

REPUBLIC OF LEBANON
MINISTRY OF ENVIRONMENT

# National Integrated Solid Waste Management Strategy of Lebanon

*Strategy Update*

**December 2025**

*In collaboration with*

COUNCIL FOR DEVELOPMENT & RECONSTRUCTION

# MINISTER'S FOREWORD



*The persistent challenges in Lebanon's solid waste sector stem not from a lack of technical capacity, but from fragile governance, weak management, and limited oversight. In line with the government's reform agenda, the Ministry of Environment has addressed these gaps through a systemic shift from fragmented responses to an integrated and sustainable framework—updating the national strategy, restructuring the cost recovery draft law and its mechanisms, and launching the recruitment of the National Solid Waste Management Authority.*

*The updated National Integrated Solid Waste Management Strategy (NISWMS) reflects the profound changes Lebanon has faced since 2019, including economic collapse, institutional strain, and the 2024 war. It recalibrates national planning to current socio-economic realities while aligning with international best practices in integrated solid waste management, circular economy, and Extended Producer Responsibility (EPR). The Strategy strengthens attention to priority waste streams—construction and demolition waste, recyclables, and hazardous waste—and reinforces decentralization with a coherent national oversight framework.*

*Financial sustainability is a cornerstone of the reform. Improved cost recovery mechanisms, the introduction of EPR schemes, and structured Public-Private Partnerships aim to reduce reliance on public funding while ensuring continuity and long-term viability. The Strategy is designed as a living framework, grounded in data, accountability, and coordinated action among national institutions, local authorities, and development partners.*

*The updated NISWMS was approved by the Council of Ministers, alongside the appointment of the Board and Director of the National Solid Waste Management Authority—marking a critical step toward consolidating governance and eliminating institutional fragmentation within the sector and operationalizing the sector's central regulatory and oversight body for the first time. While the Strategy was technically finalized prior to the enactment of the Cost Recovery Law, the reinvented draft law, finally enacted (Law No. 38 of January 5, 2026, amending Article 28 of Law No. 80/2018), provided essential legal and fiscal clarity and strengthened the framework for transparent investment in the solid waste sector.*

*Together, these measures establish a coherent institutional and financial foundation for the sector, fulfill the Ministry's reform commitments since February 2025 and mark the completion of a comprehensive package of mutually reinforcing structural reforms. In parallel, international financing has been mobilized to address remaining implementation gaps by supporting the expansion and establishment of treatment facilities in selected districts, ensuring that institutional reforms are complemented by tangible improvements on the ground.*

*The Ministry of Environment entrusts this Strategy to local authorities and the National Solid Waste Management Authority as the referential national roadmap—defining responsibilities, setting measurable standards, and affirming a shared commitment to a solid waste sector that is effective, transparent, resilient, and financially sustainable.*

**Dr. Tamara Elzein**

**Minister of Environment**

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# LIST OF ABBREVIATIONS

| ABBREVIATION | EXPLANATION |
|---|---|
| **AUB** | American University of Beirut |
| **AWTF** | Agricultural Waste Treatment Facility |
| **BAU** | Beirut Arab University |
| **CBRN** | Chemical, Biological, Radiological and Nuclear |
| **C&D** | Construction & Demolition |
| **CDR** | Council for Development and Reconstruction |
| **CNRS-L** | National Council for Scientific Research in Lebanon |
| **CoM** | Council of Ministers |
| **DAWERR** | Diverting Waste by Encouraging Reuse and Recycling (USAID) |
| **ELV** | End-of-Life Vehicle |
| **EPR** | Extended Producer Responsibility |
| **HEAD** | Human Environment Association for Development |
| **IBC** | Industrial Business Center (Waste Treatment Facility in Saida) |
| **ISWM** | Integrated Solid Waste Management |
| **LAU** | Lebanese American University |
| **LHEE** | Lebanese House Establishment for Environment |
| **LOGS** | Lebanon Organization for Green Schools |
| **LU** | Lebanese University |
| **MoE** | Ministry of Environment |
| **MRF** | Material Recovery Facility |
| **MSW** | Municipal Solid Waste |

| | |
|---|---|
| **MWTF** | Municipal Waste Treatment Facility |
| **NCC** | Nature Conservation Center (AUB) |
| **NGO** | Non-Governmental Organization |
| **NISWMS** | National Integrated Solid Waste Management Strategy |
| **NSWMA** | National Solid Waste Management Authority |
| **OMSAR** | Office of the Minister of State for Administrative Reform |
| **STF** | Sludge Treatment Facility |
| **UNDP** | United Nations Development Programme |
| **UNHCR** | UN Refugee Agency |
| **UNICEF** | United Nations Children's Fund |
| **USJ** | Université Saint-Joseph |
| **USAID** | United States Agency for International Development |
| **WB** | World Bank |
| **WMC** | Waste Management Coalition |
| **WWTP** | Wastewater Treatment Plant |

# 1 Introduction

## 1.1 Purpose and Context of the Strategy Update

The 2024 NISWS presents objectives that take into consideration the severe socio-economic crisis that affected Lebanon between 2019 and 2022; however, since late 2024, Lebanon has faced new and severe disruptions that render several assumptions underlying the December 2024 NISWMS obsolete, including:

- Israeli war on Lebanon shocks (September 2024)**:** The most recent war caused widespread destruction of infrastructure, generating large quantities of construction and demolition (C&D) waste, and shifting municipal priorities toward emergency relief and reconstruction.
- Changed waste dynamics**:** Displacement of populations has altered waste generation patterns and service demand in host communities, while damaged sorting and treatment facilities, transfer stations, and collection fleets have reduced operational capacity.
- Closure of several SWM Facilities and/or landfills limit reached
- Outdated baseline and projections: These rapid changes mean that previous waste-flow estimates, technology assumptions, and cost-recovery projections no longer reflect reality, undermining the basis for medium- and long-term planning.
- Institutional and financial stress**:** Local authorities, already constrained by the financial crisis, are now faced with the dual challenge of rebuilding critical infrastructure and maintaining essential waste services under extraordinary fiscal pressure.

These combined factors necessitate a comprehensive review and update of the NISWMS.

To respond to these new conditions and ensure that the Strategy remains a living document aligned with Lebanon's evolving needs, the Ministry of Environment, supported by the World Bank and the CDR, is leading the strategy update and master plan review.

This document builds on the foundational work delivered by LDK–ELARD, while providing a fresh assessment and a robust update that integrates:

- Updated strategic objectives and targets
- Lessons from international benchmarks and circular economy practices;
- Updated cost-recovery and Extended Producer Responsibility (EPR) mechanisms; and
- Implementation and monitoring frameworks that are feasible under Lebanon's current socio-economic and institutional conditions.

Under this mandate, the focus is to update the NISWMS, integrating the latest socio-economic data, institutional reforms, sector-specific challenges and insights emerging from consultations with stakeholders across the waste management ecosystem. This ensures that the Strategy remains technically sound, financially viable, and aligned with both global best practices and Lebanon's long-term environmental vision.

This update reflects the continuity of previous efforts, the evolving national context. It sets the stage for the comprehensive review, further stakeholder engagement, and internationally benchmarked measures presented in the following sections of this document.

The National Integrated Solid Waste Management Strategy (NISWMS) sits at the heart of the SWM governance cycle.

As illustrated in the figure below, the national SWM system is built around an interdependent sequence of policy and operational elements:

- **National Policy:** Establishes the overarching vision and long-term objectives for sustainable waste management, ensuring alignment with the country's socio-economic priorities.
- **Strategy:** Translates national policy into a comprehensive framework of objectives, priorities, and implementation pathways. It defines targets, technological approaches, and institutional responsibilities needed to realize policy aspirations.
- **Legislative Framework:** Provides the regulatory foundations for the strategy, setting out the laws, decrees, and regulatory standards that guide compliance and enforcement.
- **Planning:** Converts strategic choices into detailed, costed master plans, action plans and infrastructure roadmaps at national and regional levels, enabling phased investments and measurable milestones.
- **Implementation:** Delivers the planned projects and services on the ground, supported by monitoring, reporting, and adaptive management to ensure continuous improvement.

Within this cycle, the strategy serves as the bridge between high-level policy and concrete planning, ensuring that national waste policy is translated into legally supported, financially viable, and environmentally sound action.

In Lebanon, the updated NISWMS fulfills this pivotal function, ensuring that national policy objectives are effectively operationalized and that the waste management system remains resilient, adaptive, and aligned with both current realities and long-term sustainability goals.

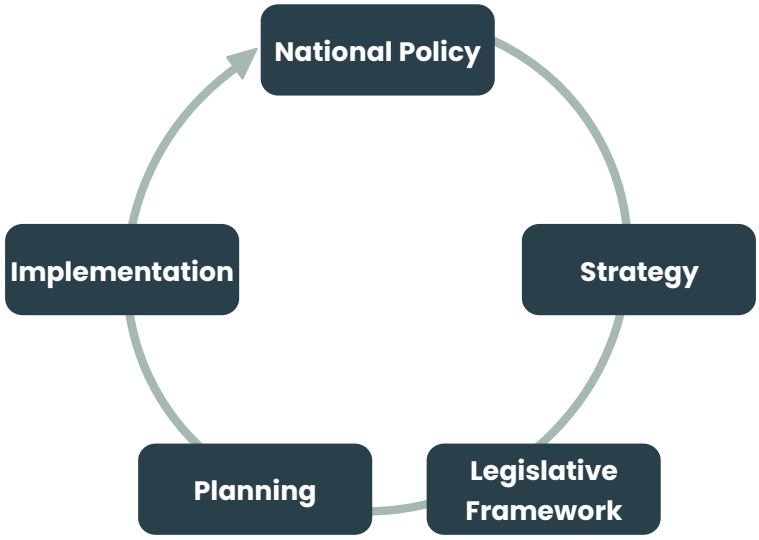



*Figure 1–1: SWM Governance Cycle*

## 1.2 Principles and System Design Approaches in Solid Waste Management

Lebanon moves towards a more efficient, sustainable, and cost-effective ISWM 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 is grounded in the values embedded in Law 80/2018 and aims at reflecting globally recognized SWM principles[1].

The updated strategy reaffirms and strengthens these principles, which guide all decisions on technologies, infrastructure, financing, and governance:

[1] Based on key international frameworks and guiding instruments, including: the Rio Declaration on Environment and Development (UNCED, 1992); the EU Waste Framework Directive (Directive 2008/98/EC, as amended by Directive (EU) 2018/851); the 2030 Agenda for Sustainable Development and its SDGs (UNGA, 2015); the OECD Recommendation on the Polluter-Pays Principle (1972); the EU Circular Economy Action Plans (European Commission, 2015 & 2020); the OECD Guidance Manual on Extended Producer Responsibility (2001; updated 2016); the UNEP International Guidelines for Integrated Solid Waste Management; the Basel Convention on hazardous waste control (1989); and the Paris Agreement under the UNFCCC (2015).

### 1 Sustainability Principle

Sustainability lies at the heart of the updated strategy. Every intervention is evaluated for its environmental soundness, social acceptability, and economic feasibility, ensuring long-term viability.

The strategy promotes balanced outcomes that reduce pollution, protect natural resources, and support green employment, while maintaining financial affordability and institutional ownership. The sustainability approach integrates life cycle thinking to evaluate impacts from waste generation to final disposal.

