Ministry of Environment

National Solid Waste Management Program

PROGRAMME IMPLEMENTATION (LOT A)
QENA & QENA GOVERNORATE

Strategic Masterplan for other Waste Qena Governorate

Final version
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Strategic Masterplan for other Waste report
Qena Governorate

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List of Abbreviations

AMC	Accompanying Measures Consultant
BMZ	German Federal Ministry for Economic Cooperation and Development
CAOA	Central Agency for Organization and Administration
CD	Capacity Development
CDS	Controlled Dump Site
CDW	Construction & Demolition Waste
CPI	Consultant/Consultancy for Programme Implementation
DTL	Deputy Team Leader
EEAA	Egyptian Environmental Affairs Agency
ESIA	Environmental (and Social) Impact Assessment
EGP	Egyptian Pound
EPR	Extended Producer Responsibility
EU	European Union
ESMP	Environmental and Social Management Plan
FC	Financial Cooperation
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
IM	Immediate Measures
IRS	Informal Recycling Sector
ISWM	Integrated Solid Waste Management
IT	Information Technology
KfW	KfW Development Bank
MBT	Mechanical Biological Treatment
M&E	Monitoring & evaluation
MENA	Middle East and North Africa
MoA	Ministry of Agriculture
MoE	Ministry of Environment
MoH	Ministry of Health
MoI	Ministry of Industry
MSW	Municipal Solid Waste
NGO	Non-governmental organization
NSWMP	Egyptian National Solid Waste Management Programme
OECD	Organization of Economic Development and Cooperation
PEA	Project Executing Agency
PM	Person month

PMU	Programme Management Unit
PSC	Programme Steering Committee
RDF	Refuse Derived Fuels
SECO	Swiss State Secretariat for Economic Affairs
SWM	Solid Waste Management
SWMU	Solid Waste Management Unit
TA	Technical Assistance
TC	Technical Cooperation
TC-C	Technical Cooperation Consultancy
ToR	Terms of Reference
WMRA	Waste Management Regulatory Agency

1 INTRODUCTION

This document presents a "Strategic Master Plan" for the management of wastes in Qena Governorate that should be managed wholly or partly outside the system for the management of municipal wastes. The Strategic Master Plan sets out the main considerations and directions for the management of the identified wastes with respect to legal and institutional considerations, technology options, financial considerations and capacity development.

This document has been prepared in the context of the methodology set out in the Terms of Reference for this contract:

Using available information, estimates based on proxy indicators or literature data, the consultant shall carry out an approximate assessment of the types and amounts of the different waste streams generated in the two Governorates. The objective is rather to have an overview of the dimension of the problem than to receive 'exact' data. In a second step the consultant shall sketch possible conceptual and technical options on how to deal with the different waste streams. The objective is not to develop solutions 'ready for implementation' but to delineate possible paths on

- How (conceptual and technical approach)
- Who (institutions and responsibilities)
- With which means (legally and financially) appropriate solutions should be developed in future.

In order to support the decision-making process, the consultant shall concisely outline the required frame conditions for the sustainable implementation and operation of suitable technologies using maybe generic form-sheets for each waste type. The sheets shall in particular contain proposals and recommendations on:

- SWM policy & legal framework
- Proposed institutional set-up and responsibility split on national, Governorate and local level
- Needed administrative capacities for management and supervision
- Required institutions and capacity development
- Suitable technical and conceptual solutions
- Rough estimates of cost
- Financing of investments
- Bearer of running cost and suitable cost covering instruments

The comments issued on the draft version of present report have been taken into consideration. The Consultant's replies are compiled in Annex 1-1 of the present final version of the report

1.1 Scope

The scope of this document includes the management of the following waste streams, which together represent the major "non-municipal" wastes that are generated in Qena Governorate:

- Agricultural wastes.
- Healthcare wastes, including wastes from hospitals and clinics
- Construction and demolition wastes.
- Non-hazardous industrial wastes.
- Hazardous industrial wastes.

1.2 Methodology

The Strategic Master Plan for the management of each waste stream describes the status quo that identifies an estimate of how much waste is generated, who generates the waste, how it is managed, the health and environmental impacts of the current management practice in the Governorate, and the main barriers to improved management. It includes institutional roles and responsibilities to achieve objectives, administrative capacity needs and capacity development requirements. It is meant as preliminary guidance for financing and cost recovery; who will pay the costs and how recovery cost will be achieved. Last but not least it identifies action plans and related timing for achieving the targeted change, together with the entities that will be responsible for the identified actions.

2 AGRICULTURAL WASTE

2.1 Status Quo

Agriculture waste is generated from agricultural crops, and sugar cane is the most important crop in Qena, based on information collected from the Directorate of Agriculture in Qena Governorate, Figure 2-1 shows the total agriculture waste generated from 2011 to 2017 on Governorate level with an annual increase of 19%.

Table 2-1: Total agricultural waste generated from 2011 to 2017

Year	Maize (summer)	Maize (Nile)	Maize Yellow	Maize Yellow (Nile)	Sugar cane	Wood trees	Oranges	Citrus	Grapes	Mango	Other Fruits	Palm Dates	Total
2010	41,859	15,761	38,974	10,945	1,202,206	593	569	3,580	1,205	15,417	6,607	4,943	1,342,659
2011	49,896	18,787	46,457	13,046	1,433,030	707	678	4,267	1,436	18,377	7,876	5,892	1,600,450
2012	59,476	22,394	55,377	15,551	1,708,171	843	808	5,087	1,712	21,905	9,388	7,023	1,907,736
2013	70,895	26,694	66,009	18,537	2,036,140	1,004	964	6,063	2,041	26,111	11,190	8,372	2,274,021
2014	84,507	31,819	78,683	22,096	2,427,079	1,197	1,149	7,227	2,433	31,125	13,339	9,979	2,710,633
2015	100,733	37,928	93,790	26,339	2,893,078	1,427	1,369	8,615	2,900	37,101	15,900	11,895	3,231,075
2016	120,073	45,211	111,798	31,396	3,448,549	1,701	1,632	10,269	3,457	44,224	18,952	14,179	3,851,441
2017	143,127	53,891	133,263	37,424	4,110,671	2,028	1,946	12,241	4,120	52,715	22,591	16,901	4,590,918

The above table shows that the highest waste is generated from sugar cane (90% of the total waste generated) and maize wastes (8% of total waste generated).

