



10 Solid Waste Management (SWM)

10-a Introduction

With the increase in Egypt's population by more than a double and a half over the last forty years, the increase in population density in urban areas, especially in metropolitan cities, and the change in the consumption patterns in urban and rural areas alike, many pressures on the environment and public health have exacerbated, including the solid waste problem, whose harmful symptoms became clearly evident throughout the country. Existing conventional waste management methods have become incapable of meeting society needs with its different groups, in terms of maintaining a reasonable level of cleanliness, controlling health hazards and adverse environmental impact and providing a generally civilized appearance for the country. Total waste quantities collected never exceeded in the best scenarios 77% of the wastes generated. Large amounts of wastes piled up in

streets and vacant areas between buildings, in addition to the spread of informal dumpsites in a number of central areas. Open burning as a means of waste disposal has become one of the main sources of air pollution in Egypt. The government had, therefore, to take action to find a suitable solution for this aggravating problem and to implement the integrated waste management initiated in 2001.

10-b Pressures on The Municipal Solid Waste Management in Egypt

The major pressures on solid waste management in Egypt are exemplified in the increase in waste quantities generated due to the escalating population, on the one hand, and the change in consumption patterns in towns and villages alike, on the other hand, in addition to the lack of awareness and the wrong handling of solid wastes in general. Various studies con-

ducted during the last two decades in a number of Egyptian Governorates and cities point out to a significant decrease in municipal solid waste collection efficiency totally lacking in some rural areas. Consequently, large amounts of waste accumulations appeared in streets, vacant land between buildings and different areas in cities and populated areas throughout the past years. Such areas have become focal points of environmental pollution and represent significant pressures on human health as well as on the environment.

Municipal Solid Waste Estimated Quantities (%) Based on Actually Collected Wastes in 1999	
Governorate	Service efficiency
Cairo	62%
Giza	64%
Qaliubeya	50%
Gharbeya	50%
Alexandria	77%
Aswan	41%
Luxor	45%
Red Sea	52.5%
North Sinai	33.3%
Estimates of municipal solid waste collection services efficiency in some Governorates	

Wastes decay and cause the spread of bad odors, insects and rodents that cause diseases and visual pollution, particularly in the neighboring residential areas. In addition wastes are liable to self-burning and deliberate open burning which cause the emission of suspended dust as well as toxic gases and smoke.

Waste Accumulating In Some Governorates According to January 2004 Estimates

Serial	Governorates	Waste accumulations m ³
1	Cairo	2,235,000
2	Alexandria	344,830
3	Giza	432,000
4	Beheira	600,000
5	Qualiubeya	403,284
6	Sharqeya	510,000
7	Marsa Matrouh	-----
8	Port Said	359,040
9	Ismailia	350,000
10	Fayoum	192,500
11	Minia	951,000
12	Suhag	281,845
13	Luxor	107,025
14	Monoufeya	280,000
15	Kafr El Sheikh	427,000
16	Damietta	236,000
17	Gharbeya	1,350,000
18	Daqahleya	900,000
19	North Sinai	-----
20	South Sinai	712,000
21	Suez	1,168,550
22	Red Sea	11,885,000
23	Beni Suef	350,000
24	Assiut	250,000
25	Qena	458,480
26	Aswan	395,660
Total accumulations		25,169,220

Source: EEAA

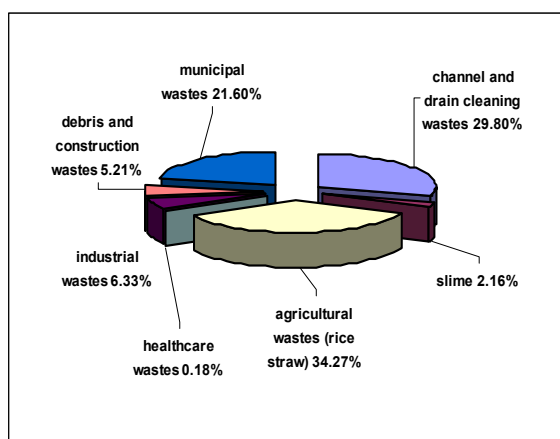
Moreover, wastes handling methods are inefficient with respect to collection, transfer, recycling or treatment. These methods are hazardous to workers, citizens and the environment in general. Final disposal of wastes is, in most cases, done in open dumpsites or in areas that are not equipped for this purpose. Attitudes of Individuals and institutions and their lack of awareness concerning the environment and health all contribute to the aggravation of the problem.

