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Promoting Recycling in the Solid Waste Management System of Cairo

A Thesis Submitted to

Sustainable Development Program

in partial fulfillment of the requirements for
the degree of Master of Science in Sustainable Development

by **Iman Mostafa Kamel Mostafa**

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Abstract

Waste management system in Cairo has been noticeably witnessing deterioration over the last fifteen years, where the entire chain of activities have deficiencies; including collection, transportation, recovery, and disposal systems. Although waste recycling is a vital element of a sustainable waste management system, as it contributes to benefiting the environment through the efficient use of resources, the society through creating job opportunities, and the economy through attracting new investments, in Egypt it is not included in the policy framework, and it is hardly a part of the formal system and is only performed by the informal sector.

This thesis identifies the gaps in the existing legislative, institutional and financial frameworks of the Solid Waste Management (SWM) system in Egypt and specifically in Cairo, that hinder mainstreaming waste recycling in specific in the policy framework. It also finds win-win situations for the parties involved in the SWM sector that would promote the recycling activity. Finally, it proposes new ways for managing the different SWM activities (collection, transportation, recovery and disposal) that would lead to successful recycling practices. The result from this study indicates that the reasons why waste recycling is not promoted in Cairo are the lack of financial autonomy, deficiencies in the legislative and institutional setup, and weaknesses in the governance of the SWM process. Accordingly, policy recommendations are proposed in addition to a SWM initiative for Cairo that clarifies the roles of each stakeholder and reform the whole chain of activities of the SWM system of Cairo, through integrating the informal sector and encouraging the local private sector participation in a way that would promote waste recycling.

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List of Abbreviations

AMANA	General Secretariat for Localities, MOLD
APE	Association for the Protection of the Environment
CCBA	Cairo Cleaning and Beautification Agency
CMU	The Contract Monitoring Unit
EEAA	The Egyptian Environmental Affairs Agency
EPR	Extended Producer Responsibility
GE	Green Economy
GIZ	The German Federal Enterprise for International Cooperation
ISWMS	Integrated Solid Waste Management System
MOLD	Ministry of Local Development
MSWM	Municipal Solid Waste Management
NSWMP	National Solid Waste Management Programme
RDF	Refuse Derived Fuel
SWM	Solid Waste Management
WMRA	Waste Management Regulatory Agency

Chapter I: Introduction

1. Background

On the global scale, the last five years have been witnessing the emergence of the concept of “Green Economy” (GE) especially in the mainstream of policy discourse, and environmental economics. GE is defined as the economy that is resource efficient, low carbon and socially inclusive. Also, it is the economy that leads to social equity, improved human well being, while considerably decreasing environmental risks and ecological scarcities (UNEP 2011). GE is becoming commonly related to the finance ministries, and is regarded as a mean to achieve the global goal of sustainable development and poverty eradication.

Sustainable Development is commonly defined as “the development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (UN, 2016). It was agreed among the UN agencies worldwide that GE is a driver to sustainable development and that “to achieve sustainable development and a higher quality of life for all people, countries should reduce and eliminate unsustainable patterns of production and consumption and promote appropriate demographic policies.” Rio Declaration, Principal 8 (UN 1992) (UNEP 2011). Therefore the two concepts of GE and Sustainable Development are closely related to the concept of Resource Efficiency, which can be defined as using the limited resources that exist on the planet in a sustainable manner while minimizing negative effects on the environment. Resource Efficiency supports the concept of delivering the maximum value with the least input (Europa, 2015).

In this context, waste recycling is one of the activities that plays an integral role in the transition toward a GE, since it is closely related to resource efficiency, and it is aiming at using the raw materials more than once, thus maximizing the value with less input (UNEP). Waste recycling falls under the umbrella of Solid Waste Management (SWM). There are three main ways of waste management; first way is the easiest, least economic and least environmental friendly, which is the dumping or landfilling, second way is the reuse or recycling, and third way of waste management is the WTE (Waste to Energy) processes.

Waste recycling has several economic benefits; it substantially saves resources and generates jobs. For instance, composting leads to the development of organic

agriculture, which benefits the rural ecosystem and the small farmers. In fact, the waste-recycling sector employs around 12 million people in China, Brazil, and United States. Sorting and recycling activities alone provide ten times more jobs than garbage incineration and landfilling on a per tonne of waste basis (Stefanie and Shaker, 2015). Having a greener waste sector that mainstreams recycling, as a core activity would eliminate the traditional waste disposal and treatment techniques such as the incineration and landfilling which harmfully affect the environment and waste the resources. It would rather direct the waste management practices towards the 3Rs strategy (Reduce, Reuse, Recycle) based on the approach of Integrated Solid Waste Management (ISWM) recognized internationally, that prioritizes waste treatment activity as per the below figure (Stefanie and Shaker, 2015)



Figure 1: Waste Management Hierarchy (Durham York Energy Center)

According to Gershman, the president and co-founder of GBB Solid Waste Management Consultants, eight countries in Europe have achieved a record in waste management (Austria, Belgium, Denmark, Germany, Netherlands, Norway, Switzerland and Sweden), where an average of only two percent of waste goes to landfilling, while more than 50 percent are recycled or turned to compost and more than 40 percent goes to Waste To Energy processes on average. “This is almost zero waste to landfill. This is incredible,” said Gershman. (“Wastecon 2014: Zero Waste to Landfill Takes More than Recycling”, 2014).

It is an irrefutable fact that policy makers are always the main drivers for any GE activity. Similarly, promoting waste recycling definitely needs a reform in policies that would encourage it, facilitate it, coordinate among all relevant

stakeholders, and create the enabling environment for it. Effective waste recycling policies are crucial to maximize the efficient SWM and reuse of waste (Mostafa, 2014). Below are some examples of how policy making promoted waste recycling in different countries.

Switzerland has made noticeable efforts in the recycling sector, with a special focus on glass and paper, where policy makers introduced several mechanisms that promoted recycling of paper and glass. For instance, every town in Switzerland has a free collection once a month for paper that includes old newspapers, food packets, telephone bills and any other paper/carton product. As for the glass, there are separated bins in all supermarkets in Switzerland for clear, green and brown glass. Further, there is a green waste recycling i.e. any waste related to households' gardens, where waste can be neatly bundled out of the household in the street to be collected. In addition, batteries, used cooking oil, or any other chemical products can be deposited in a special place in the supermarkets and they are transferred then to recycling plants ("Recycling around the World", 2005).

Moreover, 80% of the plastic bottles, which are commonly used for drinking products in Switzerland, are recycled, while the European average is only 20 to 40%. Switzerland recycling strategy is not actually driven by the trend of environmental protection, but by a strong financial incentive, as recycling is free and waste disposal costs money, where each rubbish bag has to have a sticker on it which costs at least one euro. Hence, Switzerland is one of the model countries that are adopting recycling as a core strategy for its economy, while at the same time it is by default benefitting the society and environment ("Recycling around the World", 2005).

Another example of including waste recycling, in the country's policies, is Denmark, which is regarded as one of Europe's "greenest" countries. It has been decades, since the Danish environmental policy has been looking at waste as a valuable resource. The fast push toward a greener economy, has given Denmark a proud record, where in 2003, 31% of households' waste was recycled. Since the amount of waste is not that big for Denmark to build recycling plants, particularly plastic waste, electronic waste, metal are exported for recycling. Moreover, the government promotes limiting the amount of waste by urging industries to promote eco-labeling and the products that leave a minimum amount of waste after use ("Recycling around the World", 2005).

Looking at the less developed countries, recycling in India is a growing market in the informal sector; almost 10-15% of urban wastes are recovered and through which millions of job opportunities are offered, mostly informally. Yet, recently, recycling has gained legitimacy through Public Interest Litigation, and due to the recommendations of a Supreme Court Committee on Urban Solid Waste Management, new laws for waste management were set, which should gradually uplift recycling technologies. In addition, a completely voluntary trend promoting Eco-labeling in 14 significant industries in India have emerged. Also, new legislation might soon be set to promote stewardship of products, social responsibility of producer and waste minimization (Patel, 2010).

Although the above-mentioned examples of Switzerland and Denmark cannot be really compared to Egypt, as there are obvious differences in government structure, urban management and community awareness and attitude towards the environment. However these examples just show how recycling can benefit the economy of a country on all levels, and how effective policies are the key for a greener economy. Egypt has a long path ahead to reach a status that is close to Switzerland or Denmark.

In Egypt, it is unfortunate that only 60 percent of the waste generated in Cairo is collected, where less than 15 percent is appropriately reused or recycled (GIZ 2014). According to GIZ, the German Federal Enterprise for International Cooperation, contracted by the Egyptian government to assist in waste management, a large percentage of the waste produced is released without any treatments into rivers, canals, streets or open areas, which pollutes soil, air and water, as well as negatively affecting the tourism and economy. Based on the World Bank 2011 report, Egypt loses between 0.4 to 0.6 percent of its annual GDP due to the inefficiencies of solid waste management policies. Furthermore, this report stated that 13-15 percent of Egypt's yearly waste is recycled through the informal sector (Mostafa 2014). With the growing unemployment rate, pollution, and energy shortage in Egypt, waste recycling is an opportunity that should be grasped, as it can open the door for jobs creation, less polluted environment, and energy saving. Effective waste management and recycling system can be the entry point for Egypt toward a greener economy, since the physical resource (waste) and human resources are available, just investment and sound administration of these resources are needed. This will only happen through setting waste recycling policies that are currently absent.

Over the last fifteen years, the SWM sector of Egypt has been suffering from

critical disorder that hinders the effectiveness of the system and negatively impacts the environment, the natural resources, and the public health, and thus obstructs any attempts to improve waste recycling practices (NSWMP, 2011). These deficiencies need to be addressed holistically, in order to achieve a sustainable system that would ensure improvements in the economic, environmental and social aspects of this sector, through mainstreaming waste recycling in the policy framework as a core activity of the SWM system, and without compromising the rights of any of the relevant stakeholders.

2. Research Problem:

Waste recycling cannot be formally promoted if the Integrated SWM System (ISWMS) is defected. Egypt is suffering from severe deterioration in the SWM system, which results in lost opportunities considering the waste recycling activities. First, the collection system has severe deficiencies in the service coverage, which is about 60% from the total waste generated in Cairo. These shortfalls in the service coverage are mostly resulted from the lack of financial resources, which are reflected in the poor conditions of vehicles, low workers efficiency, and lack of equipment. On the other hand, the generation of municipal solid waste in Egypt has dramatically increased, with no adequate progress achieved in the collection system to respond to this increase in the waste quantity (NSWMP, 2011).

As for the waste treatment, there are two types in Cairo, composting and recycling. There are 63 composting factories; where 3 to 4 of them are functional among them ECARU, which is the most successful model (Iskandar, 2016). The total composting factories in Egypt recover less than 10% from the total waste generated, considering that organic waste constitutes more than 60% from the total waste generated in Egypt. This gap of 50% goes to either landfilling or garbage burning. Regarding waste recycling, it is mainly managed by the informal sector, and it is not considered in the formal SWM system. There is no any structural mechanism that aims at leveraging investment in the waste-recycling sector, while there is a significant opportunity and an existing value chain to build on, that would lead to the growth of the recycling business, and the creation of formal jobs (NSWMP, 2014)

Furthermore, the current disposal system is represented in the dumpsites, landfills, and garbage burning with considerable negative impacts on the environment through the solid, liquid and gaseous emissions. The 2000 strategy, which sets a target of 90% waste disposal in sanitary landfills, has failed considerably, since only two

sanitary landfills were established in Cairo, while the disposal continues to happen irresponsibly in the dumpsites. Even the closure and aftercare of dumpsites is not happening due to the financial deficiencies (NSWMP, 2011). The above-mentioned defects need to be tackled holistically considering the roles of all the relevant stakeholders in order to create the enabling environment that would trigger waste recycling as an integral part of the formal SWM system. Below are the identified problems that led to the above-mentioned results in the SWM system.

In light of examining the current policy, legislative, institutional and financial framework of the Solid Waste Management (SWM) sector in Egypt, it was found that there are neither policies nor programs that promote waste recycling; there is no one single law that promotes the waste recycling activity, there is not even a law for SWM. Actually, there is a proposal for a SWM law that is finalized but it is not yet officially endorsed. Also, SWM responsibilities are scattered among several institutions, and due to the weak coordination, the result is that there is no accountability, which made SWM at the end of the priority list on the national level and consequently on the governorate level as well. However, there is a ministerial decree announcing the formation of the Waste Management Regulatory Agency (WMRA), which supposedly will solve the problem on the institutional level. Moreover, there is no specific budget that is allocated solely to the SWM in the governorates, which again makes SWM not prioritized. Therefore, these deficiencies in the legislative, institutional and financial frameworks of the sector should be resolved in order to mainstream waste recycling as an activity of the SWM system supported by the policies.

In addition, after investigating the roles of the different stakeholders in the SWM sector in Egypt, it was concluded that the policy makers neglect the active stakeholders in the SWM system including the informal sector, civil society and the private sector. After examining each activity by its own (collection, transportation, recovery, and disposal), it was found that substantial changes are needed to facilitate the recycling activity.

Therefore, the research problems can be summarized as below:

1. The ineffective role of government; both the central government for policy making and the local government for SWM system operations

2. The entire chain of SWM activities has inefficiencies including the missed opportunity of recycling
3. The role of the active stakeholders in recycling is neglected and not supported

3. Thesis Objectives:

This thesis aims at identifying the gaps in the existing legislative, institutional and financial frameworks of the SWM system in Egypt and specifically in Cairo that hinder mainstreaming waste recycling in specific in the policy framework. It also aims at finding win-win situations for the parties involved in the SWM sector that would promote the recycling activity. Finally, it aims at proposing new ways for managing the different SWM activities (collection, transportation, recovery and disposal) that would lead to successful recycling practices.

Cairo was selected because it is the capital and the city with the highest population and highest waste generation of Egypt. Another reason of selecting Cairo is the availability of data on the amounts of wastes, the collection, transportation, recovery and disposal systems, as well as having access to the stakeholders working in the SWM sector in Cairo.

4. Research Questions:

In order to achieve the thesis objectives, the main research question that should be answered is “**which policies**, legislative, institutional and financial framework of the Solid Waste Management **will encourage and promote waste recycling in the most suitable way to Cairo context?**” To answer this question, other questions will need answers as well:

- What are the existing policies that serve waste recycling in Egypt?
- What is the enabling legislative, institutional and financial environment that should be present to facilitate the waste recycling activity?
- Who are the main stakeholders that should be involved in making waste recycling policies and what would be their roles? How is the SWM chain of activities (collection, transportation, recovery and disposal) being managed in Cairo?
- How can the SWM chain of activities be improved in a way that serves promoting waste recycling?

Chapter II: Literature Review

In order to set an effective policy that would directly affects waste recycling, it is crucial to understand first the dimensions of making an environmental policy in general, as waste management and recycling policies lie under its umbrella. For this reason, this chapter will discuss and analyze the meaning of an environmental policy, the challenges in making it, how to define an environmental problem, and the types of policy instruments. Furthermore, the chapter will delve deeper in the waste recycling policies, the common terminologies used in setting such policies, waste recycling policies in the international literature, and waste recycling practices in the developing countries.

1. Environmental Policies:

An environmental policy is defined as the country or organization's statement about its overall direction, intentions, values and performance toward environmental issues (MEnvMan, 2015). The key factor in setting an environmental policy is setting priorities wisely, and since the agenda will not give attention to all the problems in the country, those problems should be narrowed down based on their priority level to be addressed by the government. The trick here is that how setting a policy agenda should address the environmental problems without compromising the social and economic benefits? Also, it is worth noting that setting environmental policy agenda significantly relies on events and/or accidents that would prioritize certain issues over others in certain periods of time. For instance, accidents that cause pollution or nuclear energy release, economic trends, changes in demographics, and other events definitely change the priorities on the policy agenda. Therefore, setting priorities on the policy agenda is the key starting point and the key challenge that is faced when addressing environmental policy (Fiorino, 1995).

• Challenges in Making Environmental Policy:

According to Fiorino (1995), there are several challenges in making an environmental policy; first, as mentioned above, determining priorities while setting the policy agenda, where the government needs to be active and clear in defining the problems and setting the objectives. Second challenge is maintaining the democratic values; going against the trend that the technological experts take the lead in decision making, while the people with less access to information will not participate. Third

challenge is the need to use resources wisely and efficiently, bearing in mind that using a resource is exclusive to achieve one specific objective. Therefore, resource utilization is a decision that should be taken wisely (Fiorino, 1995).

Fourth, it is challenging to create institutions that need to be flexible to deal with environmental problems and which are strong in coordination with each other. Three types of adaptations are crucial for the institutions. First, policy makers should include the environmental policies among other policy sectors more meritoriously. Second, the capacity for recognizing global problems has to be enhanced. Third, the public and private institutions should be well coordinated and related with each other.

Finally, the fifth challenge is maintaining a reliable monitoring and evaluation system, where policy makers need to set indicators and criteria for acceptable measures of performance. The challenge here is that in environmental problems, it is difficult to link the environmental results to the performance measures, and it is tricky to link cause and effect problem in an environmental issue, which might be affected by different causes internal or/and external (Fiorino, 1995). Other scholars added another challenge in setting an environmental policy which is the challenge to design an integrated policy, where social and economic criteria need to be addressed as well and not only environmental criteria, and this is the same as making a sustainable development policy which considers the three main pillars of economy, society and environment, aiming at benefiting those three pillars and not compromising the needs of any of them (Mysiak et al, 2002)

- **Defining Environmental Problems:**

Albert Einstein once said, “If I were given one hour to save the planet, I would spend 59 minutes defining the problem and one minute resolving it”. This might sound exaggerated. However, it emphasizes the significance of defining problems, and it implies that a well-defined problem would probably include the solution within it, and that solution is always straightforward and clear. Clearly defining a problem, will make it solved easier and will save money, resources and time (Cooper, 2014).

When making environmental policy, it is vital to start the policy making process by defining the environmental problem and fully understanding it. Marion and Fiorino agreed on identifying several approaches in defining environmental problems; activities based, contaminants based, medium or pathway exposure based, receptors based, or long-term effects based First, the “Activities” approach is basically defining the problem based on the activities that lead to the environmental

pressure. For instance, transportation is an activity that is a cause for an environmental stress, which is air pollution. Defining the problem based on activities enable policy makers to set integrated strategies that focus on the whole industries or sectors. “Contaminants” approach is defining the problem based on the contaminants that lead to such an environmental disorder, such as ozone, lead, and radon that are frequently found in the environment. Policy makers who use this approach focus on the whole lifecycle of these contaminants and set strategies to combat them (Fiorino, 1995) (Marion, 2011).

