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Country report on the Solid Waste Management in **LEBANON**

April 2014



COUNTRY REPORT ON
THE SOLID WASTE MANAGEMENT IN

LEBANON



Published in
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LIST OF ABBREVIATIONS

BOO	Build Operate and Own
BOT	Build Operate and Transfer
CAS	Central Administration of Statistics
CoM	Council of Ministers
CDR	Council for Development and Reconstruction
CP	Community Participation
DBO	Design Build and Operate
EIA	Environmental Impact Assessment
EU	European Union
FCR	Finance and Cost Recovery
GB	Greater Beirut
GBA	Greater Beirut Area
GoL	Government of Lebanon
IKM	Information and Knowledge Management
ISWM	Integrated Solid Waste Management
IWM	Integrated Waste Management
MoE	Ministry of Environment
MoF	Ministry of Finance
MoH	Ministry of Health
Mol	Ministry of Industry
MoIM	Ministry of Interior and Municipalities
MoPH	Ministry of Public Health
NGO	Non-Government Organization
NSC	North-South Cooperation
OMSAR	Office of the Minister of State for Administrative Reform
PA	Public Awareness
PM	Pontifical Mission (NGO)
PSP	Private Sector Participation
SSC	South-South Cooperation
NSC	North-South Cooperation
SWM	Solid Waste Management
TOR	Terms of Reference
WB	World Bank
WM	Waste Management
YMCA	Young Men's Christian Association (NGO)



COUNTRY PROFILE on the solid waste management situation in **LEBANON**

April 2014

BACKGROUND INFORMATION

Population:	5.6 million projected to 2013 ¹
Municipal Solid Waste (Msw) Generation:	2.04 million tons (projected for 2013)
Per Capita Msw Generation:	1.05 Kg/day (weighted average over the country) ²
- Urban Areas	0.95 - 1.2kg/day
- Rural Areas	0.8kg/day
Msw Generation Growth:	1.65 % per year
Medical Waste Generation:	25,040 Tons/year ³
Industrial Waste:	188,850 Tons/year ⁴
Agricultural Waste:	N/A tons/year
C&D Waste:	N/A tons/year
Waste Tyres:	N/A tons/year
E-Waste:	N/A tons/year
Packaging Waste:	N/A tons/year

TECHNICAL PERFORMANCE

Municipal Waste⁵

Msw Collection Coverage:	
- Rural Areas	99 %
- Urban Areas	100 %
Msw Final Destination:	
- Composted	15 %
- Recycled	8 %
- Landfilled	48 %
- Openly Dumped	29 %
Number of Dumpsites:	-
Number of Controlled Landfills:	-
Number of Sanitary Landfills:	
- Planned	2
- Under Construction	1
- Constructed	3
- Operational	3

Hazardous and industrial waste

Number of Hazardous Landfills or Plants (Chemical and Physical Treatment):	
- Planned	0
- Under Construction	0
- Constructed	0
- Operational	0
Types of Disposal and Treatments for Medical Waste:	Part of waste (60%) treated by autoclaving and shredding Around 1,250 tons per year are incinerated at the hospitals

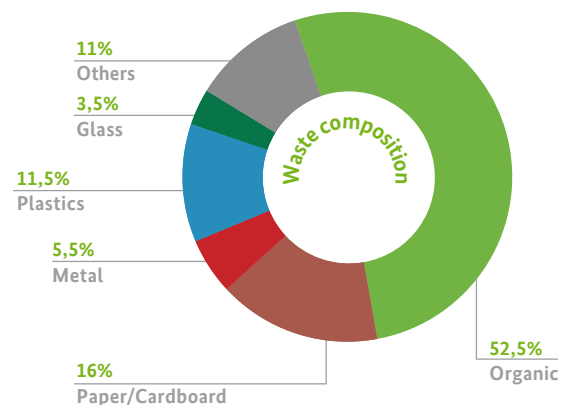
Policy and planning environment

- Emergency plan for SWM in Greater Beirut area in 1998 (still implemented) which consists on collection of around 2800 t/d of municipal waste then sorting, composting and sanitary landfilling;
- Municipal SWM Strategy for Lebanon prepared by the MoE in 2002;
- The National Integrated Strategy for SWM in the country presented in 2010;
- Recently in March 2013, and within the National strategy of 2010, MoE with CDR and MoIM has presented to the CoM a new detailed strategy.

Legal framework

General Legal Framework:

- No specific legislative framework dealing directly with Solid Waste Management (SWM);
- A draft Law on Integrated Solid Waste Management is approved by CoM in 2012 and sent to the parliament for final approval under decree number 8003 dated 23/4/2012 and it is currently under discussion at the Parliament;
- A draft law providing incentives to Municipalities hosting waste management facilities was prepared by end of 2013;



1- Excluding Syrian refugees and tourists

2- Another 1000 t/d is estimated to be generated by Syrian refugees

3- 5,040 tons of the total are infectious

4- 3,338 Tons/year is hazardous and most of it is mixed with MSW

5- Excluding the quantities generated by Syrian refugees

6- A portion (difficult to quantify) of the waste is directly recycled before reaching the municipal bins through private companies.

7- Scavenging activities (illegal) is continuously undertaken within the country.

- Three decrees address the sector specifically:
 - Decree 8735 of 1974 assigning SWM as a municipal responsibility;
 - Decree 9093 of 2002 providing municipalities with an incentive to host a waste management facility;
 - Decree 1117 of 2008 that provides incentives to the Municipalities hosting a sanitary landfill that is currently being revised before implementation.

Legal framework related to specific waste types:

- Law No. 444 (August 1988) regulating hazardous waste management;
- Decree No 8471 dated 2012 related to environmental compliance for industries;
- Decree 8006 (June 2002) amended through Decree 13389 (September 2004), classifying the different healthcare waste categories.

Institutional framework

Policy and Planning:

- Numerous government institutions are involved: Ministry of Environment, Ministry of Interior and Municipalities, Council for Development and Reconstruction (CDR), Office of the Minister of State for Administrative Reform;
- Overlapping responsibilities and unclear lines of authority.

Implementation and Operation:

- In Beirut, Mount Lebanon and Tripoli: CDR, and to lesser extent, the MoE and the MoIM;
- For some regions, OMSAR, and to lesser extent, MoE and concerned municipalities are responsible for the construction and the operation of some sorting and composting facilities through an EU fund;
- The municipalities in the rest of Lebanon.

The **institutional structure** under the draft law on integrated SWM:

- Applicable decrees is needed after issuing the draft law on integrated SWM in order to clarify the administration responsible for SWM sector in Lebanon;
- Local authorities (municipalities, union of municipalities): responsible for the waste collection only.

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Financial & cost recovery arrangements

SWM Financing:

- Allocation of budget from the government to waste management infrastructure;
- Allocation of budget from Independent Municipal Fund;
- International loans and grants;
- Proper financing by Municipalities.

SWM Costs:

Costs of SWM vary greatly in Lebanon.

	Cost of Collection and Transport	Total Cost from Collection to Disposal with Sweeping
Greater Beirut and Mount Lebanon (Except Jbeil)	USD 32 / tonne	USD143 / tonne
Tripoli	USD 64 / tonne	USD 92 / tonne
Zahle	USD 18 / tonne	USD 37 / tonne
Some rural areas	USD 10-18 / tonne	USD 20-30 / tonne

Private sector involvement

In collection and transfer: highly involved.

In disposal and treatment: highly involved - Landfilling in Greater Beirut; construction and operation of an anaerobic digester in Saida, pressing and exporting recyclables (paper, plastics, and glass), recovering materials and semi-formal sector, etc.

Options for improvement

- Issue the policy/ legal/ institutional and financial frameworks (applicable decrees) through the issuance of the law on the ISWM;
- Approval by the CoM on the feasibility study prepared by RAMBOLL and the detailed strategy;
- Preparation of the tendering phase;
- Ensuring capacity development;
- Enhancing public awareness;
- Establishing and support SWM networks, such as SWEEP-Net network.

EXECUTIVE SUMMARY

Lebanon has a population of 5.6 million people in 2013 that produces 2,040,000 tons of Municipal Solid Waste (MSW) per year. While the composition of the wastes is in majority organic (exceeding 50 %; this percentage varying between urban and rural areas, as well as between summer and winter, paper/cardboards and plastics constitute a significant proportion, with glass and metal contributing largely too. High moisture content is also prevalent in wastes, often exceeding 60%.

It is considered that the MSW generation per capita varies from around 0.7 Kg/p/d in rural areas to around 0.85 to 1.1 Kg/p/d in urban areas, with a national weighted average estimated at around 0.95 Kg/p/d. The foreseen increase in waste generation is estimated at an average of 1.65% across the country; this growth is however highly unevenly distributed.

Almost all of the MSW generated in Lebanon is collected by public or private haulers (99% in rural areas, 100% in urban); however, management varies from one area to another: 8% is recycled, 15% is composted (several treatment plants already constructed will be put in operation soon, hence increasing percentage), 51% is landfilled and 26% is disposed of in open dumps.

In the absence of a SWM strategy for the country, the SWM sector is marked by extremes: in Greater Beirut and Mount Lebanon (excluding Jbeil), a SWM system has been developed (Emergency Plan – currently around US\$ 130 million per year including specific investments) that is relatively advanced. However, the system is mainly based on bailing, wrapping, multiple handling and landfilling, with insufficient sorting and little composting, and at costs which are substantially high to the point that municipalities that participate in the system are being starved of funds for other municipal services. Outside Greater Beirut and Mount Lebanon (excluding Jbeil), waste management systems are generally characterized by rudimentary «collect and dump» approaches, except for few main cities and selected villages: a sorting plant and sanitary landfill in Zahleh, a rehabilitated dump in Tripoli, as well as small community based composting plants which have been executed in selected villages through USAID financing. In addition, a number of small and medium sized sorting and composting plants have been implemented by the OMSAR through EU financing. In Saida, an anaerobic digester has been put in place to treat the municipal waste of the city, that started its operation in 2013. Various projects have also been undertaken to rehabilitate waste disposal sites, namely Normandy, Beirut, Slayeb dump, Zahleh dump and recently Saida dump.

To date, there is no specific legislative framework that deals directly with SWM in Lebanon. Although there are many legal instruments that bear on SWM, there are only two that address the sector specifically: Decree 8735 of 1974 assigns solid waste management as a municipal responsibility, and Decree 9093 of 2002 provides municipalities with an incentive to host a waste management facility. The remaining elements of the legal framework either provide authority for entities to act with respect to municipal solid waste, or address other types of waste. A framework law for the protection of the environment was adopted in 1988 and amended in 2002 (Law 444, 8/8/2002), which defines the basis and norms for environmental protection, but which does not provide details of any regulations for the solid waste management.

Enforcement of these laws is however relatively weak and responsibilities are not well-defined. Generally, the regulations lack clarity and precision, coordination between authorities is minimal, and enforcement is practically non-existent due mostly to staffing constraints, lack of proper training, low level of fines, and

political interferences. Equally important is the lack of awareness of regulations amongst personnel who are supposed to enforce them.

In 2005, the MoE presented a Draft Law on Integrated Solid Waste Management under the METAP program. It was submitted to CoM on October 14, 2005, and is still under review. Following approval by CoM in January 2012, the Draft Law will be presented to Parliament for ratification. The Draft law aims at: (i) reducing the quantity of wastes to be disposed of; (ii) assisting in the management of solid waste and the promotion of recycling and treatment facilities; (iii) promoting waste minimization, source separation, recycling, energy recovery, effective waste treatment facilities; (iv) setting up general policy for cost-recovery; and (v) specifying the institutional framework for SWM. However, the law in itself is not sufficient for the implementation of an integrated SWM system. Such implementation would necessitate, further to law approval, the setting and issuing of the necessary applicable decrees, strategies and plans in the various domains, in the aim of ensuring a sustainability of the system, in terms of: cost-recovery system, well-defined institutional framework, and consensus, both at the national and local levels, on an agreed upon strategy.

Numerous government institutions (ministries or autonomous agencies) are involved in solid waste planning and management in Lebanon, with overlapping mandates and responsibilities and unclear lines of authority. While government institutions have been playing an increasingly important role, significant activities have also been undertaken on an ad hoc basis by the private sector and Non-Governmental Organizations (NGO).

This uncertainty concerning the institutional framework and responsibilities is a major obstacle for the implementation of an integrated solid waste management system. In recognition thereof, the Draft Law on integrated SWM brings the many stakeholders together into a single independent Solid Waste Management Board responsible for planning and decision-making at the national level, as well as waste treatment. Local authorities (municipalities, unions of municipalities, or groups of the two) will be responsible for the waste collection. The SWM Board, which will be responsible for the waste management, will be headed by MoE, and shall include members from relevant public authorities as well as the private sector (academics, consultants) and NGOs.

At the time of preparation of this report, the time frame for issuing the legal / institutional / policy framework is not clear. However, the MoE is still expecting a serious discussion/review of the Law on ISWM that was approved by the CoM in January 2012. Previous experience in this respect is however not promising and the endorsement of the law may require significant amount of time.

Explicit fees and costs recovery system for SWM does not exist in Lebanon. Lebanon suffers from major budget deficits in this sector. Financing of waste management infrastructure is currently achieved through four mechanisms: (i) allocation of budget to waste management infrastructure from the CDR; (ii) allocation of budget from a Municipal Fund through which government distributes monies to municipalities to meet capital and recurrent cost requirements; (iii) international loans and grants; and (iv) proper financing by the Municipalities for the operation of some treatment plants and sanitary landfills outside GBA and Mount Lebanon, through local taxes and the Independent Municipal Fund.

Private sector participation is a key element in SWM in Lebanon. MSW in main cities is effectively undertaken by private sector operators. In Greater Beirut and parts of Mount Lebanon, the quality of service performed by the private sector for waste collection and street cleaning as well as waste treatment is of relatively good level of urban cleanliness, but at costs which are quite significant. Outside Greater Beirut and Mount Lebanon, the quality of service by the private sector in the main cities is relatively acceptable but at costs which are substantially lower. Normally, the private sector in Lebanon is more effective than the public sector in SWM (both at the technical and financial levels). Insofar as recycling is concerned,

informal and semi-formal private sector activity plays an important role throughout Lebanon and provides a means of livelihood for at least thousands of people. The extent of this recycling activity varies according to market conditions.

Public awareness and community participation in support of SWM are still weak in Lebanon. They had been introduced as a component during the preparation of EIAs for locating landfill sites in projects financed by the World Bank, the EU or other donor agencies, and in support of some waste management operations. There is also still a lack of knowledge from the public about the methods and ways for SWM. It is clear that there is an urgent need for public awareness on both implement a komma the household and decision making levels in order to develop a good strategy and successfully put it in action. The «Not-In-My-Back-Yard» (NIMBY) syndrome plays a significant role therein. Equally important is the lack of awareness of regulations amongst personnel who are supposed to enforce them. Previous attempts for public awareness campaigns were not sufficient and effective. Some attempts to implement the sorting at the source in some zones in Beirut were not of great success. Better results were achieved with sorting at the source in some rural villages.

In conclusion, during the development of the SWM plan, the input and active participation of the local authorities and population should be sought while being well managed. NGOs and solid waste networks (such as SWEEP-Net network) could play an important role in raising awareness through the transfer of information between their members, through awareness campaigns, etc.

With regard to industrial and medical wastes, Lebanon is still considered as one of the countries that lack adequate and well-operated infrastructure for their management and disposal, although significant progress in health care waste management has been identified during the past years. As a result, unresolved environmental problems has been accumulating for years now, which lead to major issues such as 1) Increased air pollution due to indiscriminate burning of the waste; and 2) Water and soil pollution due to inappropriate disposal of industrial and health care effluents and wastes.

