Journal of International Business and Economics
June 2020, Vol. 8, No. 1, pp. 1-21
ISSN: 374-2208 (Print), 2374-2194(Online)

Published by American Research Institute for Policy Development
DOI: 10.15640/jibe.v8n1a1
URL: https://doi.org/10.15640/jibe.v8n1a1

Factors affecting Solid Waste Recycling in Egypt

Eman Hashem[1]

Abstract:

This paper illustrated the recycling efforts in Egypt. In this study, we addressed the main factors that affect the willingness to recycle in Egypt. The main source of information about waste generation and willingness to recycle (socioeconomic characteristics and attitudes of the respondents towards recycling) were from interviews with 306 respondents in Egypt.

The results showed that the most important factors affecting the willingness to recycle were: education, household income and knowledge about recycling.

The results also showed that there is a significant effect of government policy, government financial efforts and developing the waste collection system in waste recycling.

Based on these results, the government should implement comprehensive program to improve recycling. The government should take the respondents' willingness to recycle into consideration in order to improve waste management programs.

Keywords: Egypt, Recycling, Solid waste management

1. Introduction

Solid waste Management (SWM) is a vital service that affect all aspects of our life especially health and environment. Waste management is a task not only for waste collection and disposal but also includes collection, transportation, sorting and recycling of waste. Solid waste management (SWM) is vital in achieving many goals related to the sustainable development goals (SDGs). As solid waste management has a real positive impact on the people's welfare. The world generates approximately 2.01 billion tons of municipal solid waste annually, at least 33 percent of these waste is not managed in an environmentally safe manner.

Egypt is one of the countries that couldn't manage solid waste in a proper way, which affects environment and health. Egypt produces approximately 90 million tons of solid waste annually, which amounts to 55,000 tons per day. Municipal solid waste (MSW) is the most influential, with around 21 million tons of total solid waste. About 47% of the solid waste is generated from 4 governorates (Greater Cairo Governorates). Only 12% of household solid waste is recycled, and 81% is randomly disposed and the 7% remaining is disposed in sanitary landfills.

This study attempts to study the challenges facing solid waste management in Egypt and shed light on recycling as one possible solution to the municipal solid waste management problems. The term (recycling) expresses compost and regenerate materials for original purpose or for other purposes. Recycling is seen as a mean to reduce the environmental and health impact of waste disposal and raw material production. Recycling is highly affected by people's awareness and their culture. So, this paper examines the main factors that might influence the willingness to recycle for the respondent in Egypt.

2. Literature Review:

After knowing the importance of recycling for health, environment and as an important tool to achieve SDGs (Sustainable Development Goals), The Researchers tries to identify the most important factors in order to achieve success of solid waste management program. Alexis Troschinetz (2005), submitted further studies on recycling as a possible solution to the problem of MSWM (Municipal solid waste management) in developing countries.

[1] Associate professor of Economics-faculty of Business, Ain Shams University, Egypt

This study illustrated twelve factors affecting sustainable MSWM. These factors are: regulations, laws and incentives, government policy, as well as financial factors including: the budget allocated to MSWM, cost of MSWM & reliability and stability of funds.

This study also provided a percentage of case studies where these factors were important. The results showed that education of workers in the field of waste management, waste collection and financing are those obstacles that could hinder the recycling efforts in developing countries. Likewise, on the other hand, household economics is one of the smallest barriers, which identify that socioeconomic is not only factor affecting recycling in developing countries. Finding relationships between the 12 factors affecting recycling in developing countries, made it clear the importance of collaborative among factors for sustainable MSWM.

Scott callen & Janet Thomas (2006), attempted to use multiple linear regression to consider the effect of program variables and socio economic factors on recycling processes. This study presented a set of variables including unit pricing (PAYT: pay as you throw), access to a material recycling facility, grants for recycling education, grants for equipment and curbside trash service.

Also, this study was able to use the following contextual factors: education, value of housing, age of housing, density of housing, population, suburban or rural areas and type of town. As a result, this study found that unit pricing; especially in combination with curbside recycling is highly affected recycling rate. They estimated that unit based pricing increases recycling by 6.6 percentage points. While when used with curbside recycling services it increases recycling by 12.1 percentage points.

This paper confirmed that education, income and urbanization are important in the recycling process. Also, socioeconomic factors are vital and have an effective role in the recycling rate.

Rafia Afroz & etal (2008), this study investigated the factors that may affect waste generation and willingness to recycle for the respondents in Bangladesh. In this study a series of information obtained on waste generation, socioeconomic characteristics and the willingness to recycle. This information was obtained based on interviews with 402 respondents in the Dhaka city.The study used ordinary test square (OLS) regression and logistic regression analysis to identify the main factors that may affect the waste generation and willingness to recycle.

The result concluded that the dominant factors that may affect waste generation was household size and household income. This study also confirmed that age, education and knowledge about recycling are the main factors that may affect the willingness to recycle in Bangaladesh. Also, Jared Starr (2014) presented a study of municipalities of the commonwealth of Massachusetts over a 16 years period from1997 to2012. The study examined a set of programs that include the policies and characteristics of trash recycling program (which is controlled by state and waste managers) and contextual factors that includes spatial factors like density & socioeconomic factors.

The methodology of the study was by using multiple linear regressions to determine the main factors affecting recycling. The study found that relative effect of program variable is higher than the contextual variables.The study used the consistent synthesis across time model, which result that PAYT (pay as you throw) explains between 45% and 69% of variance while education and age explain the remaining. The study found that the only consistently effective policy is PAYT (pay as you throw) and age & education are the most important contextual variables.

Jessica MC Allister (2015) presents another study examining the constraints that have been found to affect solid waste systems that include: a) infrastructure, social provisions & technology b) policy, institutions and macroeconomics andc) culture, Knowledge and microeconomics, this study provided some requirements needed to promote the sustainability of solid waste management in developing countries. Where public awareness, financing, expertise, equipment and facilities must be provided. Also, this paper concluded that Solid waste management practices are perceived to require some behavioral changes. There is a need for community participation and community awareness programs.

3. Solid waste Management and SDGs

Solid waste management can play an important role in achieving some of the sustainable development goals (SDGs). Solid waste management can generate employment. The goals relating to improvement in health and protection of the environment cannot be achieved without improving solid waste management as an important part of the solution.

3.1 Goal 1 (no poverty) and Goal 8(Economic growth and decent work)

Solid waste management generally generates many jobs opportunities by street sweeping, collecting these wastes and recycling these materials. These jobs can be found in waste management through the formal sector as employees of the government or registered companies. As well as in the informal sector and small enterprises.(Barbara Gonzenbach & Adrian coad,2007:7)

In developing countries, solid waste management services are often provided by individuals and small enterprises. So, the applied policies to improve the states of waste management will improve livelihood and contribute to Sustainable development goals (Goal 1: no poverty & Goal 8: Economic growth and decent work) (Ljiljana Rodic & David c. Wilson, 2017:5)

3.2 Goal 3: Good health and well-being:

Exposure to waste has a major impact on health, as the impact will largely affect children and their health. This solid waste leads to different types of infectious diseases.

The recycling process can play an important role in improving health and reducing mortality and disease.

3.3 Goal 6: Clean water and sanitation:

It is clear that solid waste management help us to reduce pollution of waste sources. In addition to, improving treatment of waste water and drinking supplies and thus increase the availability of clean water, which is important for us.

3.4 Goal 7: Affordable and clean energy

Recycled materials as a basis of the manufacturing process use much less energy than is required to produce new products from raw materials.There can also be additional energy savings as extra energy is needed to extract, refine, transport and process raw materials ready for industry. As compare to provide industry ready materials.

3.5 Goal 11: sustainable cities

Improved waste management can improve the life conditions in cities and rural area, especially for poor people. Also, improved environment can considered a real opportunity to generate jobs.In the restructuring and improving waste management system, the informal sector should have a major role. Improving waste management system could offer better working condition for zabbaleen and scavengers.(SamuelaBassi,2011:12)

3.6 Goal 12: Responsible consumption and production

This goal (12)is to achieve the environmentally sound management of chemicals while collecting waste in our life. This is through agreed international frameworks, limiting the release of chemicals and harmful materials to air, soil and water and reducing harmful effects on environment and public health.