As for “Medium or Pathway Exposure” approach, it is concerned with defining the problem based on how ecosystems and humans are exposed to the contaminants. For example, drinking water and eating food with pesticides residues are common media of exposure. The “Receptors” approach is mainly defining the problem according to the resources, ecosystems or organisms that are affected by the environmental illness e.g. problems related to groundwater or ecological resources are mostly defined by this approach. Finally, the “Long term effects” approach defines the problem based on the long-term effects of an environmental pressure. For instance, climate change is a result of long-term effects of several human activities including fossil fuels use, industrial activities and others (Fiorino, 1995) (Marion, 2011).

- **Policy Instruments:**

After clearly defining the environmental problem, it is the time to select the suitable policy instrument or a mix of different instruments that would respond to that problem. There are three main types of policy instruments that respond to the environmental problems. The most traditional instrument is the “Direct Regulation” which is mainly using laws, restrictions, or bans to enforce a specific behavior of individuals or institutions. For instance, setting emissions standards and fines for those who do not comply with the restrictions is a direct regulation policy instrument. Second, “Information” is another instrument that started to be commonly adopted; it aims at informing people and raising their awareness about a given problem, so that they are capable to assess risks and take the proper actions. Examples of information policy instrument include awareness campaigns, media programs and even labels on products e.g. the labels on cigarette packages informing the customers with risks of smoking (Fiorino, 1995).

Third instrument is “Economic Incentives”, which emerged when policy makers became less interested in direct regulations that were not effective in responding to some problems. Such incentives motivate the company to respond in the way that is desired by the policy makers. Economic incentives include the polluter pay principle, deposit-refund systems, where the product is returned to the producer for disposal or recycling, market barriers for the activities leading to undesired effects, and market facilitations or subsidies for the activities leading to desired effects (Fiorino, 1995).

Cairney agreed with Fiorino on the classification of policy instruments; he argues that policy instruments are tools used by the government to achieve a desired result. Those instruments are classified into three main types, regulations, economic incentives, and public education (or information). Yet, he believes that policy makers in general should use a collection of different instruments to form an integrated strategy. For instance, incentives may be used in combination with regulations and public education to promote source segregation of waste (Cairney, 2015)

Stavins (1997) made a different classification of policy instruments, where there are two categories, domestic versus international policy instruments. In other words, helping individual nations to achieve their own goals versus setting standards for a group of nations. He claims that domestic policy instruments are more reasonable, effective and successful than the international ones, since they will be tailored to each nation’s circumstances and will be more focusing on achieving the very specific goals of each nation. Furthermore, he claims that the most important criterion when selecting a policy instrument; is that there should be adequate knowledge of the instrument’s ability to maximize the net benefits and this requires a full awareness of the costs and benefits resulted from using such an instrument (Stavins, 1997).

2. Waste Management and Recycling:

• Most Common concepts in the Waste Management and Recycling Policy:

Since, this study aims at finding solutions for effective policy making in the waste recycling sector that lies under the umbrella of environmental policy, it is vital to examine the different literatures, where scholars have agreed over the general concepts that are being commonly adopted globally in the waste management and recycling sector and defining them as below.

- *The polluter pay principle:* it is an environmental policy concept that entails that the pollution’s cost will be paid by the one who produces this pollution (OECD, 2014).

- *Extended Produce Responsibility (EPR)*: it is an application of the polluter pay principle, where the producers have a significant responsibility in the disposal or treatment of the post-consumer products (OECD, 2014).
- *The 3Rs (Reduce, Reuse, Recycle) OR the waste hierarchy*: it is a concept that encourages prioritizing waste reduction over reuse and recycling, and working on making it economically feasible (OECD, 2014).
- *Circular Economy*: the aim of this approach is to extend the lifecycle of certain materials through using it for a longer time and encouraging the second hand use of raw materials (OECD, 2014)
- *Deposit Refund System*: it is a system where the consumer gets a discount when the post-consumer product or its packaging is returned for recycling (Walls, 2011)
- *Landfill tax or levy*: it is a system that imposes fees on the disposal of each unit of volume or weight of waste in the landfill (Fullerton et al, 2008)

- **Introduction on Waste Recycling**

- **Waste Recycling as a driver to Green Economy:**

Green Economy is commonly defined as the economy that contributes to “improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities”. In other words, it can be regarded as an economy that is resource efficient, socially inclusive and low carbon (UNEP, UNECE). Since green economy’s objective is to balance economic goals with social needs, while maintaining environmental systems, recycling is one of the key contributors to a greener economy, because recycling fosters economic goals, through providing business opportunities, and supplying products, it promotes social inclusion through generating job opportunities, and it reduces environmental impacts, through maximizing the use of resources and minimizing waste, and thus contributing to a low carbon economy that would be partially leading to sustainable development (“International Labour Organization Department of Statistics”).

- **Why Waste Recycling is an activity that should be encouraged?**

There are numerous benefits of recycling to a country’s economy; recycling is closely connected to the use of nonrenewable resources especially metal, helping decoupling the use of materials. Also, the growing recycling market helps in generating green jobs. UNEP et al 2008 defines a green job as “any decent job that contributes to preserving or restoring the quality of the environment whether it is in

agriculture, industry, services or administration” (International Labour Office Department of Statistics, 2011 p. 2) Furthermore, recycling triggers eco-innovation and the development of technologies in the recycling sector, potentially creating markets for new products and services. Also, recycling promotes a circular economy, rather than linear economy that is characterized by waste and resource depletion. In addition, recycling helps businesses and investments to reduce the costs of landfilling and incinerating waste in terms of financial cost or environmental impact (EEA, 2011).

As a promising eco-market, recycling is becoming increasingly important in the European economy, positively affecting the total economic output (GDP), and Europe’s overseas and internal trade. Accordingly, recycling has been restated in a wide range of EU documents recently. For instance, the European Commission's Action Plan on Sustainable Production and Consumption and Sustainable Industry declared the need to decrease reliance on virgin materials and promoted optimal use of resources and recycling, highlighting its role of recycling in enhancing sustainable supply of raw materials (EEA, 2011). In addition, the European council has lately emphasized on the need to focus on “steering the market towards recycling and waste reduction and recycling certificates”. As a result, many European countries have positioned recycling at the heart of their policies in order to maximize resource efficiency (EEA, 2011).

- **Waste Recycling Policies in the International Literature:**

Scholars differed on finding out the effective policy instrument that would mainstream recycling, as a main activity in a country’s economy. So, is it the direct regulations instrument, or the information instrument or the economic instrument or a mix of two or all of them? Some argue that mandatory policies (direct regulations) are the key for promoting recycling, while others argue that behavioral change (information) is the trigger that would induce recycling. Also, others debate that financial incentives (economic instruments) are the key driver for promoting the recycling activity.

Scott and Thomas (1994) claimed that socio-economic attributes can neutralize the policy influence and clearly identified factors that are beyond the control of the public officials. Among these factors is the level of income and education that characterize the residents of each area, in addition to housing age and value, population and other demographic characteristics. Scott and Thomas suggest

that such demographic or economic factors can influence recycling activities more than policies. Therefore, the authors suggest that policy makers have to be fully aware of economic and demographic variables, in order to formulate the most suitable recycling program and tailor the initiatives to better accommodate and respond to the constituents (Scott and Thomas 1994, 411-423)

On the other hand, Professor Carlson (2001) argues that behavioral change (information) is not likely an effective method to induce a collective action toward recycling, and he claimed that policy makers are more successful when they promote activities like recycling through providing financial incentives (economic) which reduce the amount of effort required, rather than engaging the communities and wasting time in trying to change their behavior (Carlson 2001, 1300).

Another compromising point of view suggests that mandatory recycling systems (direct regulations) are the most effective method that would promote recycling and increases the compliance rate. Yet, some behavioral factors can maximize compliance. Understanding such factors would assist policy makers in formulating the most efficient recycling programs. For instance, based on psychological research, recycling increases by increasing awareness through educating the public on the urgency and significance of waste stream reduction (information). Ward and Gleiber agreed with Scott and Thomas that income and education level are directly related to the recycling activity. Finally, Ward and Gleiber concluded that awareness on the solid waste problem and the urgency of recycling would increase compliance. However, mandatory laws are still essential, where public participation is somehow mainstreamed in the early stages of the policy reforms (Ward and Gleiber 1993, 241-253)

Some examples of a mix of mandatory laws and economic instruments regarding plastic recycling were set in four states in the USA, where an advanced disposal fee of one cent per container of plastic bottles was effective in Florida, and this law was implemented as a result of the fact that plastic was not recovered at a 50% rate as mandated by the law. As a result, a packaging company would be exempted from the fee, if it removes an amount from the post-consumer plastic waste that is equivalent to the amount produced by the company. Also, California and Oregon have passed a law called “rate and date” that sets mandatory recycling rate for plastic containers, and they require from plastic companies regular recordings demonstrating how requirements were met (Achtermann 1994, 13-15)

Therefore, the three policy instruments (direct regulations, information, and economic instruments) are complementary and cannot alternate each other. They are used differently depending on the stage of the waste cycle and depending on the target group as well. For instance, information would encourage households to support recycling through changing their behavior, while economic incentives and regulations can work better while targeting recycling businesses.

- **Waste Recycling Practices in the Developing Countries:**

Unlike research on waste recycling practices in the developed countries, studies that are conducted on waste recycling practices in the developing countries is not giving adequate attention to the indirect causes that would motivate people toward the recycling activity, but rather on the direct factors affecting the stakeholders and institutions that are related to the Municipal Solid Waste Management (MSWM) system such as recognizing waste problems and the causes behind them, assessing waste management operations and quantifying waste components.

However, some studies that dig deeper in analyzing the motives behind recycling activity were conducted in Mexico and Wuhan, China. Yet, it is worth noting that the cause of having these studies in place is that China and Mexico are witnessing a social and economic growth and are transitioning into developed countries, which is not the case with a developing country like Egypt. Based on studying recycling and reuse behavior in Mexico, it was concluded by Corral-Verdugo (1997) (as cited in Troschinetz and Mihelcic, 2008) that beliefs are the most valid indicators of desired behavior. In other words, people are more likely to recycle waste when they have full knowledge and understanding of its know-how and its benefits. As for the study that was conducted in Wuhan, the fifth largest city of China, it was found by Li (2003) (as cited in Troschinetz and Mihelcic, 2008) that demographic characteristics including age, gender, and income were the most important indicators affecting the recycling activity, which means that for instance the elderly women who are responsible for the household activities will more likely tend to engage in recycling activities.

On the other hand, Troschinetz and Mihelcic noticed this lack in research and conducted an extensive research on twenty-three developing countries to assess the municipal solid waste management system and specifically the barriers and incentives of the recycling activity. The countries selected included Turkey, Lebanon, Brazil, and others. The study concluded that there are twelve main factors that can act as barriers

to recycling in the developing countries. The four most common barriers to waste recycling in the developing countries are government policy, waste collection and segregation operations, education level of the personnel, and government financing. In contrast, household income level is one of the smallest barriers, which reflects that the socio-economic level of people is not really the obstacle to the recycling activity. Also, household education, waste characterization, MSWM administration, MSWM plan, local-recycled material market, technology and human resources, and land availability are others factors that can act as barriers to the recycling activity in the developing countries (Troschinetz and Mihelcic, 2008)

Furthermore, the study concluded that there are essential aspects that should exist to improve MSWM systems including recycling. Those aspects are strategic SWM plans, a proper collection and transportation system, resource recovery and disposal systems, effective hazardous waste management, a regulatory framework, institutional capacity, public participation and environmental education, cost recovery, pricing, financing, and land acquisition. Further, the study recognized the significance of stakeholder involvement in the waste recycling activity across all factors and aspects that are mentioned earlier (Troschinetz and Mihelcic, 2008).

Therefore, there is no adequate research on the recycling policies and practices in the developing countries. However, it is concluded that waste recycling practices in the developing countries are affected by different factors whether it is the demographic characteristics or the psychographic characteristics. Studies agreed on the general factors that act as barriers to the recycling activity as well as the aspects that should exist to improve the MSWM systems in the developing countries.

- **Waste Recycling Practices in Egypt:**

Narrowing the literature down to Egypt, in general waste-recycling status in Egypt can be captured in the form of entrepreneurs' initiatives, or the informal sector's efforts, while there is no defined policy or law in Egypt that promotes or enforces recycling behavior. Actually, Egypt does not have a Solid Waste Management (SWM) law. SWM responsibilities are divided between the Ministry of Environment , Ministry of Local Development, Ministry of Housing, Utilities & Urban Development, Ministry of Water Resources and Irrigation, and more legal departments. The authority responsible for the clearing of waste in Cairo governorate which is the Cairo Cleaning and Beautification Agency (CCBA) is also responsible for applying system operations through various international companies or local

private institutions, while NGOs' roles have limitations, where their efforts go towards upping the lives of the informal sector, increasing civil morale, and sorting and recycling waste products. They also direct projects to clean in rural neighborhoods (SWEEPNET, 2014).

However, this was before November 2015, where a prime ministerial decree has announced the official establishment of WMRA on 22 November 2015, which will be an independent agency under the umbrella of the Ministry of Environment. This agency supposedly will be the responsible entity for coordinating and supervising SWM practices. As for the budgeting, the central government does not provide financial aid for the Municipal Solid Waste Management, it is the decision of the individual governorates to supply the essential budget. Even with the governorates backing their financial needs, their resources are limited and their facilities unreliable (SWEEPNET, 2014).

The stakeholders that perform waste recycling in Cairo are the private sector and the informal sector. The private sector performs composting of the food wastes, and they are supposed to compost 20% of the wastes they collect. All the private companies in Egypt recover less than 10% of the total waste generated (Iskandar, 2016). As for the informal sector, it recycles around 85% of the wastes it collect. More information on the waste recycling policies and practices in Egypt will be discussed in details later in the thesis.

Chapter III: Research Methodology and Conceptual Framework

1. Methodology

The study undertaken in this thesis is qualitative, where data were collected from several sources as below:

1. National policy documents e.g. laws, ministerial decrees, the National Solid Waste Management Programme (NSWMP) documents such as the National Strategic Directives

Rationale: The reason of using these resources is to study the current legislative, institutional and financial frameworks and the proposed solutions, in addition to understanding the different stakeholders involved and their current roles.

2. Cases of success and failure of policy, laws, and initiatives supporting waste recycling that were implemented in other countries. Seven cases of governmental policies, legislations, programs, and private sector's initiatives in the recycling field from different parts of the world were examined.

Rationale: Although each country has its own culture, special circumstances, and way of administration, exploring experiences from different countries have always been useful to get inspirations, or lessons learnt. International experiences can give some hints and insights through the challenges they faced or the success they achieved. This chapter explores seven cases of governmental policies, legislations, programs, and private sector's initiatives in the recycling field from different parts of the world. The cases are taken from India, Brazil, and South Africa. These three countries are selected because, the three of them are not very far from the Egyptian context, so if they witness success stories, then it is feasible that Egypt witnesses too; the three countries share some common attributes with Egypt; they have large populations, and they suffer from a high rate of poverty and slum areas.

3. In depth semi structured interviews were conducted with the stakeholders in the SWM field who were carefully selected to serve the thesis objectives. *"In-depth interviewing is a qualitative research technique that involves conducting **intensive individual interviews with a small number of respondents to explore their perspectives on a particular idea, program, or situation.**"* (Boyce and Neale, 2006).

Rationale: Interviews were conducted with representatives of the stakeholders' groups involved in the SWM sector to get exposed to the different points of view and

therefore ensure objectivity of the result, and thus get a holistic approach that would serve in proposing realistic recommendations.

2. Conceptual Framework

The research methodology aims at analyzing the data collected and reaching the findings and recommendations based on the following conceptual framework



Figure 2: Conceptual Framework (By author)

A “Stakeholder Approach” was used to organize the data through conducting in-depth interviews with the stakeholders who work in the SWM sector, both in policy making and within the SWM value chain. The objective of these interviews was to understand the main pillars of the conceptual framework illustrated above, through analyzing and interpreting the current SWM policies and specifically the recycling policies, and the SWM chain of activities and more specifically the recycling practices. In addition to analyzing the role of each stakeholder, which would give a wider perspective and a comprehensive knowledge of the sector, the conceptual framework investigates the potential practice of waste recycling in Cairo that would maximize the benefit of it to the country, without ignoring the interests of any of the stakeholders, and this is the reason why the stakeholders approach is adopted. Finally, seven international case studies were integrated on a cross sectional basis to support the analysis.

3. Hypothesis

The conceptual framework supports the hypothesis that waste recycling activity will be promoted if the mentioned stakeholders are provided with the guidance, support and the enabling environment that would result in clear task assignment and win-win situations for all parties, and if the SWM system is properly

managed, as effective collection and transportation systems are vital to increase the benefits of the recycling activity, and the key to achieve all of this will be through effective policy making.