Most industries in Lebanon are light manufacturing industries, mainly belonging to eight branches only: food and beverage (20%), fabricated metal products (16%), non-metallic mineral products (12%), furniture (11%), clothes and dyeing fur (10%), wood products (10%), leather products (6%) and textiles (4%). Around 188,000 tons/year of industrial wastes are generated by industries, and can be classified into 2 main categories: (i) non-hazardous wastes having the same characteristics as the municipal wastes (around 185,000 tons/year); and (ii) industrial wastes having the characteristics of hazardous wastes as referred to in the Basel Convention (around 3,338 tons/year). However, in the absence of a well-defined legislation and more stringent controls, most of the industrial and hazardous wastes are being mixed with the municipal wastes and collected in waste collection trucks.

The health care sector is considered one of the biggest and most developed service providing sectors in the country with more than 8000 health care facilities in the country, and it is primarily dominated (90%) by the private sector. The quantity of healthcare wastes in Lebanon is estimated in 2010, at 13.82 tons/day for hazardous medical waste and 55.24 tons/day of non-hazardous medical waste. Around 60% of the infectious waste is being treated by autoclaving technologies. The remaining part without treatment is mixed with the municipal wastes. It is however to be noted that, after treatment, the disposal of medical wastes is carried in the municipal waste bins. It is estimated that only 2% of the private medical laboratories, 20% of the public hospitals and 32% of the private hospitals treat their infectious wastes. In recent years, Lebanon has made significant progress in health care waste management, with the largest private hospitals initiating the treatment of their wastes through autoclaving. There are currently two on-site and five off-site operating autoclaving/microwaving treatment centers distributed all over the country; the efficiency of waste treatment using autoclaves has however not been assessed.

A wide range of international organizations and donors are participating in the sector in the country, with activities and projects focusing mainly on: (i) feasibility studies for SWM projects, dumpsites rehabilitation, marketing of compost; (ii) development of national strategies and legal/institutional framework for SWM; (iii) provision of infrastructure for solid waste collection; (iv) closure of existing dumps; (v) execution of SW treatment facilities; (vi) strengthening and developing the capacity of stakeholders at both the national and local levels; and (vii) awareness programs to population.

Information and knowledge amongst residents and stakeholders are important for efficient and sustainable development in the SWM sector. The poor dissemination of information and knowledge sharing between the various stakeholders, the lack of sufficient capabilities at both the national and municipal levels, the poor coordination between the stakeholders, the lack of clear definition of responsibilities in the public sector due to the absence of legal/institutional framework, as well as the lack of sufficient awareness and community participation in the SWM sector have been key factors hindering the setting up of an efficient SWM in Lebanon, and have given rise to the need for the establishing of networking. The benefits of networking can be well recognized amongst members and stakeholders, and can be witnessed in the contribution to a more sustainable development of the SWM sector. The potential activities of SWEEP-Net network in Lebanon have been identified at the various levels: policy, legislative and institutional, planning, financing and cost recovery, private sector participation, technology application, public awareness and public participation, data management and others.

Developing comprehensive and effective systems of Knowledge Management at a national as well as at a regional scale remains central to the effective environmental management of the Mediterranean region. With internet increasingly available, networks such as the Sweep-Net network will help to ensure that valuable knowledge is being linked via websites and that potential users know where and how to look for information.

Training and capacity building activities may be conducted through training workshops and e-learning activities, technical and advisory services, field missions and technical visits, development of guiding documents and studies, regular reports on waste management, support of awareness campaigns, and promotion of South-South and North-South cooperation and know-how transfer. Solid waste networks (such as SWEEP-Net network) could play an important role in training and capacity building. One of the drivers for the success of the capacity development programs is the strong commitment to transition into a knowledge society in Lebanon.

Due to the highly critical phase, which the SWM sector has reached, it is now a national consensus, at the political level, to address SWM as a top priority issue. Immediate action has been called for and political efforts are now directed towards setting and implementing the strategies on the grounds of ISWM principles, as well as providing effective waste management services in Greater Beirut and the rest of the country. The priorities are suggested as follows: (i) issue the policy / legal / institutional framework through the issuance of the Law on the ISWM; (ii) evaluate the previous strategies and plans of the government, in order to better set future strategies and plans; (iii) develop and issue a specific implementable national policy and strategy (with particular consideration to the adaptability of the technology selected to the local characteristics of each region in Lebanon, as well as to the site selection); (iv) ensure an efficient and cost effective implementation of private sector participation in the sector (competitive bidding, appropriate types of contracts ensuring possible project financing); (v) focus on enhanced cost recovery; (vi) set the applicable decrees for cost recovery, institutional framework; (vii) ensure capacity development; (viii) enhance public awareness; (ix) assess the objectives of proposed projects and concentrate on those projects that assure sustainability of results and that are in line with the national strategies and priorities as well as with the local conditions; (x) ensure the institutional viability of any project in terms of commitment and support at both the national (CoM and Parliament) and local (municipalities) levels; (xi) ensure political

commitment in support to locally developed strategies; (xii) follow a “progressive coverage” for SWM schemes, starting with the implementation of a landfill (a prerequisite for any type of treatment) as a temporary phase; (xiii) set the mechanism for data management and sharing between the various stakeholders; (xiv) establish and support SWM networks, such as SWEEP-Net network; (xv) monitor, in the medium and long term, the future implementation of the strategies, in order to identify the eventual gaps and needed adjustments and improvements.

Due to political volatility, economical conditions and the typical tardiness in implementing strategies and planned activities, the updates in the SWM sector are minimal since 2010 and Lebanon is still facing the same difficulties.

After thorough review of the 2010 country report on solid waste management, it was noted that the waste production figures required update. In addition, one of the major development would be the issuance of decision 55 dated 1 September 2011 which represents a new policy for the government allowing thermal treatment and valorisation of waste as energy source. The decision nominates MoE and CDR for hiring an international consultant to prepare TOR and bidding documents and modify the previous strategies.

On 10 January 2012, the draft law finalized by the MoE in 2006 was endorsed by the CoM subject for further final approval of the parliament.

SWEEP-Net provides a chance to benefit from other experiences with the possibility for sharing of information and case studies through continuous communication within the network.

Finally, it should be well noted that SWM should be given a priority at the political decision makers’ level or else the negative impacts on the Environment, Economy and Human Health will be alarming.

1 .INTRODUCTION

1.1. SOCIO-ECONOMIC AND POLITICAL SITUATION

Lebanon is a country of 10,452 km² located along, and inland from, the eastern Mediterranean. The country is mountainous; along most of the coast, fractured and deeply incised limestone mountains rise from a narrow coastal strip to over 3,000 meters. Inland, the mountains give way to the Bekaa valley, a major agricultural region, before rising again to the east of the valley towards the borders with Syria. Lebanon has a Mediterranean climate; rainfall amounts fall sharply inland from the coastal mountains.

The population of Lebanon is around 5.6 million people in 2013 and is mostly concentrated along the coast, particularly in the Greater Beirut and Mount Lebanon regions, where more than half of the population lives. It is to be noted that there has been no official population census in Lebanon since 1932 (CAS provides an estimate of the population). However, this population figure is the one foreseen by the MoE in the current strategies and plans, and could be considered a reasonable estimate compatible with the various studies in Lebanon.

While it had always been considered a serious threat to communities all over Lebanon, with laws, though rudimentary, being put as early as the thirties, the solid waste issue has become of increasing concern in the 1990. Several attempts have, since then, been put in place, whether through national or international initiatives, support and funding, to be often faced with a lack of political will or enforcement thereof. However, although the privatization of this sector in terms of collection and treatment during the last ten years has set the ground for the apparent improvement of solid waste management, a significant number of communities and municipalities are still facing major problems with the treatment and disposal of waste, hence directly affecting the environment and creating serious economical and social problems

It is to be noted that several factors have led to the increase in the solid waste burden in Lebanon, namely:

- Population growth ;
- Rapid growth of the urban areas and the big cities ;
- Increase in the income per capita ;
- Absence of legal framework and poor enforcement of the law ;
- Contradiction in environmental policies ;
- Social habits that does not encourage waste minimization ;
- Social keenness to use new materials rather than used ones ;
- Increase number of Syrian refugees in 2012 and 2013.

Insofar as public participation and public awareness in support of solid waste management are concerned, these are still weak. There is still lack of knowledge from the public about the methods and ways for SWM, with the vast majority of the population still seeing in composting, landfilling or incineration the only measures and solutions for SWM.

1.2. SOLID WASTE FACTS AND FIGURES

An estimated 2.04 million tons of municipal solid waste will be generated in Lebanon in 2013. While the majority of waste (exceeding 50 %; this percentage varying between urban and rural areas, as well as between summer and winter) is organic, paper/cardboards and plastics constitute a significant proportion, with glass and metal contributing largely too. High moisture content is also prevalent in wastes, often exceeding 60%.

Future waste generation is uncertain and no detailed comprehensive data is available on which to base estimates, particularly for the rural areas outside Greater Beirut.

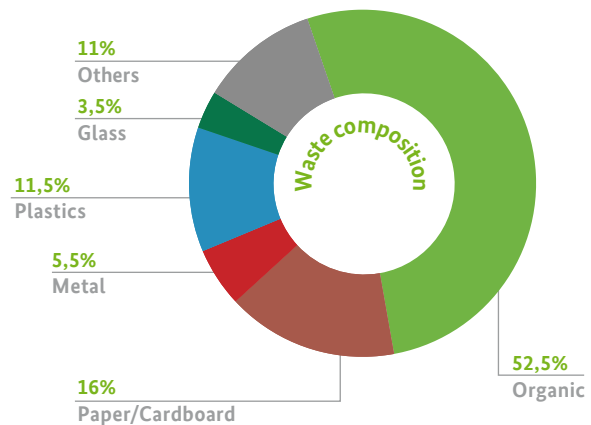


Figure 1: Waste composition in Lebanon

Based on waste management data obtained from the MoE as well as various studies undertaken in Lebanon, it could be considered that the MSW generation per capita varies from around 0.85 Kg/p/d in rural areas to around 0.95 to 1.2 Kg/p/d in urban areas. The average (over the country) could be estimated to around 1.05 Kg/p/d (assuming a weighted average between urban and rural areas). The high production rate of 1.2 Kg/p/d mainly corresponds to the region of Beirut and part of Mount.

Municipal waste collection coverage is generally high, reaching or exceeding 99 % of the population in both rural and urban settings; the quality of collection varies widely. However, in rural areas, contractors may not have the skills or equipment to effectively collect waste and municipalities do not have adequate enforcement capacity.

For the past 20 years, people were leaving the rural areas to live in the big cities like Beirut, Saida, Tripoli, which lead to a significant noticeable increase in the quantity of waste in Beirut and Mount Lebanon (area, excluding district of Jbeil, served by the private waste collection operator Sukleen) over the last years. While the tonnage of waste generated in these two areas (excluding Caza, administrative area) of Jbeil was estimated at around 2000 tons/day in 1999, it is assessed to be currently around 2,850 tons / day, this number amounting to around 51% of the total waste in all.

The waste generation per Mohafaza (according to MoE estimates) is summarized in Table 1:

Table 1: Waste generation per Mohafaza (2013)

Mohafaza	Daily Tonnage (Tons)	Percentage of Country
Beirut	600	11
Mount Lebanon	2250	40
South Lebanon and Nabatiyeh	1,000	18
North Lebanon	1,000	18
Bekaa	750	13
Total	5600	100

The majority of municipal solid wastes (around 51 %) is managed in landfill sites that serve Greater Beirut and the central Bekaa valley. While the evolution of landfilling over open dumping is a positive development after the closure/rehabilitation of Normandy dumps in Beirut and the construction of Naameh and Zahle Sanitary Landfills, leachate at the Naameh site serving Beirut is hauled for disposal in the Mediterranean. A small amount of waste is currently composted (about 11%) or recycled (about 8%). Although sorting facilities are available to serve the Greater Beirut, Mount Lebanon, Zahleh as well as other regions, collection of recyclable materials is to a large extent carried out by scavengers operating at various waste collection sites in the urban areas. Estimates for the amount of waste recycled may in fact understate the actual importance of recycling since this activity is conducted in part by the «informal» sector whose activities are, by definition, difficult to quantify.

Moreover, estimates of the MoE show that the foreseen annual increase in waste generation could be estimated at an average of 1.65% across the country; this growth is however highly unevenly distributed. This estimate is also compatible with the increase rate in Greater Beirut and Mount Lebanon region based on the previous period 1999-2009.

The foreseen municipal solid waste generation growth rate of 1.65% per year corresponding to the total waste generation is also compatible with the figures foreseen within the study “Assistance in Site Selection and Preparation of Environmental Studies for Solid Waste Facilities in Lebanon - July 2007 - prepared by the Consultant Rafic El Khoury and Partners” and the report “Country Environmental Analysis Report on Municipal Solid Waste Management (Draft version No. 5, February 28, 2010)” prepared by Anders Haldin, World Bank (rate of 1.65% per year foreseen in both reports). These reports have in fact considered the annual growth rate for both the population and the total waste generation as equal to 1.65%, which results in a waste generation per capita remaining unchanged. Doubts may be raised concerning this assumption in light of an improvement of the quality of life and economic conditions which would generally lead to an increase in the waste production per capita. However, in the present report, the total waste generation growth rate of 1.65% per year has been retained taking into consideration the following factors:

- The population annual growth rate has been less than the 1.65% during the recent years due to the political and economic difficulties encountered in the country as well as the high emigration rate (annual growth rate ranged from 1.48 % to 1.63% from 2004 to 2008 according to the report “Country Environmental Analysis Report on Municipal Solid Waste Management (Draft version No. 5, February 28, 2010)”, while the total growth rate between 2004 and 2007 according to Central Administration of Statistics (CAS) was 0.11%).
- The increase in the waste production per capita in light of an improvement of the quality of life and economic conditions may be counterbalanced if actions are taken in the future with increased public awareness and waste generation reduction efforts

As an overall figure for the country, the waste generation growth rate of 1.65% per year could be considered reasonable in light of the current conditions prevailing in Lebanon.

Figure 2 projects waste generation for selected years between 2009 and 2035 based on an average increase rate of 1.65% per year. On this basis, it is projected that waste

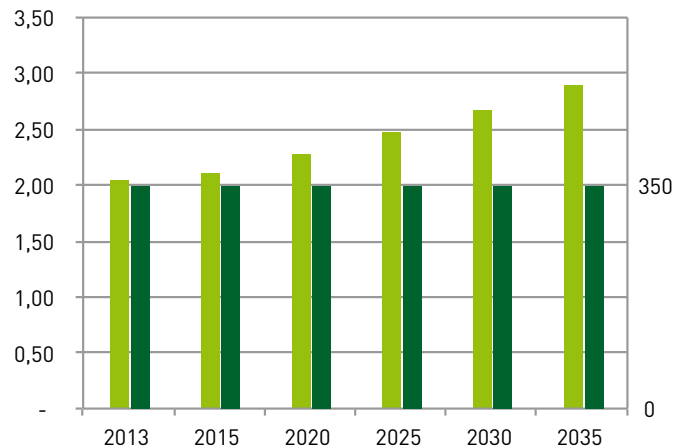


Figure 2: Projected waste generation 2009 – 2035 (comparison of current & future waste generation)

generation would grow from 1.57 million tons in 2009 to 2.4 million tons by 2035 in the absence of actions to impact on waste generation. Projections of this kind are important to effective waste management planning, and should be updated at least every few years, for the various regions of Lebanon.

It is to be noted that a sorting plant in Zahleh, a composting plant in Jbeil, as well as small community based composting plants have been executed in selected villages through USAID financing. In addition, a number of small and medium sized sorting and composting plants have been implemented by the OMSAR through EU financing (fund of approximately 14 million Euros). In Saida, an anaerobic digester has been put in place by a private company to treat the municipal waste of the city, where operation has recently started and no data is available yet about its performance.

Various projects have also been undertaken to rehabilitate waste disposal sites, namely Normandy, Beirut, Slayeb dump and Zahleh dump. However, several major dumpsites still require closure and rehabilitation as soon as new treatment facilities are put in place (such as Tripoli, Saida, Sour, Nabatiyeh and Baalbeck). UNDP recently signed an agreement with the GoL for rehabilitation and closure of the Saida dumpsite; the projected is estimated to cost around 25 Million US\$ and it will be funded by the GoL; construction should be completed by the end of 2015.