This goal aims to minimize waste generation by prevention, recycling, reuse and reduction repair. It is important for the production and consumption process to be more sustainable by improving awareness for all people. (SherienElagroudy, 2016:17)

3.7. Goal 13: Climate Action

The recycling process is important, especially solid waste, as it reduces pollution because it is a real alternative to sending that waste to landfills. Product recycling is a good thing to reduce carbon emissions and it is also important in order to prevent emissions of large quantities of greenhouse gases in order to help in achieving theSDG (13).

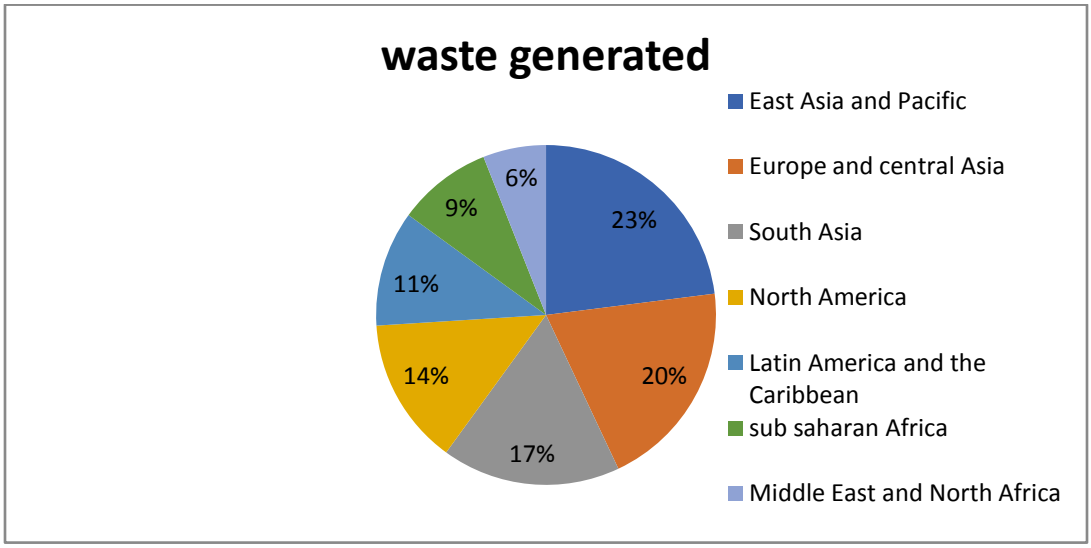
4. Global Solid Waste Management

It sound dangerous when we discover that the world generates 0.74 kilogram of waste per capita per day .the total generation of solid waste is about 2.01 billion tons, the national waste generation rate may fluctuate widely from 0.11 to 4.54kg per capita per day. Waste generation rates are generally directly related to urbanization rate and income level.

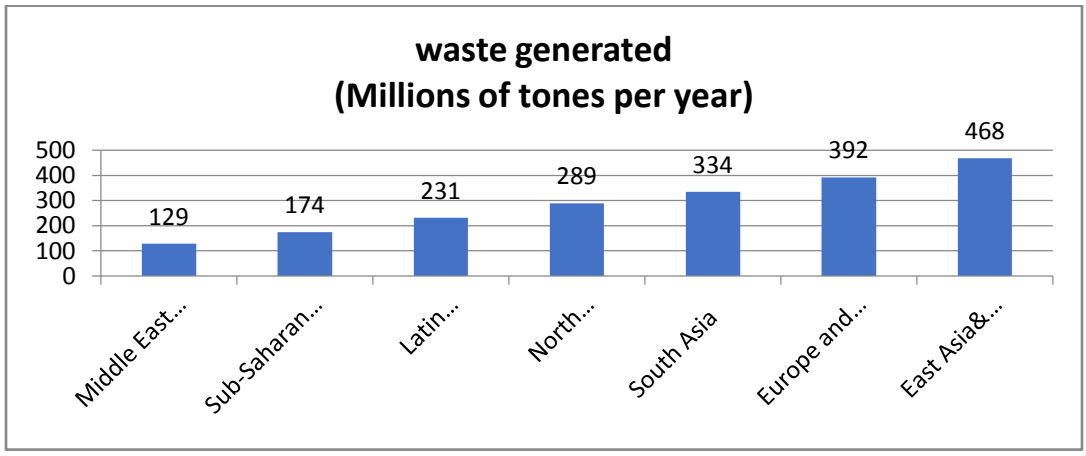
In 2016, nearly 2.01 billion tons of municipal solid waste was generated and expected to increase to 3.40 billion tons in 2050. This requires global awareness.

Figure (1) waste Generation by Region

a) Share of waste generated, by Region, percent



b) Amount of waste generated by Region



Source: World Bank (2018), What a waste 2.0 a Global snapshot of solid waste Management to 2050, World Bank Report, p. 19 & 20

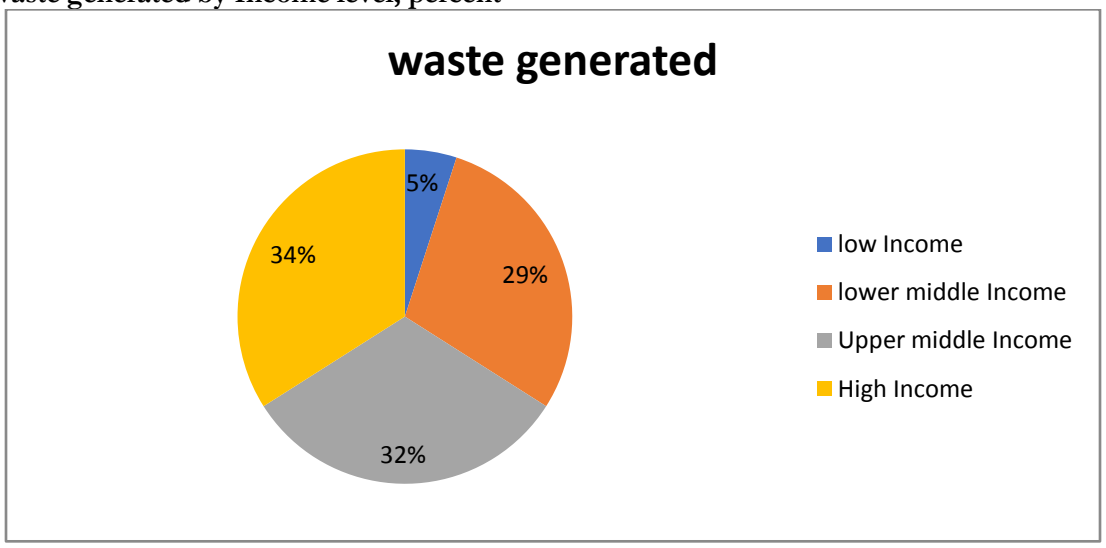
East Asia & the Pacific and the Europe & central Asia regions producing about 43 percent of the world's waste. While, MENA and sub Saharan Africa region produce about 15 percent of the world's waste which consider the least amount of waste.

East Asia and the pacific produced about 468 million tons in 2016 and the MENA region produced lower rates in the same period reaching only 129 million tons.

