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## **1. INTRODUCTION**

### **1.1. BACKGROUND**

In September 2000, the member states of the United Nations unanimously adopted the Millennium Declaration, especially the part related to the Millennium development goals (MDG), particularly target 9 of MDG 7, sets a commitment for all member states to “integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources”. Several indicators of this target indirectly involve the need for adopting environmentally sound solid waste management policies, programs and plans that are well integrated within the overall national development programs.

Locally, the solid waste sector is given attention from the public and private sector due to its negative impact on environment, public health and national economy.

In June 2003 the World Bank / METAP issued a report on the “Cost of Environmental Degradation in Lebanon”. In this report it was estimated that the annual cost of environmental degradation due to the waste sector is around 10 Million US\$ per year with an estimate of 0.05% of GDP (year 2000). However the report highlights that these estimates exclude the costs of degradation due to untreated industrial, hazardous and health sector waste.

To this end, this chapter presents the integration of the Solid Waste Sector (SWS) in the preparation of Lebanon’s Development Program (DP) 2006-2009.

### **1.2. OBJECTIVES**

The main objective behind this DP is placing emphasis on the planning and management of outputs through the efficient and rational implementation of prioritized individual projects and group of projects to support the Development Vision for Lebanon.

For the SWS, this objective would specifically mean the preparation of a Vision for the legislative, administrative, financial and technical aspects of a National Integrated Solid Waste Management Plan (NISWMP). Based on experiences and lessons learned from extensive previous and on-going work in this sector, it is imperative that envisaged plan should be:

- i. National, in the sense that it involves participatory approaches from nation-wide stakeholders.
- ii. Integrated, by taking into consideration all relevant components of the solid waste sector and ensuring strong linkages with other national development sector plans.
- iii. Environmentally sound, in that it protects the natural resources and does not put any significant short or long term pressures on the people and the environment.

- iv. Flexible, in the sense that it allows for ample space for variability and/or creativity on small and large scales within overall set guidelines and policies.
- v. Technically applicable and feasible within the Lebanese context and experience.
- vi. Economically motivating, in the sense that it fosters the development of agriculture, industry and trade markets.
- vii. Assessable, according to a set of performance indicators.
- viii. Sustainable, in the sense that it is financially affordable, socially acceptable and politically supported within a set horizon.

The above eight principals should constitute the skeleton of any ISWMP developed for Lebanon. These will be further detailed and analyzed in the following sections.

### **1.3. SCOPE**

The scope involves mainly the following tasks:

- Brief Sector Overview: including baseline data collection and review of all relevant on-going planning and policy work related to solid waste management in CDR and the Ministry of Environment (MoE) as well as other major stakeholders mainly other concerned ministries such as the Ministry of Interior, Municipalities and Directorate General of Urban Planning in the Ministry of Transportation and Public works.
- Consultation and interaction with the concerned line ministries and other stakeholders, to acquire knowledge of their main solid waste policies and programs, their specific evaluation and future outlook
- Preparation of a comprehensive Solid Waste Sector Vision outlook based on the eight principals described under section 1.2.

## **2. SECTOR OVERVIEW**

### **2.1. SOLID WASTE CATEGORIES**

Waste is generally a broad term attributed to material that is either spent or is a by-product of an activity or a process which, due to its physical and/or chemical and biological characteristics, become contextually useless and is thus discarded or rejected.

Waste categorization generally follows the generating activity, thus the terms residential waste, municipal waste, industrial waste, nuclear waste, agricultural waste, health care wastes, medical waste etc...it is known as the first level of categorization.

On the other hand, sub-categorization is frequently needed when the specific nature or characteristic of the waste is targeted, thus the terms liquid, solid and gaseous wastes, hazardous waste, non-hazardous waste, infectious waste, toxic waste etc...

A third level of categorization is sometimes used to refer to the way some of these wastes could be, or need to be, handled and managed. Based on the above, solid waste could be generally classified into these four main categories:

- municipal solid waste (MSW including residential and commercial),
- industrial waste (arising from light to heavy industrial activities),
- agricultural waste (arising from forest, crop production, landscape and livestock activities),
- special waste (arising from activities other than the above, such as construction and demolition, slaughterhouses, hospitals, used oils, used tires, batteries, sludge, end-of-life vehicles, olive oil mills, etc...).

It is important to highlight that some types of solid waste could be categorized differently or might be cross-cutting between various categories. In addition any of these categories might include hazardous and non-hazardous waste items depending on their specific characteristics of toxicity, flammability, explosivity, ignitability, etc...).

In Lebanon, until now however, such a clear categorization does not exist, and what is termed as MSW collection and disposal services, could include to some extent items from other categories.

The current relevant legislations, management practices and the majority of CDR's projects/contracts deal with the first category (MSW) and it is stipulated by the current laws<sup>1</sup> and decisions<sup>2</sup> that other categories should be generally handled by their specific generators under the overall guidance and control of the relevant line Ministries. These are reflected by the Principles of Prevention, Proximity, Polluter Pays, and Extended Producer Responsibility.

As such, this Vision shall focus on the MSW where the Government (CoM, CDR, Ministries, etc...) and the Public (Municipalities, Union of Municipalities, and other community based organizations, CBOs and NGOs) are the main key players for the ISWMP. Other categories of Wastes are being handled under separate strategies for waste management<sup>3</sup> where the main responsibility / implementation of waste management is on the waste generators themselves ( industrial waste, agricultural waste, and special waste) with the Government and the Public being involved in setting strategies, guidelines, providing off-site central infrastructure where necessary, evaluation and monitoring.