10-c Solid Wastes in Egypt

Waste Generation Rates

The total quantity of solid wastes generated in Egypt is 63 – 69 million tons/year, according to 2000 estimates, including municipal solid waste (garbage), industrial waste, agricultural waste, sludge resulting from sanitation treatment, hospital wastes, construction and demolition debris and wastes from the cleaning of canals and drains. Municipal solid wastes (garbage) include remains of households (about 60 %), shops and commercial markets, service institutions such as schools and educational institutes, utilities, hospitals, administrative buildings, streets, gardens, markets, hotels, and recreation areas, in addition to small factories and camps.

The ratio of municipal solid waste generation differs in quantity and quality from one area to another, according to the each community characteristics and conditions, to the different consumption patterns and attitudes and to the variations in the standard of living. In low income areas, solid waste generation is less than 0.3 Kg/capita /day, with high proportions of organic matter in the generated waste.



Solid Waste Percentages

In high income areas where the standard of living is relatively high, solid waste generation surges to more than 1Kg/capita/day, while organic waste decreases at the cost of recoverable material such as paper, plastic, glass, metals and the like.

Different Quantities of Waste Types According to the Report on “Solid Waste System in Egypt”, issued by EEAA in 2001

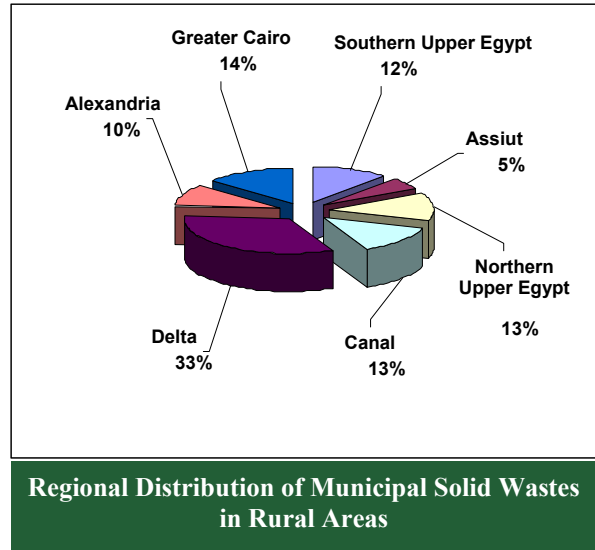
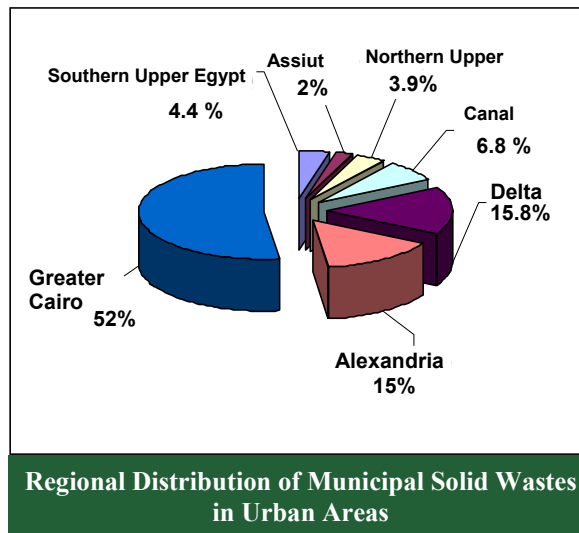
Waste type	Annual Estimated Quantity
Municipal (garbage)	14 – 15 million tons
Industrial	4 – 4.5 million tons
Agricultural	23 million tons
Sludge	1.5 – 2 million tons
Waste from cleaning of canals and drains	20 million tons
Hospitals	0.1 – 0.12 million ton
Construction and demolition debris	3 – 4 million tons

Source: Solid Waste System in Egypt, 2001–EEAA

Municipal Solid Waste Components in Egypt (%) According to 2000 Estimates	
Components	%
Organic material	50 – 60 %
Paper	10 – 25 %
Plastic	3 – 12 %
Glass	1 – 5 %
Metals	1.5 – 7 %
Rags	1.2 – 7 %
Other	11 – 30 %

