Final Draft National Integrated Solid Waste Management Strategy of Lebanon

Executive Summary

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List of Abbreviations

BOOT	Build - Own - Operate - Transfer
BOT	Build-Operate-Transfer
CDR	Council of Development and Reconstruction
C&DW	Construction and Demolition Waste
CSO	Civil Society Organization
DBO	Design - Build - Operate
EEE	Electrical and Electronic Equipment
EHS	Environmental, Health and Safety
EIB	European Investment Bank
ELV	End-of-Life Vehicle
EPR	Extended Producer Responsibility
FCA	Full Cost Accounting
GoL	The Government of Lebanon
HWM	Hazardous Waste Management
IFC-WBG	International Finance Corporation-World Bank Group
ILO	International Labor Organization
ISWM	Integrated Solid Waste Management
LWMIS	Lebanese Waste Management Information System
LT	Long-term
MBT	Mechanical Biological Treatment
MIS	Management Information System
MoE	Ministry of Environment
MoET	Ministry of Economy and Trade
MoF	Ministry of Finance
MoI	Ministry of Industry
MoIM	Ministry of Interior and Municipalities
MoPH	Ministry of Public Health
MRF	Materials Recovery Facility
MT	Mid-term
MW	Municipal Waste
NISWMS	National Integrated Solid Waste Management Strategy
NGO	Non-Governmental Organization
NSWCC	National Solid Waste Coordination Committee
NSWMA	National Solid Waste Management Authority
OMSAR	Office of the Minister of State for Administrative Reform
PCB	Polychlorinated Biphenyl
PPP	Private Public Partnership
RDF	Refused Derived Fuel
RoE	Return of Equity
SCP-NAP	Sustainable Consumption and Production National Action Plan
ST	Short-term
SRM	Secondary Raw Material
SWM	Solid Waste Management
UN	United Nations
UoM	Union of Municipalities
USAID	United States Agency for International Development
WB	World Bank
WEEE	Waste from Electrical and Electronic Equipment
WM	Waste Management

Section 1: Vision, Values and Objectives

"Lebanon moves towards a more efficient, sustainable, and cost-effective integrated waste management system, turning waste into valuable resources, putting an end to open dumping and burning and creating healthier environments for the benefit of the Lebanese people". This strategic vision for the sector is complemented by the following values based on Law 80/2018:

- Integrated solid waste management principle
- Reduction, reuse and recycling principle
- Sustainability principle
- Proximity principle
- Precautionary principle
- Preventing uncontrolled dumping and burning of waste principle
- Polluter pays principle
- Decentralization and subsidiarity principle

Accordingly, three strategic objectives are set as follows:

1. Complete, Upgrade and Operate ISWM Infrastructure
2. Enhance Community and Private Sector Stewardship Towards a Circular Economy
3. Enable an Effective Governance Framework to Implement the ISWM System

Section 2: Overview of the National Context

With a population of approximately 6,742,513 as of April 4, 2023[1], and a geographical area of 10,452 KM[2], Lebanon is hosting the largest number and highest density of refugees and displaced per capita- with the government estimation of 1.5 M Syrian displaced in 2015); and 265,000 Palestinian refugees [2] noting that the UNHCR registration of Syrian refugees in Lebanon has been suspended since May 2015 through a decision by the Lebanese Government[3].

In 2019, Lebanon has been assailed by the most severe economic and financial crisis that has been aggravated by the dual economic impact of the COVID-19 pandemic and the tragic Port of Beirut explosion in August 2020. As a result, the country witnessed a major depreciation of the Lebanese pound and related inflation, increased unemployment and poverty rates, business closures and limited access to foreign exchange and imports, This affected all sectors, including the solid waste sector, which continues to be impacted by the following drivers[4]:

- poor governance at the *national* level leading to political indecision as a result of limited qualified human resources, excessively low budget, lengthy procurement process, weak enforcement of legislation and the incomplete legal framework for solid waste management;
- poor governance at the *local* level due to the lack of regulatory and economic instruments, financial limitations and the absence of a cost recovery mechanism, weak public awareness and involvement, and the burden of over 1.5 million registered refugees leading to an increase in waste generation of 324,568 t/year, equivalent to 15.7% by the end of 2014;
- public opposition and lack of trust as a result of cumulative lack of transparency and accountability throughout the years, further hindering decision-making power and efficient long-term planning, coupled with misconceptions that limit social acceptance of engineering-based decisions.

[1] Worldometer, 2023, Lebanon Population, Lebanon Population (2023) - Worldometer (worldometers.info)
[2] 2017 figures of Palestinian camps population data from previous project with United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA)
[3] UNHCR, 2023, UNHCR Lebanon: Fact Sheet, April 2023, https://reporting.unhcr.org/document/4773
[4] MoE/UNDP/UNHCR/UNICEF, 2020. Lebanon State of the Environment and Future Outlook: turning the Crises into Opportunities.

Section 3: Assessment of the Solid Waste Management Sector

The amount of solid waste produced by households in Lebanon within various governorates and districts is approximately 2,679,992 tons per year, equivalent to around 7,300 tons/day in 2018. The financial and economic crisis has led to reduced purchasing power and consumption; waste generation rates have dropped by about 25% in 2022, to be around 5,600 tons/day, and are not expected to return to 2018 levels in the next 5–7 years.

Waste composition in Lebanon according to the 2018 ISWM policy shows a predominance of organic (52%) and recyclable waste (37%)[5]; however, consumption patterns have been impacted by both the COVID-19 pandemic of 2020 and the economic crisis (increase from ~52% to ~70% in organic waste, decrease from ~16% to ~4% in paper/cardboard waste, and a slight increase from ~11% to ~12% in plastic waste between 2017 and2021)[6].

Regarding household waste collection systems, municipalities and local authorities are responsible for waste-collection operations and sometimes contract private companies to carry out the task. In 1994, the Lebanese government signed a contract with Sukleen, a private waste management company, to handle garbage collection and street cleaning in Beirut. However, Sukleen ended its operations in 2018, and two firms, namely RAMCO and CityBlu started waste collection. Nevertheless, these firms encountered many payment problems due to the financial crisis and started operating at reduced capacity. Even though decree 5605/2019 requests municipalities to establish drop off centers for sorting at source and pushes towards a three-bin system, domestic waste is still mostly collected as mixed waste, either through curbside systems or collection points. In Beirut city, approximately 1,160 tons of waste per year leaks into the environment, with 37% originating from waste containers that mostly have an open top and are unsealed, and 63% originating from plastic waste leakage from beach goers. In fact, hard plastics, soft plastics and foam make up 77.7% of the marine litter found in the Lebanese beaches, and 88% of the marine litter collected by end of 2021 is likely to have been dumped on land, rather than being from a sea-based source[7].

The analysis of existing waste facilities (with capacity larger than 50 tons/d) showed that Lebanon has an available treatment capacity of 6,390 tons/d, which could cover the amount of waste generated in the country of around 5,600 tons/day. However, currently, only 440 tons/d of the treatment capacity is operational, which is equivalent to only 6.8%, and thus only 7.9% of the generated waste is being treated in existing facilities.