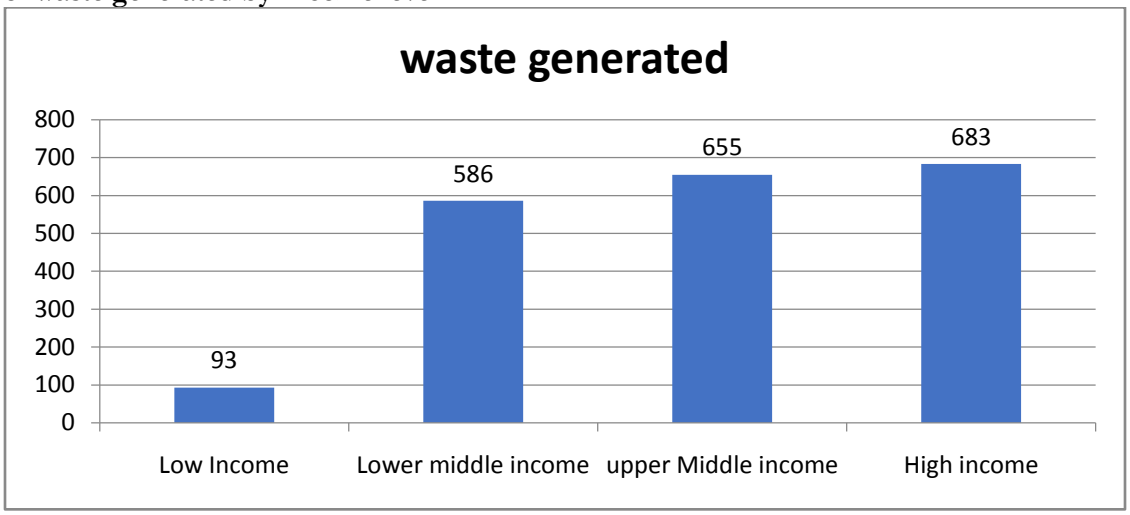
The three regions that dominated low& middle income countries produce the lowest amount of waste per capita. East Asia &Pacific generate 0.56 kg/day, south Asia 0.52 kg/day and sub Saharan Africa 0.46 kg/day.

Figure (2): Waste Generation by Income level

a) Share of waste generated by Income level, percent



b) Amount of waste generated by Income level



Source: World Bank (2018), what a waste 2.0 a Global snapshot of solid waste Management to 2050, World Bank Report, p.21

As for high income countries, they represent about 16% of the world's population; produce 34% of the world's waste (638 million tons). While low income countries, produces 5 percent of global waste (93 million tons) while it represent about 9 percent of the world's population.

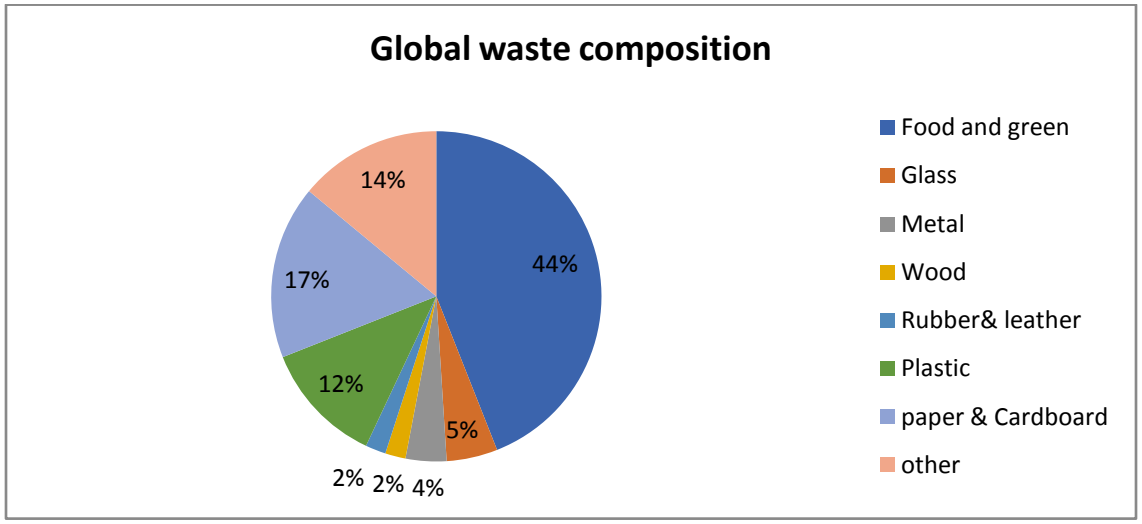
Total quantities of waste are expected to increase in low income countries by more than three times by 2050.

In general, waste generation increases with urbanization, as high income countries and economies are more urbanized and generate more waste per capita per day.

4.1 Global Waste composition:

Globally, food and green waste represent the highest waste category, which account about 44 percent of global waste. About 38% of global waste occupied by paper& cardboard, plastic, metal and glass (Dry recyclables)

Figure (3): Global waste composition percent



Source: World Bank (2018), What a waste 2.0 a Global snapshot of solid waste Management to 2050, World Bank Report , p.21

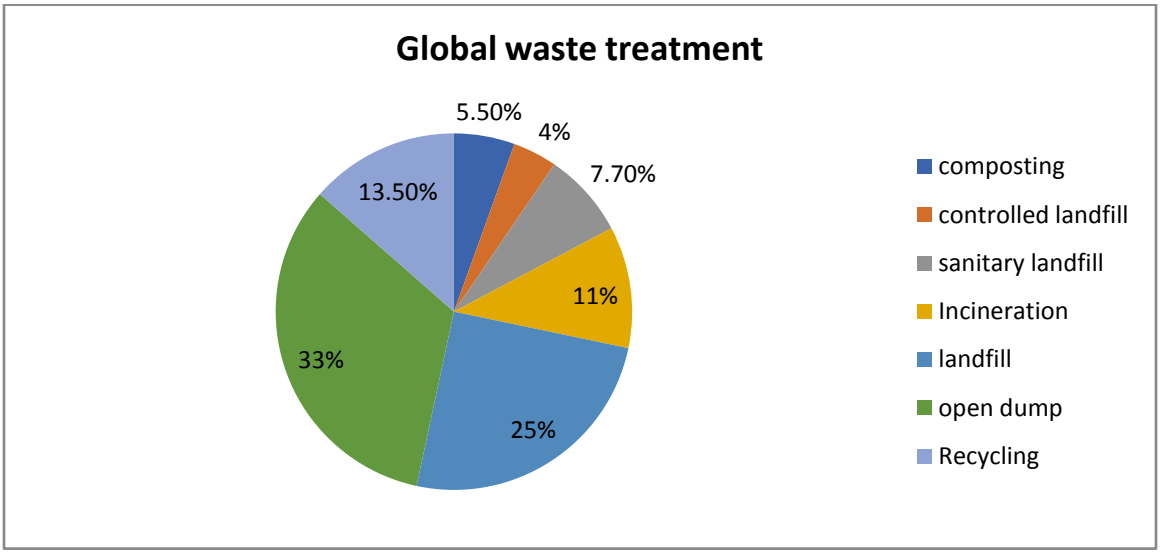
The composition of the waste varies greatly depending on the level of income but the percentage of organic matter in the waste decreases with the increase in the level of income.

The good consumed in the high income countries such as paper and plastic are higher than in low income countries.

4.2 Global Recycling:

Worldwide, there are approximately 40% of wastes disposed of in landfills. As a result, approximately 19 percent can undergo material recovery by recycling and 11 percent are incinerated. Worldwide 33% of waste being dumped