### 2 Waste Management Hierarchy Principle

The NISWMS fully adopts the waste hierarchy as the primary framework for decision-making. Actions are prioritized as follows:

a. Prevention – avoiding waste generation at source through behavioral change, eco-design, and sustainable consumption.

b. Reuse – extending product life through repair, refurbishment, and redistribution.

c. Recycling and Composting – diverting materials from disposal through source separation and recovery systems.

d. Recovery – harnessing value through material recovery, including RDF/SRF, and energy recovery including biogas.

e. Final Disposal – safe containment of non-recoverable waste, including but not limited to engineered landfilling.

This hierarchy guides infrastructure planning, investment sequencing, and the definition of performance targets, ensuring Lebanon's system moves upward from disposal toward resource recovery**.**

### 3 Circular Economy Principle

The strategy aligns with the global transition toward a circular economy**,** viewing waste as a resource and closing material loops.

Circularity is pursued through Extended Producer Responsibility (EPR)**,** waste valorization**,** innovation in treatment technologies, and the creation of markets for secondary raw materials.

By promoting design-for-recycling, industrial symbiosis, and material substitution, Lebanon seeks to integrate waste management with sustainable production and consumption systems.

### 4 Polluter-Pays and Cost-Recovery Principles

In accordance with Law 80/2018, the strategy reinforces the polluter-pays principle**,** ensuring that the economic burden of waste management is distributed equitably among waste generators, producers, and service beneficiaries.

It introduces EPR schemes, user fees, and other cost-recovery instruments to ensure the financial sustainability of the sector while maintaining affordability and transparency.

5 **Decentralization and Subsidiarity Principle**

Consistent with the governance vision of the updated strategy, waste management responsibilities are devolved to the lowest appropriate administrative level. Municipalities and unions are empowered to plan and manage services, while the central government ensures policy coherence, monitoring, and technical support through the National Solid Waste Management Authority (NSWMA).

This decentralization model promotes accountability, community engagement, and operational responsiveness.

6 **Precautionary and Preventive Principles**

Acknowledging Lebanon's environmental vulnerability, the strategy applies precaution in all planning and implementation stages. Preventive action is prioritized even in the absence of complete scientific certainty, particularly regarding hazardous waste, contaminated sites, and emerging pollutants.

The effectiveness of these strategic principles depends on their translation into rationalized, measurable objectives. Establishing a clear link between principles and objectives ensures coherence between strategic intent and operational delivery. This connection guarantees that each guiding value, whether sustainability, hierarchy, or decentralization, is reflected in actionable targets, performance indicators, and investment priorities. By aligning principles with rationalized objectives, the strategy not only maintains conceptual consistency but also enhances accountability, enabling policymakers and implementers to measure tangible progress, justify resource allocation, and demonstrate long-term environmental and socio-economic benefits.

Building on these principles, the updated NISWMS connects strategic intent with practical delivery.

# 2 Typologies of waste generated

The waste generated by activities can be classified into various typologies based on their origin, characteristics, and potential environmental impacts. Understanding these typologies is critical for adequate waste management, treatment, and disposal practices. Generally, the waste streams fall into regular, special, and hazardous categories, each requiring specific handling and regulatory compliance. The classification of waste into these categories is anchored in the legal framework.

A clear categorization of waste is essential to design efficient, sustainable, and financially viable SWM systems. This principle provides the foundation for defining infrastructure needs, cost-recovery mechanisms, and regulatory oversight across the entire waste value chain.

Solid waste can be conceptually categorized along two intersecting dimensions: waste generation source and waste type. Both dimensions are fundamental for planning collection systems, selecting treatment technologies, and designing policy instruments.

Waste Streams include**:**

- Regular waste streams**:** Consist of commingled materials that are less likely to be segregated by their generation source.
- Special waste streams: Consist of streams that can be segregated at the generation source.

Both regular and special streams encompass hazardous and non-hazardous components, but in varying proportions. Regular waste typically contains minimal hazardous fractions**,** limited to small items such as batteries, chemicals, or aerosols that may be improperly discarded. In contrast, several special streams, notably healthcare, industrial, electronic, or chemical waste, carry a higher hazardous potential, requiring dedicated handling, treatment, and regulatory oversight. Recognizing these distinctions ensures that hazardous fractions are safely isolated and managed, while non-hazardous materials are efficiently recovered, recycled, or disposed of within a sustainable and compliant SWM framework.

From the generation perspective**:**

- Household waste is dominated by regular mixed waste**,** with limited quantities of special streams (mainly recyclables or minor hazardous items).
- Non-household waste, including from commercial, industrial, healthcare, and institutional sources, contains a higher proportion of special streams, often more homogeneous and suitable for specialized recovery or disposal routes.

While the legal definitions provided under Law No. 80/2018 establish the foundation for identifying the main categories of waste in Lebanon, the practical implementation of waste management requires a more detailed understanding of how these categories translate into operational streams. For the purposes of this Strategy, waste is further grouped into regular, special, and hazardous streams, reflecting their origin, nature, and management requirements. This functional classification underpins the application of the waste management hierarchy and supports the development of tailored approaches for collection, treatment, and regulatory oversight in line with national and international best practices.

The figure below illustrates the waste typology distinguishing between household and non-household waste, and between regular and special streams. The framework integrates legal definitions (Law 80/2018), stakeholder inputs, and the best international practices to support effective valorization, treatment, and disposal planning.

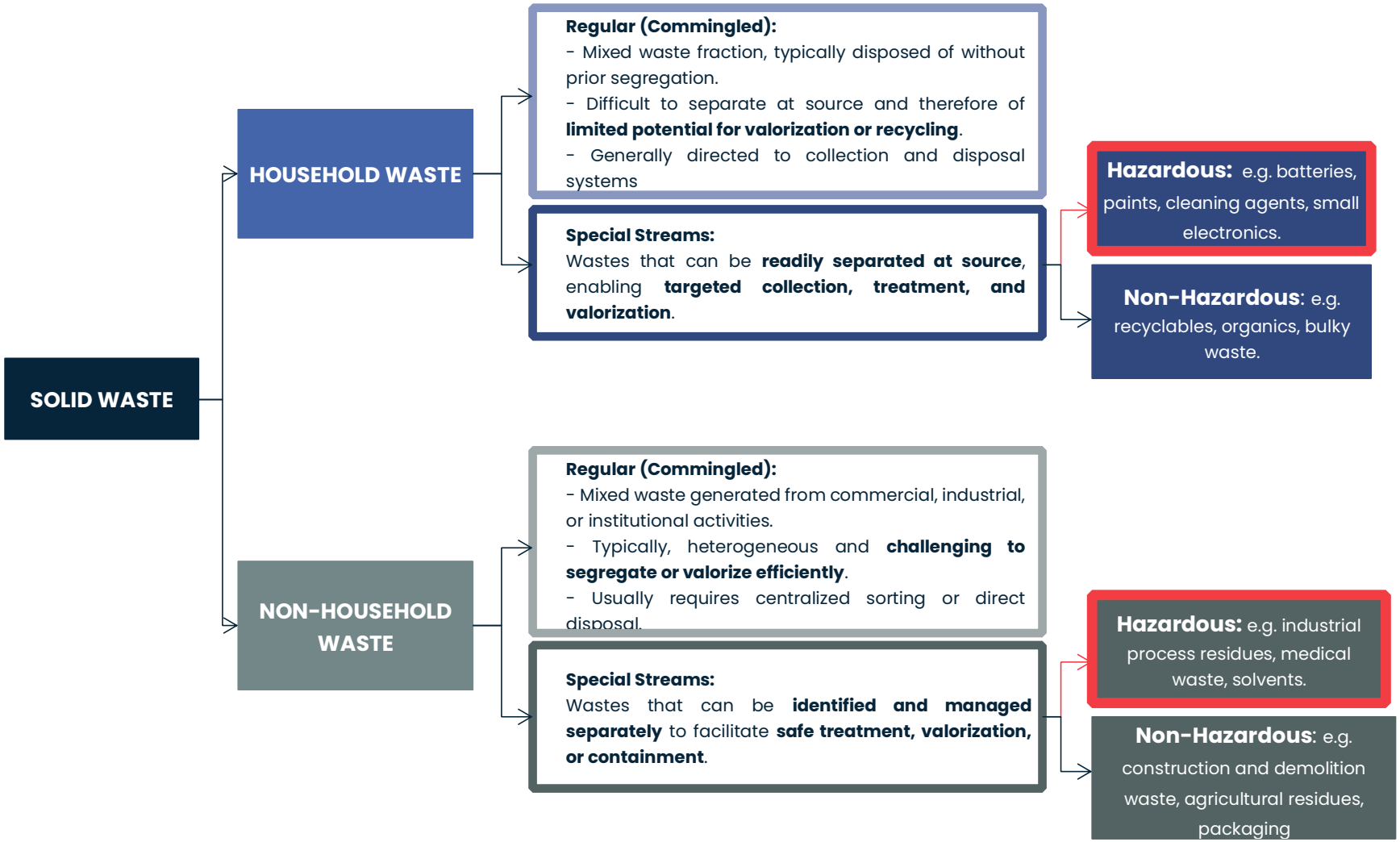



*Figure 2–1: Waste Classification Framework Integrating Legal Categories and Practical Typology*

## 2.1 Regular streams

Regular waste streams, often referred to as general waste, comprise everyday materials generated from households and non-household sources. These waste types typically include organic matter, paper, cardboard, plastics, glass, metals, and other non-hazardous materials. Regular streams are generally considered non-toxic and are managed through standard municipal waste collection systems and recycling programs. Their proper segregation and recycling are essential to minimize landfill use and promote circular economy principles. The predominance of biodegradable content, typically above 50% in the Lebanese context makes this stream a key indicator of local consumption behavior and an important focus for any integrated waste-system assessment.

## 2.2 Special streams

Special waste streams refer to waste types that, due to their composition, origin, or management requirements, require particular attention beyond regular municipal handling. These can include bulky waste, construction and demolition (C&D) debris, electronic waste (e-waste), biomedical waste from healthcare facilities, and waste containing recyclable or recoverable materials. Special streams often necessitate specialized processing or treatment methods to recover valuable components or mitigate environmental harm before final disposal.

These streams often arise from specific sectors or activities and may occur in concentrated or intermittent quantities. Nevertheless, it can be generated in small quantities at household level. Their management is increasingly emphasized in national waste inventories and strategies, as they provide valuable insight into production and consumption trends and contain materials with significant recovery and resource potential.

The figure below illustrates the common categories of special solid waste streams generated in Lebanon. Given that Lebanon does not yet have an official national waste catalogue, these categories were consolidated based on available surveys, previous studies, and field experience/observations. Each group includes specific waste types that require dedicated management pathways for collection, specialized processing or treatment methods and safe disposal, distinct from regular waste management to recover valuable components or mitigate environmental harm before final disposal.