Source: Solid Waste System in Egypt, 2001 -EEAA

The following figures demonstrate percentages of municipal solid wastes quantities generated in urban and rural areas in Egypt that ranged between about 30 thousand tons/day in urban areas and 10 thousand tons /day in rural and semi-urban areas in 2000:



Major Municipal Solid Waste Management Systems (SWMS) in Egypt

Major Conventional Solid Waste Systems are:

1. Governmental system: municipalities or cleaning authorities (Cairo and Giza) collect and transfer wastes from the streets, bins, public containers, and supervises public dumpsites and the operation of composting plants either directly or through the private sector.
2. Traditional “Zabalin” (garbage collectors) system: in this system, which date back to the early twentieth century, collectors collect garbage from household units and some commercial establishments, and transfer it to their communities (zabalin villages) for sorting and recycling. Although working conditions and methods used, that are of minimal costs and do not comply with the requirements of health and the environment, yet they are considered by clients as a considerably good service. Further, this system achieves the highest recovery degree possible, sometimes reach 80% of the garbage collected by za-

balin, which is estimated by 3000 tons per day in Cairo (about 30% of the total amount generated daily).

3. Local private companies: these collect and transfer garbage in a number of Egyptian cities. They represent a developed model of the garbage collectors' system, working in limited areas under the supervision and control of municipalities or cleaning authorities. The final disposal of wastes takes place either at the garbage collectors communities or in public dumpsites.

Integrated Municipal Solid Waste Management System (ISWMS)

Since 2000, the Government focused on enhancing private sector participation in the cleaning process and the integrated solid waste management in Egypt, as set forth in the National Solid Waste Management Strategy in Egypt, 2000. The new system is based on the privatization of waste management and restricting the role of government agencies to monitoring while implementing the philosophy of involving citizen in paying the costs of cleaning services through adding a small percentage to the electricity bill. Accordingly, some Governorates have contracted with international and regional companies with experience in this field to provide the facilities, modern technical methods needed in all stages of the waste management system, i.e. collection, transfer, recycling and final disposal in sanitary or controlled landfills as of 2001. Annex (3) provides a list of companies contracted with in some Egyptian Governorates.

Waste Recycling And Composting Plants

Aerobic composting in windrows with recyclables recovery is one of the appropriate

technologies for the Egyptian situation, types of wastes and their organic content. Thus it was recommended in the 1992 Environmental Action Plan. Consequently, according to a plan developed with the Ministry of State for Local Development and the Ministry of Military Production represented by the military factories, wastes and garbage recycling production lines were produced to offer organic compost that improve the soil, and also to recover the components of other waste material such as plastic, glass and paper...etc. Thus, A number of composting plants were locally developed and produced (53 units till 2003) with a total design capacity of approximately 8,520 ton/day, i.e. accommodating approximately 21% of the total municipal solid wastes generated per day.

However, the condition of recycling and composting plants is similar to that of composting factories in many other countries. They face many problems and constraints in management, operation, or marketing, due to some difficulties in the waste sorting process and the low operation efficiency and, therefore, the low quality of the produced organic compost. Annex (4) presents a list of waste recycling and composting plants.

10-d Most Significant Challenges Facing Solid Waste Management In Egypt

In the attempt to implement at-source segregation of wastes to be ready for recycling, many challenges face solid waste management, most significant of which are:

- Removing old accumulations in the various cities and villages in Egypt and their disposal in environmentally and health safe locations.

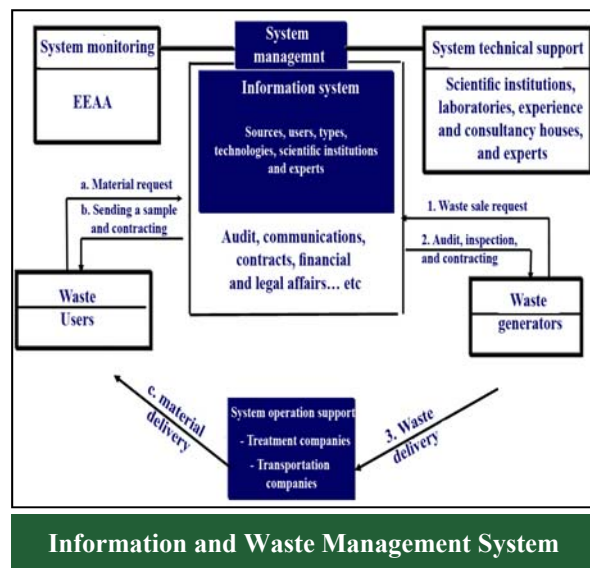
- Eliminating informal and open dump-sites.
- Eliminating the practice of burning the wastes, particularly agricultural wastes.
- Implementing an overall, integrated and sustainable methodology for solid waste management, keeping the harmony between its phases and components and ensuring smoothness of flow and implementation.
- Tightening the monitoring and control of private waste contractors to achieve waste management in the various Governorates.
Increasing public environmental awareness and overcoming wrong wastes handling practices.