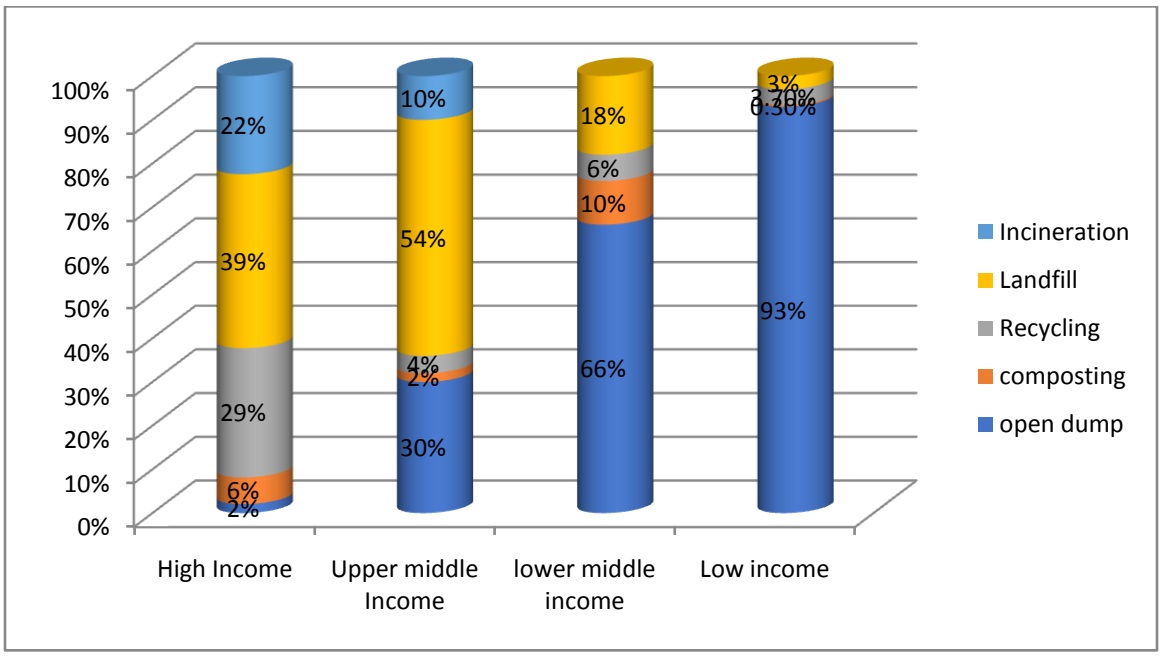
Figure (4): Global waste treatment and Disposal



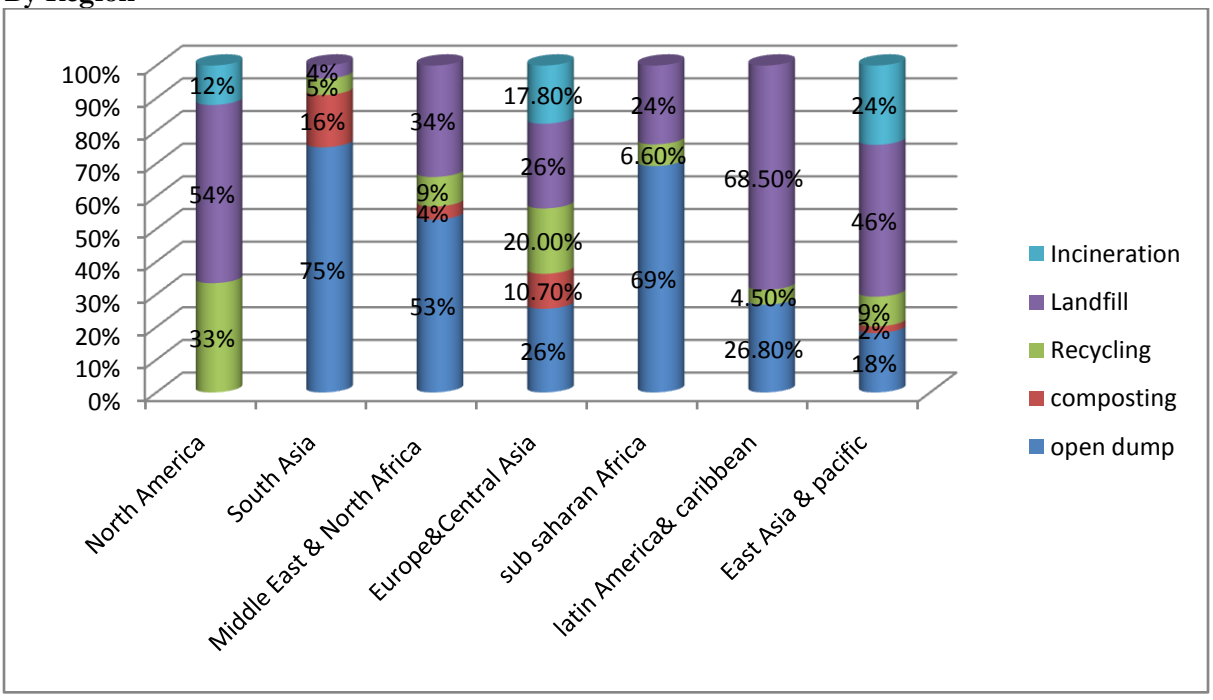
Source: World Bank (2018), What a waste 2.0 a Global snapshot of solid waste Management to 2050, World Bank Report , p.23

Figure (5) Disposal methods

a) by Income



b) By Region



Source: World Bank (2018), What a waste 2.0 a Global snapshot of solid waste Management to 2050, World Bank Report, p.25

Practices for disposing of the waste vary depending on the income level and the region. In low income countries, open dumping prevails as there are no landfills available. About 93% of the waste is treated by ways damaging environment whether dumped in water, roads or even burned in low income countries. While only 2% of waste is dumped in high income countries. About two thirds of the waste is dumped in both south Asia and Sub Saharan Africa regions. But high income countries often tend to utilize these materials through recycling. In these countries, 29 percent of waste is recycled and about 6 percent composted.

5. Solid Waste Management in Egypt:

Egypt generates about 90 million tons of solid wastes annually, which amounts to 55 thousand tons per day. Municipal solid waste (MSW) amounted about 21 million tons of the total amounts of solid waste.

Table (1): the amount of wastes generated annually in Egypt in 2016 (million ton)

Wastes type	The amount generated annually (million ton)
Municipal solid waste	21
Agriculture wastes	31
Construction/ demolition debris	5.8
Industrial wastes	4.9
Hazardous substances &wastes	0.54
Medical/ pathological waste	0.52
Sewage sludge	27
Total	**90**

Source: EEAA (2016), Egypt state of the Environment Report, p.43

In 2016, Egypt generated about 59000 tons/day of MSW which is represent 22 million tons annually. The municipal solid waste per capita is about 1.07 kg/ per capita in urban areas and 0.5 kg/per capita in rural areas in Egypt.

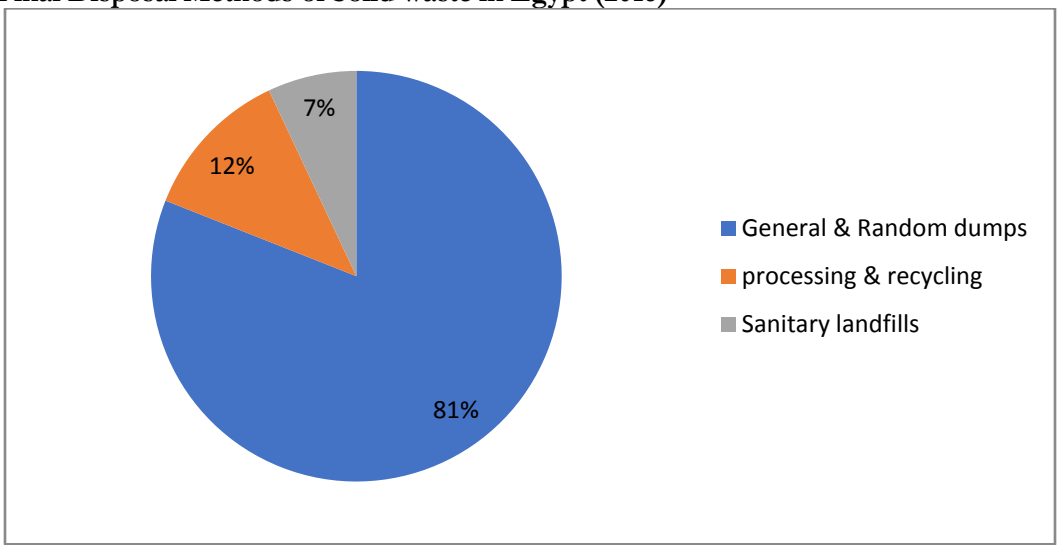
Table (2): The Amount of Municipal solid waste generated daily and annually in each governorate in 2016

