



ANNUAL REPORT FOR **SOLID WASTE MANAGEMENT** IN EGYPT, 2013

VOLUME 2: **THE REPORT**



November, 2013

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Contents

1. Introduction	6
2. The National Solid Waste Management Sector	15
3. Current Situation of Municipal Solid Waste Management in the Selected Governorates	61
4. Analysis and Benchmarking	103
5. Future Perspectives	117

TABLE OF CONTENTS

1 Introduction	6
1.1 Background and General Aspects	6
1.2 Methodology	9
1.3 Demographic and Socio-Economic Indicators	10
1.4 Solid Waste Facts and Figures	11
2. The National Solid Waste Management Sector	15
2.1 Municipal Solid Waste Management	16
2.1.1 Waste generation and composition	16
2.1.2 Waste collection, treatment and disposal	18
2.1.3 Policy, legal and institutional framework	30
2.1.4 Strategy and action plans	34
2.1.5 Finance and cost recovery	35
2.1.6 Private sector participation	39
2.1.7 Environmental and social aspects	45
2.2 Industrial and Hazardous Waste Management	48
2.2.1 Generation, treatment and disposal	48
2.2.2 Institutional arrangements	50
2.3 Medical Waste Management	52
2.3.1 Generation, treatment and disposal	52
2.3.2 Institutional arrangements	54
2.4 Construction and Demolition Waste Management	55
2.4.1 Generation, treatment and disposal	55
2.4.2 Institutional arrangements	56
2.5 Agriculture Residues Management	57
2.5.1 Generation, treatment and disposal	57
2.5.2 Institutional arrangements	60
2.6 Literature review on SWM in Egypt	60
3 Current Situation of Municipal Solid Waste Management in the Selected Governorates	61
3.1 Waste Related Data	62
3.2 Waste Collection	71
3.3 Waste Treatment and Disposal	84
3.4 Reduce, Reuse and Recycle (3Rs)	96
3.5 User Inclusivity	99
3.6 Provider Inclusivity	101
4 Analysis and Benchmarking	103
4.1 The Integrated Sustainable Waste Management Framework	104
4.2 Benchmark Indicators	106
4.3 Comparing Key Waste-related Data and Benchmark Indicators	107
4.3.1 Selected cities and villages	107
4.3.2 Waste generation	107
4.3.3 Waste composition	109
4.3.4 Physical Elements of the System	110
5 Future Perspectives	117
5.1 Implementation of Integrated Sustainable Waste Management (ISWM)	118
5.1.1 Integrated Sustainable Waste Management Planning	120
5.2 National Responsibilities	124
5.3 Economic Instruments	127
5.4 Financial Sustainability (cost recovery and other measures)	129
5.5 Extended Producer Responsibility	132
5.6 Financial Institutions Participation	137
5.7 Private Sector Participation	138
5.8 Informal Sector Participation	141
5.9 Multi-Stakeholders Involvement	145
5.10 Public Awareness and Community Participation	147
5.11 Efficient Data / IT National System	149
5.12 Development of Pilot Projects	151
5.13 Decentralised Solid Waste Management	153
5.14 International Development Agencies Support	155

ANNEXES

Annex 1: Refined Definition of Benchmark Indicators	
Annex 2: E-Waste Management and the Egyptian Subproject “Sustainable Recycling Industries” Programme	
Annex 3: Literature Review on SWM in Egypt	
Annex 4: Governorate’s Case Studies	
Annex 5: International Success Stories	
Annex 6: Review of Market-Based Instruments that have Potential Application to SWM	
Annex 7: Management Models for Decentralised SWM Projects	

LIST OF TABLES

Table 1 Generated solid waste in Egypt, 2010.....	12
Table 2 Generated solid waste in Egypt, 2001, 2006 and 2012.....	13
Table 3 Daily generated municipal solid waste in 2012.....	17
Table 4 MSW collection coverage at the selected Governorates	18
Table 5 Accumulated solid waste in the selected Governorates.....	20
Table 6 Allocated areas and locations of waste separation, recycling and disposal facilities	21
Table 7 Composting facilities and final disposal sites in the selected Governorates	23
Table 8 Analysis of SWM strategy targets, relevant performance indicators and gaps	31
Table 9 Annual expenses and revenues of MSWM in some of the selected Governorates in 2012.....	37
Table 10 Annual contract values of SWM companies serving Cairo Governorate.....	38
Table 11 EEAA required financial allocations to improve the MSW services19.....	39
Table 12 The executive stance of SWM projects and public cleaning in the Governorates	41
Table 13 Daily generated hazardous medical wastes	52
Table 14 Generated MSW in the selected Governorates in 2012.....	65
Table 15 Generated MSW in Qena Governorate.....	68
Table 16 Per capita MSW generation in the selected Governorates.....	68
Table 17 Composition of MSW in the selected Governorates.....	69
Table 18 Comparative analysis of solid waste collection services in the selected Governorates.....	80
Table 19 Comparative analysis of solid waste treatment and disposal services in the selected Governorates	94
Table 20 Key Waste-related data, population, MSW generation and composition in the selected cities and villages.....	108
Table 21 Benchmark indicators in the selected cities and villages	112
Table 22 Packaging recycling rates in European Union countries	134
Table 23 The German packaging ordinance recycling requirements.....	135
Table 24 Recycling requirements in the Swedish ordinance on producers responsibility for packaging.....	136

LIST OF FIGURES

Figure 1 Integrated sustainable waste management (ISWM) framework	8
Figure 2 The hardware and software triangles of ISWM.....	8
Figure 3 Map of Egypt’s Administrative Divisions/Governorates.....	10
Figure 4 Generated solid waste in Egypt, 2010	12
Figure 5 Generated solid waste in Egypt, 2001, 2006 and 2012.....	14
Figure 6 Municipal solid waste generation (Tonnes/day) in 2012.....	17
Figure 7 Municipal solid waste composition	17
Figure 8 Location of the selected sites for separation, recycling and disposal.....	22
Figure 9 Waste hierarchy pyramid	28
Figure 10 The development of urban built-up area of Greater Cairo Region	40
Figure 11 Extent of informal settlements in Greater Cairo Region	40
Figure 12 Citizens satisfaction by selected services	41
Figure 13 Treated hazardous medical wastes in Greater Cairo.....	53
Figure 14 Produced and recycled rice straw in 2009/2010.....	57
Figure 15 Generated MSW in the selected Governorates in 2012.....	67
Figure 16 Composition of MSW in the selected Governorates	69
Figure 17 The planning process of a SWM	121
Figure 18 Economic instruments of the different stages of the waste management process	128
Figure 19 An example of Full Cost Accounting	130

LIST OF BOXES

Box 1 Integrated sustainable waste management (ISWM)	7
Box 2 Subcontracting with micro- and small enterprises to optimise collection efficiency	20
Box 3 Establishing an organisation for the implementation and consolidation of biological treatment of biodegradable waste	25
Box 4 Best practices for utilising landfill gas for energy (LFGE) technologies	26
Box 5 Main principles of waste management hierarchy	29
Box 6 Dutch successes: public and private sector aren't wasting their time	29
Box 7 Formalisation of the traditional garbage collectors	43
Box 8 The Egyptian National Cleaner Production Centre (ENCPC)	48
Box 9 Integrated thinking: solid waste management in Singapore	55
Box 10 Asian Development Bank's rural biogas project: A hit in China	59
Box 11 The informal sector activities in Ezbet El-Nawar, El-Zarayb, El-Khossos, Kalyobiya Governorate	89
Box 12 The Brazilian experience to encourage waste picker inclusion in SWM	102
Box 13 EU Principles for waste management	124
Box 14 The main roles and responsibilities of the Integrated Solid Waste Management Sector (ISWMS)	125
Box 15 List of common waste minimisation policy instruments	133
Box 16 SWACH - A Waste Pickers' Cooperative in Pune, India	142
Box 17 Enabling conditions for integrating the waste informal sector	143
Box 18 Key points for successful community based solid waste management	154

LIST OF PHOTOS

Photo 1 Open dumping of MSW in Assiut Governorate	11
Photo 2 Dumping of MSW in a watercourse, Al Gharbya Governorate	11
Photo 3 Litter thrown out of the collection bins in a slum area in Fayoum City	19
Photo 4 Collection point in Banha, Kalyobiya Governorate	19
Photo 5 Self ignition of waste at an uncontrolled dumpsite in Fayoum Governorate	22
Photo 6 Accumulated waste plateau adjacent to the compost plant in Tanta, Al Gharbya Governorate	22
Photo 7 The Compost plant in Beila, Kafr El-Sheikh Governorate	25
Photo 8 RDF production line at Suez compost plant	27
Photo 9 Household waste dumped on a bridge in Tanta city	45
Photo 10 Self burning of MSW at Samanoud dumpsite plateau, Al Gharbya Governorate	45
Photo 11 Waste pickers at a MSW collection point in Fayoum city	46
Photo 12 Waste pickers at Abu Zaabal dumpsite	47
Photo 13 Transportation vehicle for hazardous medical waste at Suez Governorate	53
Photo 14 Hazardous medical waste incinerator at Suez Governorate	53
Photo 15 CDW dumped on roadside at Tanta city	55
Photo 16 Dumped agricultural waste at Kafr El-Sheikh Governorate	57
Photo 17 Collection workers in (a) Qena, (b) Fayoum, (c) Banha, (d) Tanta, (e) Kafr El Sheikh and (f) Suez	72
Photo 18 Transfer station at Markez Senuris, Fayoum Governorate	75
Photo 19 Transfer station at Fayoum City	75
Photo 20 Collection bins in (a) Fayoum, (b) Banha, (c) Kafr El Sheikh and (d) Suez cities	77
Photo 21 The compost plants in (a) Qena, (b) Assiut, (c) Abu Zaabal, (d) Tanta, (e) Beila and (f) Suez	85
Photo 22 The dumpsites in (a) Qena, (b) Assiut, (c) Fayoum, (d) Abu Zaabal, (e) Samannoud and (f) Suez	87

LIST OF ABBREVIATIONS

AD	Anaerobic Digestion
ARFs	Advanced Recycling Fees
CAC	Command and Control
CAPMAS	Central Agency for Public Mobilisation and Statistics
CBO	Community Based Organisation
CD	Capacity Development
CDW	Construction and demolition waste
DfE	Design for Environment
EC	European Commission
EEAA	Egyptian Environmental Affairs Agency
EGED	The Egyptian-German-EU-Development Partnership
EIA	Environmental Impact Assessment
EIs	Economic Instruments
EMU	Environmental Management Unit
ENPC	Egyptian National Cleaner Production Centre
EPR	Extender Producer Responsibility
ESTs	Environmentally Sound Technologies
EU	European Union
FCA	Full Cost Accounting
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIZ	Gesellschaft für Internationale Zusammenarbeit
ILO	Inter-national Labour Organisation
IMC	Egyptian Inter Ministerial Committee for Solid Waste Management
ISWM	Integrated and Sustainable Waste Management
ISWMS	Integrated Solid Waste Management Sector
KfW	Kreditanstalt für Wiederaufbau
LE	Egyptian Pounds
LFG	Landfill Gas
LFGE	Landfill Gas for Energy
MHP	Ministry of Health and Population
MoH	Ministry of Housing
MoLD	Ministry of State for Local Development
MSEA	Ministry of State for Environmental Affairs
MSEs	Micro and Small Enterprises
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
MTI	Ministry of Trade and Industry
NGO	Non Governmental Organisation
NSWMP	National Solid Waste Management Programme
OMSW	Organic fraction of Municipal Solid Waste
PA&E	Public Awareness and Education
PAYT	Pay-As-You-Throw
PPP	Public Private Participation
PPP	Polluter Pays Principle
PS	Private Sector
PSP	Private Sector Participation
RDF	Refuse Derived Fuel
3Rs	Reduce, reuse, recycle
SW	Solid Waste
SWM	Solid Waste Management
UNDP	United Nation Development Programme
UNEP	United Nation Environmental Programme
UN-Habitat	The United Nations Human Settlements Programme
UNIDO	United Nations Industrial Development Organisation
WB	The World Bank Group
WEEE	Waste Electrical and Electronic Equipment

1 INTRODUCTION

This starting chapter exhibits background information on the objectives of the current report, together with the accountable drivers used for the development of waste management, the integrated and sustainable waste management, the benchmark indicators practiced for the appraisal and judgment of municipal solid waste management as well as a description of the methodology used. The demographic and socio-economic indicators of Egypt are thereafter briefly presented, followed by a discussion of the present situation of the national solid waste management sector, highlighting the generated quantities of municipal, medical, construction & demolition, agricultural, industrial and waterway cleansing wastes, in addition to sludge.

1.1 BACKGROUND AND GENERAL ASPECTS

Quite a lot of publications have been written during the last decades on solid waste management in Egypt targeting different approaches and audience.^{1, 2, 3, 4} However until now we are still missing a systematic set of objectively verifiable indicators assessing the actual performance of SWM sector on the ground, and the quality of data that support such analysis.

Within the context of the EGED-NSWMP reinforcing the sustainable development of Egypt's SWM sector, all-encompassing aftermath of the non-existence of data collection and systematised reporting are restricting the competence to reach truthful plans and to attract investment in infrastructure and services. This report kept those criteria in the frontage of the effort, as sustainability and investment attraction are pillars of any wide-ranging profitable effort.

The ambition of this report is to reward intuition into the enduring solid waste

practices in 2012, with satisfactory empirical content enabling the formulation of an engaging and readable publication, which could also serve as an initial baseline against which future annual reports performance could be compared. This would in turn offer an input into monitoring and evaluation of the performance of the NSWMP in convening its objectives and targets.

The emphasis of the report is to shape SWM service delivery (waste generation and composition, street cleaning, collection, recycling, treatment and disposal) and to signal the range of different situations in Egypt. The report focuses on MSWM with all the compulsory details to be particularized. Other waste streams are verified in terms of quantity, collection, treatment and disposal activities, in addition to the specific institutional arrangements. Special attention has been instructed to profiling SWM services and practices in seven Governorates, i.e., Assiut, Fayoum, Kalyobiya, Al Gharbya, Kafr El Sheikh and Suez.

Six broad groups of drivers are answerable for development in WM⁵. Public health led to the advent of formalised waste collection systems in the nineteenth century, and persists as a key driver in most developing countries. Environmental protection came to the frontage in the 1970s, with an initial focus on rejecting uncontrolled disposal, followed by a systematic upsurge in the technical standards. Today, developing countries seem still to be harassed with these first steps; while climate change is also emerging as a key driver. The resource value of waste, which consents people to make their living from discarded materials, was a historically imperative driver, and still leftover in many

-
1. Tarek Zaki (2010) *Country Report on the Solid Waste Management in Egypt*. SWEEP-Net, <http://www.sweep-net.org/ckfinder/userfiles/files/country-profiles/rapport-Egypte-en.pdf>
 2. Tarek Zaki (2012) *Country Report on the Solid Waste Management in Egypt*. SWEEP-Net, <http://www.sweep-net.org/sites/default/files/files/FICHES%20ANG%20EGYPTE.pdf>
 3. EcoConServ Environmental Solutions (December 2010), "Up Stream Poverty and Social Impact Analysis (PSIA) for Egypt's Solid Waste Management Reform", MoLDD/UNDP/ World Bank
 4. Maïke Didero (2012), *Cairo's Informal Waste Collectors: A Multi-scale and Conflict Sensitive Perspective on Sustainable Livelihoods*, *Erdkunde*, Vol. 66, 27 - 44 (<http://www.erdkunde.uni-bonn.de/archive/2012/cairo2019s-informal-waste-collectors-a-multi-scale-and-conflict-sensitive-perspective-on-sustainable-livelihoods>)

developing countries until today. The up-to-date trend in developed countries is closing the loop, shifting from the concept of 'end-of-pipe' WM towards a more all-inclusive resource management. Two underpinning groups of drivers are institutional and responsibility issues, and public awareness.

There is no, one single driver for development in WM: the balance between these six groups of drivers has assorted over time, and will vary between countries depending on their local settings, and between stakeholders

depending on their own perspectives. The next adopt steps towards developing a sustainable integrated waste management will also fluctuate in each local situation.

The 'lens' approach of Integrated and Sustainable Waste Management (ISWM) has been amended in the present study. This approach had been fostered in the UN-Habitat flagship publication "Solid Waste Management in the World's Cities"⁶, and applied to analyse the new data set assembled on 20 cities in six continents⁷.

Box 1 Integrated Sustainable Waste Management (ISWM)⁶

Integrated sustainable waste management (ISWM), as shown in Figure 1, is a framework that was first developed during the mid 1980s by WASTE, a Dutch non-governmental organisation (NGO), and WASTE's South partner organisations, and further widened by the Collaborative Working Group on Solid Waste Management in Low- and Middle-Income Countries (CWG) in the mid 1990s. Since then it has become the 'norm'.

ISWM is a system approach that distinguishes three critical dimensions necessitated to be tackled when upwarding and/or fluctuating a solid waste management system. The dimensions, shown in Figure 1, resemble three key questions as follows:

1. The stakeholders – the people or organisations with a 'stake' or interest in SWM: who needs to be involved?
2. The elements – the technical modules of a WM system: what needs to be done?
3. The aspects which need to be deemed as part of a sustainable solution: how to attain the desired results?

Stakeholders: The main 'recognised' stakeholders involve the local authority (mightor, city council, and solid waste department), the national environment and local government ministries, and one or two private companies working under contract to the municipality. Habitually unrecognized stakeholders include (female) street sweepers, (male) workers on collection trucks, dumpsite 'waste pickers', some of whom might actually live on or at the edge of the dumpsite, and family-based businesses that live from recycling.

Other key stakeholders include the waste generators: the users of the WM service afforded by the city,

including households, offices and businesses, hotels and restaurants, institutions such as hospitals and schools, and government facilities such as airports or the post office.

Elements: These are the technical components of a WM system. Part of the purpose of using the ISWM framework is to reveal that these technical components are just a part of the inclusive picture, not all of it. In Figure 1, the boxes in the top row all attach to removal and safe disposal, and the bottom row of boxes relate to 'valorisation' of commodities. SWM entails a variety of activities, including reduction, reuse, recycling and composting, functioned by a variety of stakeholders at various scales.

Aspects: For a WM system to be sustainable, it requisites to deem all with of the operational, financial, social, institutional, political, legal and environmental aspects. These form the third dimension in Figure 1. The aspects provide a series of analytical 'lenses', which could be manipulated, for example, for assessing the situation, determining feasibility, identifying urgencies or setting adequacy criteria.

'Integrated' in ISWM denotes the connexions and interdependency between the various activities (elements), stakeholders and 'points of view' (sustainability aspects). Moreover, it advocates that technical, but also legal, institutional and economic linkages are indispensable to empower the overall system to function.

5. David C. Wilson (2007), "Development Drivers for Waste Management", *Waste Management and Research*, 25, 198–207

6. UN-Habitat (2010) *Solid Waste in the World's Cities*. In UN-Habitat's *State of Water and Sanitation in the World's Cities Series*. London and Washington DC: Earthsould for UN-Habitat.

7. D. C. Wilson., L. Rodic, A. Scheinberg, C. A. Velis and G. Alabaster (2012) "Comparative Analysis of Solid Waste Management in 20 Cities", *Waste Manag. Res.* 30: 237 UN-habitat, *Refined Definition of Benchmark Indicators, Summary Presentation of the Benchmarks Indicators for a Hypothetical City*, Revised

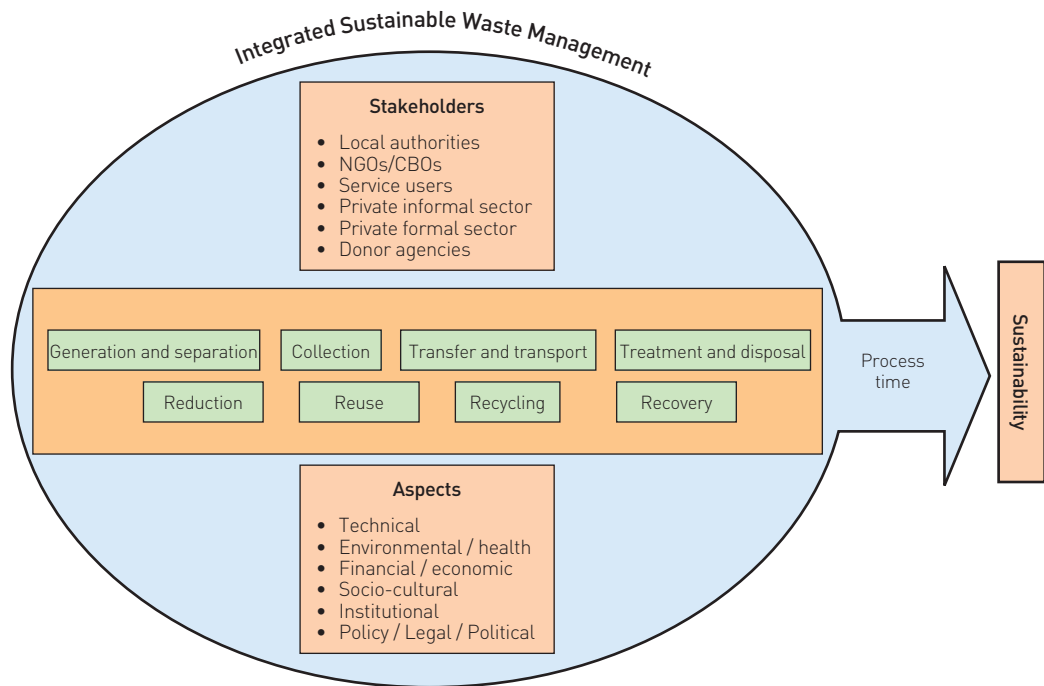


Figure 1 Integrated sustainable waste management (ISWM) framework⁶

Source: WASTE "Advisers on urban environment and development", Gouda, the Netherlands

For expediency ISWM is partitioned into two 'triangles' (Figure 2); the physical elements (hardware) and the governance features (software)⁶. The first triangle involves the three key physical elements 'hardware' that all need to be tackled for an ISWM to work sustainably over the long term:

1. Public health: maintaining healthy conditions in cities, predominantly through a sound waste collection service;
2. Environment: protection of the environment throughout the waste chain, notably throughout treatment and disposal; and
3. Resource management: 'closing the loop' by restoring materials, energy and nutrients to beneficial use, through avoiding waste and striving for high rates of organics recovery, reuse and recycling.

The second triangle focuses on ISWM 'software': the governance strategies to dispense a well operative system. Three interrelated necessities for delivering ISWM were eminent. There is a need for the system to:

1. Be inclusive, providing translucent spaces for stakeholders to interpose as users, providers and enablers (Social Support);
2. Be financially sustainable, which means cost-effective and affordable (Financial Viability); and
3. Rest on a base of sound institutions and pro-active policies (Institutional Development).

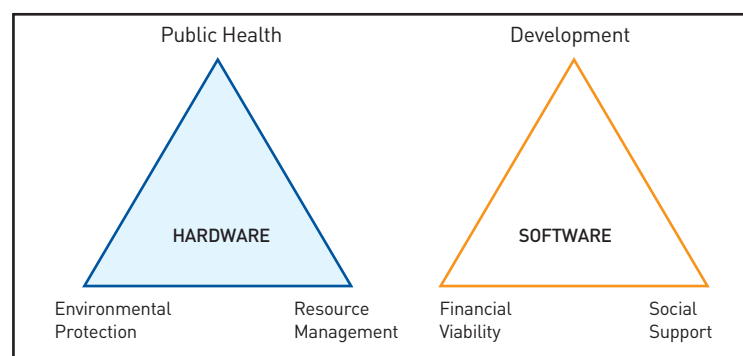


Figure 2 The hardware and software triangles of ISWM

Source: [ISWA, Solid Waste: Guidelines for Successful Planning, 2012]

1.2 METHODOLOGY

This report donates a study of the subsisting waste management situation through a professional lens. Primary data collection was achieved using interviews with the main stakeholders, observations within site visits and desk research of reports and papers. The report is the first of a series of reports that will assess SWM in the Egyptian Governorates, as part of a future nation-wide effort to create a consistent SW data and information base.

Field visits afforded insight on the actual state of affairs, problems and restrictions faced in the realization of the system. These findings are discussed further in the case studies of the Governorates. A series of interviews and discussions were performed with the officials in the selected Governorates, waste management service sector, and the civil society to collect information and data which assisted in analysing the service functioning in accordance with a clearly termed set of indicators.

In order to make the comparison feasible among the selected Governorates, a set of benchmark indicators had been applied⁸. Those indicators were operated to weigh the range of institutional, technical and promotional features of the current SWM in the Governorates and to define key shortfalls and constraints. Annex 1 provides the draft template of indicators used in profiling waste management practices in the Governorates. The indicator template includes:

- i) Waste collection and street sweeping service quality and coverage (public health indicator);
- ii) Waste disposal quality and coverage (environmental control indicator);
- iii) Reduce, reuse, and recycle (3Rs) (resource recovery indicator);
- iv) Degree of service user and provider inclusion in the planning and delivery of services (inclusivity indicator);
- v) Degree of financial sustainability (financial sustainability indicator); and
- vi) Degree of institutional coherence (institutional coherence indicator).

The first four indicator groups were applied more intensely and systematically in the analysis of the current situation in the selected Governorates. Information/data collection for the other indicator groups was embraced to some extent in the field work. A quality assurance (QA) plan had been planned in the inception phase and followed in the day to day work of the project team to insure that appropriate standards are sustained. The QA plan included the following:

- Information collected from diverse sources and site visits are reviewed for exactness;
- Verification of data;
- In case of disputing data, the different figures were provided and evaluated;
- Highlighting possible inadequacies of the presented data (unreliable, outdated, etc.);
- The assessment of the SWM sector in the selected Governorates is directed using the aforementioned set of indicators to help guarantee traceability and compatibility with future reports as well as objectivity; and
- Any data/information obtained from an external source is clearly referenced.



8. UN-habitat, *Refined Definition of Benchmark Indicators, Summary Presentation of the Benchmarks Indicators for a Hypothetical City, Revised UN-habitat Indicators v5-3*, unpublished work, [cf. Annex 1 of this report]. Egypt State Information Center, <http://www.sis.gov.eg/en/story.aspx?sid=6>



Figure 3 Map of Egypt's Administrative Divisions/Governorates

1.3 DEMOGRAPHIC AND SOCIO-ECONOMIC INDICATORS

Egypt is sited in the northeast corner of Africa and shares its boundaries with the Mediterranean Sea in the North with a coastline of 995 km, Sudan in the South, Palestine, Israel and the Red Sea in the East and Libya in the West (Figure 3).

Egypt is divided into 27 Governorates, 217 cities and 4617 villages⁹. The geographical regions as set in the urban plan are: Upper Egypt, North Upper Egypt, Central Egypt, Metropolitan Cairo, Suez Canal Region, Alexandria & Matrouh, and Nile Delta.

The estimated population of Egypt, in the 1st of January, 2012, is 81,395,541 inhabitants; of which 51.13% are males and 48.87% are females¹⁰. 42.9% of the inhabitants live in urban areas and 57.1% in rural areas. The annual population growth rate is 2.0%. According to the final results of the 2006 population census, the average size of a household in urban (rural) areas is 3.9 (4.4) persons.

According to the latest available data from Egypt Human Development Report (2010), the annual GDP per Capita was LE 10,246.1 and the Human Development Index was 0.731 in FY 2007/08¹¹. However, according to Egypt's Ministry of Finance, the GDP per Capita was LE 17,233 in FY 2010/11¹². The population density is 73.6 persons per Km². The percentage of poor persons in urban and rural areas was 11% and 28.9% of the total population of Egypt in 2008/2009, respectively.

In 2007, the percentage of literacy in Egypt's population (15+) was estimated at 70.4% of the total population (62.7% of females). The labour force comprised 20.5% professionals and technical staff (31.0% of females) and the percentage of women in labour force was 23.9%¹⁰. The unemployment rate was 8.9%; 62.4% in individuals with secondary education and 32.8% in holders of university degrees. In 2008, 37.9% of the population had received secondary or higher education (33.5% of females).

During FY 2011/12, the Egyptian economy has been held back by lingering insecurity and political instability due to ramifications of the revolution as well as sluggish global growth¹³. Real GDP is projected to grow at a modest rate of around 1.7%, reflecting disruption across various sectors, most importantly tourism, construction and manufacturing. Egypt's economy is suffering from a severe downturn and the Government faces numerous challenges¹⁴. The biggest challenge is how to restore growth and market confidence, and how to coax investors into financing projects again. Another challenge will be addressing the Egyptian population's high expectations, especially regarding youth employment. That is not an easy task, as the sharp economic downturn has translated into higher budget deficits. The Government faces the central question of how to merge the need for more public spending with the objective of reducing the deficit, which rose to 11 percent of the GDP in FY11/12.

9. Egypt State Information Center, <http://www.sis.gov.eg/en/story.aspx?sid=6>

10. Egypt's Central Agency for Public Mobilisation and Statistics (CAPMAS) (September 2012), *Statistical Yearbook*

11. United Nations Development Programme, and the Institute of National Planning, Egypt (2010), *Egypt Human Development Report*

12. General Economic and Financial Outlook (2012), Ministry of Finance, Egypt, <http://www.mof.gov.eg/English/Pages/Selected-Economic-Indicators.aspx>

13. O. Helmy and N. Abdel Raouf (2012), "Egypt's Economic - Profile and Statistics", *The Egyptian Center for Economic Studies*,

14. The World Bank, "Egypt Overview", <http://www.worldbank.org/en/country/egypt/overview>

1.4 SOLID WASTE FACTS AND FIGURES

Solid Waste Management (SWM) endures as a tenacious environmental and health anxiety for Egypt and has become a momentous concern for the sustainability of the country. The increasing levels of waste generation, changing waste characteristics and impediment in financing apt technology for disposal have been a challenge to the Governorates. With the diversification of waste streams as well as the growing incidence of household hazardous waste, electronic waste (WEEE), construction and demolition waste (CDW) and hazardous medical waste in the general waste stream, the involvedness and daunting nature of waste management challenges have gone beyond the capacity of many municipalities – in terms of finance, technology, and institutional mandate, resulting in unprecedented adverse impacts on the quality of life, human health, freshwater resources, and local environment and ecosystems.

Open burning and reliance on open dumping are still prevalent in many parts of the country, resulting in greenhouse gas emissions and formation of leachates in disposal sites. The reduction of organic waste generation and its proper treatment would provide a sustainable solution. However, up till now, no efforts towards prevention and/or minimisation of wastes were taken. At the same time, the non-existence of effective policies and programmes at the national level and the dearth of mandatory infrastructure (for collection, storage, handling/processing, treatment, recycling, converting waste to energy, etc.) obstruct the development of the sector.

Egypt is undergoing increasing population, industrialisation, urbanisation, and shifting consumption patterns that resulted in the generation of escalating amounts of diversified solid waste representing the most perceptible environmental problem among many in urban areas. The unsatisfactory collection and unacceptable disposal of solid waste signify a source of water, land and air pollution, and inquire risks to human

health and the environment. Urbanisation encompasses the enlargement of slum areas and the establishment of new ones. Population growth exaggerates the burden on urban infrastructure in many cities which are already overburdened with the delivery of urban services. The Governorates lack the resources, both technical and financial, to convene the demand for services such as water, sanitation and solid waste management.

Solid waste that is currently disposed in dumpsites portrays the greatest potential for recycling, processing, or reuse (Photos 1 & 2). Dry waste such as plastics, paper, and



Above: Photo 1 Open dumping of MSW in Assiut Governorate

Down: Photo 2 Dumping of MSW in a watercourse, Al Gharbya Governorate

metals are readily recycled. However, wet organic waste forms the bulk of the problems and could constitute as much as 60% of the total waste stream. Selected organic waste could either be reduced or transformed into organically beneficial products through the application of new and innovative approaches and technologies. These resources could be reused for the production of energy, organic fertilizers, and animal feed as well. Such attitude is in line with the principles of sustainable development, where competent exploitation of resources is closely linked with poverty alleviation goals.

No straightforward data are available on municipal waste flow in Egypt¹⁵. Approximations have been made of per

capita MSW generation rates by Governorate, differentiating between urban and rural areas. These estimates were included in the June 2000 draft National Municipal Solid Waste Strategy, without explanation of how they were derived. Those coefficients have been mutual with population data from the 1996 census to derive MSW generation estimates.

Table 1 and Figure 4 illustrate the generated quantities of solid waste in Egypt, in 2010, according to MoLD¹⁶.

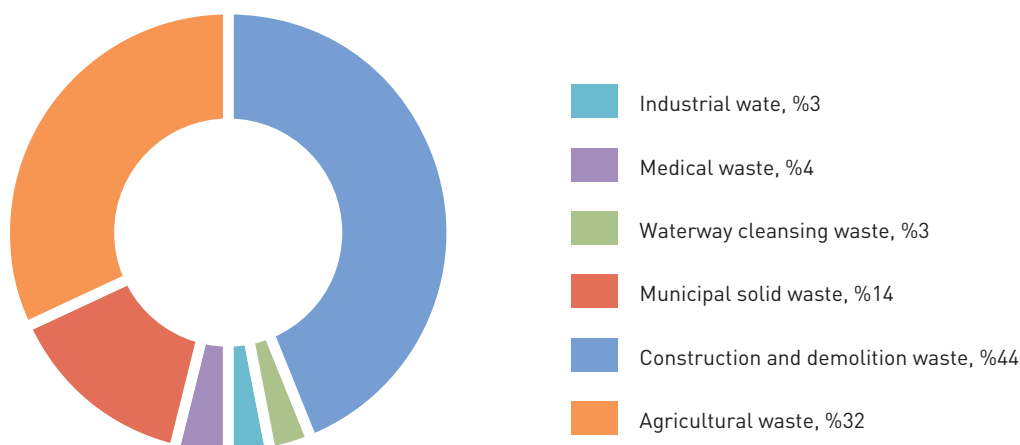
However, Table 2 and Figure 5 exhibit the corresponding estimated data for the generated wastes, based on EEAA figures for the years: 2001, 2006 and 2012.

Table 1 Generated solid waste in Egypt, 2010

Source: MoLD

Waste Type	Generated Quantity (Tonnes)
Municipal solid waste	13,806,269
Construction and demolition waste	41,748,603
Agricultural waste	30,000,000
Industrial waste	2,906,895
Medical waste	3,416,254
Waterway cleansing waste	3,058,509
Total	94,936,530

Figure 4 Generated solid waste in Egypt, 2010



15. Joy E. Hecht (November 2001), "Monitoring System: Draft Prototype Working Indicators", Egyptian Environmental Policy Program

16. Egypt in Figures (2012), Central Agency for Public Mobilisation and Statistics, Source: MoLD

Everyday problems for MSWM include institutional deficiencies, inadequate legislation and resource constraints. Open dumping is still well-thought-out as the most popular method of solid waste disposal. Long and short term plans are derisory due to capital and human resource restrictions.

One keynote argues to national development and planning of the SWM sector is the lack of trustworthy data on the quantities of generated waste and its composition. To design an effective waste management program, our prerequisite is to know how much MSW must be managed. Moreover, if we aim to reduce MSW generation, tracking the total MSW will be an imperative indicator

of success. Therefore, the total amount of generated MSW is a desperate piece of information and there is an urgent need to exploit trustworthy and accurate methods for its continual measurement

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Table 2 Generated solid waste in Egypt, 2001, 2006 and 2012

Source: EEAA

Waste Type	Generated Quantity (Million Tonnes)		
	2001 ¹⁷	2006 ¹⁸	2012 ¹⁹
Municipal solid waste	14.5	17	21
Construction and demolition waste	3.5	4.6	4.0
Agricultural waste	23.5	27.5	30
Industrial waste	4.25	4.75	6.0
Medical waste	0.12	0.15	0.28
Waterway cleansing waste	20	30	25
Sludge	1.75	2	3
Total	67.12	86	89.28

17. EEAA (2001), "Solid Waste System in Egypt"

18. MSE/EEAA (2007), "Egypt State of the Environment"

19. Waste Management Central Department (2012), EEAA

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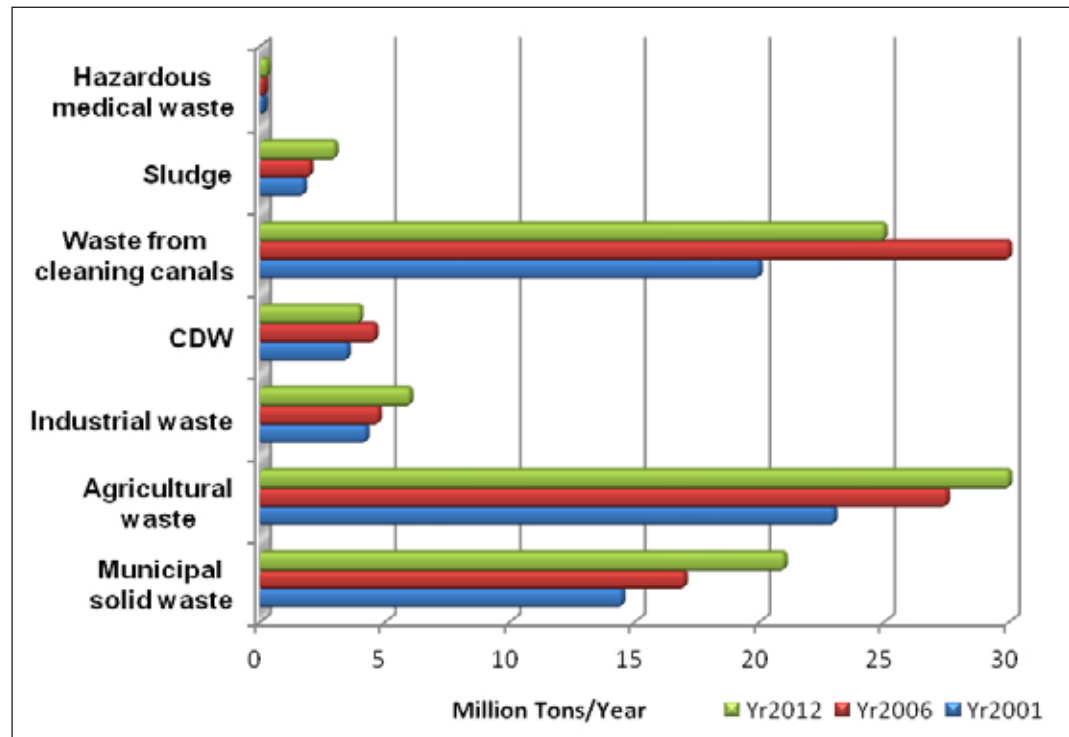


Figure 5 Generated solid waste in Egypt, 2001, 2006 and 2012

2. THE NATIONAL SOLID WASTE MANAGEMENT SECTOR



THE NATIONAL SOLID WASTE MANAGEMENT SECTOR

This chapter deliberates the current situation of the national solid waste management sector and provides a comprehensive assessment of all attributes of municipal solid waste management, including quantities of waste generated and its composition; the policy, legal and institutional framework; strategies and action plans, with special focus on the newly established National Solid Waste Management Programme (NSWMP); finance and cost recovery; formal and informal private sector involvement; and the environmental and social features. Furthermore, the generation, treatment, disposal and institutional arrangements of industrial, hazardous, medical, construction & demolition, and agricultural waste management are fleetingly considered. The last section points to a literature review on SWM in Egypt that is given in details in Annex 3.

2.1 MUNICIPAL SOLID WASTE MANAGEMENT

2.1.1 WASTE GENERATION AND COMPOSITION

Municipal Solid Waste (MSW) is defined as waste collected and treated by, or for municipalities. It covers residential, commercial, street sweepings, contents of litter containers, and market cleansing.

An important constituent that needs to be deemed is construction & demolition waste (CDW), such as building rubble, concrete and

masonry. In some Governorates this might represent a large percent of the total waste stream.

In 2012, Egypt generated about 57,020 tonnes/day of MSW¹⁹. No official or published figures are available for MSW per capita. The MSW per capita (kg per year) is 253.16, as calculated by the authors of the present report. Table 3 and Figure 6 show the daily generated MSW at the different Governorates.



It should be noted that the available data for MSW generation presented in this report is a mere approximation. An accurate measurement of generated MSW and an analysis of its composition should be carried out in the 27 Governorates of Egypt. The participating local authorities should be selected to represent Egypt as a whole, according to a sampling framework based on; frequency of residual waste collection, volume, population density (urban or rural), etc.

Governorate	Generated Waste (Tonnes/Day) ¹⁹	Governorate	Generated Waste (Tonnes/Day) ¹⁹
Cairo	15,000	Fayoum	720
Giza	4,500	Bani Souwaif	800
Alexandria	4,000	Menia	1,300
Kalyobiya	3,500	Assiut	700
Dakahliya	4,500	Sohag	1,100
Al Gharbya	3,500	Qena	1,080
Monufia	2,500	Aswan	800
El-Beheira	3,500	Luxor	470
Kafr El-Sheikh	2,500	Red Sea	450
Sharqea	2,200	Matruh	300
Damietta	1,100	North Sinai	250
Ismailia	600	South Sinai	500
Port Said	650	New Valley	100
Suez	400		
Total	57,020 Tonnes/Day		

Table 3 Daily generated municipal solid waste in 2012

Waste composition is shaped by factors such as culture, economic development, climate, and energy sources; composition impacts how often waste is collected and how it is disposed. Low-income countries have the

highest proportion of organic waste. Paper, plastics, and other dry materials make up the highest proportion of MSW in high income countries. Figure 7 exhibits the composition of MSW in Egypt in 2012²⁰.

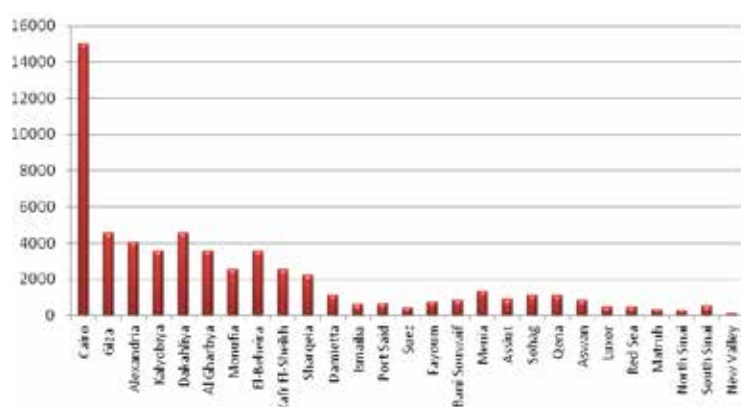


Figure 6 Municipal solid waste generation (Tonnes/day) in 2012

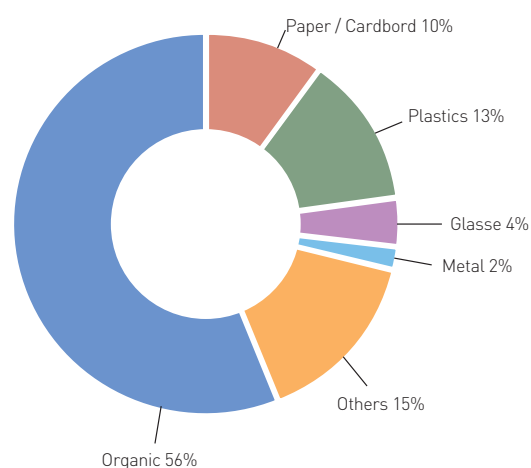


Figure 7 Municipal solid waste composition in Egypt (2012)

20. D. Hoornweg and P. Bhada-Tata (March 2012), "What a Waste - A Global Review of Solid Waste Management", Urban Development Series, Knowledge Papers, No. 15, The World Bank

The presented composition data of MSW shortages accuracy due to:

- Absence of source separation of waste.
- MSW commonly contains a fraction of sand, soil and CDW.
- Partial collection of paper from households by 'itinerant waste buyers' prior to MSW collection.
- Partial separation of plastics, paper, glass and metals, by the informal sector (zabaleen) and waste pickers, for recycling.
- Absence of accurate means for measuring MSW composition.

The percentage of population who has access to a reliable waste collection service, at different Governorates of Egypt is given in Table 4.

The inefficient MSW collection coverage (Photos 3 & 4) leads to:

- Accumulation of waste around the collection points/containers;
- Presence of litter and of overflowing litter bins in the city centre, along main roads and in popular places where people gather; and
- Illegal dumps and open burning in and around slums.

2.1.2 WASTE COLLECTION, TREATMENT AND DISPOSAL

No doubt, quantity and characteristics of the MSW are the major features that adopt the technology to be used for waste treatment/disposal. On the basis of the waste quantity, infrastructure requirement could be projected. It is also obligatory to carry out frequent waste analysis in order to assess the changes in waste characteristics due to ever-changing scenario. This data will also function as a core for upgrading or switching over to better treatment/disposal option.

Moreover, the majority of the public lack environmental ethics and awareness on the proper disposal of SW and the dangers that stem from disposal in open dumps.

Table 5 presents data on accumulated solid waste in the Governorates. About 18,513,436 cubic meters of solid waste were accumulated in Egypt, by mid of 2012 that might lead to thoughtful public health and environmental consequences.

Street sweeping is the customary method of primary collection of the daily left municipal waste. Lot of street dust and CDW are

Governorate	Waste Collection Coverage (%) ¹⁹	Governorate	Waste Collection Coverage (%) ¹⁹
Cairo	70	Fayoum	65
Giza	60	Bani Souwaif	62
Alexandria	65	Menia	55
Kalyobiya	60	Assiut	65
Dakahliya	50	Sohag	60
Al Gharbya	47	Qena	60
Monofiya	40	Aswan	70
El-Beheira	50	Luxor	75
Kafr El-Sheikh	50	Red Sea	60
Sharqia	45	Matruh	60
Damietta	55	North Sinai	60
Ismailia	60	South Sinai	80
Port Said	70	New Valley	60
Suez	70		

Table 4 MSW collection coverage at the Governorates

Source: EEAA, July 2012

collected during street sweeping, making the inert content of wastes relatively high. This could be considerably reduced by public participation in source segregation and selection of suitable collection service. Waste generators should possess a strong conviction to stop littering the streets not only to reduce the need for street sweeping but also to domain a 'civilised' image for their neighbourhoods.

At the time being, the public sector largely provides MSWM services in most of the Governorates. Such services, however, lack applicable planning, delivery, monitoring, liaison and feedback. Moreover, health and safety measures for collection workers are meagre.

On the other hand, the introduction and implementation of Private Sector Participation (PSP) in the Egyptian market was mired by several problems. The Governorates had not been provided abundant legal framework and/or leadership. A major source of wastefulness and futility in PSP are the lack of satisfactory and appropriate understanding and capacity at the Governorate level, together with inadequate national guidance and reinforce.

The broad-spectrum setup of the procurement approaches used to commence the first PSP contracts in 2001 was generally in line with common international procedures²¹. However, the approaches in which Governorates have implemented the procurements signal an underlying lack of understanding and mistrust of the private sector. Significantly, most PSP contracts were attained and entered into with no, or insufficient, technical and financial feasibility analysis and structuring. The size and scope of most contracts augments the need for a clear contract rationale.