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<sup>1</sup> Framework Law for Solid waste Management, Draft , MoE 2005

<sup>2</sup> Council of Ministers' decision 16/2003

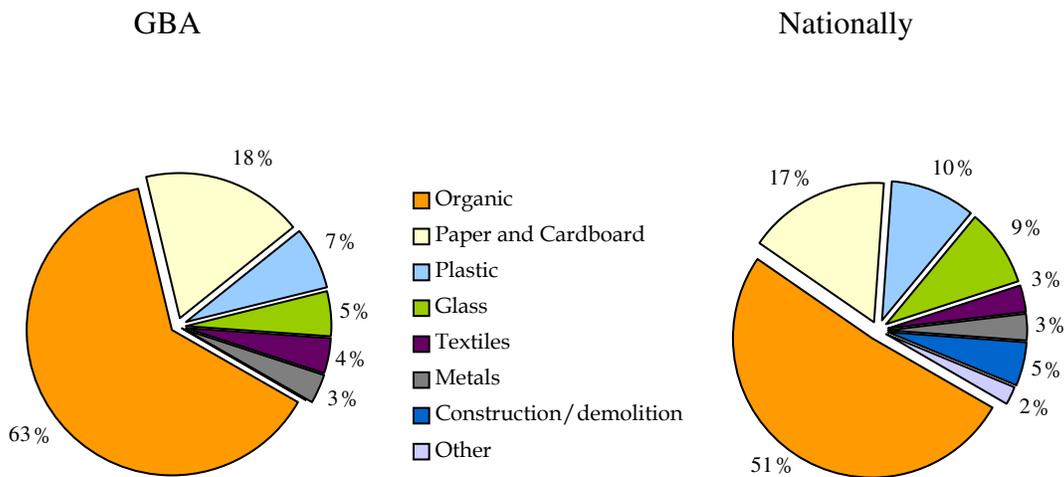
<sup>3</sup> For example NEAP05, MoE-MSD Environment

## 2.2. MUNICIPAL SOLID WASTE CHARACTERISTICS

Quantities and types of MSW generated vary to some extent from one region to the other as well as with time depending on the region’s evolvement over the years. According to the State of the Environment Report (SoER 2000), Municipal Solid Waste (MSW) makes up about 90 percent of the total solid waste stream generated in Lebanon. The main sources of MSW are households, commercial establishments, street markets, street cleaning operations, and public garden pruning. Lebanon generated about 1.44 million tons of MSW in 2001 (about 3,940 tons per day), or about 0.92 kg per person per day.

Organic waste is by far the single largest component of the MSW stream, representing over 63 percent of the total MSW quantity in Greater Beirut Area (GBA) and around 51 percent at the national level as shown in Figure 1 below.

**Figure 1: Composition of Municipal Solid Waste in GBA and Nationally<sup>4</sup>**



## 2.3. CURRENT MUNICIPAL SOLID WASTE MANAGEMENT

### 2.3.1. Emergency Plan for GBA

The first Waste Management Plan was established in 1982, during the civil unrest period. Little was implemented from that scheme. Following the initiation of the reconstruction in 1991, it could be generally stated that the first actual and planned MSW management in Lebanon commenced in 1997, after CDR had adopted the Emergency Plan for SWM in GBA (CoM Decision No. 58, dated 2/01/97). The plan called for closing the Bourj Hammoud dump and establishing an integrated MSW management system, consisting of

<sup>4</sup> State of the Environment Report, SoER 2000, MoE.

Collection, Sorting, Treatment and Disposal. A brief description of this Plan is given below:

**a. *Collection Services***

Initially these collection services included street collection bins and a fleet of collection trucks serving the GBA and were later extended to include also Cazas of Baabda, Aley, Chouf, Metn and Kserouan. With regard to the SUKLEEN contract for solid waste collection and street sweeping in Greater Beirut, which was scheduled to expire on 31<sup>st</sup> December 2000, Addendum No. 5 to the contract specified that it should be extended until a decision is taken by the Minister of the Interior and Municipalities to terminate it.

**b. *Sorting and Baling Services***

These services included two facilities for receiving, sorting and processing raw MSW (Aamrousiyeh and Karantina) with a total capacity of 1700 tones/day as initially set in the contract. In addition, one warehouse facility was also included for storing and shredding bulky and recyclable materials, located along the seashore, next to the entrance of the Borj Hammoud dump site.

**c. *Composting Services***

These services consisted of one composting plant for sorted organic material (Coral) with a capacity of 300 tons/day. It utilized the windrow system for fermentation.

**d. *Transfer and Disposal Services***

These consisted of one landfill site for the disposal of sorted MSW in the form of wrapped baled waste consisting primarily of rejects materials (Naameh); and another landfill for the disposal of inert and shredded bulky materials (Bsalim).

After fully utilizing cells 1 and 2 of the Naameh site, which covered an area of around 120,000 m<sup>2</sup> with a combined capacity of two million tons of waste, an additional area of 62,000 m<sup>2</sup> was prepared. It is envisaged that Naameh Landfill will reach its ultimate current capacity by the end of this year (2005) or middle of 2006 with the most optimistic scenario, and as such other sites have to be made available for disposal.

**e. *Total Incurred Costs***

The total incurred costs of the waste management plan between 1997 and 2004 were about \$597,178,280 with an average of about \$85.3 millions per year. This could be in the same way presented as around \$106 per ton including collection, sorting, treatment and disposal including the rehabilitation and utilization of ((existing plants or operational site)).

