



Policy Note



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LEBANON

Cost of environmental degradation due to solid waste management practices in **BEIRUT** and **MOUNT LEBANON (BML)**

In 2014, SWEEP-Net launched in cooperation with CMI (The Center for Mediterranean Integration) a sectoral analysis on the cost assessment of environmental degradation (COED) due to municipal waste management practices in the capital cities and their agglomerations in Greater Beirut, including Beirut and Mount Lebanon (BML), Greater Rabat (Morocco), and Greater Tunis (Tunisia). The principal objective was to quantify the degradation and restoration of the environment due to municipal waste management in monetary terms. This way, the program offers decision-makers on national and local levels a basis to identify and prioritize and prioritize specific actions to improve the integrated waste management practices.

Solid Waste Management (SWM) was one of the priorities of the Government of Lebanon for removing the scars of the civil war which erupted in 1975 and lasted for 15 years deteriorating all public services. Currently, with a population of 4.42 million in 2013 and a GDP per capita of US\$ 9,190 in 2012, Lebanon generates an estimated 2.55 million tons/year of waste (excluding the Syrian refugees), and made valuable progress. The collection services rate has reached 98-100% in urban areas and 90-95% in peri-urban and rural areas; about 53% of the waste generated is disposed in 4 sanitary landfills; the private sector is fully involved in the collection transport and disposal of MSW but at very high costs in BML; the state of cleanliness in the major Lebanese cities is remarkable; and the solid waste sector ranks first in terms of the Government related spending with a total of US\$ 647 million over the 1998-2008 periods.

The assessment of strategies/policies as well as the legal, institutional and regulatory framework assessment showed that: a series of SWM policies, strategies and master plans since 1998 till today including the 2012 waste to energy option were approved by successive governments but remained inapplicable;. The Waste to Energy options for the coastal zone

have a very high price tag with potential health hazards and environmental risks if these plants are not properly managed; the lack of treatment/disposal especially with regards to passive dumps is putting increased pressure on air, water, groundwater and soil; and public participation in planning, policy and implementation is inexistent as there is persistent distrust regarding waste management services by the Government as well as the refusal to pay for municipal waste services. The legal framework in waste management is still insufficient and monitoring and enforcement is significantly weak. The absence of legal framework has weakened the role of MoE and its power as a regulatory agency. There are unclear institutional responsibilities and a lack of capacity at the Council of Development and Reconstruction (CDR), the Ministry of Interior and Municipalities (MoIM), the Ministry of the Environment (MoE), the Office of the Minister of State for Administrative Reform (OMSAR) and the various Municipalities.

Lebanon also suffers from major budget deficits in the SWM sector and the system is not sustainable as cost recovery is minimal and is mainly financed through the Independent Municipal Fund originally destined for municipal infrastructure investments.

Beirut and Mount Lebanon consist of two distinctive Governorates with a total size of 2,004.5 Km² which is 19.4% the total area of Lebanon and has an average density of 1,000 people/Km² Its population of 2.1 million (47.5% of the total population) is still growing at a faster pace than other Governorates and the BML demand would continue to grow. The BML generates about 1.04 million tons/year (47 % of the total waste). With a daily generation of 1.3 Kg/capita/day, this is one of the highest generation ratios in the Middle East and North Africa (MENA) Region.

The cost for collection, street sweeping, sorting, treatment and disposal in the sanitary landfill is more than US\$ 130-140/

ton in the BML area, which are the highest costs in the MENA and higher in many countries in Europe. Clearly, the regional imbalance in favor of MSW services in BML is inequitable and unsustainable. Public budgets are wasted and prevent the Government from providing adequate MSW services to other regions of Lebanon. The Government has no immediate plan to introduce cost recovery system in BML. Even though

reasonable expectation for an enduring cost recovery would be in the range of approximately US\$ 15/capita/year equivalent on average to about US\$ 60/household/year to cover at least operation costs.

The cost assessment of environmental degradation (COED) due to municipal waste allowed to provide a profound

Table 1: BML Cost Assessment of Environmental Degradation and Opportunity Loss, 2012, US\$ million