Table 2: MSW overview in main cities

Region	MSW Daily Tonnage (Tons)	MSW Collection Operator	MSW Disposal Operator	Type of Treatment
Greater Beirut & Mount Lebanon (excluding Jbeil)	2,850	Private sector (Sukleen - Local operator)	Private sector (Sukomi- Local operator)	Sorting (1700 t/d in Qarantina and 1150 t/d in Amroussieh) ⁽¹⁾ , Bailing and wrapping (Qarantina and Amroussieh) ⁽²⁾ , Composting (300 t/d in Coral) ⁽¹⁾ , Disposal in sanitary landfill (2500 t/d in Naameh ⁽²⁾ and 120 t/d of inert matter and bulky items in Bsalim sanitary Landfill).
District of Zahleh (partly - City of Zahleh & 18 surrounding municipalities)	180	Private sector - (Local operator)	Private sector - (Local operator)	Sorting, disposal in sanitary landfill
Tripoli	350	Private sector (Lavajet)	Private sector (Batco- local operator)	Disposal in a controlled dumpsite ⁽²⁾ (but with no liner)
Districts of Saida and Jezzine (partly)	300	Private sector (NTCC - local operator)	Private sector (NTCC - local operator)	Disposal in newly operated facility

(1) Decision regarding closure after operation of newly constructed treatment facility.

(2) Facilities will be closed as soon as a new set of treatment facilities becomes operational.

MSW in main cities is undertaken by private sector operators. The overview is presented here below.

To date (July 2013), the status of SWM in Lebanon is as follows:

MSW Collection Coverage:

- 99 % in rural areas; 100 % in urban areas;

MSW Destination: (excluding Syrian refugees)

- Composted: 15% (several treatment plants already constructed will be put in operation soon, hence increasing percentage);
- Recycled: 8 % ;
- Landfilled: 48% ;
- Dumped: 29% ;

Waste management hierarchy:

- Certain waste management practices should be prioritized over others;

Proximity principle:

- Waste should be managed as close as possible to the source of its generation;

Number of sorting plants:

- Under construction: 3(Kfarkila 25 t/d, Baalbeck 150 t/d, Nabatiyeh 200 t/d) ;
- Constructed: 2(Chouf Es Swayjani 26 t/d, Fayha' 300 t/d, Minieh 60 t/d) ;

Operational:

- 13 (Qarantina and Amroussieh 2850 t/d; Zahleh 300 t/d; Saida 300 t/d, Jbeil 60 t/d; Khiam 10 t/d; Ansar 10 t/d; kherbetselem 15 t/d; Ain Baal 150 t/d; Aytaroun 15 t/d, Qabrikha 15 t/d, Ain Ebel 20 t/d, Bint Jbeil 50 t/d) ;

Number of sanitary landfills:

- Under construction: 1 (Baalbeck (MSW)) ;
- Constructed: 3 (Naameh and Zahleh (MSW), Bsalim (inert matters and bulky items)) ;
- Operational: 3 (Naameh 2000 t/d, Zahleh 180 t/d, Bsalim 120 t/d) ;

Number of composting plants:

- Under construction: 4 (Mishmish 10 t/d, Baalbeck 60 t/d, Nabatiyeh 120 t/d) ;
- Constructed: 3 (Shouf Souayjani 26 t/d, Jbeil 80 t/d, Minieh 60 t/d) ;
- Operational: 9 (Coral 300 t/d, Khiam 10 t/d; Ansar 10 t/d; kherbetselem 15 t/d; Ain Baal 150 t/d; Aytaroun 15 t/d, Qabrikha 15 t/d, Ain Ebel 20 t/d, Bint Jbeil 50 t/d) ;

Number of other treatment systems:

- Under construction: 0 ;
- Constructed: 1 (Chekka – incinerator 8 t/d – unlicensed) ;
- Operational: 1 (Saida - anaerobic digester 300 t/d).

2. NATIONAL MUNICIPAL SOLID WASTE MANAGEMENT POLICIES

2.1. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

Policy Framework

Management of solid wastes in the country still does not benefit from a well-defined national waste management policy to define the overall tools or means for achieving goals and for combining forces between the key SWM players in the country (mainly MoE, CDR, MoIM, as well as MoF).

No national consensus was reached on a specific implementable SWM strategy despite the various attempts and efforts put in place by the various stakeholders to set SWM plans. These SWM plans were variable depending on the stakeholder's view, starting from the plans set, through the CDR and the MoIM, during the nineties, to those set by the MOE in 2002, the CDR in 2005, or the strategy set by MoE in 2010.

In 2002, the MoE prepared, through the UNDP, a Municipal Solid Waste Management Strategy for Lebanon, which outlined a number of alternatives, without however providing any specific guidance.

In 2005, the CDR prepared a Waste Management Plan for the whole of the country. This plan has been approved by the CoM in June 2006, but is still waiting to be implemented, due to lack of financing and objection from some communities regarding foreseen site locations. The plan consists of dividing Lebanon into four service areas as follows: 1) Beirut and Mount Lebanon, 2) South Lebanon and Nabatieh, 3) Northern Lebanon and Akkar and 4) Bekaa, Baalbech/Hermel. The plan foresees that sorting and composting facilities be built in each of the 26 districts, with only eight disposal sanitary landfill sites being constructed (2 per service area), in addition to Bsalim for inert materials to serve GBA and Mount Lebanon.

In March 2010, the MoE presented to the CoM a national integrated strategy for solid waste management in the country with a policy framework for a 25 year contracting period starting from the first half of 2014. The plan consists of the following:

- Modifying the strategy issued by MoE in 2002;
- Updating all the numbers and statistics of the 2002 strategy ;
- Dividing Lebanon into 4 service areas ;
- Rehabilitating old dumps during the execution of the strategy, in function of the availability of the alternative treatment facility ;
- Replacing the technologies previously foreseen in the plans set in the past 13 years, which consisted of sorting, composting and landfilling, by a waste-to-energy technology equipped with humidity reduction means, and with electricity generation, resulting in a reduced percentage of ultimate wastes ;
- Building transfer stations to facilitate and to decrease the cost of transporting the waste, taking into consideration that waste collection shall be the responsibility of the municipalities;
- This plan is foreseen to start during the second half of 2010 and to end in the second half of 2013, during which period a number of actions should be taken concerning:

- Rehabilitation of the Saida dump ;
- Identification of those firms that comply with the ToRs to be prepared by MoE and CDR for the provision of the treatment services ;
- Extension of the period of operation for Tripoli and Naameh landfill ;
- Issuance of the legal framework which was prepared by MoE after final review ;
- Preparation of bidding documents ;
- Construction phase ;
- Operation phase.

The MoE strategy has been approved yet by the CoM in September 2010 where CDR and MoE were assigned to hire an international consulting firm for the preparation of an environmental and economical feasibility study and tender documents. Accordingly, an international bid was prepared by CDR in coordination with the MoE and Ramboll, a Danish firm, won the bid and prepared a feasibility study with an overall strategy to address SWM adopting WtE approaches. The study was presented to the CoM and is still awaiting approval.

Legal Framework

Local legislation

To date, there is no specific legislative framework that deals directly with solid waste management in Lebanon. A number of laws, decrees, and ministerial decisions govern environmental management in Lebanon and specifically SWM, some dating back to the 1930s. Existing legislation consists of fragmented regulations not specifically dealing with solid waste.

Indeed, although there are many legal instruments that bear on SWM, there are only two that address the sector specifically: Decree 8735 of 1974 assigns solid waste management as a municipal responsibility, and Decree 9093 of 2002 provides municipalities with an incentive to host a waste management facility. The remaining elements of the legal framework either provide authority for entities to act with respect to municipal solid waste, or address other types of waste.

A framework law for the protection of the environment was adopted in 1988 and amended in 2002 (Law 444, 8/8/2002), which defines the basis and norms for environmental protection, but which does not provide details of any regulations for the solid waste management.

On the other hand, enforcement of these laws is relatively weak and responsibilities are not well-defined. Generally, the regulations lack clarity and precision, coordination between authorities is minimal, and enforcement is practically non-existent due mostly to staffing constraints, lack of proper training, low level of fines, and political interferences. Equally important is the lack of awareness of regulations amongst personnel who are supposed to enforce them (i.e. health inspectors, police officers, as well as the general public that is supposed to abide by them). In short, the lack of a proper effective solid waste legislation has led to the consequence that the country suffers a lack of national leadership in the sector, and is definitely hampering the development of an organized SWM scheme in Lebanon.

In 2005, the MoE has presented a Draft Law on Integrated Solid Waste Management under the METAP programme. It was submitted to CoM on October 14, 2005, and is still under review. Following approval by CoM, the Draft Law will be presented to Parliament for ratification. The Draft law aims at:

- Reducing the quantity of wastes to be disposed of, to the lowest extent possible ;
- Assisting in the management of solid waste and the promotion of recycling and treatment facilities ;

- Promoting waste minimization, source separation, recycling, energy recovery, effective waste treatment facilities; while no specific treatment technology was favoured, the main requirement calls for a proven, cost-effective and certified technology ;
- Setting up general policy for cost-recovery ;
- Specifying the institutional framework for solid waste management.

However, the law itself is not sufficient for the implementation of an integrated SWM system. Such implementation would necessitate, further to law approval, the setting and issuing of the necessary applicable decrees, strategies and plans in the various domains, in the aim of ensuring a sustainability of the system, in terms of:

- cost-recovery system ;
- well-defined institutional framework ;
- consensus, both at the national and local levels, on an agreed upon strategy.

The draft law was approved by the CoM in January 2012 and it was accordingly forwarded to the Parliament for ratification. At the time of preparation of this report, the draft law was reviewed and approved by the Parliament environmental committee and is waiting for final approval by the Parliament general assembly meeting.

In an attempt to encourage private sector participation, the draft law calls for the setting up of incentives to promote safe and effective waste management, namely:

- Non-Fiscal Incentives ;
- Fiscal Incentives.

These incentives are described in more details in section 3.4 herebelow.

International treaties

Some of the international treaties that Lebanon has ratified have specific regulations pertaining to solid waste such as:

- Basel Convention; It regulates the movement of hazardous waste and obliges its members to ensure that such wastes are managed and disposed-off in an environmentally sound manner. Lebanon ratified this convention in December 1994.
- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter; Ratified by Lebanon in May 1973, it mainly prohibits the dumping of wastes in the Mediterranean Sea.
- Protocol Concerning Mediterranean Specially Protected Areas and Protocol for the Protection of the Mediterranean Sea against Pollution from Land-based Sources; Accessed by Lebanon in December 1994, these protocols ensure the sound management of protected areas of the Mediterranean by banning the dumping of wastes into the sea, and prevent, abate, combat and control pollution of the Sea area by discharges emanating from any land-based sources within their territories.

Institutional Framework

Numerous government institutions (ministries or autonomous agencies) are involved in solid waste planning and management in Lebanon, with overlapping mandates and responsibilities and unclear lines

of authority. While government institutions have been playing an increasingly important role, significant activities have also been undertaken on an ad hoc basis by the private sector and Non-Governmental Organizations (NGO).

A closer look at the institutional setting reveals in fact that there is no clear distribution of responsibilities among the different stakeholders, a situation that significantly contributes to the inadequate management of the sector. Although the legal framework clearly assigns the responsibilities of waste collection, disposal and management operations at the sub-national level to municipalities (according to Law No. 118 of 1977), represented by MoIM at the national level, MoE is also responsible for regulating the sector, establishing and monitoring environmental standards, developing solid waste management strategies and supervising waste management facilities. As a result, both MoIM and MoE have jurisdiction over SWM policy, legislation, strategy, and planning; and both have developed municipal solid waste management strategies for the country. On the other hand, the CDR (a public authority established in early 1977 by Legislative Decree No 5, whose role was later amended by several legislative decrees, in partial replacement of the Ministry of Planning, to be the government unit responsible for reconstruction and development), acting under authority of the Prime Minister, has been responsible for implementing an emergency waste management plan in the Greater Beirut area, has developed proposals for the upgrading of waste management elsewhere in the country, and has implemented several solid waste management projects throughout the country since the nineties. The CDR was also appointed by the Council of Ministers (CoM) in 2005 to propose a municipal solid waste management plan for Lebanon and to launch international tenders for this purpose.

At present, direct responsibility for MSW management in the Mohafaza of Beirut and much of the large area of Mount Lebanon, as well as Tripoli lies with the CDR, and to a lesser extent, the MoE and the MoIM. The role of municipalities in these areas is restricted to overseeing the work of a private company contracted by CDR for solid waste management services. In the rest of Lebanon, the municipalities currently constitute the main authority responsible for the collection and disposal of solid waste.

In addition, OMSAR has also been involved in the SWM sector through the implementation of several SWM projects under EU financing as well as of awareness campaigns. In addition, OMSAR is assisting the municipalities with 3 years of operation of its SWM facilities with the financial support of the government.

This uncertainty concerning the institutional framework and responsibilities is a major obstacle for the implementation of an integrated solid waste management system. In thereof, the draft law on integrated SWM brings the many stakeholders together into a single independent Solid Waste Management Board responsible for planning and decision-making at the national level, as well as waste treatment. Local authorities (municipalities, unions of municipalities, or groups of the two) will be responsible for the waste collection. The SWM Board, which will be responsible for the waste management, will be headed by MoE, and shall include members from relevant public authorities as well as well as the private sector (academics, consultants) and NGOs.

The draft Law aims at setting the responsibilities of the various entities involved in SWM as presented here below:

Table 3: Responsibilities of various stakeholders involved in swm according to draft law on iswm

Entity	Responsibilities
Waste Management Board	<ul style="list-style-type: none"> - Developing National Waste Strategy - Developing National Waste Management Plans - Authorizing Waste Management Plans, Facilities, and Waste Generators
MoE	<ul style="list-style-type: none"> - Establishing Waste Management Standards and Guidelines - In The National Strategy and Plan through the Waste Management Board (headed by MoE) - Approval of EIA and SEAs - Authorization of Waste Management Facilities and Waste Generators Environmental Permits - Establishing/ Implementing Waste Management Programs - Information Management - Supervision and Inspection of Compliance
MoIM	<ul style="list-style-type: none"> - Participation in the National Strategy and plan through the Waste Management Board - Coordinating and assisting in the development and implementation of local waste management plans - Establishing/ implementing waste management programs
Local Authorities	<ul style="list-style-type: none"> - Participation in the National strategy and plan through the Waste Management Board - Proposing and implementing local waste management plans for non-hazardous municipal waste - Establishing / implementing waste Management programs - Management of waste collection
CDR	<ul style="list-style-type: none"> - Assistance in procurement of WM projects upon request - Assistance in the development of WM plans upon request
Private Sector/ the Public	<ul style="list-style-type: none"> - Abiding by laws, regulations and guidelines on waste management - Prohibition of littering, illegal dumping and burning - Participation in the National strategy and plan through the Waste Management Board - Participation in the development and implementation of local waste management plans - Participation of facility and generator management plans

On First of September 2010, a new policy was conceived under Decision 55 by the Council of Ministers allowing thermal treatment and valorisation of waste as energy source in coastal urban areas. In addition, Decision 55 requires facilitating the involvement of the private sector in turnkey projects or 2 different operations (collection & treatment). Most important, the Decision proposes stimulating the municipalities that receive within its cadastral zone different solid waste management facilities (thermal, composting, landfilling, transfer stations, etc.).

In summary, Decision 55 states the following:

1. Adopt waste-to-energy technologies in large cities ;
2. Adopt the 2006 master plan in the rest of the country ;
3. Engage the private sector in the provision of SWM services ;
4. Mandate MOE and CDR to reconcile and merge the two plans (2006 and 2010) ;
5. Mandate MOEW to draft regulations for waste-to-energy generation by the private sector ;
6. Incentivize municipalities that will host waste treatment facilities ;

7. Mandate CDR, in coordination with MOE, to contract an international consulting firm to select the most appropriate and proven technologies (through due diligence), prepare related tender documents and supervise operations ;
8. Mandate MOE to hire an international consulting firm to monitor system performance ;
9. Mandate MOE to hire a local consulting firm to promote awareness of waste-to-energy ;
10. Vest authority in the Prime Minister to oversee implementation and secure finances.