*f. Summary of Performance*

The emergency plan assumed that 1,700 tons per day (620,000 tons per year) of raw MSW would be processed at the two sorting plants. Of this amount of waste, the plan called for recovering 160 tons per day of recyclable materials (58,400 tons per year) and transferring 300 tons per day of organic material to the composting plant (110,000 tons per year). The plan envisioned the provision of additional surface area to expand composting capacity from 300 to 850 tons per day, thus decreasing the quantity of waste sent to the Naameh landfill from 1,240 to 690 tons per day. Finally, the plan called for shredding and transporting 200 tons per day (73,000 tons per year) of inert and bulky material to the Bsalim landfill.

The performance of the GBA SWM system has improved year after year but remains well below the overall targets set in the Emergency Plan and much more below the expectations of a modernized integrated waste management plan. This is depicted in the rather high percent (77-79%) of waste that was sent to landfills in years 2000-2004, as illustrated in Figure 2 for the year 2004 figures. Typical observations can be noted<sup>5</sup>.

- The amount of waste received and processed at the two sorting facilities has increased steadily reaching about 713,000 tons in 2000 (1,955 tons per day) and around 806,000 tons in 2004 (2,208 tons per day). These quantities are greater than the 620,000 tons/year envisioned under the Plan;
- On average, about 110,000 tons of organic material was sent annually for composting throughout all the contract years from its beginning in 1998 and up till this year 2005. This amount corresponds in fact to the treatment capacity of the Coral composting plant (300 tons per day or 110,000 tons per year). Therefore, and contrary to the Plan, the amount of composting has been the same all throughout the years and a significant fraction of organic materials is not being composted but rather sent with the rest of the reject materials to Naameh for landfill disposal. This deficiency results directly from not expanding composting capacity, as stipulated by the Plan. Furthermore, the efficiency of composting was also comparatively low and did not increase throughout the contract years 2000-2004.,
- With respect to the amount of recyclable materials recovered has increased significantly throughout the contract years reaching around 66,600 tons per year in 2004. This was almost the same as the planned target of 67,000 tons (i.e., 9.41 percent of 713,000 tons) but less than the current target for year 2004, 75,853 tons (.9.41 percent of 806,000 tons).
- In year 2004, the percentage of solid waste was about 7.67% for recycling, 12.48% for composting and 77% for land filling.

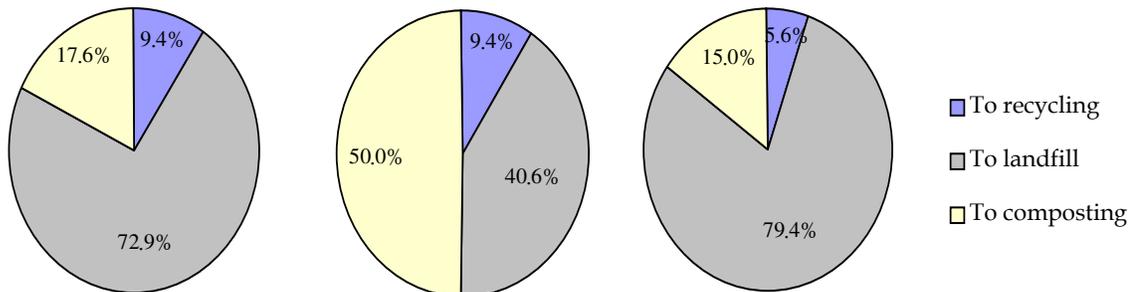
While the Plan has greatly improved the situation of solid waste in GBA, it has suffered from a number of deficiencies, including:

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<sup>5</sup> Based on State of the Environment Report, SoER2000, MoE and Consultant's Supervision Reports, Laceco, Aug 2005

- The Plan and the service Contracts defined SWM targets in quantity (i.e., ton of waste sent to recycling, composting, or landfill disposal) rather than percentage terms. This has created some confusion and the need to negotiate adjustments to the Contractor’s invoices, since the total annual quantity of waste processed exceeded the Plan’s assumption of 1,700 tons per day.
- The Plan and the service Contracts defined targets based on inputs (tons of waste *sent to* recycling, composting and landfill disposal) rather than outputs (tons of recovered materials sold to recycling industry, finished compost applied on land, and waste land disposed). This may have created incentives for the Contractor to process more waste through the recycling and composting lines, irrespective of the amounts of recycled materials or compost produced/sold);
- The Plan did not follow through with the necessary incentives to promote the recycling of recovered materials or the use of compost in various land applications (e.g., agriculture, landscaping, and reforestation).
- The general public awareness, involvement, and acceptance of the outputs were insufficient and as such this was a major reason for failure of replication of the plan in other parts of the country.
- The debatable excessive costs of the plan in addition to the social and political situation in Lebanon had a direct negative impact in spreading the plan elsewhere. Typical estimated costs for Lebanon were reported as \$ 50/ton-70/to<sup>6</sup>; however it is prudent that these cost figures be analyzed thoroughly before utilization in any decision making or planning.
- The overall management of the plan, and specifically regarding its technical, financial, social and administrative (institutional) control, evaluation, transparency, accountability, and efficient utilization was less than adequate.
- The development of proper legislations to support and complement the plan and /or rectify any gaps in the plan, specifically as mentioned in the previous bullet, was never implemented.