As for waste disposal in sanitary landfills, in 2018, when most waste-treatment facilities were operational, approximately 77.3% of the total of waste generated was sent to waste disposal sites (sanitary landfills and open dumps). In 2022, nearly 98.7 percent of the total waste generated ended up in operating landfills or open dumps. There are eight operating landfills that receive around 3,182 tons/day, which is more than their original design capacity, leading to overfilling and reducing their service life. The remaining quantity is being disposed of in open dumps, in fact, it is estimated that around 2,377 tons/day of waste were being sent to open dumps, burned, or littered, out of the total 5,600 tons/day generated.

The lack of access to centralized treatment facilities or landfills is most critical in northern areas such as Koura, Batroun, Zgharta, and Bcharre, and in southern areas such as Bint Jbeil, Marjaayoun, and Hasbaya. Small-scale donor-funded facilities in these areas are barely operational, and open waste dumping and burning are common, posing significant risks to public health and the environment.

Despite being prohibited by law, open burning of waste continues to be a common practice across the country, especially after the shutdown of most existing facilities and municipalities' inability to cover waste management costs; consequently, the number of open dumps has increased to at least 1,000[8].

[5] Sweepnet (2014). Country report on the solid waste management in Lebanon, German Corporation for International Cooperation (GIZ)
[6] World Bank, 2023, Lebanon Solid Waste Roadmap for 2023-2026
[7] WB/MoE/ISWA, 2021, Baseline Marine Pollution Survey in Lebanon
[8] World Bank, 2023, Lebanon Solid Waste Roadmap for 2023-2026

The solid waste management services have been severely affected by the crisis; less than 8% of collected household waste was being treated, over 40% of this waste ends up in open dumps, and there is little adherence to the solid waste management hierarchy.

The Government of Lebanon adopted Law No. 80/2018 on Integrated Solid Waste Management (ISWM), following the adoption of the ISWM policy in 2018 (CoM Decision 45 of 11 January 2018). Notwithstanding the importance of this milestone, some legislative reforms are still needed for the waste sector such as the establishment of the National Solid Waste Management Authority, implementation of a Management Information System (MIS) and self-monitoring, and promotion of the inclusion of informal waste management operators in the formal sector.

Current legislation and regulations pertaining specifically to **waste management** include:

- Laws: 80/2018 (sets the framework for Integrated Solid Waste Management); 64/1988 (environmental protection against hazardous waste that could harm air, water, biodiversity, soil, and people);
- Legislative decrees: 7975/1931 (stipulates that solid waste should not be dumped randomly around residential areas but be removed and managed by the municipalities),
- Decrees: 5606/2019 (hazardous waste management); 5605/2019 (sorting at source); 13389/2004 (healthcare waste management) Decree 8735/1974 (protects against solid and liquid waste pollution and assigns waste collection and sweeping to municipalities).
- MoE Decisions: 998/1 and 999/1 of 2019 and 59/1 of 2020 (specify the procedures and principles for hazardous waste generators, transporters and temporary storage facilities respectively), decision 58/2020 (classification of Reuse Derived Fuel "RDF" resulting from non-hazardous waste).
- MoE Memos: Memo 4/1 of 2022 setting for the municipalities, union of municipalities, qaemaqams and governors, a tender document template for waste collection and sweeping.

Legislation related to **environmental safeguards** in Lebanon, include, in addition to law 444/2002 (environmental protection), decree 8213/2012 (Strategic Environmental Assessment), decree 8633/2012 (Environmental Impact Assessment), decree 8471/2012 (environmental compliance for establishments) among others. National environmental **standards** include decision 52/1 of 1996 (National Standards for Environmental Quality and the Environmental Limit Values for air, water, and noise), decision 8/1 of 2001 (National Standards for Environmental Quality - NSEQ), and decision 16/1 of 2022 (updated the ELVs for air emission sources figuring in decision 8/1 of 2001), Recommendations on the control of leachate are set out through IFC-WBG EHS Guidelines.

Applicable **social** legislation include: The Labor Code of 1946 and its amendments, Expropriation law 58 of 1991 and its amendments, law 207 of 2000 prohibiting all forms of discrimination between men and women in the workplace, law 220 of 2000 stipulating the civil rights of people with disabilities, law 293 of 2014 protecting women and family members from domestic violence, law 205 of 2020 criminalizing sexual harassment at any location, as well as decree 11802 of 2004 regulating occupational health and safety, and decree 8987 of 2012 forbidding child labor in hazardous jobs.

In addition to the national legislative framework, Lebanon has also ratified several **conventions** related to the protection of the environment, natural and cultural heritage, and labor such as the Minamata Convention (Mercury), UNFCCC, the Kyoto Protocol and Paris Agreement (Climate Change), Vienna Convention (Ozone), Stockholm and Basel Conventions (Persistent Organic Pollutants (POPs) and transboundary movement of hazardous waste), Convention on Biological Diversity (Biodiversity), Barcelona Convention (Protection of the Mediterranean sea against pollution) and ILO Convention (Labor).

On the **strategic and planning aspect**, the most recent plans directly related to SWM include: the 2019-2030 Solid Waste Roadmap adopted in 2019, updated in 2020 (the Report of the Technical Committee formed by the CoM to support the Ministerial Committee in charge of studying SWM and in 2023 (ISWM Roadmap for 2023-2026), the Climate Action in the Solid Waste sector (2023), the Marine Litter Baseline (2021), and the 2017 update of the (2011) Master Plan for the Closure and Rehabilitation of Uncontrolled Dumps – noting that in May 2022, the CoM approved the sanitary landfills locations proposed by the MoE (Decision 67 of full date). Other sectoral plans that can also impact the NISWMS

include: Lebanon's commitment to the UN sustainable development goals for 2030, Lebanon's Nationally Determined Contributions (of 2015 updated in 2020), Lebanon's national strategy for air quality management for 2015-2030, the integrated vision for the Lebanese industrial sector for 2025 (issued in 2015), the sustainable consumption and production national action plan, and others.

Primary governmental authorities and private actors in waste management and their responsibilities are outlined, the MoE being responsible for the preparation of national strategies, legislation, and standards, as well as the approval of local plans and environmental permits. The National Solid Waste Coordination Committee (NSWCC) coordinates issues pertaining to the solid waste sector, while the National Solid Waste Management Authority (NSWMA) should be in charge of preparing centralized projects and supervising their implementation; however, it has not been established yet. Local authorities are in charge of planning, implementing, and monitoring local waste management services; and private service providers are in charge of constructing and operating private or Public-Private solid waste projects. In addition, other transitional (CDR, OMSAR) and secondary (MoIM, MoI, MoPH, MoET, MoF, informal sector, private sector, NGOs and funding agencies) stakeholders play various roles in waste management.

In terms of public awareness and education programs, most of the initiatives, mostly related to waste sorting and recycling, are undertaken by private entities, NGOs and other community-based organizations, projects funded by donors, municipalities and universities. These include: The American University of Beirut, Ahla Fawda, Lebanon Waste Management, Live Love Recycle, Ecoserv, Beeatouna, Arcenciel, Waste Management Coalition, Lebanese House Establishment for Environment, Human Environment Association for Development, UNICEF, USAID, Bickfaya municipality, ENI CBC Med, Sukleen, Lebanon Organization for Green Schools, etc.