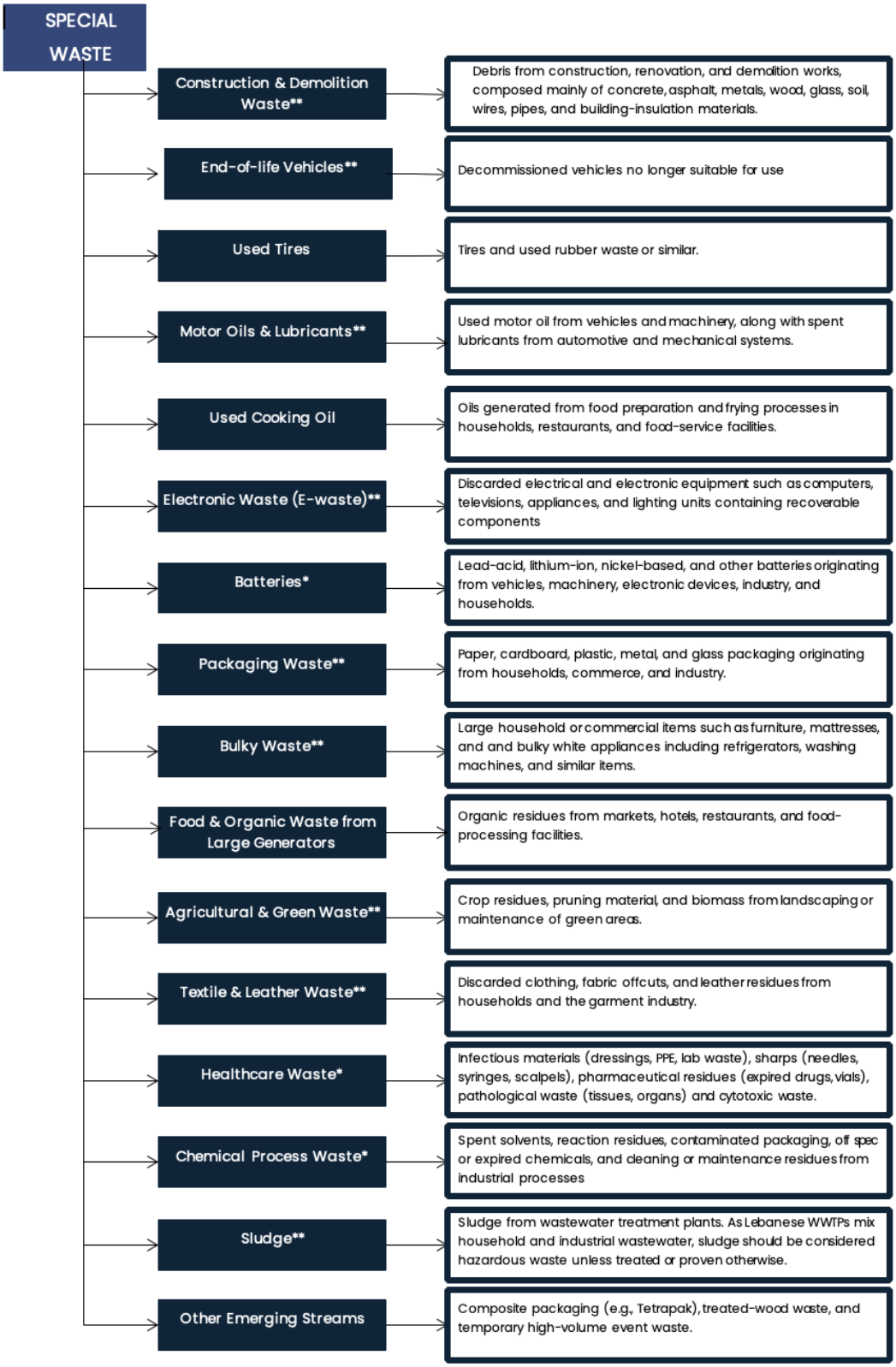



*Figure 2–2: Special Waste Streams*[2]

[2] * Most materials are classified as hazardous
** Certain fractions or contaminated materials within the stream are considered hazardous

# 3 Analysis of Current Situation of the Solid Waste Management System

## 3.1 General Socio-economic context

The population of the governorates and districts is presented in the table below; however, these figures date back to 2017[3].

*Table 3–1: Population of Governorates and Districts in Lebanon*

| NAME | STATUS | NATIVE | ESTIMATED POPULATION |
|---|---|---|---|
| **Akkar** | Governorate | عكار | 423,596 |
| Akkar | District | قضاء عكار | 423,596 |
| **Beqaa** | Governorate | البقاع | 534,342 |
| West Beqaa | District | قضاء البقاع الغربي | 150,838 |
| Rachaiya | District | قضاء راشيّا | 47,122 |
| Zahlé | District | قضاء زحلة | 336,382 |
| **Nabatieh** | Governorate | النبطية | 383,839 |
| Nabatieh | District | قضاء النبطية | 155,233 |
| Bint Jbeil | District | قضاء بنت جبيل | 104,862 |
| Hasbaya | District | قضاء حاصبيّا | 37,784 |
| Marjayoun | District | قضاء مرجعيون | 85,960 |
| **Baalbek-Hermel** | Governorate | بعلبك – الهرمل | 457,932 |
| Hermel | District | قضاء الهرمل | 69,997 |
| Baalbek | District | قضاء بعلبك | 387,935 |
| **Beirut** | Governorate | بيروت | 433,249 |
| Beirut | District | محافظة بيروت | 433,249 |
| **Mount Lebanon** | Governorate | جبل لبنان | 1,802,238 |
| Aley | District | قضاء عاليه | 196,282 |
| El Meten | District | قضاء المتن | 523,593 |
| Chouf | District | قضاء الشوف | 231,427 |
| Baabda | District | قضاء بعبدا | 568,714 |
| Jbeil | District | قضاء جبيل | 99,388 |
| Keserwan | District | قضاء كسروان | 182,834 |
| **South Lebanon** | Governorate | محافظة لبنان الجنوبي | 590,078 |
| Jezzine | District | قضاء جزين | 31,575 |
| Saida | District | قضاء صيدا | 287,987 |
| Sour | District | قضاء صور | 270,516 |

[3] City Population, 2017, Lebanon: Administrative Division (Governorates and Districts), Lebanon: Administrative Division (Governorates and Districts) - Population Statistics, Charts and Map (citypopulation.de)

| NAME | STATUS | NATIVE | ESTIMATED POPULATION |
|---|---|---|---|
| **North Lebanon** | Governorate | محافظة لبنان الشمالي | 790,951 |
| Batroun | District | قضاء البترون | 57,339 |
| Koura | District | قضاء الكورة | 75,056 |
| El Minieh-Danniyeh | District | قضاء المنية الضنية | 206,075 |
| Bcharré | District | قضاء بشري | 28,231 |
| Tripoli | District | قضاء طرابلس | 342,760 |
| Zgharta | District | قضاء زغرتا | 81,490 |
| **Lebanon** | **Republic** | **لبنان** | **5,416,225** |

While the data above refer to 2017, the current population of Lebanon is estimated at 5,860,173 as of October 1st, 2025, based on Worldometer elaboration of the latest United Nations data[4]. With such population 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[5] and 265,000 Palestinian Refugees[6], noting that the UNHCR registration of Syrian refugees in Lebanon has been suspended since May 2015 through a decision by the Government of Lebanon[7].

Registered refugees are presented in the figure below, and Syrian refugee population and distribution are illustrated in the images below.

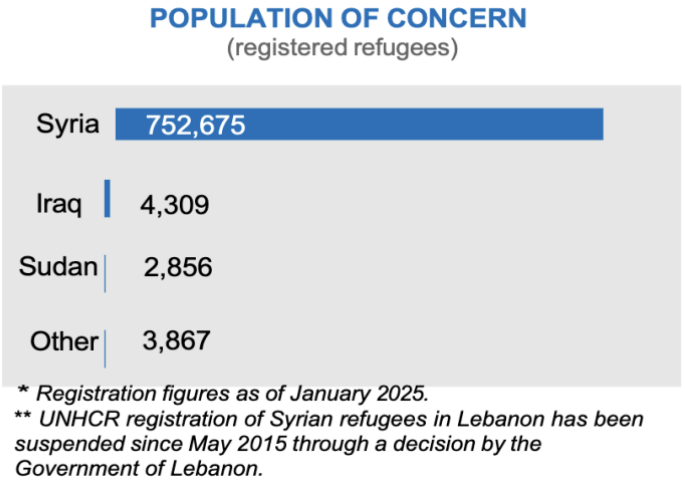



***Figure 3–1: Number of registered refugees*** [8]

In 2019, Lebanon was assailed by the most severe, multi-prolonged crisis in its modern history for over three years. The ongoing economic and financial crisis, which began in October 2019, has been aggravated by the dual economic impact of the COVID-19

[4] Worldometer, 2025 Lebanon Population, Lebanon Population (2025) - Wqorldometer (worldometers.info)
[5] UNHCR, 2023, UNHCR Lebanon: Fact Sheet, April 2023, https://reporting.unhcr.org/document/4773
[6] 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)
[7] UNHCR, 2025, UNHCR Lebanon: Fact Sheet, February 2025, https://www.unhcr.org/lb/media/unhcr-lebanon-factsheet-february-2025
[8] UNHCR, 2025, UNHCR Lebanon: Fact Sheet, February 2025, https://www.unhcr.org/lb/media/unhcr-lebanon-factsheet-february-2025

pandemic and the tragic Port of Beirut explosion in August 2020. In 2024, the outbreak of war added a further devastating layer to the crisis, triggering widespread destruction and hazardous materials risks. This economic crisis ranks among the worst economic crises globally since the mid-nineteenth century [9].

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[10]:

- Incomplete legal framework for SWM, particularly Law No. 80/2018 on ISWM and weak enforcement of legislation.
- Poor governance at the national level leading to political indecision as a result of limited resources and capacities of the MoE (human, financial, procurement, etc.).
- Poor governance at the local level due to the lack of knowledge, know-how, 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/yr, 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, efficient long-term planning, and willingness of citizens to pay, coupled with misconceptions that limit social acceptance of engineering-based decisions.

Nominal GDP fell from about $52 billion in 2019 to an estimated $23.1 billion in 2021. Between 2019 and 2021, Lebanon's GDP per capita fell by 36.5%, and the World Bank classed the nation as lower-middle income, down from upper middle-income classification in July 2022. Similar brutal contraction is generally associated with conflicts or wars[11].

The compounded crises in Lebanon, economic, financial, social, and more recently, the 2024 war, have deeply strained the country's capacity to deliver essential services, particularly in solid and hazardous waste management. The prolonged financial collapse has depleted public resources, crippled institutions, and weakened local governance structures. The war has further aggravated these pressures by damaging infrastructure, displacing populations, and generating large quantities of hazardous debris and mixed municipal waste requiring urgent management.

The combined effects have led to a systemic deterioration in environmental services. Many municipalities can no longer sustain basic waste collection, treatment, and disposal operations due to the collapse of financial systems, delayed central payments, and the lack of foreign currency needed to procure fuel, spare parts, and equipment. The informal sector has expanded to fill this vacuum, leading to unsafe scavenging practices, open dumping,

[9] The World Bank, 2022, Lebanon Overview: Development news, research, data, Lebanon Overview: Development news, research, data | World Bank

[10] MoE/UNDP/UNHCR/UNICEF, 2020. Lebanon State of the Environment and Future Outlook: turning the Crises into Opportunities.

[11] The World Bank, 2022, Lebanon Overview: Development news, research, data, Lebanon Overview: Development news, research, data | World Bank

and uncontrolled burning. These practices have heightened environmental and public health risks, released toxic emissions and contaminating soil and water resources.