**Figure 2: Targets of GBA Emergency Plan for SWM versus Achievements<sup>7</sup>**



<sup>6</sup> National Workshop on Financing and Cost Recovery of Integrated Waste Management

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Plan targets before expansion

Plan targets after expansion

Actual achievements

### 2.3.2. SWM in Areas other than GBA

**Tripoli:** following an international invitation to tender in 1999, CDR signed a contract with BATCO for the operation of Tripoli dumpsite. The contract, which is renewable annually, is financed by the Al-Fayha Union of Municipalities. The purpose of this contract is the treatment of around 300 tons/day of solid waste through proper dumping methods, extraction of general gas and flaring. In this connection, the Council of Ministers issued its Decision No.28 dated 17/7/2003 to entrust CDR with the preparation of design study for the expansion of Tripoli dumpsite and extension of the period of its use. A consultancy firm proposed a study which includes construction of a sorting and composting plant on plots No.812, 815 and 1123 adjacent to this dumpsite (total area of 13000 m<sup>2</sup>), and expansion of the dumpsite capacity by constructing a 9-10m gabion reinforced wall around its perimeter that will enable filling the spaces between this wall and the present dumpsite. In this way, the period of its use could be extended for an additional five years. The Council of Ministers issued its decision No.13 dated 15/8/2005 to entrust CDR with the consultancy firm proposals.

**Zahle:** In December 2001 CDR signed a contract with SERDIM/SCS for the operation of the new dumpsite in Zahleh and the transfer of the contents of the old uncontrolled dumpsite to it. The 2 year contract was financed by a loan from the World Bank as a part of SWEMP. Upon expiry of the two years, the Council of Ministers agreed in its decision No, 70, dated 12/2/2004 to extend the operation and supervision contract for 3 additional years terminating on 31/2/2006, to be funded out from the government general budget / Municipal fund.

Zahle landfill has a sorting plant with a capacity of around 130 tons per day; however the actual capacity of this sorting does not exceed the 70-80 tons per day and a re-design / assessment is deemed necessary<sup>8</sup> to increase the plant efficiency. The landfill has 5 cells with an average height of 24 m. In addition plans for adding a composting plant are underway to reduce the amount of landfilled organic material. About 15 municipalities are at present delivering their solid waste to the sorting plant area, at an estimated fee of \$ 27 per ton including collection, sorting and disposal.

**Normandy (Solidere)** The Normandy dump was created along the coastline of Downtown in the latest seventies by the uncontrolled deposition of inert construction debris and demolition material arising during the period of civil strife between 1975 and 1994. The dump had occupied an area of approximately 330,000m<sup>2</sup> adjoining the coastline of Saint Georges Bay and Beirut Central District. The waste material included mainly domestic waste. The waste contains a high amount of small plastic carrier bags.

SOLIDERE, the company entrusted with the reclamation of the Normandy area set the objective of the works as the production of developable land with an area of approximately 650,000 m<sup>2</sup> that poses no risk to human health, and the environment.

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<sup>8</sup> Lacey-Globex Supervision report, Aug 2005

Remediation/reclamation is performed in two stages:

Remediation/reclamation of a 70,000 m<sup>2</sup>, the area south of Boulevard (included within Phase 1 area of SOLIDERE Master Plan): Total reclamation of the area, construction of a western marina, completion of infrastructure and start building development. The sea defense/protection extends to also cover the area to be reclaimed under the second stage. Work had included the excavation of approximately 1,200,000 m<sup>3</sup> down to a depth of 7 m below sea level, segregation of approximately 600,000 m<sup>3</sup> of clean material for reuse as structural backfill, and construction of infrastructure, including utilities and road networks.

Remediation/reclamation of the area north of Boulevard (included in the Phase 2 area of the Master Plan): completion of treatment of all remaining waste material at the Normandy, the completion of infrastructure in that area and construction of an “eastern” marina. The works includes the excavation and processing of approximately 4.6 million m<sup>3</sup> of material down to a depth of approximately 21 m below sea level.

First phase was from 1996 to 1999, works for second phase started in 1999 and it is probable that works finish during 2007

The first phase was executed by directly by the SOLIDERE, while a contractor is executing the second phase.

Remediation included attenuation barrier to control leachate, gas extraction and treatment in the excavation face, separation of waste into organic and non organic fractions, stabilization of the organic fraction through composting, and/or soil thermal de-sorption. A waste incinerator is used for the incineration carcasses. Tires are shredded. Plastics are being palletized. Rocks and reinforced concrete are being crushed and re-used or sold.

Sorting is done through the use of either a stationary or mobile waste processing plants.

Approximately 4.5 million m<sup>3</sup> of clean fill material was hauled from outside the BCD. Approximately 1.6 m<sup>3</sup> of demolition material was brought in, 0.6 of which came from within the BCD.

Works were suspended and arbitration was undertaken to resolve claims between client and contractor.

**Others:** numerous small to medium scale initiatives in local municipalities, mostly financed by international aid organizations (USAID, UNDP, EU,...) and others managed by line ministries (e.g. OMSAR) with municipalities or Community Based Organizations (Arab Salim, Becharre,..) for example: Unions of Municipalities Jbeil, Ansar, Al Khyam, Tripoli, Khirbet Selm, Jezzine, Tyre, Baalbeck and others.

These plans are mainly there to solve immediate solid waste problems and/or satisfy individual or municipal or organizational socio-political goals.