Governorate	The MSW generated daily (ton)	The MSW generated annually (million ton)
Cairo	15000	5.54
Alexandria	4300	1.57
Giza	4800	1.75
Qalioubia	3800	1.39
Dakahlia	4800	1.75
Gharbia	3800	1.39
Menoufia	2650	0.97
Behera	3700	1.35
Kafr El Sheikh	2750	1.00
Sharkia	2350	0.86
Damietta	950	0.35
Ismailia	620	0.23
Port Said	670	0.24
Suez	410	0.15
Fayoum	740	0.27
BeniSuef	820	0.30
Menia	1440	0.53
Asyout	720	0.26
Suhag	1130	0.41
Qena	1335	0.49
Aswan	920	0.34
Luxour	330	0.12
Red Sea	465	0.17
Matrouh	310	0.11
North Sinai	250	0.09
South Sinai	570	0.21
El Wadi El Gidid	135	0.05
Total	**59765**	**21.81**

Source: EEAA (2016), Egypt state of the Environment Report, p.44

About 47% of the MSW is generated from 4 governorates (Greater cairo Governorates) Cairo, Qalioubia, Giza and Alexandria. While about 37% is generated from seven Delta governorates: Behera, Kafr El Sheikh, Gharbia, Menoufia, Sharqiyah, Dakahlia and Damietta. The remaining 16% is created from the 16 other governorates.

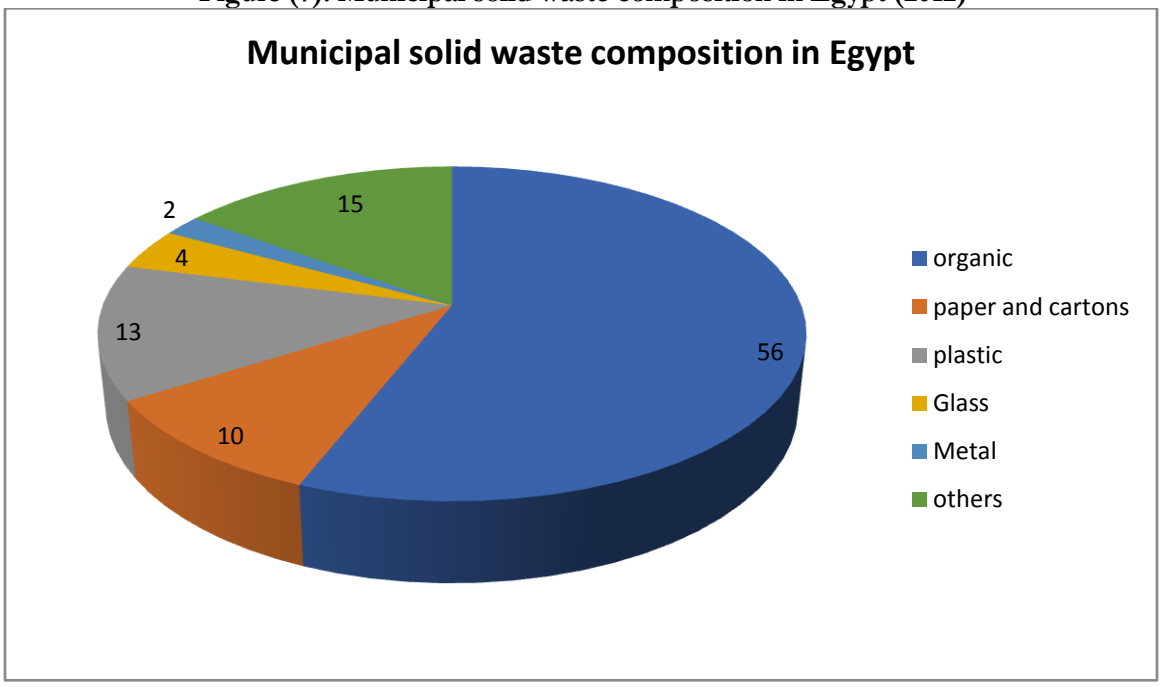
Figure (6): Final Disposal Methods of Solid waste in Egypt (2016)



Source: EEAA, Egypt state of Environment Report ,p.45

As shown in the figure above, only 12 % of MSW are recycled while 81% which is the largest proportion is disposed randomly in general and random dumps .The remaining 7% is disposed in sanitary landfills.

Figure (7): Municipal solid waste composition in Egypt (2012)



Source: CAPMAS (2017), The Annual Report of environmental statistics

The composition of municipal solid waste in Egypt is the same as the waste composition in low and middle income countries, where organic waste represents the highest proportion of waste, which amounts to about 50-60 percent.

5.1 Institutional Framework for solid waste Management in Egypt:

There has been no single Ministry charged with responsibility for solid waste management in Egypt, where responsibilities are divided between:

- Ministry of state for the environment
- Ministry of health
- Ministry of Planning
- Ministry of local development
- Ministry of Administrative Development
- Ministry of Agriculture
- Ministry of Finance
- Ministry of irrigation & water resources.

The problem in Egypt lies in the inter- ministerial coordination processes, as the responsibilities between ministries seem unclear. This is in addition to the lack of technical and organizational capacity in Egypt. All these led to duplication of efforts, lack of accountability and inefficient use of human resources. (National solid waste management, 2011:11)

5.2 Regulatory framework for solid waste Management in Egypt:

Egypt doesn't have a specific law for SMW. The laws regulate collection, treatment and disposal of solid waste lie in law 38/1967 regarding general public cleanliness and law 4/1994 to protect the environment and its amendments.

Main amendments of the legislations in 2005-2010:

- Law no. 10/2005 Establish a fee system for solid waste collection.
- Prime Minister Decision no. 1741/2005 amendment to the executive regulations of law no.4/1994 including regulations for selecting recycling sites, land filling and essentials equipment needed to collect and transfer waste.
- Law no.9/2009 amending law 4/1994 and managing the collection, treatment and disposal of hazardous waste.
- Presidential Decree no.86/2010 regulating the closure of existing dumping sites and the landfill at greater Cairo and allocation of five new sites away from the housing and commercial belt of Greater Cairo. (Sohair Mourad,2010:22)

5.3 Recycling initiatives in Egypt:

There have been many governmental attempts of recycling in Egypt but those were not enough. There are many initiatives that have been taken in this regard whether formal or informal.

Table (3): The Number of Recycling plants and their operating condition distributed according to Regions across Egypt 2016

Regions	**Number of factories**	**Operating conditions**	
		works	**Doesn't work**
Greater Cairo	11	11	0
Lower Egypt	25	24	1
Suez Canal	10	4	6
Upper Egypt	16	15	1
Total	**62**	**54**	**8**

Source: CAPMAS (2017), The Annual Report of environmental statistics, p.63

In March 2017, the government the government approved a new project called (sell your Garbage). The initiative was a set of kiosks located across the cities to deposit classified waste. People get a free in return that this waste is deposited and it is possible to donate these money to charities. There was opposition to these projects, especially from the garbage collector community, as this reduced demand for their services. On the other hand, there was a group of projects by private sector. Within the framework of these projects, garbage collections come to collect waste as they are sorted then transported for processing.

Recyclobekia was one of the organizations specializing in e-waste and also Bekia is another organization that exchanges solid waste for commodities including phone credits, groceries or metro tickets.There is also Go Green, which is a leading institution in waste collection from homes, companies, factories and cafes in exchange for money or special household items.

Informal recycling takes place based on the informal sectors that are experts in the sorting process. These people sort these materials, whether plastic, glass, paper or other materials. Each type is classified separately, then each type (like plastic) classified into groups, where each sorted group is used differently. So, the sorted solid waste transfers into raw materials ready for use in industrialization process. (ImanMostafa ,2016:56&57)

Hence, these institutions produce some final products, the most famous of which is the plastic hanger, clothes, carpets, notebook and other materials.

5.4 The challenges facing solid waste Management in Egypt:

The solid waste management system has many drawbacks and deficiencies that already exist and that have a negative impact on performance, including:

5.4.1 Legally:

- Lack of regulations and systems for solid waste management. (Randa El Mary,2018:22)
- Poor enforcement and implementation of laws & regulations.