Table 2-2 shows the total agricultural waste generated in 2017 in each district, and that 940,000 tons of agriculture waste are recycled through animal feed, composting, and RDF.

Table 2-2: Agriculture waste generation

District	Waste generated 2017 (ton/year)	Recycled agricultural waste (ton/year)	% of recycled agricultural waste
Abo Tesht	758,375	40,000	5.3%
Farshot	381,410	100,000	26.2%
Naga Hammadi	811,273	20,000	2.5%
Al-Waqf	217,009	200,000	92.2%
Deshna	614,215	100,000	16.3%
Qena	317,340	240,000	75.6%
Nakada	692,135	40,000	5.8%
Qous	600,495	140,000	23.3%
Qeft	204,526	60,000	29.3%
Total	4,596,778	940,000	20.4%

The above table shows that the highest amount of agricultural waste is produced in Naga Hammadi, while at the same time representing the lowest percentage of recycling (2.5%). El-Waqf has the highest recycling percentage, which represents 92.2% of the total waste generated in the city.

Figure 2-1 depicts the agricultural waste generated and recycled in 2017.

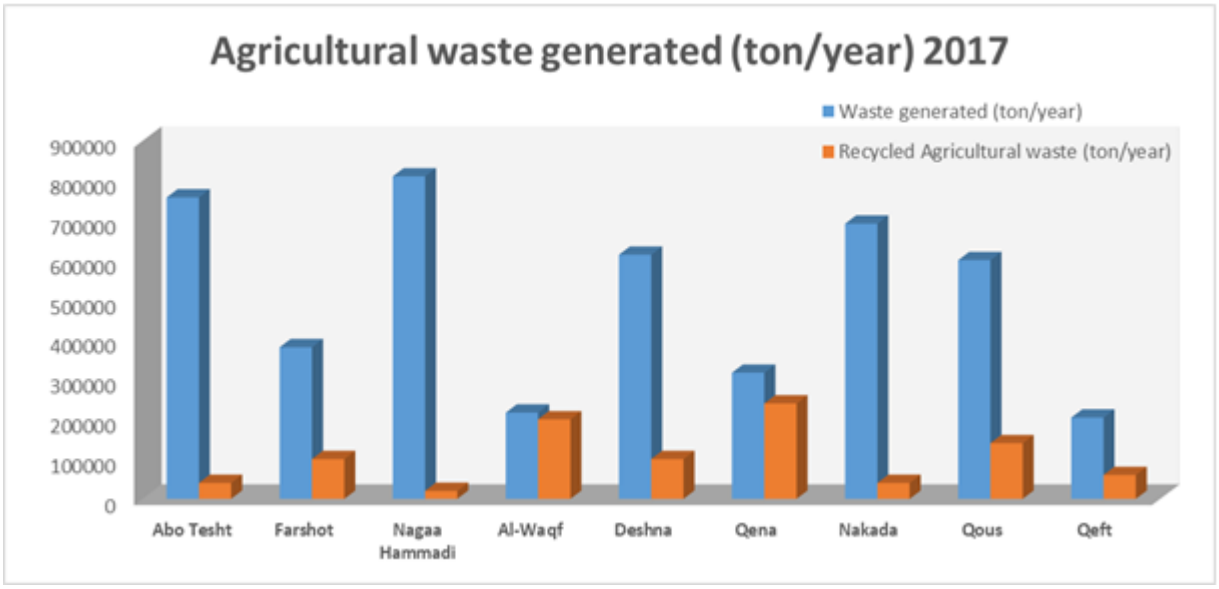

Figure 2-1: Agriculture waste generated and recycled

2.2 Health and Environment Impacts

Current management practices such as the burning of wastes have negative effects on the environment (e.g. air pollution) and impacts human health (e.g. respiratory problems linked to particulate matter).

The key issues of current waste collection systems are that they are not adapted to the collection of small quantities of materials from a large number of generators, the lack of financial incentive to collect materials, and low levels of awareness of technology options available to utilize the wastes.

2.3 Roles and Responsabilities

This chapter covers institutional roles and responsibilities to achieve objectives, administrative capacity needs and capacity development requirements. Table 2-3 shows the roles and responsibilities of the related entities.

Table 2-3: Roles and responsibilities

Entity	Roles and responsibilities	Administrative capacity needs	Capacity development priorities
Ministry of Agriculture (MoA)	Manage and facilitate productive potential of agricultural sector	Develop and maintain database on agricultural waste. Provide data/ information on agricultural wastes and investment opportunities	Organizational and financial frameworks for agricultural waste utilization
Waste Management Regulatory Agency (WMRA)	Develop and implement policy frameworks, and set up a national strategy to promote recovery of agricultural wastes	Propose policy options and strategies to promote organizational frameworks and technology applications to collect/utilize agricultural wastes	Propose policy mechanisms to promote greater use of agricultural wastes
Egyptian Environmental Affairs Agency (EEAA)	Develop policy objectives through effective implementation strategies, including monitoring and enforcement.	Develop operational strategies to maximize utilization of agricultural wastes.	Develop a compliance tool-kit that targets achievement of policy objectives through non-regulatory and regulatory actions
Governorate (SWMU)	Develop and implement a legal framework to address local priorities and opportunities. Encourage the private sector to process agriculture waste.	Take control over waste collection and disposal systems to prevent disposal of agricultural wastes.	Organizational capacity to supervise proper management of agricultural waste for materials recovery and energy generation. Promote other actions to link agricultural wastes to existing organic materials processing facilities
Private Sector	Invest in and/or operate systems to collect and/or process agricultural wastes	Available and acceptable financing opportunities Reliable and predictable regulatory and contract frameworks	Case studies/examples of effective and appropriate agricultural waste projects

2.4 Suggested Solutions

Objective

Promote recovery of wastes for composting, energy generation and manufacturing of products.