### **2.3.3. SWM in the National Physical Plan**

The work undertaken related to the solid waste sector management during the previously prepared National Physical Plan (NPP) highlights few main requirements to overcome the potential constraints of the current management practices in the solid waste sector:

- Clarification and/or reallocation of responsibilities for a decentralized management of solid waste through the municipalities or unions of municipalities (UOM)
- Provide adequate resources for these UOMs to properly implement their waste management plans; these should include both technical as well as financial means; in this respect the NPP suggested the implementation of taxes for UOM's benefit to accommodate Solid Waste services they provide. The Government would of course still have to support very low-income municipalities or encourage them to form UoMs as well as control and supervise this whole process and measure the performance of the UoMs according to pre-set objectives and schedules.
- Financial incentives should be given to municipalities who perform adequate MSW management and accept to host a waste treatment or a waste disposal facility.
- Providing the MoE with the authority to reject any waste treatment or disposal facility that does not meet the set conditions even if it was approved by the municipality or UOMs.
- Meanwhile, and notwithstanding the importance for implementing the above, the Government should carry one with the current solid waste management practices like the emergency plan of GBA and others outside GBA as mentioned earlier; however there should be a great effort spent to better control and optimize these practices both from the technical as well as the financial sides.

## **3. VISION**

Based on the above overview of the solid waste sector and the highlighted problems facing the proper management of solid waste in the country; the following sections present a proposed vision that takes into consideration the consultations held with the various stakeholders:

### **3.1. WASTE MANAGEMENT OPTIONS**

There are many options for MSW management, and generally none of these options might be correctly chosen as being absolutely better than the other. However, the site specific characteristics (environmental, technical know-how, socio-economic, financial, institutional, lessons learned and political) of each country, region or area, determine the

most suitable solid waste management plan. Such plan could contain one or a combination of options for components management such as waste reduction, separation, reuse, recycling, recover, collection, treatment and disposal.

The Vision requires that any waste management plan should be based on the criteria/objectives and principles as set out under section 1.2 and 2.1 of this report. Based on lessons learned from the current waste management practices in Lebanon, the Consultants strongly believe that the priority issues that need to be addressed are the management issues and definition of responsibilities. This would lead to a defined setup related to the institutional and financial aspects followed by the socio-economical and technical aspects. The following table presents few options for waste management in this regard:

**Table 1 Vision Options for MSW Management**

Option	Description	Collection		Treatment		Disposal	
		Infrastructure	Operation	Infrastructure	Operation	Infrastructure	Operation
A	MSW shall be managed by local authorities under the guidance and support of the Government	LA <sup>9</sup> /G <sup>10</sup>	LA	LA/G	LA	LA/G	LA
B	MSW shall be managed by the Government similar to GBA	G	G	G	G	G	G
C	Collection by the local authorities, Treatment and Disposal by Government	LA/G	LA	G	G	G	G

<sup>9</sup> Local Authority: Municipality, Union of Municipalities

<sup>10</sup> Government

D	All infrastructure by the Government, Operation by the local authorities	G	LA	G	LA	G	LA
E	MSW shall be fully managed by local authorities	LA	LA	LA	LA	LA	LA

It is to be noted that all the above options may be viable, however based on the previous discussions particularly the Vision criteria/objectives, the lessons learned from the current waste management practices and the on going legislations and waste management strategies that are being developed, the Consultants recommend a staged waste management vision as follows:

*Adopt Option C, move gradually to option D, step up to Option A and ultimately to option E.*

Such a staged approach ensures smooth transition towards the ultimate vision providing for ample evaluation and tailoring of waste management practices taking into consideration the various legal, institutional, technical, financial and socio-political strengths and constraints.

This Vision with its particular components is elaborated further in the following sections.

**3.2. VISION STATEMENT**

Summing the above in a more or less concise statement in terms of policy development would mean the following:

On the short term (1-3 yrs) business as usual to continue with major improvements on Performance and Accountability both technically and financially; Develop and enforce the solid waste framework law

On the medium term (3-8 yrs): all necessary legal, administrative, financial and technical mechanisms developed by the government for a national integrated solid waste management policy that adopts the provision of the Vision’s staged approach

On the long term (8-10 yrs): increase the involvement of the local communities in developing, implementing and monitoring site specific short and long term solid waste management plans under the umbrella of the policy developed in the medium term

Ultimately (10-15 yrs) having Local Authorities solely responsible for managing their solid waste under the Government's guidance thus attaining the ultimate targeted vision option E.

### **3.3. THE SOLID WASTE SECTOR AND THE GOVERNMENT**

Unlike many other sectors or trades, the approach here is quite different; the reason is that solid waste is not a direct product/service that the government provides for the population in response to an individual need like water, communications, electricity and education. It is rather an externality that needs to be managed to counteract the by-products of the other huge number of social and economic activities which could be classified in terms of their individual aspects as well as their mixed effects; temporal and spatial dimensions play an important key aspect pertinent to this trade.

In this respect the indicator for the evaluation of this service being the level of short and long term public health and/or environmental damage resulting from the management of this trade.

Notwithstanding the important role of the various government bodies, and since this trade is "generated by" and not "generated for" the population, the main actor (stakeholder) remains to be the population itself and the Government being rather a supportive player. This vision is in line with the "Producers' Responsibility" and the "Polluter Pays" Principles. This implies that the Government, through the involved line ministries should form an overall umbrella under which local communities, whether private or public, will handle the complete management of the solid waste sector. In this way it is believed that medium term and long term solid waste management plans are developed, implemented and monitored by local communities supported by the various legal, financial and technical mechanisms developed by the government.

