

Master of Public Health
School of Public Health
Deanship of Graduate Studies

**Assessment of Current Situation and Management Strategy
of Municipal Solid Waste in Rafah**

By:
Student: Ali Shehda Ali Barhoum
Registration No.: 20111899
Supervisor: Dr. Samir Afifi

Master Thesis submitted and accepted, date: 5/6/2004

The names and signatures of the examining committee members as
Follows:

1. A. Prof.. Samir Afifi, PhD

Head of Committee  Signature

2. A. Prof. Yehia Abed, MD, PhD

Internal Examiner  Signature

3. Prof. Adnan Enchassi, PhD

External Examiner  Signature

Table of Contents

ABSTRACT	1
1 INTRODUCTION	6
1.1 History and Demography	6
1.2 Environmental Background	9
1.3 Value and Significant of the Study	13
1.4 Overall Aim of the Study	16
1.5 Objectives.....	17
1.6 Research Questions.....	17
2 LITERATURE REVIEW	18
2.1 Conceptual Definition of Municipal Solid Waste	18
2.2 Characteristics of Municipal Solid Waste	20
2.3 Municipal Solid Waste Types, Generation and Composition.....	22
2.4 Environmental Health Risks.....	26
2.5 Municipal solid waste management.....	28
2.6 Legislative Aspects.....	31
2.7 Implementation Aspects	33
3 METHODOLOGY	37
3.1 Study Methodology	37
3.2 Method of Study	37
3.2.1 Assessment Framework.....	37
3.2.2 Municipal Records.....	38

3.2.3.2 Study Location	39
3.2.3.3 Study Population	40
3.2.3.4 Inclusion Criteria	40
3.2.3.5 Exclusion Criteria	40
3.2.3.6 Sample Size	40
3.2.3.7 Sample Method	40
3.2.3.8 Questionnaire Design	40
3.2.3.9 Ethical Issues	41
3.2.3.10 Instrument	42
3.2.3.11 Pilot Study	42
3.2.3.12 Data Collection and Response Rate	42
3.2.3.13 Limitation of the Study	43
3.2.3.15 Data Coding and Data Entry	44
3.2.3.16 Statistical Analysis	44
4 RESULTS	45
4.1 System Performance	45
4.1.1 Municipal Waste Management Description	45
4.1.2 Public Perceptions Regarding Solid Waste Management	50
4.1.3 Relationship of SWM to Other Urban Systems	52
4.2 Technical Performance	52
4.2.1 Collection Rate	52
4.2.2 Collection coverage	53
4.2.3 Number of litter bins in commercial areas (Applies mainly to Container System)	54
4.2.4 Container Collection Frequency and Consistency	56
4.2.5 Availability of Street Sweepers	57
4.2.6 Weekly Frequency of House-to-House Collection	58
4.3 Environmental Performance	59
4.3.1 Disposal rate	59
4.3.2 Hazardous waste collection and disposal	60
4.3.3 Solid Waste Recycling / Reuse	61
4.3.4 Promotion of Environmental Awareness	61
4.3.5 Prevalence of Health Hazards Reported by the Public	61
4.3.5.1 House-to-House Collection System	61
4.3.5.2 Container System	62
4.4 Financial / Economic Performance	64
4.4.1 Unit Cost	65
4.4.2 Revenues	65
4.4.3 Expenses	66
4.4.4 SWM Cost Sharing	67
4.4.5 Cost Recovery	67
4.4.6 SWM Fee Differentiation	68
4.4.7 The Public's Commitment to Pay SWM Fees	68
4.5 Social and Cultural Performance	72
4.5.1 Stakeholders in waste management in the municipality of Rafah	72
4.5.2 Stakeholder Roles and Cooperation	74
4.5.3 Municipal Complaint-Handling Mechanism	76
4.5.4 The Voice of Women	79

4.6 Institutional and Organizational Performance.....	79
4.7 Policy and Legal Performance.....	81
5. DISCUSSION.....	82
5.1 System-Level and Technical Issues	82
5.2 Environmental Issues.....	84
5.3 Financial Issues.....	85
5.4 Social and Cultural Issues	87
5.5 Institutional and Organizational Issues	88
5.6 Policy and Legal Issues	89
6 SOLID WASTE MANAGEMENT STRATEGY FOR RAFAH	90
7 CONCLUSION AND RECOMMENDATIONS.....	108
7.1 Conclusion	108
7.2 Recommendations	113
REFERENCES	115
LIST OF ANNEXES	120

Abstract

Solid waste management is one of the important services which delivered by Rafah Municipality and consumed between 40-60% of the total municipal budget. Improving services and cost recovery considered as difficult tasks and a future challenge that face the Municipality. The study aims to evaluate the current situation of the MSWM process and develop effective and efficient strategy for this service depending on the available resources and to be reflected positively on the environmental health, economy, and service quality in Rafah. Three hundred and eighty nine questionnaires were distributed among Rafah citizens, who receive the residential solid waste collection and disposal service from the municipality.