- i) Allowing a mix of approaches and technologies to be built-in in a well-planned overall collection system that covers sufficient secondary collection and transfer points, adequate storage space and drop off centres;

- ii) Empowering and specifically allowing pluralistic approaches in laws, ordinances and regulations, and inspiring pluralism in private sector contracts, i.e. opening up the system and allowing the integration of other parties; and
- iii) Selecting a combination of collection techniques that consent for optimum recovery of valuable materials by municipal and private collectors (e.g. use of open but covered trucks with baskets and/or compartments for the various materials, rather than compactors)



Above: Photo 3 Litter thrown out of the collection bins in a slum area in Fayoum City

Down: Photo 4 Collection point in Banha, Kalyobiya Governorate

21. Rebel International and EcoConServ Environmental Solutions, "Private Sector Participation in the Municipal Solid Waste Management Sector in Egypt", Final Draft Study Report, World Bank, 09.11.10

Table 5 MSW Accumulated solid waste in the Governorates

Source: EEAA, July 2012

Governorate	Accumulated Waste (m ³) ¹⁹	Governorate	Accumulated Waste (m ³) ¹⁹
Cairo	5,000,000	Fayoum	292,500
Giza	3,000,000	Bani Souwaif	150,000
Alexandria	344,830	Menia	500,000
Kalyobiya	2,000,000	Assiut	250,000
Dakahliya	1,800,000	Sohag	281,845
Al Gharbya	750,000	Qena	258,480
Monofiya	280,000	Aswan	385,240
El-Beheira	600,000	Luxor	107,022
Kafr EL-Sheikh	227,000	Red Sea	500,000
Sharqia	510,000	Matruh	146,429
Damietta	100,000	North Sinai	140,000
Ismailia	350,000	South Sinai	512,000
Port Said	359,040	New Valley	
Suez	168,550		
Total	18,513,436 m³		

Box 2 Subcontracting with micro- and small enterprises to optimise collection efficiency²²

Another way of bettering collection is subcontracting primary waste collection to micro and small enterprises (MSEs), cooperatives or community-based organisations (CBOs). MSEs and CBOs usually manage at low cost, they are flexible, accepted and supported by the local community, and they initiate employment and income in low-income urban areas. They have especially gained their spurs in areas that are habitually under-served or are not easily accessible.

The municipality could support MSE and CBO waste collection initiatives by:

1. Keeping to its part of the deal, e.g. making sure

- that secondary collection is steady and reliable
- Easing bureaucratic hindrances and regulations for MSEs and CBOs, e.g. officially recognise them as candidates for service contracts, monitor worth of their services
- Providing standby vehicles in case of (temporary) breakdown
- Assisting in the building of community awareness
- Assisting with loans for equipment or business training

The most important factor motivating collection efficiency is vehicle productivity (in kg/vehicle/day). Improving vehicle productivity denotes increasing the total number of generators served and the total amount of waste transported each day when the vehicle is in operation.

Final disposal of solid waste denotes an imperative component of an operative management. In 2001/02, EEAA initiated a Landfill Siting Program, in collaboration with the Life Program of the European Union. Within the domain of the project, 53 sites for landfills were selected in all of

Egypt. For each Governorate, maps were shaped for the proposed landfill sites, in addition to EIA and in depth studies of soil and groundwater conditions. However, due to the lack of resources, only few landfills were established.

In April 2011, the Head of the Supreme Council of the Armed Forces allocated a total area of 5,339 feddan for establishing five sites for separation, recycling and final disposal in sanitary landfills of the MSW generated from Greater Cairo. Table 6 shows the area and location of the allocated sites given in the Presidential Decree 86/2010.



Table 7 A&B provides data on the composting facilities at the different Governorates, in addition to the disposal sites. Since 1998, the Egyptian Government adapted the open aerobic composting for recycling the 'wet' organic portion of MSW. The poor performance of those composting facilities might be ascribed to technical, financial, and operations' management factors, in addition to the use of mixed waste that produces low quality compost and raises the operational costs of



Above: Photo 5 Self ignition of waste at an uncontrolled dumpsite in Fayoum Governorate

Down: Photo 6 Accumulated waste plateau adjacent to the compost plant in Tanta, Al Gharbya Governorate

Governorate	Composting Plants ¹⁹		No. of Final Disposal Sites ¹⁹		
	No. of Plants/ Location	Efficiency (%)	Uncontrolled Dump	Controlled Dumpsite	Landfill
Cairo	3 / Katammia	45	-	2	2
	1 / Al-Salam city	45			
	2 / 15th Might city	75			
	2 / Abo-Rawash	65% for a plant ^b			
Alexandria	1 / Abees 1		-	-	2
	1 / Abees 2				
	1 / Al-Montaza				
Kalyobiya	1 / Abo-Zaabal	Not working	-	1	-
Dakahlia	1 / Mansoura	Not working	7	9	-
	1 / Mataria	Not working			
	1 / Balcas	30			
	1 / Meet Ghamr	60			
	1 / Kalabsho	60			
	1 / Agaa	70			
	1/ Manzala	70			
Al Gharbya	1 / Al-Mahala	40	4	3	1
	1 / Tanta	60			
	1 / Sadaat	-			
Monofiya	1 / Monuf	30	9	0	1
	1 / Koisna	80			
	1 / Al-Shohada	80			
El-Beheira	1 / Damanhour	30	14	-	-
	1 / Kafr El-Dawar	60			
	1 / Edco	60			
Kafr El-Sheikh	1 / Kafr El-Sheikh city	Not working	-	10	-
	1 / Sidi Salem	10			
	1 / Beylla	50			
Sharqia	2 / Zagazig	80% For a plant ^b	14	-	1
	1 / Belbis	65			
	1 / Abu Kbir	65			
Damietta	1 / Damietta	75	6	-	-
	1 //Faraskoor	75			
	1 / Ras El Bar	30			
Ismailia	2 / Aboo Balah	30	5	1	-
Port Said	1 / Port Said	40	-	2	1
Suez	1 / Suez	70	-	-	1
Matruh	1 / Marsa Matruh	50	-	1	-
North Sinai	1 / Aries	20	-	6	-
South Sinai	1 / Sharm El-Sheikh	60	3	-	-

Governorate	Composting Plants ¹⁹		No. of Final Disposal Sites ¹⁹		
	No. of Plants/ Location	Efficiency (%)	Uncontrolled Dump	Controlled Dumpsite	Landfill
Giza	3 / Shobrament	45% for 2 plants ^b	-	1	-
	2 / Abo-Rawash	65% for a plant ^b			
	1 / Sidi Salem	10			
	1 / Beylla	50			
Fayoum	1 / Al-Adwaa	40	5	2	-
Bani Souwaif	1 / New Bani Souwaif	40	N/A	N/A	N/A
	1 / Samasta	50			
Menia	1 / Menia	40	-	9	-
	1 / Mallawy	60			
	1 / Adwa	70			
Assiut	1 / Bani Ghaleb	40	0	1	-
Sohag	1 / Al-Gabal AL-Gharby	30	11	3	-
Qena	1 / Qena/	40	9	-	-
	1 / Nagaa Hamadi	40			
Aswan	1 / Aswan	40	N/A	N/A	N/A
	1 / Edfoo	50			
Luxor	1 / Gobeel	70	2	2	-
Red Sea	1 / Hurghada	60	5	1	-
New Valley	2 / Kharga		0	6	-

Table 7B Composting facilities and final disposal sites in upper Egypt Governorates

^a The capacity of each compost plant is 160 tonnes/day

^b In addition to a plant in maintenance

Source: EEAA, July 2012

the plants. Other restricts are the unavailability of proper budget for operation and maintenance, as well as the absence of qualified workforce and marketing departments.

The environmental benefits of composting organic biodegradable waste are:

- Composting organic matter rather than disposing in dumpsites or landfills lessens the emission of greenhouse gases like methane.
- Using compost as a fertiliser reduces the demands for chemical fertilisers, and stimulates higher crop harvest.
- Compost ameliorates soil conditions, and might be used to remediate contaminants through varied chemical, physical and biological reactions. Compost has also been shown to adsorb potential toxic elements thus preventing them from migrating into groundwater or absorbed by crops.

At the National level, most nuisances are strongly connected with the inappropriate treatment of the organic fraction of municipal solid waste (OMSW). Composting is the customized technology for such treatment in Egypt. However, anaerobic digestion (AD) might be a more constructive option to dispense OMSW. Both treatment options reduce the environmental

Inconvenience and enable the production of a good soil conditioner rich in plant nutrients (Photo 7). Moreover, in the case of AD, biogas is generated. Nowadays, where energy sources are threatened, expensive to operate and maintain, production out of biodegradable waste is economically feasible. Thus, AD is realizing more relevance in SWM.

Box 3 establishing an organisation for the implementation and consolidation of biological treatment of biodegradable waste

It is a necessitous to institute a self-governing organisation dedicated for the implementation and consolidation of biological treatment of biodegradable waste. It is recommended to start a National Expert Knowledge Centre. The centre should be part of or under the supervision of a governmental organisation (e.g. MSEA) and should amongst others tackle the following activities:

- Organise and collect information on the technical and managerial aspects of biodegradable waste management including collection of source

separated biodegradable waste, digester technology, composting technology and marketing of biogas and compost

- Capacity building
- Raising awareness of composting and digestion
- Develop and carry out demonstration projects
- Disseminate knowledge and information: e.g. publish newsletters, organise workshops, etc
- Consultancy on design and implementation
- Helpdesk function, assist local operators with operational problems (troubleshooting)

Photo 7 The Compost plant in Beila, Kafr El-Sheikh Governorate



Anaerobic digestion projects should be further judged as a viable alternative, or supporting business activity, conducive of developing treatment projects with potential investment attraction.

The distribution of disposal facilities in the Governorates, including uncontrolled dumpsites, controlled dumpsites and landfills, is given in Table 7 A & B. Most of the waste ends up in uncontrolled dumpsites leading to meaningful environmental and health drawbacks. Moreover, the majority of the disposal sites lack: environmental monitoring, inspection and verification regime; means for controlling greenhouse emissions; appropriate management control in planning, implementing and monitoring services; use of appropriate personal protection equipment's and supporting procedures; and emergency actions to avoid the blow-out of fire.

Although establishing sanitary landfills are expensive, it is an essential environmental improvement over open dumping. The ISWM approach would gather stakeholders together (including local authorities, consumers and manufacturers) to recognize available opportunities for prevention, reduction, reuse and recycling of waste, as this will extensively reduce the sum of waste to be disposed. Mobilising the community, providing incentives and developing a set of sanctions for excess disposal will strengthen such initiative.

On the other hand, the disposal of refuse is a matter of increasing anxiety for municipalities throughout the world. As the existing disposal sites become filled to capacity and new landfills become costly to site, developing of alternative disposal methods is becoming life-threatening. In addition, the refuse being buried contains considerable quantities of energy that could replace conventional fossil fuels.

Today, the production of refuse derived fuels (RDF) is an integral part of waste management. With the spread of legal limits on or exclusions of the landfilling of untreated waste, and the prerequisite to extract energy from waste, RDF has become an important commodity (Photo 8). RDF involves organic components of MSW such as plastics and biodegradable waste compressed into pellets, bricks, or logs. Non-combustible materials such as glass and metals are detached during the post treatment processing cycle. The RDF could be used alongside traditional sources of fuel in coal power plants, cement kiln industry, plasma arc gasification modules, pyrolysis plants etc. RDF is efficient of being cleanly combusted and could offer a funding source where unused carbon credits are sold on the open market via a carbon exchange.

Box 4 Best Practices for Utilising Landfill Gas for Energy (LFGE) Technologies²³

The overall feasibility of an LFGE project for a particular landfill depends on numerous technical attentions, such as waste composition and volume, quality and quantity of LFG, and availability and location of a suitable end user. Understanding, evaluating and selecting the applicable LFGE utilisation technologies is crucial for the overall

feasibility and success of LFGE projects. Proven and emerging technologies bid practical solutions to effectively implement LFGE projects for direct-use and electricity generation, including the treatment of LFG to remove moisture, particulates and other impurities.

Photo 8 RDF production line at Suez compost plant

23. GMI (2012), "International Best Practices Guide for LFGE Projects, Chapter 4: Landfill Gas Energy Utilization Technologies", The Global Methane Initiative



At present, the challenge in the cement industry is the substitution of traditional fossil fuels with unconventional ones. At this effort of the cement industry to moderate energy costs, the use of RDF has been an eye-catching solution. Use of cement kilns to co-process RDF has a dual positive effects since not only there is the energy gain from a quantity which used to be rated as a waste stream but also elucidates the problem of space and adverse environmental impacts if this waste had been disposed in landfills.

The recent increase of fuel prices in Egypt is one of the main drivers to use substitute fuels such as RDF and agricultural biomass in cement industry. This could be deemed as Cleaner Production options since the consequential benefits are ²⁴ :

- Reduction in the quantities of waste going to disposal;
- Energy recovery from combustible wastes;
- Conservation of fossil fuels for future generations;
- Net reduction in emissions;
- Taking advantage of the CO2 trading rules; and
- Reduction in cement production costs.

Currently, Italcementi, Cimpor, Lavarge and CEMEX are in different stages of executing fuel switching processes²⁵. CEMEX cement in Assiut Governorate is substituting approximately 15.2% of their fuel with agricultural residues and is planning to expand to replace 50% of their energy by such residues by 2014. Italcementi and

Amreyah Cement will complete pilot trials for the use of rice straw and RDF in their cement kiln. Lafarge is implementing the first RDF plant in Suez Governorate as well as assessing the collection and use of rice straw in one kiln.

The cement industry has a momentous role to play in helping overcome the waste emergency in Egypt. The problems of MSW and agricultural residues might be solved by assuming a policy requiring all cement companies to use a percentage of RDF and biomass in their kilns. This would effectively create new jobs and reduce reliance on fossil fuels.

In Egypt there endures a whole informal sector of traditional waste collectors (zabaleen), scavengers and recyclers, whose business is to salvage 'waste' material. The informal sector reached high recovery rates (up to 80%) because the skill to recycle is vital for the livelihoods of the people involved ²⁵. Consequently, a massive variety of recyclables is segregated and could be further processed in accordance with new demands and technological advancements in the recycling activities.

On the other hand, as shown in Figure 9, the waste hierarchy is a key concept in decision making for waste planning and waste management. It provides a sliding scale on the preferred ways to deal with waste. The most favoured options sit at the top of the scale and the least preferred options at the bottom.

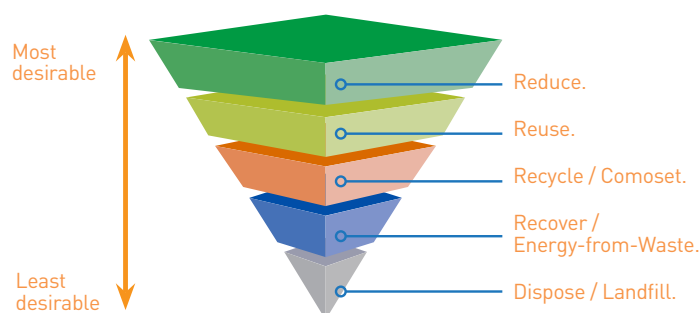


Figure 9 Waste hierarchy pyramid

Source: (<http://www.electronic-recycling.ie/blog/index.php/category/waste-to-energy/>)

24. Yasser Askar, Philip Jago, Mostafa M. Mourad and Donald Huisingh, "The Cement Industry in Egypt: Challenges and Innovative Cleaner Production Solutions", Knowledge Collaboration & Learning for Sustainable Innovation, ERSCP-EMSU conference, Delft, The Netherlands, October 25-29, 2010

25. Ellen Gunsilius (2010), "Role of the Informal Sector in SWM and Enabling Conditions for its Integration - Experience from GTZ", GTZ. (<http://www.transwaste.eu/file/001441.pdf>)

Box 5 Main principles of waste management hierarchy²²

1. Prevent the creation of waste in product design and packaging.
2. Reduce the toxicity and/or adverse impacts of the generated waste.
3. Reuse in their current forms the materials recovered from the waste stream.
4. Recycle, compost, and/or recover materials for use as direct or indirect inputs to new products.
5. Recover energy by incineration, anaerobic digestion and/or other similar processes.
6. Dispose of waste in an environmentally sound manner, generally in sanitary landfills.

The waste hierarchy inspires waste reduction, followed by reuse and refurbishment of goods, then value recovery through recycling and composting. The next option is energy recovery, the process of generating energy in the form of electricity and/or heat. This option sits in the hierarchy as a less favoured option to reducing waste, recycling or composting but is a slightly more favourable solution to landfill as the energy and heat could be utilised with the caution that pollution rises from the combustion process. Finally, waste disposal to landfill should only be used when no option further up the hierarchy is possible ^{26, 27}.

Box 6 Dutch successes: public and private sector aren't wasting their time²⁸

Due to its top-notch waste management structure, the Netherlands is able to recycle no less than 64% of its generated waste – and most of the remainder is incinerated to generate electricity. As a result, only a small percentage ends up in landfill. In the realm of recycling this is a country that is practically unique. The Dutch approach is simple: avoid generating waste as much as possible, recover the valuable raw materials from it, generate energy by incinerating residual waste, and only then dump what is left over – but do so in an environmentally friendly way.

A survey carried out revealed that separating waste is the most popular environmental measure among

Dutch people. More than 90% of Dutch people separate their household waste.

Lack of space and a growing environmental awareness forced the Dutch government to take measures early on to reduce the landfilling of waste. What ultimately proved to be the deciding factor in the Netherlands, were the regulations implemented by the Government. Introducing a tax on every tonne of material landfilled was a key as it gave waste processing companies the incentive to look for other methods – such as recycling and incinerating – simply because they were now much more attractive from a financial point of view.

In Egypt, due to absence of source separation of waste, there is no policy and practical focus on reduction and reuse of waste. The level of organisation in the informal waste sector is low and is limited to an organically grown structure of power and exploitation. Some influential *zabaleen* obtain licenses for waste collection and let others work for them under poor conditions. A few NGOs have come into view in the informal waste sector in recent decades,

promoting the interests of informal workers. Apart from the few NGOs, there are yet no waste pickers' organisations or cooperatives representing the interests of the poor and voiceless.

In the main, both public and private operators don't use appropriate personal protection equipment's or supporting procedures in recycling and composting facilities.

26. Lardinois, I. and C. Furedy. (1999). "Source Separation of Household Waste Materials - Analysis of Case Studies from Pakistan, the Philippines, India, Brazil, Argentina and the Netherlands", *Urban Waste Series 7*. Gouda, the Netherlands: WASTE

27. Gordon Feller, "Dutch Successes: Public and Private Sector aren't Wasting their Time", *Waste Management World* (<http://www.waste-management-world.com/articles/print/volume-11/issue-1/features/dutch-successes.html>)

28. CID Consulting (2008), "The Informal Sector in Waste Recycling in Egypt", GTZ

2.1.3 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

The current policy, institutional and legal framework for the WM sector is feeble. Institutional roles and responsibilities are indistinguishable and capacity is fragile, not only across Ministries, but also throughout Governorates, new communities and municipalities as well. The division of responsibility between Ministries is unclear, and this is the forerunner to duplicate effort, inefficient use of human resources, and lack of accountability.

Policy framework:

The Egyptian Environmental Policy Program (1999 – 2002) activity was to support policy, institutional, and regulatory reforms in the environmental sector, focusing on economic and institutional restrictions, abridged air pollution, improved solid waste management, and natural resources managed for environmental sustainability²⁹. The policy intentions that EEAA was pursuing to achieve include improving efficiency and performance of the SWM through a combination of strategic planning, improved administration, greater public awareness, as well as active participation of the private sector. For policy measures, EEAA would develop a national MSWM policy, through a national consultation process, including institutional, technical and economic modules, national targets, and recommended options for the segregation, collection and disposal of MSW.

MSEA/EEAA issued the National Strategy for Integrated Municipal Solid Waste Management in June 2000. The main policies adopted in the strategy were:

- The central government is the facilitator for implementing the strategy;
- The governorates and municipalities roles are planning, monitoring and control;
- Enhancing the principle of the private and public sectors and community participation in the different SWM stages in a cost-effective manner,

paving the way for investments in that field;

- The “polluter pays principle” and full cost recovery have to be applied to enhance private sector participation and system sustainability;
- Promoting recycling by encouraging recycling industries and developing markets for recycled products; and
- Increasing public involvement and awareness in the different dimensions of planning, development and implementation of the strategy.

However, many of the recommendations of the strategy did not find their way to apt implementation, though some dotted efforts and attempts for improvements were initiated¹. Analysis of the relevant performance indicators of the strategy targets and detected gaps are summarized in Table 8.

Legal framework:

Egypt doesn't have SWM legislation till now. The legal framework is dispersed in many pieces of bylaws, ordinances and regulations. The most considerable pieces of legislations are Law No. 38/1967 on General Public Cleaning and Law No. 4/1994 for the Protection of the Environment, amended by Law 9/2009.

Law 38/1967 as amended by Law 31/1976 regulates the collection and disposal of solid waste from residential, commercial, industrial and public areas. It imposes 2% of the rental value on all housing units as a cleanliness tax. The Law requires that a license be issued by the local council for all workers employed as waste collectors. Law 31/1976 considers domestic and industrial waste as garbage and solid wastes. It also specifies garbage containers, means of transportation and intervals of solid waste collection. Ministry of Housing Decree 134/1968 implementing Law 38/1967 governs the collection, transport and disposal of non-hazardous solid waste.

29. International Resources Group, Ltd. (2002), “Final Report Under Environmental Policy and Institutional Strengthening Indefinite Quantity Contract”, Egyptian Environmental Policy Program, Program Support Unit, USAID,

NATIONAL STRATEGY FOR THE YEAR 2000				
Pursued Target [Performance Indicator]	5 years target	10 years target	Current % of Implementation	Gap: 10 Yr Target
1) Min. Collection Coverage [Collection Efficiency]				
- Large cities	90%	99%	75%	24%
- Capital of Governorates	80%	90%	65%	25%
- Small provincial towns	70%	80%	50%	30%
- Large villages	60%	70%	30 - 40%	35%
2) Sanitary landfill disposal [% Landfill vs. total disposed]				
	80%	90%	5%	85%
3) Recovery [% Recovery vs. total generated]				
- Composting	50%	--	15%	35%
- Recycling	20%	--	5%	15%
4) Source separation (wet, dry & hazardous) [% SW separated at source]				
	40%	50%	1%	49%
5) Source reduction [% Reduction referred to normal growth]				
	--	5%	Zero%	100%
6) Cost Recovery]				
	100%	--	65%	35%
7) Funding				
	0.35%	--	0.10%	0.25%

Table 8 Analysis of SWM strategy targets, relevant performance indicators and gaps¹

The Executive Regulations of Law 4/1994 were promulgated by the Prime Ministers Decree 338/1995. Article 38 prohibits burning, disposal or treatment of solid waste except in designated areas far away from housing or industrial or agricultural areas as well as from waterways. Article 39 requires that collectors of waste maintain their garbage bins and vehicles in a clean state. The garbage contents should be collected and transported at suitable intervals according to the conditions of each area. The quantity of garbage should not exceed the capacity of any of these bins at any time. Moreover, Law 4/1994 also presents SW disposal area specifications.

Other relevant laws and regulations narrated to SWM are:

- Law 106/1976 organising construction works and construction and demolition debris (C&D);
- Article 117 of Law 137/1981 for occupational safety requiring employers to inform their workers of the hazards associated with the non-compliance with safety measures and that personal safety equipment, together with training on its use, should be provided to the worker;
- Law 48/1982 gives permitting authority to the Ministry of Irrigation to protect the River Nile and other waterways against pollution from solid waste;
- Presidential Decree 284/1983 establishing the Cairo and Giza Beautification and Cleansing Authorities;
- Law No.10/2005 establishing a solid waste collection fees ;
- Prime Minister Decree 1741/2005 amending the Executive Regulations of Law 4/1994 and covering regulations for the selection of sites for recycling and landfilling and equipment entailed for waste collection and transfer ;
- Article 37 (2) of Law. 9/2009 amending Law 4/1994 prohibits open burning of garbage and solid waste as well as placement, sorting, and treatment

of wastes in areas rather than those specified out of residential, industrial and agricultural areas and waterway; and

- Presidential Decree No. 86/2010 regulating the closure of existing dumping sites and the landfill at Greater Cairo and allocation of five new sites outside the residential and commercial belt of Greater Cairo.

The meagre implementation and enforcement of legislations in a concerted way is a major challenge facing the SWM sector. Legal provisions are too broad and general, or provide incomplete descriptions of a legal act, condition, or standard, or provide incomplete coverage of the range of issues that the law was designed to address causing gaps in legislation³⁰. Legislative gaps led to differing interpretations of the provisions of the law and therefore render the enforcement tough.

Laws 38/1967 and 4/1994 include a number of disparities that ought to be removed by amending the relevant provisions in both laws and their implementing regulations. Such amendments would help Governorates, towns and villages to effectively implement SW collection, transfer and disposal activities.

Legislations concerned with SWM are fragmented, and several laws include some clauses on rules/regulations regarding SWM. These rules and regulations, however, are enforced by different agencies. There is often duplication of responsibilities of the agencies involved and gaps/missing elements in the regulatory provisions for the development of operative SWM. It should also be mentioned that legislation will never be effective unless enforced. Therefore, comprehensive legislation that evades responsibilities duplication fulfils gaps of important regulatory functions, as enforcement is a requisite for sustainable development of the SWM.

30. Abt Associates Inc. and the Institute for Public -Private Partnerships (2001), "Contract Legal and Regulatory Framework - Solid Waste and Public Clean-Up Project, Governorate of Alexandria, Egypt", USAID

Institutional framework:

At the national level, the responsibility of SWM is still split between the Ministry of State for Environment Affairs/EEAA, Ministry of Local Development, Ministry of Housing, Ministry of Health and Population, Ministry of Irrigation and Water Resources, Ministry of Agriculture and Land Reclamation, Ministry of Industry and Trade, Ministry of Finance and Ministry of Investment. Such fragmentation led to unclear institutional roles and responsibilities, duplication of efforts and lack of technical, organisational, institutional capacity and accountability.

EEAA emanates the policy directives and acts as a general facilitator. EEAA ensures implementation of the provisions of environmental legislation and associated regulations and decrees, and assists governorates in identifying sites for waste facilities.

At the local level, the Governorates, municipalities, or cleansing and beautification agencies in large cities are responsible of handling the implementation and operation of SWM directly or through contracted international/local private companies, NGOs and informal sector “zabaleen”. Governorates are also responsible for setting regional strategies and planning, contracting, supervision and operation monitoring of private sector; enforcement of laws and regulations; training and public awareness. Few Governorates have a specialized unit for planning and managing SWM services. Generally, the Environmental Management Units (EMUs) participate in planning and supervision of SWM services.

Municipalities are responsible for implementation and monitoring of SWM, operating existing composting plants and supervising final waste disposal, either directly or through contracting a private company.

Cleansing and Beautification Agencies in large cities such as Cairo and Giza fulfil SWM, training and human resource development, monitoring and inspection. Recently, similar agencies have been established in Suez and Kafr El-Sheikh Governorates.

Because of the low priority given to SWM sector, the institutional capacity of local government agencies involved is generally vulnerable, particularly at Marakez and small cities level. Local ordinance/by-laws on SWM are also not well developed. These feeble local government institutions were neither provided with clear mandates nor sufficient resources to fulfil the mandates.

In 2009, The Egyptian Government established an Inter-Ministerial Committee (IMC), comprising representatives from key Ministries playing a role in the SWM sector. Since its establishment, the IMC’s consultative process has been supported by the German Government (through KfW and GIZ) and the European Union (EU). In 2010 a study was launched to support the IMC by analysing the sector framework, identifying and evaluating institutional reform options, determining the preferred institutional arrangements, preparing the NSWMP and necessary documentation to establish an investment and technical assistance (TA) programme from the German Government and EU.

2.1.4 STRATEGY AND ACTION PLANS

On September, 2013, a decision was made to establish a new “Integrated Solid Waste Management Sector (ISWMS)”, under the MSEA. The new national sector is intended to take charge of the SWM sector in Egypt and to implement the National Solid Waste Management Programme (NSWMP). The programme will be jointly supported by the EU and the German Cooperation, KfW and GIZ are the implementers of the programme together with the Egyptian side.

The NSWMP was established to support the setup of new and effective policy, legislation and institutional arrangements for WM at the National and Governorate levels in Egypt, coupled with enhanced professional capacity, and an investment pipeline for implementation of sectoral projects at both regional and local level³¹. The programme will be charged with the responsibility of developing policy and legislation, guiding the passage of this legislation through Parliament, promoting and managing investment from Government and international development partners, and strengthening the capacity of Governorates to prepare and implement bankable investment projects. This national entity will be a national centre of expertise in policy, legislation, strategy, technology and financing of WM.

The NSWMP will contribute in reforming the SWM sector of Egypt and to implement the related infrastructure step by step. It is

intended to make a significant contribution to the sustainable protection of environment and natural resources, to climate change adaptation and mitigation and to the reduction of health risks for the population of Egypt. Implementation of an enhanced SWM at the national and in particular regional and local levels will provide an opportunity to improve the living conditions of Egyptian citizens via the creation of employment as well as upgraded environmental conditions.

The projected results of the NSWMP are³³:

- Establishing WM policy supported by framework legislation and implementing regulations for precedence waste streams, and a developed institutional structure governing the waste management sector at the national and local level;
- Establishing investment pipeline, with implementation of WM concepts in four Governorates designed and implemented with multi-stakeholder participation;
- Enhancing professional capacity to direct, manage and implement policy, legislation, strategy, programs, projects and services;
- Setting up SWM plans at the national and local levels, with measures designed and implemented to increase service coverage and performance; and
- Involving civil society in the elaboration of policies and plans coupled with recognition of waste management & recycling as a profession.

31. *Environmental Resource Management and EcoConServ Environmental Solutions (December 2011), “National Solid Waste Management Programme Egypt, Final Report”, MoLD/EEAA/KfW/GIZ*

2.1.5 FINANCE AND COST RECOVERY

SWM consumes substantial financial resources, accounting for an important share of municipal expenditure across Egypt. Meanwhile, cost recovery levels are still very low. The main aftermath of the financial constraints is the shortage of coverage of the collection system that primarily touches poorer sectors of the population. In principle, cost recovery could be enhanced in several ways. Although poor households might not be willing to pay the full cost of basic waste collection and disposal services – in contrast to services such as drinking water – there is scope for improvement in the generation of revenues to finance expanded services.

In Egypt, MSWM displays three characteristics:

- i) Intensive labour, partially because they are relatively cheap and partly due to over-hiring for political reasons;
- ii) Recycling is wide spread. Labour intensive collection and processing of recyclable materials are initiated throughout the country. The zabaleen, for example, provide collection services in exchange for the opportunity to extract recyclable materials for resale. Moreover, scavengers pick out the waste from the bins, collection points and dumpsites and sell the recyclable materials; and
- iii) MSWM is often inefficient.

Economic and industrial development plays key roles in SWM. Obviously, an enhanced economy empowers more funds to be allocated for SWM, providing a more sustainable financial basis. However, by definition, developing countries have ineffectual economic bases and, hence, deficient funds for sustainable development of SWM.

There are restricted economics of scale available in SW collection. Although urbanisation intensifies the concentration per square meter of MSW, which might lower the average cost of collection, it also tends to increase the cost of MSWM because low-income urban areas are often characterized with narrow or congested streets that could not support large collection trucks³².

Disposal and treatment seems to display greater economies of scale associated with WM facilities. This suggests that collection services are best delivered on a decentralised basis, whereas it might be more cost-effective for treatment and disposal facilities to be consolidated at a regional level.

The adequate financing of MSWM in Egypt is one of the most critical elements hindering the development and sustainability of a proper and efficient system. A wide gap between the available/ allocated funding and the actual requirements exists and is expected to increase due to increasing population, urbanisation, waste generations, and the heavy burden on the national budget that might reprioritise the justifiable WM financial requests.

Public authorities are finding it difficult to raise the necessary finance to meet the required costs. Often they are compelled to concentrate on urgent needs – collection – to the detriment of processing, the result being that they incur high costs while achieving poor performances. Under these contexts sustainable waste management seems difficult to envisage.

The Egyptian central Government does not have specific financial allocations for MSWM and when transfers are made to local Governorates, they are usually insufficient. The local governments are obliged to avail some funding for waste management; however, this is also insufficient. All the officials interviewed, in the selected Governorates, were complaining from the insufficient financial allocations directed to SWM from the Central Government, in addition to their deprived resources.

The current revenue directed to MSWM comes from a tax on the electricity bill together with modest payments to service providers. In most of the visited cities in the selected Governorates, the fees are collected through electricity bills. Some exceptions were witnessed in Assiut and Fayoum Governorates. Service fee collectors go door to door to gather the fees in Fayoum

32. Stefano Pagiola, Roberto Martin-Hurtado, Priya Shyamsundar, Muthukumara Mani, Patricia Silva, December 2002, "Generating Public Sector Resources to Finance Sustainable Development: Revenue and Incentive Effects", The World Bank

Governorate's cities. On the other hand, in rural areas, this system is generally not applied. In some villages, NGOs collect fees and conduct SW collection services.

Furthermore, full cost accounting (FCA) is a tool that could help local governments to precisely and consistently assess the full costs of managing MSW³³. Local governments could use these data to reveal the costs of MSWM, discuss those costs with their citizens, and identify potential cost savings. Further, FCA data could be used to help establish rates and user fees that are sufficient to recover the full costs of the MSW services provided.

In order to precisely calculate the full cost of MSW services and programmes, the local government must identify all the direct and indirect costs coupled with providing MSW services. Habitually, direct costs include wages and benefits; general operations and maintenance; depreciation of assets; and amortisation of future outlays. On the other hand, indirect costs represent the costs of essential services provided to the MSW program by other departments or agencies of the local government, as well as costs incurred by other government entities for general administration and executive oversight. Non-fee revenues, such as interest income and sales of recyclables, are then subtracted from the total costs to calculate the net cost of the MSW services.

Upon our request from the officials in the selected Governorates, only Fayoum and Kalyobiya Governorates provided us with incomplete MSW revenues and expenses data (cf. Table 9).

From Table 9 we might observe the following:

- i) Kalyobiya Governorate officials didn't provide any data covering general operations and maintenance or depreciation of assets. On the other hand, Fayoum Governorate provided these figures for some Marakez only.
- ii) Kalyobiya Governorate officials didn't provide any data on Governmental and Governorate allocations.
- iii) The difference between the provided figures of fees for services in both

- Governorates is sizeable and could not be explained by population differences alone.
- iv) The figures indicate that break-even is almost reached in Kalyobiya Governorate while the gap between the revenues and expenses in Fayoum is considerable.

Due to the evident anomaly and lack of data, the calculated cost of solid waste services is not accurate and thus could not be used for estimating the service or even setting appropriate rates and user charges. Substantial effort is essential to accurately and systematically calculate the costs and revenues of MSW services. This highlights the weight of establishing an entity that collects and accounts for MSW data using FCA in each Governorate.

Local industry that produces relatively inexpensive SW equipment's and vehicles will reduce, or in some cases could eliminate totally, the need for importing expensive foreign equipment/vehicles and therefore foreign exchange. Such local industry could also supply associated spare parts, lack of which is often responsible for irregular and insufficient SW collection and disposal services. However, the lack of industry manufacturing SW equipment's and spare parts and a limited foreign exchange for importing such equipment/spare parts are the rule rather than exception. Moreover, most of the locally manufactured compost plants face problems in their operation and maintenance. Citizens in most Governorates have lost confidence in witnessing a substantial improvement on the short term and accordingly, their engagement and participation in building a civilised SWM have eroded which compounded the existing challenge and led to higher and prompt financial demands necessary for fast actions.

The government's desire to attract investments in SWM projects, whether in actual operations or treatment projects, is confronted with conspicuous reluctance due to many uncertainties where financial concerns come as a main issue.

Table 9 Annual expenses and revenues of MSWM in some of the selected Governorates in 2012

33. US EPA (September, 1997), "Full Cost Accounting for Municipal Solid Waste Management: A Handbook"; and Tetra Tech EM Inc. (1997), "Municipal Solid Waste Management Full Cost Accounting Workbook for Local Governments in Florida", Florida Department of Environmental Protection.

Markez	Expenses (L.E.)				Revenue (L.E.)		
	Total Annual Wages and Benefits	Operation and Maintenance	New equipment and trucks	Annual Depreciation Expense	Waste collection containers and establishing new sites/ facilities	Fees for service	Governorate allocations
Fayoum Governorate							
Fayoum	3,326,144	620,190	3,050,000	NA	350,000	699,332	350,000
Ebshway	1,440,000	500,000	1,000,000	250,000	300,000	85,000	NA
Yousef El-Sedeek	150,000	150,000	400,000	150,000	200,000	35,000	120,000
Tamia	394,265	240,020		NA	20,000	123,432	NA
Atsa	NA	88,000	670,000	NA	NA	48,000	NA
Senuris	6,012,000	4,002,000	NA	NA	190,000	242,000	NA
Total	11,322,409	5,600,210	5,120,000	400,000	1,060,000	1,232,764	350,000
Total Revenue = 2,127,764 L.E.							545,000
Kalyobiya Governorate							
Banha		NA		NA		3,000,000	NA
Khanka		NA		NA		480,000	NA
Khosoos		NA		NA		7,560,000	NA
Kaha		NA		NA		252,000	NA
Kalyub		NA		NA		1,045,364	NA
Shibin Al-Kanater		NA		NA		721,704	NA
Shubra El-Kheima		NA		NA		1,404,000	NA
Tukh		NA		NA		652,836	NA
Al-Kanater Al-Khairia		NA		NA		1,010,328	NA
Kafr Shukr		NA		NA		306,360	NA
Total	1,741,899	NA	30,000,000	NA	1,000,000	31,622,016	NA
Total Expenses for the Governorate = 32,741,899 L.E.							Total Revenue = 31,622,016 L.E.

No.	Company	Service Area	Annual Value (Million LE)
1	AMA Arab Environment Co	Northern Zone	132.3
2	AMA Arab Environment Co	Western Zone	124
3	FCC	Eastern Zone	118.1
4	Misr Service	El-Marg	14.8
5	Europa 2000	Maadi and Helwan	53.3
6	Ertecaa	Manshiyat Nasser	5.8
7	ECARO	Recycling and disposal	20
8	EcoConServ	Medical waste management	7.4
9	Contractors		0.9
Total		476.6	

Table 10 Annual contract values of SWM companies serving Cairo Governorate¹⁹

Table 10 shows private sector participation in SWM activities in Cairo governorate.

According to official information¹⁹, the cost for collection, transport and disposal could reach 215 LE per ton and accordingly the private contracts might be subject to adjustments if the provided services are destined for improvement and sustainability.

In July 2012, the Central Department of Waste Management in EEAA, proposed an executive program to improve the MSW services in Egypt, based on:

- Removal of accumulated SW;
- Improving the efficiency of collection and transport of SW to prevent further accumulations;
- Establishing mobile and stationary transfer stations;
- Improving the efficiency of controlled dumpsites;
- Establishing waste recycling centres; and
- Establishing sanitary landfills.

The estimated required financial allocations to execute the proposed programme are 3,270.4 million LE, as given in Table 11. The shown requirements are estimates and could reach much higher values when other elements are considered such as labour and management financial requests, upgrading of existing composting facilities (a disputed issue) and others such as capacity building, public awareness..etc. As of April 2013, no budget was allocated by the authorities for this programme.

Table 11 EEAA required financial allocations to improve the MSW services¹⁹

2.1.6 PRIVATE SECTOR PARTICIPATION

The private sector engagement in MSWM confronted several challenges and contractual disputes rendering a less than satisfactory performance and a reduced capability to provide a tangible improved service.

Traditionally, and for an extended period over the last years up to the early nineties, the Egyptian population relied on what was

considered an effective and convenient waste collection system managed by the informal sector or the "zabaleen". Those collectors were assigned by major informal operators to collect the household, commercial and to a lower extent, industrial wastes. The monthly collection fees were somewhat reasonable and the collection service was adequate. However, the rest of the SWM activities were left to the operators to decide on the disposal and recycling methodologies.

Governorate	Cost (Million LE)						Total (Million LE)
	Remove Accumulation	Improving collection / transport efficiency	Establishing mobile and stationary transfer stations	Establishing recycling centres	Improving controlled dumpsites	Establishing sanitary landfills	
Cairo	-	13	193	30	40	30	306
Giza	-	30	96	10	10	30	196
Alexandria	10.3	17	46	5	-	-	78.3
Kalyobiya		19.5	73.5	10	10	30	143
Dakahliya	112	56.5	124	10	-	30	332.5
Al Gharbiya	30	31.5	64	10	-	30	165.5
Monofiya	5.6	30	70	10	-	30	148.6
Al-Beheira	12	47	97	10	-	40	206
Kafr El-Sheikh	4.5	27	70	10	-	30	141.5
Sharqia	10	48.5	70	10	-	30	168.5
Damietta	3	26	40	10	-	15	94
Ismailia	7	17.5	27	5	-	15	71.5
Port Said	6	7	14.5	10	5	-	42.5
Suez	3.5	7.5	14.5	5	5	-	35.5
Fayoum	4.5	20	34	5	-	30	94
Bani Souwaif	2.25	22	47	5	-	30	106.25
Menia	10	28.5	60	10	-	30	138.5
Assiut	3.75	28.5	60	5	-	30	127.25
Sohag	4.5	35	73	10	-	30	152.5
Qena	4.5	30.5	43	10	-	30	118
Aswan	6	17	33.5	5	-	15	76.5
Luxor	2	2	15	5	-	15	39
Red Sea	7.5	14	20	5	-	15	61.5
Matruh	-	26	29	5	-	15	75
North Sinai	-	31	16	5	-	15	67
South Sinai	7.5	15	21	5	-	30	78.5
New Valley	-	15	2	-	-	15	32
TOTAL	256.4	666	1453	215	70	610	3270.4

Several MSW informal communities developed and rooted within the society employing a significant number of informal labour spread all over the waste activities.

The increased population and rapid urbanisation in greater Governorates such as Cairo, Giza, Alexandria, and Kalyobiya have built noticeable and accumulated burdens on the waste activities' system that led to negative mis-management signs, by the limited capability informal sector and the weak public system, to become obvious and bothersome.

Elkouedi and Madbouly in their report "Tackling the Shelter Challenge of Cities" stated that the rapid expansion of the built-up area within the Greater Cairo Region reached up to 270%, as shown in Figures 10 & 11³⁴.

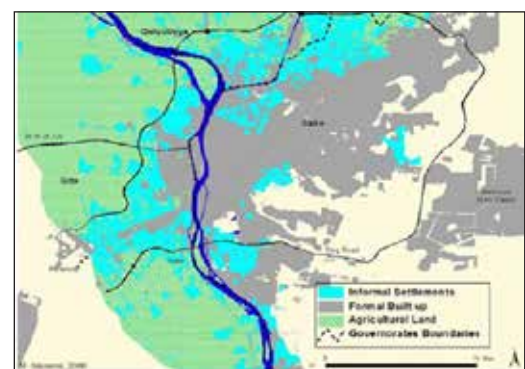
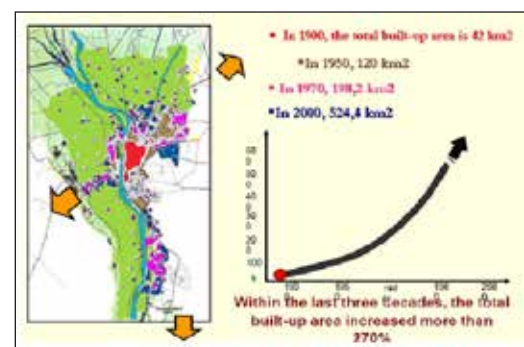
This exponential growth of waste calls for a change in practices. ISWM means reducing the volume of waste at source, improving sorting, and increasing recycling and waste recovery in the form of compost or energy. However, developing the waste sector entails investment and competencies that the public sector is not always in a position to provide. Local authorities are therefore turning to the private sector, hoping to benefit from its know-how and competitive prices. Private entities are mainly involved in waste collection, but also in recycling. The treatment of waste and derived products offers new economic opportunities for the private sector.

It is worthy to note the observations of the Ministry of Housing, the general planning authority that concise the general challenges of the rapid urbanisation as it alters the SWM activities in major urban areas (Figure 12)³⁵. Their described challenges cover:

- The unplanned growth of the built-up area;
- The excessive pressure on infrastructure;
- Environmental degradation and high rates of pollution.

- Major traffic and transportation problems within the region;
- Lack of coherent institutional framework to manage the region;
- Weak of connectivity between existing built-up area and new urban communities. and
- The economic competitiveness of the region

The general population, as well as the official entities, were obliged to look for workable options to assist and share in the mitigation of what became a chronic SWM problem. Figure 12, illustrates the degree of satisfaction of citizens with regards to provided public services³⁵.



Above: Figure 10 The development of urban built-up area of Greater Cairo Region³⁵

Down: Figure 11 Extent of informal settlements in Greater Cairo Region³⁵

34. H. Elkouedi and M. Madbouly (2007), "Tackling the Shelter Challenge of Cities: Thinking it Through Together – Cairo, Egypt", General Organisation of Physical Planning, Ministry of Housing Utilities and Urban Development, World Bank

EEAA with the assistance of some donors, started boarding the engagement the private sector WM operators beginning with the two major Governorates, i.e., Alexandria and Greater Cairo. Draft contracts were prepared, tenders were issued, and actual private operations were implemented with an almost integrated approach.

Tables 12 A & B show the executive stance of SWM projects and public cleaning in the Governorates, based on EEAA State of the Environment Report of 2004, issued Might 2005 . Since the issue of that report, several modifications occurred where some of the private operators terminated their contracts or are on the process of termination.