### **3.4. LEGAL APPROACH: LAW ON INTEGRATED SOLID WASTE MANAGEMENT**

Based on law 444/2002 "Protection of the Environment", the MoE has already prepared a draft law on integrated waste management with the assistance of the world Bank/METAP and through a wide consultation process<sup>11</sup>. This law is simple and comprehensive and if developed and enforced would no doubt improve the solid waste management in Lebanon drastically. The basic elements of the latest version of the law are:

- Principles and priorities in Waste Management
- Institutional framework and Responsibilities
- Waste Management Planning
- Information Management
- Environmental Insurance
- Permitting

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<sup>11</sup> National Workshop on the Draft Law on Integrated Waste Management, Beirut March 2005. MoE/ELARD

- Private Sector Participation
- Financing and Cost Recovery

### 3.5. INSTITUTIONAL AND ADMINISTRATIVE APPROACH

Based on the above set-up, it would then be necessary to develop the relevant institutional setup for parties at all levels starting from the local authority to the Government bodies passing through the centralized and decentralized administrative agencies. These should be developed in such a manner to ensure Smooth interaction between all as well as a reliable and transparent flow of information to enforce and sustain responsibility and accountability.

#### PROPOSED WASTE MANAGEMENT RESPONSIBILITIES

Modifications need to be made on the existing decision making and decision taking set-up, A clear and defined role, based on existing or planned mandate as stipulated by law need to be attributed to the main involved stakeholders; such definitions of roles should be complemented by sustained and genuine partnerships between the various stakeholders at all levels; the following framework set-up is suggested:

**Ministry of Environment:** should be the prime decision maker and decision taker for all solid waste management issues; all necessary legal, administrative and financial arrangements, in terms of personnel, equipment or others, should be provided to MoE to develop in close coordination with the various line ministries a national waste management policy; propose draft legislations, set guidelines, mobilize funds, provide advice and awareness to other government bodies as well as the private sector and community at large; monitor and control the overall implementation and performance of programs and action plans.

Other stakeholders should provide the necessary assistance as follows:

**Ministry of Municipalities and Interior:** through individual or associated municipalities, develops, implements, and controls local solid waste management plans specific to the area all to the approval of the MoE and other line ministries as relevant.

**Directorate General of Urban Planning (MoPW):** provides assistance as needed to the Ministry of Environment specifically through the land use and urban planning programs.

**Council for Development and Reconstruction:** provides assistance as needed to the Ministry of Environment specifically through the management of those funds and contracts that are approved by MoE and cannot be handled by local municipalities.

As mentioned above this is only a framework, and the details of which would need to be further pursued.

The envisaged responsibility allocation is summarized in the table below:

**Table 2: Summary of Proposed Wastes Management Responsibilities<sup>12</sup>**

<b>Entity</b>	<b>Responsibilities</b>
MoE	<ul style="list-style-type: none"> <li>• Develop and update the national municipal solid waste management strategy</li> <li>• Establishing Waste Management Standards and Guidelines</li> <li>• Participation in the National Strategy and Plan directly or through a waste management committee (headed by MoE, independent from MoE or belong to MoE)</li> <li>• Approval of EIAs and SEAs</li> <li>• Authorization of waste management facilities and waste generators Environmental Permits</li> <li>• Establishing/implementing Waste Management Programs</li> <li>• Information management</li> <li>• Supervision and inspection of compliance</li> </ul>
MoIM	<ul style="list-style-type: none"> <li>• Participation in the National Strategy and Plan through coordination with MoE or the waste management committee</li> <li>• Coordinating and assisting in the development and implementation of local waste management plans if and where necessary by assisting/replacing the local authorities</li> </ul>
Local Authorities	<ul style="list-style-type: none"> <li>• Participation in the National Strategy and Plan through consultation meetings</li> <li>• Proposing and implementing local waste management plans for non-hazardous municipal waste</li> <li>• Establishing/ implementing Waste Management programs</li> </ul>
CDR	<ul style="list-style-type: none"> <li>• Assistance in procurement of WM projects upon request</li> <li>• Assistance in the development of WM plans upon request</li> </ul>
Private Sector/The Public/NGOs	<ul style="list-style-type: none"> <li>• Abiding by laws, regulation and guidelines on waste management</li> <li>• Participating in the National strategy and plan through consultation</li> <li>• Participating in the development and implementation of local waste management plans</li> <li>• Preparation of facility and generator waste management plans</li> <li>• monitoring and reporting</li> </ul>

<sup>12</sup> Based on Draft Law provisions of Solid Waste.MoE

### **3.6. FINANCIAL APPROACH**

Solid waste management is considered the most critical part of any vision or plan especially in developing countries like Lebanon where there are no enough laws that guide this issue. As such it is mandatory that a law is passed and enforced that specifies who and how waste management fees will be paid for and recovered.

#### **Estimated National Costs and Affordability of MSW Management**

As described earlier, the high costs incurred in the waste management plan in GBA (\$106 / ton) have significantly impeded the replication into other areas in the country added to other socio-political factors. Other recent experiences (Zahle) reflected a much lower cost (\$27/ton); in this report, the aim being not to undertake a detailed economic and financial analysis of the current waste management plans, but rather to have an overall indication of the financial status of this solid waste sector, these values (with some adjustments) have been used to provide an estimate of the overall waste management costs on the national level as shown in table 2 below.

This table shows that the current estimated waste management costs, if the waste cost vary between \$ 95-105/ton for Beirut and Mount Lebanon and \$ 50/ton in other Mohafazat, is about M\$ 113 per year. However, if the costs of Beirut and Mount Lebanon could be dropped to similar figures in developing countries in the Mashreq and Maghreb, the total cost of a national sound and efficient waste management system would be around M\$ 70 per year.