Typology of Degradation Costs	CASWD		Lower Bound	Upper Bound	Opportunity Loss	
	US\$ million	%	US\$ million	%	US\$ million	%
Collection	0.0	0.0%	0.0	0.0	18.7	25.3%
Discharge	0.0	0.0%	0.0	0.0		
Recycling and composting	0.0	0.0%	0.0	0.0	39.7	53.7%
Landfill area avoidable	0.0	0.0%	0.0	0.0	15.5	21.0%
Underground water contamination from active landfills	14.3	21.6%	5.5	65.4		
Loss of land value around waste processing plants	2.5	3.8%	2.0	3.0		
Loss of land value around active landfills	2.8	4.2%	2.2	3.4		
Loss of land value around passive landfills	0.0	0.0%	0.0	0.0		
Loss of land value in active dumps	0.0	0.0%	0.0	0.0		
Loss of land value in high risk passive dumps	40.9	61.5%	32.7	49.1		
Health effects	NA	0.0%	NA	NA		
Methane emission avoidable	3.1	4.7%	2.9	3.3		
Forgone energy generation	2.8	4.2%	2.6	3.0		
Total	66.5	100.0%	47.9	127.2	73.9	100.0%
% GDP Beirut and Mount Lebanon		0.3%		0.2%		0.4%
% GDP Lebanon		0.2%		0.1%		0.2%

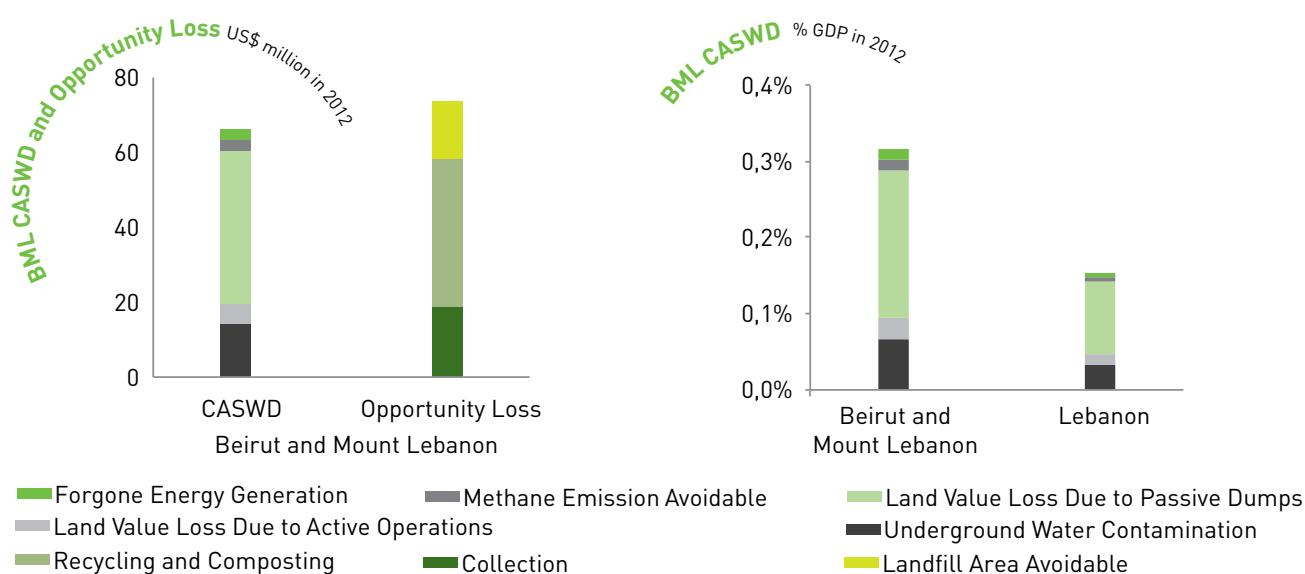


Figure 1: BML Cost Assessment of Environmental Degradation and Opportunity Loss, 2012, US\$ million

evaluation on the economic costs and a identify investments that could reap benefits. The costs are divided into 2 distinct categories: the BML COED and opportunity loss from interventions that could reap some benefits and improve the management of the waste sector in the future. These are shown in Table 1 and Figure 1. The COED due to municipal waste of BML reaches US\$ 66.5 million (LP 100 billion) in 2012 with a variation between US\$ 48 and 127 million equivalent on average to 0.3% of GDP in BML and 0.2% of the current national GDP of Lebanon in 2012. In opposite direction, the opportunity loss from interventions that could improve the waste sector management amounts to US\$ 74 million (LP 112 billion) almost equivalent to the same GDP figures.

Broken down by COED due to municipal waste sub-category, the loss of land value around high risk passive dumps is the most significant in BML with a relative value with 61.5% of the total in 2012. The water contamination due to leachate (21.6%) ranks second followed by the land loss around active waste processing plants and landfills (8%), methane emission avoidable from Naameh (4.7%) and finally by the forgone energy generation (4.2%). Health effects were not valued because they need further investigations as they are

perceived as an issue by the people living in the Naameh landfill area. The largest sub-category (61.5%) remains the liability inherited from past neglect due to poor SWM. Land depreciation around processing waste plants and landfills (8%) is a necessary bad but remains a relatively small price to pay compared to the other problems.