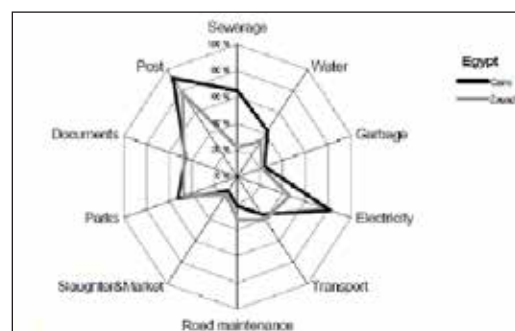


Figure 12 Citizens satisfaction by selected services³⁵

Governorate	Executive Stance from Privatisation in 2004 ³⁶	Current Situation
Aswan	Care Service Company, a Spanish Company and Delta Company	Local councils in the cities
Giza	Southern area: Al Giza Company for Environmental Services (FCC Spanish Company)	Al Haram district: Enviro Master Co.
	Northern area: The International Company for Environmental Services (Jackros Italian Company)	Northern area, Dokki and Agouza districts: International Environmental Services
	Giza Cleanliness and Beautification Authority	Other areas and districts: Giza Cleanliness and Beautification Authority
Qena	The project is self implemented in Qena city and other governorate cities and youth graduates are being employed	SWM activities is implemented by the Governorate and local councils
Luxor	Amoun Cleanliness and Beautification	General administration of cleanliness and beautification in Luxor city
New Vally	The project is self implemented and youth graduates are being employed	General administration of cleanliness and beautification in the cities
Fayoum	SWIM Process not privatized	General councils in the cities
Assiut	SWIM Process not privatized	SWM activities is implemented by the general councils in the cities, except for East Assiut district
Red Sea	SWIM Process not privatized	HEPCA company covers the area from Port Ghalib to Beranice; Ras Gharib city: Egyptian environmental services Co.; Safaga and Koser cities: El-Noor cleansing Co.; and Shalateen: Association for the protection of the Red Sea
Beni Suef	SWIM Process not privatized	General councils in the cities
Sohag	SWIM Process not privatized	General councils in the cities

Table 12A The executive stance of SWM projects and public cleaning in upper Egypt Governorates

35. EEAA (2005), "Egypt State of the Environment Report 2004 – Annex 3", MSEA (http://www.eeaa.gov.eg/english/info/report_soe2005.asp)

Governorate	Executive Stance from Privatisation in 2004 ³⁶	Current Situation ¹⁹
Alexandria	Onyx French Company	Veolia terminated the contract in Oct. 2011. Arab Contractors Co. is currently contracted
North Sinai	Hilo Care Company of Al Areesh region	Al Areesh region: Care Service Co.; other cities in the Governorate: General administration of cleanliness and beautification of the cities
Suez	Kuwaiti Tanzifco	The Governorate terminated the contract in March 31, 2012 and established Suez Cleanliness and Beautification Unit
Port Said	Misr Service Company	General administration of cleanliness and beautification of the city
Cairo	Northern area: Om Al Arab and the Arab Contractors companies	Northern area: AMA Arab Environment Co
	Western area: Europe Seir Spanish Company	Western area: AMA Arab Environment Co
	Eastern area: FCC Spanish Company	Eastern area: FCC Spanish Company
	Misr Service Company	General administration of cleanliness and beautification of the city
	Southern area: Europe 2000 and Al Fostat companies	The Governorate terminated the contract in March 31, 2012 and established Suez Cleanliness and Beautification Unit
	Sayeda Zeinab, Misr El Kadima, Khalipha, Mokattam, Dar el Salaam, El Basateen districts: Al Fostat CO.	General administration of cleanliness and beautification of the city
	Northern area: The International Company for Environmental Services (Jackros Italian Company)	Maadi and Torra: Europa 2000; El-Marg: Misr Service; 15th Might: ECARU; Helwan, El Maasara and El Tebeen: Arab Contractors Co.; Manshiyat Nasser: Ertecaa
Al Gharbia	Cairo Service Company in Tanta city and Al Nagar service Company in Mahla	SWM activities is implemented by a Cleanliness and Beautification Unit
Damietta	Hilo Care Service Company in Tanta and Ras El Bar cities (It works in Ras El Bar during summer)	General councils in the cities
Dakahlia	SWIM Process not privatized	The Ministry of Local Development contracted ECARU Co. and Retsi Land Co. as of 7/1/2013
Sharkiya	SWIM Process not privatized	General councils in the cities
Kafr Al Sheikh	SWIM Process not privatized	Kafr Al Sheikh Cleanliness and Beautification Unit established in 2012
Menoufia	SWIM Process not privatized	General councils in the cities
South Sinai	SWIM Process not privatized	Sharm El Sheikh city: Sharm Environmental Services Co.; Dahab and Nuweiba cities: Hemaia NGO; other cities: general councils
Ismailiya	SWIM Process not privatized	General councils in the cities
Matrouh	SWIM Process not privatized	General councils in the cities
Kalyobiya	SWIM Process not privatized	SWM activities is implemented by the Governorate, except Shubra El-Kheima Markez that uses private contractors
Al Behira	SWIM Process not privatized	General councils in the cities

Box 7 Formalisation of the traditional garbage collectors

While waste management is a serious problem for many rapidly growing megacities in developing countries, inhabitants in Cairo used to benefit from a comparatively well-functioning waste removal system⁴. The zabaleen – traditional garbage collectors – have been providing door-to-door household waste collection for the past six decades. They consider household waste as an important economic resource.

In the 1980s several NGOs started their work with the traditional garbage collectors, striving to improve their living conditions and professionalise work. They helped them to diversify their income generating activities by setting up small recycling workshops. This enabled the zabaleen to achieve high recycling quotas.

To reform the sector, Cairo city administration commissioned several multinationals to take over the MSWM services in 2003. This decision deprived the traditional garbage collectors of their previous entitlement to the waste, their main source of income. Although the traditional garbage collectors have utilised creative and flexible strategies to adapt to the new situation, their degree of vulnerability has increased considerably. In addition, the reform also failed to achieve the aim of an ecologically, economically, and socially sustainable waste management.

In order to adapt to the present situation, the following initiatives were taken to upgrade the level of knowledge and skills of the traditional garbage collectors and integrate them in the MSW sector in a formalised manner³⁷:

- Forty four companies have been already formed by the new generation of the traditional garbage collectors and six companies are in the process of setting up.
- Training programs covering legal, administrative, and financial issues were conducted for the companies' staff.
- Twenty Five plastic workshops, located in two different settlements of traditional garbage collectors, have been upgraded in terms of health and industrial safety standards to meet the requirements of the governmental authorities.
- A new syndicate has been set up.
- The "Recycling School" project, established in 2002, still operates and is financially and technically sustainable. The project received the Schwab Award in 2006 and other national and international recognition.
- A pilot e-waste initiative was initiated in Mokattam to provide employment for female waste workers, generate income, and preserve the local environment.

Since the first inception and implementation of private sector participation in MSWM, the overall experience and results were less than enough. The reasons are varied and controversial, and government interventions were again dominant while lacking the basic technical, institutional and financial means to face and manage the massive waste management problem.

The consequence of these capacity confines at the institutional level is that the contracts fulfilled between Governorates and private enterprises were of poor quality. Some of the primary issues of concern are the unclear definition of roles and responsibilities and inadequate risk mitigative measures. Another issue is the shift to contract for more services than for which the Governorates are able to pay. Once the services have been billed, the Governorates would delay payment or try to lower the billed amounts by querying the service provided.

Given the described facts, the current scene of MSWM in Egypt is turbulent. Public services are inefficient and financially constrained, private sector activities are suffering from contractual and financial constraints, the informal sector has narrowed their engagement to what they believe a profitable engagement (recycling), WM operations such as composting are failing in their majority, and the official capability of attracting serious investments in MSWM is non-existing. Several studies were conducted on PSP in MSWM, and the most recent was the world bank-funded study "Private Sector Participation in the Municipal Solid Waste Management Sector in Egypt" in late 2010, have sufficiently designated the major aspects and engagements (or the lack-of) in the national effort²².

Table 12B The executive stance of SWM projects and public cleaning in the northern Governorates

I) MSWM STAKEHOLDERS' IDENTIFICATION AND ENGAGEMENTS:

Comprehensive identification of engaged stakeholders in MSWM is fundamental and vital for the proper development of efficient and workable solutions. The stakeholders analysis and targeted consultations are cornerstones for attaining a common understanding and planning of MSWM activities with PSP at the heart of the effort.

The current (and targeted) MSWM stakeholders include:

- Ministry of State for Environmental affairs (and the EEAA);
- Ministry of Local Development;
- Ministry of Health;
- Ministry of finance (national budget and PPP centre);
- Ministry of Military Production (local recycling equipment manufacturer);
- Governorates;
- Cleansing and Beautification Authorities;
- Contracted Private SWM Operators (local and international), municipal waste and healthcare waste;
- Private MSWM composting operators;
- Informal Sector (Recyclers);
- NGOs;
- International Development Organisations (Donors); and
- Financial Institutions.

Each of the mentioned stakeholders should have a well-defined role and responsibility for the setup and organisation of an efficient MSWM. Identifying and sketching specific duties for each stakeholder, coordination of these duties, establishing the supporting legislative measures, allocating the financial resources, building the capable institutional structure, and assigning a 'coordinating authority' are some of the urgent tasks needed for efficient system management.

II) CURRENT OBSTACLES TO PSP IN MSWM^{21, 36, 37}

- Lack of a national consensus on a MSWM strategy and action plan;
- Lack of official capability to manage

a healthy public-private business relationship;

- Lack of official capability to articulate, monitor and implement a fair and workable public-private SWM contracts;
- Lack of financial resources and mechanisms to support PSP in MSWM;
- Absence of some legislative measures indispensable for developing and enforcing the proper MSWM culture;
- Lack of a clear priority of MSWM activities' planning and implementation;
- Lack of policy framework for solid waste management;
- Absence of a unified entity for solid waste management at the central level;
- Controversial public financial allocations for MSWM projects;
- Incapability of designing and implementing a healthy and fair formal-informal relationship;
- Lack of clear official financial commitment to support MSWM integrated activities;
- Lack of collaboration and coordination within public entities conducive of establishing the sustainable MSWM;
- Lack of accurate national data / information / statistics on MSW supportive of informed private sector engagement and proper MSWM projects' development;
- Lack of public confidence and willingness to support MSWM services;
- Access to finance, especially for SMEs, persists an impediment to private sector development;
- Reluctance of the Egyptian financial institutions to secure meaningful MSWM activities; and
- Lack of Donors' dialogue to harmonise their support of the SWM effort in Egypt

III) SOCIO-ECONOMIC AND POLITICAL SITUATION:

With regard to existing challenges tackling the MSWM endeavour in general and PSP in particular, the current political situation and its impact on the socio-economic scene have a significant backing in exacerbating the faced challenges that necessitates special highlighting.

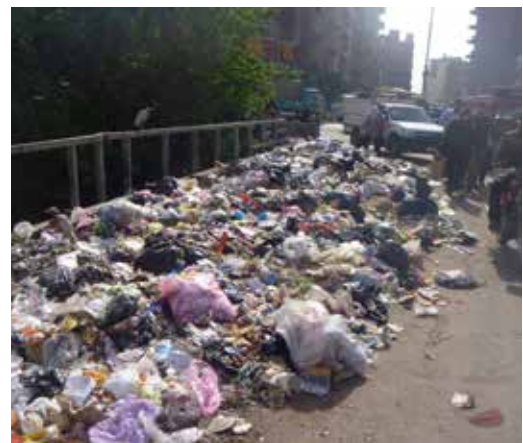
36. GTZ (2005), "Private Sector Involvement in Solid Waste Management – Avoiding Problems and Building on Successes"

37. Document of the European Bank for Reconstruction and Development, "Egypt: Country Assessment", as approved by the Board of Directors at its meeting of 31 October 2012

2.1.7 ENVIRONMENTAL AND SOCIAL ASPECTS

SWM is becoming a major environmental and public health anxiety in Egypt. The public sector is impotent to deliver SWM services effectively, the private sector participation is constrained and dumping of waste is a common practice. Limited funds are provided to the sector by the Government and the levels of services required are not always attained.

Improper MSW disposal and management initiates all types of pollution: air, soil and water. Indiscriminate dumping of wastes contaminates surface and ground water supplies³⁸. Uncontrolled burning of MSW contributes appreciably to urban air pollution. Greenhouse gases are generated from the decomposition of organic wastes in dumpsites and landfills, and untreated leachate pollutes surrounding soil and water ecosystems. Insect and rodent vectors are attracted to the waste and could spread diseases (Photos 9 & 10).



Above: Photo 9 Self burning of MSW at Samanoud dumpsite plateau, Al Gharbya Governorate

Down: Photo 10 Household waste dumped on a bridge in Tanta city

38. Pervez Alam and Kafeel Ahmade (2013), "Impact of Solid Waste on Health and the Environment", *International Journal of Sustainable Development and Green Economics (IJSDEGE)*, V-2, I-1, 2

Waste worker and pickers are not often protected from direct contact and injury. The co-disposal of hazardous and medical wastes with MSW presents serious health threat. Exhaust fumes from waste collection vehicles, dust stemming from disposal practices and the open burning of waste also weigh in health problems. People know that poor sanitation disturbs their health, especially in developing and low-income countries, where the people are the most willing to pay for environmental improvements³⁹.

Most adverse environmental impacts from SWM are rooted in inadequate or incomplete collection and recovery of recyclable or reusable items, as well as co-disposal of hazardous wastes⁴⁰. These impacts are also due to inappropriate siting, design, operation, or maintenance of dumpsites and landfills.

Improper waste management activities could increase disease transmission and threatens public health, contaminate ground and surface water, create greenhouse gas emissions and other air pollutants, damage ecosystems, injure people and property and discourages tourism and other business.

Environmentally sound WM must go beyond the mere safe disposal or recovery of wastes that are generated and seek to address the root cause of the problem by attempting to change unsustainable patterns of production and consumption⁴¹. This implies the application of the integrated life cycle management concept that portrays a unique opportunity to reconcile development with environmental protection. Accordingly, the framework for requisite action should be founded on a hierarchy of objectives and focused on the four major waste-related programme areas which are interrelated and mutually supportive. The framework must therefore be integrated in order to be a comprehensive and environmentally

responsive framework for MSWM:

- i) Waste minimisation;
- ii) Maximising environmentally sound waste reuse and recycling;
- iii) Promoting environmentally sound waste disposal and treatment; and
- iv) Extending waste service coverage.

Public awareness and community participation are well-thought-out as a prerequisite factor for establishing an effective SWM. The majority of the public lack for environmental ethics and awareness on the proper disposal of SW and the dangers that stem from disposal in open dumpsites.

The social settings had progressively given higher priority in waste management. Waste management programmes increasingly invest in communication, education, customer relations and equity issues. It has been established that further success of waste management to a great extent is directed by public participation depending largely on several social issues. To attain higher participation, public acceptability is entailed and fundamentally realised through further communication between waste management and the public.

Social aspects could not be separated



Photo 11 Waste pickers at a MSW collection point in Fayoum city

39. S. Goorah, M. Esmyot, and R. Boojhawon (2009), "The Health Impact of Nonhazardous Solid Waste Disposal in a Community", *Journal of Environment Health*, 72(1), 48-54

40. "Environmental Guidelines for Small-Scale Activities in Africa [EGSSAA], Chapter 15: Solid Waste: Generation, Handling, Treatment and Disposal", (IRG) under USAID Africa Bureau's Environmental Compliance and Management Support (ENCAP) Program, January 2005

41. The Rio Earth Summit, Agenda 21 (1992), "Chapter2 1: Environmentally Sound Management of Solid Waste and Sewage-Related Issues", United Nations Sustainable Development (http://www.regency.org/earth_summit_92/chapter21.pdf)

from the overall SWM. Public awareness and public participation are major steps in effective implementation of the SWM. Therefore, environmental education from schools is indispensable to develop the awareness at the general public level.

One important aspect of the social sustainability is the fairness factor. The social equity is related to the issue of payment for the waste management service and the overall fairness of the payment system. It is commonly agreed upon in most waste management programmes that variable rates are fairer and provides a better incentive for waste reduction as the public will be charged on the basis of the quantity of waste they discard.

Social equity is an important aspect of waste management that indirectly impact, in a larger context, the behavioural approaches and management of other organisations and businesses in the community. On the micro level, the waste management level, the fairness discussion could be seen as fundamental for the system. As a service it should be provided to everyone and be open for everyone, also in terms of feedback and information provided.

Because of insufficient resources available in the Government sector, collaborative projects often have been attempted to mobilise community resources and develop community self-help activities. Results were a mixture of successes and failures. Failed

projects with inactive communities usually did not provide people in the community with economic as well as social incentives to participate in activities. The social incentive is based on the responsibility of individuals as part of the community for the improvement of the community, and is shaped by public awareness and school education programmes. The lack of public awareness and school education about the weight of proper solid waste management for health and well-being of citizens severely confines the use of community-based approaches.

At street refuse bins, collection points, transfer stations and dumpsites, waste picking activities are common scenes in Egypt (Photos 11 & 12). People involved have not received school education and vocational training to gain knowledge and skills required for other jobs. They are also confronted by limited employment opportunities available in the formal sector. The existence of waste pickers often conceives an obstacle to the operation of solid waste collection and disposal services. However, if organised properly, their activities might be effectively incorporated into a waste recycling system. Such an opportunistic approach is required for sustainable development of SWM programmes.



Photo 12 Waste pickers at Abu Zaabal dumpsite

2.2 INDUSTRIAL AND HAZARDOUS WASTE MANAGEMENT

2.2.1 GENERATION, TREATMENT AND DISPOSAL

In 2011 the industrial sector represented 37.6% of Egypt's GDP and the number of industrial enterprises is estimated at about 64,997. The industrial sector impacts environmental degradation in Egypt to a substantial extent. According to EEAA estimates, the generated industrial waste in 2001, 2006 and 2012 were 4,250,000; 4,750,000 and 6,000,000 tonnes, respectively⁴². However, there is disagreement in connection with these estimated figures, as the MoLD estimates generated industrial waste is only 2,906,895 tonnes in 2010⁴³.

For industrial non-hazardous waste collection, the service area might include industrial waste generators of all sizes and types. A strategic decision is what level of industrial waste collection service will be provided by the contractor. Depending on the quantity and physical characteristics of the industrial solid waste from small generators, a combined waste stream might be collected

as part of the MSW collection program. Small generators whose waste would be collected under the industrial or MSW collection program must be made to conform to the collection requirements intrinsic to either program.

In the two major industrial city areas, Cairo and Alexandria, the quantity of industrial hazardous waste generated is roughly estimated at 60,000 tonnes/year⁴², 28,000 of which in Alexandria. There are approximately eight industrial areas in Egypt generating different types and quantities of hazardous wastes. It is estimated that up to a total of 200,000 tonnes/year of hazardous waste are generated from these eight areas. Therefore, the estimated generated industrial hazardous waste is about 260,000 tonnes, in 2009. Another estimated figure for the generated industrial hazardous waste reached 300,000 – 500,000 tonnes, in 2011⁴³. This broad range validates the general lack of information available on the actual amount of industrial hazardous waste generated in Egypt.

Box 8 The Egyptian National Cleaner Production Centre (ENPCPC)⁴⁶

ENPCPC was established in 2005 by MTI in cooperation with UNIDO as a service provider for the Egyptian industry. ENPCPC provides technical assistance for technology transfer in the fields of resource efficiency, industrial waste valorisation and renewable energy applications.

ENPCPC services encompass implementation of waste management systems and recycling initiatives in industries. The services include assessment

of generated waste in terms of quantity and characteristics and identification of the best options for waste handling and management. This adds value to the industry and forms further economic opportunities from newly developed products based on the sustainable use of the generated waste from the different production process. Reuse and recycling of industrial waste save costs and originates both economic and environmental opportunities.

42. Enviro Associates International, Inc. (2009), "Feasibility Study for Hazardous Waste Management in Egypt", U.S. Trade and Development Agency (USTDA)/MSEA

43. Adel El-Shafei, "Hazardous Waste Management in Egypt – Current State of Play and Opportunities for Information Sharing", Shared Environmental Information System "ENPI-SEIS" Project" Workshop, 3-4 March 2011, Cairo House, EEAA/CAPMAS/CEDARE/European Environment Agency

A pilot environmentally sound and sustainable hazardous waste management system was founded in June 2005, as a joint effort between EEAA, Alexandria Governorate and the Ministry for Foreign Affairs of Finland, in Nasiriya, Alexandria. The system was established for prevention, minimisation, storing, collection, transportation, recycling, treatment and disposal of significant groups of hazardous - industrial waste, both organic and inorganic.

The Nasiriya Hazardous Waste Treatment Centre (NHWTC) is conceived for the treatment of inorganic hazardous waste and includes: a physical-chemical treatment plant for inorganic liquid hazardous waste; a solidification and stabilisation unit; storage units for organic and inorganic wastes; a hazardous landfill with a capacity of 40,000 tonnes and a surface area of 14,000 m², designed in accordance with the European standards; evaporation ponds with an area of 5,000 m² for leachate from the landfill; organic hazardous waste transfer station; and a laboratory.

NHWTC provides collection, transportation, treatment and final disposal services for hazardous industrial waste. Moreover, EEAA authorised three local private companies for transporting hazardous liquid and solid waste to the centre, in 2011. NHWTC has defined a price structure for the treatment of inorganic hazardous waste to be disposed of in the landfill, treated by physical-chemical methods or by solidification. "Polluter pays principle" has been agreed upon from the beginning of operations, meaning the price paid by hazardous waste producers covers the treatment cost as well as depreciations of the investments. Direct investment costs are not included in the treatment price.

As a result of cooperation between the Governments of South Korea and Egypt, the first facility for treatment of mercury in

wasted fluorescent lamps was established in 2011, at the NHWTC. The facility includes units for separation of mercury, glass, metal and other lamp components. Mercury bearing powder is heated up in a distiller to recover the mercury and the remaining waste is recycled. Moreover, two small incinerators were recently installed in NHWTC and used for disposal of solid organic hazardous wastes (primarily pharmaceutical wastes). Each incinerator is fitted out with a two-stage combustion system, including an afterburner, to destroy potential contaminants of concern and control the emissions⁴⁵.

Electronic appliances are composed of hundreds of different materials that could be both toxic but also of high value⁴⁶. While bulk materials such as iron, aluminium, plastics and glass account for over 80 weight %, valuable and toxic materials are found in smaller quantities but are still of high importance. The material composition of different appliances is often similar, but the percentage of different components could vary a lot. Gold, silver, copper, platinum etc. are valuable substances which turn recycling of e-waste into a lucrative business opportunity. On the other hand, recycling of hazardous substances, e.g. carcinogens such as lead and arsenic is crucial and poses considerable health risks and environment dangers if not properly handled.

The extensive uses of electrical and electronic equipment's have raised public awareness of the negative adverse environmental and health impacts associated with their inefficient management. No records for e-waste generation, however, are available. There are data gaps regarding the numbers of computers and mobile phones in Egypt. The absence of studies and reliable quantitative data makes it a challenge to assess the size of the problem and to plan appropriate e-waste management systems⁴⁷.

44. The Egyptian National Cleaner Production Centre URL (<http://encpc.org/en/services/technical-assistance/waste-management-recycling.html>)

45. Safeguards Diagnostic Review for Piloting the Use of Egyptian Systems to Address Environmental Issues in the Proposed GEF-Financed, "Equivalence and Acceptability Assessment Report", Egypt Sustainable Persistent Organic Pollutants (POPs) Management Project (P116230), Arab Republic of Egypt, Might, 2012

46. e-waste guide info URL (<http://ewasteguide.info/node/6>)

47. Leila Hassanin and Nahla Hassan (2011), "ICTs and environmental sustainability: Mapping national policy contexts - Egypt baseline study", Association for Progressive Communications (APC) and Arabdev (http://www.apc.org/en/system/files/EgyptFinalReport_Might2011.pdf)

The private sector looks to be taking the lead in e-waste management in Egypt. Small individual efforts are being made by telecommunication and computer companies to improve their e-waste management. Recently, three private companies were established, the first for refurbishing old ICT products and total recycling of e-waste, the second offers green recycling and data destruction services, and the third to refurbish, reuse and remanufacture ink and toner cartridges. The involvement of civil society in e-waste management is restrained and is mostly concentrated in the hands of groups traditionally involved in waste handling and recycling.

The Centre for Environment and Development for the Arab Region and Europe (CEDARE) organised a side event at the third SWEEP-Net Regional Forum on ISWM, held in Cairo, on May 14-16, 2013. CEDARE, together with the Swiss Federal Laboratories for Materials Science and Technology (Empa), had officially launched the Egyptian subproject of the new "Sustainable Recycling Industries" programme, which was funded by the Swiss State Secretariat of Economic Affairs (SECO) and supported by the Egypt Green ICT Initiative. Besides introducing the new project, the aim was to discuss how to address ecological challenges of e-waste, the need for regulatory developments and laws, and the potential for business opportunities through setting adequate standards and compliance schemes, as well as financing mechanisms related to extended producer responsibility (EPR). Details on e-waste management and the Egyptian subproject programme are given in Annex 2.

The health and environmental jeopardises of e-waste handling and dismantling are not common knowledge. EEAA and MCIT have planned several initiatives to raise public awareness, but not much has been implemented so far that reaches a critical mass when it comes to shifting public behaviour. It is also notable that there is no specious coordination with the MHP, even though this is a public health issue.

2.2.2 INSTITUTIONAL ARRANGEMENTS

There is an urgent need to adopt an industrial SWM programme including:

- Inventory of generated industrial waste - quantities and classification of all waste stream generated by each industry;
- Measures to prevent pollution or ecological degradation – details of steps taken to protect against impacts on the environment;
- Targets for waste minimisation through waste reduction, re-use, recycling and recovery;
- Measures to minimise the generation of waste and its final disposal;
- Measures or actions to be taken to manage waste;
- The phasing out of specified substances – identification of hazardous substances and identification of prospects to reduce or phase out the use of these substances in production processes;
- Opportunities for reduction of waste generation through changes in packaging, product design and/or production processes;
- Mechanisms for informing the public of the impacts of the waste generating products or packaging on the environment – education programs, labelling and other mechanisms for addressing extended producer responsibility (EPR);
- The extent of any financial contribution to be made to support consumer-based waste reduction programmes;
- The period that is required for implementation of the plan – a program including target dates for implementation of the waste management plan; and
- Methods for monitoring and reporting – details on how the waste implementation plan will be monitored and scope of reporting.

Law 4/1994 and its Executive Regulation define means of sound environmental management of hazardous substances and waste and sets requirements in coincidence with the Basel Convention of 1989 controlling trans-boundary movement of hazardous

waste and its disposal, which Egypt had ratified in 1993.

The twinning project with EU (2008 - 2011) supported EEAA in better addressing and fulfilling the requirements of the international standards of hazardous waste management, as well as the world conventions⁴⁸. A legislative framework integrating harmonised provisions of the EU legal framework on HS and HWM and the respective amendments to Law No. 4/1994 was drafted. A hazardous waste regulation including new definitions for waste treatment/disposal facilities was also drafted. The European Waste Catalogue (EWC), its classification system for hazardousness and its origin related identification system of waste types was intended for implementation to substitute the current system.

The twinning project findings wished-for modifications of the structure and mandate of the departments of HS and WM in EEAA. The basic changes are to establish a separate department for HS and to unify the solid and hazardous waste departments to improve the shape of policies and enforcement. To improve the information flow and the database available for planning and strategy developments, a new department for "Data and Registry" is introduced.

An Integrated Strategy on Hazardous Substance and Waste Management (ISHSWM) had been developed, consisting of two parts, one on waste and the second on HS/chemicals⁵⁰. The strategy recommended launching a senior level Inter-Ministerial Committee (SIC) with two Advisory Groups (AGs) to strengthen the strategic management structure. The SIC would play a key role in the formulation and monitoring of the Strategy, Master Plan and each one of the Implementation Plans, taking advantage of the completed studies and strategic documents, as well as the recommendations of the AGs.

Moreover, amendment on the HS and HW monitoring and inspection system of EEAA was recommended, e.g. by inspection checklists, lists of waste produced by different industry branches based on the

European Waste Catalogue (EWC) to support the identification of waste for inspectors, guidance on taking waste samples on inspections, etc⁵⁰.

The problems facing HS and HWM in Egypt are:

- Lack of control and management of handling, transportation and storage of HS after their arrival to the country;
- Absence of unified and updatable database for all HS in the country;
- Absence of database for HW;
- Insufficient HW treatment units and insufficient well trained staff;
- No serious efforts made to inform importer/producer/user of non/less HS alternatives; and
- Lack of database/updatable list of HW producers in Egypt.

The specific aims of this twinning project include:

- Improving EEAA's institutional structure to accomplish better management of hazardous substances and waste;
- Building appropriate capacities within the beneficiary and key stakeholders to advance the management of HS and solid waste and the implementation and enforcement of pertinent environmental legislation;
- Developing a framework for integrated hazardous substances and waste management including the preparation of an integrated strategy, system and plan for efficient management of solid and other waste; and
- Harmonising Egyptian legislation pertaining to HS and waste with relevant EU laws and international standards.

There are no policies or legislation governing e-waste management in Egypt. The closest reference is Law 4/1994 and Law 9/2009 regarding hazardous waste. There are also no plans, at present, to amend those laws to include e-waste. The only regulations controlling e-waste have been set by MoT requiring that imported computers be no more than five-years old from production date.

48. TWINNING EG07/AA/EN10, EU, "Development of Integrated Hazardous Substances and Waste Management System", Twinning Final Report, Might 2011

2.3 MEDICAL WASTE MANAGEMENT

2.3.1 GENERATION, TREATMENT AND DISPOSAL

In 2010, Egypt generated 28,300 tonnes of hazardous medical waste⁴⁹. The value of generated waste was estimated based on the number of beds in public and private hospitals, clinics and medical centres. Table 13 shows the daily generated hazardous medical waste in Egypt's Governorates.

In the present case, contradiction in figures is obvious as compared with the corresponding value of 3,416,254 tons, according to MoLD16. This gives the impression that the large estimated quantity of MoLD represents the total waste generated from medical facilities. Non-hazardous waste makes up at least 85% of all waste generated at medical facilities, and is no different from general household or office waste, including 'wet' organic, paper, plastics and any other materials that do not fit into hazardous medical waste.

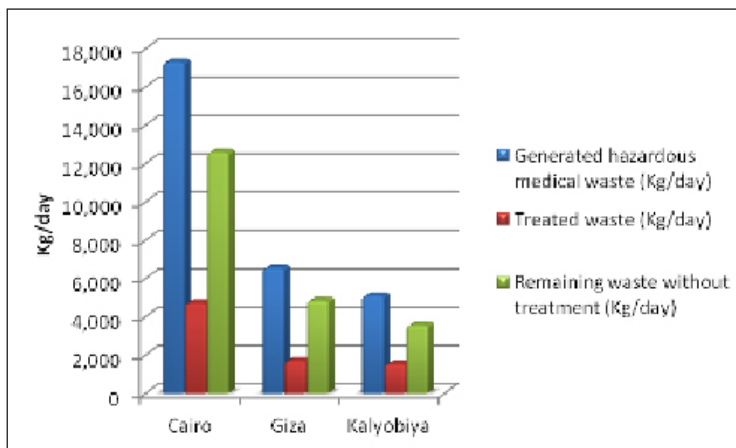
Governorate	No. of Beds	Generated Waste (Kgs/Day)	No. of Incinerators	Governorate	No. of Beds	Generated Waste (Kgs/Day)	No. of Incinerators
Cairo	34,603	17,301	13	Fayoum	2,496	1,248	3
Giza	13,080	6,540	15	Bani Souwaif	2,527	1,263	5
Alexandria	12,534	6,267	1	Menia	6,450	3,270	17
Kalyobiya	10,165	5,082	5	Assiut	7,256	3,628	8
Dakahliya	9,328	4,664	15	Sohag	4,952	2,476	4
Al Gharbya	8,451	4,225	5	Qena	3,387	1,693	3
Monufia	5,987	2,993	11	Aswan	2,758	1,379	2
El-Beheira	5,292	2,646	15	Luxor	857	428	9
Kafr El-Sheikh	3,865	1,932	3	Red Sea	826	314	3
Sharqeia	8,668	4,334	16	Matruh	1,136	568	9
Damietta	2,709	1,354	4	North Sinai	716	358	2
Ismailia	2,168	1,084	9	South Sinai	560	280	8
Port Said	1,771	885	2	New Valley	848	424	2
Suez	1,683	841	1				
Total	No. of Beds: 154,965	Generated Hazardous Medical Waste: 77,477 Kgs/Day		No. of Incinerators: 188			

Table 13 Daily generated hazardous medical waste⁵¹

49. Tarek Eed and Ehab Attia (2010), "Integrated Hazardous Medical Waste Management System", MSEA/EEAA and Ministry of Health and Population

Figure 13 show the daily generated hazardous medical waste in Greater Cairo (Cairo, Giza and Kalyobiya Governorates), the treated portion, and the portion left without treatment⁵¹. The treated portion of hazardous medical waste is about 27%. The untreated hazardous medical waste is either mixed with municipal solid waste or illegally traded for recycling; this led to serious health and environmental problems (Photo 13).

Collection, treatment and disposal of hazardous medical waste are the responsibility of the Governorates, either directly or by contracting private companies, contractors, or NGOs. The private sector has limited donation in hazardous medical waste management. Private companies provide collection, treatment and disposal of medical waste in the eastern and western zones of Cairo Governorate, in addition to Alexandria, Sharqia and Port Said Governorates.



Law 89/1998 and its Executive Regulation 1367/1998 issued by the Ministry of Finance amended by Law 191/2008, govern all Government tenders for procurement of goods and services. The private sector involved in service delivery was contracted according to this law, utilising a transparent bid process and contract award. However, regular supervision and monitoring on the ground is meagre. On the other hand, public sector participation lacks applicable service planning, delivery, monitoring, liaison and feedback.

Hazardous medical waste treatment is generally conducted by thermal incineration. Table 13 presents data on the distribution of 188 incinerators in the Governorates (Photo 14). However, most of those incinerators do not work with a mandatory competence and do not comply with health and environmental requirements. Moreover, 48 shredding autoclave units are operated for hazardous medical waste treatment.

Most of the public/private operators in the hazardous medical waste management sector lack knowledge and expertise to implement their jobs in a safe manner. Generally, they don't use appropriate personal protection equipment's and supporting procedures.

Figure 13 Treated hazardous medical waste in Greater Cairo



Photo 13 Transportation vehicle for hazardous medical waste at Suez Governorate



Photo 14 Hazardous medical waste incinerator at Suez Governorate

2.3.2. INSTITUTIONAL ARRANGEMENTS

The institutional framework for hazardous medical waste management incorporates the following:

- The Cabinet of Ministers, MHP and EEAA develop and adopt the public policies;
- MHP, EEAA and the Civil Defence Authority supervise the implementation of policies and monitoring their performance;
- MHP and EEAA issue lists and codes of hazardous substances and waste;
- MHP, EEAA, Ministry of Housing and Governorates are responsible for the development of guidelines and standards of performance and the preparation of various contracts and licenses;
- The Cabinet of Ministers, the Finance and Planning Ministries, and MHP are responsible for allocating credits of finance;
- MHP, EEAA with the participation of scientific and technical experts, and the Ministry of Communication and Information Technology are responsible for capacity building programs and awareness campaigns;
- The Governorates and local municipalities are responsible for the management of the medical waste, either directly or by contracting private companies, contractors, or NGOs; and
- The responsibilities of health care facilities are: reducing the rate of waste generation; and creating an integrated hazardous medical waste management including source separation, collection, transportation, storage, treatment and final disposal.

The responsibility of managing hazardous medical waste is dispensed between three basic systems, under the supervision of MHP and EEAA⁵¹.

- A governmental system where medical waste is directed to treatment units located inside the governmental hospitals;
- A governmental system that forms partnerships with the private sector or contracts private companies to address waste inside the medical facilities; and
- Private companies that collect, transfer, and treat medical waste.

Hazardous medical waste management legislation includes: law 4/1994 for the protection of the environment and its executive regulation 338/1995; Law 38/1967 on general public cleaning and its executive regulation 134/1968; law 48/1982 for the protection of the river Nile and waterways from pollution; the unified labour law 12/2003 for the protection of workers from likely harmful exposure; and MHP decrees 82, 343 and 413/1996 and 192/200. Limits for safe emissions from medical waste incinerators were issued by EEAA in 2000/2001.

A limited portion of the governmental financial allocations to public health care facilities is focused on medical waste management. Such allotments, however, are insufficient for managing hazardous medical waste in a safe and sustainable manner.

2.4 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

2.4.1 GENERATION, TREATMENT AND DISPOSAL

Beside municipal and industrial waste, a third waste stream is becoming more and more imperative in the context of integrated waste and resource management: construction and demolition waste (CDW)⁵⁰. The confronted problems stem from the steady increase of construction activities, which leads to increasing amounts of construction waste (Photo 15). In addition, the rising production of construction materials increases depletion of raw materials and environmental damage from material production. Since construction often goes along with demolition, and since lifetime spans of buildings in developing countries are comparatively short, waste from demolition also increases.

The disparate data of the estimated annual generation of CDW were given in 'section 1.3' of this report. The estimated figure provided by the MoLD is more than 10-folds that proposed by EEAA. MoLD estimated the generation of 41,748,603 tonnes of CDW in 2010¹⁶, whereas the corresponding estimation of EEAA is 4,000,000 tonnes in 2012¹⁹. These peculiarly divergent figures arise from the lack of precise measurement

and classification of the different types of generated solid waste that is much needed in Egypt.

Useful information on the management of CDW in Egypt is enormously limited. Illegal dumping of CDW on public roads, highways, undeveloped land and beside residential areas became common practice, causing a traffic hazard, and on windy days increases the level of total suspended particulate matter (TSP). Sustainable solutions to the CDW problems have yet to be introduced.

To evaluate CDW management options is compulsory to know the physical characteristics and composition of the CDW stream. Most CDW is non-toxic and apt for recycling. However, the recycling industry in Egypt is highly selective and uses a very small portion of the total generated waste. Proper CDW management would result in cleaner sites around construction areas, reduce airborne pollution, reduce demand on disposal sites and, given the widespread nature of this phenomenon, provide additional job opportunities for unskilled and manual labour.

Box 9 Integrated thinking: solid waste management in Singapore⁵³

Starting at the top of the 'waste hierarchy', a key objective is to reduce waste production. In this context the main portion of Singapore's non-combustible waste comes from construction waste and stabilised industrial sludge. Much of these have been diverted for reprocessing. For instance, 94% of the construction and demolition waste was recycled in 2005. At the same time, the country has also adopted specific measures to minimise waste generation, such as the careful selection of design and construction methods that minimise waste production. By undertaking these measures, Singapore is taking a big leap forward to realizing the ultimate goal of 'Towards Zero Landfill'.



Photo 15 CDW dumped on roadside at Tanta city

50. Holcim-GTZ, "Reuse and Recycling of Construction and DeMoLditiOn Waste", October, 2007 (<http://www.coproccem.com/documents/Holcim-GTZ%20-%20CDW%20Study%20-%20Revised%20Oct%202007.pdf>)

51. Vincent Teo, "Integrated Thinking: Solid Waste Management in Singapore", Waste Management World (<http://www.waste-management-world.com/articles/print/volume-8/issue-1/features/integrated-thinking-solid-waste-management-in-singapore.html>)

2.4.2 INSTITUTIONAL ARRANGEMENTS

The management of CDW is forwarded by Article 39 of Law 4/1994 and Article 41 of the executive regulations (Prime Minister Decree Number 338/1995). Both the law and its executive regulations dictate that all persons involved in exploration, excavation, construction and demolition to take necessary actions, as specified in the executive regulations, to safely store, transport and dispose wastes generated by those activities. This article contains the specifications and requires local authorities to incorporate them into permits for exploration, excavation, construction & demolition.

Laws 106/1976 and 101/1996 allow local governments to include the management of CDW in the permits required for construction activities⁵². This law also allows local governments to collect a fee from contractors and owners to, among other things, provide or pay for CDW collection and/or disposal. However, it is usually cheaper for a contractor to haul CDW to a nearby unapproved site and forfeit already paid-for disposal services at an approved, but more distant, site. Furthermore, existing legislation is not effective due to:

- Many construction activities occur without a permit;
- There is limited enforcement of these regulations;
- Few local governments provide CDW collection and disposal services; and
- The 1% building permit fee is usually committed to other services.

Even though Law 4/1994 regulated the disposal of CDW, the law did not incorporate any clauses that suggest waste minimisation.

Practical guidelines were recommended to be combined to the Egyptian Executive Regulations 338/1995 of Law 4/1994 to manage the amount and types of CDW in Egypt⁵³. The guidelines were designed based on conclusions inferred from two instructed surveys and published literature, and were then reviewed by selected participants. Subsequently the guidelines were upgraded based on the evaluation by a number of 35 prominent national and multinational construction organisations in Egypt.

The proposed Egyptian DWM management guidelines covered:

- The waste management hierarchy based on the '4Rs' Golden Rule of Reducing, Reusing, Recycling and Recovering of waste;
- The different implementation stages, which start from the early planning phase, followed by the tendering and contract formulation phase, and finally the execution phase;
- The various techniques, methodologies, procedures and strategies recommended to reduce the amount of waste; and
- The degree of involvement of all the construction industry parties (owner, engineer, designer, and contractor) in the functioning of the guidelines.

The recommendations presented act as a good basis for introducing changes, but more political support is called for to enforce their implementation. There must also be a rigorous effort of all stakeholders, i.e. the local authorities, the construction industry, the manufacturing industry, researchers, building owners, etc., to play active roles.

52. Abt Associates, Inc., SCS Engineers, Community & Institutional Development, and the Institute for Public-Private Partnerships, Inc. (2001), "SWM Privatization Procedural Manual - Chapter 9: Construction and Demolition Debris Management", Solid Waste Technical Assistance, Egyptian Environmental Policy Program/MSEA/USAID

53. Marwa Al-Ansary, Salah El-Haggag, and Mahmoud Taha, November, 2004, "Sustainable Guidelines for Managing Demolition Waste in Egypt", Paper presented at Forum Barcelona International RILEM Conference on the "Use of Recycled Materials in Buildings and Structures",

2.5 AGRICULTURE RESIDUES MANAGEMENT

2.5.1 GENERATION, TREATMENT AND DISPOSAL

In 2012, Egypt generated about 30 million tonnes of agriculture residues (around 82,200 tonnes per day)¹⁹. A large portion of agricultural residues is either burned in the fields or dumped on the banks of couldals and drains, creating obstacles to water flow and endangering water quality⁵⁴. Burning of crop residues is a problem in Egypt, especially rice straw. Egypt cultivates about 360,000 hectares of rice according to 2008 statistics, with a production of 6 million tons of straw⁵⁵.

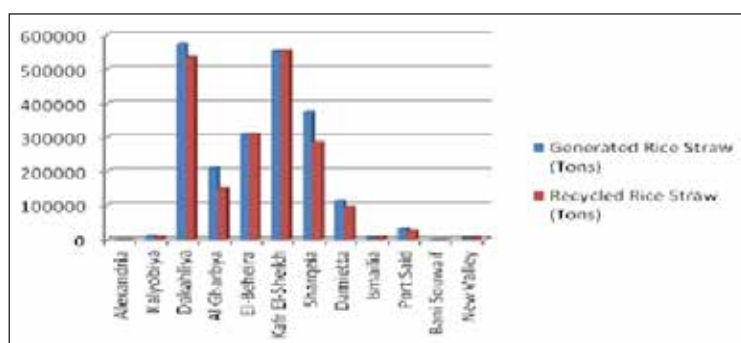


Figure 14 Produced and recycled rice straw in 2009/2010

According to the MoLD statistics, 12 Governorates cultivated rice in 2009/2010. After harvesting, the produced rice straw was 2,189,086 tonnes of which 1,969,701 tonnes were recycled¹⁶. Figure 14 shows the relation between produced and recycled rice straw.

Large quantities of surplus rice straw have been, and continue to be, burned in-field as a means of quickly clearing land for the following crops⁵⁶. Neither equipment nor services nor infrastructure is in place to harvest the non-edible portion that is yielded from rice each year. Furthermore, markets

for these materials have remained rural, traditional and at a small scale. As a result, there has been little incentive for straw harvesting and removal, and burning has always reflected in cost-effective advantages to the grower for cleared fields, disease control and timeliness.

For those living downwind of burning fields, however, issues of environmental degradation have arisen as crop yields have improved during the past 20 years. Noxious gases and black smog have come to dominate the skies over the Cairo metropolitan area during the annual rice harvesting period (September - October) with resultant air pollution, damage to structures and adverse effect on human health.

It is up to the grower to decide the way of disposing his agriculture residues. The most common practice for disposing is by dumping it at municipal waste sites, dumping it in the desert (Photo 16) or simply burning it. The failure of any management plan to tackle agriculture residues, especially rice straw, is based on the assumption that this waste is free, and the grower has just to give it away.



Photo 16 Dumped agricultural waste at Kafr El-Sheikh Governorate

54. Samir A.El-Shimi, International Resources Group (2005), "Design and Cost Analysis of Agricultural Waste Recycling Alternatives for Sinbo Village, Gharbiya Governorate", Ministry of Water Resources and Irrigation/Life/USAID

55. Mahmoud Medany (2011), "Vermiculture in Egypt: Current Development and Future Potential", FAO

56. Peter Steele, Ahmed El-Hissewy and Abd El-Azim Badawi (2009), "Technical Manual: Agro-Industrial Use of Rice Straw - Exploring opportunities for making better use of rice residues in Egypt", Ministry of Agriculture and Land Reclamation/FAO

In fact the grower realises that agricultural residues becomes valuable once collected and being ready for transport. On the other hand, as long as the residues are in his property, no one could force him to hand it over. For him, burning the residue in site has some agricultural benefits, such as use of minerals in the ash as fertilizer, as well as getting rid of insects and diseases inhabiting the surface soil layer as a result of burning⁵⁶. There is an extreme scarcity of the combining, raking and baling machines, and not enough trucks to transport the baled rice straw bales. In addition, the un-paved dirty roads render transportation between farms and market almost a mission impossible. Therefore, agricultural co-operations have to work to provide a storage place for the ready bales, trucks and mechanical equipment's to overwhelm the previous obstacles⁵⁶.

Numerous advantages might be achieved from the utilisation of agricultural residues, mainly⁵⁷:

- Creation of new small agro industries in rural areas;
- Generation of new job opportunities, particularly for women in rural areas;
- Use as compost for land reclamation, contributing to addition of new cultivated areas;
- Fostering clean farming, thus promoting export;
- Reduction of both chemical fertilisers and irrigation water;
- Substitution for fodder production, thus reduce imports of feedstuff; and
- Supporting environmental sanitation, thus increasing the opportunity for new clean environmentally friendly source of energy.

There are many potential uses of rice straw and other agricultural residues that represent significant market opportunities⁵⁸. Agricultural residues could be burned to generate electricity to provide energy for farmers, or used as feedstock for village-based centralised waste to energy (WTE) plants; it could also be used to generate biogas at the household level through small units, and/or on a more industrial scale. Thus rather than being viewed as a problem, agricultural residues should be admitted as a resource that could be utilised to generate income and help conserve other non-renewable resources.

Generation of biogas from agricultural residues has been promoted by the Government since many years, with a number of small demonstration units established. Two Government-funded plants have been constructed with technical and financial assistance from China. Generated gas is currently piped free of charge into houses in local villages for cooking. This technology has considerable potential to be of value in other Egyptian villages. However, within the widespread access to modern power/fuel in recent years, and subsidised prices, there has been limited demand for alternative forms of energy. This will change over time due to the expected increase of power/fuel prices⁵⁹.

57. Mohamed El-Tamzini, Hassan El-Shaer and Nabil Hegazi (2008), "Proceedings - Expert Consultation on the Utilization of Agricultural Residues, Cairo, Egypt", FAO

58. Karen Ellis, with inputs from Smita Nakhooda (2012), "Green Growth Opportunities and Requirements in Egypt", GIZ

59. Waste Management World, "Asian Development Bank's Rural Biogas Project: A Hit in China", (<http://www.waste-management-world.com/articles/2012/08/asian-development-bank-s-rural-biogas-project-a-hit-in-china-.html>)

Box 10 Asian Development Bank's rural biogas project: A hit in China⁶¹

China disposes large quantities of agricultural residues inappropriately, with crop residue often burnt and animal waste left to rot. Such practices are not only harmful to the environment, but also constitute a loss of potential energy and nutrient resources, which could add value to an integrated farming system, reduce costs, provide opportunities for an integrated best management approach, and help implement clean farming techniques.

A \$33 million loan from the Asian Development Bank (ADB) has raised a successful project to increase the use of biogas generated from agricultural residues as a form of renewable energy that improved the environment and promoted local economic growth in China. Thousands of villagers in China have benefited from the Efficient Utilisation of Agricultural Residues Project. The project aims to increase the use of biomass-based renewable energy systems.

Another market option to deal with is the potential for export⁶⁰. For example, rice straw pellets could be manufactured and exported. A large-scale straw pelleting plant was commissioned in 2008 for the sale of pellets into export markets. One private plant has been founded so far producing biofuel from rice straw. This plant was expected to initiate around 200 jobs, and there are plans to build new plants elsewhere.