10-e Efforts of Ministry of State for Environmental Affairs in Facing Solid Waste Management Challenges

The Solid Waste Management National Strategy For Egypt For The Year 2000

The Ministry of State for Environmental Affairs has completed the development of the Solid Waste Management National Strategy for Egypt in the year 2000, with the purpose of establishing an effective national system for the Integrated Solid Waste Management. The strategy aims at introducing the necessary improvements in the current national system and is based on two main elements: first, the sound removal of accumulations, remediation of waste dumpsites and providing suitable sites for the final disposal of wastes. Second, establishing the required system based on integrated measures, including at-source reduction, storage, collection, transfer, recovery and safe disposal of wastes for all rural and urban areas in Egypt.

Municipal Solid Waste System Guidelines was developed, including the for solid waste management legislative framework, the provisions of laws, legislations, crimes and penalties; special instructions for handling some stages of the municipal solid waste system; in addition to definitions related to municipal solid waste system and its components.



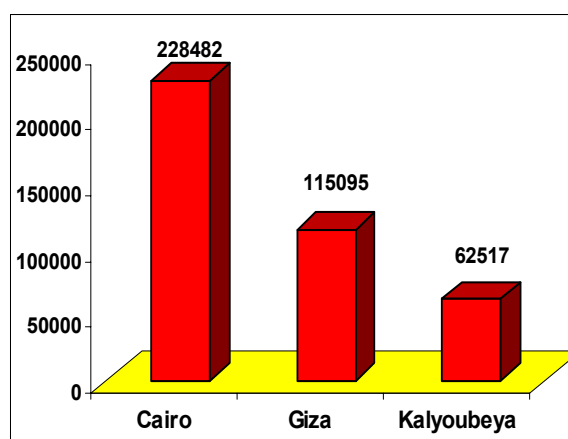
The strategy is based on the following policies:

- Public participation in paying service costs, while observing the social dimension.
- Enhancing the principle of the private and public sectors and community participation in the different SWMS stages in a cost-effective manner, paving the way for attracting investments in that field.
- Providing appropriate sites in all Governorates for the final disposal of wastes.
- Developing long-term strategies to improve the current pattern in the packaging and packing material to contribute to reducing the amount of wastes and promote the use of recyclable material.

- Increasing public awareness of the different dimensions of this issue through education, training and information.
- Encouraging recycling industries and developing markets for recycled products.
- Concerted efforts for the implementation of existing laws regulating waste handling.
- Deep rooting the decentralization concept in handling this issue with specific clearly defined roles for all relevant parties.
- Shifting the role of local administration to become the main implementer in waste handling.

For the effective implementation of public participation in incurring service costs, Governorates were granted freedom to select the suitable method for collecting collection fees or adopt any adequate system to oblige people to pay for the service, upon the Council of Ministers' approval. A number of Governorates implemented a system whereby fees were collected as a percentage of the electricity bill.

The strategy, further, comprised a solution for the composting plants problem using wastes during a period of 5 – 10 years. During this period, the main focus was directed to raising public environmental awareness and changing generated waste handling attitudes, and regarding it as valuable material that may be recycled. In this manner, sorting wastes into organic and solid material is guaranteed at source, leading to more efficient sorting at recycling and composting plants, thus, to the production of higher quality organic compost. Many efforts need the concerted work of all relevant entities, with raising the public environmental awareness at the forefront to face this problem.