The results of the study denotes that there is only 38% of the sample satisfied with the current level of the service, 32% is not satisfied and 30% is partially satisfied. There are many environmental problems with the current collection system specially the containers system. There is no separation for the hazardous waste from the municipal waste during the collection and disposal process, SWM fees are currently the same for the commercial and residential clients, operational cost recovery is currently weak due to deteriorating revenues and lack of comprehensive strategy for MSWM in the City.

The study provided recommendations, such as developing integrated MSWM strategy

taking in consideration the improving of the

develop mechanisms for community participation using the existing experiences of the municipality.

The recommended strategy aim to provide an effective, efficient, affordable, safe and sustainable solid waste management system. The recommended strategy include upgrading waste collection and transfer, improve waste disposal and treatment ,reduce waste and maximize recovery ,ensure the safe collection and disposal of all hazardous wastes, achieve financial sustainability and strengthen institutional and organizational capacity in solid waste management area.

ملخص

تقييم الوضع الحالي و تطوير استراتيجية عامة لإدارة النفايات الصلبة البلدية في

مدينة رفح

إدارة النفايات الصلبة من الخدمات المهمة التي تقدم من قبل بلدية رفح و تستحوذ على 40-60 % من ميزانية البلدية السنوية. تواجه بلدية رفح تحديات مستقبلية متعلقة بالصعوبات التي تتمثل في تحسين الخدمات المقدمة و إعادة التكلفة لذا تهدف الدراسة إلى تقييم الوضع الحالي لإدارة النفايات الصلبة و تطوير استراتيجية فاعلة إعتماًدا على الموارد المتاحة و تتعكس إيجاباً على صحة البيئة و الجوانب الإقتصادية و كذلك مستوى الخدمات في مدينة رفح. في نطاق الدراسة تم توزيع 389 إستبانة على فئة من السكان الذين يتلقون خدمات النظافة من البلدية.

ولقد دلت نتائج الدراسة على أن 38 % من حجم العينة راضٍ عن مستوى الخدمة المقدمة لهم في هذا المجال، 32 % غير راضٍ، و 30 % راضٍ إلى حد ما و كذلك دلت النتائج أن هناك العديد من المشاكل البيئية و الصحية الناتجة عن نظام الجمع الحالي للنفايات المتوالدة و خاصة في نظام الجمع بواسطة الحاويات. لا يوجد نظام خاص لجمع النفايات الخطرة و خاصة النفايات الطبية التي يتم جمعها حالياً مع النفايات المنزلية و يتم التخلص منها في مكب النفايات البلدية الرسوم المطبقة حالياً مقابل تقديم خدمة النظافة موحدة لكل أنواع النفايات المنزلية و هذا يؤثر سلباً على عملية استرداد التكلفة للخدمة. لا يوجد خطة مستقبلية واضحة لإدارة هذه النفايات

هو مطبق حالياً هو بعض برامج العمل التي تلبي الاحتياجات اليومية فقط.

أوصت الدراسة بإيجاد خطة استراتيجية شاملة لإدارة خدمة النفايات الصلبة البلدية مع الأخذ بعين الاعتبار الموارد المالية و البشرية المتاحة و بالتعاون مع المجتمع المحلي، كذلك العمل على إيجاد نظام خاص بالنفايات الخطرة من أجل جمعها و التخلص منها بالتعاون مع وزارة الصحة والعمل على استخدام البدائل الفنية اللازمة التي تتناسب مع الإمكانيات الموجودة من أجل تحسين مستوى الخدمة قدر الإمكان وتشجيع المجتمع المحلي على المشاركة في عملية التخطيط و التنفيذ لهذه الخدمة من أجل الحصول على مستوى مناسب من الأداء في هذا المجال.

تهدف الاستراتيجية المقترحة إلى إيجاد خطة مستقبلية ذات كفاءة و فعالية و لها استمرارية و يمكن الوصول إليها و ذلك من خلال تحقيق الأهداف التالية: تطوير نظام الجمع و الترحيل لهذه المخلفات، تحسين نظام المعالجة و الجمع و تقليل حجم النفايات المتولدة و زيادة نسبة استرداد التكاليف، العمل على وجود نظام آمن لجمع النفايات الخطرة و التخلص منها، العمل على وجود إدارة مالية سليمة لهذه الخدمة، تقوية و تعزيز النظام الإداري و المؤسساتي لهذه الخدمة و العمل على تعزيز فاعلية الجهات المسؤولة عن تقديم هذه الخدمة و توعيتهم حول أهمية هذا الموضوع.