Straw briquetting is another option that has been developed in recent years⁶⁰. During 2008, a joint Austrian-Egyptian initiative resulted in the establishment of a straw briquetting plant at Sharqia expecting to sell most products to the EU. A second plant is planned on the basis of the success of the first one. If successful this might result in further investment.

Thus, agricultural residues has the potential to generate significant new market opportunities for large and small scale

enterprises, and many associated jobs, and at the same time to significantly reduce pollution⁵⁸. However, there has been limited development of the sector, and the commercial viability of some of these options rests unproven. This is in part because of limited incentives to use alternative forms of energy, due to subsidised energy, partly because of the costs of doing business, and lack of appropriate investment climate and legal and regulatory framework, and partly because of immature technologies that have not enabled prices to fall sufficiently to make these options viable. However, in some technologies there has already been investment by the private sector, with some apparent success, thus it seems that with a few improvements to the enabling environment there might well be the potential for some quick wins in terms of market growth and job creation in the industry, along with visible environmental improvements.

2.5.2 INSTITUTIONAL ARRANGEMENTS

MALC has the main responsibility for providing oversight of the agricultural residues sector, in cooperation and coordination with MSEA/EEAA. Environmental Law 4/1994, and amendments in Law 9/2009, specify that farmers who practice rice straw burning could be fined up to LE 20,000 and prohibit dumping of straw in areas other than those specified, namely in residential, industrial and agricultural areas and waterways. Moreover, Directive 63/2002 of MALC prohibits the growing and burning of rice in the Kalyobiya Governorate to minimise air pollution in Greater Cairo.

MALC Decree 100/1967 required that fertilisers made from household waste should meet the following specifications:

- Nitrogen content: not less than 0.5%;
- Organic matter content: not less than 18%;
- Moisture content: not more than 30%;
- Sodium chloride: not more than 5%; and
- Carbon/nitrogen ratio: within the range of 1:17 – 1: 25

Although MALC leads on many aspects of the agricultural residues sector, it is clear that a cross-departmental collaboration is still in urgent need to support the industrial development opportunities that agricultural residues offer. Moreover, MTI is well positioned to play a role in promoting awareness of the industrial opportunities associated with agricultural residues, develop a market development strategy, and to help establish a network of relevant stakeholders, including the agribusiness industry, and to make linkages between different parts of the supply chain in order to accelerate market development.

The most obvious way to conceive a more enabling environment for the development of the agricultural residues sector would be to reduce energy and fuel subsidies, and to a lesser extent fertiliser subsidies that would generate enlarged demand for alternative sources of fuel, energy and compost, and thus stimulate demand for agricultural residues as an input⁵⁶. Another way would be to more strictly enforce the ban on the burning or unauthorised dumping of agricultural residues that would increase the supply. In combination with this, the removal of fees on authorised dumping sites in agricultural areas could be one way of increasing their use, and the cost of provision by local government could potentially be recouped by the sale of that accumulated waste for industrial purposes.

In addition, there might be scope to scale-up or develop further some of the pilot projects that have been initiated to explore uses of agricultural residues (e.g. for briquetting, gasification, etc.), and to expand them or undertake new public/private partnerships in order to ameliorate some of the risks private players would face in developing new markets and technologies in light of substantial uncertainty about future market demand.

The potential could also be explored as to whether these industries could be eligible to receive different forms of climate finance e.g. carbon credits through the Clean Development Mechanism, or grants through mechanisms such as the Global Environment Facility.

2.6 LITERATURE REVIEW ON SWM IN EGYPT

Annex 3 provides a literature review on SWM in Egypt.

3. CURRENT SITUATION OF MUNICIPAL SOLID WASTE MANAGEMENT IN THE SELECTED GOVERNORATES



CURRENT SITUATION OF MUNICIPAL SOLID WASTE MANAGEMENT IN THE SELECTED GOVERNORATES

This chapter discusses issues attached to MSWM in the selected Governorates. Detailed information, discussions and comparisons of the system's main features are presented. It also values the quantities of generated municipal solid waste, its composition and points out to the anomaly in the available figures in some of those Governorates. In addition, the benchmark indicators were qualitatively exploited to assess: waste collection and street sweeping service quality and coverage (public health indicator); waste treatment and disposal quality and coverage (environmental control indicator); Reduce, Reuse and Recycle "3Rs" (resource recovery indicator); and the degree of service user and provider inclusion in the planning and delivery of services (inclusivity indicator). Moreover, a comparative analysis of solid waste collection, treatment and disposal services is tabulated.

The NSWMP aims to set up a national database of MSWM practises in all the Governorates. This target will be achieved by a series of reports each addressing the situation in a group of Governorates. In this report, seven Governorates had been selected for in-depth study of the current MSWM situation. Qena, Assiut and Fayoum Governorates were selected as representative examples of Upper Egypt Governorates; whereas Kalyobiya, Al Gharbiya and Kafr El-Sheikh Governorates represent the Delta region and Suez Governorate represents a coastal one. The Governorates were chosen within Upper Egypt and Delta regions to represent diverse geographical locations: in the vicinity of the capital (Fayoum and Kalyobiya), in the centre of the region (Assiut and Al Gharbiya) and the farthest (Qena and Kafr El-Sheikh).

The present study covers the entire Governorates, main cities in districts (Marakez) and examples of some mother villages. Despite there are no significant model variations between villages in the selected Governorates, as the SWM situation is almost in concert with the same challenges and degradation, the villages were mainly selected to represent semi-urban areas.

The valuation of MSWM in the selected Governorates was based on a predefined set of benchmark indicators, as outlined in section 1.2 and Annex 1. Waste management indicators are used for the following reasons⁶⁰:

- Indicators could work as a basis for assessment by providing information

60. C. Visvanathan, "Waste Management Indicators: Priority and Challenges", Asia Resource Circulation Policy Research Workshop, Bangkok, 12-14 December 2012

- on conditions and trends of waste management;
- Indicators review existing targets for waste prevention, reuse, recycling, recovery and landfill diversion targets;
 - On the basis of such assessments, indicators (scores) not only illustrate the current status but spells out future waste policy directions by providing inputs to policy formulation processes;
 - Numeric value of the indicators makes it easier to interpret the situation and communicate the result to both experts

- and non-expert audience; and
- Indicators could provide benchmarks for comparisons between different Governorates, and also set a milestone or roadmap for the nation's waste management situation.

The current report limits its reach to only seven Governorates for the detailed description in order to test the methodology and benchmark indicators, but shall serve as a model for further all-inclusive reports.

3.1 WASTE RELATED DATA

It was always noticed that the generation and composition of household waste were not homogeneous. In general, they vary according to changes in consumption patterns and economic growth rates and depend on the standard of living, season of the year, day of the week, population habits and the geographical site of human settlement.

Data on the generation and composition of MSW is a key in planning for the long term management of SW in an efficient and economical manner. Such management includes the selection and operation of equipment's used in handling and treating solid waste, and the types of disposal facilities that allow resource recovery and energy generation.



Based on the inconsistent figures of generated MSW, we recommend re-estimating the generated MSW and its composition, using an approved methodology.

The national figures show considerable variability in waste generation and composition among the selected Governorates. Table 14 and Figure 15 illustrate the generated MSW in the Governorates, along with the corresponding Marakez.

Table 14 shows two sets of figures for the generated MSW in Qena Governorate, in black and red colours. The figures in black were collected by the Governorate's EMU from the corresponding authorities in the Marakez for the generated MSW in 2012. The corresponding figures in red were estimated in the study report "Solid Waste Management Project in Qena Governorate", in 2005⁶¹.

The estimated data in the 2005 report is more than 3-folds the corresponding values given in 2012 by the Marakez authorities; contradicting the expected increase in generated solid waste due to the increase in population, economic growth and changes in consumption patterns.

Table 15 summarises the available data for generated MSW in Qena Governorate. The only comparable data are those of EEAA (2012) and of the study report (2005).

However, on using the data of the study report for projection of the generated MSW in 2012, based on a population growth rate per year of 2.2% and an annual increase in SWM generation of 2.2%, then the study report figure would be about 375,831 tonnes, in 2012. The projected figure of generated MSW varies slightly from that provided by EEAA and significantly from the figure given by EMU of Qena Governorate for the same year of 2012.

Another example of anomaly in the figures of the annual generated MSW was detected in Kalyobiya Governorate. The data collected from the Governorate indicated the generation of 579,350 tonnes of MSW in 2012. The corresponding estimation of EEAA is 3,500 tonnes/day (1,277,500 tonnes/year)¹⁹. This estimation is consistent with data provided by the manager of Abo-Zaabal dumpsite who pointed out that they receive 3,500 – 4,000 tonnes/day of MSW. The Governorate authorities guaranteed that Abo-Zaabal dumpsite receives all the generated MSW from the Governorate for disposal, as the compost plant in Abo-Zaabal is not functioning since its establishment ten years ago and it is forbidden to receive waste generated outside the Governorate premises.

Table 14 Generated MSW in the selected Governorates in 2012

61. Infrastruktur & Umwelt, "Solid Waste Management Project in Qena Governorate: Public Perception Report", KfW/Qena Governorate, December 2005

Governorates and Marakez	Population*	Generated MSW (Tonnes)
Gena Governorate		
Markez Abo Tesht	400,732	1,920 40,779
Markez Farshoot	167,906	1,466 20,059
Markez Nagaa Hamadi	514,973	18,540 58,673
Markez Deshna	388,098	13,824 39,444
Markez Alwaqf	79,640	360 9,854
Markez Qena	582,068	60,933 73,774
Markez Qaft	143,122	187 16,332
Markez Qoos	418,051	8,332 45,558
Markez Naqada	161,346	6,765 18,255
Total	2,855,936	112,327 322,728
Assiut Governorate		
Markez Abnub	371,870	27,000
Markez Abutig	330,051	52,200
Markez Assiut	954,137	69,480
Markez Dairut	546,620	32,400
Markez EL-Badari	256,005	20,520
Markez EL-Fateh	286,997	19,980
Markez EL-Ghanayem	125,335	9,000
Markez Manfalut	495,130	33,480
Markez EL-Qusiya	433,323	34,200
Markez Sahel Selim	161,560	10,440
Markez Sedfa	190,597	14,760
Total	4,151,625	323,460

Governorates and Marakez	Population*	Generated MSW (Tonnes)
Kalyobiya Governorate		
Markez Banha	630,084	43,800
Markez Khanka	566,131	14,600
Markez Khosoos	343,727	30,025
Markez Kaha	31,503	12,775
Markez Kalyub	558,469	14,600
Markez Shubin Al-Kanater	500,152	14,600
Markez Shubra El-Kheima	1,210,385	401,500
Markez Tukh	550,177	14,600
Markez Al-Kanater Al-Khairia	452,139	25,550
Markez Kafr Shukr	175,084	7,300
Total	5,017,851	579,350
Al Gharbya Governorate		
Markez EL-Mahalla EL-Kubra	1,143,986	237,250
Markez Kafr EL-Zayat	420,166	54,750
Markez Samannoud	330,360	62,050
Markez Tanta	1,065,236	200,750
Markez Zifta	493,999	76,650
Markez EL-Santa	411,606	40,150
Markez Kotoor	309,696	47,450
Markez Bassyoun	269,398	47,450
Total	4,444,447	766,500

Governorates and Marakez	Population*	Generated MSW (Tonnes)
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Fayoum Governorate		
Markez Fayoum	805,902	77,015
Markez Atsa	588,780	15,330
Markez Tamia	373,324	29,200
Markez Ebshway	345,695	6,935
Markez Senuris	508,953	47,450
Markez Yousef El-Sedeek	323,918	7,300
Total	2,946,572	183,230

Suez Governorate		
Total	576,279	127,750

Governorates and Marakez	Population*	Generated MSW (Tonnes)
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Kafr El Sheikh Governorate		
Markez Al-Hamool	64,451	57,870
Markez Baltim	227,530	33,580
Markez Beila	231,686	55,115
Markez Desouk	490,626	79,205
Markez Fuwa	154,353	31,025
Markez Kafr El-Sheikh	549,815	106,580
Markez Metoubes	257,194	23,725
Markez Qallin	228,689	27,010
Markez Riyadh	154,752	139,466
Markez Sidi Salem	362,038	54,385
Total	2,721,134	607,961

*Estimated population at the end of December 2012, Source: The Governorates

Figure 15 Generated MSW in the selected Governorates in 2012

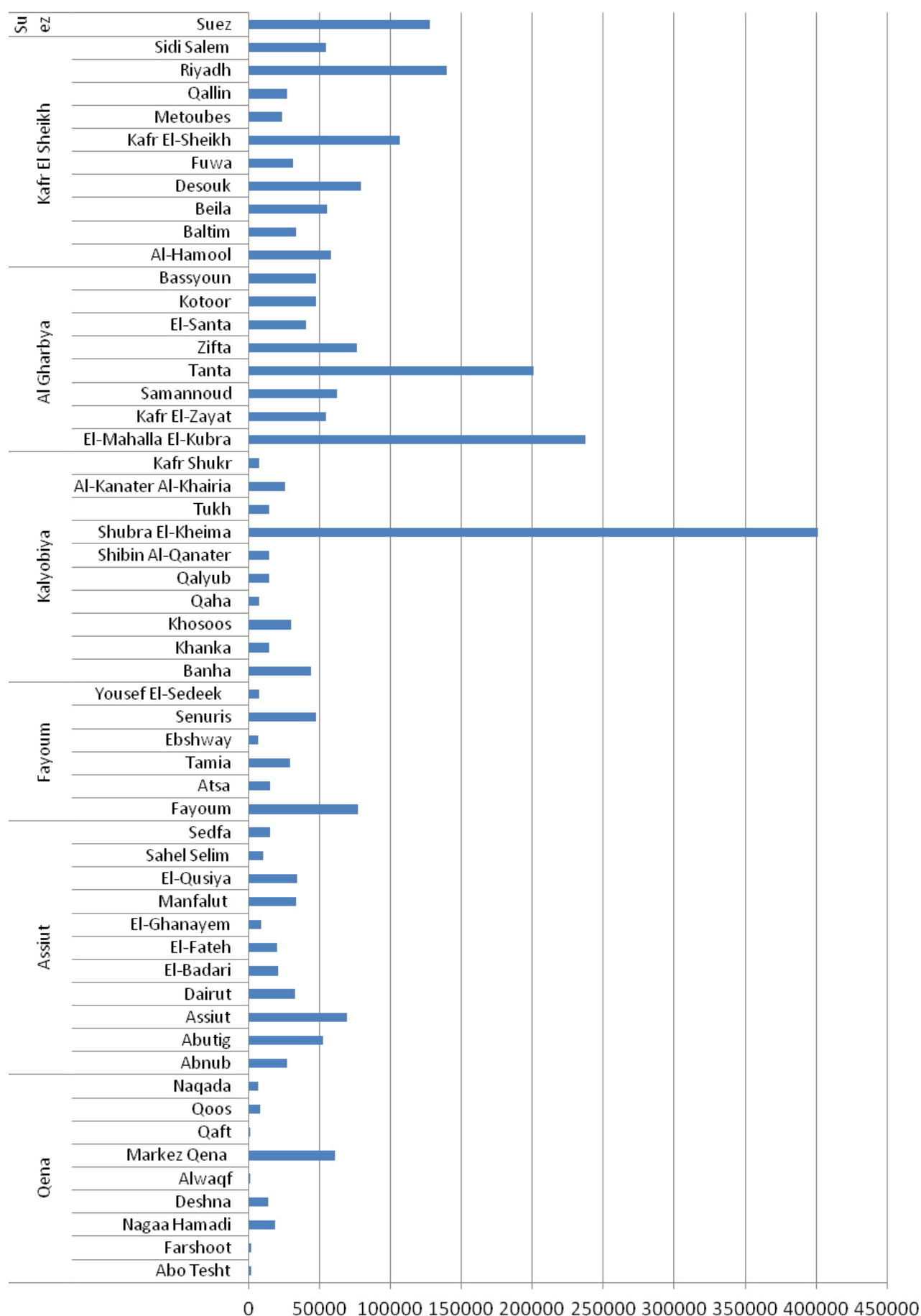


Table 15 Generated MSW in Qena Governorate

Source of Data	Year	Generated MSW (Tonnes)
EMU, Qena Governorate	2012	112,327
MoLD16	2010	55,070
EEAA19	2012	394,200
Study report63	2005	322,728

The per capita generated MSW in the selected Governorates was calculated from the above table (cf. Table 16).

Table 16 Per capita MSW generation in the selected Governorates

Source of Data	Year	Generated MSW (Tonnes)
	Kg/day	Kg/year
Qena	0.11	39.3
	0.31	113.0
Assiut	0.21	77.9
Fayoum	0.17	62.2
Kalyobiya	0.32	115.5
Al Gharbiya	0.47	172.5
Kafr El Sheikh	0.61	223.4
Suez	0.61	221.7

One important element in getting better waste management is the prerequisite to accommodate chosen technologies to the character of the waste that is generated in a particular location⁶². If wastes are wet and dense, buying compactor trucks will often be a waste of money. If wastes have low calorific value, it will not be possible to incinerate them without using supplementary fuel. If considerable amounts of toxic waste have entered the general MSW stream, leachate from dumpsites will be predominantly hazardous. On the other hand, if a portion of the waste stream is made up of organics or could be easily separated into organics and non-organics, composting might become a worthwhile waste management strategy.

In the selected Governorates, the biodegradable portion overshadows the bulk of MSW (cf. Table 17 and Figure 16). The composition of MSW in Qena⁶¹ and Kafr El Sheikh⁶³ Governorates was determined in 2005. The corresponding figures for

Assiut, Fayoum, Kalyobiya and Al Gharbiya Governorates were provided by the EMU or the Cleansing and Beatification Agencies of the Governorates. These values are rough estimates and need further verification. Moreover, the EMU and the Cleansing and Beatification Authority in Suez Governorate don't have data on the composition of generated MSW. The only available information was gotten from the compost plant, that receives all the generated MSW; indicating that 60% of the waste composition is organic

EGYPT ENVIRONMENTAL DATA AND INFORMATION (THE CRITIQUE)

The role of data / statistics / information is a vital tool supportive of informed decision making, proper planning, investment attraction, financial sustainability and credible assessment / presentation and consultation on environmental issues.

62. CalRecovery Incorporated, "Solid Waste Management – Volume 1), UNEP, 2005

63. Infrastruktur & Umwelt, "Solid Waste Management Project in Kafr El Sheikh Governorate: Public Perception Report", KfW/ Kafr El Sheikh Governorate, December 2005

Governorate	Waste Composition, %						
	Organic	Paper & Cardboard	Plastics	Metal	Glass	Textile	Others
Qena	66.5	12.4	10.2	1.0	2.0	2.1	5.8
Assiut	48.4	9.1	10.0	2.2	4.9	1.9	23.5
Fayoum	54.3	10.1	7.9	2.4	3.6	3.1	18.6
Kalyobiya	62.5	10	13.5	3	5	2	5
Al Gharbya	55	17	7	4	3	4	10
Kafr El Sheikh	85.0	2.5	5.0	0.5	0.8	1.0	5.2
Suez	60	--	--	--	--	--	40

Table 17
Composition of
MSW in the selected
Governorates

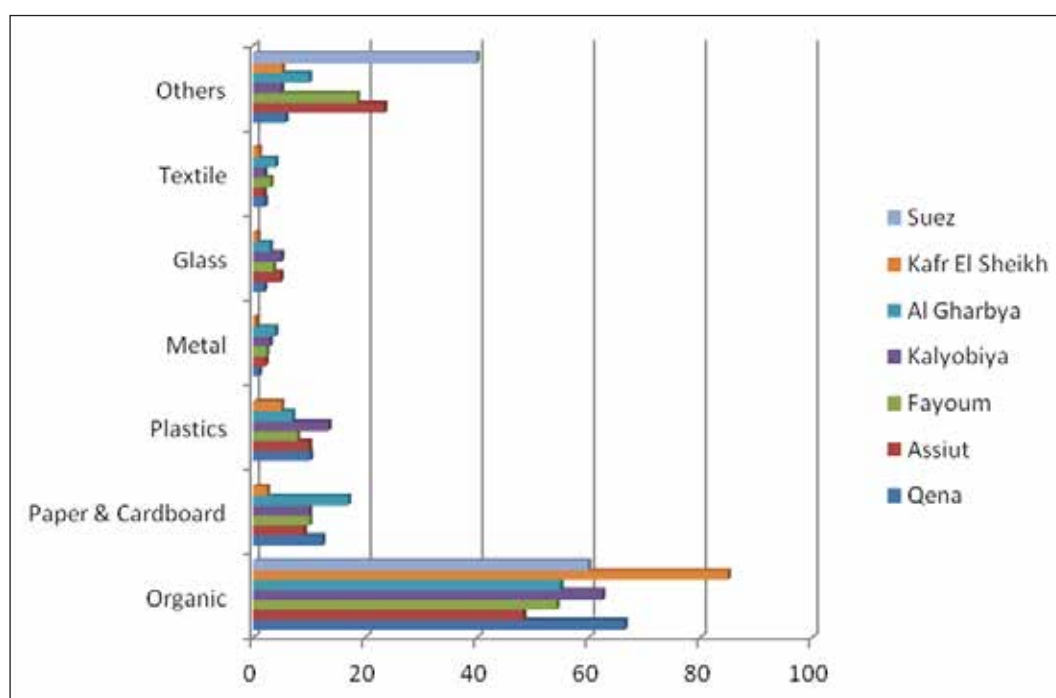


Figure 16 Composition
of MSW in the selected
Governorates

In Egypt, and over the last 50 years, keeping control over statistics has been well-thought-out as a matter of national security. The “Central Agency for Public Mobilisation and Statistics (Capmas)” was established by presidential decree in 1964 as the country’s “official source for the collection of data and statistical information, and its preparation, processing and dissemination”. Capmas is in charge of “providing all the state bodies, organisations, universities, research centres with the information that could help them to make informed decisions.

The “Information and Decision Support Centre” is another organisation within the Cabinet of Ministers with a primary task to provide information and data to the cabinet supportive of informed decision-making.

The deficiency of environmental data and information is not sector-characteristic. Actually Egypt suffers widespread statistical and informational deficiencies. The noticeable gaps and discrepancies in Egyptian statistics and the quality of basic data set up significant divide between facts and decision-making that led to a failure in analysing pressing issues. The lack of accurate data not only disturbs the quality of decisions but has more drastic impact of damaging Egypt’s international image when a discrepancy in local and international statistics is discovered.

“The Egyptian environmental statistics system is a loose network of government agencies, donors, and businesses that between them collect, process, produce, and use statistics on air and water quality, solid waste, irrigation, sewerage, soil and agriculture, protected areas, biodiversity, and other subjects⁶⁴. Most data begin and remain within Government agencies; public access to both summary reports and the motivating data is rather limited, as is data sharing among Ministries. Data on air and water quality are fairly comprehensive, but

the system has gaps regarding pollutant emissions, solid waste, and other subjects. The overall coordination of the system is still lacking. Each agency sets its own policies and collects its own data, and no one agency has the authority to require all members of the system to collaborate. Collaboration in several areas could strengthen the system; among them are data sharing among Ministries and with the public, documentation of available data, and integration of data systems covering the same topics or clear documentation of explaining why they differ⁶⁴.

The lack of collaboration between those entities has weakened the statistical system in Egypt and ignored the much needed transparency and accuracy to avoid data differences and erratic estimations.

Available data on SWM reflect such discrepancy that led to chronic failure in designing and implementing efficient solutions. Throughout the implementation of the current task (SWM Current Situation), the discrepancy of the collected data has shaped a confusing situation to say the least. This statement is necessary to highlight the insistent need of establishing a credible and efficient ‘Environmental statistical system’ where the major players are engaged and cooperating.

MSEA could and should assume the central role and duty of initiating and establishing a reliable statistical system on all environmental aspects (land, water, air, biodiversity and SWM).

The EEAA should lead acknowledging the necessity and merits of establishing a national environmental data and information system conducive of proper decision-making, appropriate strategizing and planning, attracting investment, designing and implementing competent SWM solutions and projects’ development. It might be advisable for the Integrated Solid

64. Joy E. Hecht, August 2004, “Environmental Statistics and Accounting in Egypt: Challenges and Opportunities”, Study carried out for the USAID DATA Project, Ministry of Planning

Waste Management Sector (ISWMS) to effort and assume a leading role in instituting a “national environmental data / information unit” within the organisational structure of the NSWMP. The culture of transparency, coordination and collaboration between various entities, governmental; public and private, must be progressed and nourished in order to generate a new era of information openness and sharing where all entities have a common target of facing economic and social challenges with punctuality, efficiency and practicality.

This proposed unit will certainly have technical and financial needs to be capable of operating on a respectable level, and it might be fitting to recommend further discussions and consultations within relevant stakeholders conducive of changing the current confused seen.

A first step in that attempt could be an open dialogue within EEAA, with possible assistance of GIZ, to discuss a ‘roadmap’ and possibly come up with the TOR of the proposed unit.

3.2 WASTE COLLECTION

The term “solid waste collection” is taken to incorporate the initial storage of waste at the household, shop or business premises, the loading, unloading and transfer of waste, and all stages of transporting the waste until it reaches its final destination – a treatment plant or disposal site⁶⁵. In addition, the sweeping of streets and public places, the cleaning of open storm drains and the removal of these wastes are also included (Figure 17).

Collection and transportation of MSW make the hugest claim on municipal budgets and have big impact on urban living. Of the total expenditure incurred in SWM, typically 70 to 80% is bound for collection and transportation stages of wastes⁶⁷.

The responsibility for providing SWM service lays on the Governorates, and a common and fundamental deficiency is the failure of Governorates to ensure that necessary funds are available to provide an acceptable level of service. Making matters worse, the limited funds that are available are habitually used to acquire inadequate, and often inappropriate, collection equipment’s or to maintain an insufficient, obsolete collection fleet. The absence of adequate planning and the use of improper vehicles and equipment’s have led to wasting funds and effort in this direction. Consequently, the service provided could, at best, be described as unreliable and/or inefficient.

65. Manus Coffey and Adrian Coad (2010), “Collection of Municipal Solid Waste in Developing Countries”, UN-Habitat



Photo 17 A Qena



Photo 17 B Fayoum



Photo 17 C Banha



Photo 17 D Tanta



Photo 17 E Kafr El Sheikh



Photo 17 F Suez

In general, the local authorities in the Governorates are surviving many inconveniences in keeping pace with the increase in population and in meeting the growing demand for SWM services, especially collection service. In the selected Governorates, solid waste collection service is provided by the public sector. However, small contractor companies provide collection services in Markez Shubra El-Kheima at Kalyobiya Governorate and partial collection services in Markez Assiut. NGOs handle collection services in some villages in the Governorates.

Further details concerning waste collection in each of the selected Governorates is given below.

i) Qena Governorate

There are no waste collection bins or containers used in Qena Governorate. The officials signified that using refuse collection bins was not that successful. The citizens used to dump their household waste in the street sides or corners. Moreover, the bins were at all times stolen or burned.

The streets are regularly cleaned in Qena city at least once per day. Household waste is dumped in collection points in the streets and the municipal workers collect it twice a day. The officials pointed out that they apply an unwritten plan for collection and street cleansing. In emergency situations, they mobilise some workers and equipment's to the anticipated location. Waste collection and street cleansing coverage are nearly equal in the whole rich, medium and poor residential sectors of the city.

The waste transportation trucks are covered with heavy textile sheets during the service. Waste collection trucks are at the same level of cleanliness that reflects the good working conditions of waste collectors and the positive impact on environment and health of citizens and workers.

Waste collection workers wear clean uniforms, and use somehow clean and suitable hand tools (e.g. waste collection trays and wheel barrows, with brooms and shovels). The first look at the garage

and the maintenance and repair workshop shows that although the workers do not wear any working uniforms or protective wear, the equipment's that are used for waste collection and other cleansing operations were clean and in good condition. Only simple maintenance operations of transportation fleet and equipment's are done in the workshop.

Dumping of CDW in the city streets is a problem, especially in Elbeaa district. The spread of CDW alongside the highways and watercourses is a common scene in the Governorate.

In Qoos city the whole picture of MSW collection and transportation is similar to the capital city. The city streets are clean that implies equal cleansing coverage to the whole city. However, there are insufficient waste collection equipment's and transport trucks. Only three trucks are working out of ten available. Moreover, the officials suffer from dumping large quantities of CDW in the streets of the city. An open area, inside the city, is used for collection and transfer of waste.

The directorate of health in the city is responsible for collection of hazardous medical waste and its transport using an equipped truck to Qena city for incineration. However, a part of this waste ends up to be mixed with the household waste. A contractor is responsible for collection and transport of the sludge produced from the paper mill in Markez Qoos to a designated dumpsite. However, it was noticed that large quantities of this waste are illegally dumped along the access road to the dumpsite.

In Hegaza village, at Markez Qoos, waste collection and transport is handled by the local administration unit as well. There is a lack of equipment's and workers, nevertheless, the streets look clean.

On the other hand, NGOs are responsible for collection and transportation of household waste in three villages in Markaz Naqada. Collection is conducted three times a week. The agricultural residues are generally used for feeding animals, except for sugar cane

dry leaves that is openly burned in the fields, causing serious air pollution.

ii) Assiut Governorate

Similar to Qena, Assiut Governorate doesn't use waste collection bins or containers, except for some small baskets that are hanged on lampposts in the main street in the East district of Assiut city (El Gomhoria Street).

There is no distinct role for the private sector in the SWM, except in East Assiut district, where a private contractor collects the generated households waste. Waste is dumped by both residents and the private contractor in specific collection points in the streets of the city. The system is based on two daily shifts for waste collection and transportation. Accumulated waste alongside the streets and corners is a common trait in the low income district 'West Assiut' and open burning of waste was observed in some cases.

MSW collection and street cleansing, is better in the Eastern district of Assiut (high income district) than in the Western district (relatively low income areas) by about 10-20%. In the Eastern district the waste is lifted twice daily; whereas it is lifted once per day in the West district. The major cities of the different Marakez are characterised by more clean streets in the high income East district of the city compared to those in lower income districts, although it might be lower to some extent than that for the capital city.

For street cleansing, 25 mechanical sweepers are used for the daily cleansing of the main streets in Assiut city and secondary streets are manually cleansed day after day.

In Abu Tig city, MSW collection and street cleansing is regular and efficient. The city seems relatively cleaner than the capital city of the Governorate. The system is based on one shift for waste collection and transportation daily. Similar to Assiut city, residents dump their waste in specific waste collection points at the streets, to be removed by the municipality human and technical resources. However, the technical status of the waste collection equipment's

and transportation system in Abu Tig is better than that in Assiut city.

In the day of our visit to El Fateh city, the municipal collection workers were on strike. Household waste was accumulated in the streets. Moreover, agricultural and CDW were accumulated on the main road surrounding the city.

On the other hand, in El Zarabi village, it was noticed that small quantities of accumulated waste was present in the waste collection points, despite the absence of waste collection bins or containers. The village roads and lanes were relatively clean. A common feature is that the waste transportation trucks are not covered with plastic sheets and this leads to spattering of some waste along a distance of 15-20 km during transportation. This leads to adverse working conditions for waste collectors and negative adverse impacts on the environment as well as the health of workers and citizens. The waste collection equipment's and transportation trucks are at a moderate level of cleanliness.

Neither the waste collection and transportation nor the workshop workers were dressed in specific uniforms or protective wear. Inspection of the garage and mechanical workshop in both Assiut and El Fateh cities indicates that the equipment's used in waste collection and transportation are in relatively good condition. Only simple maintenance operations of transportation fleets and equipment's are performed in the mechanical workshop.

iii) Fayoum Governorate

The entrance of Fayoum city seems clean and the streets were sprayed with water. The street sweepers wear clean uniforms and boots, and use proper equipment's for waste collection and street cleansing. The main and secondary streets inside the city were clean as well; and the service provision is equally distributed in high and low income districts. However, accumulated CDM was noticed in open areas. During our visit, we witnessed the official efforts of the city council to rehabilitate a slum area known as Darb EL-Tabakhin, including removing

the accumulated solid waste and street cleansing.

Household waste is collected in 330 collection bins, of 1.1 m³ capacities, distributed all over the city districts. The bins are open from the front side to be emptied manually and loaded to waste collection trucks. There are also few but clean waste baskets on the lamp posts. No wastes were accumulated around the waste collection bins. However, the waste transportation trucks are not covered with plastic sheets that might lead to waste spillage during transportation to the transfer station or any other facility.

The collection workers are positioned in three shifts. The first shift, 7:00 am – 2:00 pm, performs collection of MSW, street cleansing and transportation of waste. The second shift, 3:00 pm – 8:00 pm conduct street cleansing, and the third one, 10:00 pm – 2:00 am, collects the generated waste from the markets and crowded places. About 6% of the work force is working as supervisors and inspectors to monitor the service provided. They are provided with bicycles and motorcycle for transportation; whereas the general supervisor uses a vehicle.

Some NGOs participate in the collection services in semi-urban areas around the city. However, the officials complain as the collected waste is dumped alongside the ring road.

Currently, an open site in a residential area, known as El-Mahlag land, is used as a primitive transfer station. This site is surrounded by an old fence and a simple gate, some of its parts, however, are demolished. Waste is openly dumped there and illegally scavenged by informal individuals without any health caution or protection. No open burning of waste was noticed; however wastes attract flies and insects in contradiction of health and environmental standards. The transfer station is not equipped with fire fighting system that might arise for any reason, and cause additional health and environmental threat to area residents.

The officials specified their need for establishing a new transfer station in the city, taking into account its location, design, and operation to maximise the facility's effectiveness and efficiency, while minimising its impact on the community (Photos 18 & 19). Moreover, they implied their need for small trucks for collecting the waste from low income residential areas that are characterised by narrow streets.

The city garage and the maintenance and repair workshop are clean. However, the workers do not wear uniforms and are not equipped with proper tools. They dump waste oil in the nearest desert.



Above: Photo 18 Transfer station at Markez Senuris, Fayoum Governorate

Down: Photo 19 Transfer station at Fayoum City

The maintenance and repair workshop is in poor condition and needs upgrading, equipment's and capacity building of the staff.

Medical establishments have environmental registers and the generated hazardous medical waste is separated at source from other wastes inside these establishments, and incinerated.

The frequency of waste collection service in Senuris city resembles that in the capital city. This is not the case for street cleansing. Litter is scattered around the collection bins, the main roads and in abandoned areas. About 40 collection bins, of 2.0 m³ capacity, are distributed in the city. A daily shift provides the collection service. Waste is frequently collected in low income areas and accumulated waste was witnessed in few cases. Supervision and management control of the service is limited as compared with the capital city.

There is another waste transfer station in Senuris city, where one small CAT with excavation arrangements is operating; the waste storage facilities are also broken and dirty. This situation amounts to a health and environmental hazards to workers and the nearby residential area as well. The station's area is about 1,500 m², located on a main road, beside watercourse and agricultural land, without a fence or any basic arrangements for fire fighting. The station itself is a well-built concrete building with a well to host waste left-over's and a ceiling crane to lift the full left-over and load it over trucks to be emptied later in the public dumpsite. The station has an administration office and works on two shifts. It was not that easy to sight waste picking in the station and it was also difficult to identify if such picking is conducted by the informal sector or the municipality workers, since the workers don't wear uniforms or protective wear.

The local unit for Demo village and the associated 16 hamlets has a total population of about 20,000 citizens. The local unit conducts household waste collection, street cleansing and transportation to an open dump, 5 km from the village. Dredging and

CDW are accumulated all the way along the village. However, the village looks clean internally. No waste collection bins are present and the residents dump their waste in open waste collection points to be collected later. The collection service is provided free of charge and the daily generated waste is about 8 – 10 tonnes. The local unit uses a tractor, trailer, lauder and a truck of 6 m³ to provide its service.

It is worthy to mention that NGOs play an important role in providing waste collection and transport in the Marakez of Fayoum Governorate, especially in the villages. They provide the collection service to households for a fee of 3-5 EGP per month. They collect the waste three times a week; however, their functioning is relatively poor. The NGOs are in need of capacity building, awareness and financial support to upgrade their equipment and waste transportation trucks.

iv) Kalyobiya Governorate

Generally, the streets in Banha city, the capital, are not that clean and characterised by waste accumulation everywhere. Open burning of waste was noticed under the entrance bridge to the city. The main streets are clean; however, waste is accumulated in the secondary streets' corners. The residents openly dump their waste in the streets and waste is not collected on a regular base, causing health and environmental hazards to residents. Illegal dumping in open and abandoned areas is a common scene.

A limited number of waste collection bins are present in the city and most of them are broken; (Photo 20) whereas the waste collection equipment's are insufficient and technically poor. The waste collection trucks are not covered during the service which facilitates redistributing waste in streets again during waste transportation. The waste collection workers, on the other hand are unsatisfactory in number to take care of the service provision in such a large city. The collection and street cleansing crew is comprised of 421 workers and 10 supervisors. The workers do not wear uniforms or protective wear. The supervision and management control of the service is relatively poor that explains the deprived

performance of waste collection and cleansing services. The garage and the maintenance and repair workshop are in a subpar condition and needs upgrading, equipment's and capacity building of the staff.

The condition in Toukh city is not different, waste is accumulated in the street corners and open areas. On the other hand, since Kalyobiya Governorate is a rural Governorate, it was noticed that a 5 km long couldal dredging and cleaning waste is disseminated alongside the road to the city. This furthers citizens to dump their household waste over it, in addition to the CDW as well.

However, the condition in Shebin El Qanater city is extremely different from that in Banha and Toukh. Although the city entrance is very

crowded, main and secondary streets look clean. Waste collection bins are not available and residents dump their waste in waste collection points. The daily generated waste is about 100 tonnes. About 148 municipality workers and 15 supervisors provide the collection and street cleansing services. The workers don't wear uniforms or use protective wear. On the other hand, overall a fairly good waste collection and street cleansing service provision was perceived.

The city has an open transfer station of 400 m2 area that lacks obligatory equipment's. It contained a loader and a tractor with trailer. Some waste pickers were collecting the dry waste in the station. The equipment's in the city's maintenance and repair workshop are of moderate to good technical condition and somehow clean.



Above: Photo 20 A Fayoum

Down: Photo 20 C Kafr El Sheikh

Above: Photo 20 B Banha

Down: Photo 20 D Suez

The local unit of Astit village at Markez Kafr Shukr includes 4 hamlets, with a total population of about 32,000 citizens. An NGO employs eight collection workers to conduct household waste collection, street cleansing and transportation of waste to Abo-Zaabal controlled dumpsite, 60 km from the village. The NGO provides the households with plastic collection bags, collects the waste three times weekly, for a monthly fee of 8 EGP per household. They use two tractors equipped with trailers, a loader and a truck of 5 m³ to perform the job. The streets of the village are fairly clean. However CDW is present in any open area.

v) Al Gharbya Governorate

Despite the large effort done for household waste collection, street cleansing and waste transportation, by the working force and the official managers, Tanta is not that clean city. Dumped waste along the street sides is a common scene, especially in secondary streets. No waste collection bins exist all through the city, except few ones in the vicinity of the Governorate headquarter. Three shifts of workers are involved, the first one, 7:00 am – 2:00 pm, performs collection and street cleansing, the second, 2:00 pm – 10.00 pm, conducts cleansing and transportation of waste, and the third shift performs cleansing of main streets.

The daily generated MSW is about 350 tonnes in Tanta city (the first and second districts). Each district comprises 10 zones. Zones are divided on the basis of their area, population intensity, daily generated MSW and/or socio-economic settings. The number of workers and equipment's serving each zone is determined on basis of the former parameters. The number of waste collection and street sweeping workers is 96 with a deficiency reaching 40%. Two observers and one supervisor go along with each working shift in a zone. The workers wear a uniform and boots.

A new open transfer station was established in Mahalet Rooh village on Tanta - Al Mahalla main road. The transfer station is located in an agricultural area that would be a source of air and underground water pollution.

About 34 tractors with trailers and 9 trucks are used for waste collection; whereas 14 loaders and 12 trucks are used for the transportation of waste to El-Sadat landfill, about 120 km away. The Garage and maintenance and repair workshop are not clean with poor equipment's that needs upgrading. Moreover, they need to establish a truck washing station.

Public support for environmental issues is, nevertheless, severely tested whenever faced with the prospect of a new transfer station, incinerator, landfill, or other waste facility to be built adjacent to our live or work. It is at times like those when even the most public spirited citizens are likely to adopt the principle of Not-In-My-Back-Yard (NIMBY)⁶⁶. This might result in the project being blocked or seriously delayed as the planners and plant operator's deal with the oppositions of the local residents, environmentalists, and any other parties who believe they will be adversely affected by the proposed facility. Currently, the citizens of Al Mahalla Al Kubra strongly oppose the presence of a transfer station at the entrance of their city, close to a public hospital and a residential area. Moreover, CDW is scattered along the street sides in the city and in the main roads leading to it.

The situation of MSW collection, street cleansing and waste transportation in Samannoud city is worse than that of Tanta city. The daily generated waste is about 90 tonnes in the city. There are 283 workers providing waste collection and street cleansing using 16 tractors equipped with trailers and 35 trucks. Moreover, 5 loaders and 2 trucks are used for waste transportation.

66. ISWA Working Group on Communication and Social Issues (2004), "The NIMBY (Not In My Back Yard Syndrome): A Survey of Expert Contributions", ISWA

The local unit in El-Ameria, Markaz Al Mahalla, consists of El-Ameria, El-Sigaea, Al-Dowakhlia and Denosher villages and 48 hamlets of 10,304 feddan areas and a population of 64,930 citizens. The case of Al-Dowakhlia village perfectly reflects the NIMBY principle. The residents of the village refused the presence of the compost plant and the accumulated SW there. As a result of their demonstrations, the plant was shut down and the accumulated waste was removed.

El-Ameria village generates 5 tonnes/day of MSW. An NGO handles waste collection, street cleansing and transport of waste to Mahalat Rooh transfer station in Markez Tanta. The NGO employs 6 workers and uses a tractor and trailer for collection. The collection service is conducted on a daily basis and they charge each household served 4 EGP. Despite the efforts done, waste is dumped in the streets and watercourses.

vi) Kafr El Sheikh Governorate

To some extent the total number of employees responsible for MSW collection, street cleansing and waste transportation are 841, in the city, including 154 and 648 permanent and temporary workers, respectively. Moreover, 26 supervisors keep an eye on the service, in addition to 13 administration staff. Street sweeping is conducted manually. Two daily shifts provide the services, 8:00 am – 2:00 pm and 2:00 pm – 8:00 pm. The collection workers don't have uniforms or protection wear.

The system operates 73 tractors with trailers, 12 loaders, 19 small trucks and 15 large ones. The efficiency of the equipment's scales between 30 - 40%. The collection and transporting workers don't use plastic covers on the vehicles during their trips. The garage is clean although being crowded and the maintenance and repair workshop needs upgrading.

The population of Beila city is about 75,314 citizens and they generated 60 tonnes/day of MSW, at the end of 2012. The level of waste collection and street cleansing is to some extent less than that in the capital city of the Governorate. Beila city is divided into 7 zones. The workers, equipment's and vehicles are directed evenly to those zones.

In Beila Markez, collection, street cleansing and transportation of MSW services are conducted by the public sector using 20 and 163 permanent and temporary workers respectively, 6 supervisors and 5 administrative staff. The fleet consists of 34 tractors with trailers, 4 loaders and 14 large trucks. However, its efficiency is poor. The officials designated their need for additional 2 loaders. The Garage is clean and the maintenance and repair workshop only provides simple maintenance for the vehicles and equipment's.

The local unit in Abo Badawy consists of a main village and 20 hamlets. The population of the unit is about 20,000 inhabitants generating around 15 tonnes/day of solid waste. The collection, street cleansing and waste transportation services are provided by 7 workers, using 3 tractors and 2 trailers. There are 20 waste collection bins in the village and the streets were very clean compared to other visited villages in the selected Governorates. The collected waste is transported to the compost plant. Moreover, two NGOs provide the service in two of the hamlets, namely Alhema and Algazar, using 2 tractors and 2 trailers.

vii) Suez Governorate

Suez city streets are relatively clean. There are 750 iron waste collection bins of 1.3 m³ capacity and 40 bins of 2.4 m³ capacity that are mechanically lifted, in addition to 15 containers of 20 m³ capacity that are transferred by hawk lifts. The large

containers are placed in high population density sectors. It is rare to perceive neither accumulated waste around the collection containers nor litter or overflowing litter bins in the city centre, along main roads or in popular places where people gather.

About 350 tonnes of MSW are daily generated in Suez city. Illegal disposal of CDW is clear on the road sides, apart from the city centre. Open burning or illegal disposal of household waste was not noticed in low income residential sectors. Waste collection and street cleansing services are conducted on a daily basis, and the quality of services is nearly similar in the different districts of the city.

About 475 workers participate in waste collection and street sweeping. The service is monitored by 26 inspectors and 6 supervisors. Moreover, 118 drivers provide waste transportation, under the supervision of 3 staff. The workers wear uniforms and boots.

The Cleansing and Beatification Authority uses 105 equipment's and vehicles for collection and transport of MSW, including 3 compactor trucks of 25 m3 capacities, 5 compactor trucks of 18 m3 capacity, 13 Small tipper trucks, 26 mini trucks, 2 hawk lifts, 13 loaders and 4 tractors. The Agency provided documentary evidence of appropriate service planning, delivery, monitoring, liaison and feedback; and evidence for regular supervision on the ground.

Table 18 provides a comparative analysis of the municipal solid waste collection services in the selected Governorates.