- **Stakeholders Mapping**

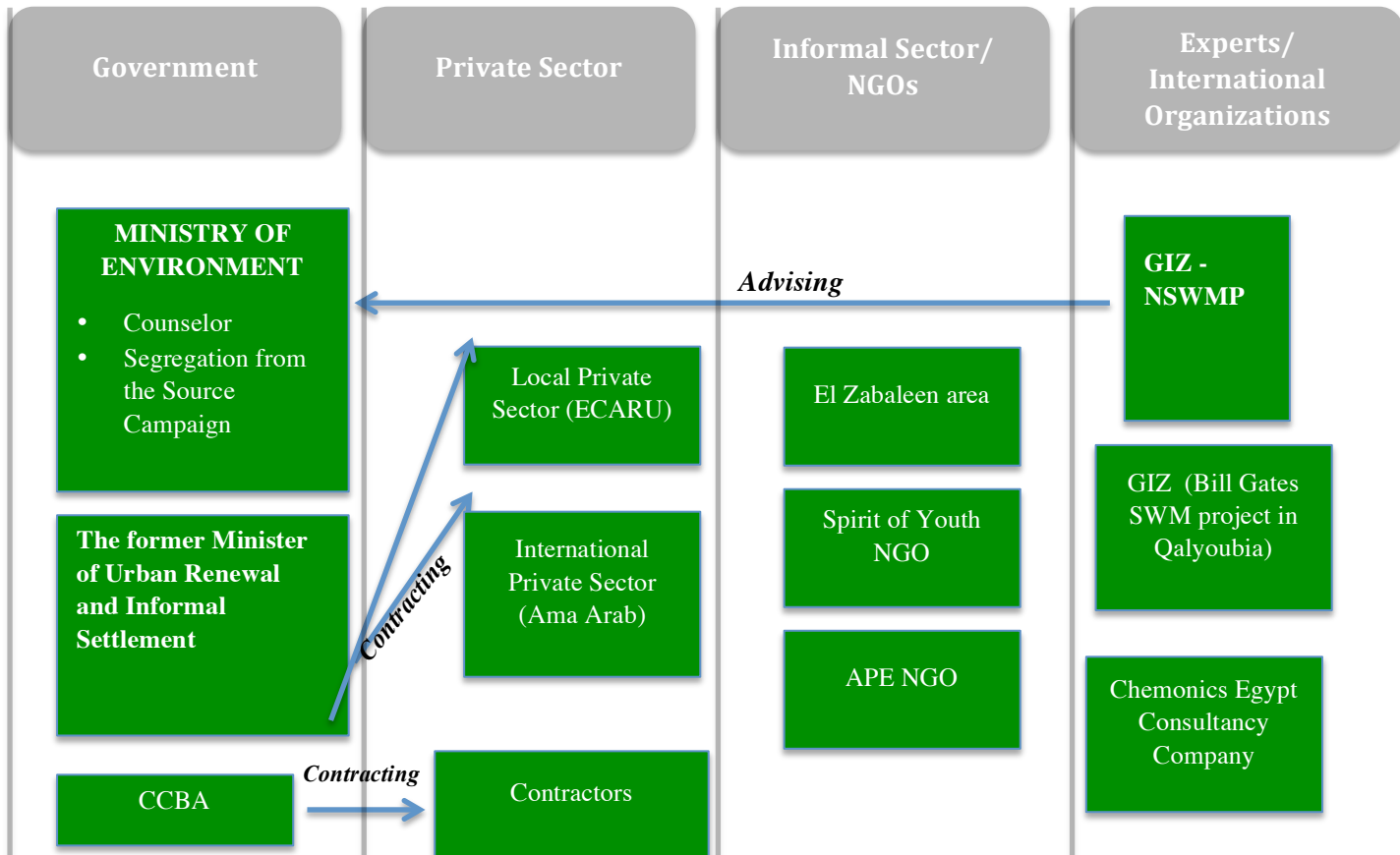


Figure 3: Stakeholders Mapping (By author)

- 10 stakeholders and key players in the SWM sector participated in the research (Ministry of Environment, the former Ministry of Urban Renewal and Informal Settlements, CCBA, International Private sector, Local Private Sector, Contractors, Informal Sector, NGOs, Experts, and International Organizations)
 - 22 persons participated in the research
- The stakeholders and interviewees were classified into four main groups that are representing the sector: the government, the private sector, the informal sector/NGOs and the experts/ International Organizations.

➤ **Government**

- The Ministry of Environment

- Mr. Magdy Zein El Deen, a legal counselor in the Central Administration for Inspection and Environmental Compliance in the Egyptian Environmental Affairs Agency (EEAA)
- Mr. Mahmoud Abdelhakim, the deputy of the former minister of Urban Renewal and Informal Settlements (who used to work in the segregation from the source campaign. He is currently transferred to work in the Ministry of Environment)

Rationale: Ministry of Environment is the governing body that is setting the guidelines for all environmental policies and practices including the SWM system in Egypt. Although SWM responsibilities are scattered among several ministries, Ministry of Environment is still the main responsible entity for the SWM portfolio in Egypt. Interviewing a legal counselor was useful to get details on legislative framework of SWM as well as the future plan of the ministry. Also, interviewing the “Segregation from the Source” campaign representative was vital to get insights about what are the factors of success and failure of such initiative in the Egyptian society.

- Dr. Laila Iskandar, The Former Minister of State for Urban Renewal and Informal Settlements

Rationale: Before being a Minister of State for Urban Renewal and Informal Settlements, She was a Minister of State for Environmental Affairs; and she has been pioneering the SWM portfolio in Egypt for years and has a wealth of knowledge about all the details and complications of the issue. In addition, she established the Spirit of Youth NGO in 2004, which is one of the most prominent NGOs aiming at formalizing the informal sector and upping the living standard of its people. Further, she is the one who initiated the “Segregation from the Source” campaign, in addition to other initiatives in the SWM field. Therefore, interviewing her gave valuable data and weight to this thesis.

- Engineer Mahmoud Mansour, Head of the Engineering Department at CCBA

Rationale: CCBA is the agency that is managing the SWM chain of activities in Cairo, and the one that contracts private companies and contractors. Interviewing one of the management at CCBA was crucial to get data about collection, transportation, recovery and disposal systems in Cairo.

➤ **Private Sector:**

- Engineer Ahmed Hassan – Projects Manager at AMA ARAB
- Engineer Fayez Mikhaeil – Projects Manager at ECARU
- A group of six contractors

Rationale: private sector has an integral role in the SWM system in Egypt, and based on the literature review and case studies, private sector companies all over the world are the ones that initiate waste recycling projects. Therefore, it is significant to interview representatives from the three main forms of private sector in Egypt, to understand their work and the challenges they face.

➤ **Informal Sector and NGOs**

- Mr. Shehata El Me'adess, an opinion leader at El Zabaleen area, Manshiet Nasser
- Mr. Ezzat Naeim, founder of the Spirit of Youth NGO
- Mr. Bekhit Nan, Public Relations Manager at Association for the Protection of the Environment (APE) NGO

Rationale: the informal sector in Cairo has a very active role in the SWM system and especially the recycling. The most famous area, which is considered the center of all the informal sector areas in Greater Cairo, is El Zabaleen area in Mokkatam district. Interviewing an opinion leader in this area provided valuable data about their work, the challenges they face and their aspirations. Further, there are two active NGOs that are located in El Zabaleen area, Sprit of Youth NGO that aims at formalizing the sector, and APE NGO that aims at educating young women through recycling projects. Interviewing representatives from these two NGOs was of benefit for the research as they represent how the civil society can play a role in the SWM system in general and recycling by the informal sector in specific.

➤ **Experts and International Organizations**

- GIZ – the National Solid Waste Management Programme (NSWMP)
 - Mr. Joachim Stretz, Programme Coordinator
 - Mr. Berti Shaker, Programme Adviser
 - Engineer Ahmed Saeid, Technical Manager
- GIZ – Bill Gates Foundation SWM project in Qalyubia Governorate
 - Ms. Heba El Behairy, Head of Component, Participatory Development Programme in Urban Areas
- Chemonics Egypt Consultancy Firm
 - Dr. Ahmed Gaber, Chairman and Senior Environmental Expert
 - Engineer Ahmed Shouman, Solid Waste Section Head

Rationale: Egypt has a wide array of technical experts in the SWM sector. International Organizations in Egypt act as the technical source of support and assistance for the developmental projects in general. It was vital to interview the ones

who made the effort to organize and improve the SWM sector through the NSWMP, understand the challenges they believe exist in the sector and the details of the program and its proposals, in addition they have valuable data about the structure of WMRA and its management. Second, GIZ has a noticeable role in the SWM sector in Egypt, through the NSWMP in addition to many pilot projects. Among these projects is the Bill Gates funded SWM project that was implemented by GIZ in Qalyubia governorate and achieved successful results. Interviewing representative from this project was beneficial to get insights from this success story. Finally, Chemonics-Egypt Consultancy Firm provides consultancy services to private companies, international organizations, and governmental institutions. For instance it was the consultancy company of “Start your Waste Recycling Business” Training Program that was implemented by the International Labour Organization in Port Said, Minya and Red Sea governorates in 2014-2015. Interviewing such experts would help comprehending the complications and details of the SWM sector and would certainly add value to the research.

4. Thesis Structure

The next three chapters will review and analyze the data collected from the in-depth interviews, national documents, governmental reports, and international cases, in order to form a comprehensive idea from the situation in Cairo and get insights from the international cases that would enable proposing a model that would promote waste recycling in Cairo. The analysis will be based on the conceptual framework mentioned earlier in this chapter. First, the SWM policy framework including regulatory, institutional and financial frameworks will be reviewed and analyzed and the position of waste recycling activities in those frameworks will be identified. In addition, the government’s initiatives that aimed at promoting recycling will be investigated. Second, the SWM chain of activities including collection, transportation, recovery, disposal and marketing activities with a focus on waste recycling will be discussed and analyzed. Third, the roles of the stakeholders that were mapped in the research will be studied. Finally, the last chapter will present the recommendations and propose a model aiming at enhancing the waste recycling activity in Cairo.

Chapter IV: SWM Policy Framework – Review and Analysis

This chapter aims at reviewing and analysing the current status of SWM sector in Egypt in terms of the regulatory, institutional, financial frameworks. Also, The government of Egypt has initiated several piloting models to improve SWM system in a way that would serve waste recycling. Among those initiatives, two are studied in this chapter; the “National Strategic Directives of Waste Management in Egypt” by NSWMP and the segregation from the source campaign.

The National Strategic Directives of Waste Management in Egypt was selected because it is the latest report published by the NSWMP, which is proposing an integrated SWM system that sets a framework for all its activities and that puts the waste recycling into consideration. GIZ, the organization managing the NSWMP acts as an advisor for the Ministry of Environment in the SWM sector. Ministry of Environment has already approved some of the directives’ proposals (e.g. the formation of WMRA). Therefore, it is crucial to examine and analyze these directives, which has a high potential to be the guideline for the SWM policy framework. The segregation from the source campaign was selected to be studied in the research, since it is the most initiative that aimed at improving waste recycling specifically through reforming the SWM system from its very beginning. This campaign was initiated by the former ministry of Urban Renewal and Informal Settlements. Thus, it is vital to study this campaign, and identify whether it had a potential for Cairo or not.

All the data in this chapter are collected from national and government documents including laws, ministerial decrees, EEAA reports, Sweepnet reports, in addition to previous theses, and the in-depth interviews conducted.

1. Regulatory Framework

This section includes a brief of the most significant laws in the Egyptian legislation covering the waste management sector.

- **Law 38/1967 and its amendment by Law 10/2005 and Law 106/2012 on General Public Cleanliness**

This law and its amendments address the aesthetic element and prohibits littering in all its forms in roads, beaches, bridges or canals, and that the waste whether municipal waste, animal waste, or wastewater should be disposed of in the specified settings that are indicated by the local council. Also, waste collection, transfer, and disposal

methods should be followed as per the implementing regulations of this law. Furthermore, this law clearly defines the responsibility of the citizens, contractors, and shop owners regarding waste collection, transportation and disposal. In addition, this law entails that any citizen or institution that undertakes activities that contribute to protecting the environment will be supported by the government through granting land or equipment. Law 10/2005 amended some provisions of Law 38/1967 regarding the public cleanness. Law 10 replaced article 8 and 9 of Law 38 with two new articles where monthly waste collection fees were set, according to the income level and the residence area. Also, law 106/2012 amended article 9 of law 38 to impose a financial penalty on littering in public roads, squares, tunnels and other spaces that are not specified for waste disposal (EEAA).

- **Law 48/1982 for the Protection of the Nile River and its Waterways from Pollution**

This law is concerned with the cleanliness of the freshwater in Egypt specifically Nile River and protecting it from pollution. The law prohibits any handling, sorting, disposal or recycling of waste near or along the waterways, except through a special license from the Ministry of Irrigation. Tourist or residential boats on the Nile River are solely responsible for the waste they generate. This law strictly bans waste disposal into the river (Bakry, 2015).

- **Law 4/1994 and its amended Law 9/2009 on the Environment's Protection**

This law is the most recent environmental law. It was originally set to compensate the deficiencies in the previous environmental laws, through indicating environmental criteria and indicators specifically aiming at limiting pollution in air, soil and water. The law highlights the fact that waste treatment must take place in the only designated areas that must be far from industrial, agricultural and residential areas. It also specifies the requirements and locations' criteria of the waste incinerators. Further, the law clarifies the responsibility of waste collectors and the specifications of the collection tools and process. In addition, the law addresses the demolition and construction waste through claiming that responsibility of disposal is completely on the company or citizen that performs the work and the local authority is not responsible. The law sets rules for waste transport, disposal and storage. Law 9/2009 was introduced to amend this law by banning garbage burning of wastes in open spaces; it also regulates waste collection, disposal and treatment of hazardous

materials (EEAA).

- **The Public Private Partnership Law 67/2010**

This law is not directly addressing SWM sector, but it facilitates the infrastructure development of SWM sector. The law regulates public-private partnership (PPP) in infrastructure projects, public utilities, and services. Accordingly, the Ministry of Environment established a specific unit for PPP, which supports private sector partnerships and regulates the private sector in the environmental projects. This law provided a framework for large-scale complex projects (Ministry of Finance).

- **Presidential Decree 86/2010**

It was issued to regulate the closure of open dumping sites and landfills existing in Greater Cairo, treatment of these sites and allocation of five other sites for proper sorting, treatment and disposal of waste far from the commercial and residential areas in Greater Cairo (EEAA).

- **SWM Proposed Law:**

The NSWMP drafted a law dedicated to SWM. It will be the first law that is set specifically to address the SWM sector. This law is expected to cover all the requirements for an efficient solid waste management system including the recycling activity; it will address the principles of integrated and safe SWM considering the waste hierarchy that prioritizes SWM practices as follows: avoid, reduce, reuse, recycle, recover, and dispose, through adopting the mechanisms that lead to prevention, reduction, reuse and recycling of waste. Also, this law is expected to include the “polluter pays” principle, where the waste’s producer is responsible for bearing the costs of the waste management process including collection, transportation, disposal and treatment. In addition, some regulations on subsidies on transportation, disposal and treatment will be developed. (NSWMP, 2014)

➤ ***Analysis of the Regulatory Framework:***

The regulatory framework of Egypt in the waste management sector as per the laws stated are concerned with waste disposal, dumping sites and their locations, criteria of waste incinerators, locations of waste treatment sites, cleanliness of the Nile River, and littering, and some are concerned with waste collection and transportation. However, none is concerned with the recycling. There is no legislative framework in Egypt that is encouraging waste recycling practices. There is no comprehensive legislation that addresses the whole life cycle of waste from having

the waste as a product, collection, and transportation until it reaches the stage of reuse, recycling or disposal in a landfill. Moreover, there is no law that clearly addresses recycling as a main activity of the waste management system that would lead to economic and environmental benefit. Thus, current legislation does not consider sustainability and efficiency management of the waste.

Concerning the proposed SWM law, Mr. Joachim Stretz, the NSWMP Programme coordinator says: “There are several provisions, but we do not find it realistic yet to enforce an obligation of 20% from plastics products should be recycled for example. We would go for another system: the EPR, where economic incentives can be established. Currently we are working on systems for recycling tires, e-wastes, and packaging wastes, and finding ways to promote that, basically obliging packaging producers to find systems for collection and recycling which would definitely consider integrating informal people”. Thus, the new SWM law proposed by the NSWMP gives hope that some attention could be placed on recycling, as it is expected to address mechanisms that lead to waste prevention, reduction, reuse and recycling. However, it is crucial to involve all the relevant stakeholders while imposing any new regulation with obligation to stakeholders, so that to avoid causing them any damage, and thus failing like what happened in Brazil as illustrated below in Table 1

Table 1: Case #1 Brazil

- **Problem:** Free plastic bags were irresponsibly littered into drains, which caused environmental problems, and 90% of the 2.5 billion plastic bags disposed monthly ends up in refuse (Larsen).
- **Government’s Kind of Intervention:** Legislation
- **Name of the Intervention:** Free Plastic Bag Ban in Sao Paulo
- **Main Actors:** Government and Supermarkets Trade Association
- **Description of the Intervention:** the government set a law that was effective in 2012 that bans the free plastic bags in the supermarkets and groceries, and instead they offer reusable and biodegradable bags costing only 10 cents or free cartoon boxes (Larsen).
- **Objective of the Intervention:** Eliminating the plastic wastes.
- **Results on Recycling:** This law resulted in consumers’ dissatisfaction and these restrictions were removed as a result of the pressure practiced by the plastic industry association.

2. Institutional Framework:

➤ *At the National Level:*

Until November 2015, there was no single institution that is fully responsible for SWM at the central government level. Practically, SWM responsibilities were scattered among Ministry of Environment specifically the EEAA, the Central Department of Waste and Material and Hazardous Substances within the EEAA, the Ministry of Local Development (MOLD), in addition to the Ministry of Housing, Utilities and New Communities, Ministry of Agriculture and Land Reclamation, Ministry of Health and Population, Ministry of Water Resources and Irrigation and Ministry of Finance.

1. Ministry of Environment specifically the Egyptian Environmental Affairs Agency (EEAA)

It is worth mentioning that the role of the Ministry of Environment is limited to only “consultancy”. In other words, it sets the basic rules, guides and gives opinion, and provides Environmental Impact Assessment (EIA) for projects. EEAA is an agency that plays a coordinating role, where its main responsibility is to ensure the implementation of the environmental legislation’s provisions, especially Law 4/1994 and its amendments and Law 9/2009 and its amendments and decrees. The EEAA officially cooperates with local waste management initiatives as a regulator through the Environmental Impact Assessment (EIA) process. EIA approval should be granted as a license to any waste management facility or any project that affects the environment directly or indirectly before operating.

Furthermore, there is a Central Department of Waste and Material and Hazardous Substances within the EEAA, which was responsible for drafting the National strategy for Integrated Solid Waste Management in 2000 (which is the foundation of the current NSWMP) in 2000. On the regional level, this department also identifies the suitable sites for waste management activities and is supposed to support governorates in their waste management activities (NSWMP, 2011).

➤ *The Waste Management Regulatory Agency WMRA*

A prime ministerial decree has announced the official establishment of WMRA on 22 November 2015, which will be an independent agency under the Ministry of Environment that can expand into branches in the governorates.

According to the ministerial decree, WMRA’s objectives are as below:

1. Organize, follow-up and supervise all the SWM activities on the national and regional levels, which would achieve a better and safer management of solid waste.
2. Strengthen relationships of Egypt with other countries and with International Organizations in the waste management field and making relevant recommendations accordingly.
3. Attract and encourage investments in the whole waste management chain from waste collection and transportation to waste recycling or safe disposal.