As for Public-Private Partnerships (PPP), many municipalities have managed to achieve several PPP success stories such as the municipality of Saida (IBC), the Municipality of Bikfaya-Mhaydseh, and Fayhaa Union of Municipalities, in addition to NGOs being actively involved in initiatives related to waste management.

The Informal's sector contribution in waste collection and recovery is estimated at around 2%. As a result of the socio-economic crisis, there has been an increase in the numbers of scavengers searching for recyclables to sell, mainly plastics and aluminium. These scavengers encounter hazardous situations and accidents when regularly entering the landfills of Bourj Hammoud and Costa Brava, while the authorities are unable to ensure the security of these sites effectively.

The strengths of the waste management system include treatment of a certain amount of waste away from open dumpsites, diverse sources of financing, the presence of detailed data, funding opportunities, a wide range of technologies for waste treatment, and the issuance of the Integrated Solid Waste Management law. While weaknesses include a significant amount of waste going to open dumpsites and landfills, unavailability of sufficient spaces in various areas for waste management, absence of a cost recovery system, mistrust between civil society and the State, poor governance and readiness towards emergencies, and the multitude of authorities involved in the sector.

Main opportunities include dumping prevention and associated financial fines under law 444/2002. There is also a potential for increasing material recovery rates, decreasing landfilling rates, improving cost effectiveness of operations, ensuring cost recovery through service fees and taxation through legislation, reducing generation rates and activating monitoring programs through an establishment of a National Solid Waste Management Authority. On the other hand, encountered challenges involve significant costs associated with sustainable solutions, absence of monitoring mechanisms, Society's refusal to impose additional fees in light of difficult economic conditions, and weakness in the implementing mechanisms of legal documents.

As for hazardous waste, the total estimated quantities generated in 2019 from the different sectors are about 71,800 tonnes, with the packaging, paints, fertilizers, printing, metal, textile, tanning, cleaning products, and used oil industries, being the largest producers of hazardous waste. No proper infrastructure for collection, treatment, and disposal of hazardous waste is present in Lebanon at the actual moment. However, several specific interventions targeted the hazardous waste management, namely the elimination of PCB (polychlorinated biphenyls) contaminated power transformers, and the

reduction of Unintentional Persistent Organic Pollutants through Waste Management in a Circular Economy.

The existing situation of special waste streams management can be summarized as follows:

- Construction and Demolition Waste: 4 million tonnes in Beirut and 17 million tonnes in Mount Lebanon are forecasted during 2018-2040
- Bulky Waste: there is no data and information on the exact amount of bulky waste generated in the country.
- Waste Electrical and Electronic Equipment: 46 kt of e-waste was generated in 2021; however, only 0.09 kt have been managed in an environmentally sound manner by two e-waste national dismantling entities in Lebanon.
- Batteries and accumulators: 15,894 to 21,885 tons of used lead-acid batteries would be collected every year in Lebanon. The waste batteries for all kinds of batteries other than those from the retrofitting of public buildings through green technologies and processes are estimated at 1,310 tons/year. While there are many facilities in Lebanon that recycle used batteries, MoE database shows only four licensed facilities.
- Used tires: Tire waste generation was estimated at 20 000 tonnes in 2020, with only three tire collection and recycling facilities active in the country. The largest part is being handled by the informal sector in a non-environmentally friendly manner.
- Used oils: Non-hazardous cooking oil is mostly exported, with approximate generation rates of 500-600 tonnes/month of liquid oil in 2017. Organic hazardous oil is produced at a rate of 11 kg/cap/yr, with more than 90 companies and individuals collecting and selling it, but only one reporting to MoE their treatment activities.
- Sludge from Wastewater Treatment Plants: The amount of dewatered sludge generated across the country was about 65,450 m3/d up till 2019. Projected quantities for 2025 and 2030 are estimated to be 86,514 and 110,542 t/y, respectively, excluding the sludge from Tripoli/Minieh plant and Beirut plant because they are planned to treat their own sludge on-site.
- Industrial non-hazardous waste: 2014 figures estimate an Approximate generation of 24,000 tonnes/year from light manufacturing industries.
- Waste from food processing: A figure that might be outdated estimates that 17,800 tonnes this type of waste is produced per year.
- Agricultural residues: No distinct estimate is available about their production.

Section 4: Assessment of Future Needs for the Solid Waste Management Sector

The strategy time-frame is of 20 years, divided in 3 implementation periods 1) Short–Term (ST) 2024-2028, 2) Mid-Term (MT) 2029-2033 and 3) Long-Term (LT) 2023-2043,. According to Law 80/2018 the NISWMS should be amended after a maximum of 10 years.

Table 1: Planning time periods of the updated NISWMS

Planning Periods	Period from the NSWMS adoption	
Short-term Period	1-5 years	2024 - 2028
Mid-term Period	6-10 years	2029 - 2033
Long-term Period	11-20 years	2034 - 2043

Forecasting waste generation is key to formulating sustainable waste management policies/systems, facilitating strategic planning, and also a challenging issue when it comes to Lebanon. Table 2 summarizes the estimated Municipal Waste Projections per Governorate and per District for the NISWMS planning time periods.