Removing Accumulations in Greater Cairo

Removing Historical Accumulations

The Government, represented by the Ministry of State for Environmental Affairs, is currently exerting efforts to develop a solid wastes database. A plan was developed for the inspection of public and secondary dumpsites, to determine the status of accumulations and the budget needed for their removal. Sites in need of urgent environmental action were identified in the following Governorates: Zaqaziq dumpsite, Sharqeya Governorate; Tanta and El Mahla El Kobra dumpsites, Gharbeya; El Mansoura and Mit Ghamr dumpsites, Daqahleya; Kafr El Sheikh and Fuh dumpsites, Kafr El Sheikh; and Shebin El Kom and Menouf dumpsites, Menoufeya. In this respect, the Ministry supported Sharqeya Governorate to remove historical accumulations in Minia El Qamh city dumpsite.

The Ministry, in cooperation with Military Forces National Service Agency, has developed a plan to remove accumulations from public dumpsites in Greater Cairo and on both sides of the ring road, and to transfer them to government landfills for disposal. An amount of 406,094 m³ was removed and transferred to public landfills

under the jurisdiction of the Governorates. El Roubiki dumpsite (55,000m²) in 10th of Ramadan City was also leveled.

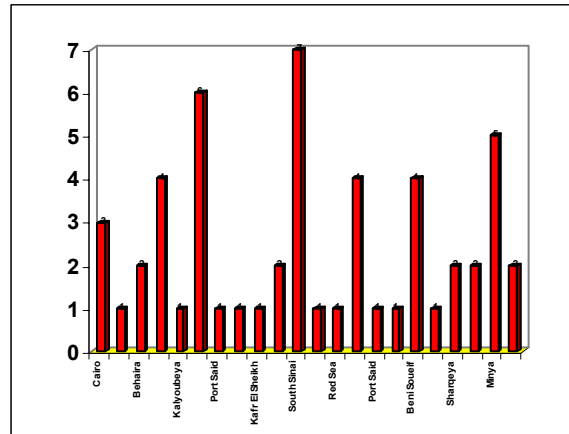
Mediation of Public Dumpsite

The Ministry of State for Environmental Affairs contributed LE 500,000 to the remediation of Zaqaziq dumpsite, Sharqeya; and LE 500,000 to the remediation of Delgamon dumpsite, Gharbeya. An accumulation of 150,000 m³ was removed from the dumpsite in Minia El Kamh city. Within the framework of the Ministry's plan to increase the efficiency of collection and transfer processes in the Governorates of Egypt, a plan was made for the Governorates of Qaliybeya, Sharqeya, Giza, Gharbeya and Daqahleya in the fiscal year 2004/2005 to provide two 20-ton hauling trucks to work as transfer station.

Through the European project "LIFE - Third Countries Programme", 53 sites were identified and selected as sanitary landfills for closed land filling of wastes country-wide, which is in line with the state plan for the complete elimination of public and secondary dumpsites in the different Governorates during the coming ten years as shown in the figure presenting the elimination of public and secondary dumpsites.

Currently, practical and technical studies are being conducted on these sites, in preparation for conducting environmental impact assessment studies in the Governorates of Cairo, Port Said and Suez.

The first sanitary landfill was established in Alexandria and started to receive wastes in 2001, management by a private company under the supervision of Alexandria Governorate. In 2003, the Governorate, in cooperation with FINNIDA (Finnish International Development Agency) has also es-



Proposed Sanitary Land filling Sites

tablished the first stage of the landfill of inorganic and nonvolatile Industrial wastes.