The above estimated figures do not include any benefits that could be incurred from recycling, recovery or other avoided treatment and disposal costs which could significantly affect the resulting net costs.

**Table 3: National generated solid waste and incurred costs**

Mohafaza	Population (1000s) <sup>13</sup>	Generation rate <sup>14</sup> (kg/c/d)	Daily generation (tons)	Unit cost	Current Estimated Yearly cost (\$Million)	Vision Estimated Yearly cost <sup>15</sup> (\$Million)	Vision Estimated Yearly cost <sup>16</sup> (\$Million)
Beirut	389.662	1.17	455	100	16.61	11.63	9.46
Mount Lebanon	1501.283	1.17	1753	100	64	44.8	36.4
North Lebanon	768.708	0.95	730	50 <sup>17</sup>	13.33	13.3	10.8
Bekaa	471.135	0.95	448	50	8.17	8.17	6.6
South Lebanon	401.075	0.95	381	50	6.95	6.95	5.7
Nabatiyeh	221.920	0.95	211	50	3.85	3.85	3.1
<b>Total</b>	<b>3753.783</b>		<b>3978</b>		<b>112.9</b>	<b>88.7</b>	<b>72.2</b>

This is in line with previous plans for the solid waste sector namely the horizon 2000 and the 3-yr CDR Project as shown in table 3 below:

**Table 4 : Waste Management Cost Comparison with Previous Plans**

MSWM Cost	Vision	Horizon 2000(1995- 2000)	CDR-3 years project (2003)
M\$/yr	72	107	67

<sup>13</sup> CAS, 2003<sup>14</sup> Based on SoER 2000<sup>15</sup> Based on an maximum of \$70/ton for Beirut & Mount-Lebanon estimated by World Bank (see footnote 9)<sup>16</sup> Based on a 10% waste reduction by 2009<sup>17</sup> Based on Zahle figures with addition of composting and leachate treatment

Based on table 4 above, the per capita estimated yearly cost would be in the range of \$22; this would constitute around 0.44% on average from the yearly per capita income and is thus on the higher limits of the affordability range set by the World Bank (0.17%-0.40%) for developing countries<sup>18</sup>. This might reflect the extent of the transitional nature of the Lebanese economy compared to other developing countries.

**Table 5 : Affordability of Waste Management Costs-per Mohafaza**

Mohafaza	Vision Estimated per capita yearly cost (\$USD)	Estimated yearly income per capita (\$USD)	% of per capita yearly income devoted to MSW
Beirut	24.27	3528	0.69
Mount Lebanon	24.27	3620	0.67
North Lebanon	14.1	2297	0.61
Bekaa	14.1	2351	0.6
South Lebanon	14.1	2111	0.67
Nabatiyeh	14.1	2026	0.7
<b>Average</b>	<b>17.5</b>	<b>2655.5</b>	<b>0.66</b>

The above analysis indicates that the average expenditure on solid waste management in Lebanon is approximately 0.31% of the Lebanon's GDP and the GDP per capita (2004 figures).

Since the Vision calls on the local authorities to be responsible ultimately for preparing, implementing and managing their solid waste plans both technically and financially, and thereby having themselves to develop their own cost recovery plans, it is imperative that

<sup>18</sup> National Workshop on Financing and Cost Recovery of Integrated Waste Management, Beirut April 2005. MoE/ELARD

these municipalities or unions of municipalities would have both the technical know-how and the financial affordability to handle these plans.

Detailed individual or case-by-case analysis of these issues will require an exhaustive study and is outside the present scope of this vision; however, and for indicative purposes only we have selected two typical samples to show the range of affordability as indicated in table 6 below:

**Table 6 : Affordability of Waste Management Costs-Sample Municipalities**

Municipality	Budget(LL) in 2003	Estimated Waste Management Costs (\$M)	Percentage of budget devoted to MSW (%)
Beirut Municipality	105,919,000,000	9.46	13
Akkar Municipalities (total for Caza)	12,801,350,000	3.4	40

This shows that most, and if not all, municipalities will definitely suffer from this financial burden if they were to bear this on an individual basis within their current budgetary system. As such it is clear that the Government would have to develop a new set-up (legal-institutional-financial) that will assist municipalities and prepare them for undertaking their waste management plans. The draft waste management law highlights such needs but it is believed that it should be complemented by several decrees from the related ministries mainly MoIM and MoF.

Each municipality or union of municipalities should be able to carry out a simple analysis to narrow down on suitable options for their specific waste management. MoE with the assistance of METAP has developed economic models<sup>19</sup> to help municipalities to take off full responsibility of Solid Waste.

The following financial aspects are depicted in the waste management law and are highlighted to reinforce this vision:

- i. Adopting the “Polluter Pays “Principle as this sector is not a service that the government is providing and could collect direct charges for it. The Polluter in this regard might be an individual or institution or enterprise, both public and private.