To achieve the above mentioned objectives WMRA will perform the below tasks:

- Coordinate and assign roles and responsibilities among all the relevant stakeholders in the SWM system.
- Cooperate with ministries; governorates and other relevant institutions in making policies and setting strategic plans that manage the different types of wastes on the national level.
- Prepare proposals for renewing the legislation tackling the SWM system.
- Ensure data and information access of the SWM sector.
- Provide technical consultancy services to the relevant authorities and stakeholders.
- Provide guidance tools to implement strategic plans on the governorates level.
- Prepare the evaluation criteria and guidance models for all the stages of SWM activities, and provide the necessary technical support on the central and local levels.
- Form a committee that examines the complaints that come from the services providers and their contracted parties, and propose solutions for these complains.
- Prepare a plan for the training and capacity building of the people employed in the SWM sector.
- Provide technical support for awareness campaigns and programs.
- Propose economic and financial instruments that would help achieving WMRA's objectives, in cooperation with the relevant institutions.
- Prepare technical researches and propose tools to set the tariff fee of the SWM services.
- Create investment opportunities in the SWM sector.
- Prepare studies for the projects and entrepreneurial and/or pilot initiatives aiming at developing SWM system and provide funds for them.
- Facilitate the processes for individual and institutional initiatives that contribute to a better SWM system

- Adopt a special technology for the waste recycling operations, in cooperation with the relevant ministries and institutions.
- Provide the technical support and prepare specific terms and conditions for licensing of the SWM practices in a way that complies with the rule of law.
- Monitor and regularly evaluate the performance of the licensed institutions.
- Propose the laws and regulations that are necessary for joining international and regional cooperation, and coordinate with the donors, ministries and relevant institutions to implement SWM projects.

As for the financial resources of WMRA, they will be mainly the amounts specified for the agency from the State Budget, the donors' funds, the administrative fees that come to WMRA in return of the licenses and technical consultancies, the return of investments, and any other resources that do not contradict with the rule of law. WMRA will have a specific budget including its revenues and costs that starts and ends as per the state's financial year (2015)

2. Ministry of State for Local Development (MOLD)

The General Secretariat of Local Administration (AMANA) is responsible for providing technical support and advice to local administration, communicating legal issues that address local administration matters among the local units, replicating successful models in the different governorates, managing training to the local administration staff. In addition, AMANA is in the position to propose relevant legislations to the local administration systems. Therefore, AMANA is responsible for supporting the governorates to develop SWM facilities, for example plants for composting, where 63 plants already exist in different governorates. However, research and evaluation have shown that only few of these composting plants operate efficiently, and some of them are already out of service; the most successful model that is worth to be replicated is ECARU plant in 15th May City. Finally, AMANA has extensive roles in all issues related to the governorate level, and SWM is only a tiny part of these duties, which reflects why the sector does not receive the proper attention within the institutional framework.

As previously mentioned, Ministry of Environment and MOLD are not the only responsible entities for SWM sector in Egypt, but the responsibilities are dispersed among more institutions; Ministry of Housing is the entity responsible for setting the locations and specifications of the dumping sites, and the treatment methods

according to Law 38/1967 (Waste Management Egypt, 2011). Ministry of Agriculture and Land Reclamation is responsible for all the activities related to agricultural waste in cooperation with EEAA. Ministry of Health and Population is handling the hospital wastes, domestic insecticide wastes, and laboratory wastes which lie under the umbrella of hazardous wastes. Ministry of Water Resources and Irrigation is responsible for handling the wastes resulting from cleaning the waterways (Al-Dorghamy, 2007). Finally, Ministry of Finance directly subsidizes Cairo Cleaning and Beautification Agency (CCBA) and Giza Cleaning and Beautification Agency (GCBA), which are the responsible entities for SWM activities in Cairo and Giza, while other governorates do not have dedicated entities handling SWM, yet, they are still directly subsidized by the Ministry of Finance to perform the SWM activities in case when the governorates are contracting private companies (NSWMP, 2011).

3. At the Governorate Level:

Individual governorates hold full responsibility for SWM activities whether directly or through contracting private companies. There is no unified strategy among governorates, but each governorate is accountable to set its own strategies, plans, institutions, and financial matters at the regional level, in addition to contracting, evaluating and monitoring the performance of private sector or NGOs, enforcement of regulations and raising people's awareness. Therefore, there are different institutional setups for SWM at the governorate level (NSWMP, 2011).

Unfortunately, because governorates' departments are most probably engaged with other tasks and responsibilities and they are lacking resources especially in physical and human resources, SWM is left as the least priority of the governorate at the district level. Only Cairo and Giza governorates have an organizational structure that is focused on SWM activities (CCBA and GCBA), which are responsible for the collection and transportation of wastes and they are also responsible for the supervision and assessment of public disposal sites, operation of composting plants whether directly or through private sector companies. Those agencies are considered as the responsible entities for concluding SWM contracts with private sector companies (Bakry, 2015).

On the other hand, in the other governorates, the Local Administration Units (LGUs) are accountable for the cities' cleaning as per the organizational setup of the city. As a result, the SWM activities have to be managed together with other services, since there is no specific body whose responsibility for SWM planning and

monitoring of operations. Yet, in governorates like Cairo, Giza and Alexandria, where waste management services were privatized, specialized departments that are responsible for SWM Service Contract Monitoring have been established (NSWMP, 2011)

➤ ***Analysis of the Institutional Framework:***

Based on the data collected through interviews and government documents, it was found that the government's role in SWM system could be described as a bumpy road, where there is neither clear functional assignment nor sector planning. Also, a significant coordination problem is in place due to having several institutions playing roles in SWM sector at the central and local government levels, which resulted in the lack of accountability, and the inefficient utilization of human resources. This has led to the fact that the SWM sector in Egypt does not receive the adequate policy attention, which reflects a deficit in the staff numbers and the level of professional dedication to the SWM sector.

The Ministry of Environment's role is limited to setting guidelines rather than implementing, and even those guidelines are not well enforced due to the increasing level of corruption. For instance, in the case of Cairo, the Contract Monitoring Unit that is entitled to monitor and enforce the companies and contractors' compliance with the contract provision is corrupted, where bribing is always being used by the private companies, and thus the contract provisions are not strictly implemented (Mansour, Naeim, and Nan, 2016). Furthermore, the political instability that Egypt has been witnessing since the revolution; the several cabinet reshuffles, and the cancellation of the Ministry of Urban Renewal and Informal settlements, after almost one year from its formation, led to the result that any effort exerted in many sectors; among them the SWM, is either ignored by the following minister in charge, or too slow in implementation to have any noticeable impact. However, the ministerial decree announcing the formation of WMRA in November 2015 is promising and gives hope that the government will give more attention to the SWM sector.

WMRA is a regulatory agency i.e. its role will mainly be regulating, organizing, and setting rules for the SWM sector. It will not implement projects, but it can act as an advisor. According to the Prime Minister decree no. 3005 for year 2015, "WMRA will include in its board, members from the Ministries of Local Development, Agriculture and Land reclamation, Trade and Industry, Housing Utilities and Urban Development, Health and Population, Defence, Interior, and Military Production. In

addition, WMRA will recruit two experts and two from the civil society working in the SWM sector that will be selected by the Minister of State for Environmental Affairs. Further, the chairman of WMRA will be eligible for the position for 3 years that can be renewed for only one term”. Also, WMRA’s board will include representatives from the private sector and the informal sector, and that the board has the right to invite any of the relevant partners during the discussion of decisions (Saeid, 2016)

It was agreed among four interviewees, that unfortunately the people who have been assigned so far to WMRA are not the qualified calibres who have the adequate technical and administrative expertise, but rather it is the time for their job promotion (Mansour, Iskandar, Shouman, and “Contractors Interview”, 2016). This reflects that bureaucratic decisions and not hiring the suitable person for the position is one of the biggest problems that are hindering the capacity of the public sector to solve any problems in Egypt. Also, three of the interviewees highlighted the fact that EEAA was established to handle the SWM problem along with other problems. Yet, the problem was not solved, it actually increased. (Naeim, Bekhit and El Me’adess, 2016). This means that it is not only about establishing new agencies, but also about corruption, and lack of planning and professionalism, which form the biggest challenges. Furthermore, interviewees representing the informal sector, NGOs and the contractors had no idea about the establishment of WMRA, which again reflects a slow motion, and indicates that these stakeholders might be excluded from this entity.

As for the governorates, the SWM system in Egypt is heavily reliant on the localities and local councils to make decisions and monitor and evaluate the laws implementation. As a result, there is no unified set of rules for governorates to follow. In addition, due to the lack of financial resources allocated to SWM on the regional level, the local administration (governorates and districts) is not empowered to perform the SWM functions. For example, they do not have access to public land for transit stations or landfills, and the central government budget allocation for SWM competes with budget for street paving and lighting, which are in high demand as well. Therefore, this lack in financial resources results in deficiencies in the SWM system of the governorates. According to the ministerial decree no. 3005 for year 2015, WMRA will “provide guidance tools to implement strategic plans on the governorates level”. However, the governorates have weaknesses in the administrative tasks, they lack the professional calibers and they lack the advanced

technical expertise, and they need not only guidance, but also trainings and capacity building to be able to administer SWM activities properly (Abdelhakim, 2016).

On another note, it is worth mentioning that unlike other governorates, Cairo and Giza has the CCBA and GCBA, which are supposedly there to organize and administer the SWM system in the city. However, unfortunately CCBA fails in delivering the desired services, due to the lack of financial resources, and the corrupted administration and monitoring system, and this will be mentioned in details in Chapter VI: Stakeholders in SWM sector in Cairo: Review and Analysis.

3. Financial Framework

According to the Classification Guide of the State Budget of the Arab Republic of Egypt published by the Ministry of Finance in 2015, there is no allocated fund for SWM in the central government budget but it follows the regulation of the central government in other sectors. The expenditures in the national budget is divided into the following six sections:

1. Salaries and wages
2. Procurement of supplies and services (including maintenance)
3. Interest
4. Subsidies
5. Other expenditures
6. Investments

The SWM financial system is centralized. On the governorate level, there is a budget line inside the investment chapter in the expenditures of the national budget that is called “Local Development Programs” and it covers the following five programs:

1. Local roads and transport
2. Street lighting
3. **Environmental improvement, including SWM, street trees, public gardens, etc.**
4. Security, firefighting & traffic management
5. Support to local units

The third program is considered as the budget line covering SWM activities for the local administration. However, it hardly covers street cleaning equipment (from sweepers to bulldozers), trash baskets, hiring temporary street cleaners, and others (MoF, 2015).

As for Cairo and Giza governorates, there are cost centres, CCBA and GCBA, where the ministry of Finance subsidizes them directly, while other governorates do not have such specialized institutions for SWM operations. The cost of waste management is estimated in Cairo to be LE 125 per tonne, while outside Cairo it is estimated to be within the range of LE 60 to LE 110 per tonne excluding the costs of recycling and recovery that is managed by the informal sector. There are two systems of charging; the first is the cleansing fee, which is formally collected mainly through the electricity bill, where the threshold varies depending on the governorates as follows; LE 1 to LE 10 from households in cities, LE 1 to LE 4 from households in small towns and LE 10- LE 30 from shops. The second system of charging is the informal cash payment in return for the door-to-door collection as a result of arrangements with the informal garbage collectors.

As for the revenues, the cleansing fee is the most significant source of financing SWM system. In addition, penalties and fines for violations according to law 38/1967 are another source of financing. Governorates collect tariff fees from the private companies working in the SWM sector. As for the informal recyclers' revenues, the cash payments system at the door is the significant source of revenues in return of the reliable collection services that they offer. However, the beneficiaries pay two different fees, which is an issue of concern. On the other hand, there is a deficiency in the cost recovery for SWM activities of around 35% of costs that are not covered by the above-mentioned revenues. This gap is partially covered by either the direct subsidies from the government or from the additional budgetary funds. Yet, relying on such sources of funds always results in deficits that are reflected in the low performance level of the governorates in the SWM operations (NSWMP, 2011)

➤ ***Analysis of the Financial Framework:***

The financial system of SWM sector is not solid, where there is a partial cost recovery of the service; “the inhabitants do not pay the adequate amount of fees that would cover a sound SWM system, but there is a proposed solution, where people living in rich areas cover the costs of those in the poor areas in case we truly understand the social solidarity concept in the cleanliness of urban cities” (Iskandar

Interview, 2016). This deficit in the financial system is reflected on the poor equipment, the weak and consumed transportation system, and thus the defected SWM system. Although there is a cost center and allocated budget in Cairo (CCBA), still there is a deficit and misallocation of the financial resources, where around 430 Millions EGP goes to the international companies (FCC and AMA ARAB) form a total of 600 Millions to all international and local companies, NGOs and contractors per year (Mansour, 2016). On the other hand AMA ARAB Company is complaining that it is not receiving 100% of its due payments, as the CCBA is not receiving its allocated budget from the Ministry of Finance. (Hassan, 2016).

4. Government Initiatives for improving the SWM system in Egypt

As a response to the deficiencies in the SWM sector in Egypt, some solutions started to emerge that aim at enhancing the system.

1. “National Strategic Directives of Waste Management in Egypt” by the National Solid Waste Management Programme (NSWMP)

The NSWMP was first initiated in year 1999-2000 to respond to the serious air pollution phenomenon known as “the black cloud”, and the programme was prepared but not implemented due to the insufficient institutional framework at the national level that would support such a programme. The Solid Waste Management crisis has noticeably increased by 2009, which revived the need for the NSWMP, and as a result, the government of Egypt established an Inter-Ministerial Committee (IMC), which included representatives from the ministries that play key roles in the SWM sector. IMC was assigned to prepare a proposal for the future institutional framework that would govern the SWM sector across the country. IMC adopts a consultative approach, which was basically supported by the German government through its organizations in Egypt GIZ, and KfW, and it was also supported by the European Union.

The main objective of IMC’s consultative approach was to establish an agreement among stakeholders on the need to create a NSWMP entity to work as a centre for excellency in legislation, policy, strategy, contracting, financing and technology of SWM sector, and to support the decentralized application of better practices of waste management in the governorates. In 2010, IMC launched a study that analyses and evaluates the waste management sector frameworks, options for institutional reform, and recommend the ideal institutional arrangements, drafting the NSWMP and

necessary documents that would attract technical assistance and investments from EU and the German Government (NSWMP, 2011)

NSWMP has become in place in 2012, and has resulted in several outcomes; a national dialogue with all relevant actors was successfully established on the development of the political and strategic framework and was submitted to the Ministry of Environment. This included the requirement of promulgating a SWM law, in addition to a central regulatory authority. Annual forum takes place that aims at promoting networking between all the relevant stakeholders in the waste sector. Moreover, some operation models for waste collection and recycling are being piloted and assessed in several governorates such as Gharbeya, Kafr el sheikh, Assiut and Qena governorates, where for instance simple models of collection and recycling were designed and supported technically and financially (Sweepnet, 2014).

Finally, the NSWMP has published the “National Strategic Directives of Waste Management in Egypt” in November 2014, which highlights directives that aim at providing support and guidance for decision makers in the waste sector. Focusing on waste recycling, it is worth mentioning that these directives consider recycling in its objectives, where it is aiming at optimizing the reuse and recycling rate when it provides economic, social and environmental benefit. Also, it emphasizes the significance of having technical and financial mechanisms to promote waste reduction and recycling, through including it in its short term and long term targets (NSWMP, 2014).

➤ ***Analysis of the “National Strategic Directives of Waste Management in Egypt”***

Focusing on waste recycling, it is worth mentioning that these directives consider recycling in its objectives, where it is aimed to optimize the reuse and recycling rate when it provides economic, social and environmental benefits. Also, it emphasizes the significance of having technical and financial mechanisms to promote waste reduction and recycling, through including it in its short term and long term targets. Furthermore, among the principles where those national directives rest on, is the “Principle of Recognition” which states that waste recycling and waste management are significant sectors of the economy, as they provide employment for skilled, semi-skilled and unskilled workers. Also, according to the NSWMP coordinator, “recycling is promoted through the principle of the waste hierarchy (avoid, reduce, reuse, recycle, recover, and dispose)”. In addition to the principle of “Consumer-Driven Change” which states that consumers can drive the need to less

amount of waste through making wiser choices, and thus leading to waste reduction, reuse and recycling.

As for the SWM law that is being drafted, it will address mechanisms that enable waste reduction, reuse and recycling. Also, Directive #7 tackles the importance of encouraging the existence of an adapted and appropriate technology mix that suits local conditions, which is supported by development programs and national researches and would trigger improvements in collection and recycling mechanisms. Directive #8 supports the fact that awareness and education are crucial to promote waste recycling and discourages the undue waste production. Finally, Directive #9 highlights the important role economic instruments can have in promoting waste recycling.

Therefore, the NSWMP presented by the GIZ sets the framework that would enable policy makers to start working on an integrated SWM system, where recycling is a core activity. GIZ as an International Organization has made adequate efforts to organize forums, write reports, and propose solutions. At the end, SWM is a public utility that must be organized by the government; where decisions are needed to organize this sector. Already the government approved one of the NSWMP proposals, which is the formation of WMRA. Yet, a faster pace is needed to administer this sector properly with the guidance of GIZ, which has already provided the framework for it.

Moreover, theoretically NSWMP provides excellent recommendations and comprehensive plan that will not necessarily be effective practically due to the lack of law enforcement and the increasing corruption (Mansour, 2016). On the other hand, the interviewees from the informal sector and NGOs were pessimistic about it, stating, “It is wasted money on some meetings and consultancies. Nothing is practical. They make good recommendations, but only on paper and the government does nothing” (Naeim, 2016). This stresses on the same point, which is the dramatic need for administrative decisions by the government.

A relevant case to the National Strategic Directives of Waste Management in Egypt is the National Waste Management Strategy (NWMS) of South Africa. Case #2 shows how the whole chain of waste management is addressed by the NWMS, giving a high weight to recycling, where the first goal of the strategy is concerned with waste minimization and recycling. The NWMS is mainly concerned with the implementation of the waste management strategy of the Waste Act, which is, based

on the waste management hierarchy that consists of several methods of waste management that are arranged in a descending priority order starting from waste minimization, then reuse and recycling, after that recovery, and finally treatment and disposal. However, implementing this hierarchy entails a mindset and behavior shift for households, private sectors and organizations. Also, it entails a proper infrastructure that eases reuse and recycling. It is noticeable that such a strategy implies that South Africa is in a more advanced status than Egypt concerning SWM, where there is a greater focus on recycling. While in Egypt, the focus of the directives is on the basic collection and transportation system. However, the NWMS has in common with the National Directives by the NSWMP, that both of them is based on the “Waste Management Hierarchy Approach”.