Table 2: MW Projections (tn/yr) for the NISWMS planning time periods

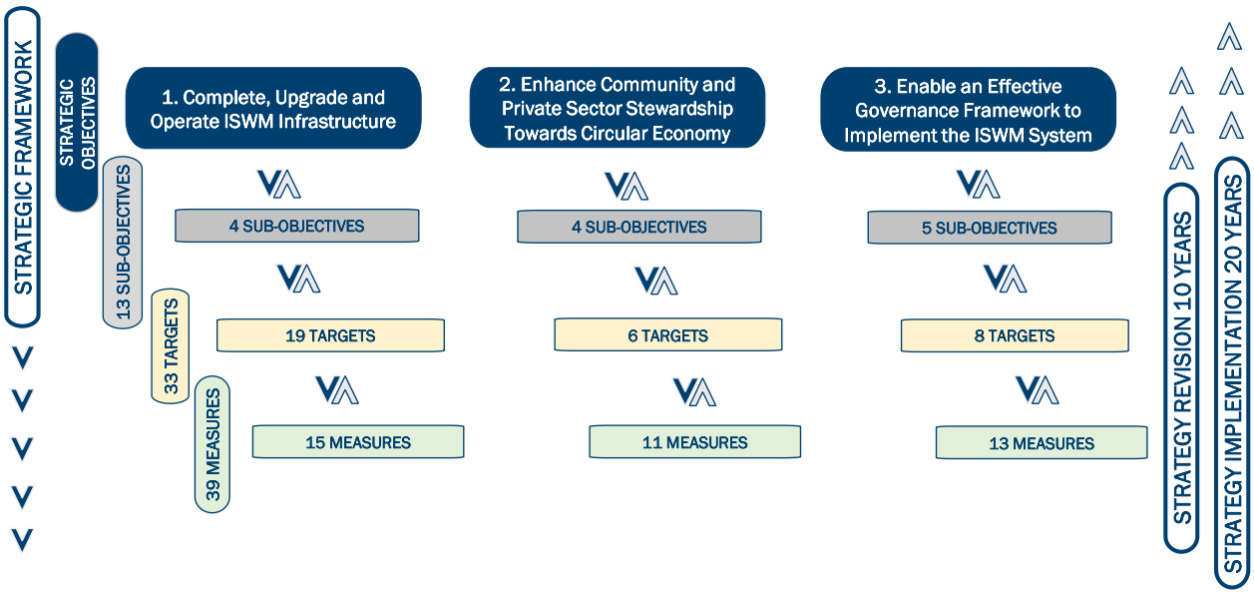
Governorate	Districts	MW Generation (tn/yr)					
		Short-term Period		Mid-term Period		Long-term Period	
		1- 5 year from strategy adoption		6- 10 years from strategy adoption		11 - 20 years from strategy adoption	
		2024	2028	2029	2033	2034	2043
Beirut	Beirut	192,200	224,615	226,268	236,551	240,466	289,876
Mount Lebanon	Aaley	143,993	168,278	169,058	176,741	179,666	216,584
	Baabda	323,359	377,894	379,646	396,899	403,468	486,372
	Chouf	84,518	98,772	99,230	103,739	105,456	127,125
	Matn	248,858	290,828	292,177	305,455	310,510	374,314
Keserwan-Jbeil	Ibeil (Byblos)	51,005	59,607	59,883	62,605	63,641	76,718
	Keserwan	115,821	135,354	135,982	142,161	144,514	174,209
North Lebanon	Batroun	27,459	32,090	32,239	33,704	34,262	41,302
	Bcharre	12,033	14,063	14,128	14,770	15,014	18,099
	Koura	32,236	37,673	37,847	39,567	40,222	48,487
	Zgharta	28,630	33,458	33,613	35,141	35,722	43,063
	Minyeh-Doniyeh	73,894	86,356	86,756	90,699	92,200	111,145
	Tripoli	154,371	180,405	181,242	189,478	192,614	232,193
Aakkar	Akkar	134,603	157,303	158,033	165,215	167,949	202,459
Beqaa	West Beqaa	56,658	66,214	66,521	69,544	70,695	85,221
	Rashaya	19,277	22,528	22,632	23,661	24,052	28,994
	Zahle	155,657	181,909	182,752	191,057	194,219	234,127
Baalbek-Hermel	Baalbeck	93,909	109,747	110,256	115,266	117,174	141,250
	Hermel	15,651	18,291	18,376	19,211	19,529	23,542
South Lebanon	Jezzine	10,956	12,804	12,863	13,448	13,670	16,479
	Saida	75,928	88,733	89,145	93,196	94,738	114,205
	Tyre	85,761	100,225	100,690	105,266	107,008	128,996
Nabatieh	Bent Jbeil	36,449	42,596	42,793	44,738	45,478	54,823
	Hasbaya	19,395	22,666	22,771	23,806	24,200	29,172
	Marjoyoun	36,311	42,435	42,632	44,570	45,307	54,617
	Nabatieh	69,468	81,183	81,560	85,266	86,678	104,488
Total (tn/yr)		**2,298,400**	**2,686,026**	**2,699,095**	**2,821,753**	**2,868,456**	**3,457,862**
Total (tn/d)		**6,297**	**7,359**	**7,395**	**7,731**	**7,859**	**9,474**

Following the NISWMS, a National Waste Management Master Plan shall be prepared that will specify the required infrastructure based on the projected waste generation for the planning periods of the NISWMS.

Section 5: Short. Medium and Long-term Objectives and Priorities for Integrated Solid Waste Management

The NISWMS is structured around three (3) Strategic Objectives (SO). Each SO is comprised of Sub-Objectives (Sub-O), which provide the short, mid- and long-term Targets, and Measures, in order to ensure Integrated Waste Management that meet the needs of the Lebanese citizens and residents on Lebanese territory.

The measures are planned to be implemented under specific time frames determined throughout the 20-year period of the NISWMS.



The Strategic Objectives and Sub-Objectives of the Draft National Integrated Solid Waste Management Strategy (NISWMS) are:

<u>Strategic Objective 1: Complete, Upgrade and Operate ISWM Infrastructure</u>

Sub-Objective 1.1: Establish an Effective Waste Collection and Transportation System

Sub-Objective 1.2: Establish Reuse, Recycling and Material Recovery Facilities for Separately Collected Waste

Sub-Objective 1.3: Establish Climate-Smart Waste Treatment and Energy Recovery Facilities

Sub-Objective 1.4: Establish Climate-Smart Final Disposal Facilities and Close/Rehabilitate Open Dumps

<u>Strategic Objective 2: Enhance Community and Private Sector Stewardship Towards a Circular Economy</u>

Sub-Objective 2.1: Engage Community in Waste Reduction and Sorting at Source

Sub-Objective 2.2: Integrate the Informal Sector in the ISWM System

Sub-Objective 2.3: Promote Private Sector Participation and Investment in Waste Management

Sub-Objective 2.4: Enhance Public Awareness and Education

<u>Strategic Objective 3: Enable an Effective Governance Framework to Implement the ISWM System</u>

Sub-Objective 3.1: Establish and Operationalize the National Solid Waste Management Authority

Sub-Objective 3.2: Establish and Implement Cost Recovery System and the Extended Producer Responsibility

Sub-Objective 3.3: Complete and Enforce the Waste Management Legislative Framework

Sub-Objective 3.4: Complete and Implement the Planning Framework at the National and Local Level

Sub-Objective 3.5: Establish and Operationalize a Waste (including Hazardous Waste) Management Information System (WMIS)