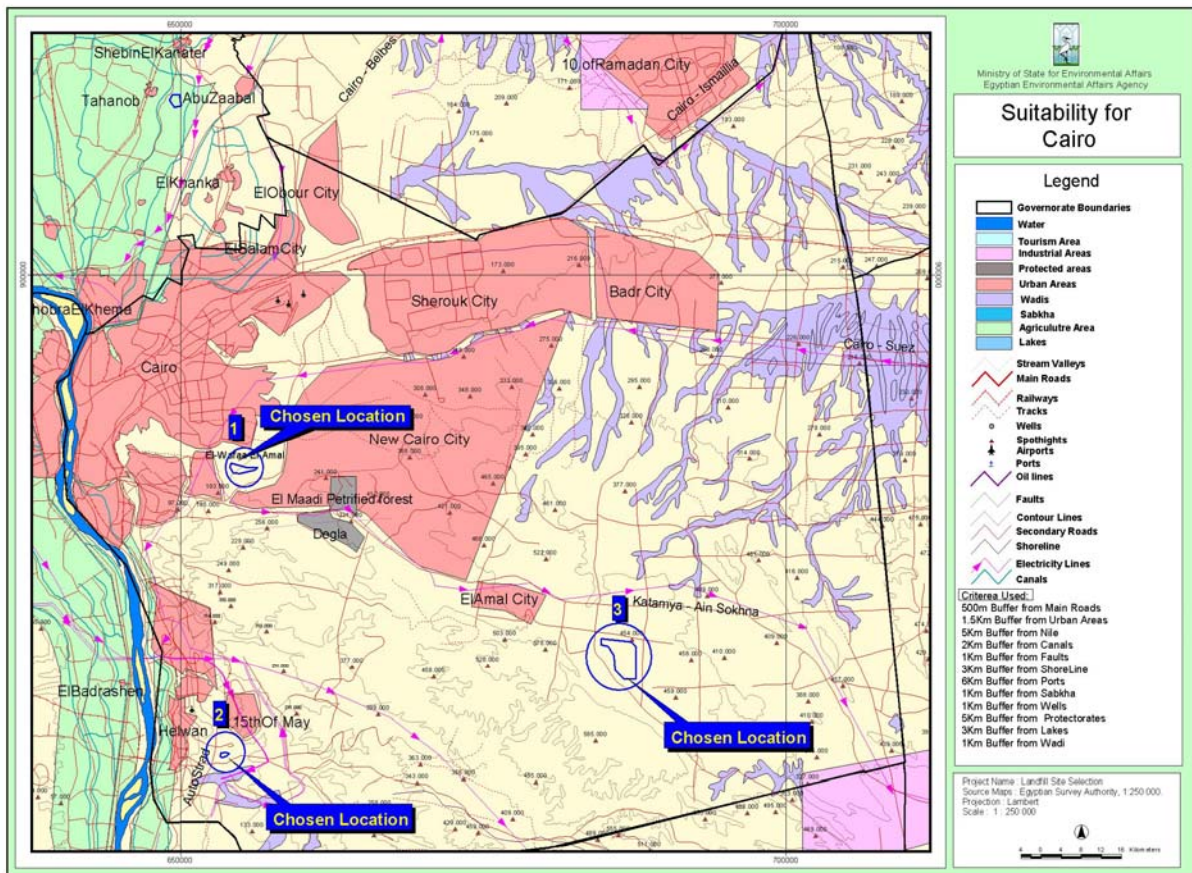
The second stage is currently underway and will include other industrial wastes that need treatment prior to final disposal.

Government Efforts in Agricultural Waste Recycling

Within the framework of MSEA concern with the disposal of municipal solid waste accumulations, the Ministry cooperated with a specialized company in conducting an experiment for the disposal of historical accumulations in Minia El Qamh city public dumpsite, which included sorting, pressing and packing of wastes.

Following the success of this experience, it is planned to use the same method to solve the problem of agricultural wastes. Wastes are pressed separately or mixed, such as rice-straw, corn waste (corn charcoal), or trees wastes to be used as animal feed and save large funds spent on nutrition.

Since 2001, the state has exerted great efforts for recycling agricultural wastes (rice straw) and their safe disposal, as shown in the table below.



Map Showing Selected Sites in Cairo that Comply With Standards

The table shows that, although farmers exceed agricultural area targeted by the Ministry of Agriculture’s plan for rice cultivation, yet recycling rates are significantly increasing.

Achievements During The Last Three Years		
Year	Quantity of Straw Produced	Quantity of Straw Recycled
2001/2002	2.48 million tons	1.5 million tons
2002/2003	2.86 million tons	1.7 million tons
2003/2004	3.00 million tons	2.00 million tons

The Ministry of State for Environmental Affairs concluded an agreement with Sichuan Institute for Research and Agricul-

tural Machinery Design in Chengdu city, People’s Republic of China, to supply 2 units for converting rice straw into gas used as fuel for farmers domestic use in houses, with the aim of implementing integrated utilization of rice straw.