Based on priorities identified in the previous section, two selected remediation measures were considered in BML by performing a benefit/cost analysis: rehabilitation of the high-risk passive dump sites in the BML area; and recycling, composting and avoided landfilling in BML in case the Government adopts a zero waste strategy. The most relevant scenarios were selected and are shown in Table 2 and Figure 2. Three scenarios were considered for the rehabilitation of dumps where: (i) MSW passive dump rehabilitation; (ii) CDW passive dump rehabilitation; and (iii) MSW and CDW passive dump rehabilitation. For recycling and composting, one scenario was considered where the same amount of waste generated in 2012 was kept constant over 20 years and where treatment reduced 2012 generation by 60% in BML. This preliminary benefit/cost analysis (BCA) is meant to show that recycling and composting has a positive rate of return,

Table 2: Cost/Benefit Analysis of BML Selected Interventions, 2012, US\$ million

CBA Indicators	Viability Criteria (10% Discount rate and 20 year investment)	Scenario 3 High Risk Passive MSW & CDW Dump Rehabilitation over 20 years	Scenario 1 Recycling and Composting 60% of the Constant Waste Volume Generated in BML in 2012 over 20 years
NPV (US\$ million)	→0	8.5	135.7
IRR (±%)	↗10%	28%	36%
PV Benefit/Cost Ratio	→1	3.2	3.1
Project Viability		Yes	Yes

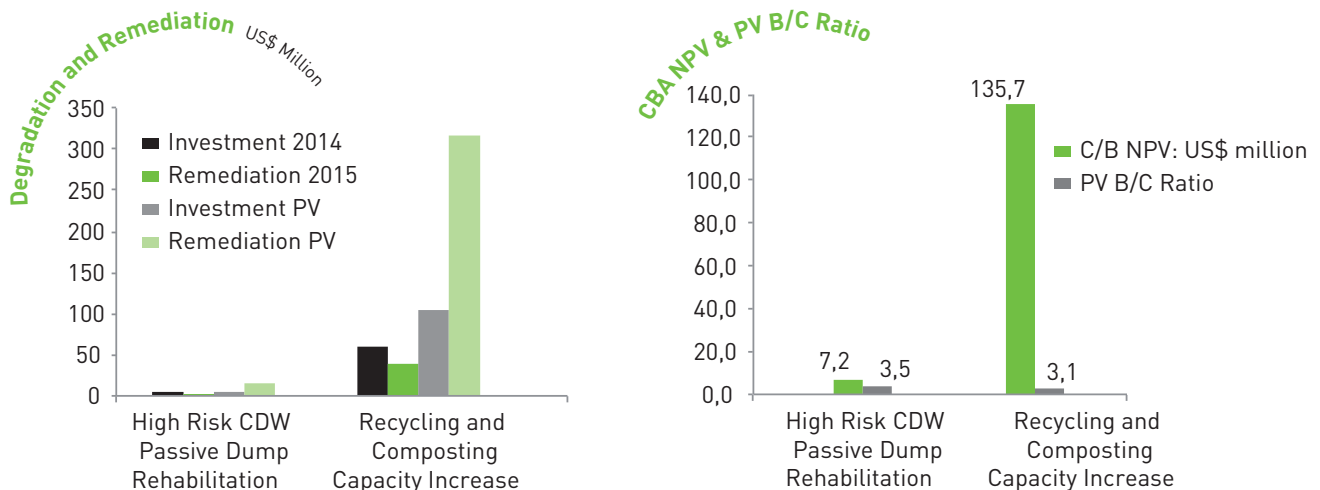


Figure 2: Cost-Benefit analysis of specific interventions in Beirut and Mount Lebanon, 2012, US\$ million

assuming the waste is processed decentralized on a caza level (each caza is assumed to have a waste processing plant) and under the condition that the price of recyclables and certified compost is assumed correctly. However, additional analysis is however needed to do a volumetric analysis (waste generation increase overtime) and include the price of the landfill. Both projects are viable with NPV of US\$ 8.5 and 135.7 million respectively. Nevertheless, other weighted criteria (e.g., scarcity of land, people resistance and NIMBY syndrome, etc.) should be considered before any selection is made.

The High Risk MSW and the construction and demolition waste (CDW) passive dump closure and rehabilitation are viable and could create occasional green jobs. However, the risk associated with soil and underground water pollution is probably considered in the Sensitivity Risk Indicator but merit further attention in selecting the priority dumps to be rehabilitated. Increasing the recycling and sorting capacity to reduce the actual waste by 60% is highly viable and needs further investigation and analysis before embarking upon more ambitious and costly investments such as waste to energy projects that could increase the government deficits in the future. More efficient alternatives, such as zero waste approaches, could prove very efficient and economically viable if waste processing is decentralized at the caza level and prices and quality of recyclables and compost are assumed correctly.