In parallel, the war's aftermath has intensified the hazardous waste burden. Damage to industrial sites, warehouses, destruction of buildings and fuel storage facilities has released rubble quantities and hazardous substances. The absence of adequate hazardous waste treatment facilities, coupled with the financial paralysis of both public and private operators, poses risks to environmental safety and human health.

The ongoing crisis has also disrupted essential urban services, from energy and water supply to healthcare waste management, amplifying vulnerabilities across all sectors. In this context, strengthening the resilience of waste management systems, through financial stabilization, institutional capacity-building, and emergency preparedness, has become a national priority.

## 3.2 Solid Waste Generation

This section examines solid waste generation in Lebanon across household and non-household waste, formed of regular and special waste streams. The special waste includes hazardous and non-hazardous waste. There is currently no systematic mechanism to collect or report national waste data, so this assessment consolidates and verifies available information to highlight trends, data gaps, and management challenges, providing the basis for identifying strategic actions to improve data reliability, and strengthen overall waste management. Due to the lack of precise solid waste baseline that details solid waste patterns by origin and quality, the following section describes observed mixed municipal solid waste generation patterns and composition, based on municipal bins observations. The mixed municipal solid waste contains materials from both household and non-household origins.

### 3.2.1 Mixed Municipal Solid Waste

#### 3.2.1.1 Mixed Municipal Solid Waste Generation per Governorate

The following subsections present first the total waste generation quantities and recent trends, highlighting changes over time at the national and local levels. This is followed by an analysis of waste composition, supporting the design of planned strategy interventions.

According to the ISWM Lebanese National Strategy (2024) and recent analyses, including the Solid Waste Roadmap for 2023–2026 developed by the World Bank, Lebanon generated approximately 2.68 million tons of non-hazardous solid household waste in 2018, equivalent to roughly 7,340 tons per day. Based on the most recent data, the estimated distribution of municipal mixed waste generation by Governorate and District is presented visually in the figure below.

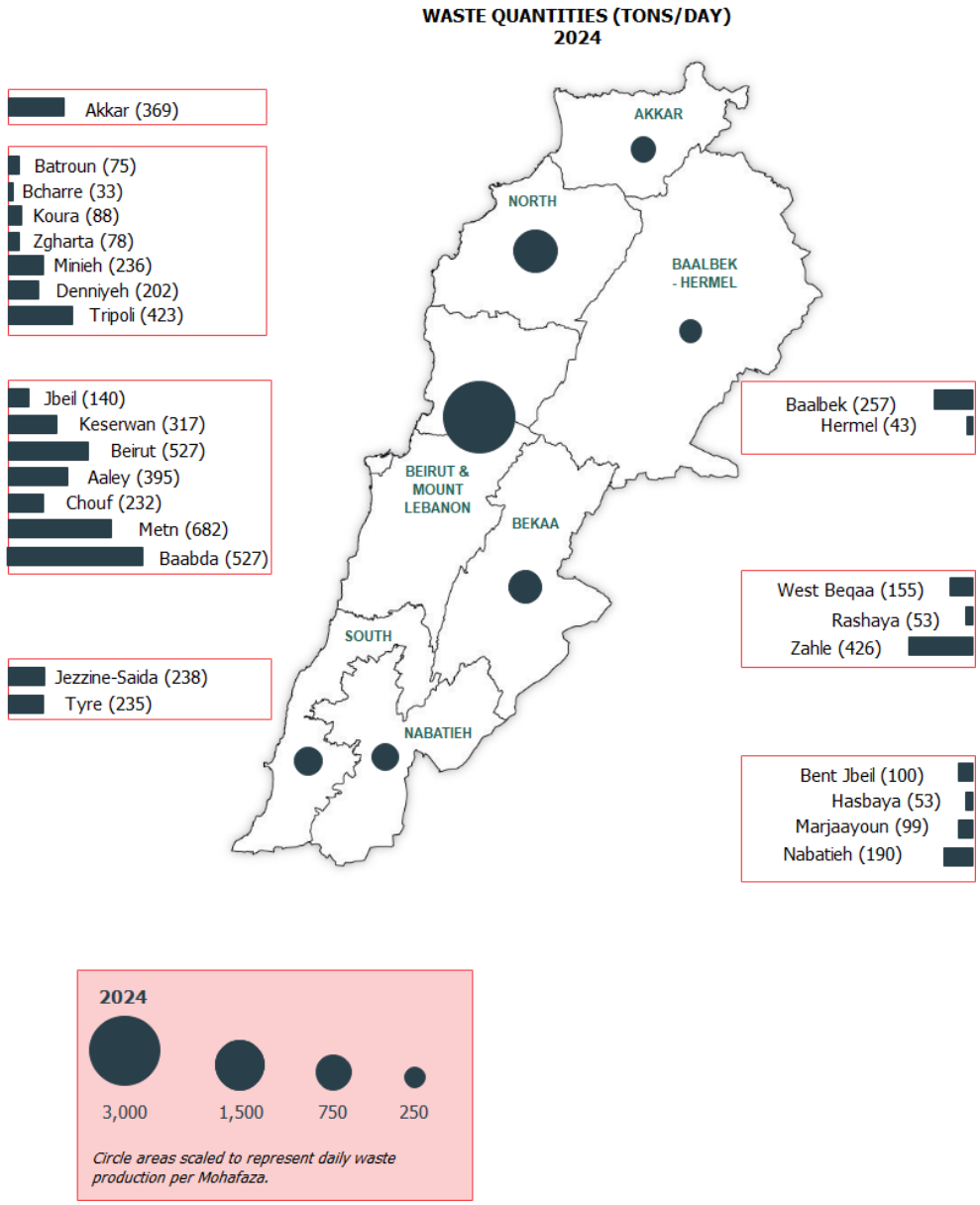



***Figure 3–2: Estimation of Mixed Municipal solid Waste Generation in Lebanon***

As outlined in the Solid Waste Roadmap for 2023–2026 developed by the World Bank[12], the prolonged financial and economic crisis that began in late 2019 has significantly impacted waste generation. Reduced household incomes, purchasing power and reduced industrial production rates have led to lower consumption levels, resulting in an estimated 25% decline in waste generation by 2022, to around 5,600 tons per day. Recent assessments show a partial rebound, with current national waste generation estimated at around 6,200 tons per day.[13]

The roadmap also highlights that the absence of reliable and comprehensive data, particularly regarding population dynamics, refugee presence, and total waste volumes, limits the accuracy of current national estimates. For context, available data from 2014

[12] MoE/World Bank, 2023, Lebanon Solid Waste Roadmap for 2023-2026
[13] CDR, MoE, World Bank, 2024, Final NISWM Master Plan.

suggested that Syrian and Palestinian refugees contributed approximately 15% of Lebanon's total solid waste, although this share is considerably higher in some areas.

While previous initiatives, including the ISWM National Strategy (2024), have made important progress in consolidating available data and improving sectoral understanding, a comprehensive and centralized system for regularly collecting and reporting national waste generation has yet to be established. Existing figures are therefore largely based on project-specific studies and institutional assessments, which provide valuable indicative trends but may not fully capture variations across time and regions. Continued efforts to develop a national waste information and monitoring system would enhance data consistency, support evidence-based planning, and strengthen coordination among institutions involved in SWM.

It should also be noted again that the estimated waste generation includes both household and non-household sources (such as shops, schools, hospitals, and other institutional or industrial activities). This combined approach reflects the practical reality in Lebanon, where household and non-household waste streams are largely collected, treated, and disposed of together.

#### 3.2.1.2 Mixed municipal Solid Waste Composition

The World Bank (WB) Roadmap for 2023 – 2026 compares the mixed municipal solid waste composition in Lebanon between 2017 and 2021, highlighting how household and commercial consumption patterns have been influenced by both the COVID-19 pandemic and the economic crisis. As shown in the table below, these shifts are reflected in the increasing share of organic waste, the declining proportion of paper and cardboard, and the relatively stable contribution of plastic and other materials.
Current data emerging from municipalities and facilities indicate a gradual rebound in several waste fractions, suggesting that overall waste composition is beginning to move back toward pre-crisis composition.

*Table 3–2: Comparison of waste composition, 2017 versus 2021*[14]

| WASTE TYPE | 2017 PROPORTION | 2021 PROPORTION | KEY OBSERVATIONS |
|---|---|---|---|
| Organic | 50–55% | 69–72% | The share of organic waste increased substantially due to the economic crisis and COVID-19, which shifted consumption toward home-cooked meals and fresh produce while reducing imports of processed and packaged foods. |
| Paper/cardboard | 15–17% | 4–5% | The reduction is linked to lower imports of packaged goods, decreased industrial |

[14] MoE/World Bank, 2023, Lebanon Solid Waste Roadmap for 2023-2026

| WASTE TYPE | 2017 PROPORTION | 2021 PROPORTION | KEY OBSERVATIONS |
|---|---|---|---|
| | | | and commercial activity, and the transition to digital media. |
| Plastic | 10–13% | 11–14% | The slight rise corresponds to a substitution effect, as low-cost single-use plastics replaced other packaging materials during the crisis and demand for takeaway and delivery services grew during the pandemic. |
| Metals | 5–6% | 2% | The decline is attributed to reduced imports and consumption of canned foods and metal goods following sharp currency depreciation and import restrictions. |
| Glass | 3–4% | 3–4% | Relatively stable, consistent across years; minor contribution to total waste. |
| Other (textile, wood, misc.) | 10–12% | 3–11% | The variation reflects decreased purchasing power and lower consumption of non-essential goods, alongside increased reuse, repair, and informal resale of textiles, furniture, and bulky waste. |

Although the Ministry of Environment is working to develop a reliable information system on national solid waste data, currently data collection remains difficult and often imprecise. This shortage of accurate information hampers the formulation of context-specific waste-management plans and reinforces the need for comprehensive waste-characterization studies at both regional and municipal levels.

Detailed material composition and corresponding recovery or disposal pathways, as defined by national circulars and decrees, are provided in Annex 3.

### 3.2.2 Special Streams

Most special waste streams in Lebanon lack systematic data collection and are commonly mixed with municipal solid waste. Establishing a national database, classification and permitting system, and clear targets for special waste streams will be essential for enabling effective, integrated and safe management of these streams.

The following section reviews the main special waste streams identified in the typology, presenting available data on generation and key observations with implications for strategic planning.

### 3.2.2.1 Hazardous Waste

Hazardous waste constitutes a critical subset of Lebanon's waste streams, encompassing materials with chemical, biological, or toxic properties that require specialized handling and disposal. Although classified within the broader group of special waste streams, hazardous waste is distinguished by its higher risk potential and the need for dedicated regulatory and treatment systems to prevent environmental and public health impacts. This section examines available information on hazardous waste generation in Lebanon, focusing on sectoral contributions and existing data limitations to support future policy and planning measures under the national integrated waste management framework.

