quseir	18-July, 2004	Mohamed Gad	Head of office	Ali Abo Sena	Role of protectorate department in MSW in Quseir	Meeting
Women Association in Quseir (NGO)	19-July, 2004	Nagat Khder	Head of NGO	Ali Abo Sena	- Explore their opinion about the MSW in Quseir - Source separation of MSW - Their role in the system of MSW in the city - Obstacles and barriers - Privatization of MSW	Meeting
Falmanco Hotel	19-July 2004	Hussein El-Malwany	Head of Human Resources	Ali Abo Sena	-Solid waste management services in Quseir - Source separation - MSW Fee	Meeting
Movinpique Hotel	20-July, 2004	Ibrahim Fathalah	Environmental Affairs officer	Ali Abo Sena	-Solid waste management services in Quseir	Meeting

					- Source separation - MSW Fee	
Head of Cleansing department in Quseir City Council	21-July, 2004	Ahamed Azzam	Head of department	Ali Abo Sena	Problems of MSW in Quseir (collection, transportation, disposal) - Employees problems - Privatization of MSW - Staff training	Meeting
General Directorate of Electricity	21-July, 2004	Mostaf khaled	Head of the directorate	Ali Abo Sena	Proposal of collection of MSW fees on the electricity bill	Meeting
Clean Home company (collection small company)	22-July, 2004	Galaa Azam	The owner of the company	Ali Abo Sena	-The collection system of Clean Home company -Their capacity to collect MSW -Their problems and obstacles	Meeting
Diving Centre of Movenpique hotel	22-July, 2004	Mikael	Head of centre	Ali Abo Sena	-Waste management system in the diving center  -Their comments on the MSW in Quseir City  - Handling of plastic bags in diving centre	Meeting
Quseir City Council, Financial department	24-July, 2004	Ahmed Mostafa	Account	Ali Abo Sena	The expenditures and revenues of MSW management in Quseir in the fiscal year 2003/2004	Meeting
Elected Council of Quseir	24-July, 2004	Adel Aish	Board committee member	Ali Abo Sena	Roles of elected council in MSW management in Quseir	Meeting
Quseir City Council	25 July, 2004	Mohamed Hemdan	Deputy of Quseir Council	Ali Abo Sena	- Management culture in the city council -Coordination to address lecture to the Women Association in Quseir *	Meeting
Dumpsite Entrepreneur	25-July, 2004	Ashraf Ibrahim	Entrepreneur	Ali Abo Sena	-Dumpsite problems -Sorting of recyclables -Prices of recyclables - Market of recyclables	Meeting
Hamaya NGO at Nuweiba city	26-July, 2004	Ahmed El Shoa	Transfer station Manager	Ali Abo Sena	-Nuweiba model for waste management  -Obstacles and barriers	Telephone conference
Quseir City council , Fleet and Maintenance	27-July,	Abdelmoneam	Head of the fleet and maintenance	Ali Abo Sena	Role of the fleet and maintenance department in the	

department, Quseir city Council	2004	Mohamed	department		process of MSW management in Qusier  -Obstacles and barriers	
Red Sea Governorate, General Directorate of Environmental Management	26-July 2004	Said Madian	Head of Environmental projects department	Ali Abo Sena	- Solid waste management policy in the Red Sea governorate  - Dumpsite problems in the Red Sea	Meeting
Quseir City Council, Environment Unit	17-27 July, 2004	Salah Shareif	Head of Environment Unit in Quseir	Ali Abo Sena	-SWM system in Quseir and its obstacles and barriers	Meeting
Red Sea Sustainable Tourism Initiative (RSSTI), USAID project	29-July, 2004	Ihab Shalaan	Project coordinator	Ali Abo Sena	-RSSTI,s role in MSW of hotels in Red Sea  - obstacles and barriers of MSW in the red sea region  -Privatization of municipal solid waste  - C&D waste in the Red Sea Governorate	Meeting
Egyptian Environmental Policy Program(EEPP)	31 July, 2004	Majeed Yousef	Waste management expert	Ali Abo Sena	-Construction and demolition waste in Egypt  - Privatization of MSW	Meeting
Quseir Heritage Preservation Society (NGO)	1-Aug., 2004	Farid Mansour	Head of the NGO	Ali Abo Sena	Their role in MSW in Quseir  - option of managing MSW by NGO in Quseir  - Their capacities and their experience, their program  - Obstacles and barriers  - company for MSW in the region	Meeting
Quseir Heritage Preservation	2-Aug., 2004	Abedel Aziz Mahmoud	Board committee member	Ali Abo Sena	-Privatization of MSW in Quseir  - NGO requirements for MSW	Meeting