5.4.2 Financially:

- The lack of financial resources needed for the solid waste management as the available resources are not enough to cover the cost of solid waste management process. (SohairMourad,2010:61)

5.4.3Technically:

- Recycling initiatives fail due to poor performance at the local government level
- Lack of expertise and human skills.
- Lack of adequacy equipment, tools or facilities for successful recycling operations in addition to poor maintenance.
- Low level of public awareness of solid waste management issues. This leads to weakness in carrying out recycling operations, as well as creating negative practices in dealing with municipal solid waste and weak public participation in solid waste management. (EEAA ,2011:13)

5.4.4 Institutional:

- Lack of institutional and administrative systems and weak coordination between different institutions.
- Lack of supervisory processes for solid waste management.
- Lack of coordination between the government and the private sector and the lack of separation between the different stages of the system from collection, disposal and transfer

6. Benefits of solid waste Recycling:-

6.1 Economic Benefits:

1) Job Creation: the recycling process is itself a major supporter of job creation. A large number of people are employed in recycling sector jobs and elsewhere in which recycled products are produced. Many of those jobs are expressed in the waste recycling sectors are green jobs because they have a strong positive impact on the environment and society.

2) Lower costs: Recycling reduces the waste collection and disposal costs.

3) Source of raw materials: In the case of waste collection, materials such as metals, paper, glass and plastic are recovered from solid waste. These materials are a real source of valuable raw materials for industries. As a result, there will be a reduction in the import of these materials from abroad.(Agbaeze E.K. &etal,2014:9)

4) Encouraging Tourism: the clean environment stimulates tourism and leisure activities. This creates additional revenues to cities and coastal areas.(SamuelaBassi,2011:22)

6.2Environment Benefits:

1) Forest conservation: the recycling process is of great importance in preserving natural resources such as trees and animals. When we recycle waste paper for example, this will help preventing cutting down the tress. As a lot of trees have to be cut for manufacturing paper from scratch.

2) Reducing pollution: Recycling of solid waste instead of sending it to the landfills will reduce the pollution. Recycling different products reduces carbon emissions, which reduces the carbon footprint of these products.

3) Energy conservation: Recycling materials requires energy. However, this may be much less than what is needed to manufacture new products.

7. Factors affecting Recycling Rate:

7.1State factors:

1) **Government policy:**

Government policy related to recycling indicates the existence of regulations, enforcement of laws and use of incentive systems.

Incentives to reduce waste and recycling can save a lot of money. The process of applying packing taxes and economic incentives to reduce waste has a greater impact on recycling in many countries than just the existence of public awareness and organized recycling projects.(World Bank ,2003:17)

Waste banks (or Garbage banks) act as a bank in order to store and preserve waste in deposits or obtain additional funds from the trash to obtain the value of specific facilities. (DwiWulandari&etal,2017:37)

2) **Government Finances:**

Cost of municipal solid waste management (MSWM) process, the budget for solid waste management by local governments, in addition to the stability and reliability of funds including the government financing factor that affects waste recycling.(Alexis Manda,2005:40)

The major challenges facing developing countries are related to the lack of government funding for solid waste management.

3) **Waste collection:**

Proper collection and separation appears to be an important process in creating better options and opportunities for scientific disposal of waste like recycling. Waste separation is a basis process that takes place at the source (households) or the processing facility which depends on the technological scope of the treatment facilities themselves (Alexis Manda, 2005: 42)

The informal sector is heavily involved in collecting, sorting, transport and recycling activities. The areas that lack collection services (especially in rural areas) in low income countries, household tend to get rid of garbage in the nearest empty places, public space or river or even burn it. Uncollected waste leads to various environmental and health risk. In addition, it affects the ecosystems of rivers. (Mahmoud zohoar & Ali Ghani, 2017:44)

7.2 Local factors:

1) **Household Education:**

The studies provide empirical evidence that shows the importance of education in affecting recycling processes. Higher education is associated with higher recycling rates because higher education is associated with higher environmental values and appreciates the value of future time periods.

Callan and Thomas (2006) illustrated that linear inter relationships between demographic variables, where they found that education had a major impact on recycling.

Studies have found that education negatively affects the demand for waste disposal and that education positively impacts the demand for recycling. In this context, the most educated individuals tend to be more aware of the environment and the extent of its preservation, which indicates an increase in the activity of reducing disposal, lower waste generation and increase recycling.(Callan & Thomas ,2006:226)

2) **Household Income:**

Some studies have shown that high income also has a positive effect on the recycling rate. The income of the individual affects his behavior toward recycling operations, existence of waste collection and disposal fees and the willingness of the residents to pay as all these are considered as the main incentives for recycling (Jared starr, 2014:26)

There are other studies that confirm that the idea of (waste) in low income families is uncommon because every substance commonly found in solid waste is of importance to these people. Increasing income is of great importance as it is considered as incentives for recycling due to changing consumption pattern. This lead to a higher percentage of recyclable materials in solid waste.(Alexis Manda,2005:43)

8. Methodology

8.1 Statistical techniques used in the study

1-Cronbach`s alpha

It is a statistical measure used for measuring reliability of the variables, It`s value ranges from 0 into 1 ,it will be better when it becomes close to 1

2-Pearson correlation coefficient

It is statistical measure used for measuring correlation between two quantitative variables and it range between -1 and 1

3-Frequencies table
It is a simple table show the number of observations lie in categories and their percent according to total number
4-Regression analysis:-

$y=\beta 0+\beta i\ xi+\ldots+\varepsilon$

Y is the dependent variable: waste recycling
X`s are the independent variables : education, household's income, knowledge about recycling, Government Policy on Waste Recycling , Government Financial Efforts in Waste Recycling ,and Developing the Waste Collection System

8.2Descriptive statistics of socio economic characteristics of the respondents

Item	Number of Respondent	Percentage
Gender		
Male	137	44.8
female	169	55.2
Governorate		
Alexandria	51	16.7
faiuom	123	40.2
dakahlia	132	43.1
Age		
Less than 20	98	32
From 20 to 30	111	36.3
From 31 to 40	45	14.7
From 41 to 50	29	9.5
50 and above	23	7.5
Education		
Illiterate	44	14.4
Primary education	59	19.3
Preparatory/secondary education	130	42.5
University/Masters/Phds	73	23.9
Income		
Less than 2500	220	71.9
Between 2500 to 10000	79	25.8
More than 10000	7	2.3
Social status		
Single	126	41.2
Married	141	46.1
Divorced	25	8.2
widower	14	4.6
Job		
Unemployed	106	34.6
Government sector	34	11.1
Private sector	74	24.2
Private business	92	30.1
Total	**306**	**100**

8.3Reliability of the questionnaire

Dimension	numbers of phrases	Cronbach's Alpha
waste recycling system	8	0.901
Government Policy on Waste Recycling	5	0.906
Government Financial Efforts in Waste Recycling	6	0.975
Developing the Waste Collection System	6	0.831

From the previous table we can note that all the coefficients "Cronbach'sAlpha " for all axes are between **0.831**and **0.975** and these values are higher than 0.7 and therefore we can say that these axes are Reliable

8.4 waste recycling according to governorate

Dimension	goverement	Mean	Std. Deviation	F	Sig.	indication
waste recycling system	Alexandria	26.9608	1.14822	3.766	0.024	Sig.
	faiuom	29.9512	0.54197			
	dakahlia	29.1364	0.54899			

From the previous table we can note that There are statistically significant differences between the mean values of waste recycling system according to the government where Sig = 0.024 It is less than 0.05 = α so , we reject the null hypothesis the highest mean value in faiuom is 29.9512 followed by dakahlia is 29.1364followed by Alexandria is 26.9608

8.5waste recycling according to gender

Dimension	gender	Mean	Std. Deviation	t	Sig.	indication
waste recycling system	male	26.7737	7.26797	-5.845	0.000	Sig.
	female	30.9882	5.33183			

From the previous table we can note that There are statistically significant differences between the mean values according to the gender where Sig = 0.000 ,It is less than 0.05 = α so , so waste recycling system varies according to gender . The mean value for female (30.98) is higher than males (26.77).