*Table 3–3: Generation of Special Waste Streams in Lebanon*

| WASTE STREAM | ESTIMATED GENERATION / AVAILABLE DATA |
|---|---|
| **Electronic Waste (E-Waste / WEEE)** | Stock of Electrical and Electronic Equipment (EEE) in 2021: **659 kt** and **46 kt** of WEEE generated in 2021, from 29 kt in 2010; only **0.09 kt** of WEEE managed properly; 71 kg of mercury, 81 t of lead and 63 t of polybrominated diphenyl ethers were added to the Lebanese WEEE stream in 2021[15]. |
| **Waste Oils and Lubricants** | Vegetable oil (non-hazardous): approx. **500–600 t/month** (2017). Organic oil (hazardous): **11 kg/cap/yr**, above the EU average of 8 kg/cap/yr and given the limited industrial activities in Lebanon [16]. |
| **Batteries and accumulators** | Data is scarce but estimates indicate that **15,894–21,885 t/yr** of used lead-acid batteries and approx. **1,310 t/yr** of other types of batteries could be generated[17]. |
| **Sludge from WWTPs** | Currently approx. **65,450 m³/day** of dewatered sludge (2019). Projections: **86,514 t/yr** (2025) and **110,542 t/yr** (2030) (excluding Tripoli/Minieh and Beirut plants, which will treat sludge on-site) [18]. |
| **Healthcare waste** | Hospitals generate approximately **5,100 tons/year**, clinics **82–90 tons/year**, and dispensaries **10 tons/year** of infectious healthcare waste. Around **80%** of healthcare waste remains landfilled untreated with municipal waste, while arcenciel and a few operators manage limited quantities (mainly for hospitals and some clinics). Additionally, **cytotoxic waste** from hospitals such as Rafik Hariri, AUBMC, Hôtel-Dieu, and others was recorded at approximately **100 tons across 15 major hospitals.**[19] |
| **Chemical and Industrial** | Non-hazardous industrial waste is mainly co-disposed with municipal waste streams, consisting of textiles, wood, packaging, and ceramics. Recycling occurs informally or through scavengers for some materials (plastics, oils, chemicals). Data on total quantities are **not available**, but hazardous |

[15] UNDP/UNITAR, 2022, National E-waste Monitor, The National E-waste Monitor Lebanon 2022 - E-Waste Monitor (ewastemonitor.info)
[16] MoE/UNDP, 2020, SOER report: Lebanon State of the Environment and Future Outlook: Turning the Crisis into Opportunities, SOER_Report_EN.pdf (unicef.org)
[17] Arcenciel, RE-FIT project, Baseline assessment of the battery value chain
[18] MoE/UNDP, 2020, SOER report: Lebanon State of the Environment and Future Outlook: Turning the Crisis into Opportunities, SOER_Report_EN.pdf (unicef.org)
[19] EU/LDK Consultants, 2020. *TaDWIR Scoping Report – Solid Waste Management Portfolio: Support and Evaluation Mission (Ref: ENI/2018/396-926).*

| WASTE STREAM | ESTIMATED GENERATION / AVAILABLE DATA |
|---|---|
| | industrial streams identified include **sulfuric acid (22,000 t)**, **chlorine (105 t)**, **oxygen/acetylene (200 t)**, and **PCB oils (ranging from 2–20 t per site)**. Hazardous industrial facilities are mainly located in Mount Lebanon, North Lebanon, and the Bekaa region.[20] |

According to the SOER report "Lebanon State of the Environment and Future Outlook" (MoE/UNDP, 2020), the total estimated quantity of hazardous waste generated in 2019 was about 71,800 tons. Besides Persistent Organic Pollutants (POPs) and Healthcare waste, the distribution of this weight by sector is shown in the table below.

Available data remain limited, underscoring the need to establish a national hazardous waste inventory, introduce classification and permitting procedures, and ensure environmentally sound management systems. Strengthening regulatory oversight and integrating hazardous waste management within the broader solid waste strategy will be key to reducing environmental risks, enhancing compliance, and aligning with international conventions and best practices.

### 3.2.2.2 Non-Hazardous Waste

The management of non-hazardous special waste streams in Lebanon remains constrained by both institutional and operational challenges. While the country has established a legal distinction between hazardous and non-hazardous wastes under Law 80/2018, in practice many "special" waste types (e.g. electronic waste, bulky waste, inert construction debris, sludge, and certain industrial by-products) are either subsumed into the general municipal solid waste stream or handled in an ad hoc fashion. The fragmentation of responsibilities and the lack of dedicated infrastructure exacerbates the problem, leading to informal collection, uncontrolled dumping or open burning, and suboptimal recovery of recyclable fractions. Consequently, although the regulatory framework envisions separate handling of non-hazardous special wastes, actual implementation remains limited and inconsistent across regions.

| WASTE STREAM | ESTIMATED GENERATION / AVAILABLE DATA |
|---|---|
| **Construction & Demolition (C&D) Waste** | Generation rates: 38 and 43 kg/m$^2$ for new construction projects in Beirut city and 76 kg/m$^2$ for low-rise buildings outside of Beirut; 1,400–1,730 kg/m$^2$ (demolition). Estimated total: 4 Mt in Beirut and 17 Mt in Mount Lebanon (2018–2040)[21]. Composition: approx. 70% concrete, 20% blocks, 5% tiles, 3% metal, 1% aluminum, 0.6% wood; main causes of C&D waste generation in Lebanon are |

[20] EDESSA & KEO. (2025, August). *National Inventory of Hazardous Substances and Stockpiles: Roadmap for Management of Hazardous Substances – Priority Action Plan.* United Nations Development Programme (UNDP).
[21] MoE/UNDP, 2020, SOER report: Lebanon State of the Environment and Future Outlook: Turning the Crisis into Opportunities, SOER_Report_EN.pdf (unicef.org)

| WASTE STREAM | ESTIMATED GENERATION / AVAILABLE DATA |
|---|---|
| | inadequate site management, poor supervision, and worker-related practices [22]. |
| **War-Generated Rubble** | Estimated 20–32 million tons of rubble generated nationwide due to Israeli war on Lebanon related destruction, including 2–4 million tons in Beirut's southern suburbs. Composed mainly of mixed C&D materials; estimates are not yet final, as attacks and destruction are still ongoing, particularly in southern Lebanon. [23] |
| **Bulky Waste** | No quantitative data is available (includes furniture, mattresses, carpets, etc.). |
| **Used Tires and Rubber Waste** | 14,000 t/yr (2014); approx. 20,000 t/yr (2020 est., based on ~2 million tires × 10 kg)[24]. |
| **Textile and Leather Waste** | Generated by households and garment industry; no national data available. |
| **Packaging Waste** | Includes paper, cardboard, plastic, metal, glass; mainly within MSW stream. |
| **Food and Organic Waste from Large Generators** | Organic residues from markets, hotels, restaurants, and food industries approx. 17,800 t/yr.[25] |
| **Agricultural and Green Waste** | Agricultural residues (pruning, crop residues, unusable agricultural products, etc., excluding pesticide containers or any other hazardous item); no distinct estimate available. |
| **Sludge from WWTPs** | Currently approx. 65,450 m³/day of dewatered sludge (2019). Projections: 86,514 t/yr (2025) and 110,542 t/yr (2030) (excluding Tripoli/Minieh and Beirut plants, which will treat sludge on-site) [26]. |
| **Other Emerging Streams** | Includes composite packaging (e.g., Tetrapak), end-of-life vehicles (ELVs), treated-wood and furniture waste, temporary event waste, and industrial non-hazardous residues; most industries in Lebanon are light manufacturing industries of eight main branches: food and beverage (20%), fabricated metal products (16%), non-metallic mineral products (12%), furniture (11%), clothes and dyeing fur (10%), wood products (10%), leather products (6%) and textiles (4%) generating industrial non-hazardous waste (approx. 24,000 t/yr)[27]. |

[22] Saad et al., 2022, The Need for a Proper Waste Management Plan for the construction industry: A Case Study in Lebanon, Sustainability | Free Full-Text | The Need for a Proper Waste Management Plan for the Construction Industry: A Case Study in Lebanon (mdpi.com)
[23] Data from CNRS-L rubble estimates (2024-2025), and MoE, 2025: Sustainable Rubble Management following the 2023-2024 War in Lebanon, Summary Note. September 2025.
[24] MoE/UNDP, 2020, SOER report: Lebanon State of the Environment and Future Outlook: Turning the Crisis into Opportunities, SOER_Report_EN.pdf (unicef.org)
[25] CDR, MoE & World Bank, 2024. Final National Integrated Solid Waste Management Strategy.
[26] MoE/UNDP, 2020, SOER report: Lebanon State of the Environment and Future Outlook: Turning the Crisis into Opportunities, SOER_Report_EN.pdf (unicef.org)
[27] Sweepnet report (2014)

### 3.2.3 Gaps Related to Waste Generation

While important progress has been made in consolidating data, national waste generation information remains incomplete and fragmented, particularly for special and hazardous streams. Addressing the identified gaps listed below is essential to strengthen planning, support informed decision-making, and enhance the effectiveness of Lebanon's ISWM strategy.

- Absence of a comprehensive national waste data system and limited spatial and temporal coverage:

There is no unified mechanism for systematically collecting, verifying, and reporting waste generation and composition data across all streams and regions. Existing figures are often fragmented, outdated, and derived from project-based assessments or institutional estimates, with no disaggregation at the Mohafaza or Caza level. This gap limits the ability to understand localized waste dynamics, anticipate trends, and design context-specific management measures aligned with actual needs.

- Inadequate accounting for demographic dynamics:

Population fluctuations, refugee presence, and internal migration are not systematically factored into waste generation estimates, weakening the reliability of national projections.

- Insufficient data on special waste streams:

Most special waste categories—such as C&D waste, e-waste, used tires, textiles, packaging, sludge, and emerging streams—lack consistent data collection and reporting mechanisms.

- Weak monitoring of large generators and commercial sources:

Data on waste generation from markets, hospitality, industrial, and institutional sectors are fragmented and outdated, limiting the assessment of their actual contribution to total waste volumes.

- Absence of economic or regulatory drivers:

The lack of incentives such as pay-as-you-throw (PAYT) or extended producer responsibility (EPR) schemes reduces motivation for waste minimization and source separation.

- No national system for waste characterization studies:

Periodic and standardized waste characterization surveys are not conducted, preventing the establishment of reliable baselines and trend monitoring.

These gaps in waste generation data and monitoring directly affect the planning and optimization of collection systems, underscoring the need for reliable, up-to-date information as the foundation for effective waste management operations.

## 3.3 Waste Collection

Efficient collection is a critical component of the SWM system, directly influencing the effectiveness of sorting, treatment, and disposal. In Lebanon, waste collection practices remain largely traditional and fragmented, with limited progress toward source

segregation and integrated collection systems. The following section summarizes the current situation, relevant institutional arrangements, and operational challenges.

### 3.3.1 Regular Waste Collection

#### Collection Practices

In terms of storage and collection of waste at source, under Decree No. 5605/2019, municipalities are required to establish drop-off centers for sorting at source and to promote the adoption of a three-bin system for separate collection. In practice, however, there is no systematic storage of sorted waste at the source, and citizens are generally not accustomed to maintaining separate bins for domestic, commercial, or institutional waste. Moreover, there is no functioning public system for the primary collection of sorted waste. Discharged mixed waste is typically collected by a combination of private companies and municipal workers.

Collection, city cleaning, and sweeping are not performed daily across all areas. Main markets and some residential neighborhoods receive daily service, while other zones are served intermittently, ranging from twice a week to twice a month. In many municipalities, collection remains inefficient and insufficient, particularly in peripheral or rural areas.