Table 3: Strategic Objective 1. Complete, Upgrade & Operate ISWM Infrastructure

Strategic Objective 1: Complete, Upgrade & Operate ISWM Infrastructure			
Measures	**Targets / Indicators**	**ST (1-5 years) & MT (6-10 years)**	**LT (11-20 years)**
Sub-Objective 1.1: Establish an Effective Waste Collection and Transportation System			
1.1.1. Design and implement a waste collection system including street-cleaning, waste collection [3-bins system for curbside collection of dry recyclables (paper/carboard, plastic, metals, glass), biowaste, and residual municipal waste] and transportation equipment (ST/MT/LT)	(1) MW Collection System Coverage	Maintenance of the current 100% coverage within 10 years	Maintenance of the current 100 % coverage
1.1.2. Design, construct, O&M Transfer Stations (ST/MT/LT)	(2) MW Collection System Optimization	Gradual Optimization within 10 years	Completion and maintenance
1.1.3. Design and implement a HW collection system (MT/LT)	(3) HW Collection System Coverage	50% within 10 years	100% within 20 years
Sub-Objective 1.2: Establish Reuse, Recycling[9] and Material Recovery Facilities for Separately Collected Waste			
1.2.1. Design, construct, O&M Drop Off, Reuse and Repair centers (paper/cardboard, plastic, metals, glass, bulky, textiles/clothes, toys, bulky waste, etc.) (ST/MT)	(4) Drop-off, reuse and repair centers	One (1) per municipality within 10 years.	
1.2.2. Design, construct/upgrade, O&M Material Recovery Facilities (ST/MT)	(5) Reuse / recycling rate of municipal waste:	At least 20 % by weight within 10 years.	At least 50 % by weight within 20 years.
1.2.3. Design, construct/upgrade, O&M Composting and/or Anaerobic Digestion Facilities with climate smart investments[10] (ST/MT).	(6) Reuse / recycling rate of paper, metal, plastic & glass	At least 20 % by weight within 10 years	At least 50 % by weight within 20 years
1.2.4. Design, construct/upgrade, O&M HW Recovery Facilities - HWRF (MT/LT)	(7) HWRF coverage	40 % within 10 years	100 % within 20 years
Sub-Objective 1.3: Establish Climate-Smart Waste Treatment and Energy Recovery Facilities			
1.3.1. Design, construct/upgrade, O&M Commingled Municipal Waste Treatment[11] and Energy Recovery Facilities – MWTF (ST/MT/LT)	(8) MW treatment prior disposal (%) (9) MWTF coverage	100%. At least 40 % within 10 years	100% 100 % within 20 years
1.3.2. Design, construct/upgrade, O&M Sludge Treatment Facilities-STF (ST/MT/LT)	(10) STF coverage	40 % within 10 years.	100 % within 20 years
1.3.3. Design, construct/upgrade, O&M Agricultural Waste Treatment Facilities - AWTF (MT/LT)	(11) AWTF coverage	At least 20 % within 10 years.	At least 40 % within 20 years.
Sub-Objective 1.4: Establish Climate-Smart Final Disposal Facilities and Close/Rehabilitate Open Dumps			
1.4.1. Design, construct/upgrade, O&M Municipal Sanitary Landfills (MWSL), including landfill gas utilization where financially viable (ST/MT)	(12) MWSL coverage (13) MW landfilled (LF) (% of generated) (14) Biodegradable LF (% of generated)	100% within 7 years. Max 75% within 10 years Max 75% within 10 years	Maintenance of 100 % coverage Max 45% within 20 years Max 50% within 20 years
1.4.2. Design, construct/upgrade, O&M CDW Sanitary Landfills (ST/MT/LT)	(15) CDW SL coverage	At least 25 % within 10 years.	At least 50% within 20 years.
1.4.3. Close and rehabilitate uncontrolled dumpsites (ST/MT)	(16) Open dumping & burning phase out (17) Gradual rehabilitation	100% within 7 years	Gradual within 20 years.
1.4.4. Design, construct/upgrade, O&M HW Disposal Sites (MT/LT)	(18) HW safe disposal (%)	50% within 10 years.	100% within 20 years.
1.4.5. Close and rehabilitate areas contaminated with HW and existing/historical HW disposal sites (ST/MT/LT) after conducting any needed inventory	(19) Contaminated sites remediation (%)	50% within 10 years.	100% within 20 years.

[9] According to Law 80/2018, "recycling" is the process of recovering materials that are contained in solid waste. These materials can be reused as substitutes for raw materials used in a manufacturing process or the properties of these materials can be used for the recycling of those materials or the manufacture of other materials. The process excludes the direct use of the energy recovered from these wastes..

[10] Refers to the allocation of financial resources towards projects, initiatives, and technologies that aim to mitigate the impacts of climate change and promote the transition to a low-carbon, sustainable economy.

[11] According to Law 80/2018, "waste treatment" refers to the processes for the transformation of waste using any of the following technologies: recycling, composting, biodegradation and/or thermal disintegration.

Table 4: Strategic Objective 2. Enhance Community and Private Sector Stewardship Towards a Circular Economy

Strategic Objective 2: Enhance Community and Private Sector Stewardship Towards a Circular Economy			
Measures:	**Targets / Indicators**	**ST (1-5 years) & MT (6-10 years)**	**LT (11-20 years)**
Sub-Objective 2.1: Engage Community in Waste Reduction and Sorting at Source			
2.1.1. Develop a plan for waste reduction – including marine litter prevention (ST) and implement measures such as reducing packaging materials, reducing single-use plastic use, promoting reusable products (ST/MT)	20) Reduction of waste generation (% per capita)	3% within 10 years	
2.1.2. Promote home composting (ST/MT/LT)	21) Home composting (% coverage)	5% within 10 years	10 % within 20 years.
Sub-Objective 2.2: Integrate the Informal Sector in the ISWM System			
2.2.1. Develop a study to identify the modalities for the integration of the informal sector (options/recommendations) (ST)	22) Incorporation of the informal sector within waste management schemes	Gradual within 10 years	100% within 20 years.
2.2.2. Implement recommendations for the integration of the informal sector (MT)			
Sub-Objective 2.3: Promote Private Sector Participation and Investment in Waste Management			
2.3.1. Prepare guidelines for PPP tender documents and contract conditions (e.g. Service Contracts, Management Contracts, Leases, Facility Concessions) (ST)	23) PPPs guidelines & incentives adoption	Gradual within 10 years	Adoption within 20 years
2.3.2. Provide increased Return of Equity in order to make the PPP approach attractive to the private sector for the investment in Collection Systems, Transfer Stations, Material Recovery Facilities, Composting and/or Anaerobic Digestion Facilities, Commingled Municipal Waste Treatment Facilities (including RDF production) (ST/MT/LT)			
2.3.3. Provide incentives for the design, construction, O&M of Recycling Infrastructure (collection and recycling for Waste Electrical and Electronic Equipment (WEEE), batteries and accumulators, used tires, used oils, end-of-life vehicles (ELVs), etc.) (ST/MT)	24) Private investments in Waste Recycling Industry - incentives	Gradual within 10 years	
Sub-Objective 2.4: Enhance Public Awareness and Education			
2.4.1. Develop an ISWM Public Awareness and Education Program covering reduction; reuse; sorting at source; separate collection of various waste streams; recycling/recovery; waste treatment and safe disposal vs. littering, opening dumping & burning (ST)	25) Community coverage (%)	100% within 10 years	
2.4.2. Implement the ISWM Public Awareness & Education Program (ST/MT)			
2.4.3. Conduct national and local dialogues on specific issues related to ISWM, such as sanitary landfilling, paying for ISWM services, energy recovery, etc. (ST)			
2.4.4. Implement education and awareness campaigns for hazardous waste producers with emphasis on their responsibilities and technological evolutions in waste management and hazardous waste prevention (ST/MT)			

Table 5: Strategic Objective 3. Enable an Effective Governance Framework to Implement the ISWM System