On 10th of January 2012, the CoM endorsed the solid waste law that was finalized at the MoE level in 2006. The Law will set an institutional and legal framework to organize the management of solid waste at the national level and it allows the government to set a cost recovery system. The law and its related applicable decrees still require the approval of the parliament before taking effect.

2.2. STRATEGIES, ACTION PLANS AND INITIATIVES

Despite the advanced strategies and concepts put in place by the MoE, MoIM and CDR insofar as SWM is concerned, national consensus, at both the national and local levels, has still not been reached and no implementable scheme has yet been developed or adopted. To date, Lebanon does not have a national approved and adopted SWM strategy.

Several priorities have been articulated, but there has been a lack of political will to adopt a strategy both at the national and operational level. Funding difficulties have been identified at the national level, and funds have not generally been available to municipalities to act on priorities identified at their level. Major difficulties have been encountered with the implementation of the strategies due to the objection of the population.

The nationwide Waste Management Plan developed by CDR in 2005, though approved by the CoM, has still not been implemented due to the lack of financing, as well as the objection of the population in some regions.

The 2005 Draft Law on Integrated Solid Waste Management presented by the MoE under the METAP program was submitted to CoM on October 14, 2005 and it was approved on 10th of January 2012 by the CoM and approved by the parliament environmental committee and is waiting for final approval by the parliament general assembly meeting.

The national integrated strategy for solid waste management, with a policy framework for 25 years of contracting services starting from the first half of 2014, was presented by the MoE to the CoM in March 2010. However, it has not been approved yet by the CoM.

Due to the highly critical phase, which the SWM sector has reached, it is now a national consensus, at the political level, to address SWM as a top priority issue. Immediate action has been called for and political efforts are now directed towards setting and implementing the strategies on the grounds of ISWM principles, as well as providing effective waste management services in Greater Beirut and the rest of the country.

The immediate priorities as identified in the sector are suggested to be as follows:

- Issuing the Draft Law on Integrated Solid Waste Management, in order to set the necessary legal and institutional framework, and hence define the leadership in this sector;
- Approving specific implementable national policy and strategy for an integrated SWM scheme (with particular consideration to technology assessment and site selection) ;

- Approving the national integrated strategy for SWM in the country with the policy framework for a 25 years period as prepared by the MoE (with the necessary adjustments and improvements particularly concerning the adaptability of the technology selected to the local characteristics of each region in Lebanon – as detailed elsewhere in this report) ;
- Implementing the approved Waste Management Strategy by ensuring the necessary funding through various possible schemes and types of contracts. Although projects for Greater Beirut and the major cities could be considered as a priority (particularly that the lifetime of the Naameh landfill site serving Greater Beirut is being continuously extended each time the capacity is reached, and that the landfill in Tripoli is not a sanitary landfill, etc), the projects for the remaining parts of the country should not be delayed ;
- Setting the applicable decrees for cost recovery, institutional framework, following the approval of the Draft Law on Integrated Solid Waste Management, in the aim to ensure the sustainability of the system ;
- Ensuring the rehabilitation of the dumpsites spread all over the country by ensuring the necessary funding, following the implementation of the corresponding solid waste treatment facilities.

At the time of preparation of this report, it is still not clear when or how these issues will be settled.

Without an institutional and legal framework set in place and effective, solid waste management in Lebanon cannot change with all the political interventions. As the solid waste law passed through the CoM, and if approved by the parliament, the SWM Board must be created and will start operating setting up strategies and action plans.

2.3. PLANNING AND INVESTMENTS

While great investments have been made to develop SWM facilities in GBA and, more recently, in other urban poles such as Tripoli, Zahleh and Saida, there is still no overall long term strategy for solving the SWM problem in Lebanon.

The most significant initiatives are the following:

- Emergency plan for Greater Beirut and part of Mount Lebanon ;
- World Bank-financed Solid Waste and Environmental Management Project (SWEMP), which closed at the end of 2003 resulting in the construction of Zahle SW facility ;
- Implementation of Saida anaerobic digester ;
- Projects for the rehabilitation of some waste disposal sites ;
- USAID financing for some sorting and composting plants ;
- Execution of a number of sorting and composting plants through the OMSAR under EU financing.

The **Solid Waste Emergency Plan for Greater Beirut** has been developed and implemented through the CDR. The plan has involved the issuance of contracts to private sector companies (Sukleen and Sukomi) to undertake all aspects of the management of solid waste in the Greater Beirut area. The system uses a full range of street sweeping, collection, sorting (manually and mechanically – facilities are currently under-sized), bailing and wrapping, recycling, composting (only around 13% of the waste is treated in the composting plant) and landfilling. The major part (around 80%) of the waste is taken to the Naameh landfill where it is deposited. However, the system is over-specified and performance is insufficiently linked to payment, with the result that there is an over-reliance on landfilling, variable results in composting, low levels of recycling and high net costs. Annual cost to the public is in the region of US\$ 130 per ton of waste handled.

Nevertheless, in the absence of other treatment facilities and in the absence of an alternative site, the existing Naameh landfill capacity serving Greater Beirut and Mount Lebanon (excluding Jbeil) has exceeded its design capacity with no new landfill being identified. As a direct consequence, the contract with the private companies is repeatedly extended with no amendments, and the lifetime of the Naameh landfill site is being continuously extended each time the capacity is reached.

The SWEMP initiative was intended to support solid waste management activities outside Greater Beirut. However, the project implementation has been difficult and the initiative was scaled back before closing at the end of 2003. A landfill had however been sited and is being operational in Zahleh in the central Bekaa valley, serving Zahleh and 18 of the 33 surrounding villages. Other foreseen landfills have however not been implemented within the scope of the SWEMP project.

In Saida, an anaerobic digester has been implemented by a private company aiming at treating the municipal waste of the city (capacity 300 tons/day extendable to 450 tons/day). However, this plant is not operational yet mainly due to contractual and financing problems.

Sorting and composting plants have also been financed by USAID for large communities as in Zahleh (sorting capacity 300 tons/day) and Jbeil (composting capacity 80 tons/day), as well as for small communities in selected villages in south Lebanon.

In addition, a number of small to medium sized sorting and composting plants have been established through the OMSAR under EU financing (fund of approximately 14 million Euros). These plants serving the municipalities or the union of municipalities are located as follows:

- Chouf Swayjani : sorting and composting plant – capacity 26 ton/day ;
- Fayhaa (Tripoli) : sorting plant – capacity 300 t/d ;
- Jbeil (Mount Lebanon): sorting plant – capacity 60 t/d ;
- Ansar (Nabatiyeh): sorting and composting plant – capacity 10 ton/day ;
- El Khiam (Marjeyoun) : sorting plant – capacity 10 ton/day ;
- Michmich – Akkar : sorting and composting plant – capacity 10 t/d ;
- El Minieh – North : sorting and composting plant – capacity 60 ton/day ;
- Tyre (south) : sorting and composting plant – capacity 150 ton/day ;
- Baalbeck – Bekaa : sorting and composting plant – capacity 60 ton/day (construction expected in 2011) ;
- Nabatiyeh : sorting and composting plant – capacity 120 t/d (construction expected in 2011) ;
- Qabrikha (Nabatiyeh) : composting plant – capacity 15 t/d.

Various projects have also been undertaken to rehabilitate waste disposal sites. These include the stabilization of organics and the use of the stabilized material in land reclamation (Normandy, Beirut), the closure and plantation of the dump (Slayeb dump, Chouf), as well as the elimination of the dump by excavating and transporting the wastes to the new landfill (Zahleh dump, Central Bekaa).

A study identifying the major dumpsites in Lebanon and addressing the technical and economical measures for their rehabilitation was prepared in 2005. However, no further action was identified in this respect.

Also, a study on cost of environmental degradation in Lebanon has been conducted in 2003.

A study “Country Environmental Analysis Report on Municipal Solid Waste Management (Draft version No. 5, February 28, 2010)” has been conducted.

After the issuance of Decision 55 dated 1 September 2010, the government started putting plans for the design and construction of WtE facilities in Greater Beirut area. The CDR in coordination with MoE has already hired an international consultant RAMBOLL for the preparation of related designs and tender documents. The consultant will make the assessment for the situation in Lebanon and accordingly propose the best technology and estimate the size of the investment required.

2.4. MONITORING

The monitoring system currently in place is insufficient as it is mostly performed by consulting companies hired by the government through the CDR or the municipalities. The MoE should be the entity responsible for environmental monitoring and lacks the human and financial resources to perform well. Again, once the draft law and its related applicable decrees are effective, a monitoring system has to be put in place.

2.5. FISCAL, FINANCE AND ECONOMICAL STEERING INSTRUMENTS

Financing of waste management (treatment and collection) is currently achieved through four mechanisms:

- The Council for Development and Reconstruction may allocate budget directly from the government through the treasury of the MoF to cover the construction of solid waste treatment plants (sorting or composting plants). The MoIM then deducts these costs from the amount owed by the Municipal Fund to the various municipalities and union of municipalities ;
- The government through the Council for Development and Reconstruction may allocate budget directly from the Municipal Fund which was established under the supervision of the MoIM (e.g., operation of SW facilities and landfills in Greater Beirut area) ;
- International loans and grants (e.g., construction of SWM plants funded by SWEMP, USAID, as well as by the EU through the OMSAR) ;
- Proper financing by the municipalities for the operation of some treatment plants and sanitary landfills outside GBA and Mount Lebanon (e.g., operation of Zahleh sanitary landfill), through local taxes and the Independent Municipal Fund. The purpose of the Independent Municipal Fund (IMF) is to give municipalities a share of 10 % of all the bills collected by the central government through "Electricité du Liban", the water authorities and different taxes collected by the National authorities. The municipalities have the right to collect only taxes for cleaning and sweeping as part of the property taxes, but the collection of this tax is not effective especially in rural areas.

It is acknowledged that the collection rate of property taxes in Lebanon is deficient. The country's existing charge and tax systems are severely limited by low collection rates, which have a profound impact on the MSW sector (the WB-METAP, Feb. 2004).

Explicit fees and costs recovery system for SWM do not exist in Lebanon. Lebanon suffers from major budget deficits in this sector.

Costs to government of waste management vary greatly in Lebanon. It is clear that the collection and disposal costs depend very much on the organization of the different management activities.

In Greater Beirut and Mount Lebanon (excluding Jbeil), the cost per ton for collection, transport, treatment and disposal of municipal waste is estimated at around US\$ 175 / ton of which about US\$ 30/ton is related to collection and transport. In 2010, CDR is currently paying around 130 million US\$/year (including waste collection and treatment, as well as street sweeping in Greater Beirut area) from the Independent municipal fund.

Outside the Greater Beirut and Mount Lebanon area, waste management costs (collection and disposal) are substantially lower. They are around US\$ 45-50 / ton in Zahleh and Tripoli, and around US\$ 20-30/ ton in some rural areas with disposal in open dumps.

These overall costs (US\$/ton) are summarized hereafter:

table 4: Cost of SWM per ton

	Greater Beirut and Mount Lebanon (excluding Jbeil)	Zahleh	Tripoli	Other rural areas	Small units
Collection	25 ⁽¹⁾	17	18 ⁽⁵⁾	10-18	5
Sorting	26	10	-	-	-
Bailing	16	-	-	-	-
Wrapping	13	-	-	-	-
Landfilling	52 (from 0 to 400,000 ton/year) 38 (from 400,001 to 500,000 ton/year) 45 (> 500,001 ton/year)	5 ^{(3) (4)}	29		
Composting	30 ⁽²⁾	-			
TOTAL	130				
			-		
			-		
			-	-	33 ⁽⁶⁾

(1) Cost excluding sweeping; sweeping: 16,000,000 USD/year

(2) Including hauling from sorting facilities to composting plants

(3) This figure constitutes the operational cost. For full cost recovery, the cost would be 15-20 \$/ton (Municipality of Zahle)

(4) The tipping fee being currently paid by the other 18 surrounding municipalities transporting the waste to Zahleh landfill is around 10 \$ / ton (partial cost recovery only). It is to be noted that the remaining 17 municipalities are disposing of their waste in a haphazard manner due to shortage of money and the lack of a law enforcing disposal into sanitary landfills

(5) Including sweeping; collection and sweeping: 2,300,000 \$/year (i.e. around 18\$/ton based on 350 tons/day)

(6) On a Build-Own-Operate (BOO) basis

In this regard, the “Country Environmental Analysis Report on Municipal Solid Waste Management (Draft version No. 5, February 28, 2010)” has been prepared. The results may be summarized hereafter.

With regard to the 2005 base CDR plan, the total investment cost (including design, VAT, contingencies and land acquisition) for sorting and composting facilities (one in each of the 26 districts) as well as disposal sites (8 sanitary landfills without sorting and composting) is estimated at US\$ 400 millions. The CDR plan results in a need of a disposal fee of US\$ 7-40 per ton dependent on the size of the plants in the concerned region. In addition to that, a gate fee in average for sorting and composting plants of US\$ 20 per ton of waste to reach a Financial Internal Rate of Return (FIRR) of 10%, has to be added.

The possibility of using the incineration technology for Greater Beirut to reduce the volume of waste to be finally disposed has also been considered in the report. The investment cost is very high, and the needed disposal fee would be USD 105 per ton for reaching a FIRR of 10%.

Implementation of the full CDR Plan will be quite costly for the government and the investment cost varies between US\$ 400 - 695 million depending on which technical solution would have been chosen. The operation cost expressed as US\$ per ton is 6 - 72 and the gate fee, in order to reach a FIRR of 10%, varies between US\$ 7 - 105 per ton (depending on the adopted solution).

As for the operational costs, which in total will amount to about US\$ 50 million per year in case of separate sorting and composting plants and sanitary landfills, they mainly require a cost recovery plan to secure that the facilities will be operational. It is not likely that the GoL will cover the operational cost, which is why a gate fee must be introduced and paid by the clients, and a system for collection of the fee must be introduced. The cost recovery plan should be agreed upon before the implementation of the WMP will start.

Concerning the strategy developed by the MoE in 2010, it has not been possible to acquire data pertaining to the technical aspects of the strategy and the specific characteristics of the foreseen treatment technologies, as well as the required investment and operation costs, which lead to the impossibility of carrying out precise estimates. However, a preliminary estimate will result in a cost per ton relative to waste-to-energy- systems exceeding 100 US\$/ton and an investment cost exceeding 700 million US\$. In addition, the implementation of the treatment project will normally be on a BOT contract basis with a 25 years contracting period.

As a conclusion, waste-to-energy technologies such as incineration (equipped with humidity reduction means in order to be compatible with the type of wastes in Lebanon) maybe a relevant option for the GBA and Mount Lebanon; however, the possibility of adopting other less expensive technologies, such as composting and landfills, need to be assessed for other regions, and particularly for rural areas and in the absence of an adequate cost financing and recovery system.

Financing and Cost Recovery in Draft Law

No matter how successful the SWM Strategy and National Plans, a valid Financing and Cost Recovery (FCR) System for SWM is essential for the sustainability of WM activities.