Table 18 Comparative analysis of solid waste collection services in the selected Governorates

Governorate	City or Village	Waste Collection Collection Responsibility	Collection Mode	Streets' Cleansing	Collection & Cleansing Coverage	Waste Transportation Trucks	Collection Workers	Transfer Stations
Qena	Qena city	City council	Dumping waste in collection points in the streets	Regularly cleaned	Nearly equal in the whole city	Reflect good working conditions	Wear uniforms and use suitable hand tools	N.A
	Qoos city	City council	Dumping waste in collection points in the streets	Regularly cleaned	Nearly equal in the whole city	Three trucks are working out of ten	Wear uniforms and use suitable hand tools	N.A
	Hegaza village	Local administration unit	Dumping waste in collection points in the streets	The main streets look clean	Nearly equal in the whole village	Lack of sufficient trucks	Lack of workers	N.A

Assiut	Assiut city	City council; except for East Assiut district, a contractor is responsible	Dumping waste in collection points in the streets	Regularly cleaned	Streets in high income district are cleaner than in lower ones	In relatively good condition but trucks are not covered	Not wearing uniforms	N/A
	El Fateh city	City council	Dumping waste in collection points in the streets	Regularly cleaned	Nearly equal in the whole city	In relatively good condition but trucks are not covered	Not wearing uniforms	N/A
	El Zarabi village	Local administration unit	Dumping waste in collection points in the streets	The roads are relatively clean	Nearly equal in the whole village	In relatively good condition but trucks are not covered	Not wearing uniforms	N/A
Fayoum	Fayoum city	City council. Some NGOs participate in collection in semi-urban areas	Sufficient collection bins are available	Regularly cleaned	Equally distributed in high and low income districts	In relatively good condition but trucks are not covered	Wear uniforms and use suitable hand tools	A primitive transfer station in a residential area
	Senuris city	City council	Accumulated waste around collection bins	Regularly cleaned	Accumulated waste was observed in few cases	Trucks are not covered	Not wearing uniforms	A transfer station exists.
	Demo village	Local administration unit	Dumping waste in collection points in the streets	Regularly cleaned	Nearly equal in the whole village	Trucks are not covered	Not wearing uniforms	N/A
Kalyobiya	Banha city	City council	Limited number of bins. Dumping waste in streets	Inadequate cleaning	Only main roads are clean	Trucks are not covered	Not wearing uniforms	N/A
	Shebin El Qanater city	City council	Dumping waste in collection points in the streets	Main and secondary roads look clean	Nearly equal in the whole city	Trucks are not covered	Not wearing uniforms	Open transfer station
	Astit village	NGO	Door-to-door collection	Regularly cleaned	Main roads are clean	Trucks are not covered	Not wearing uniforms	N/A

Governorate	City or Village	Waste Collection Collection Responsibility	Collection Mode	Streets' Cleansing	Collection & Cleansing Coverage	Waste Transportation Trucks	Collection Workers	Transfer Stations
Al Gharbya	Tanta city	Cleansing and Beatification Authority + city council	Limited number of waste bins. Dumped waste along the street sides	Not adequately cleaned	Only main roads are clean	Most of the trucks are covered	Wearing uniforms	Open transfer station in Mahalet Rooh
	Saman-noud city	City council	Dumping waste in collection points in the streets	Poor street cleansing	Not proper	Trucks are not covered	Not wearing uniforms	A transfer station turned to a huge open dumpsite
	El-Ameria village	NGO	Dumped waste along the street and couldal sides	Poor street cleansing	Not proper	Trucks are not covered	Not wearing uniforms	Open transfer station in Mahalet Rooh
Kafr-El Sheikh	Kafr El Sheikh city	Cleansing and Beatification Authority + city council	Insufficient number of waste collection bins	Moderately clean	Nearly equal in the whole city	Trucks are not covered. Transportation fleet efficiency about 40%	Not wearing uniforms	N/A
	Beila city	City council	Collection bins are available	Moderately clean	Nearly equal in the whole city	Trucks are not covered, Transportation fleet efficiency is poor	Not wearing uniforms	N/A
	Abo Badawy village	Local administration unit	Sufficient waste Collection bins	Regularly cleaned	Nearly equal in the whole village	Trucks are not covered	Not wearing uniforms	N/A
Suez	Suez city	Cleansing and Beatification Authority	Sufficient collection bins are available	Regularly cleaned	Equally distributed in high and low income districts	Reflect good working conditions	Wear uniforms and use suitable hand tools	N/A

Summary of findings and recommendations

- The public sector provides MSW collection, street sweeping and waste transportation in the capital cities of the selected Governorates;
- The responsibility of service planning, delivery and monitoring is assigned to: a SWM unit in Assiut Governorate; Cleansing and Beatification Agencies in Al Gharbya, Kafr El Sheikh and Suez Governorates; and local administration in the Marakez and cities of Qena, Fayoum and Kalyobiya Governorates;
- The proportion of waste collected in the capital cities of the selected Governorates might be more than 70 - 80%, However, in other cities at the Marakez, the figures are likely to be low;
- No waste collection bins or containers are used in Qena and Assuit Governorates. Few collection bins exist in Kalyobiya and Al Gharbya Governorates and insufficient number in Kafr El Sheikh Governorate. Adequate number of collection bins are available in Fayoum, and Suez Governorates;
- In all the selected Governorates, street cleansing is performed manually, except for East Assiut district;
- MSW collection points, used as open transfer systems, exist in residential districts in the capital cities of Fayoum, Kalyobiya and Al Gharbya Governorates;
- Traditional core areas of old cities and unplanned slum areas pose a particular problem for MSW collection because of narrow access routes and lack of space for waste containers;
- A wide range of refuse vehicle types are used in the selected Governorates. Two dominant trends regarding the vehicles being used give cause for concern. The first relates to the use of outdated vehicles that are uneconomical and inefficient. The second relates to the gradual replacement of obsolete refuse vehicle fleets with modern compactor trucks that are unsuited for most applications;
- In the selected Governorates, regular supervision, of waste collection and street cleansing exists on the ground. However, the supervision system is successful in Qena, Fayoum, Kafr El Sheikh and Suez Governorates; whereas being moderately to poor in Assuit, Al Gharbya and Kalyobiya Governorates;
- A hot-line is used to receive citizen's complaints in Al Gharbya Governorate. Moreover, citizens' appreciation of the development of household waste collection and street cleansing services is clear in Fayoum and Suez Governorates;
- The lack of technical resources should be considered. Suez Governorate has a proper maintenance workshop. However, the other selected Governorates lack such facilities to a variable extent.
- The collection and street cleansing workers are generally provided with overalls and boots in the selected Governorates, except for Kalyobiya and Kafr El Sheikh Governorates. Moreover, social health insurance is available for all the collection workers.
- The lack of skilled and trained human resources should be considered when planning improvements to SWM. Moreover, capacity building programmes are needed for all the staff dealing with MSWM;
- Despite of the regular collection and street cleansing, the quality of street cleaning seems poor due to citizens' attitudes of random dumping of their household waste on roadsides and waterways.
- Some citizens regard the streets as an appropriate place for dumping their domestic waste. Public education would change this attitude. Moreover, the low level of environmental awareness among the public makes it difficult to implement household segregation into two or more waste streams. The enforcement of legislation, will have a significant impact on WM and is closely linked to public attitudes and awareness; and
- Involving the public in the planning of issues that affect them, such as the type of collection service, the frequency of collection, the provision and location of storage containers is essential.

3.3 WASTE TREATMENT AND DISPOSAL

Disposal of MSW denotes to the 'different treatments that are run through the waste to avoid environmental and health hazards'. Success of SWM is directly related to the disposal efficiency. Disposal involves planning, administrative set up, finance, technology support and their interdisciplinary relationships. The imperative aspect of this stage is the selection of the most proper disposal technology. To dispose waste in efficient way technology knowledge, trained manpower, appropriate infrastructure and availability of land is urgently obliged.

The disposal of solid waste is challenging. This problem lasts to grow parallel to population and industrialisation growth. Disposal of waste in uncontrolled dumps has become repetitive in the majority of Governorates. An evaluation of waste treatment and disposal in the selected Governorates is given below.

i) Qena Governorate

Street scavengers carry out sorting of household waste dumped in the streets of the capital city. They separate and collect a fraction of the dry portion (plastic, paper, glass, metals and textile) of the waste. Moreover, they collect some recyclables in the uncontrolled dumpsite.

About 40 – 50 tonnes of the collected waste, by municipal workers, are directed to the compost plant, operated by the public sector, 7 km out of the city (Photo 21). The remaining MSW is transported directly to an uncontrolled dumpsite. The distance from the city to the dumpsite is about 65 km.

The access road to the compost plant in Qena city is fairly good; however, the plant was out of commission at the time of our visit and needs massive repairs. Large quantities of solid waste were surrounding compost plant. The MSW received in the plant is manually segregated and the dry recyclables are separated. The residual waste is transported to the dumpsite.

The compost plant occupies an area of 16 feddan and is surrounded by a steel mesh fence. The number of workers is 40 and 8 supervisors and drivers. The available equipment's and transportation vehicles therein are: a sorting line, a sieve, a shredder, 2 balers, 3 front loaders, 4 tractors, 4 trucks and a water wagon. In addition to un-sanitarily working conditions, most of the workers do not wear uniforms or use any protective wear.

The separated plastics, cardboard, metal and textiles are pressed in bales, except glass which is stored in woven plastic bags, and occasionally sold in auctions. The compost plant manager stated that the workers daily separate about 50 kg of plastics and 250 kg of cardboard. These small amounts of the separated items confirm poor separation of dry recyclables. Moreover, he pointed out that the manufactured compost is sold for only 50 LE/tonne as the farmers are not willing to buy it. The low price of the compost might be an indicator for its poor quality.

The access road to the uncontrolled dumpsite is not paved. Solid waste is accumulated on both sides of the road that is also not lighted. Therefore, the dumpsite operations are limited to the day-light working shifts only. This is not the only operational problem that faces the dumpsite, but it also lacks the equipment's required for covering the incoming waste (e.g. shovel loaders or bulldozers). Open burning of waste is a common scene there and fire fighting equipment's are not available. No mitigative measures exist for controlling greenhouse emissions. The open burning of waste could be attributed not only to the waste self-igniting process - that might probably happen during summer - but also to man-made fire around the dumpsite. The dumpsite is not secured by a fence, and the farmers might be trying to extend their activities to parts of the nominal area of the dumpsite. The farmers are using drip irrigation network around and somehow inside the dumpsite location. This will - by time - cause soil and ground water

pollution, and negatively affect the quality of farmers' life and the produced crops as well.

In the dumpsite, no records are carried out for the incoming mixed waste volumes, weights and/or categories. There is a lack of permitting/licensing procedures, environmental monitoring, inspection and verification. Similarly, the facility lacks management control in planning, implementation and monitoring services. The workers don't use uniforms or protective wear. Both the working environment and

health conditions are poor.

For Markez Qoos, the generated mixed MSW is openly dumped in an uncontrolled dumpsite, of 167 feddan areas, 5 km outside the city of Qoos. The access road to the site is unpaved and not lighted, and there are no definite borders to the dumpsite area. The dumpsite faces an unavailability of workers and equipment's. Open burning of the waste is detected. The situation of Qoos dumpsite is identical with that discussed previously.



A



B



C



D



E



F

Photo 21 The compost plants in (a) Qena, (b) Assiut, (c) Abu Zaabal, (d) Tanta, (e) Beila and (f) Suez

ii) Assiut Governorate

Waste pickers and scavengers are active in Assiut city. They sort the MSW in the city streets and the dumpsite, collecting the dry recyclables. Recycling of MSW in Assiut Governorate is restricted to composting of organic waste and recycling of paper/cardboard.

The compost plant in Bani Ghaleb, at a distance of about 17 km from Assiut city, was established in 1998 and occupies an area of 38 feddans. The plant is located in a dirty area, bordered by a CDW and the working conditions inside the plant are poor. The plant is walled by a fence. The received mixed MSW is manually sorted to separate plastics, cardboard, glass, metals and textiles. The plant was designed to operate two shifts daily with production capacity 10 tonnes / hour. However the plant is operating now with 50% of its production efficiency, although its technical resources are fairly good.

El-Hadi plant was established in 1977, on an area of 2 feddan, in Ezbet Al-Nasiriyah, at El-Fath Markez. The raw material used in the plant is waste paper segregated from the MSW generated in Assuit city and surrounding cities. The plant produces 2.5 tonnes/day of multi-layered grey cardboard that is marketed in Cairo.

The reject waste from El-Hadi plant is transported to an uncontrolled dumpsite in the Eastern Mountain located about 25 km far from El-Fath city. Whereas, the rejected waste from the compost plant, about 60% of the incoming waste is transported to an uncontrolled open dumpsite beside the plant in Bani Ghaleb. The access road to the dumpsite is unpaved and generally unsuitable to accommodate waste transportation trucks. The area of the dumpsite is 24 feddan and is not surrounded by a fence. Many private land reclamation activities are going around it. Open burning practices are common. Absence of management and supervision from the municipality was noticed during our visit.

Generally, MSW generated from the 11 Marakez of Assiut Governorate is transported and finally disposed in 10 uncontrolled dumpsites. The access roads and the conditions of the dumpsites are similar to that mentioned above for the uncontrolled dumpsite in Bani Ghaleb. During our visit, we observed self-ignition dumpsites in El Fath and Abu Tig.

Moreover, there is a controlled dumpsite serving El Zaraby village alone, but the uncontrolled dumpsite of Markaz Abu Tig as a whole lies at about 1 km far from it. This indicates that a better planning for MSWM is essential.

lii) Fayoum Governorate

Scavengers are active in sorting and collecting dry recyclables from the open collection points, transfer station and the uncontrolled dumpsites in the Governorate.

The compost plant in El-Adwa, Fayoum Markez has not been functioning for more than 10 years now.

The generated MSW in the Governorate is transported to uncontrolled open dumps. The dumpsite of Fayoum city, located in New Fayoum beside the Western Cairo – Assuit road, occupies an area of 60 feddans and the transportation distance is about 30 km (Photo 22). The access road to the site is lighted. The condition of the dumpsite is like that in Qena Governorate.

The new controlled dumpsite in Kom Oshim is a little bit modern, where the access road is wide and paved, and is surrounded by a fence and gate. It also has a loader and equipped with a weighing bridge, electric generator, shelter for the equipment's, guiding signs and an administration building. This dump is working 24 hours/day and the fence is equipped with lamps yet they're not functioning. There is a controlled landfill consisting of one lined active cell for the disposal of the residues 'ash' resulting from hazardous medical waste incineration. However, the municipal

waste is not compacted or even covered with soil or any other inert material, as there is no bulldozer that makes waste in a direct contact with ambient air leading to possible health and environmental hazards. It is worth mentioning that the dumpsite has no access to water, which explains the use of soil to combat any fire that might arise. Moreover, the weigh bridge is not operating due to the breakdown of its computer. Many equipment's and spare parts were stolen from the dumpsite during the January, 2011 revolution time.

The dumpsite is used for the disposal of the MSW generated in Senuris and Tamiya Marakez. 13 workers and 4 private individual waste scavengers work in the dumpsite without wearing any personal protective equipment's. The dumpsite's original area is 17 feddans, with 100 Feddans for future extension, and receives 180 tonnes/day of MSW.

Two more uncontrolled open dumpsites exist in the Governorate. The first in Kasr El-Basel is used for the disposal of MSW generated in Itsa Markez. The second in Hanna Habib serves Ebshway and Yousef El-Seddeek Marakez.

The situation of all the dumpsites in the Governorate is similar to that in Qena Governorate.

iv) Kalyobiya Governorate

Scavengers collect the recyclable items from household waste dumped in the streets, collection points and the controlled open dump in Abu Zaabal. The compost plant in Abu Zaabal was established in 2009 but is not functioning. The plant manager indicated that it is not operating due to problems in the production line.



A



B



C



D

Photo 22 The dumpsites in (a) Qena, (b) Assiut, (c) Fayoum, (d) Abu Zaabal, (e) Samannoud and (f) Suez

The road to the main dumpsite for Kalyobiya and part of Cairo Governorate, in Abu Zaabal, is unpaved and not lighted. Large amounts of waste are accumulated on both sides of the road and sometimes on the road itself. The dumpsite is rented to a private contractor who pays 21,000 LE/month for manual sorting of waste and collection of dry recyclables. Waste scavengers don't wear any personal protective equipment's. The sources of transported waste to this dumpsite are Kalyobia municipalities, private companies and contractors, and waste collectors. The dumpsite accepts almost all types of waste; municipal, industrial and CDW.

The dumpsite is the largest septic focus of the whole area around. It is established over an old quarry and the nearby ground water is rising up. It is located close to Ismailia irrigation canal that is used as a source of potable water for Kalyobiya Governorate, and this might lead to water pollution.

The shovel loader and bulldozer are working well in the dumpsite. The dusty environment is a real problem, in addition to the presence of insects, flies and other rodents. Dogs and even sheep are found inside the dump working area (or work face). Waste is spread first by the loader before being covered directly by soil. Waste alum powder (used in the water treatment plants) is used as a final cover to the disposed waste

The planning, organisation, management and engineering of the site are poor. The system lacks environmental monitoring, inspection, and verification.



E



F

Box 11 The informal sector activities in Ezbet El-Nawar, El-Zarayb, El-Khossos, Kalyobiya Governorate

While several private waste collection companies operate in Cairo, the traditional waste-collectors (zabaleen) from the poorer neighbourhoods interpose most significantly to waste collection.

The zabbaleen living in El-Zarayb neighbourhood collect around 700 tons of household waste on a daily basis from the Eastern zone of Cairo Governorate and some areas in El-Khossos. The collected waste is sorted for dry recyclables such as plastics, paper and cardboard, metals, textiles and bones.

Currently, there are about 256 warehouses, workshops and small recycling plants that receive and process the sorted recyclables in El-Zarayb and Ezbet El-Nawar. The warehouses include about: 110 for plastics; 22 for paper and cardboard; 24 for scrap metals; 7 for glass; 9 for textiles; and one for bones.

Plastic workshops include: 7 for plastic washing; 33 for crushing; 6 for agglomeration of used plastic bags

to fine particles to be used for producing new plastic bags; and 27 for Pelletizing that use finely crushed or agglomerated plastic wastes, remove impurities and transform them into pellets ready to be used for different plastic products. Moreover, there are 4 plastic film making small plants for the manufacture of plastic garbage bags, 3 plastic mats production plants, a shoes insole production plant; and two plastic shoes and slippers production plants.

GIZ is supporting Kalyobia Governorate since 2010, through the Participatory Development Programme in Urban Areas (PDP), to develop integrated community-based waste management in two cities, El-Khossos and El-Khanka. The project includes an analysis of the current waste collection system, separation and recycling, in addition to developing a solid waste management strategy that emphasises the role of the informal sector. The Bill and Melinda Gates Foundation have provided a grant of US\$5.3 million towards the project.

In March 2013, Kalyobia Governorate, GIZ and Ecocem - a subsidiary company of Lafarge Group - signed a cooperation agreement that will address some of the WM problems in the Governorate, find alternative solutions to the growing energy crisis facing industries in Egypt and build a new value chain for the local communities⁶⁷. This cooperation is a good example of public and private organisations joining efforts to work together on finding solutions to Egypt's environmental problems, while at the same time enhancing economic opportunities for poor urban populations.

This cooperation agreement builds on the existing partnership between GIZ and Kalyobia Governorate to rehabilitate an old recycling facility. Within this context, a new processing line to produce Refuse Derived Fuel (RDF) from waste materials – that might be used as an alternative source of fuel in cement factories – will be built. This facility will establish more than 50 job opportunities while also benefiting informal

waste collectors and recyclers who will work on separating recyclable materials such as plastics and metals.

Ecocem will provide technical support for the operation of the RDF processing line. Part of the revenues generated from the sale of RDF will be reinvested by the Governorate to enhance the waste collection and transportation systems in the cities of Khossos and Khanka. This agreement will also entail the cooperation between Ecocem-Lafarge and GIZ in conducting research on the use of RDF, initiating stakeholder consultations as well as dissemination of technical knowledge. This will for the most part be done in cooperation with the National Solid Waste Management Programme (NSWMP).

v) Al Gharbiya Governorate

Waste pickers in Al Gharbiya Governorate perform the same job as in Kalyobiya Governorate.

67. URL: <http://egypt-urban.net/ecocem-lafarge-and-giz-agree-to-pilot-new-waste-management-solutions-for-egypt>

About 1,200 tonnes/day of the generated MSW in the Governorate is transported to the compost plant, located in Defra, Tanta Markez. The capacity of the compost plant reaches 320 tonnes/day at the time being, the plant is working with 30 – 40% efficiency. The quantities of remaining untreated MSW and the plant rejected waste are about 1,000 tonnes/day accumulated besides the plant forming a plateau of about 20 meters height, despite about 1,100 tonnes of MSW is transported daily from the Governorate to El-Sadat landfill.

The access road to the compost plant is paved; the plant is walled by a fence and occupies an area of 5 feddans. The incoming waste transportation vehicles are weighed at the entrance of the plant. The quality of the produced compost is reasonable. The workers neither wear a uniform nor use personal protective equipment's. No environmental monitoring, inspection or verification is regularly conducted by any independent organization.

The formed open dump, beside the compost plant, exists in an agricultural area and poses the serious health, safety and environmental threats. i.e., fire and explosion; inhalation of toxic gases; injury to workers and scavengers working on or around the dumpsite; contamination of soil and groundwater; dissemination of diseases initiated by mosquitoes, flies and rodents; and decrease in the quality of life to nearby residents and the local community. Moreover, the present situation exhibits public nuisance, diverts of land from more productive uses and depresses the value of surrounding land.

Due to limited land availability in the Governorate, a controlled-landfill was established in El-Sadat, about 120 km from Tanta, the capital city of the Governorate. The landfill area is 100 feddans, including 12 cells, each is 5 feddans and with a capacity of 375,000 cubic meters of MSW. At the time being, five of the cells are already filled. The landfill contains a leachate collection system; however, no gas collection system has yet been installed.

The access road to the landfill is paved; the site is lighted and surrounded by a fence.

The site has a proper entrance gate and the incoming waste transportation vehicles are weighed. The facility uses a loader and three trucks for soil transportation, each of 20 cubic meter capacity. However, the site lacks the presence of a maintenance and repair workshop. Scavenging activities are prohibited.

The infrastructure of the landfill is in place, disposed waste is compressed and daily covered in the cells and a system for leachate containment collection is in place. However, the landfill system lacks surface and ground water monitoring, and collection and venting of landfill gas.

An environmental impact assessment study was conducted before the landfill construction. EEAA provided the necessary permitting/licensing for the facility and conducts regular environmental monitoring and inspection. Fire fighting equipment's are available. Appropriate service planning, delivery and feedback evidences are accessible. The workers wear uniforms and boots, and are aware of safe operating procedures.

Moreover, a new compost plant has been established in El-Sadat landfill and its operation is expected to commence shortly. The proposed production capacity of the plant is 450 tonnes / day.

On the other hand, the uncontrolled dumpsite in Samannoud city represents the worst case of municipal solid waste disposal facilities in Egypt. The accumulated waste in the site appears as a large plateau, about 30 meters high, and the waste are permanently on fire. At the site, there are no recording or inspection of incoming waste, no control of waste placement, no compaction of waste, and no application of soil cover. Despite the eternity of fire in the site, scavengers are active, and vermin, dogs and birds are within the nearby.

The Samannoud dumpsite is located in an agricultural area and is about 500 m from a residential area. The neighbouring residents suffer from the continuous emission of smoke and air pollutants. An emergency plan has to be implemented for closing or upgrading this site.

vi) Kafr El Sheikh Governorate

Waste picking of the dry portion of MSW is a widespread practice in the Governorate.

Two compost plants exist in Kafr El Sheikh Governorate in Beila and Sidi Salem Marakez. Both plants are leased to the private sector and the plants' production efficiencies are 50 and 15%, respectively. The officials in the Governorate indicated their need to upgrade both plants and to establish two additional ones in Tal El-Dabaa and Tal Om-Gafaar. However, the Governorate's previous experience deep-rooted the failure of their officials' in managing the existing plants and thus rented it to the private sector and suffered from many severe problems.

The access road to Beila compost plant is paved and a fence surrounds it. The generated MSW in Beila Markez and surrounding areas is entirely transferred to the plant. The plant receives about 300 tonnes/day of MSW, 200 tonnes of which are daily rejected and sent to a dumpsite, and produces about 50 tonnes/day of compost. The plant is rented for 35,000 LE/month. Scavengers exist inside the plant, working in the reception area of the waste. The plant works one shift, 7:00 am – 5:00 pm, and employs 8 workers. The workers don't wear uniforms and don't use personal protective equipment's. The quality of the produced compost is fair. The environmental condition is poor inside the plant.

vii) Suez Governorate

Similar to the other Governorates, scavengers act upon segregation and collection of dry recyclable waste from the waste collection bins and landfill.

The compost plant in Suez city occupies an area of 16,470 square meters. The access road to the plant is paved and it is surrounded by a fence. The incoming waste transportation vehicles are weighed at the entrance of the plant. The inner roads in the plant are clean and the environmental conditions are good.

The plant capacity is 160 tonnes/day and with poor production efficiency. The Executive Director of Cleansing and Beautification

Authority confirmed the need for improving the production efficiency of the existing production line in the compost plant and the add-on of a new production line. The produced compost is of good quality.

The workers wear uniforms and boots and use personal protective equipment's. Moreover, there is documented evidence of appropriate service planning, delivery, monitoring and feedback in the plant.

Moreover, a processing line for the production of Refuse Derived Fuel (RDF) from waste materials is acquainting within the composting plant. The processing line is operated and managed by Lafarge Group.

A controlled landfill, now functioning as a controlled dumpsite, is used for MSW disposal. It is located 10 km from Suez city centre, with a total area of 104,000 square meters. The access road is paved, clean and lighted. However, it is not surrounded by a fence. The incoming waste transportation vehicles are weighed at its entrance.

Scavengers are working in the site. The waste is placed in designated areas, compacted and irregularly covered. No fires were noticed in the site. Incoming waste volumes, weights and categories are registered. The site lacks leachate collection and landfill gas collection and treatment system. There is documented evidence of appropriate service planning, delivery and feedback. The workers wear boots and uniforms.

Assessment of composting plants in Egypt

In most Governorates of Egypt, the solid waste stream is characterized with a high organic content. The combination of high organic content, low labour costs, and the need for desert reclamation and soil conditioning rendered composting a desirable alternative that should be cared about for the treatment of solid waste in Egypt. At the time being many Egyptians are aware of health threats associated with the escalating application of high rates of chemical fertilisers and a conspicuous move towards 'biological products' is gaining momentum.

Introduction of composting plants started with few numbers of imported plants through international loans from the World Bank (e.g. the Swiss-made plant in Shoubra, another in Shata Damietta which is still operating with lesser capacity, and the British one which was located in Abis area in Alexandria and called Abis 1. There is another facility donated to Egypt through JICA and is still operating in Alexandria.

The department of the semi-industrial ??? at the Academy of Scientific Research and Technology stepped into the market with a pilot plant in Zagazig / SharKia Governorate. The Government of Egypt, through a USAID fund has established a national program to build 50 composting plants all over Egypt through the Ministry of Military Production factories. ENTAG, a private SWM management company established close cooperation with the military production factories and was successful in forming a technology / manufacturing alliance where several plants were made and installed.

Current situation of implemented facilities

Composting in Egypt faces certain challenges in achieving a successful operation. The high percentage of rejects might be attributed to the design of production lines in addition to the reasons mentioned above. It could be a result of combination of factors among them, design of machines, inappropriate waste intake, and lack of monitoring the fermentation process. Design of good production lines that provide high quality finished product and minimise environmental pollution is on top of the challenges.

In Egypt, it is fair to conclude that one of the top challenges faced by composting programs is the provision of trained management and technical staff for running the composting facilities. This is particularly in the new facilities being built. Furthermore, the role of the private sector as a partner to the public sector in operating the facilities to the benefit of the communities served is weak. In sum, many technical problems and poor management led to higher production

costs and ultimately financial losses.

Since their introduction in the late nineties, the composting facilities experienced enduring problems that could be categorised in the following:

i) Technical: More or less all of the composting plants are manufactured locally through the military factories and the Egyptian Industrialisation Authority. The facilities that were built by the first one are poorly designed, and poorly finished as there are many technical problems incorporated in the design and manufacturing, lead to quick technical problems that need frequent repair with high cost of spare parts. The original design has not been changed or improved since the first version. Most of the current plants face real technically oriented problems and are not addressed for technical reasons such as the repeatedly and frequent damage, break and disturbance of the main components of the plant, and the unavailability of the spare parts on time in addition to the lack of technical skills among the plant operators. Moreover, there are other non-technical reasons that will be addressed in the following levels.

ii) Organisational: The organisational structure of composting plants in Egypt is varying from one governorate to the other. Sometimes it belongs to the city manager or the secretary general according to the number and importance of the plant to the governorate. The staff is selected from the mechanical fleet and most of the time was not trained enough to take care of the plant operation and most important to plant repair and maintenance. This is another reason for the repeatedly disturbance that might occur to such plants.

iii) Financial: The plants were built to cope with the waste generated in their surrounding cities and governorates, as a service facility (i.e. non-for-profit). This means that the original feasibility studies for these plants did not take care of depreciation cost as part of the overall costs that the

plants operators should bear. Therefore, and in the most successful case, a compost plant could hardly cover its direct operational costs with some gross profit, but for sure the financial cash flow will show deficit when depreciation figures are added.

The typical governmental/public monetary document cycle is longer than a compost plant manager to bear in order to procure – in a very short time – a necessary spare part. This, in addition to the same cycle for selling the secondary materials is applicable.

Composting plants are erected based on a personal request from a governor to the relevant authority (here is the Ministry of the Local Development/Administration, and in close coordination with the Ministry of State for Environmental Affairs). This, most of the time lacks the necessary economic studies relevant to the availability of a local market to compost, the market prices of compost and secondary material, the cost of waste tipping and transportation to the plant, the distance to the nearest landfill/dumpsite, the amount of waste generated in the plant's area (where a good number of the plants are under operation where the amount of incoming waste is much lesser than the nominal capacity of the plant. This is, in addition to other elements such as the availability of skilled labourers.

a) Environmental: All the plants should have a permission from the Central Department of Environmental Impact Assessment (belongs to the Egyptian Environmental Affairs Agency – EEAA), before they are erected. However, on the other hand, the

environmental and health conditions of most (if not all) of these plants are miserable.

This includes, but not limited to the illegal dump of rejects around the plant's area that attracts flies and rodents, the unavailability of protecting gears to labourers whom use their bare hand in waste sorting and are subjected to every health hazardous. Litter is scattered around the production lines and fence area from outside and inside, the unavailability of emergency plans technically, environmentally and health wise to take care of any problem promptly and/or professionally.

b) Social: People are not well aware about the availability of composting plants in their cities and governorates, the role of these plants in waste recycling and minimisation in specific and on protecting the environment in general, and the value of these plants. This diminishes their understanding to this issue in general and the public efforts on tackling waste management problems that lead to the minimum public support to the governmental efforts and so willingness to participate and pay for these services.

Finally, a comparative analysis of municipal solid waste treatment and disposal services in the selected Governorates is given in Table 19.

Table 19 Comparative analysis of solid waste treatment and disposal services in the selected Governorates

Governorate	City or Village	Waste Treatment and Disposal										
		Waste Pickers		Compost Plant		Production Efficiency	Compost Quality	Workers	Other Recycling Facilities	Disposal Facility		Landfill
				Management								
Qena	Qena city	Collect dry recyclables from collection points in the streets and dumpsites		Public sector	The plant needs massive repair	--	--	Do not wear uniforms	--	✓	--	--
	Qoos city	Collect dry recyclables from collection points in the streets and dumpsites		--	--	--	--	--	--	✓	--	--
	Hegaza village	Collect dry recyclables from dumpsites		--	--	--	--	--	--	✓	--	--
Assiut	Assiut city	Collect dry recyclables from collection points in the streets and dumpsites		Public sector	50%	Medium		Do not wear uniforms	--	✓	--	--
	El Fateh city	Collect dry recyclables from collection points in the streets and dumpsites		--	--	--		--	Waste paper recycling plant (at Ezzbat El-Nasseria) produces 2.5 ton/day of multi-layered grey cardboard	✓	--	--
	El Zarabi village	Collect dry recyclables from dumpsites		--	--	--		--	--	--	✓	--
Fayoum	Fayoum city	Collect dry recyclables from collection bins, transfer stations and dumpsites		--	Not functioning for more than 10 years	--	--	--	--	✓	--	--
	Senuris city	Collect dry recyclables from collection bins, transfer stations and dumpsites		--	--	--	--	--	--	--	✓	--
	Demo village	Collect dry recyclables from dumpsites		--	--	--	--	--	--	✓	--	--

Kalyobiya	Banha city	Collect dry recyclables from collection points in the streets and dumpsite	--	Not functioning since establishment in 2009	--	--	Remarkable informal recycling activities in El-Khososs and El-Khanka	--	✓	--
	Shebin El Qanater city	Collect dry recyclables from collection points in the streets and dumpsite	--	--	--	--	The Governorate, GIZ and Lafarge signed agreement to build a processing line for RDF	--	✓	--
	Astit village	Collect dry recyclables from dumpsite	--	--	--	--		--	✓	--
Al Gharbya	Tanta city	Collect dry recyclables from bins, collection points in the streets and transfer station	Public sector	30 - 40%	Medium	Do not wear uniforms	--	✓	--	✓
	Samannoud city	Collect dry recyclables from bins, collection points in the streets, transfer station and dumpsite	--	--	--	--	--	✓	--	✓
	El-Ameria village	Collect dry recyclables from the, transfer stations	--	--	--	--	--	--	--	--
Kafr El Sheikh	Kafr El Sheikh city	Collect dry recyclables from bins, collection points in the streets and dumpsites	--	--	--	--	--	✓	--	--
	Beila city	Collect dry recyclables from bins, collection points in the streets dumpsites, compost plant and dumpsites	Private sector	35%	Good quality	Not wearing uniforms	--	✓	--	--
	Abo Badawy village	Collect dry recyclables the compost plant and dumpsites	Private sector	35%	Good quality	Not wearing uniforms	--	✓	--	--
Suez	Suez city	Collect dry recyclables from bins and dumpsites	Public sector	30%	Good quality	Wearing uniforms	The reject of compost plant used to manufacture RDF	--	✓	--

Summary of findings and recommendations

- Scavengers actively perform household waste segregation and collection of dry recyclables from waste collection points in the streets, collection bins, transfer stations, and open and controlled dumpsites.
- Most of the visited compost plants are out of order or work with poor production efficiency.
- The compost plants are managed and operated by the public sector, except for Kafr El Sheikh Governorate, that leases its two compost plants to the private sector.
- The quality of the produced compost is generally poor, as the raw material is a mixed MSW.
- The common disposal technique utilises uncontrolled dumpsites that pose major environmental and health risks.
- Al Gharbiya Governorate's landfill is

located in El-Sadat, about 120 km from the capital city of the Governorate.

The waste transportation vehicles use narrow roads to reach the landfill. The location of the landfill sets a financial and effort burden on the Governorate. The officials stated their need to upgrade the existing composting plants and to establish additional ones, to lessen the quantity of waste to be transported to the landfill.

- The two worst cases of waste disposal facilities are in Al Gharbiya Governorate's uncontrolled dumpsites in Tanta and Samannoud. They pose serious environmental, health and fire hazards; urgent action is needed.
- An open dump cleanup project has to be implemented in the whole Governorates to close the open dumps, clean up waste on the land, and develop safe solid waste disposal practices using sanitary landfills.

3.4 REDUCE, REUSE AND RECYCLE (3RS)

Reduce; reuse and recycling bear an imperative stand in the waste management hierarchy. Waste materials should be separated at source as much as possible to improve the quality of materials for reuse and recycling (including organics for composting), to reduce energy use in collection, and to improve working conditions at all stages. This will profit also those earning a living from waste recovery²³.

In addition, the hierarchy promotes the recovery – through reuse, recycling, composting – of as many waste materials as possible before disposal or incineration²³. Reuse and recycling reduce the amount of materials requiring collection and disposal that means:

- Longer lifetimes for landfills; more capacity for waste in other kinds of treatment facilities;
- Lower transportation and landfill costs;
- More reliable and local supply of raw materials to local industries, avoiding using foreign exchange and import procedures;
- Reduced extraction of non-renewable raw or virgin materials and associated

environmental devastation;

- Reduced deforestation;
- Conservation of resources, energy and water;
- Provision of income and employment;
- Availability of affordable products for the poor; and
- Employment/income generation.

Waste reduction at source implies minimising material and energy consumption including reduction in use of toxic/hazardous substances. Reducing material/energy intensity in production and consumption of goods and services has been widely acknowledged as a preferred approach by many international organisations and national governments. Some examples are; UNEP/UNIDO Cleaner Production approach, China's circular economy approach, Japan's sound material recycling society and 3R approach, EU's waste prevention and recycling strategy.

Waste Prevention

Waste prevention is given the highest priority in ISWM. This is a preventive action that seeks to reduce the amount of waste

that individuals, businesses and other organisations generate. By not generating waste, fewer collection vehicles and a fewer number of refuse collectors would be needed; fewer and smaller waste handling facilities would be required, and it would extend the life of the landfills. Society as a whole would benefit from a successful implementation of any waste prevention program.

There are several ways in which waste generation could be prevented ⁶⁸:

- By empowering public policies that discourage the production, sale and consumption of products containing unnecessary packaging material;
- By empowering public policies that discourage the production, sale and consumption of disposable products;
- By empowering public policies that encourage the production, sale and consumption of reusable or recyclable products;
- By empowering public policies that encourage the production, sale and consumption of long-lasting products (which do not have to be discarded often);
- By empowering public policies that promote the consumption of large-size products. The amount of packaging material –plastics, glass or metal– needed to contain a kilogram or liter of a product decreases as the size of a product increases. For instances, larger bottles and containers require less material per unit of product than the smaller ones. When they are discarded, they result in less waste that needs to be collected, transported and disposed of;
- By empowering public policies that encourage the production, sale and consumption of repairable products (that do not have to be discarded when they malfunction); and
- By minimising the weight of products. Public policies could encourage the production, sale and consumption of light-weight products (which, when discarded, would result in a reduction of the weight of the waste to be collected, transported and disposed off).

Reuse

Reuse consists of the recovery of items to be used again, perhaps after some cleaning and

refurbishing. Reusing materials and products saves energy and water, reduces pollution, and lessens society's consumption of natural resources compared to the use of single-use products and materials.

Reuse of materials and products is regarded as more socially desirable than recycling the same materials. Cardboard boxes that are used for shipping products, for example, could be folded and sent back to the manufacturer to be reused for shipping the same or other products. Beverage bottles could be disposable, returnable (reusable) or recyclable. Reusable bottles have the lowest environmental impact of the three.

Even though private companies have created reuse programs on their own, if public policies existed to promote it, reuse could dramatically increase. Public policies that provide incentives for businesses and individuals to engage in reuse could have a significant and positive economic and environmental impact.

Recycling

Recycling is the recovery of materials for melting them, re-pulping them and reincorporating them as raw materials. It is technically feasible to recycle a large amount of materials, such as plastics, wood, metals, glass, textiles, paper, cardboard, rubber, ceramics, and leather. Besides technical feasibility and know how, demand determines the types and amounts of materials that are recycled in a particular region. Areas with a diversified economy and industrial base usually demand more different types of raw materials that could be recycled.

Recycling could render social, economic, and environmental benefits. It provides an income to the informal sector that recovers recyclable materials. Factories that consume recyclable materials could be built for a fraction of the cost of building plants that consume raw materials. Recycling saves energy, water, and generates less pollution than obtaining raw materials that translate into lower operating costs. Recycling also reduces the amount of wastes that need to be collected, transported and disposed off, and extends the life of disposal facilities that saves money to the municipalities. Recycling could result in a more competitive

68. Martin Medina (2011), "Globalization, Development, and Municipal Solid Waste Management in Third World Cities", *El Colegio de la Frontera Norte, Tijuana, Mexico*

economy and a cleaner environment, and could also contribute to a more sustainable development.

If the Integrated Solid Waste Management Sector (ISWMS) decides to adapt an ISWM approach, a waste prevention programme has to be developed and implemented, followed by promoting the reuse of products and materials, and then recycling comes next. Up till now, the focus in Egypt has been on recycling. Policy makers seem unconcerned with prevention or reuse.

In the selected Governorates, a small fraction of the generated household waste is collected as clean source separated dry materials by street peddlers, itinerate waste buyers and selective collectors.

In general, the compost plants receive mixed MSW. Limited separation of the raw waste is performed to reduce contamination. Thus, the quality of the produced compost is poor. Adoption of source separation of household waste is a necessity to improve the quality of compost and minimise its production costs.

In Qena and Assuit Governorates, the majority of agricultural residues are used, as it is, for animal feeding, except sugar cane waste that is habitually burnt out in the fields. In the Delta Governorates, especially Al Gharbiya and Kafr El Sheikh Governorates, the agricultural residues are used for animal feeding, composting and biomass generation that is utilised as alternative fuel for cement kilns.

At the Governorates level, there is a limited to non-existing degree of policy and practical focus on diverting waste from treatment and disposal to recycling.

In the selected Governorates, the informal sector, especially scavengers 'waste pickers', plays a crucial role in the management of solid waste. They carry out source separation of MSW and collect the dry recyclables such as plastics, paper, glass, metals and textile. They perform their sorting work on

the dumped waste in the streets, collection bins, collection points, transfer stations and dumpsites.

Understanding, acknowledging, and if possible, incorporating informal waste workers into new ways of delivering improved services are a sustainable way out. Cooperation with and support of the informal recycling sector leads to increasing levels of resource recovery, securing livelihoods for the informal waste workers and reducing the amount of waste requiring disposal.

The informal sector, informal recyclers and waste pickers are increasingly motivated to organise and fight for recognition and a place within the formal SWM systems. They could be organised in many different ways: cooperatives, associations, companies, unions, micro-enterprises. Organising benefits them by means of raising social status and self-esteem; improving members' incomes and quality of life, circumventing middlemen; improving working conditions and contributing to better health quality; facilitating the development of networks; providing institutional frameworks for hiring them for local bodies/firms; preventing harassment and violence; and eliminating child labour.

Up till now, no serious effort has been made to incorporate the informal recycling sector into the formal SWM system. The Integrated Solid Waste Management Sector (ISWMS) should actively facilitate organising the informal recycling sector, providing them with an access to source separated waste, promoting their recognition and acceptance, and providing capacity building programs for them.

In most cases, the public sector operators are provided with protective wear and personal safety wear, in addition to health insurance. This is not the case for private operators and the informal recyclers. Because they seldom work with personal protective devices, waste pickers clearly face many serious occupational health risks.

Possible Incentives for 3R Activities

It is generally accepted that 3R concept and activities' implementation would impact the patterns of behaviour and consumer choices that would lead to savings in materials and energy benefiting the environment.

In this context it is strongly recommended to consider the adoption of viable 'economic instruments' to further strengthen these behaviours and choices. The choice of implementable economic instruments, their policy requirements, and implementation mechanisms, are basic tasks for a collective stakeholders' dialogue.

Some examples, described in some detail in this report, are favourable tax incentives on products that are made by recycling used materials (such as paper, plastics, glass, metals), the EPR approach linked to a deposit-refund system, interest-reduced loans on recycling activities, and many others that might emerge from the informed stakeholders' dialogue and focused discussions.

It is therefore, a priority objective for the Integrated Solid Waste Management Sector (ISWMS) to embed the 3R concept, operational and supportive market-based instruments in its prioritised duties.

3.5 USER INCLUSIVITY

'User inclusivity' refers to the active involvement of households, waste generators and other system users in making the ISWM system work⁶⁹. It is the extent to which the users of the system have access, control and influence on how the system works. This aspect of governance could be considered from two perspectives. There is the inclusivity of the users of solid waste services – that is, to what degree are these stakeholders included in the planning, policy formation and implementation processes. The second perspective on user inclusivity refers to the performance of the system, and the extent to which it serves all users equitably and according to their needs and preferences.

User inclusivity is roughly divided into several sub-categories include:

- Consultation, communication and involvement of users, both in decision-making, and in doing for themselves in relation, for example, to home composting and waste prevention;
- Participatory and inclusive planning and system design that includes inclusivity in siting facilities;
- Institutionalising inclusivity, for example, feedback mechanisms, client surveys, and solid waste forums and 'platforms'.

UN-habitat benchmark indicators that summarise the performance of a city's SWM system in a standardised manner, defines user inclusivity as the degree to which users, or potential users, of the solid waste services (i.e. households, business and other waste generators) are included in the planning, policy formation, implementation and evaluation of those services⁶⁹.

In the selected Governorates, assessment of equity issues related to the extent to which all citizens, irrespective of income, receive a good service that protects public health and the environment, indicated that:

- The service providers try to provide a good level of service to all citizens, irrespective to their income. However, the level of service varies in each city and between cities in the same Governorate.
- Generally, the capital cities of the Governorates receive better services than other ones, except for Kalyobiya Governorate. The service provided to the residents of Shebin El Kanater city is better than that in the capital city, Banha.
- The equity of service provision to residents in a city could be divided to:
 - o Medium/high equity in providing SWM service, irrespective of income level, in Qena, Qoos, Assuit, Fayoum, Sennouris, Shebin El Kanater, Kafr El-Sheikh, Beila

69. Pl refer to Annex 1 of this report

and Suez cities.

- o Medium equity in providing SWM service in El Fateh, Banha, Tanta and Samannoud cities.

In general, the existing level of legal right to be heard and level of implementation of laws, bylaws and other legal instruments, is inadequate at the national and/or local level. Authorities should have a legal obligation to consult with and involve citizens in decisions that directly influence them. In reality, such consultation is rather limited. Consultation and participation of stakeholders outside the bureaucratic structures are seldom. Citizens are often overlooked in the service delivery framework. However, they could play an active role in improving accountability and service quality of both public and private sectors. The Integrated Solid Waste Management Sector (ISWMS) should take the lead in enabling the public and private sectors to form partnerships with SW system users for better service delivery.

Genuine participation of citizens in the planning, design, implementation, and evaluation phases are principal prerequisites for establishing a successful SWM. Currently, citizens are not involved in SWM decision making, planning or implementation processes, at the national and local levels. One of the expected tasks of the Integrated Solid Waste Management Sector (ISWMS) would be facilitating the establishment of SWM committees, task forces and/or 'platforms' that would meet regularly and effectively to participate in the planning, implementation and assessment phases of the sector.

Public feed-back mechanisms on SWM services include, but not limited to:

- Community meetings and/or questionnaires; and
- Implementation of a public complaints system maintained by the municipality and detailing each complaint received its nature and location and features and timing of rectification actions taken.

Local councils used to be the source of public feed-back through community meetings. Following the 2011 uprising, the local councils in the Governorates were resolved. Thus, this mechanism of public feed-back is not active at present. Suez Governorate uses questionnaires for evaluating the SWM service standard, through the Cleansing and Beatification Authority. In Al Gharbiya Governorate, the Cleansing and Beatification Authority receives public complaints from community meetings and also uses a hot-line for receiving complaints. Moreover, the municipalities in the selected Governorates implement public complaints systems detailing each complaint received, its nature and location. Furthermore, the Cleansing and Beatification Authority of Al Gharbiya Governorate utilises a hot-line for receiving public complaints.

Public education and awareness on SWM are factors that could greatly improve the management of SW in Egypt. Some of the benefits that accrue from education and awareness on SWM are:

- Building of positive attitudes, skills, values and concerns towards the environment between citizens and authorities responsible for managing wastes;
- Predisposing the citizens and the Agencies to participate actively in segregation, reduction, reuse, composting and recycling of SW;
- Development of appropriate skills needed for segregation of solid wastes at source as this is key to proper WM;
- Decreasing the rate of improper management of wastes and consequently the dissemination of diseases; and
- Enhancing policy implementation by decision makers on waste management.

Egypt lacks the implementation of a comprehensive, culturally appropriate public education and awareness programmes. There is an urgent need to promptly start such programmes using printed-press, TV, radio, community meetings and schools' programmes.

3.6 PROVIDER INCLUSIVITY

Provider inclusivity is the extent to which the economic niches in service delivery and valorisation are open and accessible to non-state actors, especially the private formal and informal sectors, micro- and small enterprises (MSEs) and community-based organisations (CBOs)⁶. Inclusivity could also be considered from the perspective of the waste service provider that includes both the informal and formal sector.

Provider inclusivity covers:

- Inclusivity in providing solid waste, sweeping and cleaning services; and
- Inclusivity and protection of livelihoods related to valorising materials – specifically, formal and informal recycling and organic waste management.

The degree of provider inclusivity represents the degree to which non-municipal service providers from the formal private, community or 'informal' sectors are included in the planning and implementation of solid waste and recycling services and activities⁶.