Key policy actions to achieve objectives

- Develop financial frameworks to support collection of wastes and link to appropriate infrastructure.
- Establish standards to achieve collection of high quality, uncontaminated agricultural waste materials.

2.5 Financing and Cost Recovery

Preliminary (estimated) capital cost to improve agricultural waste management in Qena Governorate (approx. 20.5 million EGP).

Cost recovery

Who pays?

- Waste Producer
- End-user pays market price for products or energy developed from waste.

Cost recovery mechanism

Payment based on:

1. Quantity (weight)/ quality of material delivered to collection system or processor;
2. Value of product or energy developed from the waste

2.6 Action Plan

No	Action	Responsibility	Qena Governorate																	
			2018				2019				2020				2021				2022			
1	**Review/enhance legal framework**	**WMRA**																				
2	**Promote frameworks to utilize agricultural wastes**	**EEAA, MoA, SWMU**																				
3	**Develop database on agricultural waste**	**MoA**																				
4	**Provide data /information on opportunities to use waste**	**MoA, WMRA**																				
5	**Develop case examples of investment in waste use**	**MoA**																				
6	**Ensure agricultural waste does not enter disposal**	**SWMU, EEAA**																				
7	**Capacity building**	**MoA, MWRA**																				

There is a wide variety of potential applications of agricultural wastes. The most common include the application of wastes directly to the land, composting, or used as energy source. In some cases, agricultural wastes may be used as animal feed. Potential applications of agricultural wastes are described below.

Direct Application to the Land

Agricultural wastes (e.g. fruit and vegetable wastes) that are high in moisture and low in fibre may be applied directly to the land. These types of wastes break down rapidly and return nutrients directly to the soil. Best results may be obtained when these wastes are ploughed into the soil and not left on the surface. Simple processing of wastes (e.g. chopping or cutting the wastes into pieces) speeds up the breakdown of the wastes and promotes a rapid incorporation of the wastes into the soil.

Composting

Composting is an aerobic process for managing organic wastes, including agricultural wastes. Agricultural wastes are arranged into a pile. The waste breaks down over time as a result of natural decomposition processes. The speed of decomposition is optimized through careful management of moisture and oxygen levels within the pile, and may be further increased if manure is mixed into the agricultural wastes.

Composting of agricultural wastes is undertaken as a commercial activity in Egypt. However, the availability of agricultural wastes to commercial (or other) composting operations is limited by poor collection systems. Compost manufactured from agricultural waste brings extensive benefits to agricultural soils, including the addition of structure, the retention of water, and the release of moisture for plants. Compost has particular value with regard to reclaiming desert soils for agriculture.

Energy

Agricultural wastes may be used to generate energy. There are two main options:

1. A wide variety of agricultural wastes, including corn (maize), can be managed through anaerobic processing. Anaerobic processing may also be used to manage manure. Some agricultural wastes require more time than others to process. Methane is the output of anaerobic treatment; a high calorific-value gas that can be recovered for energy use either directly (e.g. burning for heat) or indirectly (e.g. to drive a generator to create electricity).

   Some anaerobic processes can be undertaken at a scale as small as an individual household, or at a commercial scale. Capital costs for most processes are high; operating costs are low but an effective operation depends on careful control of feedstock.

2. Refuse-derived fuel (RDF). Agricultural wastes may be directly burned for their fuel value. Wastes require collection and (typically) mechanical processing so that they have a form that minimizes transportation costs, and can be readily used at a thermal energy facility. Processing may require simply chopping the wastes to an acceptable dimension, or may require additional steps (e.g. pelletizing). In principle, all dry agricultural wastes may be considered for RDF, but the most attractive candidates are wastes that are dry and have a high energy value.

Animal Feed

Agricultural wastes may potentially be used as animal feed. Different agricultural wastes have different possibilities in this regard, depending on:

- **Nutritional value**. Different agricultural wastes vary widely in their nutritional value, and wastes that have low nutritional value are not attractive as a food source for animals.
- **Digestibility**. Fibrous agricultural wastes (e.g. corn) may not be easily digested by animals, and this will reduce their ability to metabolize the nutrients that are contained in the waste.

In some cases, a simple treatment can bring about chemical changes in the waste material that can improve the nutritional value.

3 HEALTH CARE WASTE

3.1 Status Quo

The total number of healthcare facilities (Governmental, educational, clinics, and other private facilities) is 4,081, and the total health care waste generated in Qena Governorate is about 2,043 kg/day; 336 kg/day from hospitals (government and private); 1,440 kg/day from all health care facilities without beds (government and private); and 267 kg/day from all other[1] facilities.

3.1.1 Health care facilities in Qena

A. Hospitals (Bed Capacity)

There are a total of 40 governmental hospitals in Qena with a total of 1,238 beds. Table 3-1 shows the distribution of governmental hospitals based on beds capacity[2].

B. Other Categories of Hospitals (Bed Capacity)

There are a total of 61 other hospitals in Qena, with a total 1,618 beds. Table 3-2 shows the distribution of other hospitals based on beds capacity[3].