Accordingly, the draft law on ISWM in Lebanon and its legal framework provide venues for cost recovery for the SWM in Lebanon by providing the adequate framework for the following:

- Setting up sources of financing;
- Cost Recovery for Solid Waste Management;
- The investment and operational cost of waste service providers and facility operators for Solid Waste can be recovered through several sources including but not limited to:
 - Direct at-source waste management fees (e.g., waste user charges) including tipping fees at various waste transfer, treatment and disposal facilities collected by local authorities or their designated agents working under license, franchise, contract or concession agreements ;
 - Product charges on packaging wastes ;
 - Fines from non-compliance activities in accordance with this law and its standard decrees of application; and

- Other sources of cost recovery to be determined by decrees ratified by the CoM based on the proposal of the MoF and the MoE.
- Authority to Collect Waste Management Fees;
- Non-Fiscal Incentives ;
- Fiscal Incentives: In an attempt to encourage PSP, the law calls for the development of fiscal incentives to promote safe and effective waste management. These can be established, for instance, as follows:
 - Tax exemptions on the purchase of recovered material ;
 - Tax reduction on profits - enterprises or private entities, including NGOs, waste generators, waste holders, and facility operators, and service providers that are recognized to perform beneficial waste management activities shall be awarded by a tax reduction on profits.
 - The implementation of the foreseen SWM strategies requires ensuring the necessary funding for both investment and operation costs, through various possible schemes and types of contracts (such as BOT contracts).

On the other hand, it is thus mandatory to pinpoint the fact that evaluating the sources for the recovery of the recurrent costs of waste management is futile without analysing the affordability of such services as well as the willingness-to-pay of the Lebanese public. However, in the absence of willingness to pay studies for SWM services in Lebanon, the affordability of such services is examined based on various reports previously established.

One disadvantage of the lack of special fees allocated to the SWM sector and the corresponding cost recovery practice is that, even if the residents comply with their duties and pay municipal taxes, they are rarely aware that they are paying for waste management services.

Explicit fees on solid waste management services are thus an essential component of an orderly waste management which cannot be avoided on the long run in Lebanon. On the one hand, such charges contribute to increasing responsible behaviour of waste producers (whether households or free economy) in the sense of the “polluter pays principle”.

With regard to the proposed explicit fees for SWM, a phased implementation could be foreseen starting from a partial cost recovery at the initial stage (corresponding, for instance, to a recovery of operation costs) to a full cost recovery at a later stage, depending on the affordability of the population to pay these fees.

For a limited period of 3 years, the government (through an EU grant) took the initiative to finance the operation of SWM facilities (Ain Baal, Minieh, Baalbek, Qabrikha, Ansar) constructed by OMSAR reaching overall a maximum of US\$ 15 million.

The SWEEP-NET working group on fiscal finance and economical aspects hosted by Lebanon held a meeting in 9-10 January 2012; a national day was organised on January 11 and was attended by key stakeholders in the country. A draft guide for decision makers was discussed and subsequently finalized than published. One of the major findings of the meeting is the importance of having a cost recovery system, adopting “polluter pays principle” to promote awareness for reduction of waste production and secure the necessary finances to cover the costs.

2.6. PRIVATE SECTOR PARTICIPATION POLICY

Private sector participation is a key element in solid waste management in Lebanon. MSW in main cities is effectively undertaken by private sector operators.

In Greater Beirut and parts of Mount Lebanon, the quality of service performed by the private sector (Sukleen) for waste collection and street cleaning is of high level of urban cleanliness, but at costs which are quite significant. With regard to waste treatment and disposal, the quality of service performed by the private sector (SUKOMI waste treatment and SUKOMI Landfills) is mainly based on bailing, wrapping, haulage and landfilling, with insufficient sorting and little composting, and at costs which are substantially high. These relatively high costs are mainly due to the type of contract award on a non-competitive basis. In fact, The Sukleen contract was awarded in 1994 for one year through competitive bidding, and was then extended for five years, with the collection area being expanded to reach the current size. Sukleen's contract has expired as of 31 December 2000 and has, since then, been periodically renewed awaiting the selection and appointment by the GoL of an operator for these services by means of an international bidding process. The waste treatment and landfilling contracts were directly awarded in 1998 for 10 years to SUKOMI (contract of landfilling based on BOT). These contracts are being annually renewed.

It is to be noted that international contractors (Radians-USA) have also been involved (1999-2010) in the reclamation of a waste dumpsite in the Normandy area along the Beirut waterfront. The contract was awarded through competitive bidding by SOLIDERE, the company responsible for the development of Beirut Central District.

Outside Greater Beirut and Mount Lebanon (such as Tripoli and Zahleh), the quality of service by the private sector in the main cities is relatively acceptable (although with lower quality than Greater Beirut and Mount Lebanon) but with at costs which are substantially lower.

In Tripoli, the private sector participates in waste collection (Lavajet) and disposal (BATCO) through competitive bidding. In the city of Zahleh, the private sector participates as well in waste collection and disposal through competitive bidding. In Saida, the private participation has been involved in the construction of an anaerobic digester to treat the municipal waste of the city, based on a BOO contract. However, although already constructed, this plant is still not operational. Local private waste management companies have been involved in the construction and operation of some composting plants, which have been implemented in some villages through financing from the USAID and the EU (through OMSAR). Elsewhere, local contractors are involved in waste collection and disposal in dumpsites at the municipality level. Given the scarcity of waste collection vehicles and the problems that might arise, municipalities generally prefer to contract waste collection to a local contractor who is typically selected through competitive bidding. However, the selection of contractors may be overwhelmingly based on cost, not value for money or even competence to perform the service. Consequently, service delivery may be very poor.

Normally, the private sector in Lebanon is more effective than the public sector in solid waste management (both at the technical and financial levels), due to the fact that the municipalities lack the necessary means, resources and skills. This is also, most often the case, not only at the level of rendering services but also at ensuring open, transparent and competitive procedures contract award.

However, the absence of a reliable procurement procedure for waste management projects may lead to some failures, difficulties or delays. This corresponds, for example, to the case of the digester of the city of Saida, the contract of which was awarded to a private operator under a BOO contract in return of a tipping fee per ton of waste. However, the construction of the project has faced many difficulties, suspensions and delays, and consequently induced delays in the start of operation. This was mainly due to contractual and financing problems. These problems are currently under negotiation between the concerned authorities and the operator for finding the appropriate solutions.

Insofar as recycling is concerned, informal and semi-formal private sector activity plays an important role throughout Lebanon and provides a means of livelihood for at least thousands of people. Recycling networks are created through a system of waste pickers and materials traders operating to recover materials before they are collected from points of generation or storage, and after disposal in a waste disposal facility. The extent of this recycling activity varies according to market conditions. Some examples of recycling firms are: SICOMO and SOLICAR for recycling paper and cardboard, ELIE DEBS company for recycling plastics, LEEDS for recycling HDPE and LDPE, and SOLIVER for recycling glass. Recycled metal is pressed and sold to exporters because there are no local foundries to work with reclaimed metal.

In this respect, the draft law on integrated SWM aims at encouraging Private Sector Participation (PSP) in WM activities. Therefore the law called for a decree that specifies procedures to be followed in the procurement of WM projects. The decree supports PSP through the following:

- Identification of Waste Management Activities: WM activities are defined to include the construction, operation, maintenance, modernization, repair, expansion, control, monitoring, and post-closure care of new or existing WM facilities as well as delivery of a service (waste collection, waste transport and transfer, waste treatment) ;
- Identification of institutional responsibilities regarding privatization ;
- Identification of a reliable procurement procedure for waste management projects ;
- Setting up requirements from contractors ;
- Developing criteria for awarding of contracts ;
- Specification for minimal core contract terms.

It was noted recently that the private sector has been approaching the MoE for guidance in the necessary procedures to be taken to finance, construct and operate SWM facilities. The private sector if involved in similar activities can recover the cost by charging municipalities or union of municipalities on per ton of solid waste received at the facility. The private sector has the capacity to finance the projects and provide technical professional assistance as needed to abide to international standards.

In the context in strengthening the role of the private sector and based on the needs in Lebanon, an international consultant (RAMBOLL) was hired by CDR to prepare TOR and tender documents for the construction and operation of WtE facilities. Furthermore, the MoE will assign an international consultant to monitor and supervise the different activities in the implementation of these phases. The MoE has the knowledge and capability to monitor the SWM projects however lacks the resources (staff, etc.).

2.7. PUBLIC AWARENESS, EDUCATION AND COMMUNITY PARTICIPATION

Public awareness and community participation in support of solid waste management are still weak in Lebanon. It had previously been introduced in identifying landfill sites locations in projects financed by the World Bank, the European Union or other donor agencies, and in support of some waste management operations. Public participation in solid waste planning has also been introduced as a component during the preparation of EIAs for solid waste management facilities. These public awareness actions were undertaken by NGOs, consultants, service providers and municipalities.

There is also still lack of knowledge from the public about the methods and ways for SWM, with the vast majority of local population still seeing in composting, landfilling or incineration the only measures and solutions for SWM. Only few are inclined to consider or abide by the 3Rs principle (Reduce-Reuse-Recycle). It is clear that there is an urgent need for public awareness on both the household and decision making levels in order to develop a good strategy and successfully put it in action.

The «Not-In-My-Back-Yard» (NIMBY) syndrome plays a significant role therein. Individuals are wary of waste management facilities and municipalities are often reluctant to accept wastes from elsewhere, despite the significant financial incentives now available for municipalities to do so. The NIMBY syndrome was a major factor which affected the SWM strategies and implementation of treatment facilities. For instance, in the CDR plan of 2005, SWM facilities are foreseen individually in each district, hence inducing a major increase in investments due to the lack of economies of scale, as well as difficulties for the site selection particularly in high dense regions such as greater Beirut and Mount Lebanon. In this respect, the potential consideration of larger scale facilities in Chouf or Jbeil to lessen the burden off the GBA was faced with serious objections from these regions' local residents.

More generally, the various strategies set since the nineties have faced a lot of objections from the population of the concerned regions. It is certain that public participation in waste management facility siting can facilitate new waste management facilities. As an example, the siting of a landfill site in Zahleh has been successful through a process that included public awareness, consultation and participation, but also the strong support of the local politicians. By contrast, public hostility to waste management facilities, and an absence of public participation in related decision making, contributed to the burning down by the public of an incinerator in Aamrousiyeh and the failure of a landfill siting process in Kfar Hazirans Jbeil. This experience demonstrates that waste management facility siting is as much about managing and addressing community issues as it is about satisfying technical environmental and financial criteria.

Equally important is the lack of awareness of regulations amongst personnel who are supposed to enforce them.

Previous attempts for public awareness campaigns were not sufficient and not sufficiently effective. Some attempts to implement the sorting at the source in some zones in Beirut were not of great success. Better results were achieved with sorting at the source in some rural villages, further to an initiative undertaken by a local NGO in Bsharre and in Arabsalim to promote sorting and recycling of waste products by encouraging the local communities to sort waste at source into dry and wet components. However, these NGOs were later faced with the problem of marketing the recyclable.

In general, the poor results of the campaigns may be due to the following:

- There are high levels of public suspicion about solid waste management facilities in Lebanon ;
- The population did not perceive the effective positive outcome of their participation. No direct correlation has been identified between the campaigns and the benefits to the SWM implementation on the one hand and to the population on the other hand (technical, environmental, financial, etc) ;
- No direct benefits for the population were identified ;
- Failure in the adoption till this date of a strategy for the SWM and in the implementation of a SWM system and facilities ;
- Lack of technical skills and human resources to manage this problem, particularly at the local level.

In conclusion, during the development of the SWM plan, the input and active participation of the local authorities and population should be sought while being well managed. NGOs and solid waste networks (such as SWEEP network) could play an important role in raising awareness through the transfer of information between their members, through awareness campaigns, etc..

The awareness campaigns should:

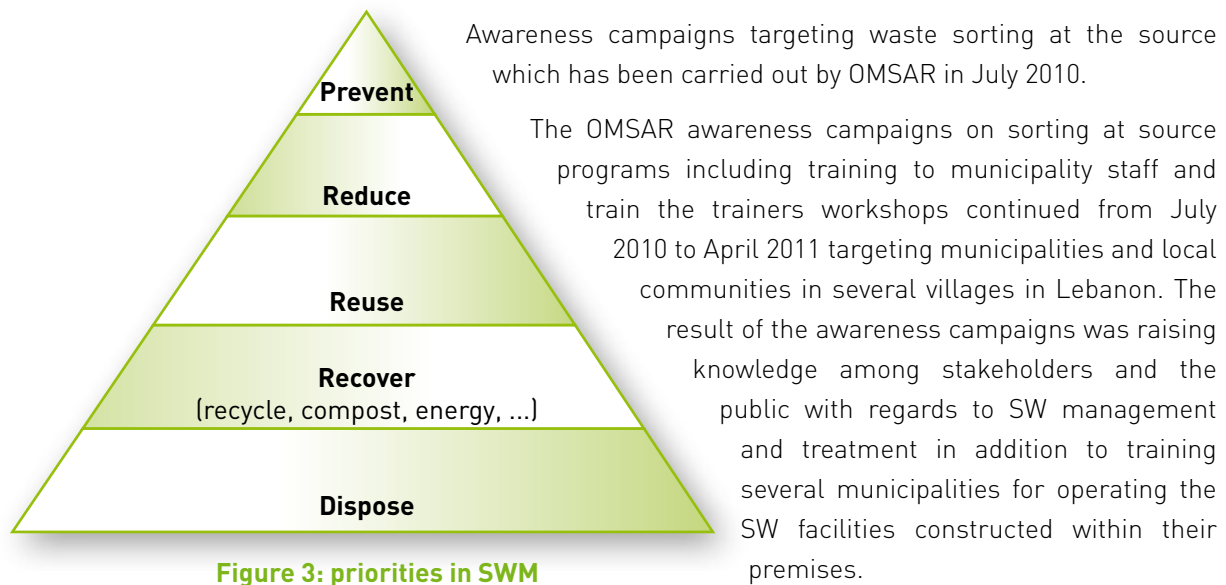
- Be accompanied with the approval of an integrated SWM framework (policy, legal, institutional, specific plan and strategy with the consent of the various parties, cost recovery system, etc) ;

- Concentre on the negative impacts of the current poor SWM in some of the regions (negative impacts of open dumping and leachates on health, environment, surface and groundwater, etc. ;
- Concentrate on the fact that the objectives of the ISWM projects are sustainable ;
- Encourage media to focus on the issue ;
- Share all the strategies and plans with the public and communities to create a circle of trust between them and the government ;
- Develop a communication strategy and/or communication programs in the media or in the press: no specific and sustainable strategy are identified, and little action is identified in this sector.

Priorities in Waste Management should be clearly set to target the following:

- Whenever possible and economically feasible, prevention and then minimization of waste generation has legal priority over all other alternatives to WM in the Republic of Lebanon;
- Secondly, the usable portion of the waste stream shall be reused and recovered when economically feasible and when this does not cause significant adverse impacts on the environment ;
- Finally, waste that could not be avoided, reused or recovered shall be disposed of in an environmentally safe manner.

It is essential to point out that several workshops have been organized by the MoE and several NGOs to promote public awareness and community participation, which is considered a major factor in the development of an integrated solid waste management system.



2.8. NATIONAL CAPACITY BUILDING AND TRAINING INITIATIVES

Although several workshops have been organized by the MoE, international institutions, and other institutions to strengthen the capacity of personnel both at the national and municipal levels, and while a number of donors have provided extensive training and capacity building in the past in SWM services, there is still a lack of understanding about management, technology, financing, and enforcement, monitoring and follow up. Also, a wide range of management skills, which are required at both the national and the municipal level. In particular, capacity development in contracting the private sector and managing

private sector contracts is required. Equally important is the necessity to provide capacity building and training for decision makers.

With respect to policy/legal/institutional issues, focus should be on preparation of SWM legal frameworks at the national level, and on knowledge and application of the legal framework, as well as enforcement and monitoring at the municipal level. Several additional aspects of waste management are necessarily captured within this, since capacity development on legal frameworks requires that issues such as financing and cost recovery, private sector participation, community awareness and participation, and data and knowledge management are also addressed, as well as institutional structures for delivering SWM services.

Enhanced knowledge of the various technologies that might be applied to waste management is required at both the national and municipal levels, which will also benefit from training in computer use for waste management purposes.