Converting Rice Straw into Fuel

This is being undertaken in the framework of the efforts to introduce modern tech-

nologies to benefit from agricultural wastes and eliminate one of the reasons behind the “Black cloud” in Egypt. Among the advantages of this project are:

1. Disposal of rice straw wastes by converting it into gas for domestic uses.
2. Limiting the phenomenon of rice straw burning by farmers.
3. Introducing the technology for utilizing solid wastes, which is considered one of the major environmental and health problems facing the Egyptian society and converting it into clean energy.



10-f Future Vision

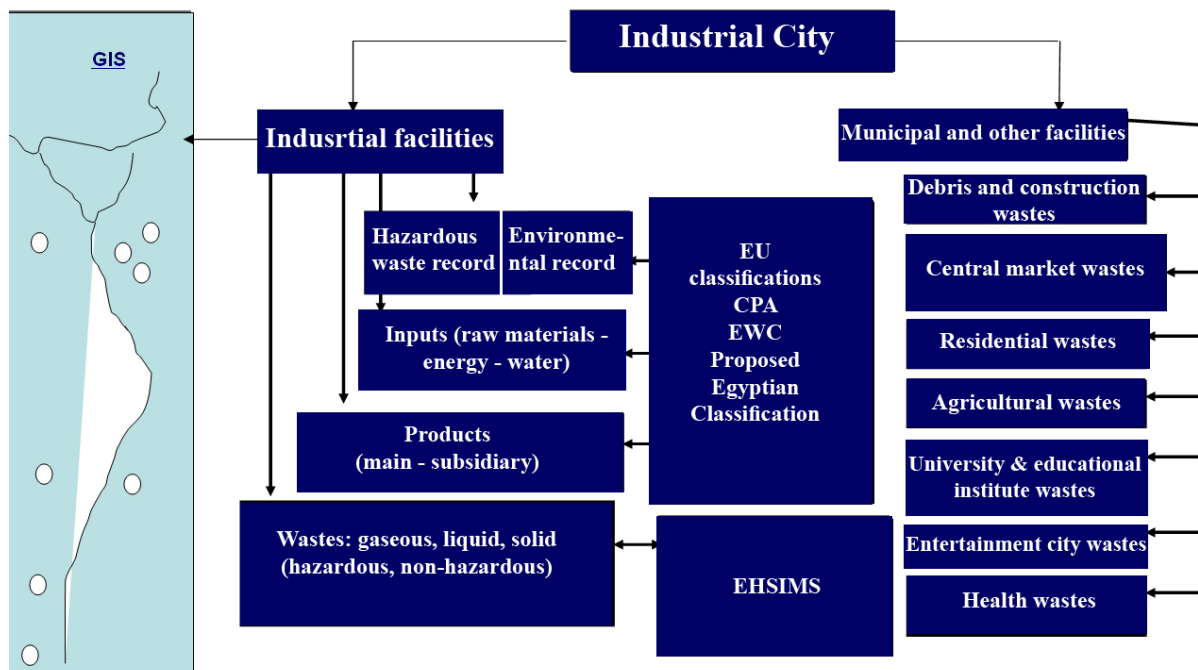
The future vision includes the establishment of an effective national system for integrated municipal solid waste management in Egypt, based on the upgrading and developing the main elements such as policies, legislation, financing, institutional organizations, human resources, technological infrastructure and enlightened public participation. Progress towards this goal has actually been implemented; the municipal solid waste management national strategy for the year 2001 provided a strategic action master plan till 2010.

Among the most significant outputs of this plan is the development of an upgraded legislative framework and new effective

governmental organizations, associated with the establishment of capacitated private sector institutions and activating non-governmental organizations to work in the field.

The plan also comprises raising public awareness of the problems and solutions of solid waste management, in addition to developing human resources and building equipped qualified centers for education, researching, development and training, to form the main base of experts and professional labors.

Further, the master plan aims at developing the processes of planning, implementation, and infrastructure (equipment), among the most important of which are: developing implementation master plans for Governorates, establishing an information base for monitoring and information, removing all historical accumulations and remediation of their sites. In addition, it targets establishing separate systems for the management of hazardous wastes related to building new and safe waste disposal sites and integrating and developing existing formal and informal systems (garbage collectors (zabalin), sorters, and recycling units).



A Simple Plan of an Integrated Industrial and Municipal Wastes Management Information System Basic Structure For An Industrial City.

10-g References

- National Strategy for the Integrated Municipal Solid Waste Management, 2000.
- Egypt's Solid Waste System Guidelines, 2001.