C. Healthcare Facilities (without beds)

There are a total or 620 healthcare facilities without beds in Qena. Table 3-3 shows the distribution of healthcare facilities[4].

D. Other Healthcare Facilities (without beds)

There are a total of 3,360 other healthcare facilities without beds in Qena. Table 3-4 shows the distribution of other healthcare facilities[5].

[1] Integrated Health Care Waste Management Plan in Egypt 2014-2019
[2] Integrated Health Care Waste Management Plan in Egypt 2014-2019
[3] Integrated Health Care Waste Management Plan in Egypt 2014-2019
[4] Integrated Health Care Waste Management Plan in Egypt 2014-2019
[5] Integrated Health Care Waste Management Plan in Egypt 2014-2019

Table 3-1: Governmental hospitals

Qena	General Hospitals			Specialty Hospitals and branches												All MOHP hospitals and branches
	Public hosp.	Central hosp. A	Central hosp. B	Ophthalmic/ Eyes' hosp. and branches	Maternity and child hosp.	Brain and neurosurgery Hosp.	Psychiatry hosp. and branches	Geriatric hosp.	Special. Hosp.	Skin and leprosy hosp. and branches	Chest hosp.	Tumours centres	Kidney hosp.	Fever hosp. and branches	Tropical branches	
No.	2	3	4	10	-	-	1	-	-	9	1	-	-	8	9	**47**
Bed	387	335	170	24	-	-	-	-	-	-	108	-	-	214	-	**1,238**

Table 3-2: Other hospitals

Qena	Specialized Medical Centres Amana hospitals				Health Insurance Org. hospitals	Educational hospitals and institutes	Curative Establishment hospitals	All MOHP-related hospitals	All MOHP hospitals and branches	University hospitals	Public Sector's hospitals	Police and prisons' hospitals	Private hospitals	Other hospitals	All hospitals
	Uni- or Multi-Specialty Centres	Tumours' Centres	One-Day surgery	Total											
No.	-	-	-	**-**	-	-	-	-	47	1	1	1	11		**61**
Bed	-	-	-	**-**	-	-	-	-	1,238	440	102	40	238		**1,618**

Table 3-3: Healthcare facilities without beds

Qena	Primary healthcare Services								School health		Family Planning			Environmental Health					Rabies treatment centres	Physiotherapy centre	TOTAL MOHP HCFs
	Family health units	Family health Centres	Rural health units	Rural health centres	Health offices	District and comprehensive clinic	Urban health centres	Mother and child care	General health	Dental health	Fixed urban	Fixed rural	Mobile clinics	Env. Health units	Pre-marital investigation	Commission committees	Food handler examination	Drug analysis labs			
	136	-	83	3	9	-	-	-	81	16	40	191	15	9	27	1	9	-	-	-	**620**

Table 3-4: Other Healthcare facilities without beds

Qena	MOHP- Table 2A	Private clinics (registered)	Dental clinics (registered)	Laboratories	Pharmacies (2)	Dialysis machines (Registered)	All Healthcare Facilities
	620	789	153	111	1,538	149	3,360

3.1.2 Estimated Quantities of Healthcare Waste Generated

Table 3-5 shows an estimation of total waste generated in hospitals and health care facilities[6].

Table 3-5: Total waste generated.

Qena	Hospitals and their branches						Healthcare Facilities- HCFs other than hospitals			All Hospitals and HCFs	Contingency- 15%	Estimated HCW quantity- Kg/day
	MoH	MoH-related	University	Private	Public Sector, and others	All hospitals	MoH and related HCFs	Private HCFs	All HCFs			
	139.97		-	24.22	19.53	336.13	468.4	971.7	1,440.1	1,776.23	266.44	2,042.67

[6] Integrated Health Care Waste Management Plan in Egypt 2014-2019

Based on data collected from the Directorate of Health in Qena, the total healthcare waste generated is 1,921 kg/day. Table 3-6 shows the total healthcare waste generated on a daily basis in the different cities.

Table 3-6: Total health care waste generated

City	Total waste generated 2017 kg/day	%
Abo Tesht	110.7	5.76%
Farshot	126	6.56%
Naga Hammadi	257.7	13.41%
Al-Waqf	65.2	3.39%
Deshna	74.3	3.87%
Qena	846.6	44.07%
Nakada	100.8	5.25%
Qous	223.2	11.62%
Qeft	116.5	6.06%
Total	**1,921**	**100%**

The above table shows that the highest health care waste is generated in Qena, which also has the highest number of health care facilities (Government and private), while the lowest amount of waste is generated in Al-Waqf and Deshna.

3.1.3 Healthcare waste treatment

The main treatment technology used in Qena is incineration and steam sterilization. Of the 7 incinerators only 6 are working with low efficiency, while sterilization is currently not being applied. The total daily waste treatment is 730 kg/day which represent 36% of the generated waste and the rest is disposed in open dumpsites. Table 3-7 shows the total number and capacity of hazardous healthcare treatment technologies available in Qena[7].

Table 3-7: Number and capacity of hazardous healthcare treatment facilities

Qena	Incineration facilities				Steam Sterilization (with shredding)				Total
	MOH		Non-MoH		MoH		Non-MoH		
	work	not	work	not	work	not	work	not	
No	3	3	1	-	-	1	-	-	**7**
Capacity	300	300	100	-	-	200 **L/h**	-	-	**730**

[7] Integrated Health Care Waste Management Plan in Egypt 2014-2019

3.1.4 Healthcare waste transportation

The total number of vehicles transporting hazardous healthcare waste in Qena is 7, which is insufficient to transport the amount of waste generated. Table 3-8 shows the number of vehicles.