A shortage of suitably trained staff at both the national and municipal levels is also noted. A significant example would be that of the MoE, which is partly responsible for the monitoring of waste management facilities. However, the Ministry is currently understaffed and has no possibility to carry out a meaningful and effective monitoring. It had since long been decided to increase the number of staff, but nothing much had happened. Recently however, a wide range of needed positions have been posted. While this process may still required some time due to administrative procedures, its initiation is nonetheless a major positive step towards achieving the desired staffing goals. It is of paramount interest that the MoE promptly obtains the staff resources needed to carry out the supervision of waste management in Lebanon.

Under the H2020 initiative, several workshops related to solid waste management were organized in Lebanon and throughout the Mediterranean countries. Most of the participants were nominated from the concerned municipalities or ministries.

One of the workshops organized and financed by the H2020 was a mission/training of 11 participants from concerned ministries, parliament, environmental press, etc. to visit several operating WtE facilities in the Netherlands.

2.9. CAPACITY BUILDING REQUIREMENTS

Capacity building and awareness activities are required in the WtE treatment option of solid waste treatment sector due to lack of national expertise and since WtE approach is new to the Lebanese concept and since previous experience and technical expertise are not available.

Needs for technical support and capacity building may be summarized as follows:

- The adequate country capacity, at the national levels and particularly at the local municipal levels, is one of the critical missing factors in current efforts to build an integrated SWM system. Development efforts will fail, even if they are supported with substantially increased funding, if the development of sustainable capacity is not given greater and more careful attention. This is now widely recognized by donor organizations and partner countries alike, as articulated in the 2005 "Paris Declaration on Aid Effectiveness" ;
- Poor dissemination of information and knowledge management ;
- Lack of sufficient public awareness and participation of the population in the SWM sector ;
- Decision-makers are generalists rather than technical specialists ;
- Insufficient South-South and North-South-cooperation and know-how transfer.

Developing comprehensive and effective systems of knowledge management at a national as well as at a regional scale remains central to the effective environmental management of the Mediterranean region. With internet increasingly available, networks such as the SWEEP-Net network will help to ensure that valuable knowledge is being linked via websites and that potential users know where and how to look for information.

Training and capacity building activities may be conducted by the following means:

- Training workshops and e-learning activities ;
- Technical and advisory services ;
- Field missions and technical visits ;
- Development of guiding documents, studies, tools for decision makers ;
- Regular reports on waste management ;
- Support of awareness campaigns ;
- Promoting South-South and North-South cooperation and know-how transfer.

Solid waste networks (such as SWEEP-Net network) could play an important role in training and capacity building.

One of the drivers for the success of the capacity development programs is the strong commitment to transition into a knowledge society in Lebanon.

2.10. NATIONAL INITIATIVES MULTI STAKEHOLDER EXCHANGE

No national initiatives are currently in place for multi-stakeholder exchange; however, with the absence of a legal framework, the CoM's strategies or directives form the main driver for all stakeholders. Approving the SW law would be considered as the national initiative to organize the sector and is considered as the national initiative in this regards.

2.11. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

The case study of Tunis that was studied part of the SWEEP-NET working group on fiscal finance and economic aspects was very interesting. Tunis was able to put in place a polluter payer principle tax (5%) on several products that may produce waste. The tax is directly collected by the Ministry of Finance and used to finance 80 % of the operation of SW treatment facility; the remaining 20% is covered by the local communities. Lebanon should benefit from such experience and try to apply a cost recovery system within the same direction, in addition to encouraging waste reduction as one of the most important approaches towards an integrated solid waste management system.

Case Study 1: Integrated Solid Waste Management in Zahleh

Project:

The project consists of collecting about 180 tons of municipal waste from some municipalities in the district of Zahleh, sorting the waste to remove the recyclable materials, landfilling the refuse in the adjacent sanitary landfill. The gas coming out from the landfill is being flared and the leachate is collected and treated. The collection and treatment of wastes is contracted to the private sector at competitive prices (for details of prices, refer to other sections of the report). The implementation of the landfill

site in Zahleh has been successful through a process that included public awareness, consultation and participation, but also the strong support of the local politicians and authorities.

Lessons learned:

- Municipalities can have a success story in SWM independently from the government ;
- Viability of any SWM project necessitates the commitment and support at both the national and local levels ;
- Collection could preferably be the responsibility of the municipalities (while encouraging contracting with the private sector) ;
- Low cost per ton of sorting and landfilling as compared to other areas in Lebanon, due to proper competitive contracts with the private sector ;
- Make use of all the funds and loans provided to the municipalities from various donors like the EU, USAID, YMCA, World Bank, etc., in an orderly manner compatible with the local needs and priorities.

Recommendations:

- Allow the municipalities, such as Zahleh, to create a cost recovery system to be able to pay all the operation, maintenance and construction costs in the future ;
- Ensure political and municipal commitment for SWM projects ;
- Possibility of adopting similar project schemes for other municipalities or unions of municipalities ;
- Give such municipalities financial and legal incentives to start awareness campaigns on sorting at the source first and then composting, since the project is in the midst of agricultural lands.

References:

Mr. Joseph Diab Maalouf – President of the Municipality of ZahleMaalaka.

Mr. Assaad Zgheib – former president of the municipality.

Case Study 2: Solid Waste Management in Saida

Project:

In the aim of replacing open dumping which has always been undertaken in the city of Saida (existing dump at the shore), a private company has built a treatment plant for a max capacity of 300 tons/day (possibly extendable to 450 tons/day) to treat the waste collected from the district of Saida and Jezzine (under a BOO contract) in return of a tipping fee per ton of waste. The plant is composed of a sorting phase, an anaerobic digester and an open area for compost maturation. This plant is however not operational yet mainly due to contractual and financing problems. It is to be noted that the construction of the project has faced many difficulties, suspensions and delays, and consequently induced delays in the start of operation. This was mainly due to the lack of prior agreement with the concerned municipalities (other than Saida), the lack of capacity of the municipalities to pay the set tipping fees, as well as the lack of a law prohibiting the disposal of waste in a haphazard manner in regions where a proper treatment system already exists hence obliging the municipalities to transport their waste to the treatment system. This problem is currently under negotiation between the concerned authorities and the operator for finding the appropriate solutions.

Lessons learned:

Although it is a proven technology abroad (constructed by a German firm, with its operation foreseen to be supervised by the same firm), this technology is not yet tested in Lebanon, particularly in the absence of sorting at the source. A commissioning period was done during 2013 and the result should be disseminated to grasp the needed experience;

The absence of prior agreement with the various municipalities to be eventually served by the facility, of a legal framework on SWM as well as of a cost recovery system has created contractual difficulties ;

The municipalities, mainly the small ones, cannot afford to pay for the treatment of their waste using this kind of treatment, particularly in the absence of a cost recovery system.

Recommendations:

- A new contract should be signed with all the municipalities involved ;
- Locate a new site for the disposal of inert materials preferably before starting the operation ;
- Assist in the preparation of typical contracts with the private sector.

References:

- Environmental impact assessment presented to the MoE.
- Environmental audit prepared and presented to the MoE.
- Reference: Name: Ghassan Firzli – Institution: IBC – Position: Project manager – Mob: 00961 3 682417 – Fax: 00961 7 736184 – email: g-ferezli@ibc-enviro.com

Case Study 3: Small Community Based Composting Plants**Project :**

11 small community based composting plants were built in selected municipalities throughout Lebanon, particularly in the south. They were funded by the Non-Governmental Agencies (NGOs) "Young Men's Christian Association" (YMCA), "Pontifical Mission" (PM) and "Creative Associates International Inc." (CAII) with the aid of finance from United States Agency for International Development (USAID). The execution of the plants has been undertaken by the private sector. The operation of the majority of the plants is carried out by the municipalities themselves.

Lessons learned:

- Some of the plants suffer considerable operational problems which are due to technical failure in the systems, or to financial, institutional and/or legislative barriers ;
- The absence of sorting at the source as well as proper sorting and refining units at the plant is a major obstacle for the production of good quality compost and hence its marketability ;
- Some of the municipalities do not have the technical capacity for the proper operation of the plant ;
- The small scale of the plants would not allow to develop economies of scale that would reduce overall costs and would also focus available technical expertise on fewer facilities for which higher levels of performance would be feasible ;
- The rushed planning of the aids implementation for some of the plants is one of the problem.

Recommendations:

- Support of specific campaigns for promoting sorting of wastes at the source in the household, in a pilot village which already disposes of a composting treatment plant, hence clearly illustrating the correlation between sorting at the source and the improvement of the SWM in general and compost quality in particular ;
- Assist in marketing of compost ;
- Encourage contracting operation to private sector ;
- Better planning of bilateral arrangements and aids, in order to ensure that the SWM technologies and projects are in line with the priorities and strategies of the GoL as well as the local conditions, in the aim of ensuring a better effectiveness of these aids.

References:

- Evaluation Report - Rural Material Recovery and Composting Facilities In Lebanon - Output of Short Term Input From 15 September To 14 October 2004 - Submitted to the Ministry of Environment of the Republic of Lebanon - Project MSC IPP Environment - MVV Consultants and Engineers - Berlin, October 2004.

Lebanese experience with SWM has provided for a range of lessons learned at the various SWM components, which would, when properly assessed and taken into due consideration, lead to an improvement in the SWM sector. These are categorized here below:

Table 5: Lessons learned

Solid Waste Management Component	Lesson Learned
Policy, Legislative, Institutional	<ul style="list-style-type: none"> • The political will to consider SWM as a priority on the national agenda is essential • Establishing a legal framework for SWM tackling technical, institutional and financial aspects is of utmost importance • Increasing the number of staff at the MoE is essential for ensuring adequate monitoring of the SWM system in the country • Well-established leadership and proper coordination between all the related institutions and administrations are vital for ensuring the successful implementation of a SWM strategy • The municipalities lack the human resources and technical skills for management of SW treatment facilities
Planning	<ul style="list-style-type: none"> • Setting up agreed upon plans and strategies between public administrations (CDR, MOE, municipalities, union of municipalities, ...) is a key element of any successful SWM system • Defining both a short term and a long term strategy with clear timeframe is needed to avoid resorting to emergency plans • Good plans requires transparency and cooperation with the local communities
Financing and Cost Recovery	<ul style="list-style-type: none"> • Creation of sustainable cost recovery systems relying on “polluter pays” principle is vital • Financial reinforcement of the municipalities is required to give them the possibility of playing their key role • Proven diverse competence among the private sector is essential to enhance competitiveness and achieving better services at better prices • Creation of incentives for municipalities is essential to encourage them to participate in SWM and host waste treatment facilities.

Private Sector Participation	<ul style="list-style-type: none"> • Good service can be achieved by the private Sector, as it is in the case in Zahleh and at acceptable prices, with open, transparent and competitive procedures. • Inadequate contract terms lead to consequent problems • Privatization by the municipalities of the collection system is beneficial
Public Awareness and Public Participation	<ul style="list-style-type: none"> • Sharing all the strategies and plans with the public and communities is a key factor in creating a circle of trust between them and the government • Sorting at the source can be very helpful for the improvement of the quality of compost and the increase of recyclables
Technology Application	<ul style="list-style-type: none"> • The adaptability of the treatment technology selected to the general characteristics in Lebanon and specific characteristics of each region is of major importance, particularly concerning the following factors: economic aspects, social aspects, financial level, type of waste, possibility of application of sorting at the source, density of population, land availability, presence of agricultural areas, marketability of compost, etc.). • Considerable operational problems may be suffered in small community based projects, due to technical failure in the systems, or to financial, institutional and/or legislative barriers.

2.12. UPCOMING INITIATIVES

No major initiatives are foreseen in the coming short period. However, some ideas are discussed in between the MoE and MoF on putting together a financial scheme and cost recovery system regarding SWM in Lebanon. The scheme was addressed with various alternatives through the preparation of the draft Law.

3. INDUSTRIAL & HAZARDOUS WASTE MANAGEMENT

3.1. LEGAL AND INSTITUTIONAL FRAMEWORK

The current legal framework for hazardous waste is primarily defined as follows:

- Hazardous wastes are regulated under Law 64 dated back to 1988 ;
- Lebanon has ratified one main international convention dealing directly with the issue of hazardous waste, the Basel Convention on the control of trans-boundary movements of hazardous wastes and their disposal ;
- Decisions on industrial wastes management issued by the MoE concerning the required environmental conditions to be respected by the industries.

The MoE is relying on the classification referred to in the Basel Convention and is using the characteristics of the hazardous waste mentioned therein to give permits for the import of materials into Lebanon. The materials types are classified into 3 lists as follows:

- Green list; containing the non-hazardous materials that are acceptable and can be imported into Lebanon ;
- Orange list; containing some hazardous materials with a possibility of recycling them ;
- Red list; containing all other hazardous waste, such as lead, zinc, fly ashes, asbestos, etc. .

It is to be noted that all materials listed in the orange and red lists are not allowed to be imported in Lebanon (even if these materials are considered as raw materials for local industry).

On the other hand, hazardous waste management is addressed in Law number 64/88 on the protection of the Environment from pollution generated from hazardous waste. Nevertheless, this law is not enforced yet.

During 2012, two major decrees were enacted by the government which are:

- Decree 8471/2012 on “environmental compliance for establishments whereby starting end of 2015, each establishment should submit an environmental audit report confirming their environmental compliance to the MoE. The MoE, after approving the report will issue an “Environmental Compliance Certificate” that should be revised every 3 years ;
- Decree No. 8633/2012 on “Fundamentals for Environmental Impact Assessment” where each industry should prepare either an Initial Environmental Examination (IEE) report or an Environmental Impact Assessment (EIA) study for any construction, relocation, modification, addition, expansion, rehabilitation or decommissioning -of any existing licensed private project- which may result in significant environmental consequences and submit it to MoE for approval. According to Article 5 of this Decree:
 - If the proposed project falls in the domain of Annex 1 of the Decree No. 8633/2012, it will be subjected to an EIA study according to information contained in Annex 8 of the same decree;
 - If the proposed project falls in the domain on Annex 2 of the Decree, it will be subjected to an IEE as per information contained in Annex 6.

Accordingly the studies conducted should clarify the industrial waste management within the industry; however, the draft solid waste law tackles this issue in at least forcing the separation of industrial waste from the municipal solid waste stream.

3.2. STRATEGIES AND PLANNING

Without a legal and institutional framework, no strategies and planning initiatives can be adopted. The organization of any sector should start with the implementation of the creation of the legal frameworks that would result in the implementation of specific institutional rules leading to the preparation of national strategies and policies. In accordance with decree 8471/2012 which is the compliance decree, the Minister of the Environment in close coordination with the Minister of Industry will set deadlines for complying to the decree for each of the industrial sectors.

3.3. FINANCING

From the central government, no financing schemes are foreseen. However, some municipalities such as the municipality of Zouk Mosbehtry to force the industries within its cadastral boundaries to be fully in charge of the management and safe disposal of the industrial and hazardous waste generated at their facility.

3.4. COLLECTION, TREATMENT AND DISPOSAL

Most industries in Lebanon are light manufacturing industries, mainly belonging to eight branches only: food and beverage (20%), fabricated metal products (16%), non-metallic mineral products (12%), furniture (11%), clothes and dyeing fur (10%), wood products (10%), leather products (6%) and textiles (4%) [Reference: "Treatment and Disposal of Municipal Solid Waste in Lebanon – Request for Proposals – October 2004 – Part IV – Project Information Memorandum – FITCHNER"].

Wastes generated by industries can be classified into 2 main categories:

- Non-hazardous wastes having similar characteristics to the municipal wastes;
- Industrial wastes having the characteristics of hazardous wastes as referred to in the Basel convention.

It is however essential to note that, in the absence of a well-defined legislation and more stringent controls, most of the industrial and hazardous wastes are being mixed with the municipal wastes and collected in waste collection trucks.