Both assessments helped reach the following conclusions:

- The municipal waste management sector especially in BML, is characterized “by many investments carrots and no institutional and regulatory sticks”;
- The municipalities in BML do not have the financial, managerial and human resources and the tax base to be able to provide and sustain adequate MSW services;
- After 18 years since the emergency plan of SWM was approved, the Central Government continues to invest in the SWM services at very high cost;
- The lack of proper disposal of all types of wastes are adversely affecting the surface and groundwater resources of BML, given the high permeability of its soil;
- The COED due to municipal waste is high (UD\$ 81.6 million) and represents 0.2 percent of the national GDP in 2012. This degradation affects primarily the natural resources until further evidence is provided that pollution generated from MSW also can affect public health;
- With the exception of two large dump sites which were rehabilitated and the Saida dumpsite is being rehabilitated, no other investments were made on the MSW and CDW dumps which are continuously spreading out in the region;
- BML is being adversely affected by a past neglect of its open dumps, an unsustainable present of its MSW

services and a bleak future for alternative solutions to its major disposal sites. Many ministerial decisions were taken and plans prepared. The political economy and crisis management still prevail over a strategic and realistic approach for an integrated SWM system for this region.

Based on the above general conclusions, the following recommendations are proposed for moving towards an integrated sustainable waste management system using BML as a pilot region. Such a system would consist of three building blocks: (a) involving the stakeholders; (b) establishing an effective and efficient waste system elements from pre-collection to disposal and the valorisation of the municipal waste; and (c) strengthening the municipal waste management aspects from an institutional, legal, financial, and environmental and social point of view. At this stage, it is important to note that these three blocks cannot be implemented in parallel over a short and medium terms of 2-5 years, however, it should start by the following elements at pace commensurate with the socio-economic situation in Lebanon.

a) Stakeholders involvement and participation can be initiated by:

- The Ministry of the Environment and the local NGOs for developing a joint communication strategy that will facilitate the understanding of the MSW services in BML and gain the support and participation of households on the interventions proposed by the municipalities and by CDR;
- The MSW operators and the local NGOs by establishing a pilot community interaction in 1-2 cities such as in Byblos and Aley, whereby the MSW management stakeholders including the informal and formal private sector, and local NGOs contribute their views on the development of city master plans, facility planning /siting and facility monitoring;
- CDR and the MOE soliciting community inputs to address the NIMBY responses of new MSW management facilities and explaining the social, economic and environmental benefits of the proposed new facilities.

(b) An effective and efficient MSW can be achieved by:

- Establishing investment priorities that will include: (a) establishing at the caza level or within a group of municipalities, new MSW facilities with technologies that are environmentally proven, technically feasible, cost effective, affordable, and within the management capacities of the municipalities it serves; (b) rehabilitating high risk old dumps (such as Hbaline) simultaneously with establishing new MSW facilities as the NPV for old dump

rehabilitation is US\$ 7.2 million over 20 years; (c) apply the reward system provided by the Council of Ministers for municipalities that would establish new MSW facilities and rehabilitating the old dumps;

- Managing waste materials as an economic resource by: (a) decentralizing the composting and recycling activities at the caza level as the benefit cost analysis showed a very high net present value (NPV) of 135.7 million over 20 years in case the Government will be planning to adopt a zero waste strategy;
- Making use of the Clean Development Mechanism for the Naameh landfill as a new source of revenue to the neighboring municipalities, that make clean technologies financially attractive, and may also attract new stakeholders and new levels of private sector interest and capability;
- Reviewing the cost effectiveness for MSW Services in the BML by: (a) re-assessing the operations costs of the short term 3-year and 5-year contracts for collection services, sorting plants and the composting plant; and (b) introduce competitive bidding for public procurements after the expiration of current contracts in order to achieve better cost efficiency.

(c) Strengthening the municipal waste management aspects will include:

- Preparing a MSW management plan that would identify the best solutions based on benefit/cost analysis and on a complete set of actions, including coordination needs among all the stakeholders along these priorities in ways that are protective of the environment, affordable, and responsive to feedback from the public;
- Developing an effective institutional framework within BML that will include: (i) clear identification of responsibilities and coordination between the municipalities, the MOE, CDR and the operators in charge of tasks associated with the design, operations, monitoring, and enforcement of waste management systems;
- Establishing environmental criteria and standards for MSW and developing of incentives to favor environmentally sound SWM services;
- Introducing a phased approach for cost recovery in BML accompanied by improved MSW management services that is public acceptable, and based on effective public awareness campaigns;
- Conducting research, data collection and analysis on the linkages between health and pollution due to MSW to determine the impacts of pollution on public health using the Naameh landfill as a pilot.

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