Table 3-8: Number of vehicles

Qena	MoH – various brands					Total
	Chevrolet	Aveco	Fantom	Esozo	Toyota	
	3	3	-	-	1	**7**

3.2 Health and environmental impacts

Health, environmental and other problems caused by inadequate management practices risk the spreading of disease either directly or by attracting of vermin, rodents and other disease-carrying organisms.

Main issues are inadequate source segregation, collection, treatment, and disposal infrastructure, and the absence of separation of hazardous from non-hazardous health care waste (all health care waste is therefore considered hazardous).

3.3 Roles and Responsibilities

This chapter covers institutional roles and responsibilities to achieve objectives, administrative capacity needs and capacity development requirements. Table 3-9 shows the roles and responsibilities for the related entities.

Table 3-9: Roles and responsibilities

Entity	Roles and responsibilities	Administrative capacity needs	Capacity development priorities
Ministry of Health (MoH)	**At Central Level** Include health care waste management in sector budgets. Ensure health care facilities implement/ operate proper health care waste management systems.	**At Central Level** Capacity to create, coordinate and monitor health care waste management systems **At Local Level** Capacity to plan health-care waste management systems. Capacity to tender, select and manage health care waste management contractors	**At Central Level** Technical planning and implementation of health care waste management. **At Local Level** Administrative supervision of health-care waste management reporting, trouble-shooting and maintenance of proper health care waste management systems.
Waste Management Regulatory Agency (WMRA)	Establish regulatory standards for health care waste management with the cooperation with MoH, and activate the health care manual	Coordinate with the Ministry of Health and any other project working in the same area.	Policy and implementation alternatives for health care waste management

	issued in 2015		
Egyptian Environmental Affairs Agency (EEAA)	Monitor and enforce legislation.	Management and reporting of monitoring records. Procedural capacity for monitoring and enforcement.	Technical capacity to monitor health care waste treatment facilities and report data and findings Procedures for monitoring and enforcement
Governorate (SWMU)	Encourage the private sector to process health care waste.	Control over waste collection and disposal systems to prevent disposal of health care wastes.	Organizational capacity to supervise proper management of health care waste.
Private Sector	Invest in and/or operate collection and/or treatment systems.	Documentation of proper health care waste management.	Operational capacity to implement health care waste management system/technology

3.4 Suggested Solutions

Objective

- Separation of hazardous from non-hazardous health care wastes.
- Phased implementation of effective storage, collection and disposal for all hazardous health care waste, beginning with hospital wastes and including definition, and separation of hazardous wastes.

Key policy actions to achieve objectives

Specification of standards for health-care waste management, supported by planned sector investment, operational budgeting, and effective enforcement.

3.5 Financing and Cost Recovery

The higher Committee for Health and Environment affiliated to the Ministry of Health has identified the value of treatment and disposal of one kg of health care waste at about 5 EGP. This means that the preliminary (estimated) cost to improve health care waste management in Qena Governorate is approx. 5 million EGP annually if managed by the private sector. If managed through the Directorate of Health the preliminary (estimated) capital cost about lies at around 10.3 million EGP.

Cost recovery

Who pays?

Health care facilities that produce the waste

Cost recovery mechanism

Health-care budgets

3.6 Action Plan

No	Action	Responsibility	Qena Governorate																			
			2018				2019				2020				2021				2022			
1	**Establish sector waste management standards**	**MoH, WMRA**																				
2	**Strategic plan for health care waste management system**	**MoH**																				
3	**Establish administrative/ reporting framework**	**WMRA, EEAA**																				
4	**Invest in treatment technology**	**MoH, WMRA**																				
5	**Monitor/enforce legal requirements**	**EEAA**																				
6	**Capacity building**	**MoH, MWRA**																				

Source segregation in health care facilities is an important first step towards proper management of healthcare waste (HCW).

Approximately 70% of health care waste is general non-hazardous waste, and can be managed in the same way as household waste provided it is separated from - and managed separately from - hazardous HCW.

The most important of hazardous wastes in terms of their quantity and their potential impact on public health and the environment are infectious and pathological wastes, and sharps. Based on technology availability today, the technologies that have the greatest potential for treating these wastes in the region are considered to be:

- Double chamber incinerators.
- Autoclave treatment

The central function of these technologies is to be able to achieve a high level of sterilization of infectious waste, including sharps, and pathological waste. However, the capital costs associated with these technologies and their operating costs vary widely, as does the reliability of their performance. Traditionally, incineration of hazardous HCW has been undertaken, but this is now being phased out by the Government of Egypt.

Advanced autoclave technology is emerging as a preferred alternative to the incineration of hazardous HCW. The technology brings the advantages of reliably high performance, moderate capital and operating cost and no emissions to cause concern in local communities.

The organization of treating hazardous HCW has an important impact on costs. Treatment facilities that are dimensioned to serve several hospitals can be located at either a single hospital that serves a regional waste treatment function, or at a central location in a district. This approach reduces costs as compared to the transportation of all wastes to a treatment centre that is located at a waste disposal site.

4 CONSTRUCTION AND DEMOLITION WASTE

4.1 Status Quo

It is very difficult to determine or estimate construction and demolition waste at a National level; all numbers and figures mentioned in published reports are estimated. These reports as well as data collected from cities and villages, have been used to estimate the amounts of C&D in all district of Qena Governorate. Based on these numbers, the total waste generated is about 751 tons/day[8]. Table 4-1 shows the C&D waste generated per day.

Table 4-1: Total C&D waste generation

City	MSW generated 2017 (ton/day)	% of total waste generated 2017
Naga Hammadi	186	25%
Qena	183	24%
Qous	98	13%
Deshna	87	11.6%
Abu Tesht	83	11%
Qeft	37	5%
Farshot	37	5%
Nakada	37	5%
El-Waqf	3	0.4%
Total	**751**	**100%**

The above table shows that 49 % of the total C&D waste is generated in 2 cities (Naga Hamady and Qena), and 35% in 3 cities (Qous, Deshna, and Abu Tesht), while 18 % of the waste is generated in all other cities.