Table 2: Case #2 South Africa

- **Problem:** increasing population and economic development have led to the increased amounts and complexity of waste and thus waste management has become more complicated, which is mainly compounded by having general and hazardous wastes all mixed together
- **Government's Kind of Intervention:** Policy and Legislation
- **Name of the Intervention:** National Waste Management Strategy (NWMS)
- **Main Actors:** Government, labour unions, industries, NGOs, and citizens
- **Description of the Intervention:** It is a legal requirement of the Waste Act, 2008. The Waste Act is mainly based on an overall approach that guides waste management in South Africa, which is the "Waste Management Hierarchy". The hierarchy consists of several methods of waste management that are arranged in a descending priority order as below ("National Waste Management Strategy"):

1. Waste minimization and avoidance
2. Reuse and recycling
3. Recovery
4. Treatment and Disposal

• **Objective of the Intervention:** NWMS has 8 major goals that should be achieved by 2016 as follows

1. Encouraging minimization, reuse, recycling, and recovery of waste, targeting a 25% of recyclables from landfill to be reused and all municipalities to initiate "waste separation at source" well defined programs, in addition to achieving the specified targets of recycling in paper, lighting, pesticides and tires industries.
2. Guaranteeing that delivery of waste services is effective and efficient, through maintaining accessibility to 75% of rural households and 95% of urban households to waste collection services and ensuring that 80% of wastes dumping sites have legal permits.
3. Increasing the contribution of the waste management sector to growing the green economy, through creating a minimum of 69,000 jobs in the waste management sector, and 2,600 cooperatives and SMEs in the waste delivery and recycling services.
4. Increasing public awareness of the health hazards and environmental impacts of waste, where 80% of municipalities should launch local awareness campaigns and 80% of schools should implement awareness programs on wastes.
5. Establishing Integrated Waste Management Plans (IWMP) through encouraging municipalities to integrate their IWMPs into their Integrated Development Plans (IDPs). Also, all waste management facilities are required to report to the South African Waste Information System (SAWIS).
6. Maintaining comprehensive budgeting and financial management for waste facilities and services, where all municipalities involved in waste services have to present cost benefit analyses for the waste management programs, in addition to cost reflective tariffs.

7. Providing clear measure to recover polluted lands, where a minimum of 80% of sites should be assessed and reported to the contaminated land register.
8. Effectively enforcing the Waste Act, where 50% increase in the enforcement actions will take place against non-compliant activities ("National Waste Management Strategy")

- **Results on Recycling:**

There are three major indicators that would assess if the first goal concerned with waste minimization, reuse, and recycling is achieved. First, the response of the paper, pesticide, tire, and lighting industry toward the specified targets for waste minimization, recycling or reuse that are set in their Industry Waste Management Plans (IndWMPs). Second, the percentage of the recyclable wastes deterred from the landfills, where the target is to divert 25% of the recyclable wastes for recycling, reuse or recovery. The third indicator will be the total number of municipalities that initiated campaigns of separation of waste at source. These indicators will be measured before the end of this year 2016 to evaluate if the NWMS is achieving its targeted goals or not ("National Waste Management Strategy (NWMS) approved for implementation by Cabinet").

- **Key Success Factors:**

The consultative and participatory approach adopted in the NWMS was a key success factor to produce such a comprehensive integrated policy document that involves all the relevant national and regional departments, in addition to the engagement of other stakeholders who have crucial roles in the waste management process including households, NGOs and private sector.

2. "Segregation from the Source" Campaign:

Dr. Laila Iskandar, the former Minister of Urban Renewal and Informal Settlements contacted the Ministry of Supply and Internal Trade to cooperate on implementing an initiative where citizens are provided points to be redeemed to food items in return of segregated waste. This is a form of economic incentive where a direct subsidy is provided in return of a certain behavior. Further, awareness programs were developed in Dokki, Agouza and Imbaba to educate residents on source segregation, and provide them with separate bags to dispose of the organic and the non-organic waste separately in order to facilitate recycling and create a more hygienic system. Also, the Minister conducted public seminars with her presence that aim at raising the public awareness about the



Figure 4: Segregation from the Source Campaign
(almasryalyoum)

segregation from the source concept. (“20 Million Tons: Managing the Challenge of Solid Waste”). However, these efforts have been paused when the Ministry of Urban Renewal and Informal Settlements was cancelled in September 2015 (Sweepnet, 2014)

➤ ***Analysis of the “Segregation from the Source” Campaign:***

The interviewees differed in their point of views toward this initiative. Some of them believe that this is a form of direct subsidy in return of a certain behavior, which might be a burden on the government that may fail to sustain it for a long time. They claim that in order to guarantee sustainability, waste recycling should be based on a self-sustained system that creates revenues. “For 90 million people, how would you provide a system of points to be redeemed with food items for a given weight of separated wastes? While for the rich people, it would not be an attractive incentive” (Stretz, 2016). In contrast, other interviewees argue that this initiative was an excellent one and that it should not be a burden on the government, because simply this should not ever happen through the government but through the private sector that will make use of these segregated wastes in its industries and give incentives in return. The government’s role will only be collecting the cleaning fees from households, similar to what it does now (Shouman, 2016).

As per the interview conducted with the former Minister of Urban Renewal and Informal Settlements Dr. Laila Iskandar, the one who initiated this campaign, she claimed that it is essential to give incentives to people who separate wastes. For instance, giving them discounts on the cleansing fees. However, this needs a very high level of monitoring, and a fair authority that would reward those who separate wastes, and this would require a complicated system that is not suitable to Egypt. Thus, it should be done gradually, where incentives are given to the company that collects waste, and to the inhabitants who commit to the rules. “Giving incentives to the housewife for separation and commitment, through knowing this information from the contractor is a very strong incentive” Said Dr. Iskandar.

Another point of concern that was raised by the interviewees from the informal sector, NGOs, and contractors is that the segregation from the source can lead to the emergence of the “Robabikia” man, and the housewives especially in the poor areas would rather sell the bag of the non-food waste to him than giving it for free to the waste collector. The former minister recognized this point and she assumed that the garbage collector in the poor area would not earn from recyclables and for this

specific reason, she proposed that garbage collectors in the poor areas would be paid more than those in the rich areas as a form of compensation.

Dr. Iskandar clarified that the financial deficit is one of the biggest challenges of this initiative, she proposed to CCBA to pay the contractor 12 EGP per apartment instead of 4 EGP, and in return CCBA would apply the separated collection and provide the two different bags to households and try this as a pilot experience for three months. However, CCBA and the contractors refused. CCBA refused because it will be a higher cost. Contractors refused because three months contracts are not secure for them and they were afraid to lose their jobs afterward (Mansour, 2016). Another challenge is that the garbage collector is not used to the concept of waste separation, and even if households segregated the waste, the garbage collector might mix it again in his truck.

In general, segregation from the source is an excellent initiative, since it would save lands as less wastes will be landfilled, it would lead to smaller amounts of refuse waste. So, there will be no need for the high costs of the sanitary landfills, which need covers for isolations, specific equipment, gas network and others, and that costs a lot when the organic material is included. “Segregation from the source saves effort and time of the worker, which is very important” (Shouman, 2016). Such initiative needs intensive awareness campaigns for the citizens and the garbage collectors that might take years to change the culture. It also needs strong incentives and motivation to change people’s behavior. On the other hand, restaurants and hotels are responsive to the source segregation concept, and implementing the campaign would be doable with such target group (“Contractors Interview”, 2016).

A very similar experience that was successful took place in Curitiba City in Brazil, which was based on the fact that simple initiatives and incentives can work better than high tech solutions or complicated plans. Case #3 illustrates that segregation from the source campaign based on economic incentives can work and achieve the desired results, but the question is whether it would be sustainable in a city like Cairo or not.

Table 3: Case #3 Brazil

- **Problem:** the increasing piles of garbage in the poor neighborhoods of the city.
- **Government's Kind of Intervention:** Incentive Programme
- **Name of the Intervention:** Purchase Garbage Program and the All Clean initiative
- **Main Actors:** Municipality and households

- **Description of the Intervention:**

City of Curitiba in Brazil, has taken successful initiatives that improved recycling among citizens with low income, as well as people living in the informal settlements. The municipality creatively introduced the "Purchase Garbage Initiative", where the citizens are rewarded baskets of food in exchange of garbage; 8 to 10 kilos of garbage are exchanged by a food basket, also waste can be exchanged by transportation tokens or school equipment e.g. notebooks. This initiative has intensively motivated the households to abide by the rules of waste segregation, where they were requested to separate recyclables materials including plastic, paper, food, and electronics to be collected by the municipality three times a week. Without the "Purchase Garbage Program", it would be a great challenge for the government to convince people with low income living in the informal settlements to separate recyclable wastes.

As for the "All Clean" initiative, the government grants temporary jobs to unemployed or retired peoples to clean up particular areas in the city where garbage is accumulated. As a result, such simple initiative has provided employment opportunities, and thus another win-win situation (*OECD Territorial Reviews: Antofagasta, Chile, 2013*).

- **Objective of the Intervention:** Minimize the amount of litter and wastes in the informal settlements and poor neighborhoods.
- **Results on Recycling:**
 - The collection of around 6800 tons of segregated waste daily.
 - The city has achieved a self-financing system of public transportation rather than being burdened with debt payment for the operations and constructions that subway systems require.
 - Public participation in the recycling programs has increased to around 70 percent of the households
 - Around 1200 trees were estimated to be "saved" as a consequence of the daily volume of paper being recycled.
 - 31,000 families in 60 neighborhoods have benefited from the Purchase Garbage Program by receiving 1,200 tons of food, school notebooks and almost million transportation tokens, in exchange of 11,000 tons of garbage that were collected (*OECD Territorial Reviews: Antofagasta, Chile, 2013*).

- **Success Factors:** Curitiba has made a success story in recycling through closely understanding the public's needs and tailoring the policies to satisfy those needs. A win-win situation has been created very simply, yet creatively whether through incentivizing people with the food basket, transportation tokens and notebooks or through providing temporary jobs, and thus indirectly building a new image for "waste" in the citizens' minds through drawing the perception that waste worth money and it is valuable that you can buy food or transportation tokens by it.

Therefore, based on Case #3, People's engagement and having a win-win situation in every initiative taken, was the key for success that did not reflect on recycling alone, but on other social factors such as employment, and better access to transportation and food. It was a municipality's initiative that was very effective, since it targeted poor citizens and taught them the recycling culture, through rewarding them with benefits that satisfy their very basic needs. Curitiba's initiative is very simple and smart and should be considered for replication in any country that has a high rate of poor and slum areas. However, in a complicated city like Cairo where there is a high range of people's income level, such initiative would not necessarily work.

Chapter V: SWM Value Chain in Cairo – Review and Analysis

It is vital to analyze the SWM system value chain and the position of waste recycling in it, in order to identify the gaps and accordingly propose the suitable solutions that will be focusing on enhancing the whole system for the objective of promoting the waste recycling activity. SWM system value chain comprises of waste collection, transportation, recovery, disposal, and marketing of the recycling's products



Before describing and analyzing the SWM value chain, it is essential to identify the waste composition of Cairo. According to CCBA,

- Organic waste 50% - 60%
- Plastic 10% -15%
- Paper and cartoon 8% - 12%
- Textiles 2% - 3%
- Glass 1% - 3%
- Metal 1.5% - 2%
- Refused 11% - 28%

The total amount of wastes produced in Cairo is around 16,000 tons per day

1. Collection System:

Currently in Cairo, there are two main models of waste collection; the first model is collecting the garbage from the large containers that are placed in the streets. This model has been initiated since the international companies were contracted. Those companies place large containers in the streets, where each apartment should throw the garbage in. The second model of collection that exists in Cairo is the door-to-door collection, which is mainly implemented by the contractors. This model is the traditional one that has been implemented for years by the informal sector in the old districts of Cairo. Finally, there were attempts by the former Ministry of Urban Renewal and Informal Settlements to implement segregation from the source, which

is a more advanced model than the door-to-door collection, where two different bags (food waste and non-food waste) for each household are collected.

➤ ***Analysis of the Collection System:***

Most of the interviewees agreed that the first model of the street containers was the main reason of the emergence of the “scavengers”, who might belong to the garbage collection informal community, that lost their jobs by the introduction of the private companies, or they might be poor people who are living in the informal settlements and they are seeking income generation through selling items from the garbage. The scavengers’ phenomenon resulted in sorting the garbage in the streets around the containers, which led to the dirtiness of the streets. Also, the irresponsible behavior of some inhabitants of throwing the garbage off the containers, and the delay that sometimes happen by the companies in unloading the containers, result in having unclean streets and unhealthy air.

As for the door-to-door collection, it has advantages over the street containers model that it avoids sorting in the streets and thus the streets stay cleaner. Also, in terms of waste recycling, this model would serve it better as the most valuable items of the garbage are not taken by the scavengers. However, based on the interview conducted with the contractors, it was found that some households are reluctant to commit to opening the door for the collector or people are not available in the house at the time the collector passes by, and therefore they dispose of the garbage in the streets. On the contrary, in some places, people reject the idea to put their garbage in the containers. So, the international companies resorted to contract people from the informal sector and the traditional door-to-door collector resumed his work, where he is paid around 2 EGP per unit and in return the company gives him the freedom to sort and take what he wants from the garbage (El Me’adess and Naeim, 2016). Finally, the segregation from the source model is theoretically the most suitable solution for recycling promotion, as it saves effort and time, in addition to saving the value of the non-food waste to be high quality compost. However, this initiative has been stopped once the Ministry was cancelled.

2. Transportation System:

After collection, the waste is transferred in open trucks to the transfer stations. Then, larger trucks that are managed either by the international company or by CCBA, depending on who manages the given district, transfer the garbage from the station to the landfill, dumpsite or the composting factory ECARU. Some waste

contractors who work in districts close to ECARU transfer the waste directly to ECARU, without passing by a transfer station (Mansour, 2016).

➤ ***Analysis of the Transportation System***

The current weaknesses of the transportation system in Cairo are the insufficient number of trucks that are outdated. Ideally, one truck should serve a maximum of 800 residential units. However, due to the financial limitations, the truck collects garbage from a number of residential units that exceeds its capacity, and since it is a consumed open truck, some of the garbage is dropped from the trucks during the transfer, which makes it a defective system.

After placing the garbage in the transfer stations, and since people from the informal sector officially have no access to those stations, they tend to bribe the guards to let them sort the garbage and take the items they want. Therefore, after the sorting made by the scavengers in the street containers, and after the sorting conducted by the informal sector inside the transfer stations, most of the leftover of the garbage would be the organic waste and the refused items (Mansour, Naeim, Nan, El Me'adess and "Contractors Interview", 2016).

Finally, "the transportation system can be done through several types of vehicles; it can be a tricycle, lorry, donkey or others. Nothing is wrong" Said Dr. Iskandar. It does not have to be a sophisticated and advanced vehicle if the financial resources are limited. Actually, it depends on the area, and the mentioned basic vehicles might be more suitable and work better than the advanced ones, especially if the area that is served is congested with buildings and the streets are narrow. Also, Transportation has costs: fuel, depreciation (need for maintenance), time, and workers. Thus, there is a need to measure the exact cost of the transportation to impose the relevant fees on the citizens (Iskandar, 2016).

3. Recovery System and Informal Recycling:

Formally, **compost factories** represent the recovery activity. First of all, it is vital to define some of the concepts that lie under the umbrella of the recovery activity.

- ***RDF***: it includes the segregated waste that is traded in a manufacturing process or installation of power generation to achieve high calorific value (e.g. the cement industry). It mostly encompasses the contaminated plastic bags, processed paper, wood residues and other commercial wastes (Gendebien et al., 2003).

- Composting: it is the process where the biodegradable or organic waste (food leftovers) is turned through aerobic decomposition into rich fertilizers ("Compost Collection Services", 2014).
- Refuse waste: everything that is left after composting and recycling, and which cannot be used as RDF, and thus has to be landfilled ("Compost Collection Services", 2014).

The biggest compost factory in Cairo is ECARU, where wastes are sorted; the organic wastes go to the compost factory. However, from the compost produced, only around 25% is sold because the farmers' culture is not yet ready to accept the natural fertilizer. Unfortunately, in Egypt natural fertilizers are more popular in the land reclamation and not in the normal agriculture. For this reason, the marketing department in the company is working on finding techniques to increase the sales of the compost. As for the RDF produced, only around 25% is sold. But the market of the RDF is booming in Egypt, where there is a rising demand from cement factories (Mikhaeil, 2016). There are two other compost factories managed by FCC and AMA ARAB. However, all interviewees agreed that ECARU is the best one operating in Cairo.



Figure 5: Composting in ECARU (By author)

Finally, the informal recycling happens through the informal sector who are experts in the sorting process, where they sort plastic from paper from glass and others, and they even classify the plastic for example to several types, where each sorted group is used differently. They mainly recycle the solid non-food wastes to raw

materials that are ready to use in industries by the factories of plastic, paper, glass and others. Further, they produce some final products; the most famous one is the plastic hanger, in addition to clothes, rugs, notebooks, accessories and others that are mainly produced by APE NGO.

➤ ***Analysis of the Recovery System and Informal Recycling:***

For the compost factories, it is obvious that the revenue of the company comes mainly from the government's payments of the contract, and that is relying only on recycling operations would make the company losing, and this is again a result of having a contract that is based on 80% disposal and 20% recycling, which makes the company not obliged to improve the sales of its recyclables, since the company is paid a fixed amount anyways for 80% landfilling and 20% composting of the wastes it receives. For instance in the case of ECARU, 25% of the garbage it receives, is organic waste that is recycled to compost, only 0.5% is recyclables (due to the scavengers' phenomenon that take recyclables from the garbage before it reaches the factory. Without scavengers, recyclables could reach a percentage of 20%), 50% is refused waste that goes to the landfill, and 20% is refused waste that is recycled to RDF (Mikhaeil, 2016). Finally for the informal recycling, it is worth noting that the informal sector represents a very active value chain where one tone of garbage generates five direct jobs; three people work in collection and transportation, two in sorting, in addition to other seven indirect jobs (Naeim, Nan, and El Me'adess, 2016). Thus, this implies that waste recycling is a significant source of jobs generation.

4. Disposal System

There are three systems of formal disposal in Cairo, disposal in a **landfill**, **dumpsite**, or recovery through a compost factory. FCC Company is managing "El Wafaa w El Amal" landfill, where garbage burning takes place. Another landfill is managed by ECARU Company, which is way healthier than the above-mentioned landfill (El Wafaa w El Amal). On the other hand, AMA ARAB Company is managing a **dumpsite** in Kattameya, where garbage is disposed without any kind of recovery. What usually happens in Cairo is that people from the informal sector go to the dumpsite and the transfer stations; where they bribe the guards to take the solid non-food wastes and transfer them to their areas, where wastes are recycled.

It is important to highlight the difference between a landfill and a dumpsite. A landfill is a hole in the ground padded with insulation, where the garbage's effect is not transferred to the soil or the surrounding environment, and it prevents the

deployment of water seepage into the ground. Also, a landfill includes a pipes network that produces methane. However in Cairo, methane gas is not utilized and not linked to other industries. While a dumpsite is a hole where the garbage is dumped, and each layer of garbage is layered with a covering material (e.g. sands) to limit odors, pollution and inflammation (Mansour, 2016).