Table 6: Generation of industrial solid waste by source and category in Lebanon

Category	Source / Type	Quantity (ton/year)	Remarks
Hazardous waste	Pesticides manufacturing	326	Mainly packaging waste and sludge contaminated with pesticides
	Industrial waste containing heavy metals	1,166	From waste paper recycling, printing, ceramics industry (pigments), metal galvanizing, non-ferro metal recycling
	Industrial oily waste	1,018	Residues from waste oil recycling, oily sludge, residues from solvents recycling
	Industrial paints, resins, dyes, adhesive residues	536	Mainly from paint, and wooden and metal products manufacturing
	Polychlorinated biphenols (PCBs)	40	
	Tanneries	250	Hazardous due to chromium content
Sub-total		3,338	
Non-Hazardous waste or recyclable waste	Various process waste with heavy metals contents below hazardous waste limits	1,292	Scrap leather, wood and paper waste, waste from textile, printing and ferro-metal industry
	Sludge from asbestos/cement manufacture	2,400	Dumped at private landfills
	Used lubricating oils	10,000	
	End of life vehicles	6,300	Recyclable parts
	End of life vehicles	700	Non-recyclable parts, this can be hazardous waste depending on the type of car dismantled
	Industrial mixed waste (non-process related)	20,000	
	Car tires	14,000	
Sub-total		54,692	
Construction and Demolition waste	Ceramic industry (tiles, flags), cement industry	73,000	Around 71,000 tons/year of this waste is dumped at private landfills (cement industry)
Putrescent waste	Food and beverage manufacturing	17,820	
	Slaughterhouses	40,000	
Total		188,850	

(Reference: FITCHNER, CDR, Lebanon, "Treatment and Disposal of Municipal Solid Waste in Lebanon – Request for Proposals – Part IV – Project Information Memorandum", October 2004)

Industrial and hazardous waste are being mixed with municipal solid waste for the exception of some industrial zones required by the municipalities to properly manage their own waste. From a general strategic point of view, industries could join efforts to create industrial waste treatment facilities which could be an action supported by the central government. However, the central government should play the lead role in monitoring, raising awareness and enforcing the implementation of pollution abatement measures at the level of industries.

3.5. PRIVATE SECTOR INVOLVEMENT

In general, most industries are owned or managed by the private sector and thus the private sector is fully involved. In private self-motivated initiatives or upon complaints driven approaches from surrounding citizens, some industries tend to separate and treat their own waste such as Hawa Chicken slaughterhouses, Sanita, etc. .

3.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

No documented case studies are reported, however, an initiative by the municipality of Zouk Mosbeh was reported on enforcing the industries in properly/safely managing and creating their generated industrial waste.

3.7. UPCOMING INITIATIVES

No initiatives are foreseen in the near future regarding industrial and hazardous waste management. This issue should be further addressed at the national level after the approval of the solid waste Law. Some actions/initiatives shall be taken once the Compliance decree with its deadlines are enforced by the government.

4. MEDICAL WASTE MANAGEMENT

This section is based on the “Report on Demonstrating and Promoting Best Techniques and Practices for Reducing HCW to Avoid Environmental Releases of Dioxins and Mercury” dated April 2010 (Study financed by UDPD and GEF to the benefit of the MoE).

Wastes generated by health care activities include a broad range of components, which can cause, if poorly managed, a wide range of adverse health and environmental impacts. It is hence essential to segregate health care wastes (HCW) at the point of generation, treat them appropriately and then dispose of them safely.

Management of HCW had initiated, in the last few years, many debates in terms of choosing environmentally sound treatment technologies. Incineration, a method that has long been adopted worldwide, is becoming less desirable considering the amounts of dioxins, furans and other toxic air pollutants that may be produced as emissions and/or in bottom or fly ash. With the increased availability of alternative treatment methods nowadays, shifting toward the adoption of cleaner treatment technologies seems a more responsible choice.

Unfortunately, Lebanon is still considered as one of the countries that lack adequate and well-operated infrastructure for management and disposal of HCW, although significant progress has been identified during the recent years. As a result, unresolved environmental problems has been accumulating for years now, which lead to major issues such as

- 1) Increased air pollution due to indiscriminate burning of the waste; and
- 2) Water and soil pollution due to inappropriate disposal of health care effluents and wastes.

4.1. LEGAL AND INSTITUTIONAL FRAMEWORK

The health care sector is considered one of the biggest and most developed service providing sectors in the country, and it is primarily dominated by the private sector. More than 90% of the hospitals in Lebanon are operated by the private sector. The number of healthcare facilities is shown in table 7.

Table 7: Number of health care facilities (HCF) in Lebanon

Reference	Number	Healthcare Facilities
Syndicate of Hospitals, 2009	15	Private hospitals (Long stay)
Syndicate of Hospitals, 2009	129	Private hospitals (Short stay)
Ministry of Public Health, 2009	30	Public hospitals
Syndicate of Biologists, 2006	171	Private Medical Laboratories
Syndicate of Biologists, 2006	110	Medical Laboratories in hospitals
Syndicate of Biologists, 2006	25	Blood Banks
Lebanese Dental Association, 2008	3,807	Practicing Dentists
Ministry of Public Health, 2009	118-133	Primary healthcare centres
Ministry of Public Health, 2009	900	Dispensaries
Syndicate of Pharmacists, 2009	2,130	Pharmacies
(CDR & ERM, 1998)	680	Dental laboratories
(CDR & ERM, 1998)	100	Veterinarians

In accordance to the decree 8006 dated 2002, all medical institutions are responsible for the management of its generated medical waste. In 2011, the government through the MoE tried enforcing that decree with continuous follow up with all these medical institutions (mainly hospitals).

Hazardous wastes are regulated under Law 64 dated back to 1988. Recently, Lebanon has enacted key legislation on Health Care Waste Management - Decree 8006 (dated 11/06/02) amended through Decree 13389 (30/09/04). This decree classified the different HCW categories and addressed their relative disposal conditions.

Table 8. Summary of the Lebanese legal framework in relation to the health care waste management

Legal Text	Date	Title
Law 64	1988	The law of Environmental Preservation Against Harmful and Hazardous Waste Pollution
Law 387	1994	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
Law 444	2002	The Framework Law for the Protection of the Environment
Decree 8006	2002	Determination of the Categories of Health Care Waste and Ways of Disposal off
Law 432	2002	Stockholm Convention on Persistent Organic Pollutants
Decree 13389	2004	Amendment of the Decree 8006/2002

4.2. STRATEGIES AND PLANNING

The permitting mechanism for infectious healthcare waste treatment facilities was established by Decree 13389. According to this decree, HCWM should be treated before disposal of at specialized treatment facilities, licensed by the MoE.

It is important to highlight that the Lebanese legal framework is still lacking environmental guidelines for the establishment and operation of HCWM treatment facilities and for the licensing of HCWM transportation vehicles. Moreover, the quarterly reports submitted by licensed healthcare waste treatment facilities are not unified and there is a need to have a consistent reporting system for better monitoring and analysis.

4.3. FINANCING

Since it is their responsibility the medical institutions finance the treatment of the medical waste whether performed at the institution or elsewhere. Having a centralised treatment approach can reduce the cost paid by each institution.

There has been some projects intending on assisting some municipalities and health care establishments for the treatment of medical waste. Support on this was through the construction of a medical waste treatment facility in Abassieyh by OMSAR and through a project for training and awareness implemented by MoE and UNDP.

4.4. COLLECTION, TREATMENT AND DISPOSAL

The quantity of healthcare (risk and non-risk) wastes generated in Lebanon is presented in table 8. Estimated hospital risk and non-risk waste generation in Lebanon (Tons/Day)". It is however to be noted that, after treatment, the disposal of medical wastes is carried in the municipal waste bins.

Table 9. Estimated hospital risk and non-risk waste generation in Lebanon (tons/day)

Year	Hospital risk waste	Hospital non-risk waste	Total
1998	10.81 ⁽¹⁾	43.24	54.05
2000	11.32	45.28	56.60
2005	12.46	49.84	62.30
2010	13.81	55.24	69.05

(1) This estimate has been based on an average hospital risk waste generation of 1.5 kg per day per occupied bed.

Source: [CDR & ERM, 1998]

In recent years, Lebanon has made significant progress in Health Care Waste Management (HCWM). In 2003, HCW treatment started with two service providers; Arc en Ciel (AEC), and EnvSys. AEC is a Lebanese NGO that began providing HCWM services in 2003. It purchased and installed a wet-type autoclave in Hotel Dieu Hospital in Beirut, one of Lebanon’s largest private hospitals. Hotel-Dieu de France treatment facility currently treats the wastes generated solely by the facility. EnvSys, a Lebanese company specialized in HCWM, operated autoclaves on mobile units servicing hospitals. Recently, AEC bought the two mobile units of EnvSys and stabilized them in two locations: one in Zgharta (north Lebanon) and the other in Jisr El Wati (Beirut) The unit cost for the transportation and treatment of HCW ranges between 0.55-0.60 US\$/kg as charged by AEC.

In 2004 and 2005, the MoE granted 3 licenses for healthcare waste treatment by incineration; however, these licenses were not renewed till date. The other 7 licenses issued by MoE are for HCW treatment facilities using autoclaves.

Currently, there are two on-site (located at Clemenceau Medical Centre (CMC) and Haykal Hospital) and five off-site operating autoclaving/microwaving treatment centres distributed all over the country. All the off-site treatment centres are operated by AEC.

Table 9 presents the number of healthcare facilities treating their infectious wastes according to MoE licenses. MoE is currently revising five Environmental Impact Assessment (EIA) reports for potential new non-burn treatment facilities.

Table 10. Healthcare facilities treating their infectious wastes

	Private Hospitals (Short-stay)	Public Hospitals	Private Medical Laboratories
Total Number	171	30	129
No. of HCF treating their wastes	3	6	42
% of HCF treating their wastes	2%	20%	32%
No. of Beds (Effective)		1255	9667
No. of Beds with treated infectious wastes		612	4532
% of Beds with treated infectious wastes(effective)		49%	47%

Hospitals wishing to install a waste treatment unit need to get the MoE (MoE) approval first by conducting an Environmental Impact Assessment.

In an effort to formalize environmentally sound HCWM practices, MoE with the assistance of the EU and UNDP published in 2002 an “Environmental Auditing Manual for Hospitals” that aims to (i) assess compliance with government legislation, regulations and guidelines; (ii) assess adherence to internal policies and procedures; and (iii) identify areas for improvement to minimize the adverse impacts related to HCWM.

Development partners have already committed funds for waste treatment technology. AEC has received a grant from the EU Life Third Countries program to install an autoclave in the Mohafaza of Mount Lebanon (€450,000); the EU has also approved funding for two HCWM projects in the Mohafaza of southern Lebanon (Abbasiyeh, €342,000) and Mount Lebanon (Chouf Suwajjani, about €220,000) through a program with the Office of the Minister of State for Administrative Reforms (OMSAR); the Spanish Agency for International Development (AECI) has funded a HCWM project in the Mohafaza of southern Lebanon (Saida) that will be operated by AEC. These initiatives, plus the treatment facility at Hotel Dieu in Beirut, provide a cluster approach to HCW treatment by servicing a group of hospitals.

The MoPH has developed accreditation standards and guidelines for acute hospitals in Lebanon grouped into 38 discrete sections; section 38 addresses waste management and contains 8 standards. The weight of any single section has little overall significance on the accreditation system - i.e., a hospital may fail the waste management section and yet score well overall.

Hospitals are reluctant to pay for waste treatment. Whether they can afford it or not, hospitals are not accustomed to the notion that the “polluter pays” and need to be made aware of their environmental responsibility. Enforcement of basic HCWM practices will require incentives and good will. Any given hospital has the option of buying the service from a local service provider or buy and operate its own unit on site.

Existing waste treatment technologies are not adequately monitored. The efficiency of waste treatment using autoclaves has not been assessed.

The initiative of the MoE concentrates mainly on adopting the autoclaving alternative for treatment of medical waste. As 95% of the medical waste can be treated through the autoclaving technique; therefore, the MoE is more in favour of adopting this technology as compared to incineration. The autoclaving would result in non-infectious inert materials that can be disposed in sanitary landfills.

According to local legislations, the responsibility of regulating the HCW sector was distributed among a number of authorities namely, MoE, MoPH, MoIM and CDR. The following Table 11 lists the different public administrations responsible of regulating the HCW and summarizes their duties in this domain.

Table 11: List of the main stakeholders responsible of regulating the HCWM sector

Stakeholder	Responsibility
Ministry of Environment	Responsible for legislation, licensing and monitoring
Ministry of Public Health	Responsible for studying the health impact of any waste management program Governs the hospital accreditation program
Ministry of Interior and Municipalities	Municipalities are responsible for providing waste collection and disposal facilities. HCW treatment plants are granted a license from the Governorate based on the MoE license. Internal Security Forces are responsible of Law enforcement
Council for Development and Reconstruction	Monitors the execution of major projects endorsed by the government

Other stakeholders that might be involved with the HCWM include the syndicate of private hospitals, UNDP, WHO, GEF, AEC, Universities, the Order of Physicians, the Order of Dentists, the Syndicate of Medical Laboratories and the Syndicate of Dental Laboratories.

Most of treated medical waste is being disposed at the available close by landfill or dumpsite which is an acceptable approach. However, all medical waste should be properly treated and disposed, so the MoE should keep forcing the institutions to abide by the related decree. Arcenciel (a Lebanese NGO) has been

very active in this field and provided collection and treatment (autoclaving) for medical waste generated from hospitals in several regions from Lebanon.

4.5. PRIVATE SECTOR INVOLVEMENT

According to MoE, most of the medical waste generated by the institutions is being collected and treated by the private sector (mainly autoclaving). According to MoE, the role of the private sector involvement is to centralize the treatment especially in the urban areas, where most of the medical institutions are located, which will lead to reducing the cost and improving the quality of service.

4.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

The MoE has taken the initiative to have 2 case studies as pilot project to work with two hospitals (Hammoud hospital in Saida and Nabatiyeh governmental hospital in Nabatiyeh) on applying the best practices and environmental management (waste sorting at source, management, trainings, etc...). In the near future, these two pilot projects will be generalized on all the interested hospitals.

4.7. UPCOMING INITIATIVES

No initiatives will be foreseen in the near future, but the pilot projects will be applied in other medical institutions.

5. GREEN WASTE & AGRICULTURAL WASTE

This section could not be developed in similarity to previous sections since the green and agricultural waste is considered as MSW and is treated similarly.

5.1. LEGAL AND INSTITUTIONAL FRAMEWORK

No information available.

5.2. STRATEGIES AND PLANNING

No information available.

5.3. FINANCING

No information available.

5.4. COLLECTION, TREATMENT AND DISPOSAL

No information available.

5.5. PRIVATE SECTOR INVOLVEMENT

No information available.

5.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

No information available.

5.7. UPCOMING INITIATIVES

No information available.

6. PACKAGING WASTE

6.1. LEGAL AND INSTITUTIONAL FRAMEWORK

No information available.

6.2. STRATEGIES AND PLANNING

No information available.

6.3. FINANCING

No information available.

6.4. COLLECTION, TREATMENT AND DISPOSAL

The paper recycling industry is operating with a general minimum capacity of around 150,000 tons/year of sorted papers and cardboards from existing operational sorting facilities and directly from various sources and scavengers.

Through personal communications with the paper industries, following are the numbers reported by the paper and recycling industry for 2012:

Table 12: Paper recycling industry activities

Industry	Source Sorted and Scavengers	Healthcare Facilities
Sicomo	12,000	54,000
Mimosa	7,000	
Sipco	15,000	
UNIPAK	10,000	
Solicar	18,000	55,000

6.5. PRIVATE SECTOR INVOLVEMENT

No information available.

7. CONSTRUCTION & DEMOLITION WASTE

This section could not be developed in similarity to previous sections since the construction and demolition waste (C&D) waste is considered as MSW and is treated similarly although in Beirut and Mount Lebanon, C&D waste is normally requested to be collected separately and is taken to the Bsalim landfill (within Beirut and Mount Lebanon region) along with other type of materials that are considered as inert materials.

However, in many locations in Lebanon, most of the construction and demolition waste is being dumped in open spaces such as rivers and valleys. In few cases, this type of waste is used a backfilling materials in landfills or other constructions sites (behind retaining walls or similar activities).