<sup>19</sup> National Workshop on Financing and Cost Recovery of Integrated Waste Management, Beirut April 2005. MoE/ELARD

- ii. For this ultimate goal to complement the technical/management goal (responsibility on local authorities), several measures would need to be taken:
  - a. Local authorities should be granted and helped-out to collect fees to cover total investment and recurrent costs for the management of non-hazardous wastes and to collect tipping fees from waste collectors and transporters at any transfer, treatment or disposal facility, or to delegate fee collection to a commissioned bill collector or their authorized private sector facility operators.
  - b. Upon the importation or manufacturing of certain packaging wastes, obligations should be set on the manufacturers/importers/distributors to either have provisions for recycling or pay certain fee for the product ultimate treatment and disposal.
  - c. another way Of complementing this would be through an extra buyer's fee which would carry incentives for them to return back the product instead of disposal.
- iii. Government financial institutions providing financial services shall, in accordance with and to the extent allowed by the enabling provisions of their respective charters or applicable laws, accord high priority to extend financial services to individuals, enterprises, or private entities engaged in waste management.
- iv. Tax Exemptions on the Purchase of Recovered Material – The purchase of material recovered from the waste stream shall be exempted from value added tax, or any other taxation, for a period of ten (10) years following the day this law comes into force.
- v. 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 a tax reduction on profits equivalent to up to 50% of the value of taxation on the beneficial activity.

Main sources for Financing<sup>20</sup> might include one or more of the following depending on the schedule of implementation of the vision and related action plans from one hand and the evolvement of the discussions with the Ministry of Finance regarding this issue:

1. National Treasury of the Republic of Lebanon,
2. Budgets of the Local Authorities,
3. Independent Municipal Fund,
4. Funds Collected by Municipalities,
5. Grants and loans,
6. National Fund for the Environment,

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<sup>20</sup> National Workshop on Financing and Cost Recovery of Integrated Waste Management, Beirut April 2005. MoE/ELARD

7. Funds from the generators of waste,
8. Private sector investments in WM facilities, and
9. Other sources of funds in accordance with the law.

### **Cost Recovery for Municipal Waste**

Options for cost recovery are many and their application depends on the legislative environmental and financial measures and could include anyone or a combination of the following:

1. 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 agent working under license, franchise, contract or concession agreements;
2. Product charges on packaging wastes;
3. Fines from non-compliance activities in accordance with this law and its standard decrees of application; and
4. Other sources of cost recovery to be determined by decrees ratified by the CoM based on the proposal of the Ministry of Finance and the Ministry of Environment.

### **3.7. SOCIO-ECONOMICAL AND TECHNICAL APPROACH**

Notwithstanding the importance of this component of the Vision, the socio-economical and technical approach is not envisaged to pose any major constraint once the above vision components are in place.

On the other hand, from a technology point of view, this has been exhaustively subjected to extensive studies and discussions among the various stakeholders; in addition to the lessons learnt for the past 8 years; regardless of technologies that would be adopted in solid waste management and mainly treatment and disposal, it would have to respect the following norms<sup>21</sup>:

- a. That the technology should be actually implemented in the developing and developed countries with factual proof of its effectiveness and financial, economic, environment profitability thereof.
- b. That the cost of such technology should be acceptable and supportable by the Lebanese community.
- c. That this technology be congenial with environmental safety duly recognized by related world corps and organizations and should have obtained the certification of ISO14000 and that of ISO9000.
- d. The technology is based on the following waste management hierarchy (7Rs) that should be inherent within any waste management technology option or plan

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<sup>21</sup> MOE Strategy on the management of municipal solid waste (unpublished Draft 1999)

**(REDUCE, REUSE, RECYCLE, RECOVER, REMEASURE, RETHINK, REJECT)**

- Source reduction
- Source segregation and Sorting
- Collection and transport
- Treatment and recovery
- Final disposal
- Cost Recovery

### **3.8. ACTION PLANS**

#### **3.8.1. National Action Plan**

As described earlier, this proposed vision is developed based on the lessons learned from previous and on-going work in solid waste management in Lebanon, the neighboring countries as well as internationally; it builds on and complements the extensive work carried out mainly by the MoE and specifically the Draft Law on Solid waste currently under review.

After approval of this vision and its adoption by the CoM, a nationwide action plan and solid waste management programme will be prepared based on the approved provisions of this vision; such action plan will put the detailed activities and milestones for proper implementation of the vision. To maximize on the efficiency of such action plan, and avoid duplicating any on-going similar work, this action plan will be coordinated closely and evaluated with the current action plan (copy attached in Appendix A) which is being developed under the National Environmental Action Plan (NEAP)<sup>22</sup>.

#### **3.8.2. CDR Action Plan**

As such and upon approval of this vision, the Consultants will embark on their second mission in mainly assisting CDR in implementing this vision. This could be achieved through undertaking the following actions:

- ❖ Conducting an internal review process for sector management
- ❖ Undertaking Performance Evaluation for on-going projects

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<sup>22</sup> Expert Workshop on the National Environmental Action Plan-NEAP 05 , Beirut March 2005-MSC IPP

- ❖ Preparing Evaluation Corrective Actions (ECAs)
- ❖ Monitoring the Implementation of ECAs
- ❖ Categorizing and Prioritizing the pipeline solid waste projects
- ❖ Coordination with concerned line Ministries
- ❖ Provide assistance to line Ministries, as stipulated by the solid waste law and detailed in the national solid waste action plan

***Contract ID***

<b><i>Title:</i></b>	
<b><i>Location/Geographic Extent</i></b>	
<b><i>Objectives as related to Vision</i></b>	
<b><i>Scope as related to Vision</i></b>	
<b><i>Financing Agency(ies)</i></b>	
<b><i>Managing Agency(ies)</i></b>	
<b><i>Execution Agency(ies)</i></b>	
<b><i>Status/Performance Indicator</i></b>	
<b><i>Umbrella Project (Vision)</i></b>	
<b><i>Main Output(s) related to Vision</i></b>	
<b><i>Evaluation towards Vision</i></b>	