➤ ***Analysis of the Disposal System***

Officially, garbage burning should not take place in the landfills. According to the interviewees, it is not clear how garbage burning takes place in Al Wafaa w Al Amal landfill. Is it deliberate or self-ignition? In all cases, this reflects lack of transparency, and mismanagement of the landfill where garbage burning should not ever happen deliberately and also self-ignition should not happen in a landfill since it is supposedly padded with insulation, and therefore the garbage's effect should not be transferred to the surrounding environment. On the other hand, according to a field visit that was conducted to ECARU, there are no emitted odors from the landfill; also there are no unpleasant views of garbage. It looks like a desert land. On the other hand, odors are absolutely unpleasant while passing by El Wafaa w El Amal for kilometers away.

5. Marketing of the recycling's products

Formally, the marketing of the compost is still weak, where the compost factories do not sell more than 25% of its products. As for the RDF, the market is booming and the demand for it is increasing. On the other hand, the informal sector is successful in marketing all its products; where they contract plastic, metal and glass factories in 10th of Ramadan City, who buy the second hand raw materials from them. Some products are exported to China such as the plastic bottles of water. Also, the final products produced by APE NGO are marketed through a group of women volunteers who conduct bazars, where they set the prices they want. Also, there are two Egyptian ladies living in USA who always have open days in their houses in New York and other states to sell the products. Further, Omar Effendi in Ahmed Orabi Street in Mohandessin district started to buy from APE some products including carpets and sells them in the store (Nan, 2016)

➤ ***Analysis of the Marketing of the recycling's products:***

It is noticeable, that what the formal sector produce from recycling operations (compost and RDF) is not well marketed, whereas some interviewees agreed that the compost produced is not of a high quality; the tone of compost is sold for only 70

EGP, while the market of the RDF is promising (Mansour, Hassan, and Mikhaeil, 2016). Yet, this reflects that the formal sector is not really spending on R&D and market analysis to increase its sales, and this is a logical result of the lack of economic incentives and regulations set by the government to promote waste recycling activity. On the other hand, the Informal sector is very keen to find ways to sell 100% of their production, because this is their ultimate source of income, and they actually succeeded in this. Therefore, if recycling activity became a big source of income for the formal sector, then definitely there will be more investment on marketing the compost and RDF or even innovating new types of recyclables.

Chapter VI: SWM Stakeholders in Cairo – Review and Analysis

Beside the national institutions involved in the SWM sector mentioned earlier in the institutional framework, focusing more on Cairo, there are vital players in this sector; Cairo Cleaning and Beautification Agency (CCBA), the private sector companies, the informal sector, the civil society, and the experts/ international organizations

1. CCBA

It is the main agency responsible for the cleanliness of Cairo governorate through organizing the SWM system in Cairo, contracting private companies, NGOs and contractors to perform garbage collection, transportation and disposal. Also, the agency is responsible for the streets and bridges cleanliness. According to the data collected through the interview conducted with Engineer Mahmoud Mansour, the Head of the Engineering Department at CCBA, Cairo is divided into four major areas; each area is managed differently as explained below in details

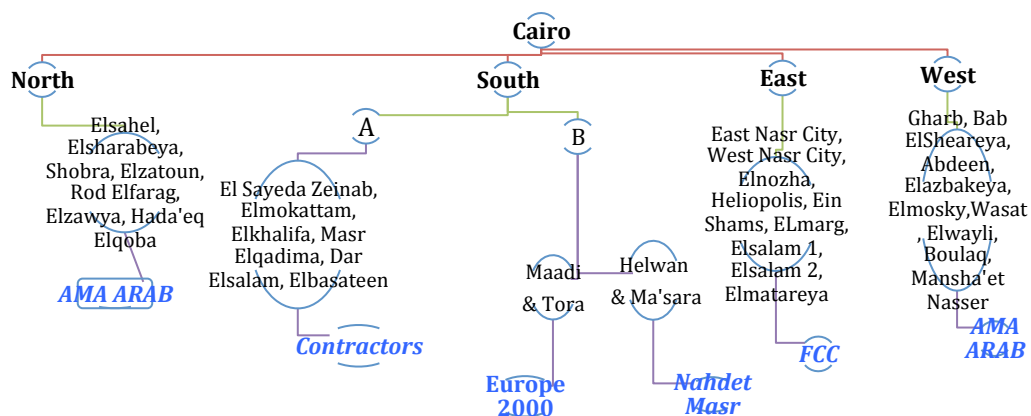


Figure 6: The current SWM system of Cairo (By author)

As per the above chart, the northern and western areas of Cairo are managed by AMA ARAB Company, which is an international Italian company that was contracted by CCBA in 2003 for 15 years. It is responsible for all the collection, transportation, disposal and cleaning activities, and it manages a dumpsite in

Kattameya, in addition to managing compost factories. As for the eastern area of Cairo, it is managed by FCC, an international Spanish company that was contracted by CCBA in 2002 for 15 years. FCC performs the exact same activities as AMA ARAB, with the difference that it manages a landfill (and not a dumpsite) in Al Wafaa w Al Amal. Also, it manages a factory in El Salam City, which produces compost and sells the refused wastes to the RDF factories (Mansour, 2016).

AMA ARAB and FCC are contracted through a tender, where the winner of such tenders is supposedly the company that offers the lowest price with the best technical offer. According to the contracts, FCC and AMA ARAB companies are responsible for the collection, transportation, disposal, in addition to the cleanliness of the streets and bridges (Mansour, 2016).

The southern area of Cairo is divided into two sub areas South A and South B.

- South A:

There is no company responsible for it, but CCBA contracted individuals called “contractors” where each contractor manages a number of garbage collectors. Each contractor manages a range of 7000 – 10,000 apartments and is paid 4 EGP/month for each residential unit. The contractor is responsible to bring his own trucks and garbage collectors. Theoretically, the garbage collector is supposed to transfer the garbage to the transfer station in Basatin and CCBA is responsible to collect garbage from Basatin and transfer them to ECARU, the compost factory in 15th May area. However, what happens in reality is that the garbage collector, in agreement with his boss (the contractor) sorts the garbage in any available space in the street (which is illegal) and takes what he wants and most probably transfer what he sorted to Manshiet Nasser (El Zabaleen Area) and only leave the organic waste which will not be useful for him to be transferred to El Basatin station. Unlike the international companies, contractors are only responsible for collection and transportation, while CCBA is responsible for the disposal and treatment activities (through transferring garbage from Basatin station to ECARU) in addition to the cleanliness and beautification of the streets and bridges (Mansour, 2016).

- South B:

This area is divided into two subareas where a local company manages each. Maadi and Tora are the first subarea and they are managed by Europe 2000. Helwan and El Maasara are the second subarea and they are managed by Nahdet Masr. Europe

2000 collects garbage and transfers it directly to ECARU (and not to a transfer station) due to its proximity. Those local companies' are responsible for collection, transportation and cleanliness of the streets and bridges, while CCBA is responsible for the treatment and disposal through ECARU (Mansour, 2016).

Further, there are a couple of NGOs (Erteqa2 and Elkheir w Elbaraka) that are handling some districts or sub districts. CCBA pays the private companies, Contractors and NGOs a total of around 600 Millions EGP annually. It is worth mentioning that there is a third party that performs monitoring and evaluation on the compliance of the contracts terms. This party is the Contract Monitoring Unit in Cairo governorate, and it is responsible for the control and surveillance for example imposing fines (Mansour, 2016).

- ***Future Plans for CCBA after 2018:***

The contracts for all the international and local companies will end by 2018. After that, the plan is to separate the collection and transportation activities from the sorting and recycling activities. One local company will manage each 2-3 districts, so that to avoid the major drops if CCBA faced a problem with any of the companies, which is not the case now where the company is responsible for a whole area, that includes a minimum of 6 districts. Those companies will work like Europe 2000 and Nahdet Masr (collection, transportation and cleanliness of the streets), and CCBA will contract two major companies to be responsible for sorting and recycling; ECARU and another project that is still under planning "the Sorting and Recycling Complex in Belbeis road" and will be most probably offered to foreign investors. This project is supposed to work on all kinds of recyclables. Also, it is worth noting, that it is planned to close all the existing landfills and dumpsites, since all the garbage will be disposed in the two above-mentioned companies (Mansour, 2016).

- ***Analysis of CCBA Role in the SWM sector:***

As mentioned before, the cleanliness, beautification and SWM system of Cairo is managed by CCBA, which obviously does not have a uniform plan across Cairo. It is worth mentioning; that the budget spent on a district managed by an international company is much higher than the budget spent on a district managed by a local company or the simple form of contractors. Yet, according to most of the interviews conducted, the best system in Cairo in terms of cleanliness of the streets is the one implemented in the area managed by the simple form of contractors (South A). In addition, there is a lot of corruption especially in the Contract Monitoring Unit

that is entitled to monitor and enforce the companies and contractors' compliance with the contract provision, which leads to the fact that rules are not enforced equally, more privileges are given to the international private companies, and thus SWM system is defected.

Also, it was found from the CCBA and AMA ARAB interviews that CCBA suffers from financial deficit, where it is not receiving the full amount of its allocated budget from the Ministry of Finance, and this justifies the poor equipment of the agency, and the poor performance of the companies, as they do not receive their full payments from CCBA. Therefore, there is a serious financial problem that CCBA is facing, and that is hindering any improvements in the system. According to CCBA interview, the future plans seem to be promising, but it is still on paper. Until now, there are no selected investors for this recycling project, and there are no alternatives for the international companies, whose contracts will end after two years, which raises a question mark if these plans are realistic or will be postponed.

2. Private Sector

There are three types of private sector contractors that work in the SWM sector, the local companies, the international companies, and the simple form of contractors.

- Local companies

Local private companies have been engaged in SWM sector in Egypt since the 1980s. Those companies are promising for growth, where the market consists of several leading companies such as ECARU in 15th May, which is specialized in recycling waste to compost. In addition, there are plenty of active SMEs that need capacity building to be able to manage larger facilities (Milik, 2010).

- International companies:

Year 2002 was the beginning of having international companies involved in the SWM sector. It was the French company "Onyx" which became known later as "Veolia for Environmental Services" in Alexandria city, which was contracted through a bidding process, in addition to other companies in Cairo and Giza governorates such as; the Spanish company "FCC", the Italian company "AMA ARAB" in Cairo

Cooperation agreements between the government and the private sector companies:

There are four main types of cooperation agreements between the government and the private sector companies as follows:

- *Contracting*: the government contract the company to conduct particular services in return for a certain fee and for a specified period of time. The services provided by the companies can be waste collection, waste transportation, street sweeping, or beach cleansing. Examples of such companies are Nahdet Masr and Europe 2000.
- *Concession*: The government awards a private company a dumpsite or a governmental facility for the company's use in recycling activities or resource recovery.
- *Private subscription*: Residential districts and commercial waste generators hire one or more firms to provide waste management services in return for a determined fee. However, this type of contracting in Egypt is always conducted with the informal sector, which work informally based on the demand.
- *Franchising/ Licensing*: The government grants a license to a private company in return for a specific fee that the company pays, and accordingly the private company provides waste management services in the agreed upon areas and collect fees from the households, and in this case the company is entitled to own the generated waste (Milik, 2010).

Regardless the type of the contracting, all the contracts of private companies in Cairo that include recovery and disposal in its terms, is mandating 20% recycling and 80% landfilling from the total waste that the company receives. Any recovery or recycling activities conducted by the private sector is limited to composting, while any other type of waste recycling is done by the informal sector.

- Contractor:

In South A area of Cairo, CCBA is contracting individuals and not companies, called "Contractors". Each contractor is managing one or more districts, through hiring a group of garbage collectors. The contractor is responsible for providing his own equipment including trucks, and in return he is paid by CCBA a fee per each residential unit.

- ***Analysis of the Private Sector Role's in the SWM Sector:***

- *Local Companies:*

It is noticeable that the government's policy toward garbage is aiming at "getting rid" of the garbage rather than "getting use" of it, and this justifies its contracts with the private sector companies that entails them to do only 20% recycling while 80% safe disposal. For instance, the local private company ECARU, which is agreed upon by all the research's participants to be the most successful one operating in the

recycling field in Cairo, makes more than 20% recycling of the wastes it receives, from only composting. Also, it is worth noting that ECARU is earning money basically from the government's payment of the contract value, while recycling represents very small amount of its profit (Mikhaeil, 2016). Therefore, the existing rules in the private companies' contracts do not encourage waste recycling.

In addition, there are two other local private companies operating in South B region of Cairo, Europe 2000 and Nahdet Masr, which are responsible for collection, transportation of waste, and cleanliness of the streets. The wastes collected by these two companies are transferred to ECARU for treatment and disposal. According to four interviewees, there are lots of complaints from Europe 2000 Company that it is underperforming.

International Companies:

As for the international private companies in Cairo, their participation did not happen thoughtfully, and it is planned not to renew any contracts for the International private companies after their end by 2018 (Mansour, 2016). Yet, no alternatives have emerged till this moment, which raises a possibility of renewing them again until setting a plan. Although the contracts of the private sector enforces 20% recycling of the waste the company receives, some companies do not reach this percentage in recycling, and this reflects the existing corruption in the Contract Monitoring Unit.

On the other hand, according to an interview conducted with the projects manager at AMA ARAB Company, he confirmed that the biggest challenge is a financial one, the company is not receiving its due payments as stated in the contract, due to deficit in the budget of CCBA that is funded from the Ministry of Finance. For this reason, the company is not investing in buying new equipment. Finally, it was concluded that the existent private companies in Cairo do not really care about the sorting process of the garbage; they rather contract people who are originally from the informal sector, and they give them the freedom to sort and take what they want from the garbage and in return they give them low salaries, and this is a natural result of the rules set in the contracts that does not enforce a high percentage of waste recycling and the inability of the government to pay 100% of the due payments. Despite the fact that waste recycling is supposed to be a profitable activity, this is not the case in Cairo, since waste recycling is not facilitated by the policies, and the quality of the waste is not adequate to make a profitable business from recycling. For this reason, the companies

are not really keen to perform recycling activities, since they perceive them as burden that would entail high cost with low return and with no economic incentives.

Thus, the overall strategy of the government toward the private sector participation is based on giving fees to the companies in return of 80% disposal and 20% recycling activities, and this might have some resemblances with the “tipping fee model” that is adopted in India as illustrated below in Table 4 and Table 5.

Table 4: Case #4 India

- **Problem:** 50 million tons of Municipal Solid Waste (MSW) is generated yearly in India, with a 5% increase every year due to the population growth and urban expansion, where 70-90% is collected in large cities, while less than 50% is collected in the smaller cities
- **Government’s Kind of Intervention:** Programme
- **Name of the Intervention:** Tipping Fee Model
- **Main Actors:** government and private sector
- **Description of the Intervention:** The private sector was encouraged to share their managerial and technical experiences in the formation of an integrated waste management system, and consequently 36% of the MSW contracts in India were granted to the private sector. The most predominant model for the private sector participation in the MSW value chain of India is the tipping model, where private companies are paid a tipping fee for every ton of waste collected and dumped (Furniturwala).
- **Objective of the Intervention:** Improving the SWM system and decreasing the piles of garbage in India through engaging the private sector in the waste collection and disposal process.
- **Results on Recycling:** the programme discouraged recycling, since companies are incentivized to send more tons of waste to the landfills.

Table 5: Case #5: India

- **Problem:** the increasing amounts of the landfill wastes
- **Government's Kind of Intervention:** N/A it is a private sector's initiative
- **Name of the Intervention:** Non-Tipping Fee Model
- **Main Actors:** private sector and government
- **Description of the Intervention:** Hanjer Biotech Energies, a prominent company in the waste to energy sector in India has adopted the non-tipping fee model, where the waste collected is processed without charge, and the only revenue comes from only waste recycling (Furniturwala).
- **Objective of the Intervention:** this model encourages lower rates of landfill waste and entails the private sector players to be innovative in segregation and recycling technologies
- **Results on Recycling:** the company was able to recycle 85% of the waste that it receives. Hanjer has succeeded to operate with 90% utilization of its capacity and was not a financial burden on the government, since it is not asking for the tipping fee, in addition to the fact that it is reducing the environmental burden that waste usually creates, by recycling wastes into high quality products (Furniturwala).
- **Key Success Factors:** Hanjer has heavily invested in R&D to reach high quality end products (wet fraction recycled to compost, dry fraction recycled to green fuel, plastics recycled to plastic ingots, and inert material recycled to sand) and to develop an in-house technology that enabled the company to minimize the use of raw material, and thus decrease its production costs by 50% in in five years.

Case #4 and Case #5 implies that the tipping fee model is a barrier that discourages the recycling business. Private sector participation is crucial but not through the tipping fee for each tone of waste dumped, but it could be rather for each tone of waste recycled. Moreover, R&D investment seems to be the key for the recycling boom in India. The tipping fee model might have been used in India as a way to encourage the private sector to clean the streets and decrease the piles of accumulated garbage. Similarly, in Egypt, the fee paid to the companies in return of disposal/landfilling services might be a barrier that discourages recycling, and Hanjer model can be inspirational in a sense that what if Egypt invests in R&D for example to improve the quality of compost and RDF and therefore increase its price in the market and be encouraged to do more recycling, instead of landfilling.

Contractors:

The contractors who are contracted directly through CCBA are managing South A region of Cairo. Some of those contractors are originally from the informal sector. According to their contracts, it is illegal that the contractor sorts the waste. However, many contractors do sorting and take the waste items they want, which reflects dereliction from the Contract Monitoring Unit. Currently, the contractor is paid 4 EGP per the residential unit. Deductions including taxes and insurance reach 49%, which makes it around 2 EGP per apartment excluding all the costs that the contractor pays (Mansour, and “Contractors Interview”, 2016). This might be a reason that justifies why contractors do sorting, since their net income per apartment ends to be very low and thus they tend to find another source of income through sorting waste. Yet, contractors are more controlled and monitored by CCBA, where fines are always imposed on them if garbage is accumulated in the streets, while the private companies have higher authority and are more out of control due to corruption (Mansour and the “Contractors Interview”, 2016)

3. Informal Sector:

The informal sector in Egypt plays a very active role in the SWM sector, where it can be even considered to possess the highest level of expertise in waste management and recycling activities. Yet, they are completely neglected by the government in the decision making process of waste management policies.