Strategic Objective 3: Enable an Effective Governance Framework to Implement the ISWM System			
Measures:	**Targets / Indicators**	**ST (1-5 years) & MT (6-10 years)**	**LT (11-20 years)**
Sub-objective 3.1: Establish and Operationalize the National Solid Waste Management Authority (NSWMA)			
3.1.1. Complete and endorse the Decrees on the NSWMA bylaws, operating and recruiting procedures, wage and salary scale and NSWMA Board of Directors appointment (Art. 13 of Law 80/2018) (ST)	26) NSWMA operationalization	Operational within 2 years	
3.1.2. Provide staff for the National Solid Waste Management Authority (ST)			
3.1.3. Provide Technical Assistance to support the National Solid Waste Management Authority (ST)			
Sub-Objective 3.2: Establish and Implement Cost Recovery System and the Extended Producer Responsibility (EPR)			
3.2.1. Adopt and enforce the draft law (and regulations as needed) on financial instruments and cost recovery (ST)	27) Cost recovery system set up and coverage	Gradual set up and functioning; 50% coverage within 10 years.	100 % coverage within 20 years.
3.2.2. Prepare guidelines for the full cost accounting of waste management activities and related tariffication schemes (ST)			
3.2.3. Develop, implement and enforce regulations and guidance documentation on the EPR system for packaging waste and special waste stream(s) (such as CDW, Electrical & Electronic Equipment, Used Tires, Used Oils, Batteries and Accumulators, End-of-Life Vehicles) (MT)	28) EPR schemes coverage by stream or product (%)	40% within 10 years	100 % within 20 years.
Sub-Objective 3.3: Complete and Enforce the Waste Management Legislative Framework			
3.3.1. Draft/ adopt the decree on non-financial incentives for Solid Waste Management (Article 29 of Law 80/2018) and the ministerial decisions identified in the ISWM Law and which have not been adopted yet[12] (ST)	29) Legislative framework completion	100% within 5 years	
3.3.2. Develop and execute an ISWM training and capacity building program to strengthen capacity of central and local authorities involved in waste management (ST/MT)	30) Authorities' enforcement capacities strengthening	Within 10 years.	
3.3.3. Improve capacities and mechanisms within MoE to ensure proper compliance control and enforcement of hazardous and non-hazardous waste management legal framework (ST/MT)			
Sub-Objective 3.4: Complete and Implement the Planning Framework at the National and Local Level			
3.4.1. Develop the Local Waste Management Plans (ST)	31) Local plans development	Within 3 months from NISWMS endorsement	
3.4.2. Develop action plans for priority waste streams (Hazardous Waste; CDW; Electrical & Electronic Equipment; Used Tires, Used Oils, Batteries and accumulators; End-of-Life Vehicles) (ST)	32) Action plans for waste streams development	Within 2 years	
Sub-Objective 3.5: Establish and Operationalize a Waste (incl. Hazardous Waste) Management Information System (WMIS)			
3.5.1 Draft/adopt the ministerial decision/ guidelines related to the WMIS (Art. 18 of Law 80/2018) (ST)	33) WMIS establishment and operationalization	Within 3 years	
3.5.2. Establish & implement the WMIS through a training program on the use of the WMIS (registry and reporting, storing, verifying, analyzing, evaluating and providing data & information, reporting & monitoring) (ST)			

[12] 1 Clause of the local programs to be prepared by local authorities (Article 11); 2. Clauses for self-monitoring reports for producers, users, transporters and importers of material that produces non-household solid waste, service providers, and operators (Art. 15); 3. Mechanism for the field inspections to the producers, users, transporters and importers of material that produces non-household solid waste, service providers, and operators, and their reports (Art.9); 4. Standards, specifications and conditions for collection and transportation (Art. 20) ; 5. Standards, specifications and conditions for sorting at source and mechanical sorting (Art. 21); 6 Standards, specifications and conditions for reuse and recycling (Art. 22A); 7. Standards, specifications and conditions for composting, biological disintegration and fuel production (Art. 22B); 8. Standards, specifications and conditions for thermal disintegration, and management of by products (Art. 22C); 9. Standards, specifications and conditions for processing of waste prior final disposal (Art. 23); 10. Standards and conditions for final disposal (Art. 24); 11. Standards and conditions for final disposal and technical. specifications for each type of sanitary landfill (Art. 24); 12. Standards and conditions for service providers, operators, and hazardous waste producers, users, importers and transporters (Art. 27)

Section 6: Best Technologies and Management Options to Promote the Principles of Reduction, Re-Use and Recycling/Recovery Towards a Circular Economy

The NISWMS aims to implement the global waste management hierarchy, where waste prevention is considered as the priority, whilst it is followed by the reuse, recovery, and final safe disposal of the remaining non-recoverable waste. Accordingly, the strategy aims to activate the top part of the global waste management hierarchy by setting clear goals to reduce waste generation and mainly resort to reuse. And then, activating separate collection of waste types at source, which contributes towards minimizing cross-contamination among products and raises the quality of the extracted materials and their value as recyclable materials. Separate collection should be gradually introduced in Lebanon to ensure the circularity of materials.

To facilitate or improve preparing for re-use, recycling and other recovery operations, gradually, the following waste categories should be subject to separate collection and should not be mixed with other waste or other materials with different properties: a) at least biowaste, paper/cardboard, plastic, metals, glass, textiles, cooking oils and bulky waste included in the non-hazardous municipal waste; b) hazardous waste, including hazardous municipal waste (separately collected at source per waste type and not be mixed with non-hazardous municipal waste); c) Construction and Demolition Waste (C&DW); d) Waste from Electronic and Electric Equipment (WEEE); f) batteries and accumulators; e) end-of-life tyres; g) end-of-life vehicles; h) oil wastes and wastes of liquid fuels.

Waste that has been separately collected for preparing for re-use and recycling should not be incinerated, with the exception of waste resulting from subsequent treatment operations of the separately collected waste for which incineration delivers the best environmental outcome. Waste can be separately collected through door-to-door systems, drop-off points in the streets, civic amenity sites, Deposit Return Systems (DRS), take-back schemes, specific collection centers and at community-based reuse and repair centers. Waste collected separately should be delivered to the Material Recovery Facilities (MRF) and/or to Recycling Facilities. Innovative technologies/processes for recovery should be promoted with less environmental hazards and better recycling potential. Sorting of single stream recyclable materials from municipal waste (commingled recyclables), this can be carried out at Material Recovery Facilities.

Treatment of biowaste can follow any of the following technologies, with the possibility of following any other technology that meets international standards and achieves the objectives of the strategy: a) Composting, b) Anaerobic digestion / Composting, c) Biological drying. With regards to the treatment of mixed municipal waste, Mechanical Biological Treatment (MBT), or Thermal Treatment can be applied, or any other technology that meets international standards and achieves the objectives of the strategy.

The choice of the WM infrastructure needs to consider the NISWMS values, contribution to climate resilience and environmental and social sustainability. Selection of the appropriate location for this infrastructure, especially sanitary landfills, needs to be undertaken according to a set of criteria, including but not limited to: geological / hydro-geological / geotechnical; environmental; physical planning; technical & operational; financial; and social criteria (Annex 3), .

For management purposes, the country needs to be divided in service zones according to physical planning, environmental techno-economic and social criteria. These are set in the National Master Plan that has been developed.

Public Awareness and Education on ISWM is critical. This includes informing on reuse, sorting at source, separate collection of various waste streams, recycling/recovery, waste treatment and safe disposal vs. littering, opening dumping and burning. Moreover, national and local dialogues on specific issues related to ISWM, such as paying for ISWM services, accepting sanitary landfilling as an essential part of the ISWM cycle and energy recovery to reduce landfilling, should be conducted. Education and awareness campaigns for hazardous waste producers, with emphasis on their responsibilities and technological evolutions in waste management and hazardous waste prevention should be implemented.

Equally important is the need to improve the capacities and mechanisms within MoE to ensure proper compliance control and enforcement of the waste management law, regulations and requirements.

The development of a comprehensive and well-functioning Lebanese Waste Management Information System (LWMIS) will address the lack of reliable data on the waste sector and will provide the baseline and a key decision-making tool to develop future waste management plans and strategies.