Assessment of the degree to which laws and/or other legal instruments are put in place and implemented at both national or local levels enabling the 'private sector' to deliver 'public' services shows that Egypt's legal SWM framework lacks a consistent model and guidance for private sector participation (PSP) arrangements. However, the existing policy and legal framework has not presented obstacles to PSP arrangements in MSWM. The same applies for public-private partnership (PPP) and community based organisation (CBO). Moreover, the sector lacks the presence of an organised informal sector.

The public sector handles the SWM services in the selected Governorates, except for:

- A private contractor collects the household waste in about 90% of East Assiut district;

- Small private companies and contractors collect household waste at Markez Shubra El-Kheima, Kalyobiya Governorate;
- NGOs provide collection and transportation of household waste in some villages of the Governorates;
- Private contractors rent the two compost plants in Kafr El-Sheikh Governorate; and
- The informal sector 'scavengers' provide source separation of MSW in the selected Governorates. They collect the dry recyclables such as plastics, paper, glass, metals and textile. Their work is not yet legalised.

On the national level, there are no organisations or structures in place that represent the private waste sector and actively participate within SWM planning forums, task forces, committees and/or steering-groups.

The informal sector 'scavengers' who are working in the selected Governorates are not organised. Officially, this unorganised group is neither acknowledged nor protected.

The central Government actively encourages and promotes private sector participation in providing different services, including SWM. However, the Governorates are free to act differently. In the selected Governorate, PSP in providing SWM services is minimal, as stated above.

The private sector is included within open, transparent and accountable bid processes for the provision of SWM services. An example is the bid process recently announced by Kafr El Sheikh Governorate, in the beginning of 2013, for providing SWM services in the Governorate. However, the process was cancelled due to the lack of private sector interest in the bid.

Box 12 The Brazilian experience to encourage waste picker inclusion in SWM⁷²

During the last two decades, Brazil has moved to replace repressive policies on waste picking with new inclusive policies that give worldwide in its inclusive policies regarding waste pickers.

The Brazilian presidential decree Of 2006 commits state institutions to segregate waste at source and its donation to waste picker cooperatives and/or associations. Article 5 specifies that a committee should be created at each Federal Government facility that is responsible for overseeing the implementation of on-site source segregation, insuring that recyclables are donated to the waste pickers. The committee should report to the Inter-ministerial Committee for Social Inclusion of Waste Pickers twice a year with an assessment on the process.

- The decree defines the types of organisation (cooperatives and associations of waste pickers) that could register to receive recyclables from federal Organisations should be of a non-profit nature;
- Organisations should have a proper place for sorting and classification of recyclables; and
- Organisations should adopt the system of splitting shares amongst members.

As a result of the legal backing to redistributive measures and social recognition of informal waste picker organisations, Brazil has become one of the most progressive countries

Article 6 states that the process of deciding which organisations will be entitled to the donation of recyclables must adhere to the rules of publicity and transparency of the public administration in order to ensure that all waste picker organisations are aware of the selection process.

This policy makes the generator of waste responsible for the return of recyclables to the productive chain. This increases the volume of recyclables available to waste pickers. The policy was recognized as a big advancement for the MNCR (the National Movement of Waste Pickers) as it made the inclusion of waste pickers mandatory. This necessitated the availability of fiscal and financial incentives for the recycling industry, for the development of regional programmes in partnership with waste picker organisations, and to facilitate the structuring of these organisations. After 20 years of debate, the National Policy of Solid Waste was finally approved in July 2010. Thus what had been a government policy became law. This law offers exceptional recognition to waste pickers' administration entities and gives instructions on requirements:

- Organisations should be composed exclusively of waste pickers whose living depends solely on this kind of activity;

4. ANALYSIS AND BENCHMARKING



ANALYSIS AND BENCHMARKING

This chapter elaborates further on the Integrated Sustainable Waste Management (ISWM) framework and its key dimensions, in addition to the benchmark indicators and its drivers and governance strategies. The main waste related data, for 13 cities and 6 villages in the selected Governorates were presented. Moreover, the benchmark indicators' scoring form was used to compare the WM systems in the studied cities and villages to support an understanding of processes and drivers that affect them. The outcomes of the benchmark indicators' study are discussed, tabulated and recommendations for improvement are provided.

4.1 THE INTEGRATED SUSTAINABLE WASTE MANAGEMENT FRAMEWORK

When the current modernisation process started in developed countries in the 1970s, 'modern waste management' was largely defined in engineering terms – a technical problem with a technical solution. Gradually, as many city authorities would confirm from their own experience, the world community learnt that no technology could solve the problems related to economic and social sustainability of waste management solutions⁷⁰.

If the costs of day-to-day operations are not recovered, if the citizens are not interested or willing or simply could not afford to pay, the system will not be able to sustain itself over a longer period of time, regardless of access to grants and loans for capital investments from the central Government or international financing agencies. 'Better' technology could not solely solve this kind of problems.

If the municipal authorities do not have adequate knowledge and capacity to monitor the performance of a private service provider, if the collection system in place is not in accordance with citizens' needs and

preferences, if the measures are imposed rather than discussed and negotiated with the system users, then, the system will not be embedded and sustained by the society and will never perform as designed. The use of more advanced technology could not alone resolve these kinds of issues either.

ISWM is a framework to describe, theorise, assess and ultimately improve (depending on the focus of the user) existing systems of waste management in a city⁷². ISWM is distinguished from more traditional, engineering-based waste management assessment and planning methods in several ways that are among others, by:

- An explicit attention for a broad range of stakeholders, issues and conditions;
- A particular concern for the most disadvantaged groups;
- Giving priority to the conservation of environmental resources, using the waste management hierarchy as a cornerstone;
- Basing the assessment on a wider range of normative principles, including fairness, sustainability and equity besides

70. Sonia Dias, "Women in Informal Employment Globalizing and Organizing", (WIEGO Policy Brief NO.6), Might 2011

71. Ljiljana Rodic, Anne Scheinberg and David C. Wilson (2010), "Comparing Solid Waste Management in the World's Cities", Key-note paper at ISWA World Congress 2010, Urban Development and Sustainability – a Major Challenge for Waste Management in the 21st Century, Hamburg, Germany, 15-18 November 2010

72. J. Anschütz, J. I. Jgosse, and A. Scheinberg (2004). "Putting Integrated Sustainable Waste Management into Practice: Using the ISWM Assessment Methodology", ISWM Methodology as Applied in the UWEF plus Programme (2001-2003). WASTE, Gouda, the Netherlands.

- efficiency and effectiveness;
- Its radical shift in approach to the planning process, from a technical bureaucratic exercise to decentralised and participatory one; and
- Its strong emphasis on the importance of taking into account the particular conditions, strengths and weaknesses of the local context.

In order to achieve this, ISWM identifies three key dimensions of the waste management system:

- The relevant stakeholders;
- The waste system elements; and
- A set of aspects which are heavily dependent on the context (cf. Figure 1).

Those dimensions are resulting out of the understanding “that it is not the technical issues, but the other aspects of waste management that are most likely to influence the success or failure of interventions”⁷³.

Stakeholders - the first key dimension recognised in ISWM is the stakeholders. ISWM defines a stakeholder hereby very broadly as “a person or organisation that has a stake, an interest in (...) waste management”⁷². Besides the municipality and the households that are always stakeholders, that could be very specific for each context and have diverse interests. One central challenge of the ISWM process is “to get them to agree to cooperate for a common purpose that of improving the waste system”.

Elements - ISWM recognises a set of waste system elements that could be interpreted as those non-human actors. They wrap the four

phases: generation, collection, transport and treatment/disposal that might be described as the technical components of a waste management. Furthermore, they also involve the four elements of the waste hierarchy prevention/reduction, reuse, recycling and recovery (referred to as waste hierarchy elements), with a declining desirability from the first to the last element (cf. Figure 9).

Aspects – This is the last key dimension in the ISWM approach that describes six “lenses, through which the waste system could be assessed”⁷³. These aspects (technical, environmental/health, financial/economic, socio-cultural, institutional and policy/ legal/political) are seen as crucial to assess and understand, in order to apply changes to the system.

ISWM focus on how technological dimensions (e.g. collection and treatment) and social dimensions (e.g. socio-cultural aspects or stakeholder relations) in a waste management interrelate and that they have to be described together in order to understand how waste management functions and to make improvements on it. Furthermore, it offers a helpful framework for the assessment including all the dimensions well thought-out as obligatory in the technical components of the WMS.

Along with the theorisation of ISWM as a concept, a set of guidance documents have been devised that offer an analytical framework for assessing and improving the existing SWM. One of these guidance documents; Benchmark Indicators, was used for the methodology in this study.

73. N. Dulac (2001), “Organic Waste Flow in Integrated Sustainable Waste Management: Tools for Decision-Makers”, Experiences from the Urban Waste Expertise Programme (1995-2001). Gouda: WASTE.

4.2 BENCHMARK INDICATORSMANAGEMENT FRAMEWORK

A major constraint in comparing SWM in different cities is the lack of consistent global solid waste and recycling system benchmarks – even the most common indicator, cost per tonne, is not available in most cities. The most basic kinds of information are collected in very different ways in various cities⁷⁴, if indeed they are collected and recorded at all⁷³.

In this context, a form was developed to formulate a new standard method for data collection and analysis, as well as an international database that rests on about 300 data documents. These data documents include a number of quantitative benchmarks that could be functional to cities to derive smart indicators, as well as a complete waste mass balance presented by a process flow diagram, thus allowing comparison between cities and supporting better understanding of the processes and driving forces that affect them all.

Benchmarking of waste management services is far from being a straightforward exercise, even within a single small country with uniform regulations, governance system, culture, level of development and climatic conditions. In order to make comparison achievable among vastly different cities from all over the world, a detailed methodology was designed to present key indicators and key narratives about the waste management policies and practices in the city in a form that was accessible to readers.

There are no ‘one size fits all’ solutions – any successful approach needs to address all

three physical system components and all three features of good governance⁷³. This enables cities to recognize the next steps in their development as a function of where they are now and where they wish to be. A reliable approach starts from the existing strengths of the city and build upon them; involving all stakeholders to jointly design locally tuned models. Learning from each other in a community of practice provides an opportunity to ‘pick and mix’, adopt and adapt the solutions that will work in a particular local situation.

Benchmark indicators are presented and compared for three key drivers that match physical components of an integrated and sustainable waste management (ISWM), i.e.: public health / collection, environment / disposal and resource recovery – and for three governance strategies required to deliver a well functioning ISWM, i.e.: inclusivity, financial sustainability and sound institutions / pro-active policies. Key insights include the worth of the informal recycling sector in many developing country cities; they not only deliver recycling rates comparable to modern Western systems, but also save the city authorities millions of dollars in avoided waste collection and disposal costs.

In this chapter, the data collected through our field visits are used to compare and contrast SWM in cities and villages around the selected Governorates, in order to get to a broad understanding of what solid waste management is and what it could mean for cities, whether they are located in Upper Egypt, the Delta or a Coastal area.

74. David C. Wilson, Ljiljana Rodic, Anne Scheinberg and Graham Alabaster (2010), “Comparative Analysis of Solid Waste Management in Cities Around the World”, *Proceedings Waste 2010: Waste and Resource Management – Putting Strategy into Practice* Stratford-upon-Avon, Warwickshire, England, 28-29 September 2010

4.3 COMPARING KEY WASTE-RELATED DATA AND BENCHMARK INDICATORS

Wilson et al discussed in detail the Solid Waste Management in cities around the world, using the benchmark indicators.^{75,73,76,75} Their comparative analysis methodology has been adapted in the present study.

4.3.1 SELECTED CITIES AND VILLAGES

The present study focused on seven Governorates, i.e., Qena, Assiut, Fayoum, Kalyobiya, Al Gharbiya, Kafr El-Sheikh and Suez. This chapter presents and compares the results for 19 cities and villages, including the 7 capital cities of the Governorates, 6 main cities in Marakez and 6 mother villages “semi-urban areas”, taking into account that Suez Governorate contains one city.

The selection criteria were aimed to give a good mix of cities and semi-urban areas that would display a range of urban solid waste management across Egypt. Among the 19 cities and villages selected, there are four cities with a population over 400,000, and two mother villages with population less than 16,000. On the other hand, in Markez Qoos at Qena Governorate, the population of Hegaza village is higher than Qoos city which is the capital city of the Markez. Table 20 identifies the 19 selected cities and villages and their populations, municipal solid waste generation and composition.

The Governorates officials provided the data for population and generated MSW and its composition. As recommended earlier, the NSWMP and the Integrated Solid Waste Management Sector (ISWMS) should focus on estimating the quantities and composition of MSW generated in the different Governorates, using standard methods. The per capita generated waste was calculated

by the authors. The Gross Domestic Product (GDP) per capita values were obtained from Egypt Human Development Report, issued by the United Nations Development Programme, and the Institute of National Planning, in 2010¹². However, GDP values were given for the Governorates as a whole, irrespective of the cities and villages within the Governorate.

4.3.2 WASTE GENERATION

Earlier studies indicated that the cities in the lowest-income countries generally show waste generation in the range 150-250 kg/capita/year, those in middle income countries 250-450 and those in high income countries 450-650 kg/capita/year⁷⁶.

In the studied cities and villages, a maximum waste generation of 342.8 kg/capita/year was estimated at Tanta city, Al Gharbiya Governorate; whereas Assiut city generated a minimum waste quantity of 90.8 kg/capita/year and El-Ameria village at Al Gharbiya Governorate generated 96.3 kg/capita/year of MSW.

It is expected, as a general trend, that the generated household waste would be maximum in the capital city of each Governorate and minimum in the mother villages “semi-urban areas”, due to the expected variation in GDP per capita, in those cities and villages. This assumption is true in Al Gharbiya Governorate only. However, it is early to reach a conclusion in that issue. Further studies are urgent after the exact measurement of the generated MSW in the selected Governorates.

75. David C. Wilson, Costas A. Velis and Ljiljana Rodic (2012), “Integrated Sustainable Waste Management in Developing Countries”, *Waste and Resource Management*, 166 (2), 52 - 68

76. Lars Mikkelsen with Gabriela Boyer (1999), “Observations of Solid Waste Landfills in Developing Countries: Africa, Asia, and Latin America”, Urban Development Division, Waste Management Anchor Team, The World Bank

Location	Population	GDP (LE) per capita	Kg Per Capita/ year	Kg Per Capita/ day	Composition of MSW (%)						Metal	Glass	Textile	Other
					Organic	Paper	Plastics							
Qena Governorate														
Qena city	220,655	6,387.5	274.1	0.75	66.5	12.4	10.2	1.0	2.0	2.1	5.8			
Qoos city	68,319	6,387.5	131.4	0.36	66.5	12.4	10.2	1.0	2.0	2.1	5.8			
Hegaza village	99,102	6,387.5	147.3	0.40	76.4	1.9	4.0	1.7	2.5	1.1	12.4			
Assiut Governorate														
Assiut city	482,266	8,019.6	90.8	0.25	48.4	9.1	10.0	2.21	4.93	1.91	23.45			
El Fateh city	17,697	8,019.6	305.1	0.84	48.4	9.1	10.0	2.21	4.93	1.91	23.45			
El Zarabi village	19,536	8,019.6	158.4	0.43	48.4	9.1	10.0	2.21	4.93	1.91	23.45			
Fayoum Governorate														
Fayoum city	364,377	8,433.7	250.4	0.69	60	6	6	2.4	6	3.5	16.1			
Senuris city	101,035	8,433.7	252.9	0.69	75	12	5	1	1	1	5			
Demo village	13,585	8,433.7	241.8	0.66	45.4	7.3	13.7	0.9	1.8	0.9	30			
Kalyobiya Governorate														
Banha city	186,119	8,134.4	245.1	0.67	62.5	10	13.5	3	5	2	5			
Shebin El Qanater city	65,232	8,134.4	250.7	0.69	62.5	10	13.5	3	5	2	5			
Astitt village	17,056	8,134.4	113.9	0.31	62.5	10	13.5	3	5	2	5			
Al Gharbya Governorate														
Tanta city	468,510	8799.6	342.8	0.94	54	15	6	4	4	3	14			
Samannoud city	63,482	8799.6	312.8	0.86	55	16	6	3	5	2	13			
El-Ameria village	18,943	8799.6	96.3	0.26	57	15	3	4	3	4	15			

Location	Population	GDP (LE) per capita	Kg Per Capita/ year	Kg Per Capita/ day	Composition of MSW (%)						
					Organic	Paper	Plastics	Metal	Glass	Textile	Other
Kafr El Sheikh Governorate											
Kafr El Sheikh city	166,132	8,927.9	285.6	0.78	85.0	2.5	5.0	0.5	0.8	1.0	5.2
Beila city	75,314	8,927.9	290.8	0.80	85.0	2.5	5.0	0.5	0.8	1.0	5.2
Abo Badawy village	15,862	8,927.9	207.1	0.57	90.0	1.5	3.0	0.5	0.3	0.6	4.1
Suez Governorate b											
Suez city	576,279	8745.8	221.7	0.61	60	-	-	-	-	-	40

a The composition of MSW is estimated by Governorate officials for the whole Governorate in the study (Environmental Characterization of Assiut Governorate, 2004)

b No data were available for the composition of MSW in Suez city. However, the compost plant manager indicated the presence of about 60% organic waste in the received MSW.

4.3.3 WASTE COMPOSITION

The following aspects should be well thought about before dealing with waste composition⁷⁶.

- How and where in the composition is measured. For example, the measurements apply to:
 - the whole waste stream generated;
 - the wastes collected from households; or
 - the wastes arriving at the disposal site.
- What are the wastes included in the sample? – e.g. high values for 'other' might reflect the large fraction of CDW.

Table 19 shows the composition of MSW, as estimated by the Governorates, except for Kafr El Sheikh Governorate, that provided results for general composition of waste in urban and rural areas, as measured in 2005⁶⁵.

- The wet organic fraction is predominant in the waste and ranges between 54.4 - 90% in Demo village (Fayoum Governorate) and Abo Badawy village (Kafr El Sheikh Governorate), respectively.
- The paper content range in the waste between 16% in Samannoud city (Al Gharbiya Governorate) and 1.5% in Abo Badawy village (Kafr El Sheikh Governorate).
- Plastics percentage ranges between 13.7% in Demo village (Fayoum Governorate) and 3% in El-Ameria village (Al Gharbiya Governorate) and Abo Badawy village (Kafr El Sheikh Governorate).

Table 20 Key Waste-related data, population, MSW generation and composition in the selected cities and villages

4.3.4 PHYSICAL ELEMENTS OF THE SYSTEM

The benchmark indicators are used both to allocate comparison between cities and to support an understanding of processes and drivers that affect them all. Table 21 shows a comparison of seven benchmark indicators for the 13 cities and six mother villages “semi-urban areas” including at least one indicator for each of the three drivers / physical elements and the three governance elements⁷¹. Four of the benchmarks are quantitative, while three, on inclusivity and institutional coherence, are necessarily qualitative. The assessment is also represented as follows:

- High 81 - 100%
(traffic light indicator – green)
- Medium/High 61 - 80%
(green/orange)
- Medium 41 - 60%
(orange)
- Medium/Low 21 - 40%
(orange/red)
- Low 0 - 20%
(red)

The public health indicator provides data on the percentage of population that has access to waste collection services and street sweeping. The quality of waste collection service is high in Qena and Qoos cities in Qena Governorate, Fayoum city, Abo Badawy village in Kafr El Sheikh Governorate and Suez city; medium/high in Hegaza village in Qena Governorate, Senuris city in Fayoum Governorate, Shebin El Qanater city and Astit village in Kalyobiya Governorate, and Kafr El Sheikh city and Beila city in Kafr El Sheikh Governorate; medium in El Zarabi village in Assiut Governorate, and Demo village in Fayoum Governorate; medium/low in Assiut and El Fateh cities in Assiut Governorate, Banha city in Kalyobiya Governorate and Tanta city in Al Gharbiya Governorate; and low in Samannoud city in Al Gharbiya Governorate (cf. Table 21).

The second benchmark indicator for environmental control is related to the percentage of total waste destined for land disposal and is classified according to the degree of organisation, management and engineering of the disposal site. According to the World Bank classification, maximum score would be focussed to fully engineered facility such as fully functional sanitary landfill site; followed by a partially engineered facility, such as engineered landfill site; then a controlled facility follows, such as a controlled landfill; followed by a semi-controlled facility such as a semi-controlled dump; and the worse situation is dumping waste in an uncontrolled facility⁷⁶. The percentage of total waste destined for land disposal, for the studied cities and villages, is given in column 2, of Table 21. In general, MSW generated in the selected Governorates is destined for disposal in uncontrolled dumpsites with the exceptions of: disposal of waste generated in Tanta city, in Al Gharbya Governorate; where the waste is transported for a distance of about 120 km and disposed in a controlled facility in El-Sadaat city; disposal of waste generated in El Zaraby village, Markez Abu Tig in Assiut Governorate; disposal of the generated municipal solid waste of Kalyobiya Governorate in Abu Zaabal controlled dumpsite; and disposal of the generated waste from Senuris and Tamiya Marakez at Fayoum Governorate in a controlled dumpsite in Kom Oshim.

The data given in column 2 highlights the weightiness of the present situation involving disposal of MSW in uncontrolled facilities. Overall the environmental condition of the uncontrolled dumpsites is extremely vulnerable, with severe environmental pollution. One of the priorities of the NSWMP and the Integrated Solid Waste Management Sector (ISWMS) would be to endeavour this national problem and to facilitate upgrading open dumps to sanitary landfills.

The third benchmark indicator is dedicated to resource recovery, through minimising waste generation combined with increasing materials recycling, as shown in column 3 of Table 21. Recovering energy from MSW is not common in Egypt yet and the focus is directed on material recovery. The highest rates of resource recovery, in the range of 48% to 50%, are achieved in Suez and Beila cities and Abo Badawy village. This high recovery rate is for the most part due to recycling of the organic portion of the waste. The public sector is responsible for the recovery in Suez city, whereas the private sector manages and operates the compost plant receiving the generated waste from Beila city and Abo Badawy village. The poor rates of resource recovery, in other cities and villages, might be ascribed to the limited activities of informal scavengers in materials recycling of glass, paper, plastics and metals.

Poor governance is a major reason why cities' solid waste and other urban systems fail⁷³. In examining governance aspects, it was focused on inclusivity of users and service providers, financial sustainability, and the strength of the institutional framework.

A key aspect of good waste governance is inclusivity and fairness, with a dual focus on users and service providers⁷⁶. Columns 4A and 4B, in Table 21, shows a qualitative assessment of inclusivity for each category. The assessment is based on a composite score from a set of qualitative indicators allowing a yes for present and a no for absent feature in the system.

For user inclusivity, the indicator represents the degree to which users of the solid waste services are included in policy formation, planning and siting of facilities, as well as

in evaluation of these services⁷⁶. Criteria include, for example, functioning citizens' committees with a mandate and scope to address waste management issues; formal procedures to measure customer satisfaction with waste management services at municipal or sub-municipal level; and effective feedback mechanisms between service providers and service users that are used as the basis for making changes or improvements. For provider inclusivity, the indicator represents the degree to which both formal and informal private/ community-based service providers and waste recyclers are included in the planning and implementation process of waste management services and activities. Moreover, both measures of inclusivity include a focus on solid waste and recycling stakeholders outside of the formally recognised solid waste structures.

The score of user and provider inclusivity is generally poor, for the studied cities and villages, indicating a general trend for Egypt. Only Fayoum and Suez cities achieved medium score on user inclusivity measure. The remaining cities and villages score was medium/low, except for Samannoud city in Al Gharbiya Governorate that got low score. The score for the degree of provider inclusivity varied a little. Fayoum and Tanta cities, in addition to Astit village in Kalyobiya Governorate and El-Ameria village in Al Gharbiya Governorate achieved medium score; 7 cities and villages achieved medium/low score and the remaining 8 cities and villages got low score.

Table 21 Benchmark indicators in the selected cities and villages

Location	Drivers for Solid Waste Management			Governance			
	Public Health	Environmental Control	Resource Recovery	Inclusivity	Financial Sustainability	Institutional Coherence	
	1	2	3	4A	4B	5	6
Percent Collection / Sweeping Coverage							
Percent Controlled Treatment / Disposal							
Percent Recycling Rate							
Degree of user Inclusivity							
Degree of Financial Sustainability							
Degree of Institutional Coherence							
Qena Governorate							
Qena city	95%	0%	3%	Medium/Low	Low	Medium/Low	Medium
Code							
Qoos city	95%	0%	3%	Medium/Low	Low	Medium/Low	Medium
Code							
Hegaza village	65%	0%	2%	Medium/Low	Low	Medium/Low	Medium/Low
Code							
Assiut Governorate							
Assiut city	30%	0%	22%	Medium/Low	Medium/Low	Medium	Medium
Code							
El Fateh City	25%	0%	0%	Medium/Low	Low	Medium	Medium
Code							
El Zarabi village	45%	40%	2%	Medium/Low	Low	Medium	Medium
Code							
Fayoum Governorate							
Fayoum city	90%	0%	3%	Medium	Medium	Medium	Medium
Code							
Senuris city	65%	10%	3%	Medium/Low	Low	Medium/Low	Medium
Code							
Demo village	60%	0%	2%	Medium/Low	Low	Low	Medium/Low
Code							

Kalyobiya Governorate									
Banha city	35%	0%	5%	Medium/Low	Medium/Low	Medium/Low	Medium/Low	Medium/Low	Medium/Low
Code									
Shebin El Kanater city	65%	0%	5%	Medium/Low	Medium/Low	Medium/Low	Medium/Low	Medium/Low	Medium/Low
Code									
Asfit village	65%	0%	5%	Medium/Low	Medium	Medium/Low	Medium/Low	Medium	Medium
Code									
Al Gharbya Governorate									
Tanta city	35%	50%	22%	Medium/Low	Medium	Medium	Medium	Medium	Medium
Code									
Samannoud city	20%	0%	3%	Low	Medium/Low	Medium	Medium	Medium	Medium
Code									
El-Amieria village	40%	50%	5%	Medium/Low	Medium	Medium	Medium	Medium	Medium/Low
Code									
Kafr El Sheikh Governorate									
Kafr El Sheikh city	75%	0%	3%	Medium/Low	Low	Medium/Low	Medium/Low	Medium	Medium
Code									
Beila city	75%	0%	48%	Medium/Low	Medium/Low	Medium	Medium	Medium	Medium
Code									
Abo Badawy village	85%	0%	48%	Medium/Low	Medium/Low	Medium	Medium	Medium	Medium
Code									
Suez Governorate									
Suez city	90%	0%	50%	Medium	Medium/Low	Medium/Low	Medium/Low	Medium	Medium
Code									

The poor user and provider inclusivity score indicate the need for:

- Equity for service users that comprises:
 - o Waste collection coverage;
 - o Consultation and involvement of users in decision-making on policy, planning and siting of facilities, and
 - o Formal procedures for measuring customer satisfaction and effective feedback mechanisms between service users and service providers.
- Enhance the inclusion of non-municipal service providers from the formal private, community or 'informal' sectors in the planning and implementation of solid waste and recycling services and activities

Good waste governance requires that the system be financially sustainable⁷⁷. Compiling comparative – and comparable – data on costs and on cost recovery has proved to be particularly strenuous: accounting systems vary widely; cost and budgeting mechanisms are often fragmented and scattered over several departments; many cities are either unable or perhaps unwilling to share information.

According to Wilson et al.⁷ the financial sustainability benchmark indicator is highest in the high-income cities, but below that income level, the data are scattered widely and over the complete range from 0–100%.

Column 5 in table 21 shows the score for financial sustainability indicator. The score is:

- “Medium” for Assiut and El Fateh cities and El Zarabi village in Assiut Governorate, Tanta and Samannoud cities and El-Ameria village in Al Gharbiya Governorate, Fayoum city, and Beila city and Abo Badawy village in Kafr El-Sheikh Governorate;

- “Medium/low” for Qena and Qoos cities and Hegaza village in Qena Governorate, Senuris city in Fayoum Governorate, Banha and Shebin El Qanater cities and Astit village in Kalyobiya Governorate, and Kafr El Sheikh and Suez cities;
- “Low” for Demo village in Fayoum Governorate

SWM is in economic terms a merit good – i.e. a good, or rather a service, deemed so important, in this case for public health reasons that the law requires that it is provided for the profit of the entire society, regardless of the interest of the market to supply it or the users' ability (or willingness) to pay for it⁷. This means that the function of the city needs to remain strong, if not in provision, then in regulation, of the services. It is also practically impossible to exclude non-payers, as the service is prone to 'free-rider' behaviour. For such reasons, cost recovery from paying users – although considered weighty – is not the central feature of financial management in most of the selected cities.

A strong and transparent institutional framework is indispensable to good governance in solid waste⁷. Without such a framework; the system will not work well over the long term. The cleanliness of a city and the effectiveness of its solid waste management might be useful as a proxy indicator of good governance. The competence of services to lower-income communities also reflects on how successfully a city is addressing issues of urban poverty and equity. For waste management to work well, the city also needs to address underlying issues relating to management structures, contracting procedures, labour practices, accounting,

77. David C Wilson, Ljiljana Rodic, Anne Scheinberg, Costas A Velis and Graham Alabaster (2012), “Comparative Analysis of Solid Waste Management in 20 Cities”, *Waste Management and Research*, 30(3), 237–254

cost recovery and corruption. Clear budgets and lines of accountability are essential.

Indicator 6 in Table 21 shows the benchmark indicator for 'degree of institutional coherence': about 73% of the studied cities and villages score "medium" against this indicator. The score of the remaining cities and villages was "medium/low. The score against this indicator is:

- "Medium" in Qena, Qoos, Fayoum, Senuris, Tanta, Samannoud and Suez cities, and Astit village as well as the cities and villages of Assiut and Kafr El Sheikh Governorates; and
- "Medium/low" in Banha and Shebin El Kanater cities, and Hegaza, Demo and EL-Ameria villages.

Comments and Recommendations:

- In the studied cities and villages, there are examples of strong political commitment and leadership showing perceptible results, such as in Qena, Fayoum and Suez Governorates, but also of weak and disinterested institutions with accompanying poor performance of the SWM.
- Despite the truthful efforts of the Cleansing and Beatification Authority and the EMU staff in Al Gharbiya Governorate, lack of resources affects the level of SWM.
- Though limited resources are available in Abo Badawy village, at Kafr El-Sheikh Governorate, the head of the public unit succeeded to establish a proper MSW collection, street cleansing and transportation system in the village.

- There are needs for:
 - o Developing a comprehensive national law(s) to address SWM requirements;
 - o Updating the national strategy, and developing a master plan for ISWM;
 - o Adapting comprehensive SWM pro-programmes to create 'quality communities' for cities' residents;
 - o Adapting a decentralised SWM approach in the Governorates;
 - o Establishing a management information system (MIS) responsible for regular measurement of data, collection and monitoring;
 - o Equity of service delivery for high and low income areas, and in particular the slums;
 - o Improving service implementation, management and supervision;
 - o Initiating a programme for dumpsite closure and remediation and establishing fully engineered facilities for waste disposal;
 - o Initiating a programme for household waste segregation;
 - o Addressing the existing problems of composting plants and encouraging the diversity of waste treatment projects in the Governorates;
 - o Integrating the community and/or informal recycling sector with the formal SWM;
 - o Stakeholders involvement in the planning, policy formation, implementation and evaluation of the services;
 - o Including non-municipal service providers, such as the formal private, community or 'informal' sectors in

- the planning and implementation of solid waste and recycling services and activities;
- o Participation of the private waste sector in SWM planning forums, task forces, committees and/or steering-groups;
- o Initiating and use of public feed-back mechanisms including: community meetings and/or questionnaires; implementation of a public complaints system maintained by the municipality and detailing each complaint received; its nature and location; and nature and timing of rectification actions taken;
- o Presence of national and local institutional and/or legal incentives that actively encourage private sector, public-private partnership (PPP), community based organisation, and organised 'informal participation within SWM;
- o Increasing budget allocations to provide high quality service;
- o Developing a mechanism for cost recovery taking into account cross-subsidise charges for those who could least afford to pay;
- o Applying the extended producer responsibility (EPR) to pass the burden of SWM back in part to those who place on the market products which make up a significant part of the solid wastes that are handled by the cities;
- o Preparing guidelines for local authorities on how to implement the laws and strategy;
- o Establishing well organised and adequately resourced SWM units in the Governorates certifying that SWM services are planned, delivered and funded and could enforce the legislation; and
- o Implementation of a comprehensive, culturally appropriate public education and awareness raising programmes.

Annex 4 provides the Governorate's case studies, including Governorate's profile; major stakeholders and their contact information; Governorate's needs; and scoring forms. Moreover, Annex 5 presents some international success stories and best practices.

5. FUTURE PERSPECTIVES



Most of the topics discussed in this chapter are at the policy level. MSEA and NSWMP are currently in the process of elaborating a new national policy on SWM. This chapter points out to the magnitude of bearing the following issues in mind, according to the expert opinion of the author's team based on gathered data and experiences, in the preparation of the forthcoming new national policy:

- Planning and implementation of Integrated Sustainable Waste Management (ISWM);
- The national responsibilities;
- Economic instruments;
- Financial sustainability (cost recovery and other measures);
- Extended Producer Responsibility (EPR);
- Financial institutions participation;
- Formal and informal private sector involvement;
- Multi-stakeholders involvement;
- Public awareness and community participation;
- Establishing an efficient data / IT national system;
- Development of pilot projects;
- Decentralisation of Solid Waste Management; and
- International development agencies support.

5.1 IMPLEMENTATION OF INTEGRATED SUSTAINABLE WASTE MANAGEMENT (ISWM)

The annual report discusses the key aspects for the implementation of an ISWM. The system requires the integration/coordination between public entities with regard to policy, legislative and institutional building in addition to PSP, multi-stakeholders consultation and active public participation.

ISWM is a concept targeting the establishment of an environmentally-sound and financially-sustainable SWM. It focuses on all the elements in the waste management from generation to final disposal. This integrated approach should comprise technical, environmental, legal, socioeconomic and financial aspects, involving the stakeholders at different levels to ensure an effective implementation.

It is vital to identify and implement sustainable solutions for waste collection, recycling, treatment and disposal. New waste management must be established taking into account the informal sector in order to raise awareness, promote an adequate waste collection and treatment tools and the economic growth of this activity sector in a technological efficient and sustainable way⁷⁸.

The central focus would be the integration of the sustainability aspects of SWM, such as environmental impacts, economic considerations and the social settings. It is also imperative to integrate appropriate low cost and efficient technologies with community based management and their relevant governance, institutional frameworks and socioeconomic constraints,

78. Gerhard Schories (2012), "Integrated Sustainable Solid Waste Management in Asia: Project Final Report", VEREIN ZUR FOERDERUNG DES TECHNOLOGIETRANSFERS and DER HOCHSCHULE BREMERHAVEN E.V.

linking waste treatment with poverty reduction and improvement of welfare of the population. An in-depth understanding of the strengths, weaknesses, opportunities and threats in the specific local context are deep-seated when developing a robust and sustainable solution.

The concept of ISWM recognises that success in SWM depends on engaging a range of stakeholders, capitalising on their strengths to build an effective team with clear distribution of roles and responsibilities. This involves attitudes and behaviour of service providers as well as service users thus including citizens and institutions generating waste, MSWM staff, employees of private enterprises and informal sector actors such as zabaleen, waste pickers, waste dealers and recyclers.

Problems might be aggravated not only by technical or financial factors, but also due to inadequate managerial capacity, a weak institutional framework, a challenging environment, socio-cultural or conflict situations. In such cases, it is not money or equipment's that provide better solutions, but rather a change of social, institutional, legal or political conditions. The ISWM concept was developed to reflect this reality, as a means to articulate a vision of waste management that would pay attention to all these various aspects.

Establishing an ISWM requires:

- Analysing the main constraints for implementing new concepts on MSWM (from waste collection to treatment), compiling data on waste generation and treatment and identifying common and urgent problems. In general, the methods of SW collection and disposal are inadequate and institutional capacity for the waste management in industry must be strengthened, identifying gaps in the technical knowledge and socio-economic policy barriers is required;
- Finding the most suitable and feasible solutions through the study of the most appropriate adapted technologies on SWM for each specific problem;
- Definition of an innovative ISWM concept specifically considering the recent situation and future trends. The "waste

management hierarchy" does not address costs. Therefore, it could not help assess the economic affordability of waste management, etc. There is no one 'best method' of waste management as it is a complex phenomenon with a range of consequences for the involved stakeholders and the society;

- Integrating and encouraging the role of formal and informal private sector participation in the SWM sector, and.
- Public awareness and education are needed in order to understand the problems that arise from inadequate solid waste management, the correct way to deal with SWM and the opportunities it might represent, such as recycling.

A national policy for ISWM has to be developed and implemented aiming at the control of waste generation rate, waste segregation, material recovery, and waste disposal technology that will have minimum impacts on local residents.

The proposed policy could be grouped into five major categories:

- Monitoring of waste generation situation including waste characteristics and sources of waste generation;
- Assistance to local Governorate authorities both financially and technically. The assistance would cover the whole WM hierarchy starting from source separation, collection, transportation, material recovery, and disposal;
- Awareness raising for both local government authorities and the public;
- Development of appropriate MSWM regulations and implementation guidelines; and
- Involvement of stakeholders in MSWM.

The national policy would aim to minimise waste generation by promoting the 3Rs including promotion of waste reduction, separation at source and waste materials recovery. As for waste treatment facilities, the policy would support the establishment of central SWM disposal facilities with appropriate technology to be shared among municipalities. Privatisation of waste management services is also needed to

achieve high efficiency as well as to attract investment from the private sector. To achieve the targets of ISWM that focus on the 3Rs, a strategic plan has to be developed aiming to reduce waste generation and enhance waste segregation, reuse, and recycling in every community. The strategy would include promotion of resource-efficiency, sustainable consumption, waste reduction and recycling, and technology-based treatment and disposal.

For policy implementation, the Polluter Pay Principles (PPP) might be enforced for all waste generators. Databases for SWM might be updated and distributed to all parties involved. Law and regulation would also be updated and revised when appropriate. Example of matters that should be regularly updated are service fees, subsidy schemes for waste reduction, and the program for local community to participate in SWM and monitoring of environmental quality.

A part from the above measure, there are also other potential implementation measures including the promotion of environmental education, research and development in environmentally sound technologies, capacity building for government officers and related stakeholders, and raising environmental awareness among citizens and the local public.

Due to the growing GHG emissions from the waste sector, the national strategy should include reducing organic fraction in the waste to disposal and upgrade technology from open dumping to sanitary landfill. Waste separation is to be promoted to enhance waste utilisation and resource recovery. Composting and waste to energy are recommended.

In general, the national legislations are fragmented and focused on controlling the collection and disposal of generated waste. The new master SWM law to be drafted should be in association with the proposed national policy on resource recovery and 3Rs, promoting waste reduction, reuse, and recycling.

The newly established Integrated Solid Waste Management Sector (ISWMS) is proposed to set a SWM standards aiming at enabling the Governorates to effectively implement the proposed national policy. The standard should provide a framework, guidelines and recommendations to local authorities on SW administration, WM plan, public participation, facility development, involvement of private sector, and technologies for solid waste treatment.

5.1.1 INTEGRATED SUSTAINABLE WASTE MANAGEMENT PLANNING

ISWM planning is a dynamic tool including aspects that range from policy-making and institutional development to technical design of integrated solutions for the handling and disposal of waste⁷⁹. The concept of ISWM differs from the conventional approach towards waste management by seeking stakeholder participation, covering waste prevention and resource recovery, including interactions with other systems and promoting an integration of different habitat scales (city, neighbourhood, household). ISWM does not cope with WM as just a technical issue, but also recognizes the political and social factor as the most important.

ISWM consists of three dimensions; each is of crucial importance and must be cautiously cared about all through the Planning

79. Klundert, Ar. & J., Anschutz, 1999, "Integrated Sustainable Waste Management: the Selection of Appropriate Technologies and the Design of Sustainable Systems is not (Only) a Technical Issue", accessed 2nd November 2011, the World Bank (http://www.worldbank.org/urban/solid_wm/erm/Annexes/US%20Sizes/Annex%204B.3.pdf)

Process: those are:

- Stakeholders;
- The Waste System Elements; and
- The Sustainability Aspects of the SWM System.

Stakeholders have different roles and interests in relation to waste management; the challenge of the ISWM process is to get them to agree to cooperate for a common purpose, that of improving the waste management.

The waste management elements refer to how solid waste is handled and where it ends up. The idea of a waste management hierarchy⁸⁰ has been taken as an operational policy guideline, due to the important environmental implications of where solid waste ends up (Figure 17 A).

The sustainability aspects could be defined as principles, or lenses, through which the existing waste management could be assessed and with which a new or expanded management could be planned. In order the new or the expanded SWM to be sustainable, it needs to consider all of the technical, environmental, health, financial-economic, Socio-cultural institutional, legal and political aspects.

5.1.1.1 OVERVIEW OF ISWM PLAN⁸¹

SWM plans have a key role to play in achieving sustainable waste management. More specifically a SWM plan aims to:

- i) Define the baseline: Collecting reliable data and other information on the existing waste situation, for national, provincial or local government, or for a specific industry, is a critical first step in compiling an integrated waste management plan. The aim of gathering this background information is to provide a realistic and quantitative basis for the development of the plan, based on actual data and prioritized requirements and needs.
- ii) Identify the roles & responsibilities of key stakeholders: When preparing an ISWM plan attention should be placed on ensuring that the roles and responsibilities of key stakeholders are clearly defined.



Figure 17A SWM Hierarchy

- iii) Identify the strong and weak points of the current SWM: It is important to identify the true character of the current SWM and establish a basis of its shortfalls, constraints and/or strong points.
- iv) Prepare the appropriate SWM action plans: It is the core of the planning procedures as it defines the actions to be implemented and which will establish the new SWM.
- v) Provide guidelines on how to pass from the planning phase to the implementation phase: It is crucial to ensure the continuity between the planning process itself and the implementation. Therefore the planning process should provide detailed guidance on performance measures and information management, both of which should be used to monitor the performance of SWM and thus the implementation of the SWM Plan.
- vi) Control of technological measures: An outline of waste ensures identification of areas in that technological measures should be taken to eliminate or minimise certain types of waste.
- vii) Outline of governance requirements: SWM plans make way for statement of financial, institutional and social requirements. On this basis, the need for future actions, such as investments in SWM plans, public awareness campaigns, training courses for the relevant authorities, etc., would be determined.

80. (Figure Source: Carlos Silva Filho, *SWM in Brazil: Situation and Perspectives*, The ISWA World SW Congress 2012)

81. ISWA, "Solid Waste: Guidelines for Successful Planning", 2012

5.1.1.2 THE PLANNING PROCESS

The planning process of a SWM consists of the following five major phases, as demonstrated in Figure 17 B:

- i) **The Mobilising Phase:** It is the phase prior the beginning of the planning process. In the initial phase of the SWM planning it is substantial to implement activities that will mobilise the planning process. These activities are mainly related to 'Mobilizing Support' activities that include the 'Political Support' and the 'Stakeholders' Participation. In that way it ensures the engagement and cooperation of the main stakeholders, factors that will "push" forward the procedure to proper implementation.
- ii) **The Status Phase:** It is the phase that a comprehensive baseline of the current situation in SWM is created. Aim of the baseline is to evaluate the range of institutional, technical and promotional aspects of current SWM and define key shortfalls and constraints. This valuable management of information forms a benchmark for the design of an improved SWM.
- iii) **The Planning Phase:** It involves all the activities required to prepare an appropriate SWM action plan. The planning part is prepared in accordance to the baseline, the requirements set by the national legislation and the relevant assumptions for projecting future developments.
- iv) **The Implementation Phase:** After the development of the SWM plan, its assumptions are put into practice via the appropriate legislative, technological and logistic approach. An implementation program has to be prepared.

- v) **The Monitoring & Review Phase:** The monitoring and review phase involves activities that identify the actions that shall be monitored and the relevant indicators of performance. Indicators are then estimated and the applied SWM is evaluated and reviewed. Wherever deficiencies and low performance are observed additional action to improve the applied SWM has to be implemented.

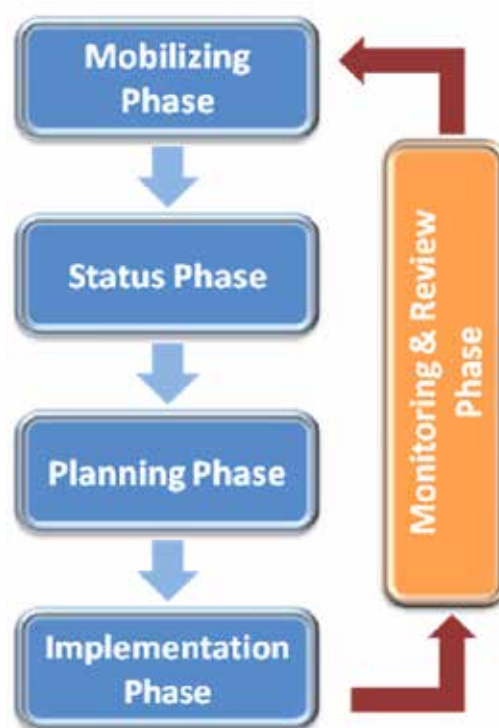


Figure 17A The planning process of a SWM system

Source: ISWA, "Solid Waste: Guidelines for Successful Planning", 2012]

5.1.1.3 GENERAL STRUCTURE OF A SWM PLAN

The detailed structure of the waste management master plan depends on its specific purpose and area, the time horizon as well as the local legislation needs⁸³. However, a broad approach of the elements in a solid waste management plan is:

Background:

- Overall waste problematic
- Legislation;
- Description of national waste policy and prevailing principles;
- Description of objectives set up in specific areas; and
- Inputs from the consultation process.

Status Part

- Diagnosis of Current Waste Management
 - o Waste sources & streams;
 - o Amounts of wastes & types;
 - o Existing waste management system; and
 - o Economics & financing of the WM system.
- Projections
 - o Socio-economic projections; and
 - o Waste projections.
- Conclusions
 - o Strong and weak points.

Planning Part

- Assumptions for planning;
- Definition of the scope of the plan;
- Proposal of scenarios;
- Setting goals & targets; and
- Action Plan.

Implementation Part

- Establish instruments for the implementation of a waste management plan
 - o Policy instruments;
 - o Legal instruments;
 - o Economic instruments;
 - o Environmental agreements / partnerships;
 - o Public awareness and communication; and
 - o Planning.

Monitoring & Review

- Define the actions to be monitored;
- Define the means and right indicators to measure the performance of the applied SWM system; and
- Assess & review the applied SWM system.

5.1.1.4 ISSUES OF CONCERN

Before moving to the implementation of a SWM Master Plan, there are certain issues that should be taken into consideration.

Those are:

- The scope of the master plan;
- Time horizon of the plan;
- Stakeholders in the planning process;
- The role of informal sector;
- Public awareness and communication;
- Identification and prioritization of needs;
- Environmental impact of the master plan;
- Time schedule of the master plan; and
- Relationship with other plans

5.1.1.5 BENEFITS OF ISWM APPROACH

Considering the issues discussed in this section, adopting the ISWM approach could bring clear benefits including:

- Lower costs of waste management;
- Less environmental pollution (of soil, water and air);
- Conservation of raw materials;
- Better coordination between urban services;
- More active citizens who contribute to urban development;
- People that are more satisfied with the service provided and are less inclined to subversive activities;
- Better image of the city / country;
- Fewer health hazards;
- Better cost management and higher cost recovery;
- Better performance waste management departments; and
- Potential increased income from tourism, agriculture and other major economic activities.