These figures are relatively high compared with other urban and rural cities in other Governorates.

4.2 Health and Environmental Impacts

Health, environmental, and other problems caused by unsightliness is inconsistent with tourism development values.

Main barriers to improved management of the waste are a weak regulatory and enforcement framework, absence of facilities/infrastructure for productive management, and absence of incentives for productive management.

4.3 Roles and Responsibilities

This chapter covers institutional roles and responsibilities to achieve objective, administrative capacity needs and capacity development requirement. Table 4-2 shows the roles and responsibilities for the related entities.

[8] Solid Waste Management Unit in Qena.

Table 4-2: Roles and responsibilities

Entity	Roles and responsibilities	Administrative capacity needs	Capacity development priorities
Waste Management Regulatory Agency (WMRA)	Establish regulatory standards for construction/demolition waste to be managed at licensed/permitted locations; require permits for development to include requirements for waste management; require developers to implement the waste management requirements of the permit.	Coordination with Ministry of Local Development, Governorate entities and other public entities with development/construction responsibilities.	Policy options for management of construction/demolition waste. Policy coordination with other public entities.
Egyptian Environ-mental Affairs Agency (EEAA)	Monitor and enforce legislation.	Supervision of monitoring/ enforcement activities, reporting monitoring and enforcement actions, and implementation of enforcement procedures.	Monitoring procedures for construction/demolition waste, preparation of construction/demolition waste monitoring reports, establishing procedures for enforcing construction/ demolition waste management.
Governorate (SWMU)	Issuance of development permits to include provisions for management of construction/demolition waste, and provision of sites in each district for management of construction/demolition. Encourage the private sector to process construction/ demolition waste.	Control over waste collection and disposal systems to prevent disposal of construction/ demolition waste. Procedures for issuance of development permits to include provision for management of construction/demolition waste.	Provision of templates that integrate construction/ demolition waste management with development permits. Opportunities for processing/reutilization of construction/demolition waste.
Private Sector	Invest in and/or operate collection and/or treatment systems.	Proper supervision of contractors to ensure that construction/demolition waste management requirements are implemented. Utilization of processed construction/demolition waste in development projects.	Operational capacity to implement health care waste management system/technology

4.4 Suggested Solutions

Objective

Collect wastes to maximize productive uses and create employment.

Key policy actions to achieve objectives

- Establish construction and demolition waste facilities,
- Require construction and demolition wastes to be delivered to a processing facility,
- Link waste management obligations of the developer to the permit that allows development
- Enforce legal obligations.

4.5 Financing and Cost Recovery

Preliminary (estimated) capital cost about 20.5 million EGP.

Cost recovery

Who pays?

Waste Producer

Cost recovery mechanism

Waste management costs included in cost of development projects.

4.6 Action Plan

No	Action	Responsibility	Qena Governorate																			
			2018				2019				2020				2021				2022			
1	**Specify legal requirements**	**WMRA**																				
2	**Develop administrative procedures**	**WMRA, EEAA, SWMU**																				
3	**Identify processing sites/ procure equipment**	**SWMU**																				
4	**Develop monitoring/ enforcement templates**	**EEAA, SWMU**																				
5	**Monitor/enforce legal requirements**	**EEAA**																				
6	**Capacity building**	**MWRA, SWMU**																				

Construction and demolition waste is widely used in the Governorate as a filler material to raise the level of ground for construction projects. These wastes are well-suited for this purpose:

- They are inert (except for wood). Therefore, they do not degrade, or create gas or leachate.
- They can be compacted to suit the needs of construction projects.
- They form a stable base for construction.

Other applications of construction and demolition waste include:

- Plastics may be recycled or used as RDF.
- Construction and demolition waste may be crushed and used as landfill cover.
- Concrete and brick can be crushed to meet general or specific specifications for use as aggregate or in concrete; in some countries, the use of aggregate manufactured from concrete and brick is widely used in road construction.
- Wood can be chipped and used as a bulking agent to facilitate composting of household (or other) organic materials, or may be used as a refuse-derived-fuel.
- Glass can be crushed and used to promote drainage, or used in asphalt (where it has been shown to increase the life of asphalt) or paint (where it increases reflectivity and improves visibility of e.g. road markings). Construction glass has different qualities as compared to glass packaging and may not be recyclable through those infrastructures.

Successful story:

The Arab Contractors established a treatment facility for recovering construction and demolition waste in 6 of October city with a capacity of 100 tons/ day, and with a capital investment reaching up to 30 million EGP. The biggest obstacle facing the factory is marketing and a low demand for their products. A policy action is needed from the municipality to commit companies in buying a specific percentage of these product, thus encouraging the private sector to invest.

5 NON-HAZARDOUS INDUSTRIAL WASTES

5.1 Status Quo

There are three main industrial sectors in Qena Governorate (Cement, Sugar, and Aluminium), the total non-hazardous waste generated by different sectors is about 1.5 million tons/ year[9]. Table 5-1 shows the total industrial waste generated in 2017.

Table 5-1: Non-hazardous waste generation

Source	MSW generated 2017 (ton/year)	Industrial waste generated 2017 (ton/year)
Cement plant	54	125,120.32
Sugar factories	2,185	132,1307.3
Aluminium company	2,500	-
Total	**4,739**	**1,446,428**

The above table shows that industrial waste represents 97 % of total non-hazardous waste, and only 3% represents municipal solid waste. The majority of industrial waste is generated by the sugar industry.

5.2 Health and Environmental Impacts

The disposal of wastes in dumpsites or into the environment contributes to negative environmental effects (e.g. impacts on air quality from burning waste), and related public health effects (e.g. respiratory problems linked to particulate matter).