Common modes of collection used by municipalities and the private sector include containerized service and roadside pickup, either from open piles or fixed containers[28]. While nearly the entire Lebanese territory is covered by some form of waste collection service with 100% waste collection in urban areas and 99% in rural areas, the quality, frequency, and efficiency of these services vary significantly.[29] Some isolated villages and communes remain underserved or irregularly serviced.

According to the WB Roadmap for 2023 – 2026, municipalities and local authorities are formally responsible for waste collection operations and sometimes contract private companies to carry out the task.

In 1994, the Lebanese Government signed a contract with a private waste management company, to handle waste collection and street cleaning in Greater Beirut. This contract gradually expanded to cover all the Mount Lebanon Governorate (excluding the Jbeil Caza), with fees deducted from the Independent Municipal Fund. This contract ended in 2018, after which the company was replaced by two other private companies that took over waste collection under periodically renewed contracts. These companies have faced problems with payments due to the financial crisis, resulting in reduced operational capacity.[30]

Outside Greater Beirut and Mount Lebanon, municipalities have historically managed waste collection through local contractors or municipal labor, often without standardized service

[28] Abbas et al., 2019, Solid Waste Management in Lebanon: Challenges and Recommendations, (PDF) Solid Waste Management in Lebanon: Challenges and Recommendations JEWM Solid Waste Management in Lebanon: Challenges and Recommendations (researchgate.net)

[29] CDR, MoE & World Bank, 2024. Final National Integrated Solid Waste Management Strategy.

[30] Chehayeb, 2021, State of decay: How rubbish became Lebanon's latest dumpster fire, State of decay: How rubbish became Lebanon's latest dumpster fire | Business and Economy News | Al Jazeera

models or long-term contracts.[31] With limited technical capacity and heavily constrained budgets, further aggravated by the financial and economic crisis, many municipalities have struggled to sustain regular waste collection and street cleaning services. Payment delays to contractors, shortages in fuel and equipment, and the absence of unified performance standards have led to inconsistent service quality across regions. As a result, several municipalities have resorted to ad-hoc arrangements, reduced collection frequency, or reliance on informal waste pickers.

Domestic waste in Lebanon is still collected as mixed waste, either through curbside systems or collection points. Collection vehicles are not equipped to handle multiple waste fractions. Consequently, almost all collected waste is now transported directly to disposal sites (dumps), and source segregation initiatives have been largely ineffective.[32].

### Environmental Implications of Ineffective Collection

The WB Roadmap for 2023 – 2026 highlights the scale of uncollected waste, particularly in Beirut city where an estimated 1,160 t/yr leaks into the environment. Approximately 37% of this leakage originates from open or unsealed garbage containers. The remaining 63% of waste leakage is estimated to result from beach goers. The plastic leakage rate is equivalent to 3.2 kg/person/year (7.3% of total plastic waste generation), about seven times higher than the rate in well-performing waste systems (0.5 kg/person/year). The figure below illustrates the fate of uncollected waste in Beirut.

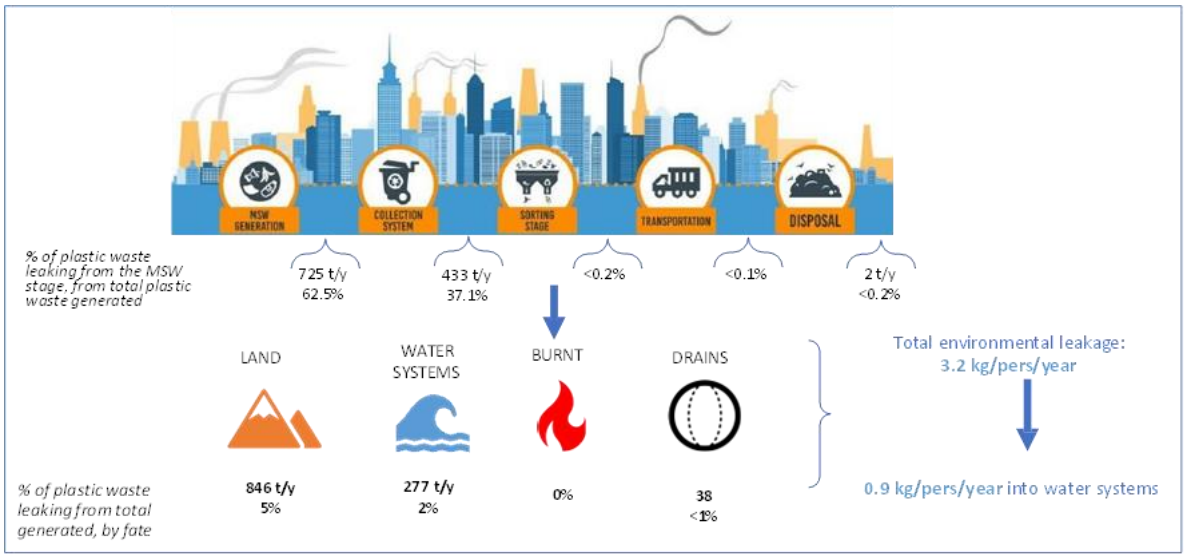



*Figure 3–3: Fate of Uncollected Waste in Beirut[33]*

Inadequate waste collection practices contribute to contamination of water, soil, and air, posing serious risks to public health, the marine environment, and the economy. Plastic materials, particularly hard plastics, soft plastics, and foams, constitute over 77% of marine

[31] Kreidieh, R., & Kheir, R. (2017). *Solid Waste Management in Lebanon: Challenges and Recommendations.* American University of Beirut.
[32] MoE/World Bank, 2023, Lebanon Solid Waste Roadmap for 2023-2026
[33] MoE/World Bank, 2023, Lebanon Solid Waste Roadmap for 2023-2026

litter on Lebanese beaches. Notably, 88% of marine litter collected by the end of 2021 is believed to have been dumped on land rather than originating from sea-based sources.[34]

The above analysis highlights Lebanon's waste collection system operates under high coverage but low efficiency. Despite the legal framework promoting sorting at source and municipal responsibility, implementation remains limited. Most of the waste is collected unsorted, through inefficient and irregular collection schedules, and directed to disposal sites without recovery. Financial constraints, weak institutional coordination, and lack of public participation have further eroded service quality. As a result, collection inefficiencies directly drive environmental pollution and resource loss, underscoring the urgent need for systemic reform, sustainable financing, and operational modernization in the national waste management strategy.

Ineffective solid waste collection in Lebanon leads to the rapid accumulation of uncollected waste in public bins and streets, causing overflow, foul odors, the proliferation of pests, and increased environmental and health risks for surrounding communities.

### 3.3.2 Special Streams Collection

Special streams include waste types that, due to their composition, size, or origin, require specific collection approaches distinct from regular municipal waste. As previously described, these streams encompass both hazardous and non-hazardous categories, many of which have significant recovery potential but remain poorly managed.

Overall, collection systems for special waste streams are uneven, largely informal, and data deficient. While some initiatives and private operators contribute to selective collection, national coverage and reporting are still limited.

The following subsections provides an overview of the status of hazardous and non-hazardous special waste streams in Lebanon based on available data.

#### 3.3.2.1 Hazardous Waste Collection

Lebanon currently lacks dedicated infrastructure and formal collection systems for hazardous waste. Most hazardous materials are not segregated at source and often end up mixed with municipal waste or disposed of through environmentally unsafe practices, including open dumping, open burning, or release into water bodies. Efforts to control pollution have been limited to isolated initiatives prompted by complaints or local authorities.

[34] WB/MoE/ISWA, 2021, Baseline Marine Pollution Survey in Lebanon

*Table 3–4: Collection of Hazardous Special Waste Streams and Key Observations*

| WASTE STREAM | CURRENT COLLECTION PRACTICES | KEY OBSERVATIONS |
|---|---|---|
| **Electronic Waste (E-Waste / WEEE)** | Collected informally or disposed of with municipal waste. | Lack of formal collection infrastructure; unsafe informal recycling; minimal data and reporting. |
| **Waste Oils and Lubricants** | Collected by several small entities; limited reporting[35]. | Fragmented system, lack of quality control; limited traceability and environmental oversight. |
| **Batteries and Accumulators (Lead-Acid)** | Estimated **15,894–21,885 t/yr** lead-acid batteries collected ("Retrofitting of public buildings through green technologies and processes" funded by the EU, implemented by ICU, arcenciel, Fondation Diane, and the University of Genoa, 2024). | Collection partly informal; risks of acid leakage and improper handling; limited recycling or export options. |
| **Sludge from WWTPs** | Managed mainly at treatment plant sites; collection depends on plant operation; many plants are underutilized or inactive due to lack of sewer connections | Many WWTPs are non-operational or under-capacity. Future expansion will require scaling up sludge collection logistics. |
| **Healthcare Waste** | Collected by specialized operators (e.g., arcenciel) from hospitals and clinics for treatment (autoclave/microwave/pyrolysis). | Limited geographic coverage; inconsistent segregation at source; high treatment costs for smaller facilities. |
| **Other Hazardous Waste** | Some informal practices, such as co-processing hazardous waste in cement plants, happen occasionally. | Lacks monitoring, permitting, and quality control; does not replace formal hazardous waste collection infrastructure. |

The above analysis point to fragmented and unsafe collection practices. Data availability is limited to isolated initiatives, and several streams (particularly e-waste, oils, and healthcare waste), depend on ad hoc or donor-supported systems. While co-processing in cement plants provides a partial mitigation pathway, it remains informal, unregulated, and insufficient as a national solution. Strengthening the legal mandate for hazardous waste collection, licensing collectors, and ensuring treatment capacity are essential steps toward compliance with international standards.

[35] MoE/UNDP, 2020, SOER report: Lebanon State of the Environment and Future Outlook: Turning the Crisis into Opportunities, SOER_Report_EN.pdf (unicef.org)

### 3.3.2.2 Non-Hazardous Waste Collection

Non-hazardous special streams differ from regular waste due to their volume, physical characteristics, or generation pattern. Despite their importance, collection systems remain largely informal or underdeveloped, with limited data on quantities and pathways.

*Table 3–5: Collection of Non-Hazardous Special Waste Streams and Key Observations*

| WASTE STREAM | CURRENT COLLECTION PRACTICES | KEY OBSERVATIONS |
|---|---|---|
| **Construction & Demolition (C&D) Waste** | No formal collection system: Site management practices largely determine waste handling; often dumped illegally. | Lack of data, poor enforcement, and no designated collection points or recycling facilities. |
| **War-Generated Rubble** | Collected by contractors appointed by national authorities and transported to approximately 40 temporary storage sites across affected districts. | Sustainable rubble management is scheduled to be finalized under the LEAP project once it is implemented, following parliamentary approval. |
| **Bulky Waste (Furniture, Appliances, etc.)** | Collected occasionally through municipal or informal services; large portion unrecorded. | No systematic collection; limited public awareness or scheduled collection days. |
| **Used Tires and Rubber Waste** | Two active collection/recycling facilities. A significant portion enters MSW or is handled by the informal sector. | Limited collection; handled informally; poor monitoring and traceability. |
| **Textile and Leather Waste** | Mixed with municipal waste or occasionally recovered informally for reuse/recycling. | No dedicated collection points; absence of producer responsibility schemes. |
| **Packaging Waste** | Collected through regular municipal systems or informal scavenging; limited sorting at source. | Minimal recovery rates; lack of extended producer responsibility mechanisms. |
| **Food and Organic Waste from Large Generators** | Mixed with municipal waste. | No dedicated collection or valorization channels. |
| **Agricultural and Green Waste** | Typically, collected with municipal waste. | Absence of coordinated collection and treatment programs. |
| **Sludge from WWTPs** | (See also hazardous section) Collected and handled at plant level; reuse or disposal limited. | Operational inefficiencies and inadequate treatment limit proper management. |
| **Industrial non-hazardous waste** | Collected and managed at facility level. | Limited information on centralized collection systems. |

| WASTE STREAM | CURRENT COLLECTION PRACTICES | KEY OBSERVATIONS |
|---|---|---|
| **Other Emerging Streams** | Includes composite materials and multi-layer packaging. | No data or structured collection systems in place. |

### 3.3.3 Informal Sector

The informal waste sector plays a small but significant role in Lebanon's overall waste management system. Operating outside formal institutional and regulatory structures, informal waste pickers contribute to the extraction of valuable materials (particularly plastics, metals, and paper) from municipal waste streams. Despite their contribution, the sector remains largely undocumented, unregulated, and often associated with unsafe working conditions.