SEAM project	3-Aug, 2004	Philip Jago	Project Manager	Ali Abo Sena	-Problems of MSW management in Egypt  - Privatization of MSW in Egypt  - Community based organization for MSW management	Meeting
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\*The interviews included addressing lectures to the women association in Quseir and setting up meetings with 3 families from Quseir. Also, they included meeting with some Bedouins in the dumpsite (local indigenous people). Further , it included working as a scavenger with the cleansing department in Quseir for one day, where I met the individuals who are working in sweeping and collection solid waste in addition to people working in the sorting of MSW in the dumpsite. Moreover, these interviews included meetings with some tourists in the city to explore their opinion about the cleansing status of Quseir. On the other hand, the interviews included meeting some retailers to explore their opinion about the new fees system in Quseir.

## **Appendix: 3 Some Funding Opportunities**

### **1- Egyptian Environmental Affairs Agency**

#### **Egyptian Environmental Protection Fund (EPF)**

30 Misr Helwan Agricultural Road, Maadi, Cairo, Postal code 11728, Egypt

Tel: 002 02 5256452

Fax: 002 02 5256490

### **2- Leif – UNDP**

**Address:** Zahraa El Maddi Masaken Misr El tameir, Building 3, Cairo, Egypt

**Contact Person:** Emad Adly

**Tel:** 202-516519/516245

**Fax:** 202-5162961

E mail : [aoye@link.net](mailto:aoye@link.net) , [emad.adly@undp.org](mailto:emad.adly@undp.org)

### **3- Egyptian Swiss Development Fund**

**Address:** 14 Abdel Moneim Reiad st, El Mohandesin, Giza, Egypt

**Contact Person:** Dr. Max Gigger- Executive manager

**Tel:** 202-3380732-3380731

**Fax:** 202-3381277

### **4- Sawiris Foundation for Social Development**

**Address:** 22 El Montazah st, El Zamalik , Egypt

**Contact Person:** Mona Faeik, Huda Saweirs- Project managers

**Tel:** 202-7366783/7362012/7364841

**Fax:** 202-7362013

E mail : [sawirisfoundation@link.net](mailto:sawirisfoundation@link.net), [info@sawirisfoundation.org](mailto:info@sawirisfoundation.org)

Web site: [www.sawirisfoundation.org](http://www.sawirisfoundation.org)



## **5- Netherlands Embassy**

**Address:** 18 Hassan Sabry st, El Zamalik , Egypt

**Contact Person:** Locil Meriks

**Tel:** 202-735955-

**Fax:** 202-7357928

E mail: [kia-os@minbuza.nl](mailto:kia-os@minbuza.nl)

Web site: [www.holandemb.org.eg](http://www.holandemb.org.eg)

## **6- The Short and Medium-term Priority Environmental Action Programme (SMAP).**

Address: European Commission  
Environment DG  
Information Centre  
Office: BU-9 01/11  
B - 1049 Brussels  
Belgium  
Fax: +32 (0)2 299.61.98

Web site: <http://europa.eu.int/comm/environment/smap/home.htm>

## **7- Swedish International Development Agency**

20 Sveavägen, Stockholm, Sweden

Web Site: [www. Sida.se](http://www.Sida.se)