Section 7: Treatment & Disposal Sites

The analysis of existing waste facilities (with capacity larger than 50 tn/d) showed that Lebanon has an available treatment capacity of 6,390 tn/d, which could cover the amount of waste generated in 2022 in the country of around 5,600 tn/d. However, at the moment, only 440 tn/d of the treatment capacity is operational which is equivalent to only 6.8% and thus only 7.9% of the generated waste is being treated in existing facilities. The status of existing treatment and disposal facilities, across the Lebanese governorates and districts is presented in Table 18 of the NISWMS.

The required waste management facilities will be determined at the National Integrated Municipal Waste Management Master Plan which will be prepared based on the Strategic Objectives and Measures of the NISWMS. The Master Plan will focus on upgrading and rehabilitating existing infrastructure wherever possible and feasible.

Section 8: Closure and Rehabilitation of Uncontrolled Dumpsites

As for the waste disposal sites, remedial measures differ from one dumpsite to the other based on the complexity of the case and the availability of alternative waste management solutions. Some of the measures for MSW dumpsites include excavating, pre-treating and transferring to a waste treatment facility and/or sanitary landfill; transferring or converting to a sanitary landfill; and grading, caping, and managing of gases and leachate. The Rehabilitation Decision Tool (RDT) can be used as a methodology for the description and comparison of alternative remediation scenarios relying on the RSI (Risk Sensitivity Index).

For the CDW dumpsites, considered remedial measures focus on sorting, crushing and recycling; transferring to other priority dumpsites or to an approved construction and demolition landfill; grading the surface and covering with soil (re-vegetate); and achieving intended use. Measures and actions towards the new era involve introducing a penalty system for uncontrolled disposal, developing technical specifications for rehabilitation, promoting education and awareness, and mobilizing of financing for the closure of dumpsites.

Section 9: Implementation Timeline

As mentioned in section 4, the strategy time-frame is of 20 years, divided in 3 implementation periods 1) Short–Term (ST) 2024-2028, 2) Mid-Term (MT) 2029-2033 and 3) Long-Term (LT) 2023-2043, to ensure that all NISWMS Measures set under the three NISWMS Strategic Objectives are successfully introduced and carried out throughout the Implementation Period of 20 years, an Implementation Timeline has been developed. The latter is divided into the three implementation periods:

Section 10: Infrastructure Costs (CAPEX & OPEX)

The cost of construction and operation will be determined at the National Integrated Municipal Waste Management Master Plan which will be prepared based on the Strategic Objectives and Measures of the NISWMS.

Section 11: Sources of Funding and Cost Recovery Methods

Except for the collection and sweeping costs which are fully funded by the municipalities (with municipal fees or IMF), sources of financing for treatment and disposal vary from one area to another. The investment (CAPEX) costs for waste management are provided by several finances, such as national/

municipal budget, donors (e.g. EU, USAID, UN, etc.), loans (WB, European investment Bank (EIB), the Arab Funds, etc.), private operators. Additionally, the operation and maintenance costs (OPEX, including repayment of loans where applicable) for waste management services are covered by municipal budget, fees collected on behalf of municipalities and redistributed to each municipality (IMF), national treasury, revenues of the waste management system (selling recyclables and organic materials), fees paid by the citizens and other waste producers for provision of waste treatment services. Private funds are also utilized in for the construction and operation of waste management facilities either in the form of PPP contracts or concession and service contracts. Law No.80 foresees additional funding resources, such as public funds and the National Environmental Fund.

The current situation of the waste management activities in Lebanon is unsustainable in the absence of waste management fees. Article 28 of Law 80 is currently being updated to incorporate service charges for waste management paid by commercial sectors and households. Adoption of this amendment is critical for securing the operation and maintenance costs of waste management facilities. Aiming for a full cost recovery solution, several economic instruments are prioritized, constituting themselves sustainable without the need for subsidies by the central government.

Section 12: Material and Non-Material Incentives

Material incentives in waste management refer to tangible rewards like subsidies, grants, or tax breaks, aimed at encouraging desired behaviors such as waste reduction, recycling, or proper disposal. Non-material incentives, on the other hand, are intangible rewards such as educational campaigns, public recognition programs, or social pressures that motivate behavior change towards sustainable waste management practices. Both types of incentives are vital for promoting behavior change and achieving sustainable waste management goals.

Regarding material incentives, Law 280/2014 and Decree 1117/2008 specify several incentives. Furthermore, Decree 167/2017, which is based on article 20 of the Environment Law 444/2002, aims at promoting and supporting the use of environmentally friendly products and services, including sustainable energy products, through the application of customs tax reductions and income tax reductions.

Non-material incentives have been implemented to promote projects relating to integrated solid waste management, especially recycling, reuse and energy recovery in a sound and effective manner, such as:

- Permitting or registration procedures for waste service providers and operators
- Shipment of waste (import – export – transit)
- Mandatory Recycling and Composting
- Recycling Collection Services
- Multi Stream Recycling Collection Services
- Source Separation Incentives
- Landfill Ban – Organics

Social and Communicative Policy incentives could also be considered. Effective communication and awareness raising activities can improve the chances that waste prevention and recycling information will be absorbed and acted upon. Such incentives include: i) communication campaigns and information channels and ii) awards and competitions.

Section 13: Responsibilities of the Local Authorities

The local administrations (municipalities, groups, unions of municipalities) play an important role in the waste management sector of the country. More specifically, they are essential for the achievement of the proposed objectives and indicators set within the NISWMS. Thus, each local administration or group of administrations should carry out the following:

- Preparation of a solid waste management database.

- Conduction of an evaluation on human and technical cadres, infrastructure, technical resources, the financial budget allocated for the implementation of effective waste management activities, and a statement of financial and technical needs, etc.
- Developing proposals for waste collection systems and transportation mechanisms in an economically feasible and technically effective manner, and the related operational expenses and maintenance programs for the machineries and human cadres of these systems.
- Developing economically feasible and environmentally friendly projects to improve the solid waste management and reduce its generation or landfilling, by including methods of sorting at the source, mechanical and biological treatment, and safe final landfilling.
- Improvement of supervision and control, review of waste collection and transportation mechanisms, and application of collection and transportation systems by using topographic maps and computer models to reduce the associated financial costs.
- Cooperation with local community institutions regarding environmental awareness and implementing initiatives that achieve waste reduction, sorting and reuse.
- Identification of marketing opportunities for waste sorted according to the activities in the area and networking with the private sector to find investment contracts with financial and technical recovery that leads to improving solid waste management and achieving strategic objectives.

Section 14: Obligations of Non-Domestic Waste Producers

Requirements imposed on non-domestic waste producers, according to Law 80/2018, relate to self-monitoring; periodic declaration of type and quantity of wastes generated; reduction of solid waste production at each of the stages of manufacturing, design, use and final disposal; and protection of the environment from potential adverse effects. MoE Decisions 998/1/2020, 999/1/2020 and 59/1/2021 specify the procedures and principles for hazardous waste generators, transporters and storage facilities licensing, respectively.

Decisions need to be issued covering the following aspects of WM, particularly non-domestic waste:

- The procedure for self-monitoring of waste generators and procedure for the inspection and audits of the MoE on waste generators in application of Chapter 3, Articles 15 and 17 of Law 80;
- The procedure for creating a national database for all information related to solid waste in application of Chapter 4, Article 18 of Law 80;
- The procedure for conducting a national baseline survey that includes all sources of hazardous waste and their generators in application of Article 7 of Decree 5606/2019;
- The procedure for applying for permits for the storage, treatment, and disposal of HCW.