Box 13 EU Principles for Waste Management⁸⁴

- Waste management hierarchy: Waste management strategies must aim primarily to prevent the generation of waste and to reduce its harmfulness. Where this is not achievable, waste materials should be reused, recycled or recovered, or used as a source for generating energy. As a final resort, waste should be disposed of safely (e.g. by incineration or in landfill sites).
- Self-sufficiency at Community and, if possible, at Member State level. Member States need to establish, in co-operation with other Member States, an integrated and adequate network of waste disposal facilities.
- Best available technique not entailing excessive cost (BATNEEC): Emissions from installations to the environment should be reduced as much as possible and in the most economically efficient way.
- Proximity: Wastes should be disposed of as close to the source of their generation as possible.
- Precautionary principle: The lack of full scientific certainty should not be used as an excuse for failing to act. Where there is a credible risk to the environment or human health from acting or not acting with regard to waste that serves to provide a cost effective response to the risk identified should be pursued.
- Producer responsibility: Economic operators, and particularly manufacturers of products, have to be involved in the objective to close the life cycle of substances, components and products from their production throughout their useful life until they become waste.
- Polluter pays: Those responsible for generating or for the generation of waste, and consequent adverse effects on the environment, should be required to pay the costs of avoiding or alleviating those adverse consequences. A clear example could be seen in the Landfill Directive.

5.2 NATIONAL RESPONSIBILITIES

The National responsibilities towards the establishment of an ISWM system are diverse and vital to the creation of the system. The establishment of the Integrated Solid Waste Management Sector (ISWMS) is an important step however, it will need enacting legislation, enforcement of necessary guidelines with clear incentives and disincentives, land allocations allowing the establishment of well-managed transfer stations, treatment facilities and sanitary landfills, financial incentives such as tax holidays and customs' exemptions, SWM budget allocations, green procurement guidelines, etc.

Accordingly, the national government, as well as local authorities, has a role in developing and implementing support policies and guidelines conducive of the

efficient execution of Integrated Solid Waste Management Sector's targeted tasks.

The Integrated Solid Waste Management Sector (ISWMS) will take the charge of developing the waste management sector, formulating policy, preparing legislation and regulative measures, and assisting the implementation of an integrated financial and technical support programme from the German Government and the European Union³³. Assistance from other international development partners in the waste management sector will be sought under the framework of the NSWMP. ISWMS will take charge of waste management policy and strategy implementation and will also lead investment programming and provide support to the Governorates and Municipalities.

82. *Handbook on the Implementation of EC Environmental Legislation, Section 4: Waste Management Legislation, 2008*

Greening the waste sector will require the articulation of a waste management policy based on the internationally accepted waste hierarchy. Using the word “green” as an adjective generally means that the product or

service it describes benefits the environment by being sustainable and/or reducing negative environmental impacts. Green waste management puts reduce, reuse, recycle and recover the resource into action.

Box 14 The main roles and responsibilities of the Integrated Solid Waste Management Sector (ISWMS)³²

1. Policy: Setting national waste management policy including objectives and targets.
2. Strategy: Development, implementation and updating of national waste management strategy and action plan.
3. Legislation: Drafting waste management legislation, and supporting the passage of legislation through parliament.
4. Economic & financial instruments: Research and establishment of appropriate economic and financial measures.
5. Parliamentary briefings: Support to the Minister in Parliamentary briefings and subcommittees.
6. Stakeholder dialogue: Coordination of inter-sectoral dialogue on SWM issues
7. Investment planning/promotion: Investment planning/pipelining, identification and promotion of investment opportunities in the waste management sector.
8. Program management/coordination: Management of programs financed by government and international development partners.
9. Project identification and design: Technical assistance to support Governorates and Municipalities in preparing waste management plans and integrated, bankable SWM concepts.
10. Guidelines and standards: Preparation and dissemination of best practices guidelines; development of technical and environmental standards.
11. Information and data: Collection and reporting of information and data (e.g. from Governorates and Municipalities).
12. Knowledge management: Collection and sharing of best practices amongst national and regional networks.
13. National focal point: Information and advisory service.
14. Monitoring & evaluation: Collection and publishing of key performance indicators and data
15. Research & Development: Management of R&D programs.
16. Awareness raising: Behaviour change, communications and environmental education.
17. Tariff Policy: Financial regulation, including establishing affordability benchmarks.

The 3Rs offer an environmentally friendly alternative to deal with the growing generation of solid wastes and offer a unique opportunity to local and national authorities for the conception of a more furnished human urban environment by effectively promoting resource efficiency and waste prevention as a top priority within the overall policy, planning and development. The 3Rs provide opportunities for source reduction (increased resource efficiency/minimise raw material input), waste prevention/minimisation of environmental risks through eco-friendly designs and products, and

structured or reorganised production processes so that the solid waste of one industry becomes a valued input to another one (industrial symbiosis). The 3Rs also goes hand in hand with the Green Economy concept, as both determine for extracting/using less resources and creating less waste.

On the other hand, there is a need for the Integrated Solid Waste Management Sector (ISWMS) to fundamentally orient the policy directions towards resource efficient and zero waste society through the development of policy instruments that encourage waste

prevention and minimisation based on the public private partnership (PPP) and extended producer responsibility (EPR). Zero waste is a 'whole system' approach to resource management that maximises recycling, minimises waste, reduces consumption and ensures that products are made to be reused, repaired or recycled back into nature or the marketplace. Zero waste aims to minimise use of resources and maximise the ongoing benefits of the inherent value within the waste generated by society.

Multi-stakeholders involvement is envisaged in the formulation of the national SWM policy, strategy, preparation of legislation, planning and implementation of services. The Integrated Solid Waste Management Sector (ISWMS) will consult stakeholders to define policies that will progressively help formalising the recycling sector and support in the growth of the Egyptian recycling businesses. Moreover, ISWMS will consolidate and prepare a waste framework law within the framework of public and stakeholders' consultations.⁸² The final draft of the law will be used to establish a basis for identifying SWM secondary legislation and decrees.

The Integrated Solid Waste Management Sector (ISWMS) will coordinate with the relevant Ministries and institutions to review the current tariff structure in Egypt and explore other possible scenarios that could achieve more efficient SWM along with raising revenues. Pay-As-You-Throw (PAYT) is a system where households pay for garbage collection by the amount of trash discarded, rather than a flat fee. This provides a financial incentive to recycle and reduce the amount of waste discarded. Under traditional solid waste collection and disposal systems, residents pay indirectly for the service through a flat fee attached to their electricity bill. With a PAYAT Programme, residents pay directly for collection services based on the amount of waste thrown away. Some communities that have instituted PAYT systems have seen their overall waste disposal rate decline 25-45%⁸³.

Tax incentives could be granted by way of full tax holidays, partial tax holidays where only a portion of profits and income will be exempted, concessionary tax rates,

accelerated depreciation allowances and enhanced deduction of expenditure or combination of more than one of these methods. Tax holiday benefit should be extended to SWM for developing urban infrastructure.

The Integrated Solid Waste Management Sector (ISWMS) will facilitate the investment programming and implementation component of the NSWMP. Investments will be implemented at both regional and local levels, under the leadership of the Governorates. The role of the Integrated Solid Waste Management Sector (ISWMS) will be to coordinate, guide and assist the process of decentralised implementation of improved infrastructure and services.

The ISWMS will provide Guidelines for sound financial management practices for SWM at the local level. This will include the developments of templates and models – covering all data input needs to assist local governments to undertake proper financial planning. Moreover, NSWMP and ISWMS will prepare guidelines and models for preparation of regional waste management plans.

The ISWMS will assess in detail, and consult with development and commercial banks to establish seed financing to put in place an SWM SME fund. Procedures for accessing credit and grant support from this fund will be designed to enable access from new entrant entrepreneurs, recycling associations, and SMEs. Moreover, the ISWMS will assess and put in place other mechanisms for stimulating development of the national waste management industry, eg. Operator models that favour participation of smaller companies, pro-SME contract clauses, tax relief for start-up enterprises, recycling parks, and other support measures⁸³.

The ISWMS will establish a communication division responsible for participatory monitoring and evaluation; social assessment; awareness raising and behaviour change; and social integration and informal sector empowerment. This division will also help in institutionalising the participatory monitoring and evaluation process and give it an official form.

83. US EPA, URL (http://www.epa.gov/region7/waste/solidwaste/reduce_waste.htm)

5.3 ECONOMIC INSTRUMENTS

Economic instruments (EIs), also known as market-based instruments, comprise all incentives/disincentives that mobilise the self-interest of consumers, producers, and service providers to make environmental upgrades or moderate adverse environmental consequences. These instruments might be used to address basic environmental needs, or might motivate actions to address environmental protection beyond the prescribed minimum accepted standards of command-and control regulatory approaches.

There is a growing interest in the use of EIs in environment policy making. Generally, EIs have a great potential in supporting the command-and-control measures decreed by government. They introduce more flexibility, efficiency and cost-effectiveness into SWM measures. EIs could work harmoniously with traditional regulatory mechanisms as well as help provide the necessary funds for supporting sound environmental management initiatives such as recycling and waste disposal facilities. The proper design and enacting of implementable EIs should be an integral effort in future SWM activities.

The use of appropriate EIs could help to achieve sustainable development by providing the means of internalising environmental degradation and resource depletion costs into the production and consumption process⁸⁴.

In general, EIs could be broadly classified into three categories:

- i) Revenue-raising instruments, e.g. raise capital or cover operational cost for establishment and operation of SWM programmes;
- ii) Revenue-providing instruments; e.g. mechanism that encourage to install a desirable behaviour based on user charges such as waste collection and tipping fees, or fines to eliminate wrong SWM practices (e.g. littering, burning), or deposit-refund programs; and

- iii) Non-revenue instruments, these could combine a fee with a subsidy whereas the fee is waived when the desired effect is reached, e.g. time/target-linked tax-holidays for certain SWM tasks or projects.

EIs could be used as a tool in SWM to⁸⁵ :

- Reduce the amount of waste generated;
- Reduce the proportion of hazardous waste in the waste generated;
- Segregate hazardous waste for special handling and disposal;
- Encourage recovery, reuse and recycling of wastes;
- Support cost-effective SW collection, transport, treatment and disposal systems;
- Minimise adverse environmental impacts related to SW collection, transport, treatment and disposal systems, and
- Generate revenues to cover costs.

For furthering these environmental objectives, economic instruments could generate incentives and disincentives at different stages of the WM process, most importantly at the stage of waste generation, waste treatment and waste disposal (cf, Figure 18)⁸⁶. At each stage of the SWM process, different economic instruments might be appropriate to further the respective environmental objectives. For example, waste charges might initiate incentives for improved separation and general waste reduction at the stage of waste generation. Deposit-refund systems might conceive incentives for better collection at the same stage. At the stage of waste treatment, Advanced Recycling Fees (ARFs) could provide revenue for the recycling processes so that recycling of certain products might be increased. At the stage of waste disposal, landfill taxes could originate disincentives for landfill disposal and divert waste streams to other waste management methods such as recycling instead.

84. UNEP, Kenya Institute for Public Policy Research & Analysis (KIPPRA) and the National Environment Management Authority (NEMA) (2005), "Selection, Design, and Implementation of Economic Instruments in the Solid Waste Management Sector in Kenya: The Case of Plastic Bags"

85. IDB (2003), "Economic Instruments for Solid Waste Management: Global Review and Applications for Latin America and the Caribbean", Environment Network regional policy dialogue study series, Inter-American Development Bank, Washington DC

86. Kai Schlegelmilch, Eike Meyer and Damian Ludewig, "Economic Instruments in the Waste Management Sector: Experiences from OECD and Latin Americould Countries", Green Budget Germany, GTZ



Criteria for Choosing Instruments

There are dozens of potential solid waste instruments that each country might implement. The global literature does not provide adequate comparative information to conclude whether certain economic instruments are better than others. The data are not available to assess the extent to which any instrument would reduce waste, increase recycling, reduce toxics, generate revenues, etc. Choice depends on local priorities, preferences, and abilities. Local capacity, public interest, and ability to pay are just a few of the differences between countries that influence choice⁸⁷.

The following evaluation criteria are recommended to be considered:

- Environmental effectiveness – i.e., does the instrument lead to the desired environmental improvements, such as reduction in waste generation, increased waste recycling, reduced emissions from transport and disposal;
- Economic cost-effectiveness – i.e., does the instrument generate incentives for investment and innovation toward reduction of pollution control costs;
- Administrative cost-effectiveness – i.e.,

does the instrument require affordable and available levels of skill and effort to implement and monitor;

- Revenue usefulness – i.e., are revenues generated able to be applied to address the environmental objectives of the instrument and adequate to set measurable improvement;
- Ease of implementation and replicability – i.e., are the relative costs and benefits relatively easy to assess and the legal requirements for introducing the new instrument reasonable;
- Acceptance – i.e., does the general public and the affected industries accept the instrument as a viable means of cost-effectively achieving environmental improvement without adversely affecting competitiveness, employment, income distribution, and trade;
- Distributional effects – i.e., is there distributional disparity or inequity in the application or impact of the instrument, particularly regarding effects on lower income households, small businesses, and disadvantaged parties;
- Short-term results – i.e., does the

87. Sandra Cointreau and Constance Hornig (2003), "Global Review of Economic Instruments for Solid Waste Management in Latin America", Regional Policy Dialogue, Inter-American Development Bank, Washington, DC, USA

- instrument have the potential to result in sufficient short term improvement to motivate political administrators to undertake commitment to the costs associated with the instrument under their political term;
- Economic development enhancement – i.e., does the instrument provide an environment that maintains trade competitiveness and inspires industrial development and employment generation; and

- Waste type applicability -- i.e., does the instrument address a wide range of waste types and has significant impact on overall urban waste quantities, or does the instrument address only a limited number of unique and important waste types.

Annex 6 provides a global review of market-based instruments that have potential application to solid waste management.

Figure 18 Economic instruments of the different stages of the waste management process⁸⁸

5.4 FINANCIAL SUSTAINABILITY (COST RECOVERY AND OTHER MEASURES)

Processes for planning SWM capital expenditures are lacking or absent in Egypt. Capital purchases of equipment's are generally treated on a single year basis and are not generally included in SWM service cost recovery structures. Recurrent costs are borne through Governorate financing, usually through a combination of special SWM levy and allocations from general revenues. The Government and Governorates participate directly and indirectly in the financing and cost recovery of MSWM.

Although good quality data on current SWM expenditures is not readily available, it is apparent that the proportion of total costs covered by special cost recovery mechanisms is nowhere more than 65 percent of total operating costs¹. Cost recovery mechanisms are not directly related to the extent to which individuals and entities either generate waste or use SWM services. Concepts of "full cost accounting", "user-pay" and "polluter pay" have not generally been applied with respect to SWM.

New sources of financing are required for sector reform and for the planning and implementation of new SWM. Financing could come from public or private sector entities, and from internal and external sources. Traditional sources of financing could include allocations from general revenues and loans/credits from the international community. More innovative options include forms of concession contract and application of the "polluter pay" principle to manufacturers, importers and distributors.

The design of mechanisms that link recovery of SWM costs to the amount of waste generated, how it is managed and who is responsible for its creation is critical to achieving enhanced SWM that are financially sustainable, protective of human health and the environment that minimise the amount of waste requiring management⁸⁸. An essential first step in developing a cost recovery schedule consistent with this approach is to assign a cost to all elements and negative impacts of the SWM, a technique known as Full Cost Accounting (FCA).

88. GTZ-ERM-GKW, "Solid Waste Management Finance and Cost Recovery", Issue Paper 2, METAP Regional Solid Waste Management Project The World Bank, 2005

Reform of financing and cost recovery frameworks in Egypt is essential to the financial sustainability of enhanced SWM systems. Financial and cost recovery frameworks should be adopted that reflect the following⁹⁰:

- Application of the “polluter pay” principle;
- Full cost accounting;
- Application of the user-pay principle;
- Establishment of funds for capital purchase/replacement;
- Allocation of funds for SWM recurrent expenditures; and
- Local decision making on SWM financing and cost recovery within the context of the national policy.

Often decision makers are unaware of the legal and environmental issues and lack knowledge regarding SWM⁸⁹. The applied FCA assists decision makers to better understand constraints and benefits of their SWM by clarifying budget needs and management components in a transparent and comprehensive manner.

For the majority of municipalities, the understanding for total expenditures of SWM and the need to refinance municipal services to sustain SWM is rather meager. The actual money available for SWM services is often based on the outcome of budget negotiations. The FCA is considered as a useful tool to clarify management and service costs and to support planning and SWM budgeting. An example of the approach used to form the FCA in a city is given in the following Figure 19.

Other reasons to apply FCA are:

- i) To identify hidden costs;
- ii) To trace and reform inefficiencies of a program;
- iii) To evaluate scenarios considering financial aspects and potential environmental impacts on SWM; and
- iv) To investigate the potential for implementing new and innovative systems, especially to secure refinancing based on user fees whereby citizen’s participation and incentives for waste reduction at source are provided likewise⁹⁰.

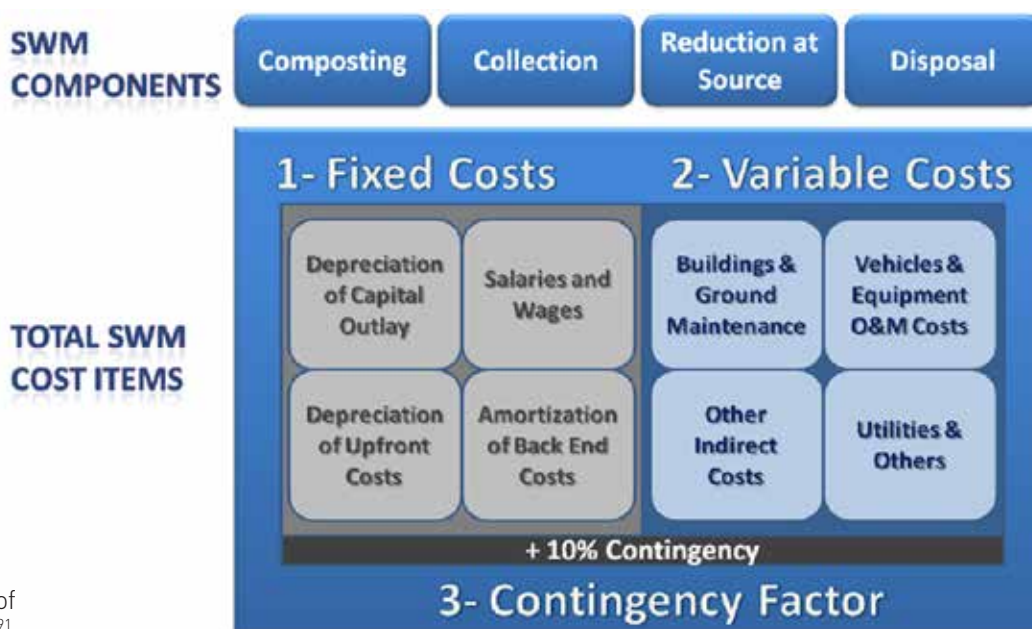


Figure 19 An example of Full Cost Accounting⁹¹

89. Jouke D. Boorsma, Rene G. Gaudiél and Johannes G. Paul, “Cost Recovery Mechanism to enhance Solid Waste Management in Bayawan City, Philippines: Experiences and Potentials”, GIZ, 2011

90. A. Karagiannidis, A. Xirogiannopoulou and G. Tchobanoglous, “Full Cost Accounting as a Tool for the Financial Assessment of Pay-As-You-Throw Schemes: A Case Study for the Panorama Municipality, Greece”, *Waste Management*, 28, 2801-2808, 2008.

If cost recovery becomes a serious issue, one of the first steps is to analyse the potential for differentiating fees by categories of household and business users, so that those who are able to pay more cross-subsidise those who could pay only a little⁹¹. This is complicated because the number of individuals and sub-units within a 'household' or 'compound' varies widely, especially in cultures that support polygamy. A more feasible approach is to set a fee per 'connection' based on average socioeconomic settings in the different wards in the city, with the possibility of granting exceptions to the general rule based on specific characteristics. A second approach is to announce that cost recovery is coming, but to start without charges for a period of time, such as a year, and to use this time to gather data, to evaluate the impacts of rainy and dry seasons and cyclical changes on the waste stream, to optimise routing, to organise fee administration and to open communication channels with users. Actually recovering costs might take even longer. Political and social approval of cost recovery requires a well thought out communication strategy. Cost recovery is like any kind of negotiated agreement, it only works if there is a sense of a contract covering that pays for what in what circumstances. In SWM, the users have to participate in planning, make choices and pay; and the providers have to interpret the choices made in terms of implementation, provide the service, satisfy the users and use the income wisely.

Fees could also be used to influence waste-related behaviour. Volume-based pricing is used to encourage household and business generators of waste to make use of recycling and composting options, so that they have less waste to throw away. One approach is that, in order to use the disposal system, clients have to buy special bags or special tags to prepay for disposal. The introduced Pay-As-You-Throw (PAYT) system motivates users to actively avoid waste generation at source.

The principle behind this use of fees is to make ordinary disposal more expensive so as to stimulate and finance recycling and safe disposal, and to push people to choose more environmentally friendly alternatives. This only works when the alternatives are easily accessible and the clients know how to use them.

Financial sustainability is more than about money, it is a link between financial and economic dispenses and other elements with the ISWM framework:

- Urban expansion and the growth in waste generation stimulate a process of modernisation. The net result of modernisation is that the costs associated with the WM public service are likely to increase.
- A budget for solid waste management is important for organising the use of funds. Budgets guide the municipality in spending public money, and they are a tool that taxpayer-citizens could use to hold the municipal authority accountable.
- Cost recovery is one of the sources of funds for solid waste services. Municipalities have more variety but less structure for cost recovery, so they have a greater need for legal, fiscal and institutional support for analysis, policymaking and implementation.
- Cost recovery depends on the 'willingness to pay,' another term for the price elasticity of public goods, and is a complex and often misunderstood issue. Fees have to be in line with priority of citizens for a clean immediate neighbourhood, on what is understood to be an adequate and reliable service.
- Recycling materials within the recycling supply chain involves a completely different set of rules than that of public services and should be seen as the private trading of private goods characterised by supply and demand.
- Modernisation requires municipalities to understand the differences between SW services and commodity trading.

91. Anne Scheinberg, "Closing the circle: Bringing Integrated Sustainable Waste Management Home", VNG International, Waste, July 2008

- Recycling is not a source of revenue, and should not be relied upon to finance SW services. Nevertheless, it is a source of benefit, and could reduce the costs of modern, environmentally sound, services.
- Poorly conceived recycling schemes could be a lose-lose proposition, with poor people losing their livelihoods, markets for recyclables flooded with low-value materials, and an increased burden on municipal dumping sites.
- Well-designed recycling that builds on

existing private sector activity could be a win-win proposition, protecting the environment, feeding resources to local industry and agriculture, and reducing municipal costs for waste management services and disposal.

Egypt has to initiate programmes in SWM financing, which include FCA, engaging the public in accepting the waste fee system, and institutionalising the cost-recovery mechanism in the form of local ordinance.

5.5 EXTENDED PRODUCER RESPONSIBILITY

Extended producer responsibility (EPR) is a policy concept aimed at extending producers' responsibility for their products to the post-consumer stage of their products' lifecycle. EPR is an important tool in a sustainable ISWM. The concept, design and implementation demand understanding and consent of a variety of public/private stakeholders (manufacturers) as per products' environmental impacts and the responsibility towards paying for the cost of post-consumer impacts of their products.

Approaches to EPR implementation are usually through mandatory legislation, voluntary participation or negotiated agreements where policy mechanisms include take-back requirements, recycling and disposal tax, deposit and refund fees and minimum recycled content.

Since the term Extended Producer Responsibility (EPR) was first coined and the German packaging take-back law was passed in the early 1990s, the EPR concept has become an established principle of environmental policy in many countries⁹². A core characteristic of any EPR policy is that it places some responsibility for a product's end-of-life environmental impacts on the original producer and seller of that product. The thinking behind this approach is that it will provide incentives for producers to make design changes to products that would reduce waste management costs. Those changes should include improving product recyclability and reusability, reducing

material usage and downsizing products, and engaging in a host of other so called "design for environment" (DfE) activities.

EPR might be applied both to industrial wastes and to packaging and post-consumer waste. In many countries existing waste management policies towards industrial and post-consumer wastes differ, and consequently the effects of a shift to EPR-based policies might differ somewhat between these two components of the overall waste stream. Nevertheless the basic rationale and characteristics of EPR programmes are common to a wide range of programmes, including programmes relating to both industrial and household (post-consumer) wastes.

There are several key motivating factors driving EPR policy development. One motivation for EPR is to reduce the overall costs of SWM, by establishing incentives for producers to consider the end-of-life waste management costs of their products. It is important to emphasise here that the relevant costs are not just the direct financial expenditures incurred by those responsible for waste management, but a wider and more comprehensive concept of costs, including both monetary and non-monetary costs incurred by all parties affected by waste management policies.

The policy instruments that lie under the EPR umbrella include different types of product fees and taxes commonly called

92. Working Group on Waste Prevention and Recycling, "EPR Policies and Product Design: Economic Theory and Selected Case Studies", Organisation for Economic Co-operation and Development (OECD), Feb. 2006

“advance recycling fees” (ARFs), product take-back mandates, raw material taxes, and combinations of all these instruments. EPR instruments are contrasted with non-EPR policies such as “pay-as-you-throw” waste collection charges, landfill bans, and others⁸⁹.

It is argued that a cost-effective instrument will be one that exploits all the possible avenues for waste reduction – i.e., source reduction, recycling, material substitution, and product design changes – and not just a single method. This means that policy options such as a combined ARF/recycling subsidy work better than an instrument that just targets, say, recycling. The take-back option is difficult to evaluate conceptually since much depends on how it is implemented in practice. All systems operate with producer responsibility organisations

(PROs), and the financing mechanism that the PRO uses is a critical determinant of the option’s cost-effectiveness.

The EPR programmes implemented in individual countries differ widely, in a number of respects, including the industries and products covered the policy context in which they have been introduced, the nature of the responsibilities placed on producers, the forms of organisation, and the economic, social and cultural context in which the programmes operate.

An EPR programme involving product take-back, producer-financing of waste management costs, and recycling targets is not the only way in which these waste management objectives could be addressed⁹³. A range of possible alternative policy instruments might be employed.

Box 15 List of common waste minimisation policy instruments⁹⁵

• Product take-back

Producers are assigned the responsibility of taking-back their products at the end of their useful life

• End-of-life waste management fees

Consumers are charged all or part of the marginal collection and treatment costs of general household waste or of specific waste products through an “end-of-life” fee. This might be a charge per bag or per kilogram of general household refuse (“pay as you throw”), or a specific charge for the collection and treatment of a particular item (e.g. car tyres, refrigerator, end-of-life vehicle, etc)

• Advance disposal fee

A tax or charge might be levied at the time a product is sold, at a level intended to reflect the end-of-life waste management costs of the product. Producers might be responsible for collecting the charge and remitting it to the public authorities, but are otherwise not necessarily involved in the collection or disposal of wastes.

• Mandatory deposit-refund system

A deposit is levied at the time the product is sold, and all or part of the deposit is later refunded when the product (or its packaging – e.g. a bottle) is returned for reuse, recycling or safe disposal. Producers (or

retailers) might be responsible for collecting the deposit, and for end-of-life collection and refund.

• Recycling incentives

Measures to stimulate recycling markets could include subsidies paid for the collection of materials for recycling (or direct public provision of collection facilities), subsidies paid to reprocessing firms, or subsidies to users of recycled materials. The use of recycled materials could also be encouraged by regulations requiring minimum recycled-materials content in certain products, or by taxes on virgin materials.

• Disposal disincentives

Taxes on landfill disposal or incineration might act to influence both the choice of disposal option (e.g. might influence the choice between landfill and incineration) and might also discourage disposal in any form, compared with recycling and waste-reduction. However, such taxes will normally only influence the disposal choices of waste management organisations (e.g. municipal waste management agencies), and unless supplemented by other measures will not influence consumer or producer decisions that affect the quantity or characteristics of waste generated.

93. Working Group on Waste Prevention and Recycling, “Analytical Framework for Evaluating the Costs and Benefits of Extended Producer Responsibility Programmes”, Organisation for Economic Co-operation and Development (OECD), March 2005

An EPR programme involving product take-back, producer-financing of waste management costs, and recycling targets, generally has the potential to secure a number of desired changes, including both changes in product design ("design-for-environment" incentives) and changes in waste management towards greater use of recycling. To achieve these endings through the use of other policy instruments would normally require a combination of alternative policy measures.

EXAMPLES OF EPR

i) Pro Europe (Packaging Recovery Organisation Europe)

Probably the best known example of EPR is seen in Europe. Founded in 1995, PRO Europe is organisation behind the well-known "Green Dot," the umbrella organisation for European packaging and packaging waste recovery and recycling schemes. The organisation is the general licensor of the "Green Dot" trademark, the means by which producers signal that they

Country	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
EU (27 Countries)	:	:	:	:	:	:	:	:	54.6s	56.9s	59.2s	60.5s	62.3s
Austria	64.5	64.9	65.6	69.4	64.3	65.9	64.2	66.2	66.9	68.4	67.2	67.9	66.9
Belgium	62.3	63.5	59.4	62.5	71.3	70.2	73.9	76.4	76.8	79	80.4	78.9	79.1
Bulgaria	:	:	:	:	:	:	:	:	30.8	35	54.8	50.3	45.9
Czech Republic	:	:	:	:	:	:	51.4	55.7	59	63.4	65.9	67.1	68.8
Denmark	40.1	50	53	55.7	57.2	57.3	53.8	53.2	52.5	56.2	56.8	59.7	84
Germany	80.6	79.7	79.2	78	75.9	74.4	70.6	69.6	68.2	66.5	66.9	70.5	73.5
Estonia	:	:	:	:	:	:	:	33.5	40.3	45.7	49.6	43.5	57.2
Ireland	15.2	14.8	17.4	18.9	27	34.9	51.2	56.4	55.6	54.5	60.6	61.7s	64.9
Greece	37	34.6	33.6	33.3	33.4	32.6	33.1	36.7	41.8	42.8	48	43.8	:
Spain	33.5	33.6	37.9	39.8	43.6	44.3	43.1	47.4	50.4	54	56.3	59.1	60.3
France	39.7	41.5	42.1	42.2	44	45.4	47.9	50.7	53.3	54.8	57	55.2	56.4
Italy	3	31.6	34	38.4	45.5	51.4	51.4	53.3	53.7	54.9	56.8	59.6	64
Cyprus	:	:	:	:	:	:	:	22	11.1	25.2	25.7	34	42.2
Latvia	:	:	:	:	:	:	:	45.6	47	42.2	39.6	46.8	44.9
Lithuania	:	:	:	:	:	:	:	32.7	32.5	37	42.9	51.7	57.7
Luxembourg	38.4	41.8	39.8	45.2	57.3	56.8	60.1	61	62.6	63.8	62.5	63.6	61
Hungary	:	:	:	:	:	:	:	43.3	45.9	48.9	46.4	50.8	51.1
Malta	:	:	:	:	:	:	:	5.9	8.1	10.8	10.4	:	:
Netherlands	55.2	62.4	63.6	58.8	56	57.4	56.4	58.5	59.4	70.2	69.8	72.4	74.9
Poland	:	:	:	:	:	:	:	28.3	29.5	37.1	48.2	42.9	36.8
Portugal	:	34.8	34.9	30.8	37.7	35.8	38.3	41	44.3	51.4	56.5	61	59.9
Romania	:	:	:	:	:	:	:	:	23	28.6	30.6	33.5	40.5
Slovenia	:	:	:	:	:	:	:	34.3	45.3	40.3	46.9	52.4	49.6
Slovakia	:	:	:	:	:	:	36.3	37.6	29.8	36.3	61.1	47.7	59.9
Finland	41.7	44.6	49.5	49.8	47.2	49.2	40.8	39.9	43.2	49.1	51.9	56.7	55.5
Sweden	57.9	74.9	65.1	57.8	63.2	64.7	60	49.8	48.2	58.1	59.3	58.5	58.9
United Kingdom	24.1	28.2	35.3	39.9	42.4	44.2	46.8	49.7	54.4	57.5	59.3	61.5	61.8

have paid for the cost of managing post-use packaging. Rather than having producers take responsibility for the physical recovery of their own packaging, they take financial responsibility through licensing with PRO Europe to utilise the Green Dot. Today, twenty five nations are now using the “Green Dot” as the financing symbol for the organisation of recovery, sorting and recycling of sales packaging.

ii) The German Packaging Ordinance System:

The German Packaging Ordinance (an EPR system) proved to influence all three of the environmental objectives that have been discussed in this section (Table 23):

- Well organised collection with high collection results,
- Increased recycling, and
- Promotion of DfE activities leading to overall life cycle environmental improvements of products and product systems

	Ordinance 1991**			Revised Ordinance***	
	Collection 1996	Sorting 1996	Recycling* 1996	Recycling 1996****	Recycling 1999
Glass	80%	90%	72%	70%	75%
Paper, cardboard	80%	80%	64%	50%	60%
Plastics	80%	80%	64%	50%	60%
Tinplate	80%	90%	72%	70%	70%
Aluminium	80%	90%	72%	50%	60%
Beverage could	80%	80%	64%	50%	60%

Table 23 The German packaging ordinance recycling requirements⁹⁶

* Recycling targets are implicit from the ordinance,

**** In reality, a retroactive requirement

Sources: **Packaging Ordinance (1991)⁹⁴,

*** Packaging Ordinance (1998)⁹⁵

iii) The Swedish Packaging Ordinance 1997:

The Ordinance also requires the producers to organise a suitable collection system that facilitates the separation of packaging waste. The producer is furthermore obliged to inform households and others about separation, collection and management

of discarded packaging (Table 24). The collection of waste packaging is organised through the establishment of a number of separate producer responsibility organisations (in Swedish called “materialbolag”) for the various materials.

Table 22 Packaging recycling rates in European Union countries

94. Group on Pollution Prevention and Control, “Extended Producer Responsibility, Phase 2, Case Study on the German Packaging Ordinance”, Environment Directorate, Organisation for Economic Co-operation and Development, 15 Might, 1998

95. “Ordinance on the Avoidance and Recovery of Packaging Waste, in the Version Promulgated on 21 August 1998”, Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Table 24 Recycling requirements in the Swedish ordinance on producer's responsibility for packaging

Type of Packaging	1987	30 June 2001
Aluminium (non-beverage)	50%	70%
Paper and carton	30%	40% (70%**)
Corrugated cardboard	65%	65%
Plastic (not consumer ready beverage PET)	30%	30% (70%**)
Steel	50%	70%
Refillable glass bottles for soft drinks	95%	
Refillable glass bottles for liquor	90%	
Other glass packaging	70%	70%
Beverage could of aluminium	90%	90%
PET bottles	90%	90%
Wooden		15% (70%**)
Other materials (for each material type)		15% (30%**)

*Reuse requirement, for bottles filled in Sweden only,

**Total recovery requirement

iv) Couldada, a Leader in EPR Implementation:

Known as "Stewardship Program", defines its EPR objective as follows⁹⁶:

"Stewardship, or the responsible management of the environment and its natural resources, requires governments, industry and consumers to assume a greater responsibility for ensuring that the products we manufacture, use, reuse or dispose of have a minimum impact on the environment".

The objective of the Couldada-Wide Principles for EPR is to assist and support jurisdictions in the development of EPR programs. The overarching goals of the principles are to minimise environmental impacts, maximise environmental benefits, promote the transfer of end-of-life responsibility for the product and/or material to the producer, and encourage design for environment (DfE). Design for environment (DfE) examines a product's entire lifecycle and proposes changes to how a product is designed in order to minimise its environmental footprint. Incorporating DfE might contribute to natural resource

and energy conservation, biodiversity preservation, source reduction, waste minimisation, and pollution prevention.

Program Design Principles

- EPR programs transfer end-of-life responsibility for waste product or materials to producers from municipalities and other waste management authorities.
- Potential programs undergo a comprehensive analysis to assess whether they are appropriate for EPR and to define the role of the various actors in the product chain.
- Policy instruments selected are flexible and determined on a case-by-case basis.
- Local governments and other stakeholders are participated to discuss environmental goals, objectives, priorities and performance measurement, and to enhance a program's acceptability and effectiveness.
- EPR program and policy development and implementation are based on transparency.

96. "Couldada-Wide Principles for Extended Producer Responsibility", Couldadian Council of the Ministers of Environment, June 21, 2007

Implementation Principles

- i) Programs and policies are designed and implemented in a way that environmental welfares are maximised while economic dislocations are minimised.
- ii) A communication strategy is devised to inform participants in the product chain, including consumers, about the program and enlist their support and co-operation.
- iii) EPR programs undergo periodic evaluations to ensure that they are functioning appropriately, are subject to performance measurement, and include accessible and transparent reporting.
- iv) Costs of program management are not borne by general taxpayers.
- v) Consumers have reasonable access to collection systems without charge, to maximise recovery opportunities.

5.6 FINANCIAL INSTITUTIONS PARTICIPATION

Adequate financing is a cornerstone in the establishment, operationalisation and sustainability of an efficient ISWM. Financing has many venues and participants, these venues neither effective nor sustainable.

The waste management is taken care of by local government through its own budgetary resources. However, with rapid increase in waste generation rates and awareness for effective and efficient SWM practices to protect public health and environment the demands for huge investments, to bring improvements in many aspects of the SWM chain, started rising.

Governorates must rely on a variety of financial resources to fund the SWM services. In most cases, different resources are used to finance capital investments than to finance operating and maintenance costs.

Financial institutions have clear mandates to profitability, clients' receiving adequate and competitive returns on their deposits, and those are realised through financing and investing in reasonably-secured money tools and projects.

A most important objective is the active participation in 'economic development' while engaging in projects' finance where some 'risk' is involved. Taking reasonable calculated financial risks need knowledgeable capability and innovative finance mechanisms, expertise might not be existent within the current Egyptian banking system.

There were attempts of a few interventions led by some international development organisations, such as KfW, USAID, CIDA and others to encourage Egyptian banks in supporting environmental projects, however, these attempts were limited as per duration and funds. Sustainability of these activities also failed to be self-sustained after the end of a specific assistance program.

Despite of huge financial reserves (liquid cash) in Egyptian financial institutions (over 220 billion LE), they are conservative in providing needed finance for MSWM projects. They either have a negative perception of the commercial viability of the activities, no adequate SWM project evaluation expertise, prefer highly secured investments or incapable of assessing a 'bankable' SWM project feasibility.

Several measures could be taken to encourage the engagement of Egyptian financial institutions in participating in sustainable SWM projects. Foremost, through creating a win-win situation where mutual benefits are evident and sustainable.

Creating a win-win situation:

- i) Role of Financial Institution: personnel capacity building in SWM projects' evaluation, supporting the bank's SMEs department with SWM expertise, enacting the social responsibility concept by allocating funds for SWM community projects, financial solutions to chronic utilities problems (power generation

through waste-to-energy projects), soft loans (reduced interest rates).

Egyptian banks could also seek alliances with international finance bodies to pool some resources targeting the support of commercially-viable environmental projects.

- ii) Role of Government: PPP and economic instruments, engaging private sector through PPP framework for investment in alleviation actions is recently encouraged in developing countries to lessen the burden of public finance. PPP is a sourcing method for Government to increase participation of private entity in delivery of public services. In a PPP project, the Government establish a long-term partnership with private entity to develop, construct, operate and maintain public services such as to construct, operate and maintain an integrated sanitary landfill. SWM projects should be included as a prioritised sector to be developed as PPP.

There are various business models by which PPP might be implemented, such as Build-Own-Operate (BOO), Build-Own-Transfer (BOT), Operate and Maintain, and Lease-Develop-Operate. A PPP might be identified and prepared by the government (referred to as "solicited project") or identified and proposed to the government by a business entity/project developer (referred to as "unsolicited" project).

Another important role national and local authorities could initiate is establishing

markets for recycled materials and products. Government could allocate a portion of its annual procurement for recycled products thus encouraging the vitality of this business and easing recycling activities' quest for modernisation and expansion.

- iii) Role of Private Formal and Informal Sector: forming business alliances and allocating joint resources for ISWM investments, seeking external partial funding and suppliers credits (technology providers...), and seeking the assistance of donors in their quest for establishing viable commercial models in SWM.
- iv) Role of International Development Organisations (Donor Agencies): Grants, loan guarantees, technical assistance, projects' feasibility preparations, capacity building support for financial institutions in SWM projects' evaluations. Several international lending institutions have been involved in financing SWM investments in economically developing countries. Some of the most active institutions include The World Bank and KfW. The financings have covered replacement and expansion of the SW collection fleets, construction of transfer stations and purchase of transfer trucks, design and construction of sanitary landfills and purchase of landfill equipment's, development of composting facilities, and others. The majority of the financings of SWM projects have been included as part of development bank loans for large urban development projects.

5.7 PRIVATE SECTOR PARTICIPATION

Private Sector when adequately engaged, contracted and supported would offer a very effective venue in supporting the overall SWM efforts. Previous experiences with PS involvement might not provide an encouraging model. However, wider discussions and consultations are needed to

assess past public/private coordination with the aim of building future collaboration based upon the true conviction of PSP role in Egypt.

The participation of the private sector in any or all of the activities associated with SWM could be a cost-effective solution. However,

the level and type of participation has to be properly planned and implemented so that both the community and corporations involved benefit. Involvement of the private sector in solid waste management should be treated as a partnership – among local government, the contractor, and the community.

The way forward:

Prospects for the private sector engagements in MSWM are still largely dependent on the establishment of a strict, secure regulatory framework, good public governance and better access to finance. They are also constrained by the local authorities' limited financial resources. To some extent, recycling and recovery activities are not affected by budgetary limitations.

The public authorities engaged in MSWM must be able to offer a clear, well-defined and securing contractual framework for the private sector. Public-private contracts must be relatively long term so that private operators could customise and improve the services provided, while complying with municipal budgets. Shared responsibilities must be stated explicitly so that private operators are best able to manage their risks.

Financial and legal stipulations (such as penalties or termination conditions) must be included in the contract to ensure that private operators fulfil their role in a professional manner and comply with the strategic framework (particularly in terms of service level and access). Ultimately, local authorities must have the work force and sufficient resources to be able to monitor and control contracts and, more generally, implement a consistent public policy.

Private sector involvement in MSWM implies a shift in the role of Government institutions, from service provision to regulation, delegation to the private sector and monitoring of the service provided by private companies. Public institutions in Egypt

should support the proper and sustainable transfer of SWM services to the private sector. The existing legislations governing PSP should be enforced; and appropriate systems of monitoring and control must be developed, along with relevant skills at the respective Government and Governorate levels.

Moreover, one of the problems facing private companies is that basic recyclable wastes are removed at the point of collection. The waste that was delivered to the treatment facilities was virtually dry recyclables-free. Waste pickers typically take away about 10-15% of the waste (by weight) that consist basic recyclable waste such as plastic, paper, glass and metals, reducing the nominal value of the waste. A private company that processes such basic recyclables is most likely to face bottlenecks in the supply of raw materials if it does not know how to ensure a proper supply. This important issue needs a constructive dialogue and common understanding between the informal sector and private-contracted SWM companies. The business models of private companies need to take account of the informal sector – a sector with which they are in competition, but which also offers opportunities for cooperation.

Accordingly, existing and future MSWM contracts need serious revamping to address major challenges and that should be a prioritised 'stakeholders' consultation'.

The need for MSWM stakeholders' coordination and collaboration is a priority. The establishment of the ISWMS, with sufficient power and resources, became evident to enable the efficient coordinating role as well as monitoring the implementation of the articulated policies and action plans. Stakeholders' discussions and interactions, as set by the proposed national authority, are essential to reach a national consensus and plan on MSWM effort.

A revised, revamped, MSWM action plan is needed and should be a priority task designed in accordance with the outcome of wide stakeholders' dialogue and agreement.

The concept and mechanisms of the ISWM approach must be adopted and the anticipated PSP should consider the engagement in the full spectrum of MSWM activities and not only the end-of-pipe projects such as composting and/or waste-to-energy. The failure of such projects, in their majority, is a direct result of the absence of the 'integrated' vision.

The basic concept of 'profitability' must be rooted and accepted by the public authorities as PSP willingness to engage and function mainly depends on it. Profitable business is a sustainable business capable of providing and honouring contractual obligations.

To attract private investments, the authorities need to establish a strategic framework tailored to local conditions and based on consultation with all local stakeholders. This must take into account the type of waste involved, the resources available and the institutional setting. For a public waste management policy to be sustainable, a pragmatic, customised and progressive approach is essential. Such an approach is preferable to applying high standards from the beginning.

As to provide specific and concise recommendations, the GTZ study on private sector involvement in SWM is a valuable guiding document for PSP⁹⁷. According to the study, the following recommendations might help local government agencies to become successful clients:

- Develop public sector capacity: Private sector participation demands new skills on the public sector side, so time must be allowed for developing capacity, and competent advisors and trainers should be engaged;
- Develop a sound strategy: There are many options in terms of the nature of the client and the private sector service provider, the nature of the relationship

and the scope of the tasks included.

Opportunities for stepwise growth should be considered;

- Allow enough time: The preparation of a strategy and the tender documents, the preparation of bids by prequalified companies, the preparation of contracts and the mobilisation stage before full implementation all take more time than is normally allowed, if they are to be done well;
- Financial resources should be realistically assessed. It might not be possible for a local government administration to do all that it would like to do with the financial resources that are available to it. It is essential, before a contract is signed, for the administration to be sure that it will be able to pay the contractor in full and on time;
- Public awareness is not an optional luxury, but an essential component in any successful private sector participation. There should be an effective Programme for gaining the cooperation and support of the public;
- Monitoring is not a means for showing that the public sector is the stronger partner, but is to motivate the service provider to operate according to the contractual agreement; and
- Competition, transparency and community involvement are essential components in any strategy to ensure value for money and to minimise the effects of corruption. If a public administration is not prepared to embrace these characteristics, it is not ready to consider any kind of partnership with the private sector.

Despite all challenges, the waste sector could offer genuine economic opportunities. In an environment where the costs of energy and raw materials are escalating, waste represents an attractive resource; processing it could become a profitable business – leading to the establishment of sustainable management practices within the sector led by the effective engagement of the private sector.

97. Adrian Coad (2005), "Private Sector Involvement in Solid Waste Management: Avoiding Problems and Building on Successes", GTZ

5.8 INFORMAL SECTOR PARTICIPATION

In order to raise awareness, promote an adequate waste collection and treatment and to support the economic growth of the SWM sector in a sustainable way, efficient waste management must be established taking into account the valuable contribution of the informal sector. This integrated approach should comprise technical, environmental, legal, socioeconomic and financial aspects, involving the key actors at different levels to ensure an effective implementation.

The SW informal sector is an integral and dynamic player in the national effort. Policy development/reform and planned engagement within the formal sector are essential. Public and private sectors have a major role in streamlining the informal activities through continued dialogue, negotiations and phased relationship development.

According to the International Labour Organisation (ILO) the informal sector waste workers are defined as individuals or small and micro-enterprises that intervene in waste management without being registered and without being formally charged with providing waste management services. This sector “zabaleen, waste pickers, scrap collectors, traders and recyclers” is often not officially recognised and acknowledged, yet its members contribute significantly to the waste management of Egypt, by collecting, sorting, processing, storing and trading waste materials in the recycling value chain. The informal sector is also a labour intensive, with low technology and low income⁹⁸.