The informal sector is located in six areas in Greater Cairo, the largest and most famous one is El Zabaleen area in Manshiet Nasser, where around 5,000 tons per day are collected, and it is considered to be the center of the informal sector because it was the first area that conducted waste recycling, and that is why it was the luckiest in terms of media coverage and funds. In addition, there are Ezzbet EL Nawar at El Khosous in Qayoubia (3,500 tons per day), Torra (2,000 tons), 15th May (1,000 tons), El Moatamedya and Barageel (Giza) (5,000 tons per day). Cairo produces around 16,000 tons; Giza produces around 5,000 tons per day. As mentioned, the six informal sector areas collect a total of 16,500 tons per day from a total of 21,000 tons. There is a gap of 4,500 tons that are either collected by the private sector or are accumulated as garbage piles in the streets or is burned in street (El Me’adess, 2016).

Around 85% from the waste collected by the informal sector in the six areas is recycled. The 15% that are not recycled e.g. plastic bags, medical wastes, diapers, wood and others are transferred to the dumpsites or transfer stations through bribing

the guards, since officially the informal sector is not allowed to access those dumpsites and transfer stations. However, there is another option of the refused items. Two people in Manshiet Nasser take them and sell them to the cement companies e.g. Lafarge. Almost everything in the waste is utilized by the informal sector, even the organic wastes are fed to the pigs, and the manures are sold to composting factories (El Me'adess, 2016).

Further, because the international private companies do not apply door-to-door collection, but they place large containers in the streets and many people rejected the idea to put their garbage in the containers, the traditional door-to-door collector resumed his work. So, the private companies resorted to contract "El Waheya" and give them the freedom to the garbage collector to sort and take what they want from the garbage. The private companies even sell the recyclables to El Zabaleen, since they do not make use of them. It is worth mentioning that when the private companies placed the garbage containers, the scavengers' phenomenon, the so-called "*El Nabasheen*" started to emerge; those are groups of informal garbage collectors that do not necessarily come from the informal sector, but they might be poor people who are looking for a source of income through searching for the valuable items in the garbage (Naeim, 2016).

The informal sector workers are divided into two main groups:

1. Garbage Collectors:

Garbage collectors (door-to-door collection), have been present in Egypt since 1920s that were called "El Waheya" whose original hometown is "El Wahat" or the Oases. El Waheya are the first people to work in garbage collection, and they used to work mainly in downtown Cairo. El Waheya used to collect garbage and dispose it in empty areas and leave it under the sun temperature until it dries. Then, they resell it in Cairo as a form of Energy. In 1949, Cairo's governorate prohibited the use of garbage as fuel, which posed a problem to El Waheya especially because Cairo started to expand to new areas e.g. Maadi, Heliopolis and others. They met a man from Upper Egypt and agreed that he will bring his family and friends to assist in the field, and he will take the empty land where they used to dry the garbage in, and he will live in with his families and friends and get their pigs to eat the organic waste. Then, the story of the informal sector started to develop until CCBA was introduced in 1984, and it stipulated that formal companies should be responsible for the cleanliness of Cairo, and each company should apply to handle a specific area. CCBA also

contracted El Waheya (contractors) who were forced to form companies through licenses, and garbage collectors remained in their work under El Waheya who became licensed. The garbage collector takes all what he wants from the garbage (El Me'adess, 2016).

2. Recyclers:

They sort garbage in their houses. The wives and kids always do sorting, and they give the organic waste to pigs that live inside the house, and which were slaughtered during the swine flu, but then the informal sector managed to bring pigs after the 2011 revolution. According to the Spirit of Youth NGO interviewee, the informal sector living in Manshiet Nasser has neither unemployment nor street children, as everyone has a job to do. They conduct initial sorting (food wastes vs. non-food wastes), and then they sort the non-food wastes to plastic, paper, metal, glass and others. After that, they even sort the plastic for example to several types of plastic and so on. After sorting, each type of product is either squeezed and sold directly to factories (e.g. paper and cartoon), or squeezed and exported to China (e.g. plastic bottles of water) or processed through machines to be treated as raw materials and prepared for industries (e.g. plastic). Some final products are produced by the informal sector, such as the plastic hangers, in addition to clothes, rugs, notebooks, accessories and others that are mainly produced by APE NGO that is located in Manshiet Nasser (Nan, 2016)



Figure 7: Plastic Bottles to be exported to China *(By author)*



Figure 8: Plastic Pellets
(By author)



Figure 9: Plastic bottles segregated by color
(By author)

Finally, the informal sector is a community that has neither unemployment nor street children. Everyone works; one tone of garbage generates five direct jobs (three work in collection and transportation and two work in sorting) and seven indirect jobs (processing plastic, paper, metal and the other different types of sorted wastes). Further, 40% of the children go to schools, while 60% go to literacy classes (Nan, 2016)

4. Civil Society

NGOs working in the SWM sector in Cairo are mostly formed by people from the informal sector. Two Egyptian women are agreed upon by the interviewees from the informal sector and NGOs, to be the pioneers of establishing a foundation for the civil society in the SWM sector, those women are Dr. Laila Iskandar the former Minister of Urban Renewal and Informal Settlements, and the co-founder of Spirit of Youth NGO and Mrs. Yousriya Loza Sawiris, Secretary-General for Sawiris Foundation, Founding President of the Association for the Protection of the Environment (APE), philanthropist. Activities of the civil society are mainly directed toward upping the living conditions of the informal sector and promoting a healthy and safe waste collection, transportation, sorting and recycling mechanisms, and education services. Also, civil society is concerned with formalizing the informal sector. Furthermore, some NGOs have significant role in promoting segregation from the source in different governorates of Egypt, yet limited areas. Spirit of Youth and APE NGOs are two of the most active NGOs in the SWM field that are located in Manshiet Nasser.

- ***Spirit of Youth:***

It was established in 2004, where a group of young people from the informal sector (El Zabaleen) initiated the idea under the supervision of Dr. Laila Iskandar (the former Minister of Urban Renewal and Informal Settlements). The NGO's objective is upping the living standard of El Zabaleen in a way to formalize them and that the government



Figure 10: Recycling School by Spirit of Youth NGO

recognizes the sector and integrates it, through institutionalizing it. The NGO used to form several companies through cooperating with the Ministry of Investment; 1,200 families were institutionalized from the six informal sector areas in Cairo and Giza. Every 10-15 persons who already work together were grouped into companies. 75 companies were formed. Then, contracts were not renewed after the cancellation of the Ministry of Urban Renewal and Informal Settlements. Also, the NGO conducted awareness campaigns from 2009-2014 on segregation from the source in areas

including Dokki, Agouza, Embaba, Mohandesin and Maadi, and this was even before the government initiated the campaign. Among the achievements of Spirit of Youth NGO, is the recycling school that gives literacy classes through recycling work to the kids of Manshiet Nasser who did not get the chance to go to schools, so that they get educated and earn money at the same time (Naeim, 2016).

- **APE:**

It started as a compost factory in El Zabaleen area, which was later, transferred to Kattameya due to its pollution impact. By time, there was an idea of having income generation projects for females that at the same time gives literacy classes, because many of the females in El Zabaleen area do not have the chance to go to schools because they are pressured with the sorting activities in addition to the house work and they need to work and generate money to their families. APE started by bringing the clean garbage directly from textiles factories, and girls work on sorting and producing products from them. The girl is trained and paid and this goes in parallel with the literacy classes. In addition, the NGO has a nursery where around 250 kids are there whose mothers work in the NGO.

Marketing of the products takes place through a group of female volunteers who have lots of connections and bazars. Also, there are two Egyptian women living in USA who always conducts open days in their houses in New York and other states and sell APE products. Further, Omar Effendi in Ahmed Orabi, started to buy some products including carpets and sell them in the store. Now, the ultimate goal of the NGO is education and at the same time income generation (Nan, 2016).

➤ ***Analysis of the Informal Sector/ NGO's Role in SWM Sector:***

“Cairo has already an established vibrant recycling market, and we have a very dynamic value chain e.g. El Zabaleen, where they collect garbage from even other governorates; it is their source of living. We have to build on this asset through policymaking and providing healthy environment, as they have the know-how but their jobs are not decent” (Shaker, 2016). All interviewees agreed that the informal



Figure 11: APE NGO's Exhibition
(By author)

sector in Cairo is the most active stakeholder in the waste recycling activity, where it recycles 85% from the total wastes it receives, and thus it is an asset that needs to be improved through R&D and enabled by policy, legislation and contracting system.

Garbage collection, sorting and recycling is an inherited profession for the informal sector where all the family members participate in. It is not just a normal job for them, but it is the core of their lifestyle and the sole source of income. Over and above, they are truly passionate in their work and they are very knowledgeable and experienced with the types of waste, sorting and treatment of wastes. For this reason, the informal sector in Cairo is extremely reluctant to the idea of leaving this job to any other sector; garbage for them is a property that they do not want to give up. That is why the contracts of the international private companies dissatisfied this sector. Yet, those international companies resorted to contract many people from the informal sector to collect garbage and gave them low salaries and in return gave them the freedom to do sorting.

As for the informal sector's aspirations, an expression that was used by all interviewees from informal sector and NGOs is "give the bread to the baker"; the baker is referred to the informal sector. All the interviewees agreed that the informal sector is an existing active value chain in the recycling activities, and that this sector aspires to be formalized by the government, but with decent contracts. What happens is that when the government contracts people from the informal sector, it sets unsatisfactory conditions, where the contractor takes a small amount per apartment and after taxes and deductions, the contractor will not be really earning. Finally, they hope to participate in the decision making with the other stakeholders, since they see themselves as the most active party in the sector (El Me'adess, Naeim, and Nan, 2016)

For the challenges the informal sector is facing, the conflicting policies are the biggest one. For example the cancellation of the Ministry of Urban Renewal and Informal Settlements which was taking real steps toward formalizing the informal sector. Another challenge is the contracts of the international companies that are hindering contracting and formalizing the informal sector. Further, the informal sector are completely excluded from the decision making, and what supports this point is that the leader of El Zabaleen area, and the two NGOs located there had no idea about the establishment of WMRA (El Me'adess, Naeim, and Nan, 2016).

Generally, most of the active NGOs in the SWM sector are originally people from the informal sector that are making efforts to achieve the aspirations of this sector through participating in the decision making. They also have social objectives including education and awareness campaigns. Such NGOs have the energy and passion to work, since most of its members are youth from the informal sector. Further, they are capable of dealing with and understanding the society in Cairo, since they work on the ground and interact with the people. Those NGOs are an opportunity that should be utilized by policy makers to promote waste recycling.

5. Experts and International Organizations:

Experts in the SWM sector in Egypt are represented in consultancy companies such as Chemonics-Egypt and EcoConserv that provide technical support for the government, private sector, and International Organizations. In addition, technical expertise is possessed by International Organizations such as GIZ, which has implemented loads of project in the SWM field. Among them is the Bill Gates Foundation funded project that was implemented in Qalyubia governorate.

- ***Analysis of Experts' and International Organizations' Role in the SWM Sector:*** Based on the interviews conducted with experts from Chemonics-Egypt and GIZ-Bill Gates project, it was found that such organizations possess a wide experience in the SWM sector, and that there are calibers that have high level of expertise and are willing to provide consultancy and technical assistance, but again the problem is always in the administrative decisions of the government that hinder the utilization of such resources. After analyzing the role of each stakeholder, it was found that Cairo has the adequate technical capabilities, the calibers and experience that would enable the boom of the recycling marketing. What is really lacking is the strong coordination among the stakeholders, the ability to assign the right person to the right task, and the sound administration of the system. In addition, not all stakeholders participate in the decision-making. The CCBA is becoming a weak stakeholder due to its financial deficit. The informal sector that possess the expertise and represents an active value chain are completely neglected from the government' decisions. And the private sector is not provided with the incentives that would be for their interest. Below are Case #6 and Case #7 that reflects how strong coordination among the stakeholders had led to the kick off of e-waste recycling in India

Table 6: Case #6 India

- **Problem:** in 2011, India used to generate 400,000 tons of e-waste yearly, where only 19,000 tons are recycled.
- **Government's Kind of Intervention:** Policy and Legislation
- **Name of the Intervention:** E-Waste Rules
- **Main Actors:** government, producers, consumers and bulk consumers in addition to those involved in the sales and processing of the electronic equipment and components.
- **Description of the Intervention:** the Ministry of Environment and Forest (MOEF) has placed a policy that encourages responsible recycling in India, where producers have a legal liability to reduce and recycle electronic waste. Producers will have to make sure that e-waste is not disposed into household waste through guiding their consumers with information on equipment disposal after use, and raising their awareness of the hazardous parts in the e-waste. Government departments are responsible for recycling the e-waste that they generate, whether through channeling it to collection centers or giving it back to the suppliers. In addition, under these rules, e-waste records should be maintained and available to authorities like the state Pollution Control Boards. Importers and manufacturers were given a one year as a grace period for setting proper collection centers ("Implementation of E-Waste Rules 2011").
 - **The general rules:**
- Bulk consumers have to ensure maintaining records of the e-waste they generate and avail these records to inspection by the relevant authorities when requested. They also have to guarantee the channelization of the e-waste they generate to the authorized centers of collection or the registered recyclers, or returning the e-waste to the producers through the take back services.
- The State Pollution Control Board (SPCB) has to closely inspect, monitor and evaluate the collection mechanisms and centers of the producers and recyclers, ensuring that authorization is granted to the dismantlers and recyclers and update it on a case by case basis, and ensuring that those authorized have the technical capabilities, and the proper space to recycle e-waste without damaging the environment. Also, SPCB is responsible for availing all the terms and conditions for dismantlers and recyclers.
- The Transporters of the e-waste should take permission form SPCB before transferring e-waste from a state to another
- Bulk consumers and consumers of electronic equipment should ensure that the e-waste they generate is properly channelized to the authorized collection centers recyclers.
- Producers should abide by a specified limit of the hazardous material in the components of the electronic products ("Implementation of E-Waste Rules 2011").

- **Objective of the Intervention:** Maximizing benefits from the outstanding amount of e-wastes and decreasing its hazardous effects through encouraging responsible recycling
- **Results on Recycling:** A responsible process of E-Waste recycling is being on the ground. Also, the emergence of several e-waste recycling initiatives; the most prominent one is E-Clean India.
- **Key Success Factors:** the engagement and strong coordination between all relevant stakeholders, and the very clear tasks assignment has greatly improved the E-Waste management system in India.

Table 7: Case #7 India

- **Problem:** in 2011, India used to generate 400,000 tons of e-waste yearly, where only 19,000 tons is recycled.
- **Government's Kind of Intervention:** N/A
- **Name of the Intervention:** E-Clean India
- **Main Actors:** government, producers, consumers and bulk consumers in addition to those involved in the sales and processing of the electronic equipment and components.
- **Description of the Intervention:** In 2013, "Clean E-India" was initiated by the International Finance Cooperation (IFC), in partnership with Attero, an e-waste asset management and recycling company, introduced this initiative that aims at collecting and properly recycling e-waste through adopting an integrated approach that includes the informal sector in an organized channel, while also raising consumers' awareness about e-waste collection network. Nitin Gupta, the CEO and Co-Founder of Attero claimed that the governmental rules that were effective in 2012 were the main drive behind the Clean E-India initiative, in addition to the technological advancement that were developed and tailored to recycle electronics in an economic and friendly environment ("About Clean E-India").
Clean E-India adopts a take-back program that operates in four major cities in India that produce large amounts of e-waste, Delhi, Ahmedabad, Mumbai, and Hyderabad. The channel starts when consumer calls the "e-captain" who will collect the e-waste from the consumer's house, and in return gives the consumer benefit for it. Then, the e-wastes are transferred to Attero center of processing, where they are scientifically recycled ("About Clean E-India")
- **Objective of the Intervention:** Maximizing benefits from the outstanding amount of e-wastes and decreasing its hazardous effects through encouraging responsible recycling.

- **Results on Recycling:** An integrated chain of E-Waste recycling was created, which led to economic and environmental benefits. Moreover, awareness on the hazardous effects of e-waste was raised. Also, the economic value of E-Waste was increased and practices of an efficient management of e-waste were promoted. Further, among the achievements of Clean E-India were that with the support of Delhi Government, green cover of Delhi was doubled from 10% to 20%.
- **Key Success Factors:** The involvement of all relevant stakeholders was crucial to achieve an efficient e-waste value chain, including government, regulatory bodies, NGOs, industries, consumers, recyclers and informal sector.

Case #6 and Case #7 show that effective policies would result in successful initiatives. When E-Waste Rules were set through defining clear assignments for all the relevant stakeholders with a high level of coordination, the private sector will be motivated to take initiatives that will be supported by these governmental policies. In the case of India, Attero, a private sector company in cooperation with IFC, initiated “Clean E-India”, which has created an organized value chain involving all stakeholders that maximized the economic benefit of E-Waste, while increasing consumers’ awareness about the hazardous effects of the wrong disposal of E-Waste.

Chapter VII: Conclusions and Recommendations

1. Conclusions

Based on the research conducted, it was concluded that the main reasons why the waste recycling activity is not promoted in Cairo are lack of financial autonomy, deficiencies in the legislative and institutional setup, and weaknesses in the governance of the SWM process.

- **Lack of financial autonomy:**

The financial centralization, where the Ministry of Finance is the sole entity responsible for funding, is restricting the governorates (and in the case of Cairo it is CCBA) and limiting their freedom to make decisions. Also, with the absence of an allocated fund for SWM in the central government budget, the result is that SWM is left at the end of the priority list of the governorates' plan.

- **Deficiencies in the legislative and institutional setup:**

Unfortunately, there is a lack of enforcement of the existing laws that are related to the environment and cleanliness, which makes it challenging to promulgate new laws related to waste recycling. In addition there is neither regulations nor economic instruments that would encourage waste recycling. Further, the weaknesses in the institutional capacity, lack of accountability and unclear task assignments, made the SWM system as a whole at the end of the priority list in the policy agenda of the government.

- **Weaknesses in the governance of the SWM process:**

Among the elements of good governance, there is “accountability”, which does not exist in the SWM of Egypt, where it is not clear in the policy statements, who is accountable for what. Another element is “effectiveness and efficiency”, which is also weak, as waste recycling is a part of a complete chain of activities (collection, transportation, recovery, disposal and marketing of the recycling's products), there is neither effectiveness in the performance nor efficiency in the resources utilization especially the environmental resources. The whole chain should be working well to enable waste recycling, but the reality is that this chain of activities is defected from its very beginning (collection). So, it needs a complete reform in order to achieve an improved SWM system and then promoting waste recycling can be doable.

Also, “consensus oriented” is another element of good governance that entails participatory approach aiming at understanding the different needs of all the relevant stakeholders in order to reach a compromising consensus over the best scenario for all the stakeholders that should be achieved in a sustainable manner. This is totally absent in the SWM framework of Egypt, where there are active stakeholders in the SWM sector, who have the capacity, and technical expertise to perform recycling activities, but what is really lacking is the strong coordination among them to get the best out of each. Therefore, the bad management and lack of coordination among those stakeholders and neglecting them in the decision-making is a key reason why waste recycling is not promoted. For example, the informal sector has a capacity to recycle 85% of the waste collected, yet this sector is not supported by the policies that would provide an enabling environment that would help formalizing it and facilitate performing its function more sustainably.