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1 Introduction

The chapter includes historical, geographical and demographical data about Rafah city due to the relevance of these factors to identify the city's constraints and challenges. This chapter also contains definitions, objectives of the study, an overview of the research's questions and the field surveys designed and used specifically to analyze the municipal solid waste service.

1.1 History and Demography

The Palestinian territories are composed of two geographically separated areas: the West Bank and Gaza Strip (Roy, 1995). Gaza Strip is overpopulated and population density is estimated at 1,261,909 (36.4%) of total Palestinian population. The population is mainly concentrated in larger cities and eight refugee camps that contain two third of the total population. The population density in Gaza is very high, the density rate is about 3,505 inhabitants per one square kilometer and the population growth rate is 4.0% (PCBS, 2002). Part of the refugee population is moving from camps to new municipal urban areas in the different cities (MOH, 2002).

Gaza has a coastline of 40 km at the eastern extreme of the Mediterranean and on the edge of the Sinai Desert and total area of 365 km². The average daily temperature ranges from 25 C in the summer to 13 C in winter and the relative humidity vary from 60% to 80% respectively in winter (Gaza Environmental Profile, 1994).

Rafah is one of the oldest cities in Palestine. The simplified Arabic encyclopedia describes Rafah as a very old city. It was known as Rafia during the time of the

time of the Ashurs (Middle East and Egypt, 1796-1914). It is located at the southern border of the Gaza Strip (Annex1). It is the main link between Palestine and Egypt, and historically benefited from its location and today is known as a main cross boarder. The City gained the status of a municipality recently in 1972. Prior to that, a village council governed it. Based on the Camp David Accord I between Egypt and Israel in 1982, the city was divided into two parts: one under the Egyptian control and the other under the Palestinian.

One of the main issues in the case of Rafah is Israeli presence in various settlements, which block the access to the northern parts of the city and to the sea. The current population of Rafah city estimated at 145,000 of which 80% are refugees and the growth rate is estimated to be 4.32%, the average household size is 8.6 people. The main income source for Rafah population is working opportunities in Israel, in addition to the agriculture and small-scale businesses (PCBS).

The municipality of Rafah encloses an area of 30,000 dounum according to the master plan of 1999. The largest urban concentrations, i.e. the refugee camps that exist since 1948, are located northwest of the city center. The other significant concentrations are at the northern border of the city in the areas of Tel-Sultan and Canada Camp. There are thirteen districts in Rafah city according to the urban planning 1999, and they are EL-Mawassi, Tal sultan, western Rafah, Rafah Refugees camps, Al Shaboura, Down Town, Kherbit El Adas, El Salam, Al Jenaina, Al Hashash, Al Zohoor, Mosbah and a large Industrial area known as Al-Bayyok. (Kosny.M, 1999) see table 1.

Table 1.1: Districts of Rafah; Area, Population and Population Density 2002

TABLE 1.1 Districts Of Rafah; Area, Population and Population Density 2002

District No.	District	Area (1000 m2)	Population (1997)*	Population (2002)**	Population Density (Persons/1000m2 (donum))
1	Al Mawasi	2670	1558	1950	0.73
2	Tal Al Sultan	2060	18111	22500	10.92
3	Western Rafah	2620	7600	10000	3.81
4	Rafah Refugees	770	19000	20000	25.97
5	Al Shaboura	1160	23971	25000	21.55
6	Down Town	1680	14000	19000	11.30
7	Kherbat Al Adas	3055	5144	8000	2.61
8	Al Salam	2965	7300	10000	3.37
9	Al Jenaina	1705	7421	16250	9.53
10	Al Hashash	2185	1500	2000	0.91
11	Al Zohoor	1530	2950	5000	3.26
12	Mosabeh	2175	1283	1800	0.82
13	Al Bayouk ***	2525	2560	3500	1.38
14	Settlements	2950			
<i>Total</i>		30500	112398	145000	

Notes:

Population Growth Rate 4.32%

Household size is 8.6 Persons

The Statistics is only for the Municipal Area

() A Palestinian Central Bureau of Statistics (PCBS) Figure.*

*(**) According to the population growth percentage 4.3% and the transfer from the refugees camps to Rafah Internal Districts.*