Informal waste recycling involves urban poor and marginalised social groups who use waste picking as a source of income, and often as their only survival strategy. In an unequal society, however, informal waste recycling will continue for the foreseeable future⁹⁹.

A diversified network of collecting and recycling activities has developed,

concentrated in recycling neighbourhoods and integrated in a complex value chain and recycling industry. Besides the waste collectors, roamers buy trade and exchange recyclable waste items. Waste pickers collect the waste by picking through dumps, landfills and street bins. Middlemen, intermediary buyers and wholesale merchants are also involved in this informal waste system and small enterprises operate with recycling machines, processing machines or maintenance equipment.

The recycling industries in the zabaleen settlements have developed extensive upstream and downstream links with other informal and formal markets throughout the country. In addition to collecting mixed household waste, they also purchase source segregated waste from commercial and institutional waste generators, as well as roamers, middlemen, etc. These are sold either as end products or as inputs for other manufacturing activities to large-scale industry and informal sector small enterprises. Trading and manufacturing networks have grown to cover the whole country from Alexandria to Aswan.

The industry has spawned its own dealers, its own centres of production and recycling, and its own business culture of credit, trade and finance.

After the privatisation of waste collection and disposal, international and local private enterprises became responsible for the collection, recycling and disposal of waste and the zabaleen lost access to their main source of income. They continue to intervene selectively, and in certain neighbourhoods where national companies have taken over responsibility for waste collection and subcontract to zabaleen. But this collaboration remains very limited and irregular. Private enterprise attempts to engage informal sector workers as waste collectors in companies have not been very successful because the majority of workers leave after a short time. For the moment, it seems as if

98. D. C. Wilson, C. Velis and C. Cheeseman (2006), “Role of Informal Sector Recycling in Waste Management in Developing Countries”, *Habitat International*, 30, 797–808

99. E. Sembiring and V. Nitivattananon (2010), “Sustainable Solid Waste Management Toward an Inclusive Society: Integration of the Informal Sector”, *Resources, Conservation and Recycling*, 54, 802–809

the privatisation of waste collection services has hindered informal sector integration in waste management in Egypt.

Work in the informal recycling sector is usually insecure, and carried out under appalling health and occupational safety conditions, sometimes inhuman. Waste pickers face great risks of injury, especially those who work at open dumps: they might be run over by trucks or become the victims of surface subsidence and fires.

Integrating the informal sector into SWM is not an easy task. Decision makers face dilemmas in integrating the informal sector. On the one side, the informal sector contributes to SWM but still requires basic

service needs and social rights. On the other side, improving collection and technology would limit the contribution of the informal sector. Several steps should be conducted to overcome this dilemma. The first step is changing the perception of decision makers about the contribution of the informal sector. The second step will be strengthening the partnership among actors involved in the informal sector. Partnerships might induce both human and social capitals that in turn might increase the accumulation of other capitals such as financial, physical, and public infrastructure. Accumulation of real capitals and increases in tangible capitals might in turn reduce the social stigma against the informal sector¹⁰⁰.

Box 16 SWaCH - A Waste Pickers' Cooperative in Pune, India¹⁰²

Solid Waste Collection and Handling (SWaCH) Cooperative, is India's first wholly owned cooperative of self-employed waste pickers/waste collectors and other urban poor. It is an autonomous enterprise that provides front-end waste management services to the citizens of Pune. SWaCH is authorised by the Pune Municipal Corporation (PMC) to provide door-to-door waste collection and other allied waste management services. The scope of SWaCH includes collection, resource recovery, trade and waste processing. Currently, through its 1,867 members, it provides services to the population of over 1.5 million people of Pune.

SWaCH bridges the garbage gap between people's doors and the PMC collection points. It offers total solutions for wet garbage and dry garbage, while enabling the waste pickers and collectors to keep their livelihoods and get trained to carry out their work professionally and in an occupationally safer way. The integration of the waste pickers through SWaCH has helped to reduce waste disposal by more than 20%. For the PMC, the cost of engaging with the informal sector is much cheaper than engaging with private sector.

Advantages of integrating the informal sector

The official solid waste management in Egypt could not be managed without the full engagement of the informal sector with its different components; waste pickers, scrap collectors, traders and recyclers. Although not officially recognised, they often form the very basis of waste collection services, at no cost to local authorities, central governments or residents.

The integration of informal stakeholders increases the efficiency of the solid waste management. Integrative and decentralised approaches offer advantages in economic, environmental and social terms and are thus seen as being the most sustainable future alternative in SWM in Egypt. The advantages of informal sector integration are explained below:

100. URL: (<http://swachcoop.com/about-swachpune.html>)

i) The environmental advantages:

The informal sector achieves high recovery rates (up to 80%) because the ability to recycle is vital for the livelihoods of the people involved. Consequently a huge variety of recyclables is segregated and could be further processed in accordance with new demands and technological advancements in the recycling industries. A drop in recovery rates was witnessed in Egypt following private sector involvement in solid waste collection, indicating the important role of informal sector involvement for efficient recycling schemes. The informal sector also contributes to the reduction of greenhouse gases and thus to the mitigation of climate change.

ii) The economic advantages:

Although informal sector activities very often take place outside official and formal channels, unlicensed and untaxed, they nevertheless contribute significantly to the national economy.

Scrap collectors are entrepreneurs who add value merely by collecting and then transforming waste into tradable commodities. New enterprises are formed, trading networks evolve, capital accumulation and investments take place and savings are made in terms of raw materials, transport and energy¹⁰¹. Furthermore, labour and employment

generation occurs through informal sector integration.

Activities supporting informal sector integration include facilitating credit, skills development and improvements in managerial know-how and marketing to enhance the competitiveness of labour-intensive small-scale activities. Through these kinds of activities, formerly unskilled workers are educated, new jobs are created and structural disparities are reduced.

iii) Social advantages:

Even though the income and living conditions of informal waste workers differ significantly according to their main activities, the majority of informal waste workers (dump and street waste pickers) constitute the lowest level of society. Working conditions are unimaginable and include permanent exposure to dangerous, toxic and contagious substances. Waste pickers are often bitten by dogs, subjected to harassment from officials, exploited by traders and have no legal protection. They live in inhuman and humiliating circumstances and generally lack of sanitary services, health care and social benefits. Child labour is the rule, not the exception, and life expectancy is low. Their task is carried out in the most dehumanising manner, with workers obliged to sort through putrefying garbage to retrieve the scraps of paper and plastic that will earn them a living.

Box 17 Enabling conditions for integrating the waste informal sector¹⁰³

Integrating the informal waste sector depends on many factors. The four major enabling conditions relevant for promoting the integration process are:

- 1. VOICE** - The organisation of informal sector workers into membership-based bodies accountable to their members and the representation of these organisations in relevant policymaking institutions.
Organisation is a precondition to integration.
- 2. VISIBILITY** - Official recognition of the economic contribution of informal sector workers, resulting from improved labour force and other economic statistics and from policy research.

The demand for integration has to be substantiated.

- 3. VALIDITY** - Legal identity and formal recognition of informal sector workers and their membership-based organisations.
Integration has to be backed by political power.
- 4. VIABILITY** - The commercial viability of the informal waste sector is the single most important reason informal waste enterprises continue to flourish under existing competitive market conditions.
Economic autonomy supports Integration.

101. "The Waste Experts: Enabling Conditions for Informal Sector Integration in Solid Waste Management -Lessons learned from Brazil, Egypt and India", GTZ, 2008

Integrating informal sector workers has the potential to significantly improve their living conditions. In a development approach that attempts to strengthen informal sector integration in solid waste management, the objectives being pursued are:

- To improve the working and income conditions of informal sector actors; and
- To give them the longest-term perspective possible as waste management actors. This requires a minimum of official recognition and organisation of waste pickers. It does not mean however that the informal sector has to be fully formalised.

Informal workers have limited general business knowledge, and are often socially disadvantaged. For this reason, policy changes need to consider the specific circumstances of the informal sector. Governorates could provide waste pickers with identity cards and health insurance schemes; they could also support them in establishing cooperatives or Sees, and provide them with training.

Moreover, in the context of privatised waste collection services, collaboration between the informal sector and the formal waste collection sector is possible. Waste pickers could partner with waste collection enterprises or vice versa. For those who are not engaged in recycling, a partnership with the informal sector would reduce the volume of waste collected and would cut their transport costs.

A particularly sensitive social issue in connection with financing waste projects is the role of the waste pickers. It is critical for the lending institution to determine the extent to which the envisaged financing affects the income generating capacity of the waste pickers, and which instruments are available to enhance their living and working conditions, and their income levels. One option is the establishment of a close operating relationship between the formal and informal sector. Eventually, such cooperation might contribute to a progressive formalisation of the waste sector so that the waste pickers receive training, health protection, benefits, and fair compensation for their labour.

Recommendations for informal sector integration in solid waste management¹⁰³

- i) Proper sector analysis: Taking all relevant actors and circumstances at local, regional and national levels into consideration, is a vital prerequisite for any strategy development. It will require concerted, committed and consistent effort on all possible fronts to successfully implement informal sector integration into solid waste management.
- ii) Promoting pilot projects and personal involvement: The implementation of pilot projects paving the way for further developments. Creating initial results, raising public attention, describing the field of opportunities – such practical results at local level could be a powerful inspiration to others. They could show that change is possible and value could be created in many ways and could thus act as catalysts for further integration efforts.
- iii) Documenting informal sector contribution to solid waste management: Studies that quantify the contribution of the informal waste sector to reductions in municipal waste handling costs, environmental costs, poverty alleviation, downstream employment generation and health costs need to be undertaken to support the demand for integration.
- iv) Creating public awareness: Public relations activity is important in improving public attitudes towards informal sector activities. In collaboration with the media, PR could highlight success stories and help to improve the reputation of waste picker organisations.
- v) Encouraging municipalities to actively pursue local informal sector integration: Municipalities play a critical role in the integration process as they are generally the official providers of waste management services. The creation of linkages between informal sector initiatives, municipal departments and decision makers and the alignment of their activities is therefore highly recommended.
- vi) Providing capacity building support for waste picker organisations: In order to 'compete' in the solid waste management sector waste pickers have to become consistent service providers. Consulting in the field of capacity building is of great importance in improving

- the competitiveness of waste pickers' organisations and guiding them through the various challenges they will have to face during the formation process.
- vii) Making informal sector integration a national policy: Official recognition and acknowledgement of waste pickers, their interests and their valuable contribution to waste management services within federal laws requires integration at political and social levels. It demonstrates national political will, thus affecting underlying habitual public attitudes and promoting necessary cultural change processes.

Any policy-making process should be participatory and inclusive, integrating informal workers and their organisations into decision making and involving as many different stakeholders as possible. It should also allow for policies to be developed through negotiation between appropriate government departments and relevant stakeholders, based on a shared understanding of the economic importance of informal sector waste recycling

5.9 MULTI-STAKEHOLDERS INVOLVEMENT

SWM projects have recently relied on the participation of different stakeholders within their communities for the sustainability and success of projects. The active engagement of members of the community, underprivileged populations, women and youth, civil society, the private sector and city councils representing local administration not just as stakeholders, but as partners is instrumental to development and successful implementation of projects. Their participation at different project phases develops a sense of ownership of the project.

A multi-stakeholder approach enables several stakeholders to pool in their resources and get involved in projects/schemes in terms of perspectives, inputs, suggestions and participation¹⁰². It also provides a broader platform for discussion, sharing and action plans. It is more likely that sustainability of the project is ensured in such an approach, while at the same time promoting social responsibility. According to UNEP, complexity, costs and coordination of SWM has dictated multi-stakeholder involvement in every stage of the waste stream¹⁰³.

SWM involves a wide range of stakeholders from the political to the street level. Political decisions will heavily influence the performance of MSWM, and levels of awareness and participation of other stakeholder groups largely dictate the pace of progress at the street level.

The stakeholders active in SWM are manifold and include local authorities, provincial and national governments, formal private SWM companies (large-scale enterprises and registered small-scale enterprises), business associations, compost and bio-gas facility operators, farmers, latrine emptying service providers, waste-pickers, informal waste collectors 'zabaleen' and buyers, materials dealers, recyclers, service users (residents, commercial establishments, etc.), NGOs, CBOs, religious institutions, universities, banks, etc. These stakeholders usually have different interests (economic, political influence, social status, etc.) and play different roles. Identification of the stakeholders and their interests is important in coordinating their participation and involvement in various waste management activities¹⁰⁴.

102. G. William (2009), "Multi Stakeholder approach towards Solid Waste Management", Bremen Overseas Research and Development Association (BORDA)

103. UNEP-IETC, "Waste Management – Activities, Global Partnership (<http://www.unep.or.jp/ietc/SPC/activities/GPWM/background.asp>)

104. Kurian Joseph (2006), "Stakeholder Participation for Sustainable Waste Management", *Habitat International* 30, 863–871

Households form the largest category of stakeholders in solid waste management. To support households in playing their expected roles, it is important to recognise that within a neighbourhood community, households might belong to a variety of social groups, and so might vary in their cultural beliefs and practices, major occupations, income and expenditure patterns, access to community and infrastructure services, gender and age.

The ISWM approach differs from conventional approaches towards SWM by seeking stakeholder participation, by including waste prevention and resource recovery explicitly, by encouraging the analysis of interactions with other urban systems and by promoting an integration of different habitat scales (city, neighbourhood, household)¹⁰⁵. The best-functioning solid waste management involve all the stakeholders in planning, implementing and monitoring the changes⁶.

Cooperation and coordination between the different stakeholder groups will ultimately lead to increased sustainability of SWM, such as changes in behaviour and sharing of financial responsibilities. On the other hand, ignoring certain activities or groups (for example the informal sector that recovers and recycles a substantial amount of waste) will result in decreased sustainability of the system, for example in the form of negative public health effects or increased unemployment.

Participation of key stakeholders during the strategic planning provides a major opportunity to link the strategic plan firmly to reality and mobilise stakeholder involvement. A structured series of participatory workshops provides a vehicle through which to develop consensus between stakeholders, inspire contributions and secure broad-based ownership.

Stakeholders and their alliances, identification and analysis

The MSWM seen in Egypt is complex, fragmented and suffers lack of coordination and cooperation amongst the stakeholders. There is an urgent need for a dedicated

effort to identify and analyse the SWM stakeholders, their alliances, relations, interests, needs and potential roles and responsibilities.

As a planning tool, Stakeholders' Identification and Analysis is used to get a better picture so planners could concentrate on strategies that will build on existing alliances and devise mechanisms to deal with existing challenges.

The planning process needs to be effectively managed and balance the need for active contribution of key stakeholders with their limited time availability. This introduces a key role for 'facilitators' to help structure, guide and manage the process, maximise contributions and work to secure consensus on key issues and strategic planning proposals.

Stakeholder identification and analysis are critical first steps in a participatory planning process and constitute one area where a rigorous approach might be applied. Stakeholder analysis is often undertaken late in a planning and management process, in response to a crisis. However, early identification and analysis exercises could help prevent such crises. Within the context of the specific management issues to be addressed, stakeholder identification and analysis provide a basic understanding of the social and institutional context in which the planning process will take place.

A typical participatory planning process will involve the following main steps¹⁰⁶:

- Determine need for planning process;
- Stakeholder identification;
- Stakeholder mobilisation;
- Stakeholder analysis;
- Definition of mechanism for stakeholder participation and process to be used to arrive at decisions and solutions;
- Identification of problems, issues, and needs;
- Definition of goals and objectives;
- Collection of information on which to base decisions;
- Analysis and sharing of results with

105. Arnold van de Klundert and Justine Anschiitz (2000), "The Sustainability of Alliance between Stakeholders in Waste Management", Working paper for UWEP/CWG

106. Tighe Geoghegan, Yves Renard, and Nicole A. Brown (2004), "Guidelines for Stakeholder Identification and Analysis: A Manual for Caribbean Natural Resource Managers and Planners", Caribbean Natural Resources Institute/UNEP/ United Kingdom Department for International Development

- stakeholders;
- Identification and assessment of options;
- Negotiation;
- Formulation of decisions and agreements; and
- Monitoring and evaluation.

Stakeholder identification and analysis provide early and essential information about:

- the individuals, groups and institutions that will be affected by and should benefit from the ISWM activities and interventions;
- the capacities that these individuals,

- groups and institutions possess;
- the people, organisations and institutions who could influence, and contribute to, the planning and management processes;
- the past, current and potential relationships within the ISWM system; and
- the current and potential management conflicts.

In all development processes, not just in SWM interventions, there is a need to understand the reality and the complexity of interests and relations, evaluate and predict impacts, and assess human capacity.

5.10 PUBLIC AWARENESS AND COMMUNITY PARTICIPATION

Well-designed public awareness campaigns would lead to an increased and active public participation in facing the chronic SWM problems. The general public is evidently resentful of the impacts of poor management of SW and seems ready and willing to assist in effective solutions providing the seriousness of public authorities in addressing, assisting and implementing viable management programs and projects.

Most cities face urban environmental problems and these are partly caused by inadequate provision of basic services including waste collection. Due to a lack of financial, human and technical resources, municipalities are not able to provide basic services to all neighbourhoods within their city. Especially the poor neighbourhoods are deprived of basic services.

Stakeholder awareness of SWM and environmental issues and their preparedness to participate in the improvement of MSWM practices are closely linked¹⁰⁷. Public Awareness and Education (PA&E) programmes are needed because popular support for any issue could be greatly increased if the public is informed about it adequately and comprehensively. To create effective PA&E programmes, a variety of tools with different costs must be combined in order to achieve the highest possible impact at the lowest cost.

Public Awareness and Education (PA&E) programmes don't come free. A mix of low-, medium and high-cost tools must be used to achieve the highest possible impact at the lowest cost.

The major Objectives of PA&E programmes for SWM are to:

- Inform the public of new SWM methods and requirements;
- Gain public support for MSWM initiatives; and
- Improve the profile of MSWM.

To develop a successful PA&E strategy, the most appropriate mix of tools for the city must be combined. An overview of some of the many tools available that could be combined for this purpose, are distinguished broadly by cost categories. Low cost tools include: mass-education activities such as articles in newspapers, news releases, speeches, guest appearances of municipality personnel in radio programs and public service announcements; guest lecturers for schools, universities, clubs, interest groups/ NGOs and public events; simple internet site; poster contests and exhibitions; workforce courtesy training; house to house visits by (voluntary) awareness workers; and neighbourhood committees for information and awareness building regarding public health, environment and SWM.

107. ERM, "Facilitator Guide for MSWM, Step 4E, PUBLIC AWARENESS AND PARTICIPATION", World Bank/SDC

Medium cost tools are: in-depth web page on MSWM issues and municipal activities in the field; “waste telephone” information service for households and local industry/business; information documents such as newsletters, flyers, posters, fact sheets, briefing papers, press kits and school resource packs; events such as press conferences, educational events, specific local workshops and public information evenings; community involvement projects such as promotion of district cleansing days, best-kept-street competitions and children/youth group projects; audio-visual aids such as training videos for work force, information videos for the community and slide shows; improve appearance of work force; and eco-award schemes for districts, companies, outstanding municipality workers and competitions in schools.

High cost tools include: employing special information and relations officer for the public and business community; bringing SWM issues into schools by introducing it to curricula as part of environmental or hygiene/health education; developing appropriate textbooks and training programs for teachers and headmasters on SWM/environment/public health; and by advertisements and commercials.

The MSWM departments should take the lead in developing community awareness, but this function could be delegated to local NGOs through an appropriate agreement. Surveys are a form of public information dissemination and should be used as an opportunity to raise the profile and understanding of key MSWM issues.

Communities should be motivated enough to solve their common problems themselves¹⁰⁸. This enables them to become agents of their own development instead of positive beneficiaries of development aid. The key to the success of SWM system in any city is the cooperation of citizens. Citizens ought to be involved in proper storage, collection and safe disposal of waste. Community should also be made aware of health risks

associated with improper SWM.

For SWM projects to have a continuing impact, community participation are a precondition and this entails involving the community at different stages and degrees of intensity in the project cycle¹⁰⁹. Community participation is essential throughout the whole project, thus from project design and implementation to evaluation, ensures the reflection of community priorities and needs in the activities of the project and motivates communities into maintaining and operating project activities after the project is completed.

Strong community organisations might be able to provide solid waste collection services through self-help approaches, contracting with private enterprises, or establishing collectives to perform the service. Such direct participation of the community is generally limited to activities associated with primary collection of domestic refuse. Examples of some of the most common roles that communities could undertake are¹¹⁰:

- Managing waste within the household and removing them from the premises;
- Reducing waste production and facilitating recovery for the purpose of recycling;
- Keeping public areas around the neighbourhood clean;
- Supporting and/or participating in public projects intended to improve solid waste management;
- Supplying “watchdogs” for the neighbourhood and the city at large;
- Providing input to solid waste facility siting decisions;
- Participating in the preparation of strategic solid waste management plans;
- Providing public education for raising awareness about issues and problems of solid waste management, including health education, environmental health, and attitudes towards wastes and waste workers; and
- Sponsoring or participating in special campaigns, competitions to raise the profile of SWM.

108. Gurdeep Singh, Tauseef Zia Siddiqui and Anshul Jain, “Community Participation through Information, Education, Communication and Capacity Building of ULB for Solid Waste Management, Proceedings of the International Conference on Sustainable Solid Waste Management, , Chennai, India, pp.504-507, 5 - 7 September 2007

109. A. Subash (2006), “Community Participation in Solid Waste Management”, Policy Workshop on Municipal Solid Waste Management, Anna University, India; Sustainable Solid Waste Landfill in Asia

110. Janis Bernstein “Social Assessment and Public Participation in Solid Waste Management”, Urban Environment Thematic Group, WB” August , 2004

It is essential for the success of SWM projects to understand the requirement of community participation and support. In the past there have been no major efforts to create public awareness for citizens, which is a vital component of SWM. The community participation could be strengthening through multidisciplinary nature of Information, Education and Communication (IEC) for the citizen's one side and Capacity Building Programmes for the Urban Local Bodies (ULBs) officials and staff another side.

Communication strategies, such as awareness raising campaigns, are essential to generate a broad-based understanding of SWM issues among community members. Appropriate time frame, achievable objectives and adaptive planning might affect community participation in a positive way. Factors favouring the sustainability of community participation and hence of SWM are¹¹¹:

i) Communication strategies are essential to generate a broad-based understanding of SWM issues among community members on the one hand and responsiveness of the stakeholders to the demands of the community on the other;

- ii) Representative local leaders and community based organisations (CBOs) could stimulate community participation and ensure that community needs are taken into account;
- iii) Women play a determining role in SWM and they form important channels of communication;
- iv) Community initiatives and CBOs are less durable if they are not, at some point, recognised and supported by the local authority;
- v) Intermediary and consultation organisation to support CBOs in continuing their activities in SWM;
- vi) Cooperation between the CBO and the local authority to maintain and operate the service according to formal agreements with stakeholders;
- vii) Financial and operational viability to make community services less dependent on external support; and
- viii) Follow-up support after project implementation to reinforce awareness and new practices and assist when required with operation and management of new organisations.

5.11 EFFICIENT DATA / IT NATIONAL SYSTEM

The attempts to improve SWM practices in Egypt have suffered because of the paucity of reliable and standardised technical data and the absence of a mechanism for disseminating data when available. An effective technical data system is clearly needed that would gather essential information about the SWM sector and develop it into meaningful data to assist planners, researchers and other decision makers concerned with SWM.

The availability, completeness and upgrading of SWM information are necessary for supporting the ISWM. The establishment of a national SWM Information system within the organisational structure of

the ISWMS is essential. Data collection, processing and continued analysis, providing a national 'depository' of all literature, data, information, projects, and related efforts are crucial building blocks in an efficient management system. Moreover, the database would contain information on SW facilities, operations, and disposal sites throughout the nation.

Meanwhile, the ISWMS should consider building a national network to consolidate information on SWM related policies, programmes, documentation, contacts...etc in a reliable common environment accessible to SWM practitioners and stakeholders in Egypt.

111. Laura Moninga, "Community Participation in Solid Waste Management: Factors Favouring the Sustainability of Community Participation, A Literature Review", WASTE, June 2000

The mission of the proposed network is to enhance the knowledge and skills of SWM institutions and practitioners through dissemination of information and promotion of exchanges and partnerships among SWM entities¹¹². The network would provide a quick and easy access to a wide range of features that affects SWM, including policies, institutional framework, action plans, financial, technical and social aspects.

The network would also propose directions for futures research and for local implementation. The general aim of the proposed network would be to develop a variety of innovative, adaptable and replicable approaches to a more efficient SWM, integrating appropriate low-cost and efficient technologies with community-based management and their relevant governance, institutional frameworks and socio-economic constraints.

The objectives of the proposed network would be:

- To serve as a centre of expertise and knowledge on ISWM;
- To encourage awareness raising and build national capacity for improved ISWM;
- To develop and disseminate new knowledge products;
- To advise the Governmental agencies on SWM issues and concerns;
- To prepare, share and maintain a database of contacts, areas of expertise, educational resources and any relevant information about institutions and practitioners involved in SWM;
- To spread case studies of best practices in order to accelerate the uptake of waste-related infrastructure and services at various stages of SWM, such as avoidance, prevention, minimisation, segregation, collection, transport, recycling, recovery, reuse, treatment and disposal; and
- To develop a set of indicators to assess the network progress.

The main stakeholders foreseen are:

- Ministry of State for Environmental Affairs;
- Institutions and administrations involved in SWM sector (Ministry of Local Development, Ministry of Trade and Industry, CAPMAS, Ministry of Health, Ministry of Agriculture and Land Reclamation, Ministry of Communications and information Technology, Ministry of Housing, Utilities and Urban Development and Ministry of Finance, Governorates, Cleansing and Beautification Agencies, academic and research institutes ... etc.);
- Private sector companies and representatives of the informal sector;
- Local NGOs working in SWM;
- Consultants and consultancy firms; and
- International development agencies.

As there will be different stakeholders and contributors interested in different SWM fields (e.g. municipal waste, medical waste, industrial hazardous wastes, e-waste ...etc), focus groups would be created inside the network in order to cope with this situation and to avoid sharing irrelevant information.

The planned future arrangement of the proposed network would include:

- Recruitment of capabilities in the information, data management and analysis fields;
- Equipping the IT centre with advanced hardware and software applications;
- Creation of a Website serving the network purposes, activities and supporting the members with all needed information and references;
- Connections and communication methods with members, information providers and other stakeholders;
- Regular Meetings arrangements and plans; and
- Adding discussion forums or blogs on the Internet for members to post their thoughts or questions where others could give their input.

112. Tarek Zaki (2010), "Report on the Roadmap/Action Plan for SWM Network in Egypt", SWEEP-Net, unpublished work

5.12 DEVELOPMENT OF PILOT PROJECTS

Setting workable development models is a proven venue for advancing SWM. Pilot Projects provide the opportunity to test public interest and willingness to participate in new ideas in SWM. Pilots are an ideal way to gather information, try out new methods and routines and find out what works and what doesn't in particular regions, climates and populations. Pilot projects in collection, treatment and recycling SW could create real interest and offer a positive impact on investors and financial institutions' perceptions.

Pilot projects are designed and implemented to serve multiple purposes, such as:

- To demonstrate the applicability of the approach in local conditions and instil confidence in the local authorities;
- To demonstrate the economic, environmental and social benefits of the specific project and build commitment of stakeholders;
- To provide hands-on work opportunity to partner institutions and support capacity building; and
- To become a model for other local authorities to replicate it.

Testing approaches and feeding in pilot experiences into national policy making processes and legislation is a proven strategy in development cooperation in the SWM sector. In many cases, it needs good practices to prove to decision makers that an approach is viable. Successful projects often work on several levels and combine pilot projects on the local level with accompanying the elaboration of public policies and guidelines. This could facilitate the dissemination of new approaches on a national scale.

Examples of successful pilot projects that could be a model for adaption are:

1. UNEP implemented a pilot project for "Engaging Governments and Industry in Demonstrating 3R Principles through Integrated Waste Management"¹¹³. The project was developed with the objective of

demonstrating the economic, environmental and social benefits as well as the applicability of ISWM approach in specific local situations and in order to accomplish:

- Demonstration of 3R principles through ISWM in four cities that could serve as model for other cities in the region for replication and adoption;
- Enhancement of capacity of local government authorities, businesses and civil society organisations in dealing with waste issues;
- Achievement of resource augmentation through the application of 3R principle;
- Demonstration of Environmentally Sound Technologies (ESTs) for SWM; and
- Improvement of the management of waste in the target cities, thus improving the environmental condition and reducing health hazard in the local communities.

The project initially comprised of three main activities: development of guidelines and training materials on ISWM; development of ISWM Plan for three cities in China, India and Lesotho; and development of a Waste Exchange Program within industries in Penang, Malaysia. However in the course of the project, the activities were expanded as lack of knowledge among stakeholders in specific areas was identified. The additional activities included: development of manuals on Waste Electrical and Electronic Equipment (WEEE/ E-waste); regional training on ISWM in Africa and Asia-Pacific; and South-South Cooperation Workshop on WM, Law and Governance.

The activities undertaken under this project have led to the following results:

- i) The ISWM plans developed for the three target project cities prove the applicability of ISWM approach.
 - ii) The potential for application of 3R approach has been also demonstrated.
 - iii) Environmental, Economic and Social benefits of ISWM approach have been demonstrated.
2. UN-Habitat and the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) have

113. Division of Technology, Industry and Economics (2010), "Engaging Governments and Industry in Demonstrating 3R Principles through Integrated Waste Management", International Environmental Technology Centre, UNEP

launched a pilot project for SWM in four cities in Pakistan¹¹⁴. The pilot project has been initiated through the establishment of Integrated Resource Recovery Centres (IRRC), a Decentralised community-based recycling and composting facility. The IRRCs have been built and operated at low costs by using limited mechanical technology, ensuring low operational costs with minimal equipment breakdowns, while creating job opportunities. The project aims to develop an efficient waste collection and transfer system that will be associated with the IRRC. Thorough developing a proper SWM, UN-Habitat aims towards waste minimisation, recycle and reuse of waste materials and income generation resulting in environmental protection.

3. In Santo Domingo, the capital of the Dominican Republic, the waste is collected by both the local authority and commissioned private operators, but the absence of a waste collection plan often results in waste left on curb sides for several days, which spoils the city landscape. Santo Domingo and its neighbouring cities rely on a final disposal site in the north of Santo Domingo, although the site is not operated under sanitary conditions. JICA carried out a study to formulate a master plan with a target year of 2015 to solve the aforementioned issues and to strengthen the waste management capacity of Santo Domingo city hall¹¹⁵.

During the course of the study, several pilot projects were undertaken to ensure the practicality of the master plan and to demonstrate technical know-how of waste management. One of the pilot projects aimed to improve waste collection. In a target area with about 160,000 residents, a new, rational waste collection system was established and achieved substantial results, such as a 15% increase in the hourly collection amount. In another pilot project, using a medical complex as the model site, the introduction of a system to properly separate, collect and treat hospital waste was facilitated to

replace the common practice of handling infectious wastes-including used syringes and bloodstained gauze-together with general wastes. After witnessing the results of the pilot project, an initiative was taken to replicate the system in other medical facilities.

4. Pilot projects and studies have shown that informal waste sector co-operatives have particular difficulties in assuring successful financial management, even after training, without external support¹¹⁶. Integration measures must thus be prepared to accompany informal worker co-operatives over the longer term in order to ensure sustainable management.

At the same time, it must be pointed out to co-operatives that they have to establish a viable business model and that external support is only provided for the start-up phase. The example of Recicla in Mozambique has shown that despite the initial elaboration of a feasibility study, the group counted too much on external support for a while and did not manage to cover all its costs. Only after a process of intense discussion and advice about the future evolution of the co-operative, the members started to share the vision of Recicla as a financially viable business.

Egypt-Specific Pilot Projects Potential

Reviewing the international experience, and considering the current SWM seen in Egypt, two efforts might offer good potential for sustainability, replicability and stakeholders' engagement:

- i) A pilot ISWM project utilising the PPP route where Government (e.g. Ministry of Finance) and a major private SWM company (or consortium) are executing a joint SWM facility / activity (e.g. waste-to-energy); and
- ii) A pilot Private / Informal sector ISWM project where a private SWM company establishes a WM facility (collection, transportation, composting, recycling, etc) with full engagement of the informal sector as per contributions and profit sharing.

114. UN-Habitat (2012), "UN-Habitat and UNESCAP Join Hands in Solid Waste Management Project", URL: <http://www.unhabitat.org/content.asp?cid=11410&catid=5&typeid=6&AllContent=1>

115. Kokusai Kogyo Group, International Cooperation – Helping Developing Countries Advance, "The Study for Integrated Management of Urban Solid Waste in Santo Domingo / Project for Appropriate Waste Management in Santo Domingo de Guzman", July 2005–September 2011

116. Ellen Gunsilius, Sandra Spies and Sofía García-Cortés (2011), "Recovering Resources, Creating Opportunities: Integrating the Informal Sector into Solid Waste Management", GIZ

5.13 DECENTRALIZED SOLID WASTE MANAGEMENT

MSWM constitutes a serious problem in Egypt. Most Governorates lack the resources to meet the demand for services such as water, sanitation, and SWM. The insufficiency of services results in a deterioration of the urban environment. Generally, Governorates do not collect the totality of wastes generated and of the wastes collected; only a small fraction receives proper treatment and/or disposal. The insufficient collection and inappropriate treatment and disposal of SW pose risks to human health and the environment. Over the next several years, the rapid urbanisation will tend to further deteriorate this situation.

Increasing resources are spent attempting to improve MSWM. Conventional approaches usually involve solutions that are centralised, bureaucratic, and ignore the potential contribution of the informal sector, with little public participation in the decision process, and often use imported technology. Conventional approaches often fail and a different approach is needed. A "Decentralised Model" for MSWM might be more appropriate to the conditions prevalent in several Governorates. In the proposed model, the specific needs of low-income areas would be considered; it would promote community participation and incorporate informal zabaleen and waste pickers into public-private partnerships, microenterprises, or cooperatives. The proposed approach could help solve the problems of SWM in a socially desirable, economically viable, and environmentally sound manner.

The conventional solutions that are commonly adapted to MSWM problems often have the following features¹¹⁷:

- i) Centralised and undiversified: solutions that do not distinguish the different needs and heterogeneity of neighbourhoods within each city, and between cities in the Governorates
- ii) Bureaucratic: top-down solutions, usually reached without or with little community participation

- iii) Capital-intensive approaches: involving advanced technology and equipment, frequently imported from industrialised countries
- iv) Formal: conventional solutions only consider the formal sector, neglecting the existence and possible contributions of the informal sector that has developed around waste collection and recycling in many cities.

Many local governments devote a substantial portion of their annual budgets to collecting, transporting and disposing of solid wastes. The traditional approach to solid waste management focuses on end-of-line solutions that are capital- and technology-intensive, and therefore costly.

Alternative and more suitable ways of tackling these issues could be found by looking at the life cycle of the waste and reducing it at as many stages as possible. Normally, MSW undergoes three stages in its life, generation, collection and disposal. The life cycle approach requires minimising waste by reducing, reusing and recycling solid waste at all stages in the life cycle. Thus, practices such as banning the use of plastic bags, working with manufacturers and retailers to reduce packaging material, and using recyclable materials or home-based composting, minimises waste at the waste generation stage. Sorting waste at source and recycling, and extracting and using methane from landfills, reduces waste at the collection and disposal stage. Employing all these strategies significantly reduces the amount of waste that reaches landfills, extending the duration of their use and reducing collection and disposal costs.

The informal sector recycling system often comprises several categories of zabaleen and waste pickers, who collect recyclable wastes from households, refuse collection bins, street-side and dumpsites. It also comprises middlemen who buy the recyclable waste and sort, clean and sell it to small-scale enterprises that recycle the

117. Martin Medina "Human Settlement Development - Vol. III - Municipal Solid Waste Management in Third World Cities: Lessons Learned and a Proposal for Improvement", *Encyclopaedia of Life Support Systems (EOLSS) and UNESCO*

waste. By the time waste reaches dumpsites, its “recyclability” is nearly diminished.

Since the generated MSW contains about 60% organic, even with 100 per cent recycling of the other constituents, the bulk of the disposal problem remains. This means that savings in terms of transport costs would be minimal as organic waste would still need to be collected with the same frequency. Moreover, as the prices of recyclable materials fluctuate considerably, the increase in average income among zabaleen and waste pickers would also be marginal. Thus, recycling is part of the solution, not the whole solution.

A new approach that treats the organic fraction in solid wastes as a resource, “trash to cash”, is needed. From the perspective of local governments and informal sector, such an approach should¹¹⁸:

- i) Reduce transport costs;
- ii) Improve collection services; and
- iii) Provide waste pickers with higher and regular income and better working conditions.

Most of these criteria could be met by decentralised community-based SWM projects. Several local governments, non-governmental organisations and research and training institutes have undertaken such projects with varying degrees of success.

Box 18 Key points for successful community based solid waste management¹²¹

- The successful implementation of community-based SWM and composting programmes city-wide requires building partnership among all stakeholders-national, state, and local governments, communities, the local private sector, and development partners, with local government positioned at the centre to manage implementation.
- A strong supportive enabling environment needs to be developed and maintained at national and local government levels.
- Establishing a shared vision and strategy among stakeholders and securing the political will to implement them are essential.
- Progress needs to be measured using simple and easy-to-measure indicators.
- Cost-effective implementation is a key in promoting community-based activities city-wide.
- Capacity-building is necessary and efforts might include work with local government, the local private sector, and resource agencies.
- The programme should mobilise both private investments by households and private sector as well as public investments by government for the majority of funds required for project implementation, capacity building and program management.

Recognising the need for concerted actions to effectively deal with the SWM problem, the ISWMS has to initiate a program aimed at improving SWM, by adapting a “Decentralised system” and community participation functioning with roles and responsibilities, clearly identified to each stakeholder. The main drive of the plan is to involve citizen and community organisations in SWM. Community groups would be involved in various activities including collection, segregation, processing, dissemination of information and awareness building. Units would be set up to process the organic waste locally generated into compost. All issues relating to this have to be tied up to ensure

capacity utilisation continuity in operation and maintenance¹¹⁹.

Decentralised community-based waste management systems have an important role to play in the Governorates. Such systems will encourage and support local communities to take responsibility for wastes in their areas, and involve them in reusing, recycling and economic processing of the wastes locally. This will substantially reduce the amount of waste going to the dumps. The advantages of such community-based systems will include:

- Better health and sanitation for local communities;
- Conservation and optimum use of

118. Economic and Social Commission for Asia and the Pacific, Committee on Poverty Reduction (2006), “Community-Based Solid Waste Management”, United Nations Economic and Social Council

119. D.G.J. Premakumara (2012), “Best Practices and Innovations in Community-Based Solid Waste Management in Cebu”, the Japan Fund for Global Environment

materials by recycling and reuse of wastes that might promote sustainable use of materials.

- Conversion of wastes into compost will to some extent reduce the use of chemical fertilisers, a major contributor to global warming. Surplus compost produced by urban communities could be sold to peri-urban and rural communities for farming, again, cutting down fertiliser use;
- Decentralised waste management will substantially reduce the need for transporting wastes over large distances, saving fuel and reducing vehicular emissions;
- Reduction in the wastes brought to the dumps will reduce GHG emissions from the dumps.
- Handling and processing wastes at local levels will mean greater participation of local communities, greater efficiency in collection and segregation, cleaner neighbourhoods, lower costs on

transport and processing, and more local employment, particularly for economically backward groups such as waste pickers and especially poor women. Local-level waste management could also be linked with the Government's various poverty reduction and welfare measures for poor women;

- It will substantially reduce the overall cost of WM; and
- The system will create awareness among communities about problems related to the environment, global warming, climate change, sustainability, etc which could push them into greater involvement in the management of such issues at local, city and national levels.

Annex 7 provides examples of management models for decentralised SWM projects (small, medium and large scale decentralised composting)¹²⁰

5.14 INTERNATIONAL DEVELOPMENT AGENCIES SUPPORT

Donor agencies activities are diversified with varied orientation. International agencies could play a major role in supporting the development of SWM projects through innovative funding and technical cooperation. The need for coordination is evident and that could be another role for the ISWMS.

In the last 20 years, a number of SWM projects have been carried out in developing countries, in collaboration with external support agencies. Some projects were successful in producing lasting impacts on the improvement of SWM in developing countries. However, many projects could not support themselves or expand further when the external agencies discontinued their support. A number of technical, financial, institutional, economic, and social factors contribute to the failure to sustain the projects, and they vary from project to project

The external support agencies have limitations in the amount of resources they could provide and the mandates and modes under which they could operate projects.

Sometimes, projects are initiated with specific aims and expected outputs, but their scopes are not comprehensive enough to consider external factors influencing them. The external support agencies often do not fully understand socio-economic, cultural, and political factors influencing the selection of appropriate SWM systems. In other cases, very limited follow-up support, including human resource development activities necessary to sustain the project implementation, is provided by the external support agencies.

These problems and constraints associated with external support agencies' collaboration with developing countries in SWM could be minimised, and the sustainability of such collaborative projects improved by packaging efforts of external support agencies; defining clear roles of relevant agencies and improving their coordination in developing countries; creating key human resources; supporting strategic planning and follow-up implementations; developing self-financing schemes; and raising awareness of the

120. Iftekhar Enayetullah, Silke Rothenberger, A. H. Md. Maqsood Sinha and Chris Zurbrugg (2006), "Decentralised Composting for Cities of Low- and Middle-Income Countries: A Users' Manual", Waste Concern and Eawag / Sandec.

public and decision makers¹²¹.

An important role for international development agencies is the building of capacities within the SWM sector through designing, development and implementation of capacity development (CD) initiatives. The primary objectives for development assistance in this sector should be based on the idea of supporting Egypt in enhancing the SWM capacity of the entire society and in building sustainable SWM systems.

The UNDP defines CD as the process by which individuals, organisations, institutions, and societies develop “abilities” (individually and collectively) to perform functions, solve problems, and set and achieve objectives¹²². This is a widely used concept, although the definition of CD varies slightly from donor to donor. Within the general CD framework, there are three layers—individual, organisational, and institutional or societal levels. These layers are not mutually exclusive, but rather each level is interconnected in a systemic way.

SWM capacities at the individual level represent the knowledge and skills of individuals who are engaged in SWM, including not only the government institutions in charge of SWM, but also those in CBOs, NGOs and the private and informal sectors¹²³. Individuals engaged in actual SWM services often have low social status and inadequate education. Improving their capacities or their knowledge and skills, in addition to providing them with opportunities for public health education in relation to their working environment is needed. Technical cooperation of international development agencies in technology transfer activities, training and hands-on practice should be designed to improve the capacities of individuals.

SWM capacities at the organisational level represent the physical, human and intellectual assets, leadership, organisational management frameworks and organisational

cultures that are all required to achieve objectives set by the organisations involved in SWM. Government institution staff should have the necessary skills and managerial and planning ability. Also required physical assets including the facilities, equipment, land, funds and capital necessary for such SWM components as waste collection, transportation, intermediate treatment and final disposal.. Moreover, physical assets also require intellectual capacity for their application, including expertise in SWM technologies and systems, and statistical information, including waste flow data, literature, manuals, and research data.

SWM capacities at the institutional/societal level represent the environment, conditions, mechanisms, policies, institutions, regimes, and norms that are required both to enable capacities to be demonstrated at the individual and organisational levels and to ensure that sustainable SWM systems work. SWM calls for a relevant legal framework, that is, legislation that defines wastes and determines where the responsibility for waste management lies. Based on such legislation, regulations should be established regarding standards on the collection, treatment and disposal of wastes and the management of environmental loads, standards for waste generation, and wider environmental standards. These regulations should be accompanied by legal enforcement, including the authority to provide guidance and to punish offenders. SWM also calls for wider environmental and urban management policies, specific political objectives and leadership to achieve these objectives. The society’s economic system, including its economic scale or level of economic development, is an important prerequisite both for capacities at the level of the legal framework, standards and policies and capacities for the establishment of an actual SWM..

In addition to frameworks, policies and the economy, SWM capacities at the institutional/societal level might include informal institutions such as customs and

121. Hisashi Ogawa (1996), “Sustainable Solid Waste Management in Developing Countries”, 7th ISWA International Congress and Exhibition, Parallel Session 7, “International Perspective”

122. Management Development and Governance Division (1997), “Capacity Development”, Technical Advisory Paper 2, UNDP

123. Institute for International Cooperation (2005), “Supporting Capacity Development in Solid Waste Management in Developing Countries, Towards Improving Solid Waste Management Capacity of Entire Society”, International Cooperation Agency (JICA), Japan

norms concerning waste. Among social organisations involved in SWM are sweeper castes and social classes, CBOs, NGOs and other types of associations at the community level, and formal and informal recycling markets and industries.

Other capacities identified in the wider context of the entire social system concerning SWM include: environmental/waste education in schools and social education; systems (good governance) or partnerships to ensure that the opinions of local residents are taken into account; and ownership by the society as a whole in relation to SWM, especially public consensus, sentiment or willingness to work together to provide rational SWM services.

This integrated approach should comprise technical, environmental, legal, socio-economic and financial aspects, involving the key actors at different levels to ensure an effective implementation. It is essential to promote international cooperation with local research organisations, universities, and social and governmental stakeholders.

The ISWMS focus would be directed to the reform of the SWM sector by encouraging the development of national and regional WM infrastructure, support innovative funding measures, and sharing best practices across the country, in order to support environmentally sound and sustainable SWM. Moreover, the ISWMS has to adapt a strategy that provides a mechanism for coordination of the future activities of international development agencies, ensuring the integration of any efforts to get the maximum possible benefit from this resource. With the support of bilateral and multilateral partnerships, the goal is to establish a national successful ISWM system.

Key to successful collaboration¹²⁵

- i) Packaging external support: A number of external support agencies recognize SWM as a priority issue in developing countries and are interested in supporting to improve the situation. However, their approaches to solving SWM problems in developing countries have been piecemeal and not well coordinated. Also, their support has been provided mostly on a short-term basis. These characteristics of external support are inherent in the

organisational mandates and operational modes of the external support agency, and therefore they could not be easily changed.

What could be changed, however, is to unite support from different international aid agencies to make a collaborative project more comprehensive and long-term/continuous. This requires better coordination and communication among the external support agencies and development of partnership among them, removing the organisational egos and sharing and contributing their resources to the benefits of the recipient country.

- ii) Defining Clear Roles of Relevant Agencies in Developing Countries: better coordination for effective implementation of a solid waste management collaborative project is also required by the various agencies involved in solid waste management in the recipient country. A working group involving officials from the various agencies could be set up to discuss initially the roles and responsibilities of their respective agencies, and the working group could be later upgraded to an administrative committee or task force.
- iii) Developing Human Resources: for sustainable solid waste management in developing countries, human resource development should always be part of the external support package.
- iv) Developing Self-financing Schemes: governments of developing countries have limited funds for SWM and must develop measures to reduce and recover the expenditure and increase revenues where possible. They need to turn their SWM systems to more self-financing programmes. External support could be effectively used to develop different alternative cost-cutting, cost-recovering, and revenue-raising schemes (e.g., waste minimisation, deposit-refund system for recyclable materials, import or sales tax on certain packaged products, collection of user service charges, etc.) and implement pilot studies on these economic incentive measures.

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