Main barriers to improved management of the waste is the cost of transportation to disposal sites, and a lack of monitoring and enforcement of regulatory requirements.

5.3 Roles and Responsabilities

This chapter covers institutional roles and responsibilities to achieve objective, administrative capacity needs and capacity development requirements. Table 5-2 shows the roles and responsibilities for the related entities.

[9] Solid Waste Management Unit in Qena

Table 5-2: Roles and responsibilities

Entity	Roles and responsibilities	Administrative capacity needs	Capacity development priorities
Waste Management Regulatory Agency (WMRA)	Establish regulatory standards for industrial waste to be managed at licensed/permitted facilities. Strengthen legal framework and national strategy to require tracking of industrial non-hazardous wastes.	Supervision of waste tracking system in cooperation with the Ministry of Industry.	Options and experience in legal frameworks for tracking non-hazardous industrial wastes.
Egyptian Environmental Affairs Agency (EEAA)	Monitor and enforce legislation. Follow up on the EIA approval issued for transportation and disposal entities.	Supervision of monitoring/ enforcement activities, reporting monitoring and enforcement actions, and implementation of enforcement procedures.	Monitoring procedures for Industrial waste and tracking system.
Governorate (SWMU)	Encourage the private sector to process non-hazardous industrial waste. Fee-based acceptance of non-hazardous industrial wastes at publicly disposal sites.	Financial and planning capacity to integrate industrial non-hazardous wastes into a waste management system.	Creation and implementation of planning and financial frameworks that accommodate private sector wastes and fees.
Private Sector	Contract with the industry to transport non-hazardous wastes. Comply with tracking requirements. Get EIA approval for transportation.	Capability to manage a waste services contract and to participate in a waste tracking system.	Contract management and implementation of a waste management tracking system.

5.4 Suggested Solutions

Objective

- Maximize recovery of wastes
- Ensure proper management of residual wastes

Key policy actions to achieve objectives

- Establish legal responsibility of generator to ensure proper management of wastes
- Introduce tracking systems to ensure disposal of wastes at licensed facilities (and not at an unregulated, intermediate location).

5.5 Financing and Cost Recovery

Preliminary (estimated) capital cost of about 10.3 million EGP.

Cost recovery

Who pays?

Waste Producer

Cost recovery mechanism

- Payment to service provider against invoice for service
- Fees paid to owner of treatment/disposal facilities based on quantity of waste treated/disposed. Waste management costs included in cost of development projects.

5.6 Action Plan

No	Action	Responsibility	Qena Governorate																			
			2018				2019				2020				2021				2022			
1	**Establish regulatory standards, and amend legal framework to require waste tracking**	**WMRA**																				
2	**Design waste tracking system tools**	**WMRA, EEAA, SWMU**																				
3	**Implement waste tracking system**	**SWMU**																				
4	**Monitor waste tracking system**	**EEAA, SWMU**																				
5	**Capacity building**	**MWRA, SWMU**																				

As far as possible, non-hazardous industrial wastes should be recovered in order to capture material and energy of the waste. Traditionally, the following options may be considered:

- Recycling
- Composting
- Energy recovery

Uses for various types of non-hazardous industrial wastes have been identified in recent years, and relevant aspects are addressed below, together with the disposal of residual materials.

Traditional Options for Recovery of Non-Hazardous Industrial Wastes

Recycling

Many waste materials that are generated by industry are similar to those that are generated by households, and can be recycled in similar ways. Cardboard, paper, metals, glass and plastics, for example, can all be recycled through the same infrastructure that is used to recycle these materials from households. Industries may however generate larger quantities of these materials. Therefore, these materials should be separated at source by the industry.

Composting

Organic materials that are generated by the industry may be suitable for composting. Sugar processing industries – in particular – generate large quantities of organic material that is suitable for composting. These materials should be separated at source.

Energy Recovery

Combustible materials may be recovered for their energy value. This may be an attractive option for combustible materials that do not have sufficient value in the recycling market. The most common opportunities for the recovery of materials for energy value include low value plastics (e.g. film plastics) and low-grade paper/cardboard.

Recent Relevant Initiatives

Recent relevant initiatives for the reutilization of specific non-hazardous industrial wastes include the following:

Sugarcane Waste

The waste from sugarcane processing may be palletized and sold as animal feed. However, a recent innovation exploits the cellular structure of sugarcane (including sugarcane waste) to create a cellulosic product that is characterized by both high strength and high viscosity.

The product is used in the manufacture of items as varied as paint, cosmetics, composite materials in the aerospace sector, and concrete.

Disposal of Non-Hazardous Industrial Wastes

Non-hazardous industrial wastes may be disposed of in the same disposal facilities as municipal wastes.

6 HAZARDOUS INDUSTRIAL WASTES

6.1 Status Quo

There are three main industrial sectors in Qena Governorate (Cement, Sugar, and Aluminium); the total hazardous waste generated by these different sectors is about 410 tons/year[10]. Table 6-1 shows the total hazardous industrial waste generated in 2017.

Table 6-1: Hazardous waste generation in 2017

Source	Hazardous waste generated 2017 (ton/year)
Cement plant	-
Sugar factories	-
Aluminium company	410
Total	**410**

The above table shows that all hazardous wastes are generated by the Aluminium Industry.

6.2 Health and Environmental Impacts

Health, environmental, and other problems may arise from the contamination of land where hazardous wastes are deposited; there is a high potential for widespread contamination of surface water and groundwater. There is also a high potential for severe public health impacts when people are in contact with hazardous wastes.

Main barriers to improved management of hazardous waste are an inadequate legal framework, inadequate accountability of stakeholders, insufficiently developed institutional framework, lack of monitorable/enforceable controls, absence of sector strategy, insufficient treatment facilities, lack of capacity.