*(***) Only the Municipal Area of Al Bayouk*

1.2 Environmental Background

There are many major environmental problems in Gaza Strip due to long occupation period by the Israelis (Kelly & Homer-Dioxin, 1995). Thirty years of deteriorating infrastructure and negligence, over the period 1967-1994, lead to inadequate investment in the various environmental sectors, particularly water, wastewater sanitation and solid waste (Gaza Environmental Profile, 1995). Overpopulation is also a major challenge that creates more pressures, especially on the limited natural resources in the area and has a profound impact on the quality of health and social life of people. (MOH, 2002). During the period some of existing infrastructure deteriorated while the population and their needs rapidly increased. This lead to environmental degradation on almost every aspect (El-Hawi, M. and Hamilton, A. 2001)

The ground water scarcity and pollution is another major problem in the Gaza Strip. In the south near Rafah water tables decline about 0.2 m per year. As a result the senility increase in the same area with 20mg/l/year. In the northern area of Gaza Strip the situation is better (UNEP, 2003). There are numerous sources of pollutions for the groundwater and the increasing of nitrate and chloride content of the underground water is a clear indicator about this pollution. The increase level of the chloride in the drinking water can be detected by taste. This detection methodology does not apply to the Nitrate, therefore presenting more dangerous impact on health. There are other pollutants like pesticides, heavy metals that are undetectable in Gaza (Gaza Environmental Profile, 1995). One of the main problems affecting the ground water quality is the increase level of chloride l with a high concentration that reaches above WHO standards 250 mg per liter (Al-Yaqubi, 2001). The increase of ground water salinity is due to several reasons which include surface Salinization, sea water intrusion

and possible upcoming of deep brines due to over-pumping of fresh water (MoPIC, 1996). Based on survey conducted by PWA (CAMP 2000), there are pesticides detected in well-water samples like DDT, Lindane, aldrin, dieldrin, endrin, endosulfan, endosulphan sulphate, methoxychlor and heptachlorepoide. While these pesticides were found below the level of WHO guidelines for the drinking water, the complexity of the environmental health situation means that the problem is likely to be more serious. There are many sources of pollutants contamination such agriculture fertilizers, waste dumping sites and direct discharge of untreated sewage to the soil and wadi (CAMP, 2000).

Wastewater issue is one of the other major environmental problems; only 60% of population in Gaza Strip is connected to sewer networks while cesspits and septic tank receive the rest (MOH, 2002). The lack of waste water treatment facilities in most areas of Gaza Strip leads to discharge of raw or partially treated sewage direct into the sea and this create many problems like health risks, health hazards associated with swimming, waterborne pathogens and environmental risks, (Islamic University Gaza, 2001). There are three-wastewater treatment plants in Gaza: Rafah, Gaza city and Beit Lahia. All of these facilities have difficulties in the operation and did not function effectively. They are also over-loaded, sewage composition affected by the low water quantity per -capita which led to increasing the organic constituents and influent salinity. In Rafah the wastewater network covers about 54% of the municipal area according to the report of water & wastewater department in Rafah municipality. The wastewater collected and pumped in a collection pool which was built in 1987 and is located in the western part of the city with partial treatment. The location was designed as a temporary place for wastewater collection. The partially treated wastewater pumped

into the sea (MEnA, 2000)a. An EU project is supposed to cancel this lagoon and construct a new treatment plant with Khan Younis at northern east of Rafah.

Solid waste generation and management is one of the major environmental problems in the Gaza Strip (MEnA, 2000)b. The rapid population growth rate and the increase in the generation of the solid waste due to change in the life patterns besides the high population density. Under these conditions there is particular concern in the Gaza Strip about the solid waste management taking in consideration the limited natural and financial resources in the area (MOH, 2002). The inadequate solid waste management has different environmental impacts in Gaza Strip. Air pollution from burning of waste in the dumpsites or in the waste containers has negative health impacts on the soil quality and the ground water resources available are also affected by the uncollected wastes, caused by inadequate available equipments (UNEP, 2003)c. Hazardous wastes in the Palestinian Territories area not separated from non-hazardous wastes during the collection process. It is a mix with other municipal waste and dispose in the municipal dumpsite (MEnA.1999, Palestinian Environmental Action Plan). In Gaza city there are hazardous wastes cell in the landfill, which were designed, to receive the hazardous waste from different areas in Gaza strip but due the current political situation and unsafe access to this site its use is still limited (Abul Kumboz, 2002). According to the results of Abul-Kumboz in 2002, the management of hazardous waste in Gaza Strip need more efforts and care from different aspects and organizations. Most of the organizations that deal with hazardous wastes management work individually without coordination or cooperation. There's no segregation at the source in hazardous waste management issue due to lack of capacity and awareness and training of municipal personnel in charge.