7.1. LEGAL AND INSTITUTIONAL FRAMEWORK

No information available.

7.2. STRATEGIES AND PLANNING

No information available.

7.3. FINANCING

No information available.

7.4. COLLECTION, TREATMENT AND DISPOSAL

No information available.

7.5. PRIVATE SECTOR INVOLVEMENT

No information available.

7.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

No information available.

7.7. UPCOMING INITIATIVES

No information available.

8. WASTE TYRES

This section could not be developed in similarity to previous sections since the wasted tyres waste is considered as MSW and is treated similarly. It should be noted in some cases, tire shredders are installed (such the case of Zahle centre for solid waste treatment) whereby the resulting shredded tires are used as drainage materials during the construction and extension of the sanitary landfill.

There have been recently some private initiatives to build factories for the treatment of used tyres which will allow for the recycling of the extracted metals and use of rubber as fuel source.

8.1. LEGAL AND INSTITUTIONAL FRAMEWORK

No information available.

8.2. STRATEGIES AND PLANNING

No information available.

8.3. FINANCING

No information available.

8.4. COLLECTION, TREATMENT AND DISPOSAL

No information available.

8.5. PRIVATE SECTOR INVOLVEMENT

No information available.

8.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

No information available.

8.7. UPCOMING INITIATIVES

No information available.

9. OIL & LUBRICANTS WASTE

This section could not be developed in similarity to previous sections since no studies were conducted to address the status of collection and treatment of oil and lubricants waste.

9.1. LEGAL AND INSTITUTIONAL FRAMEWORK

No information available.

9.2. STRATEGIES AND PLANNING

- No information available.

9.3. FINANCING

No information available.

9.4. COLLECTION, TREATMENT AND DISPOSAL

No information available.

9.5. PRIVATE SECTOR INVOLVEMENT

No information available.

9.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

No information available.

9.7. UPCOMING INITIATIVES

No information available.

10. E-WASTE

This section could not be developed in similarity to previous sections. A local NGO called Beatoona has been involved since 2009 in collecting E-waste from various private and public institutions. After segregation, this waste is shipped to France for treatment and/or disposal.

10.1. LEGAL AND INSTITUTIONAL FRAMEWORK

No information available.

10.2. STRATEGIES AND PLANNING

No information available.

10.3. FINANCING

No information available.

10.4. COLLECTION, TREATMENT AND DISPOSAL

No information available.

10.5. PRIVATE SECTOR INVOLVEMENT

No information available.

10.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

No information available.

10.7. UPCOMING INITIATIVES

No information available.

11. INTERNATIONAL FINANCIAL ASSISTANCE PROGRAMS (BI-, & MULTINATIONAL)

Assistance programs normally provide training, workshops and capacity building such as the H2020 initiative where several workshops related to solid waste management were organized in Lebanon and throughout the Mediterranean countries.

12. INTERNATIONAL ASSISTANCE PROGRAMS (BI-, & MULTINATIONAL)

TECHNICAL ASSISTANCE PARTNERS AND DONORS

A wide range of international organizations and donors are participating in the sector in the country. A number of projects address different approaches for recovering value from waste, and some address aspects of hazardous waste management relevant to the SWM sector.

The activities and projects are mainly focused on the following sectors:

- Feasibility studies for SWM projects, dumpsites rehabilitation, marketing of compost, etc. ;
- Development of national strategies and legal/institutional framework for SWM ;
- Provision of infrastructure for solid waste collection ;
- Closure of existing dumps ;
- Execution of SW treatment facilities (sanitary landfills, sorting and composting plants, biogas collection and treatment systems, etc.);
- Strengthening and developing the capacity of stakeholders at the national levels, such as the MOE as well as at the local level such as municipalities ;
- Awareness programs to population (such as to encourage local inhabitants to implement sorting at the source).

H2020 (CB/Med) continues to support the MoE in providing training workshops for different stakeholders in SWM sector. Most of the participants were nominated from the concerned municipalities or ministries.

One of the workshops organized and financed by the H2020 was a mission/training of 11 participants from concerned ministries, Parliament, environmental press, etc. to visit several operating WtE facilities in The Netherlands.

Furthermore, a training workshop on composting techniques and benefits was organized in Egypt during December 2010 that was attended by several participants from national institutions.

13. NEEDS ASSESSMENT FOR CAPACITY DEVELOPMENT UNTIL 2015

It is expected that the H2020 (CB/Med) will continue providing technical support until 2013. There is a need for capacity building at the national level for two main issues:

- WtE alternative treatment options, and
- Adoption of a cost recovery system for solid waste management.

Two trainings on WtE will be organized under the H2020 (CB/MED) in March and April 2014. The purpose of the first workshop is introducing WtE to relevant Lebanese stakeholders while the second workshop is intended to include detailed discussions amongst stakeholders.

14. CONCLUSION & RECOMMENDATION FOR SWEEP-NET ASSISTANCE

As a regional network, SWEEP-NET can provide significant technical support to participating countries by sharing information, success stories and cases studies that may apply in other countries. The SWEEP-NET can provide access and contact information to experts and professionals in the field of SWM as well as other related networks.

The SWM should become one of the main priorities at the decision makers level since the cost of environmental degradation caused by bad practices in SWM is raising every year significantly. The SWEEP-NET can provide assistance in raising awareness and addressing the issue at the highest levels in different countries and probably at the League of Arab Countries.

OPPORTUNITIES OF NETWORKING AND PARTNERSHIP

Information and knowledge amongst residents and stakeholders are important for efficient and sustainable development in the SWM sector. The poor dissemination of information and knowledge sharing between the various stakeholders, the lack of clear definition of responsibilities in the public sector due to the absence of legal/institutional framework, the poor coordination between the stakeholders, the lack of sufficient capabilities at both the national and municipal levels, the lack of sufficient political support to the SWM sector, as well as the lack of sufficient awareness and community participation in the SWM sector have been key factors hindering the setting up of an efficient SWM in Lebanon, and have given rise to the need for the establishing of networking such as the SWEEP-Net network. The benefits of networking can be well recognized amongst members and stakeholders, and can be witnessed in the contribution to a more sustainable development of the SWM sector.

The opportunities for activities and projects that the SWEEP-Net network is targeting shall be mainly based on the following criteria:

- Are in compatibility with the strategy/priorities/actions of Lebanon ;
- Reflect a critical demand of the country, not a need of a person or a particular decision maker ;
- Have a regional dimension: opportunity can be transferred and adapted to other countries in the MENA region ;
- Can serve as a case study for the MENA group of countries ;
- Are limited in time and resources ;
- The recommendations concerning the main opportunities and priorities for actions of the SWEEP-Net network in Lebanon, based on the results of the national workshop which has been held on June 1st 2010, are summarized in table 13 herebelow.

Table 13: Recommendations concerning main opportunities and priorities for actions of the SWEEP-Net network in Lebanon

Solid Waste Management Component	Recommendations concerning main opportunities and priorities for actions of the SWEEP-Net network in Lebanon
Policy, Legislative, Institutional	<ul style="list-style-type: none"> - Set a campaign for positive lobbying and pressure on decision makers for the approval of an integrated SWM framework (policy, legal, institutional), of a national specific strategy and plan which obtain the consent of the various parties, and for taking the necessary decisions and actions - Set a campaign for participation in the decision making process - Preparation of an evaluation report concerning the proposed draft law on integrated SWM, and applicable decrees - Participation in finalizing the applicable decrees necessary for the implementation of the Integrated Solid Waste Management law following its approval, in the aim to ensure a sustainability of the system (cost recovery, institutional, etc) - Intervention in the decision making process, in setting the plans and strategies in the SWM sector (from their early stages) through eventual representation of the network in the SWM Board, which will be responsible for the waste management in Lebanon in conformity with the proposed draft law on ISWM - Campaigns and workshops for capacity development at both the national and the municipal level in the various technical and administrative sectors (mainly contracting the private sector and managing private sector contracts) - Organization of workshops aiming to strengthen the experience of consultants and operators in specific fields
Planning	<ul style="list-style-type: none"> - Preparation of an evaluation report concerning the previous strategies and plans of the government, in order to better set future strategies and plans - Preparation of an evaluation report concerning the strategies and plans foreseen by the government in the aim of : <ul style="list-style-type: none"> - Identifying the eventually needed adjustments and modifications (mainly in terms of appropriate selection of waste disposal sites and technologies), taking into consideration the specific characteristics and differences between the regions of Lebanon (economic aspects, social aspects, financial level, quantity and type of wastes, environmental aspects, type of waste collection and the possibility of application of sorting at the source in the future, density of population, land availability, presence of agricultural areas, marketability of compost, political aspects, acceptance of the population, etc.) - Providing the decision makers with the power of persuasion - Set-up, following the preparation of the evaluation report, a meeting with the Minister of Environment and the governmental committee for SWM, as well as their support staff, to discuss the foreseen strategy and the corresponding evaluation report - Monitoring, in the medium and long term, the future implementation of the strategies, and preparation of an evaluation report in this respect, in order to identify the eventual gaps and needed adjustments and ameliorations - Study to set a priority list for closure of existing dumps, establishing the 10 most important ones to close - Study for rehabilitation of a selected priority dump which already disposes of a solid waste treatment facility (such as Sour) - Allowing Lebanon to benefit of the Carbon financing, through a study to identify the necessary steps, through workshops for decision-makers, through arranging visits for decision-makers to other MENA countries which already have major successful experience in this sector (such as Tunisia).
Financing and Cost Recovery	<ul style="list-style-type: none"> - Study for setting a sustainable system for cost recovery (relying on "polluter pays" principle, setting of specific fee of SWM, etc)

Private Sector Participation	<ul style="list-style-type: none"> - Assisting in setting the specific measures for setting the open, transparent and competitive procedures in contracting the private sector in the SWM sector - Study to identify the various possible schemes and type of contracts for SWM, and recommend the most appropriate ones - Assisting in the preparation of typical contracts with the private sector operators incorporating the collection of waste sorted at the source (including the awareness campaigns and measures to be undertaken by the Contractor to encourage the adequate participation of the population in the implementation of the sorting at the source)
Public Awareness and Public Participation	<ul style="list-style-type: none"> - Participation in carrying out public awareness campaigns (waste minimization, sorting at the source). To ensure effectiveness, the campaigns should: <ul style="list-style-type: none"> - be accompanied with the approval of an integrated SWM framework - be accompanied with communication programs in the media and press - be accompanied with a direct correlation between the population participation and the benefits to the SWM implementation on the one hand and to the population on the other hand (technical, environmental, financial, etc) - Participation in carrying out public awareness campaigns for decision makers. - Support of specific campaigns for promoting sorting of wastes at the source in the household (priority in a pilot village which already disposes of a composting treatment plant, hence clearly illustrating the correlation between sorting at the source and the improvement of the SWM in general and compost quality in particular) - Strengthening of environmental and solid waste education into all levels of education (schools, university programs, etc), through reviewing and analysing environmental education programmes and plans, and making recommendations
Technology Application	<ul style="list-style-type: none"> - Preparation of an evaluation report concerning the plans and treatment technologies foreseen by the government, in coordination with the MoE
Data Management	<ul style="list-style-type: none"> - Development of a rich and informative website of SWEEP-Net - Setting an adequate system for data management related to SW
Miscellaneous	<ul style="list-style-type: none"> - Management of industrial and hazardous waste (identification of main industrial and hazardous waste producers and quantities, proposals for management, etc) - Management of medical waste (assessment of the efficiency of existing waste treatment technologies)

On the other hand, examples of practices that Lebanon can transfer to other SWEEP-Net countries could be as follows:

- The legal / institutional framework that Lebanon has drafted (draft law on ISWM) can serve for the preparation of the framework in other SWEEP-Net countries ;
- Successful implementation of a SWM in Zahleh through the commitment and support at both the national and local levels ;
- Lebanon, through his SWM experts, can assist in organizing capacity development workshops in other SWEEP-Net countries, in light of their qualifications and experience in this sector ;
- Lebanon, through its SWM experts, can assist in setting the governmental strategies and plans in other SWEEP-Net countries, or in the preparation of evaluation reports in this respect in order to identify the eventually needed adjustments and modifications ;
- Common private sector participation in SWM in Lebanon:
 - Efficiency in terms of quality of service ;
 - Direct relationship between the absence of a competitive procedure and the high costs of SWM ;
 - Importance of adequate contract terms.

- The difficulties and failures that Lebanon has faced in the SMW sector can provide an illustration about the following:
 - The absence of a legal / institutional framework is a major obstacle for the implementation of an ISWM system ;
 - The absence of a national strategy leads to high cost emergency plans ;
 - The absence of a national strategy may lead to the implementation of SWM technologies and projects which are not in line with the priorities of the country and its local conditions.
- Experience of Lebanon in the implementation of small community based composting plants, which was not quite satisfactory (for details, refer to Section “Lessons Learned”) ;
- Experience of Lebanon in the rehabilitation of old dumps, mainly Normandy and Zahleh ;
- Experience of Lebanon in the previous attempts to implement the sorting at the source in some zones in Beirut as well as in some rural villages (for details, refer to Section “Public Awareness and Community Participation”).

Besides, the priority topics for the working groups on the regional level could be summarized as follows, as identified during the regional workshop which was held in Tunisia in June 2010:

- Policy, legislative and institutional framework;
- Financing and cost recovery ;
- Public awareness ;
- Data management ;
- Technology application.

In this respect, it is recommended to concentrate on few but essential priority activities. The feed-back on these initial activities will help to refine the activities of the network and working groups. It should be noted that workshops organized through the Sweep-Net at the national level are always useful since it helps keeping the dialogue open among stakeholders and it triggers a good communication and dissemination of information on SWM.

OPTIONS FOR IMPROVEMENT AND DEVELOPMENT

While the priority actions are addressed in more detail in Section 11 hereafter, recommended specific actions and options for improvement and development are summarized here below.

- Issue the policy/ legal/ institutional framework ;
- Evaluate the previous strategies and plans of the government, in order to better set future strategies and plans ;
- Assess the objectives of proposed projects and concentrate on those projects that assure the sustainability of results, and that are in line with the national strategies and priorities as well as with the local conditions ;
- Ensure the institutional viability of any project in terms of commitment and support at both the national (CoM and Parliament) and local (municipalities) levels ;
- Ensure political commitment (CoM and Parliament) in support to locally developed strategies ;

- Ensure the building up of a global consensus at all levels: communities, municipalities and government, through public awareness campaigns ;
- Avoid confinement in standard political visions aiming at balanced regional development; insofar as SWM is concerned, focus should rather be targeted at those areas with local consensus on an agreed upon plan ;
- Follow a “progressive coverage” for SWM schemes by proceeding first with tendering of waste disposal operations where there is agreement over specific final disposal locations. In addition, even if a national strategy as well as a complete treatment scheme are not defined yet, the start with the implementation of a landfill (a prerequisite for any type of treatment) as a temporary phase could also be possible ;
- Ensure that old dumpsites closure is an integral part of local development vision or strategy; International donors (World Bank, EIB, Islamic Bank, EU, USAID, should be encouraged to fund closure of dumps as part of integrated plan that includes the pre-condition of having an alternative treatment facility. Funding would cover site assessment, detailed design of remediation activities, implementation of remedial project ;
- Create a priority list for closure of all dumps, establishing the 10 most important ones to close ;
- Seek information and discuss the steps needed to benefit from the Carbon Credit Program fund aimed at the containment and treatment of gases generated by organic waste under the Clean Development Mechanisms (CDM) ;
- Setting the open, transparent and competitive procedures in contracting the private sector in the SWM sector ;
- Capacity building (detailed in section 3.7) ;
- Public awareness / community participation (detailed in section 3.6) ;
- Setting the mechanism for data management and sharing between the various stakeholders;
- Establishing and support of SWM networks, such as SWEEP-Net network ;
- Monitor, in the medium and long term, the future implementation of the strategies, in order to identify the eventual gaps and needed adjustments and improvements.

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The regional solid waste exchange of information
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