8.6waste recycling according to age

Dimension	age	Mean	Std. Deviation	F	Sig.	indication
waste recycling system	lower than 20	28.7755	6.03176	2.144	0.075	Insig
	from20 to30 age	30.1261	6.99625			
	from31 to40 age	28.9333	6.59339			
	from 41 to50 age	29.1034	5.34753			
	bigger than 50	25.8696	7.71247			

From the previous table we can note that There are no statistically significant differences between the mean values for waste recycling system according to the age , where Sig = 0.075 is higher than 0.05 = α

8.7 waste recycling according to educations levels

Dimension	**education levels**	Mean	Std. Deviation	F	Sig.	indication
Waste recycling system	illiterate	27	6.46997	4.233	0.006	Sig.
	basic education	27.4746	5.98664			
	intermediate education	30.2077	7.10573			
	university and higher educations	29.7123	5.74330			

From the previous table we can note thatThere are statistically significant differences between the mean values of waste recycling system according to the education levels where Sig = 0.006 is less than 0.05 = α, highest Mean in intermediate education is 30.2077 followed by university and higher educations is 29.7123 followed by basic education is 27.4746 , followed by illiterate is 27 .

8.8waste recycling according to income

Dimension	income	Mean	Std. Deviation	F	Sig.	indication
waste recycling system	lower than 2500	29.6864	6.33875	14.310	0.000	sig
	from 2500 to 10000	28.5570	6.04629			
	bigger than 10000	16.8571	9.17294			

From the previous table we can note that There are statistically significant differences between the mean values of waste recycling system according to the income where Sig = 0.00 is less than 0.05 = α , highest Mean for people that lower than 2500is 29.6864, followed by from 2500 to 10000 is 28.followed by bigger than 10000 is 16.8571

8.9waste recycling according to social status

Dimension	**social status**	Mean	Std. Deviation	F	Sig.	indication
waste recycling system	single	28.1270	7.47688	1.779	0.151	insig
	married	29.9716	5.86995			
	divorced	29.3600	6.77545			
	widower	28.6429	3.49961			

From the previous table we can note that There are no statistically significant differences between the mean values according to the social status where Sig = 0.151 is bigger than 0.05 = α

8.10waste recycling according to job

Dimension	**job**	Mean	Std. Deviation	F	Sig.	indication
waste recycling system	without work	29.6887	5.68098	0.724	0.538	insig
	government sector	28.5294	6.89855			
	freelance business	28.4239	6.34924			
	private sector	29.3649	7.92183			

From the previous table we can note that There are no statistically significant differences between the mean values of waste recycling system according to the job where Sig = 0.538 is bigger than 0.05 = α

8.11The effect of Government Policy on Waste Recycling?

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.589[a]	0.347	0.345	5.34419
a. Predictors: (Constant), Government Policy on Waste Recycling				

From the previous table we can note that The value of the correlation coefficient is .589 which indicates a moderate positive correlation between Government Policy on Waste Recycling to waste recycling system The value of the coefficient of determination is 0.347 , which indicates that Government Policy on Waste Recycling, was able to explain 34% of the values of the changes in waste recycling system

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4621.518	1	4621.518	161.816	.000[b]
	Residual	8682.341	304	28.560		
	Total	13303.859	305			
a. Dependent Variable: waste recycling						
b. Predictors: (Constant), Government Policy on Waste Recycling						

From the previous table we can note thatSig = 0.000 ,It is less than 0.05 = α so , we reject the null hypothesis so there is the effect Government Policy on Waste Recycling to waste recycling system

Coefficients[a]					
Model		Unstandardized Coefficients		t	Sig.
		B	Std. Error		
1	(Constant)	4.356	1.969	2.212	0.028
	Government Policy on Waste Recycling	1.191	0.094	12.721	0.000
a. Dependent Variable: waste recycling					

From the previous table we can note that There is a statistically significant effect of Government Policy on Waste Recycling where the value Sig = 0.000 It is less than 0.05 = α , looking at the value of 0.589= b the greater the Government Policy on Waste Recycling by 1 unit , waste recycling system increases by 0.589

8.12 The effect of Government Financial Efforts on Waste Recycling ?

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.716[a]	0.513	0.512	4.61491
a. Predictors: (Constant), Government Financial Efforts in Waste Recycling				

From the previous table we can note that The value of the correlation coefficient is .716 which indicates a strong positive correlation between Government Policy on Waste Recycling to waste recycling system The value of the coefficient of determination is 0.513 , which indicates Government Financial Efforts in Waste Recycling, was able to explain 51% of the values of the changes in waste recycling system.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6829.440	1	6829.440	320.670	.000[b]
	Residual	6474.420	304	21.297		
	Total	13303.859	305			
a. Dependent Variable: waste recycling system						
b. Predictors: (Constant), Government Financial Efforts in Waste Recycling						

From the previous table we can note that
Sig = 0.000 ,It is less than 0.05 = α so , we reject the null hypothesis there is the effect of Government Financial Efforts in Waste Recycling to waste recycling system the model is moral

Coefficients[a]					
Model		Unstandardized Coefficients		t	Sig.
		B	Std. Error		
1	(Constant)	2.124	1.529	1.389	0.166
	Government Financial Efforts in Waste Recycling	1.083	0.060	17.907	0.000
a. Dependent Variable: waste recycling system					

From the previous table we can note that

There is a statistically significant effect Government Financial Efforts in Waste Recycling where the value Sig = 0.000 It is less than 0.05 = α , and looking at the value of 0.716= b the greater Government Financial Efforts in Waste Recycling by 1 unit , waste recycling system increases by 0.716

8.13The effect of Developing Waste Collection System on waste recycling?

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.733[a]	0.537	0.535	4.50195
a. Predictors: (Constant), Developing the Waste Collection System				

From the previous table we can note that the value of the correlation coefficient is .733 which indicates a strong positive correlation between Government Policy on Waste Recycling to waste recycling system The value of the coefficient of determination is 0.537, which indicates Developing the Waste Collection System, was able to explain 53% of the values of the changes in waste recycling system

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7142.534	1	7142.534	352.413	.000[b]
	Residual	6161.325	304	20.268		
	Total	13303.859	305			
a. Dependent Variable: waste recycling						
b. Predictors: (Constant), Developing the Waste Collection System						

From the previous table we can note that Sig = 0.000 , It is less than 0.05 = α so , we reject the null hypothesis there is the effect Developing the Waste Collection System to waste recycling system

Coefficients[a]					
Model		Unstandardized Coefficients		t	Sig.
		B	Std. Error		
1	(Constant)	4.297	1.346	3.192	0.002
	Developing the Waste Collection System	1.124	0.060	18.773	0.000
a. Dependent Variable: waste recycling					

From the previous table we can note that There is a statistically significant effect of Developing the Waste Collection System , and looking at the value of 0.733= b the greater effect Developing the Waste Collection System by 1 unit , waste recycling system increases by 0.733

Results summary:

1) the important factors for willingness to recycling were: education, household income and knowledge about recycling
2) There is a statistically significant effect of Government Policy on Waste Recycling.
3) There is a statistically significant effect Government Financial Efforts in Waste Recycling.
4) There is a statistically significant effect of Developing the Waste Collection System

9. Conclusion:

The waste generation and willingness to recycle is an important component of a waste management plan that would be a path to achieving Sustainable Development Goals (SDGs)

In Egypt, waste and lack of proper management constitute health and environmental problems for the population and public health. In Egypt, only 12% of MSW are recycled while 81% is disposed random dumps and 7% is disposed in sanitary landfills.

Recycling is highly influenced by culture and public awareness. So, this paper examined the factors that influence the waste generation of the respondents and their willingness to recycle.

This paper found that education, household income and knowledge about recycling are the most important factors affecting willingness to recycle in Egypt.