6.3 Roles and Responsibilities

This chapter covers institutional roles and responsibilities to achieve objective, administrative capacity needs and capacity development requirements. Table 6-2 shows the roles and responsibilities for the related entities.

[10] Solid Waste Management Unit in Qena

Table 6-2: Roles and responsibilities

Entity	Roles and responsibilities	Administrative capacity needs	Capacity development priorities
Waste Management Regulatory Agency (WMRA)	Develop/adopt an enhanced legal framework.	Application of the waste hierarchy, sector strategy development.	Sector policy and legal options. Lessons learned elsewhere.
Egyptian Environmental Affairs Agency (EEAA)	Monitor and enforce legislation. Follow up on the EIA approval issued for the transportation and disposal entities.	Hazardous waste monitoring and tracking. Sector education and enforcement strategies.	Hazardous waste management facility planning. Design/implementation of monitoring/tracking systems. Education and enforcement.
Governorate (SWMU)	Encourage the private sector to process and treat hazardous industrial waste. Support the implementation of hazardous waste collection/storage systems.	Monitoring local priorities for hazardous waste management. Hazardous waste emergency response plan.	Hazardous waste monitoring. Emergency plan preparation and implementation readiness.
Private Sector	**Generators**: Ensure proper management of hazardous wastes. **Facility Operators**: Invest in/operate treatment facilities.	Reporting to regulatory entities. Financial management to ensure environmental security of operations.	Certification of proper operation of facilities. Monitoring and reporting of operations.

6.4 Suggested Solutions

Objective

Recovery of material and energy value where feasible; environmentally safe disposal of remaining materials; ensure proper management of residual wastes.

Key policy actions to achieve objectives

Enhanced legal framework that assigns enforceable responsibilities to stakeholders.

6.5 Financing and Cost Recovery

Preliminary (estimated) capital cost of about 10.3 million EGP.

Cost recovery

Who pays?

Waste Producer

Cost recovery mechanism

Fee for service

6.6 Action Plan

No	Action	Responsibility	Qena Governorate																			
			2018				2019				2020				2021				2022			
1	**Develop sector strategy**	**WMRA, MoI**																				
2	**Develop enhanced regulatory framework**	**WMRA**																				
3	**Strengthen institutional framework**	**WMRA, EEAA**																				
4	**Prepare emergency response plan**	**EEAA, SWMU**																				
5	**Monitor waste tracking system**	**EEAA, SWMU**																				
6	**Capacity building**	**MWRA**																				

7 OTHER SPECIFIC PRIORITY WASTES

7-1 E-WASTE

Some efforts have been made in recent years to kick start professional waste management and recycling systems, and to recover valuable metals like platinum, indium etc. but these are in their infancy and face significant hurdles. Information regarding e-waste is scarce. In addition to a lack of data on quantities and types of e-waste generated, other problems facing e-waste management include lack of legal framework placing responsibilities on producers of electronic goods placing on the Egyptian market and a lack of consumer awareness of the environmental impacts of these wastes.

7-2 TIRES

It is estimated that around 210,000 tonnes of used tires are generated annually in Egypt. This amounts to over 5 million waste tires. Management practices consist of re-treading, burning to recover the metal wire, recycling and use as alternative fuel. Approximately 100,000 tonnes of tires, just under 50% of the total, are unaccounted for. Large generators tend to sell used tyres in public auctions. In these auctions, industry operators tend to only succeed in buying tires that cannot be reused or retreated as the Informal Recycling Sector (IRS) offers a better price to get all the waste and further sells the low-quality tires to the recycling industry. There are no standards for tires that can be reused or retreaded leading to accidents caused by low quality products sold especially by the IRS. Export duties restrict the export of scrap metal wires.

Annex

Annex 1-1: AMC / PMU comments (with replies)

Table 1 Compatibility with Terms of Reference (ToR) – Strategic MP for other wastes/ Qena

Key Requirements of the ToR	AMC-Remarks	PCI - Replies
Approximate assessment of the types and amounts of the different waste streams generated in the Governorate	Identified waste types and their annual amount: • Agricultural wastes: 4.6 million t/a • Healthcare wastes: 700 t/a • Construction and demolition wastes: 751 t/d • Non-hazardous industrial wastes: 1.4 million t/a • Hazardous industrial wastes: 410 t/a	No Reply
Sketch of possible conceptual and technical options on how to deal with the different waste streams (how, who, with which means)	Done	No Reply
Preparation of generic form sheets outlining required framework conditions for the sustainable implementation and operation of suitable technologies	Done	No Reply
SWM policy & legal framework	Done	No Reply
Proposed institutional set-up and responsibility split on national, Governorate and local level	Done	No Reply
Needed administrative capacities for management and supervision	Done	No Reply

Required institutions and capacity development	Done	No Reply
Suitable technical and conceptual solutions	Done	No Reply
Rough estimates of cost	Done	No Reply
Financing of investments	Done	No Reply
Bearer of running cost and suitable cost covering instruments	Done	No Reply
Presentation of the required decisions on the national and Governorate level	Done	No Reply

Annex 1-1: AMC / PMU comments and replies

Table 2 Suitability and comprehensibility of the content - Qena

Review Criteria	AMC-Remarks	PCI -Replies
Clear description of the objectives of the report and its place within the entire project	OK	No Reply
Clear description and analysis of the problem/ central issue	Only five waste types have been considered for the master plan. Further specific waste types most probably generated in the Governorate are missing: Hazardous household waste Waste tires Bulky waste Waste electrical and electronic equipment Sludge from waste water treatment Slaughterhouse waste	Strategic Master Plan for other waste report haven been updated including estimated figure for those type of wastes mentioned in the AMC comments. See chapter 7
Clear description and assessment of options available for the solution of problems	OK	No Reply