Therefore, a set of recommendations are proposed below for the SWM policy framework, and an integrated model is initiated that would enhance the SWM value chain in light of a clear task assignment of the stakeholders

2. Policy Recommendations:

It is crucial to enforce and build on the existing initiatives that are promising to improve the SWM sector. So, the formal approval of the National Strategic Directives for Solid Waste Management Sector in Egypt is recommended, since it already includes a comprehensive set of regulatory, economic and communication instruments that would regulate the whole SWM sector. In addition, all the interviewees agreed that a mix of regulations, economic incentives, and communication instruments should be applied to promote the waste recycling status in the policy framework:

Regulatory instruments:

- The existing laws should be well enforced i.e. imposing strict fines on littering for the citizens and imposing strict fines on the garbage accumulations for the contractors/companies
- Laws enforcement will happen if there is a strong monitoring system, which is currently absent. Therefore, NGOs will play this role of monitoring, where each area will elect an NGO to be responsible for the law enforcement from the side of the citizens and the contractors/companies. These NGOs will be paid by CCBA in return of these monitoring services. Why NGOs? Because based on the research, it was

found that the civil society is the most entity that fully understands the interests, and behavior of the citizens, and when the citizens elect the NGO that represents them, this would definitely lead to a more transparent result.

Economic instruments

- It is recommended to promulgate the SWM law that is proposed by the NSWMP, as this law is the first one that is handling the whole cycle of SWM system and which also considers waste recycling through proposing the economic instrument, the Extended Producer Responsibility (EPR), where the producers would be more encouraged to recycle waste, in order to save the costs that he/she would pay to collect, transfer and dispose of his/her waste. However, the EPR needs to be adapted to the Egyptian context in a practical way. In other words, a research needs to be conducted to identify whether the producer will be responsible for the whole cost of the waste he produces, or he can only pay for part of the cost (e.g. transportation cost only). Also, there should be a strong and well-enforced legal document that supports the EPR, or it will never happen.
- In addition to the SWM law, it is recommended to impose the landfill tax. Currently, CCBA pays fees for the private sector companies in return of landfilling. However, it is proposed, that CCBA pays fees for the private companies in return of landfilling 30% only of the waste it receives. Why 30%? Because according to the data collected from CCBA 11% to 28% of the waste generated in Cairo is refused. Therefore a maximum of around 30% can be landfilled, as the rest of the waste can be either recycled or composted. If the company exceeds this 30%, a tax will be imposed on every tone landfilled. Furthermore, this 30% will be gradually decreased every year, with the development of the RDF market that will allow more refused waste to be recycled.
 - Tailored mechanisms need to be developed to enforce this tax, and to make sure that the companies/contractors abide by the 30% landfilling. This can be achieved through developing a strong monitoring system that will be adopted by a department of monitoring and evaluation that is recommended to exist under the umbrella of WMRA. This monitoring system will impose fines on the companies or contractors that landfill in unspecified areas to avoid paying the tax.

- There should be a high incentive for investors in the recycling industry. One possible incentive is implementing the polluter pay principle, where fees will be collected from all the companies that result in environmental harm, and on the other hand, removing 100% of the taxes from the companies that will invest in waste recycling activities. In this way, the fees imposed on the polluters will compensate the taxes removed from those who invest in waste recycling.
- Economic incentives for source segregation should be applied on enterprises, hotels and restaurants which should be less challenging than the households. Examples of such incentives can be discounts on the cleansing fee on the electricity bill, and discounts on the taxes. Also, it is recommended to impose fines on those who do not segregate waste.

Communication and Awareness Raising Instruments:

- The most effective instruments that change the mindsets are the mass media. The famous talk shows should be shifted to talk about environmental problems, in addition to assigning the NGOs to conduct awareness campaigns that interact directly with people. Two significant topics should be stressed on by mass media, advertising, and NGOs: littering, and segregation from the source. In addition, there should be a decision taken to integrate environmental topics in the educational curricula.

Institutional Framework:

The establishment of WMRA is an achievement in the SWM sector that supposedly will solve the problem of coordination, accountability and the scattering responsibilities among different institutions. However, it is recommended that not only this agency should coordinate tasks but also should be involved in the implementation, supervision, and follow up, in order to avoid the risk of having corruption in the local administration, in addition to the fact that the governorates have low experience in managing SWM systems; they have weaknesses in the administrative tasks, they lack the professional calibers and they lack the advanced technical expertise. Therefore, this agency should at least train, build the capacities, and oversee the governorates' representatives who will administer SWM systems, so that they become qualified calibers that would participate with the agency in the policy and decision-making, and they should not be excluded. Also, this agency should monitor and evaluate the governorates' performance through a certain criteria that is transparent yet strict enough based on a reward and punishment system to guarantee an improved performance.

Regarding the recommended functions of WMRA, there should be a department within WMRA responsible for the monitoring and evaluation. This department will closely work with NGOs, which will conduct monitoring on the district level, and will undertake monitoring activities on Cairo level through evaluating the disposal sites and ensuring that the landfill tax is implemented properly. In addition, there should be a department that is working only on boosting the recycling business through for example encouraging the public-private partnerships, contacting investors, and initiating economic instruments that would incentivize businesses to work in the recycling field.

As for the district level of Cairo governorate, CCBA should cooperate with local private companies, where each will manage one or two districts and it should also cooperate with NGOs that are trusted by the households to conduct the monitoring activities and ensure compliance (this will be explained in details later in the chapter).

Financial Framework:

Decentralization of the financial system is crucial. There should be an allocated budget for SWM sector that is specified by the central government, where the individual governorates would have the financial autonomy. Each government should get benefit of its SWM revenues that should not go back to the Ministry of Finance. Also, SWM sector should not be mixed with other sectors in the budgeting because this leads to having the SWM not prioritized. Moreover, WMRA should be responsible for measuring the exact cost of the SWM system and accordingly set the relevant fees, so that to avoid the situations where CCBA or the governorates would fail to pay the necessary payments needed for the SWM system, where the social solidarity concept in the cleanliness of urban cities should be applied, people living in rich areas pay higher amounts of fees than those in the poor areas.

3. The proposed SWM system for Cairo

The below model is targeting the households and it aims at improving the SWM chain of activities and empowering the relevant stakeholders in a way that would enhance the waste recycling status. It is to be implemented as of year 2018 after the end of the private sector's contracts. According to the research conducted, private sector is the main entity that can drive SWM and recycling activities, while the government's role should be limited on supporting and providing facilitation. The SWM system will be micro-based where local companies will manage only one or

two districts, instead of having a company that is managing an area consisting of six districts, in order to avoid having major drops if one company is underperforming. Local companies will apply based on requests for proposals, and priority will be given to the companies formed by the informal sector, as they already have the experience and as they are a key stakeholder that should be integrated in the system.

- **Collection and Transportation**

Only the local companies will be responsible for the collection and transportation system, in order to open the door for the informal sector to form companies. NGOs will play a significant role at this stage, where they will be responsible for the monitoring of the companies' and citizens' performance, in addition to conducting intensive awareness campaigns on waste segregation. One NGO will be elected by the citizens to handle one or two districts. There will be two lines for collection and transportation where each line is managed by different companies than the other.

- **Line 1:**

Door-to-door collection, where the company will pass by the residential units or the enterprises to collect the food wastes that are disposed in a black bag provided by the responsible NGO. The collector will dispose of the bag in the truck. Trucks will transfer the waste into the transfer stations. It is the responsibility of the CCBA to create walls in all the existing transfer stations that separate the food from the non-food wastes. CCBA will transfer the wastes from the transfer stations to ECARU and other compost plants. This case will save the value of the organic wastes resulting in a better quality of compost that can be sold at a higher price than its current price. Also, having a specific line each type of waste will eliminate the risk that the garbage collector would mix the segregated waste.

- **Line 2:**

Door-to-door collection, where the company will pass by the residential units or the enterprises to collect the non- food wastes that are disposed in a white bag provided by the responsible NGO. The collector will dispose of the bag in the truck. Trucks will transfer the waste into the transfer stations. It is the responsibility of the CCBA to create walls in all the existing transfer stations that separate the food from the non-food wastes or allocate different transfer stations for each line. CCBA will transfer the wastes from the transfer stations to the recycling plants (this will be described later in the "landfilling/recovery").

Having two different lines will save the value of the organic wastes resulting in a better quality of compost that can be sold at a higher price than its current price. Also, having a specific line for each type of waste will eliminate the risk that the garbage collector would mix the segregated waste. Further, having a collector for each type of waste will oblige the housewives to separate the wastes, since each garbage collector will refuse to collect the type of waste that he is not assigned to collect, because this is simply will not be his job. Of course, it would be a great challenge for NGOs to raise the awareness among the housewives on waste segregation. However, this two lines system would facilitate it. Also, people who do not segregate waste will not have any chance to dispose of the garbage except in the streets, and in this case, the NGOs will do the necessary monitoring through contacting the company and identifying those who litter and report to the Contract Monitoring Unit which will impose the necessary fines as per the law. Also, there will be different schedules for each line, where the frequency of collection of line 1 will be higher than line 2, and this should be carefully studied in order not to avoid high costs of transportation.

Since this phase (collection/ transportation) will be challenging, as it requires change in the culture and attitude of the housewives and garbage collectors toward waste, strong economic incentives are needed at least during the first year of the initiative. For the housewives, there should be discount on the cleansing fee and there should be fines imposed on those who do not segregate. For the garbage collectors, there should be bonus within their contract benefits, where he can get bonus if he maintains the waste to be segregated until he reaches the transfer station.

- **Recovery and Disposal**

According to CCBA interview, there are future plans that after the end of the private sector's contracts, there will be two only factories for disposal and recycling in Cairo, ECARU and another project that is still under planning "the Sorting and Recycling Complex in Belbeis road" and will be most probably offered to foreign investors. This project is supposed to work on all kinds of recyclables, and all the current landfills and dumpsites will be closed. If this plan was actually achieved, it will be of a great benefit to the recycling business and it will also saves lots of lands, and eliminate the pollution as landfilling will happen in only two sites that are far from the residential areas. Line 1 will transfer the waste to ECARU, and the organic waste will be composted and the refused items will be landfilled, taking into

consideration the landfilling tax mentioned earlier. Line 2 will transfer the waste to Belbeis plant. This plant should be hiring people from the informal sector who are experts in the sorting process, and the employer should provide them with decent contracts that will give them benefits more than what they were having informally. Also, this plant supposedly will invest in R&D in order to produce high-end products from recyclables, and not just the basic raw materials that are currently produced by the informal sector.

According to the Catalan Association of Door-to-Door Municipalities in Spain, experts in separate door-to-door collection in Catalonia claim that this kind of collection system can considerably reduce the disposal costs through reducing the residual fraction of waste, it can increase the value of the recovered materials from the waste, and it can increase the separate collection to 70-80% versus 30-40% if collected from bins. Furthermore, this system should not cost more than the combined collection system, with the provision of much higher recovery rate of the materials (Prado, 2010). In addition, Milan City has implemented a door-to-door collection system for five fractions of waste, and this required an extensive planning and monitoring to ensure the service sustainability, in addition to a supplementary effort required from the households' side to separate the five types of waste. However, this is too advanced to be implemented in Cairo, since Milan city was already implementing waste segregation in the street containers. So, they already had the culture. This experience in Milan has achieved success; after implementing the plan in third quarter of the city, the rate of recycling has increased from 34% in 2011 to 48% in the first quarter of 2014 (Good Practice Milan: Door to Door Food Waste Collection for Households, 2014)

- **Marketing:**

Connections with local and international companies should be established from an early stage to make sure that there is a demand on the compost and the recycling products. Marketing companies can be assigned by the Ministry of Environment to work on finding markets so that the production would match the demand.

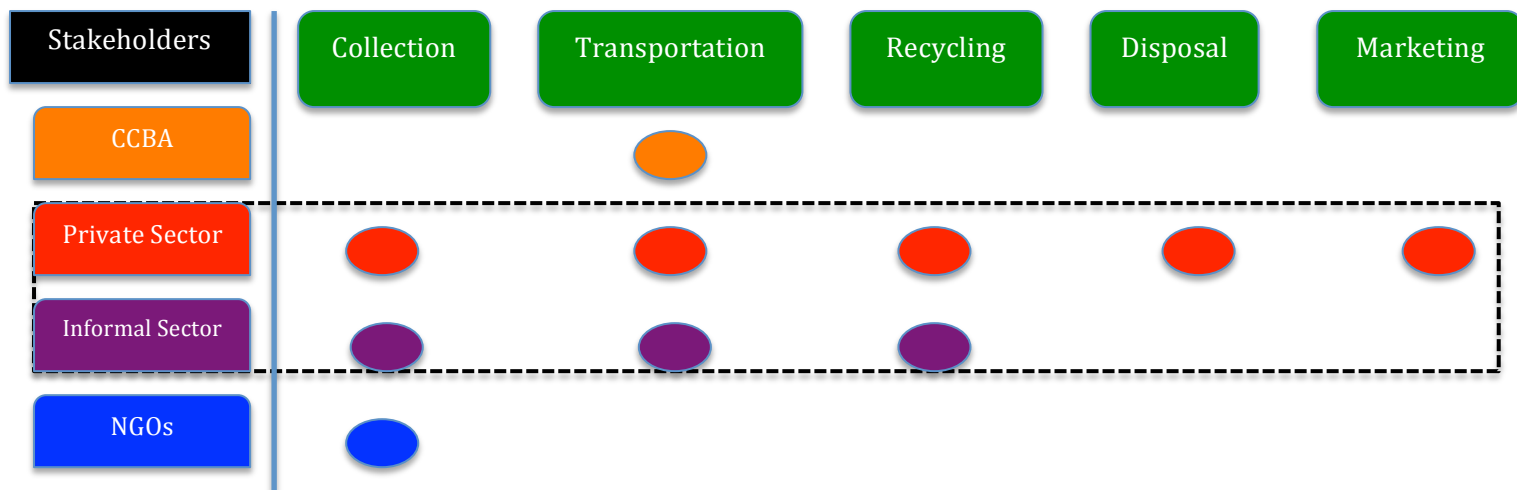


Figure 12: The proposed SWM Initiative in Cairo (By author)

Figure 12 illustrates the role of each stakeholder in each activity in the SWM system. As illustrated, CCBA's role will be contracting the companies that will perform collection/ transportation and the company/investor that will manage the recycling plant. After that, its role will be limited on transferring the waste from the transfer stations to the compost plants or the recycling plant. The private sector's role is crucial in the whole cycle of SWM starting from collection till the marketing. As for the informal sector, they will be integrated through forming companies that will participate in the collection and transportation of waste and they will be hired to work in recycling plant. Thus, the informal sector will be formalized and considered as a private sector, and by time they will be hopefully merged with the private sector into only one sector. As for the NGO, they will have a significant role in the very beginning of the SWM chain of activities (the collection phase), where they will conduct awareness campaigns as well as monitoring and ensuring that the companies and the citizens abide by the rules. Focusing on waste recycling as an activity, the private sector and the informal sector will be the main drivers of it. However, this cannot happen without the NGOs' push at the collection phase.

This two-lines system will be challenging, as the NGOs will need to make significant efforts to raise the awareness among the housewives on waste segregation. In addition, the cost measurement of this system would be more complicated than the current system. For this reason, it is highly recommended to conduct a feasibility study for this model in order to indicate the cost that will be needed to operate this

large number of companies and NGOs. Yet, having small local companies that are working on the micro level based on simple non-sophisticated equipment and a monitoring system conducted by the NGOs should not be of a high burden on the government in terms of costs.

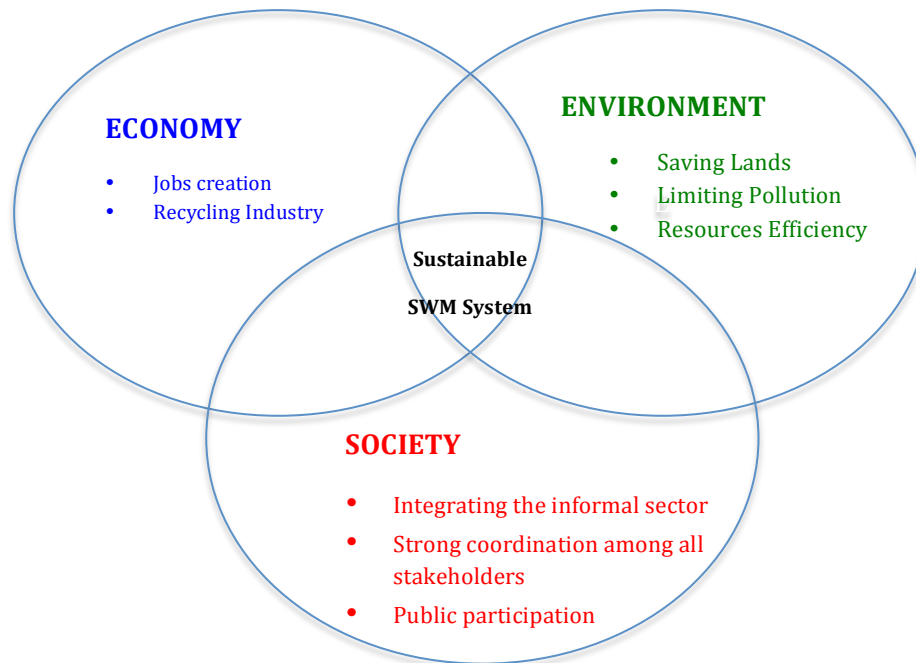


Figure 13: Sustainable Waste Management through Recycling (By author)

Therefore, the initiated model supported by the policy recommendations would lead to a sustainable waste management system. Environmentally, lands will be saved, as all the landfills and dumpsites will be cancelled except two sanitary ones (ECARU and Belbeis Plant). Pollution will be eliminated, since those landfills will be far from the residential areas, and there will be more efficient use of resources, since the waste will be recycled. Economically, this model will create green jobs, as it will entail a large number of collection and transportation companies, as each one or two districts will be managed by two companies (one will be responsible for the food waste and one for the non-food waste). In addition, the recycling plants will require substantial human resources. Also, investing in R&D would lead to have a stronger recycling industry that is much needed with the current economic recession. Finally, on the social level, the informal sector will be integrated formally in the system, NGOs will allow public participation and will understand better people's needs and complains. Furthermore, this system would achieve a very high level of coordination

with clear task assignments of all the relevant stakeholders, which would lead to a social satisfaction.

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