Section 15: Private Sector Participation

Private Sector Participation in the waste sector has emerged as a critical component in addressing the challenges of waste management worldwide. With growing urbanization, industrialization, and population expansion, the demand for efficient waste management solutions has intensified. In response, governments and municipalities are increasingly turning to private sector entities to enhance service delivery, infrastructure development, and innovation in waste management.

In this context, the Lebanese Parliament ratified the Public Private Partnership (PPP) law No 48/2017, which includes various types and forms of public-private partnership (PPP) contracts in Lebanon (management contracts, Build-Operate-Transfer (BOT) contracts, leases, and concession contracts). The PPP approach/contracts could be a useful mean to mobilize the needed financial resources, in addition to any other possible support such as the provision of technical expertise in the waste management sector. In this context, the following should be taken into consideration for tendering and procurement under PPP arrangements, which will incentivise and encourage investors to participate in PPP projects:

- Prepare the bidding and necessary tender documents individually for each project by specialized consultants depending on the type of assigned services and responsibilities, etc.

- Ensure competitive procurement procedures to allow the participation of a large number of interested bidders.
- Set the selection criteria based on pre-approved detailed feasibility studies.
- Set performance measures of various PPP options to provide participants with a basis to prepare their bids.
- Ensure PPP contracts with 7-20 years duration, in order to guarantee that the projects are properly implemented and to subdivide the capital over the whole project duration.
- Ensure the involvement of the private partner from the initial stage of the project (i.e. design).
- Provide increased Return of Equity (RoE) in order to make the PPP approach attractive to the private sector.
- Promote PPP contracts of the following types: a) Service contracts to perform street-cleaning and collection services within a city or area of proposed contract; b) Management contracts, such as operation of an already constructed MRF, rehabilitation of dumpsites; c) Service franchises, such as sorting-at-source awareness campaigns or collection of specific type of waste (source-sorted biowaste or recyclables); d) Facility concessions, such as Build - Operate - Transfer (BOT), Build - Own - Operate - Transfer (BOOT), Design - Build - Operate (DBO), etc., which could be applicable for transfer stations, MRFs, composting facilities, MBTs, sanitary landfills, etc.
- Provide technical assistance to municipalities and UoM for strengthening the capacity of staff to manage and supervise the relevant contracts. Create guidelines that help authorities to correctly prepare their cooperation with the private sector;
- Provide and implement a clear inspection and enforcement program, including a sanctions system, discouraging and limiting illegal behavior.

It is noteworthy that due to the low intrusion of formal public or private sector in waste management sorting and recycling, informal waste-picking flourishes both in the “city” and the “dumpsite” level. The integration of the informal sector into formal waste management systems can contribute to reduce overall system costs, to support the local industry by providing low-cost materials and to create new jobs. Measures are proposed towards this direction.

Participation of Displaced Persons

According to the United Nations High Commissioner for Refugees (UNHCR)[13], Lebanon remains the country hosting the largest number of refugees per capita, living in Informal Tent Settlements (ITS), abandoned buildings, and prefabs, and 12 official camps. ITSs are facing many challenges and limited access to proper waste services. In response, Municipalities/UoMs should include emergency measures in the Local Waste Management Plans for displaced persons aiming to promote pilot waste management project enhancing separate collection and recycling within ITSs, considering all aspects:

- Governance:
  - inclusivity – by allowing stakeholders from refugees and hosting community to participate, contribute (incl. waste management fees) and benefit, both as service users and service providers, and also by integrating the private sector;
  - financial sustainability – by ensuring that waste management services and projects are cost-effective, affordable and income-generating;
  - sound and pro-active measures – by assessing what is most urgent, needed and challenging and allocating resources and mitigation actions accordingly.
- Physical/technical:
  - recyclables’ traders – by establishing an agreement or a partnership with NGOs, waste sorting centers, private companies known as recyclables traders in order to secure a selling market for the materials sorted from waste;
  - refugees as workers – by training the refugees, especially the youth and women, on the procedure of sorting and treating their waste (recyclables sorting and organics composting) and remunerating them, to keep them motivated and keen to contribute to project’s success;

[13] UNHCR Fact Sheet, April 2023, https://reporting.unhcr.org/document/4773

- operations management – by continuously managing and supervising the daily operations conducted and monitoring the project's outcomes.

Section 16: Civil Society Engagement

Civil society can play an important role in promoting awareness and pushing forward the 3Rs implementation at the community level. In this regard, Circular No. 7/1 of 2017 encourages both the public and private sectors to sort waste at source and use recycled products for their positive environmental impacts; it also includes some guidance on the process of sorting from source as well as some composting instructions. Encouraging the development of a network of drop off centers would further facilitate and promote sorting of waste at source.

Local authorities can facilitate policy discussions and the involvement of CSOs and citizen organizations in the development and implementation of SWM projects. Furthermore, they can establish local hubs to create networking opportunities for representatives of local initiatives. The government can also support these efforts by offering free advertising and promotion, reducing taxation, and increasing access to funds.

Section 17: Marketing of Recovered and Recycled Products

Secondary raw material (SRM) markets are essential for moving towards a circular economy in Lebanon. These markets can ensure that good-quality recycled materials are circulated throughout the economy, which minimises the need to extract natural resources as a result. To achieve circular economy goals like recirculating materials and sustaining the value of materials even after they have been disposed as waste, a well-functioning SRM market is important. For the development of the latter, major barriers are identified at each stage of the SRM value chain. For the improvement of the SRM markets throughout all stages of the SRM value chain, several measures are identified. Additionally for each waste stream material, specific indicative quality standards, end-of-waste criteria and user specifications are set.

Section 18: Strengthening Capacities for Integrated Solid Waste Management

The relatively low level of awareness regarding modern waste management methods is a main obstacle in the face of effective implementation of solutions. By circulating accurate guidelines with regard to terminology or enhancing public awareness concerning waste management, the sector can be amply revitalized, given that there is an increasing interest from the public, the Lebanese government, and the private sector in proper waste management. Public awareness and education policy can also have a significant impact on the success of the strategy. In addition, designing and conducting training programs for municipal employees and other authorities involved in waste management, regarding the methodology for carrying out awareness programs by their own means, based on their roles and positions.

Moreover, departments for public awareness and public participation in the municipal waste management campaign should be developed and established on the local level with the support of the Service of Awareness and Guidance at the Ministry of Environment, and dedicated budgets should be allocated for those. In general, financial support should be allocated to local authorities to carry out public awareness campaigns on a regular basis. Finally, partnerships between the public sector, the private sector, academic institutions, and NGOs must be established to ensure the effective and successful implementation of public awareness and education programmes. Noting that the private sector possesses high capabilities to invest in public awareness through campaigns within the framework of social responsibility policy for their private companies.

Section 19: Supervision, Monitoring and Evaluation

In order to evaluate the progress towards achieving the strategic objectives and sub objectives, monitoring indicators have been established based on Tables 3 to 5, taking into account the initial conditions as a baseline. The monitoring plan includes the designated timeframe for implementing each monitoring indicator in alignment with the strategy adoption. Additionally, the plan outlines the method used to calculate and measure the indicators, facilitating the assessment and quantification of the plan's performance.