The study also found that government policy, government financial efforts and developing the waste collection system play an important role in enhancing waste recycling rate in Egypt.

References:

Agbaeze E.K. &etal (2014), **impact of sustainable solid waste management on economic development- lessons from Enugu state Nigeria**, journal of Economics and sustainable development, vol5, no.9

Alexis Manda (2005), **Twelve factors influencing sustainable recycling of municipal solid waste in developing countries**, Master thesis of science in Environmental Engineering, Michigan technological university

Barbara Gonzenbach& Adrian coad (2007), **solid waste management & The Millennium Development Goals**, CWG (collaborative working group on solid waste management in low and middle income countries, CWG Publication series no.3

Callan& Thomas (2006), **Analyzing demand for disposal and Recycling services** , Eastern Economic Journal, volume 32, No.2, 2006

CAPMAS (2017), **The Annual Report of environmental statistics**

DwiWulandari&etal (2017), **waste banks: waste management model in improving local economy**, International journal of Energy Economics & policy 2017, 7(3), 36-41

EEAA (2011), **National solid waste management programme (MSWMP) Egypt**, main report

EEAA (2016), **Egypt state of the Environment Report**

ImanMostafa (2016), **Promoting recycling in the solid waste management system of cairo**, Master thesis, the American University in cairo.

Jared starr(2014), **Patterns in trash: factors that drive municipal solid waste recycling**, Master theses, University of Massachusetts Amberst

Jessica McAllister (2015), **factors influencing solid waste management in the developing world** , all graduate plan B and other reports 528, Utah state university

LjiljanaRodic& David c. Wilson (2017), **Resolving governance issues to achieve priority sustainable development Goals related to solid waste management in Developing countries**, sustainability 2017,9,404

Mahmoud zohoar & Ali Ghani (2017), **municipal solid waste management challenges and problems for cities in low income and developing countries**, International journal of science and Engineering applications volume 6 issue 02, 2017

National solid waste management(2011), **programme (NSWMP) Egypt**, Main Report

RafiaAfroz&etal (2008), **factors affecting waste generation and willingness to recycle: a study in a waste management program in Daka city**, Bangladesh, faculty of Economics and Business, university Malaysia Sarawak (UNIMAS), FEB working paper series no.0803

Randa El Mary (2018), **Good governance and Integration for sustainable Municipal solid waste management: A case study of Egypt**, Master thesis submitted to the Graduate program in sustainable development, The American University in Cairo

SamuelaBassi (2011), **Analysis for European Neighbourhood policy (ENP) countries and the Russian federation on social and economic benefits of enhanced environment protection**, Egypt: country Report, Institute for European Environmental policy (IEEP)

Sherien Elagroudy (2016), **Municipal solid waste management and green economy**, global young academy

Sohair Mourad (2010), **Assessment of solid waste management in Egypt during the last decade in light of the partnership between the Egyptian government and the private sector**, Master thesis, The American University in cairo

World Bank (2003), **waste reduction, Reuse and Recycling**, Thailand Environment monitor, 2003

World Bank (2018), **What a waste 2.0 a Global snapshot of solid waste Management to 2050**, World Bank Report.

Appendix:

Are you satisfied with the garbage collection system in your area؟		
	Frequency	Percent
no	175	57.2
yes	63	20.6
neutral	68	22.2
Total	306	100.0

In your opinion, what are the most important difficulties facing the recycling process in Egypt؟)		
	Frequency	Percent
Lack of awareness among citizens and lack of knowledge to deal properly with garbage	130	42.5
Lack of a good garbage collection and recycling system	97	31.7
the lack of physical possibilities required to provide recycling requirements of suitable boxes and places of discharge	49	16.0
others	30	9.8
Total	306	100.0

	strongly disagree	disagree	neutral	agree	strongly agree	Mean	General trend
	Frequency						
	Percent						
I have a good knowledge of the concept of waste recycling	95	61	68	35	47	2.60	disagree
	31.0	19.9	22.2	11.4	15.4		
I educate parents and children about the importance of waste recycling	30	81	73	79	43	3.08	disagree
	9.8	26.5	23.9	25.8	14.1		
waste recycling preserves natural resources in countries]	15	65	75	100	51	3.35	agree
	4.9	21.2	24.5	32.7	16.7		
I think the best solution for waste disposal is recycling	9	32	32	156	77	3.85	agree
	2.9	10.5	10.5	51.0	25.2		
It is best to separate garbage when dumped or in specific recycling locations	16	19	30	135	106	3.97	agree
	5.2	6.2	9.8	44.1	34.6		
Waste recycling is critical to environmental conservation	7	8	36	165	90	4.06	agree
	2.3	2.6	11.8	53.9	29.4		
waste recycling is of economic importance to society	10	8	27	160	101	4.09	agree
	3.3	2.6	8.8	52.3	33.0		
Waste recycling is critical to environmental conservation	7	8	29	163	99	4.11	agree
	2.3	2.6	9.5	53.3	32.4		

	strongly disagree	disagree	neutral	agree	strongly agree	Mean	General trend
	Frequency						
	Percent						
[It is good that the government contributes to finding solutions to overcome pollution from waste incineration	1	31	23	168	83	3.98	agree
	0.3	10.1	7.5	54.9	27.1		
Government should develop and manage waste system	5	5	22	184	90	4.14	agree
	1.6	1.6	7.2	60.1	29.4		
Government should improve environmental conditions and reduce pollution	3	6	22	172	103	4.20	agree
	1.0	2.0	7.2	56.2	33.7		
[Government should establish awareness conferences on the proper disposal and recycling of waste	4	1	26	165	110	4.23	agree
	1.3	0.3	8.5	53.9	35.9		
[necessary laws regulating recycling in the country	4	3	22	168	109	4.23	agree
	1.3	1.0	7.2	54.9	35.6		

	strongly disagree	disagree	neutral	agree	strongly agree	Mean	General trend
	Frequency						
	Percent						
[The government should impose sanctions on the dumping of waste in the streets, rivers and seas	8	7	24	173	94	4.10	agree
	2.6	2.3	7.8	56.5	30.7		
It is essential that the Government finance waste recycling projects	5	6	23	183	89	4.13	agree
	1.6	2.0	7.5	59.8	29.1		
[The role of government in overseeing waste recycling programs should be strengthened	4	2	25	185	90	4.16	agree
	1.3	0.7	8.2	60.5	29.4		
[Government should support recycling projects	6	4	22	177	97	4.16	agree
	2.0	1.3	7.2	57.8	31.7		
[Government should fund awareness raising programs among community groups and culture of waste recycling	7	4	23	168	104	4.17	agree
	2.3	1.3	7.5	54.9	34.0		
[It is essential that the government encourage businesses that conserve the environment through loans and grants	5	4	21	177	99	4.18	agree
	1.6	1.3	6.9	57.8	32.4		

	strongly disagree	disagree	neutral	agree	strongly agree	Mean	General trend
	Frequency						
	Percent						
[imposing taxes on the family according to the size of the household waste, encouraging the family to recycle it instead of disposing it	106	126	46	15	13	2.03	disagree
	34.6	41.2	15.0	4.9	4.2		
Workshops and training families on recycling methods lead to the success of the recycling system for waste	60	23	37	79	107	3.49	agree
	19.6	7.5	12.1	25.8	35.0		
[Rehabilitation and training of cleaners leads to improve the system of recycling of waste	8	6	20	181	91	4.11	agree
	2.6	2.0	6.5	59.2	29.7		
[Introducing modern waste collection vehicles helps in the recycling process of waste	6	7	20	180	93	4.13	agree
	2.0	2.3	6.5	58.8	30.4		
[Developing the garbage collection system in Egypt, increases the chances of successful waste recycling	4	6	24	178	94	4.15	agree
	1.3	2.0	7.8	58.2	30.7		
[Distributing garbage containers in the streets helps in the recycling of waste	3	4	24	186	89	4.16	agree
	1.0	1.3	7.8	60.8	29.1		