As reported by Lebanon's latest State of the Environment Report[36], 1% of the total generated waste is collected by the informal sector. However, this figure is likely an underestimation, as there is no systematic data at major collection points. Other sources estimate the informal sector's recovery of plastics alone at around 2% of total municipal waste, while non-documented estimations of the MoE suggest that about 2-3% of the municipal waste is recovered informally for recycling.

The scale and visibility of informal waste picking have increased considerably due to the ongoing socioeconomic crisis. As reported in the article "Lebanon's poorest scavenge through trash to survive[37], many individuals, driven by unemployment and the collapse of the Lebanese pound, have turned to scavenging as a survival strategy. Informal collectors search through bins, streets, and disposal sites to extract recyclables that can be sold to scrap dealers. Prices typically range around USD 0.20 per kilogram of plastic bags, USD 0.30 for other plastics, and USD 1.00 for aluminum.[38] Although these values seem modest, access to hard currency (USD) provides a critical income source. However, the absence of regulation exposes informal waste collectors to significant occupational, social, and safety risks. Competition over waste "territories" has reportedly led to confrontations and violence, with incidents of waste pickers being beaten or injured for collecting from marked dumpsters. Their work is also associated with direct exposure to hazardous waste, unsafe traffic conditions, and unprotected handling of sharp or contaminated materials.

In addition, informal access to landfills and dumpsites poses serious safety and operational challenges. A decision to prevent informal waste pickers from entering the Jdeideh landfill was reached during a meeting between the Interior and Environment Ministers, the Governors of Beirut and Mount Lebanon, the President of the Council for Development and Reconstruction and other officials and security forces.Despite these efforts, informal waste pickers regularly enter landfills in Bourj Hammoud-Jdeideh and Costa Brava where they

[36] MoE/UNDP, 2020, SOER report: Lebanon State of the Environment and Future Outlook: Turning the Crisis into Opportunities, SOER_Report_EN.pdf (unicef.org)
[37] Voa news, 2022, Lebanon's Poorest Scavenge Through Trash to Survive, Lebanon's Poorest Scavenge Through Trash to Survive (voanews.com)
[38] CDR, MoE & World Bank, 2024. Final National Integrated Solid Waste Management Strategy.

face hazardous working environments and the constant risk of accidents. Waste collection companies have also reported operational disruptions and safety incidents.

In conclusion, although the informal sector collects only a low percentage of total municipal waste, it remains an active component of Lebanon's waste collection landscape, particularly for recyclables such as plastics and metals. However, informal collection operates without coordination, safety measures, or data reporting, often interfering with municipal operations and exposing workers to hazardous conditions.

### 3.3.4 Gaps in Waste Collection

While collection services cover most of the Lebanese territory, the system remains uneven, fragmented, and financially strained. Collection practices have not evolved in parallel with national policy objectives or with the increasing complexity of waste streams. Addressing the gaps listed below is essential to improve service reliability, promote segregation at source, and support the transition toward an integrated and circular waste management system.

- **Uneven collection coverage:**

Although urban areas achieve nearly full coverage, many rural and remote communities remain underserved or inconsistently served. Collection frequency varies widely from daily in central areas to as little as twice a month in others, resulting in accumulation, illegal dumping, and open burning.

- **Financial and institutional constraints:**

Municipal budgets are largely absorbed by SWM costs, leaving little room for investment in improved collection systems or equipment. Delays and shortfalls in disbursements further disrupt service continuity and contractor payments, leading to irregular operations.

- **Ageing and inadequate collection fleet:**

Many municipalities rely on old, poorly maintained collection trucks that frequently break down and lack modern equipment for efficient and safe operation. The ageing fleet limits route coverage, increases operational downtime, and raises fuel and maintenance costs. The absence of systematic fleet renewal prevents municipalities from meeting service requirements reliably.

- **Lack of proper weighing and tracking of collected waste:**

Collection operations largely operate without reliable weighing systems or structured tracking mechanisms. In many cases, a single truck collects from multiple municipalities without separate weighing, making it impossible to attribute accurate quantities to each service area. This leads to major data gaps, billing inaccuracies, and poor waste flow monitoring.

- **Limited support for source segregation and sorting initiatives:**

NGO-led and donor-supported efforts exist but remain scattered, small-scale, and short-lived, lacking institutional backing or long-term financial mechanisms. As a result, household-level sorting and selective collection have not become standard practice.

- **Mixed waste collection practices:**

Virtually all waste types are collected as mixed municipal waste, regardless of source or composition. The absence of separate collection systems for organic, recyclable, or hazardous fractions prevents effective recovery, recycling, or safe disposal.

- **Absence of dedicated collection for special waste streams:**

Special streams, such as construction and demolition waste, bulky items, used oils, e-waste, or agricultural residues, are not collected through separate or traceable systems, leading to environmental degradation and loss of recoverable materials.

- **Unregulated informal collection activities:**

The informal sector contributes modestly to the recovery of recyclables but operates outside regulatory oversight, without occupational safety measures or coordination with municipal collection services. This creates inefficiencies, safety risks, and data gaps.

In summary, Lebanon's waste collection system faces systemic weaknesses in coverage, segregation, and financing, which hinder progress toward efficient resource recovery and environmentally sound waste management

## 3.4 Waste Treatment

Waste treatment in Lebanon remains limited and inconsistent, with most of the generated waste still bypassing any formal processing before final disposal. Over the last two decades, several sorting and composting facilities were established across the country to reduce landfill dependency and promote material recovery. However, these facilities have suffered from chronic underperformance due to insufficient funding, weak maintenance, and poor operational oversight. The 2019 financial crisis, compounded by fuel shortages and the devaluation of the Lebanese pound, has further crippled treatment operations. As a result, only a small fraction of waste, less than ten percent, is currently processed through treatment facilities, while the rest is directly sent to dumpsites or landfills.

### 3.4.1 Regular Waste Treatment

Regular solid waste has historically been the target of sorting, composting, and other biological or mechanical treatment approaches. When properly operated, these can reduce landfill burden, recover valuable materials, and lower environmental impacts.

In past years, Lebanon had multiple composting and sorting facilities across different regions in Lebanon mainly funded by international donor funds. These were intended to separate organics, recyclables, and residual waste. The composition of municipal waste is favorable for composting: organic waste often accounts for more than 50 % of MSW, and recyclable content (paper, plastic, glass, metal) typically makes up ~29 %.

However, the actual throughput of these plants is much lower than intended. Many facilities have ceased operation or work at minimal capacity due to funding deficits, electricity and fuel shortages, lack of spare parts, staffing problems, and contamination of input waste (i.e. mixed or non-segregated waste). The Solid Waste Roadmap (2023–2026) reports that

although Lebanon generates ~5,600 tons/day of MSW (in 2022), only about 8 % of that is treated in existing facilities[39].

Composting has become nearly non-operational. Although the organic fraction of waste in Lebanon is high (~50–55 %), usable compost production is limited.

Sorting and material recovery operations (MRFs) have also suffered. Many MRFs originally built to extract recyclables (plastics, metals, paper) now process far less material or have shut down entirely. Some municipalities and NGOs maintain small-scale sorting and recycling programs, but these cover only a tiny fraction of total waste.

Thus, the reality is that regular waste treatment is largely dormant: although the infrastructure exists in places, it is rarely used at scale, and most municipal waste bypasses treatment altogether.

[39] MoE/World Bank, 2023, Lebanon Solid Waste Roadmap for 2023-2026

The figures below provide a visual representation of the status of treatment facilities and landfills:

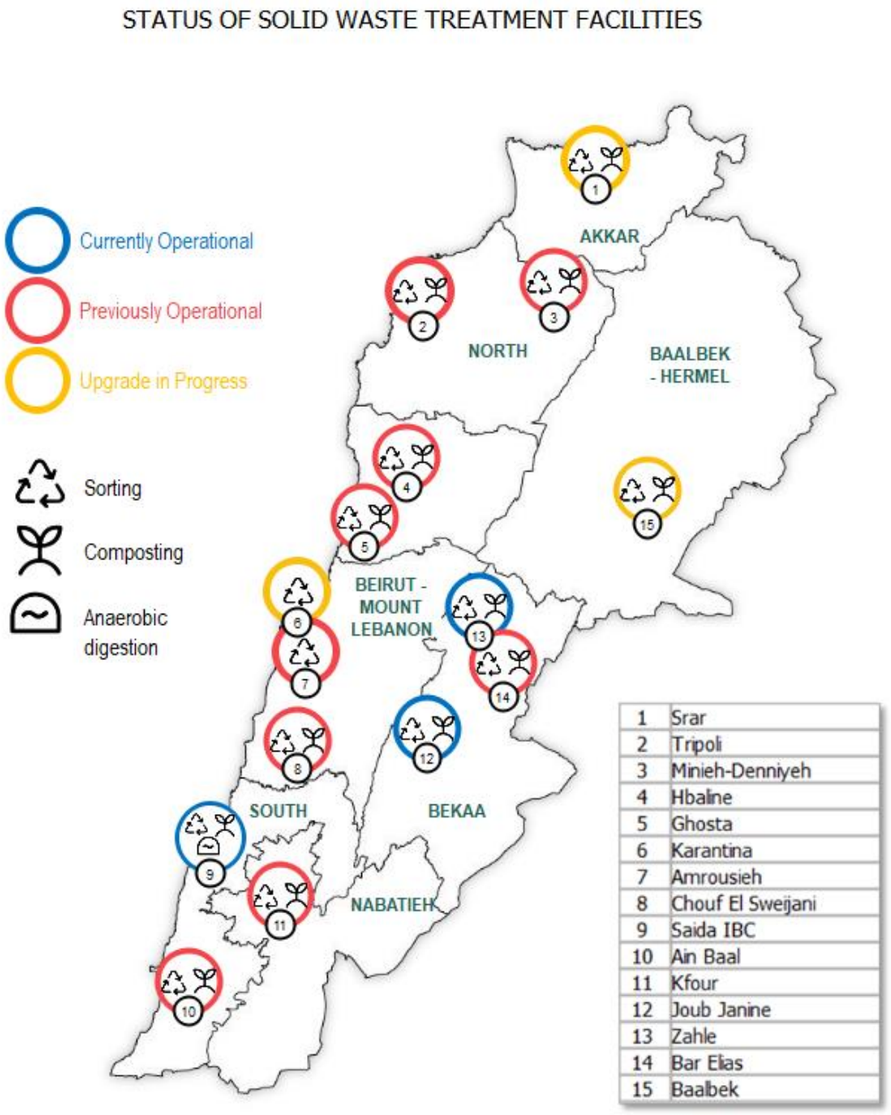



*Figure 3–4: Status of Treatment Facilities*

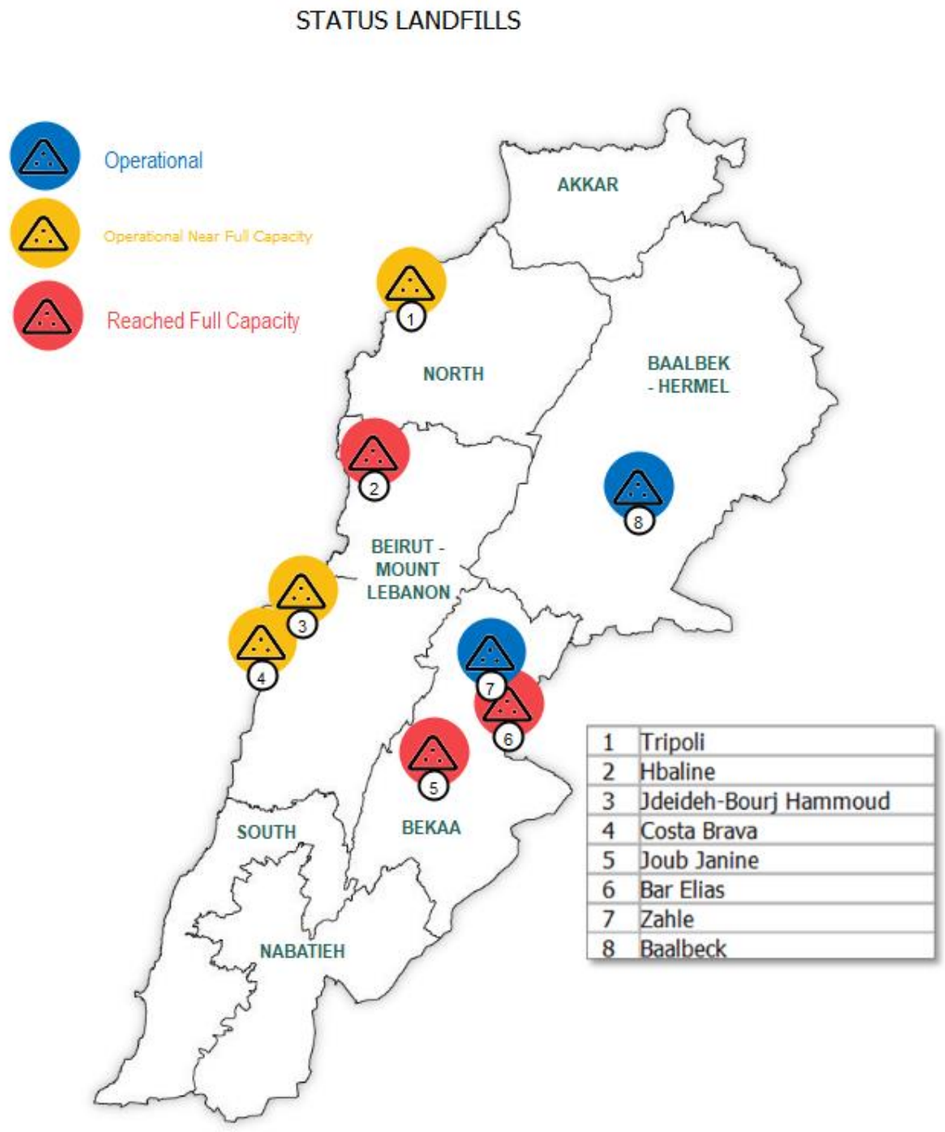



*Figure 3–5: Status of Landfill*

### 3.4.2 Special Streams Treatment

Treatment of special waste streams, including medical waste, industrial hazardous waste, electronic waste, used tires, construction and demolition debris, and sludge, remains extremely limited in Lebanon.

Within the healthcare sector, only infectious waste is currently treated under regulated conditions. Hospitals and larger medical centers contract with private operators, most notably *arcenciel*, which manages three operational infectious waste treatment facilities. Two additional facilities are also in place: a publicly owned facility in Abassieh and a privately owned one in Choueifat. No infectious healthcare waste treatment facility currently operates in the North, leaving hospitals in this region dependent on long-distance transport.

These units handle sterilization of infectious and sharps waste prior to disposal, thereby reducing biological hazards. However, the treatment of other hazardous healthcare categories, such as cytotoxic, pharmaceutical, and chemical waste, remains largely unaddressed. A small portion of these highly hazardous wastes, mainly cytotoxic and expired pharmaceuticals, is exported abroad for environmentally sound destruction through specialized offshore facilities under Basel Convention. The remainder, lacking dedicated national infrastructure, is commonly mixed with municipal waste or managed through informal means, leading to risks of contamination and occupational exposure. Smaller clinics, laboratories, and home-based healthcare providers in particular lack access to authorized collection and treatment systems, further exacerbating the unsafe handling of hazardous medical residues.

Industrial and chemical waste treatment is virtually non-existent on a national scale. Lebanon lacks a dedicated hazardous waste treatment or stabilization facility, leaving most industrial waste to be stored, burned, or disposed of improperly. Occasionally, hazardous materials such as PCBs have been removed under special projects and shipped abroad for destruction (389 tons of toxic chemicals removed in 2016 and 2020[40], but these efforts are exceptional and not sustained.

Electronic waste treatment is similarly fragmented. For example, while Lebanon generated about 46,000 tonnes of e-waste in 2021, only about 90 tonnes (0.09 kt) were documented as being handled in an environmentally sound way by dismantling or recycling entities; the rest is likely dumped, processed or stored informally without adequate environmental safeguards. [41]

[40] Wang, Q., & Mghames, L. (2021, September 29). *Lebanon: 389 tons of toxic chemicals removed through groundbreaking work*. World Bank Blogs

[41] UNITAR (SCYCLE Programme). The National E-waste Monitor: Lebanon 2022. United Nations Institute for Training and Research, 2022.

Used tires also suffer from under-treatment: only a few recycling plants exist (insufficient to absorb current volumes), and most tires are reused, burned, or disposed of without treatment.

Construction and demolition (C&D) debris lacks formal treatment options; C&D debris is often reused or dumped without systematic processing; rubble from the 2023-2024 war is currently stockpiled at temporary sites after preliminary processing. Meanwhile, the MoE has set Standard Operating Procedures and prepared Sustainable Rubble Management Plans, including mapping to identify final sites, with targets of 70% rubble recycling and 30% used to rehabilitate selected sites.[42] Securing funding through the Lebanon Emergency Assistance Project (LEAP) is still pending parliamentary approval.

Sludge from wastewater systems also lacks stabilization or drying infrastructure and is frequently disposed of untreated.

In sum, Lebanon's special waste treatment capacity is extremely weak, with few dedicated facilities, widespread informal or improper handling, and occasional reliance on external disposal for highly hazardous waste. A robust national strategy must therefore prioritize expanding specialized treatment infrastructure, enforcing standards, and integrating treatment for non-municipal waste streams into the broader waste management system

### 3.4.3 Gaps in Waste Treatment

Lebanon's waste treatment sector remains critically weak, constrained by structural, technical, and financial barriers that affect both regular and special waste streams.

- **Absence of Source Segregation**

The lack of source segregation is the most fundamental constraint. Mixed municipal waste reaches treatment facilities contaminated with recyclables, inerts, and hazardous residues, making sorting and composting inefficient. This also allows special streams of waste to enter the municipal stream, undermining environmental safety and treatment quality.

- **Limited Technological Diversity**

Lebanon's treatment capacity remains confined to low-technology sorting and composting. More advanced options such as anaerobic digestion, biodrying, or waste-to-energy have not been developed beyond studies or small pilots. For special streams, there are no functional systems for industrial, hazardous, or electronic waste, and limited or outdated capacity for tire, sludge, or construction waste treatment.

- **Lack of Infrastructure for Special Waste**

No national facilities exist for hazardous waste stabilization, treatment, or secure disposal. Industrial residues, sludges, and healthcare waste are often burned or co-disposed with

[42] MoE, Standard Operating Procedures for Post Disaster Rubble Management (2025) and MoE, Sustainable Rubble Management following the 2023-2024 War in Lebanon, Summary Note. September 2025.

municipal waste. Special streams, such as e-waste, tires, and construction debris, are managed informally and without oversight.

- **Institutional Fragmentation and Weak Oversight**

Governance is fragmented among the Ministry of Environment, the Council for Development and Reconstruction, and municipalities, leading to overlapping mandates and inconsistent management. For special streams, the lack of a clearly mandated authority has resulted in unregulated practices and a complete absence of waste tracking or performance reporting.

- **Financial Self-Sufficiency**

Facilities lack cost-recovery mechanisms and depend on irregular public or donor funding. Revenues from compost or recyclables are negligible, while inflation and currency depreciation have sharply increased operational costs. The absence of long-term financing also discourages private sector engagement in both municipal and special waste treatment.

- **Need for Strengthened Technical Guidance and Support from NSWMA**

Local authorities often operate with limited access to updated technical knowledge on suitable waste treatment technologies and international best practices. This can make it challenging for municipalities to assess treatment options or plan for more advanced or specialized facilities. The operationalization of the NSWMA, as envisioned under Law 80/2018, is therefore essential to provide standardized technical guidance, capacity-building programs, and advisory support. A stronger national technical backbone would enable municipalities to make informed, evidence-based decisions and ensure that technology selection aligns with national priorities and environmental safeguards.

In summary, Lebanon's treatment system suffers from weak infrastructure, lack of hazardous waste capacity, and institutional fragmentation. Strengthening the sector requires introducing source segregation, diversifying treatment technologies, establishing dedicated facilities for special streams, and ensuring financial and operational sustainability through effective governance and monitoring.

## 3.5 Waste Disposal

Waste disposal represents the final and most critical stage of Lebanon's SWM system. Despite multiple interventions to improve sorting and treatment, disposal remains the endpoint for almost all waste generated in the country. The continued dependence on landfilling and open dumping results from limited treatment capacity, weak enforcement of standards, and an absence of sustainable planning for final disposal sites. Although several engineered landfills were developed in recent years as part of emergency interventions, they were designed as short-term measures rather than part of an integrated national network. Today, these landfills are over capacity, while uncontrolled dumping and open burning remain widespread.

### 3.5.1 Regular Waste Disposal

As for waste disposal in sanitary landfills, in 2018—when most waste-treatment facilities were still operational, 5,674 tons/day (approximately 77.3% of the total 7,342 tons/day generated) was sent to disposal sites, including sanitary landfills and open dumps. By 2022, an estimated 5,528 tons/day, nearly 98.7% of the total 5,600 tons/day generated, was being disposed of in operating landfills or open dumps[43].

Currently, there are six operating sanitary landfills, receiving approximately 3,182 tons/day, which exceeds their original design capacity, leading to overfilling, shortened service life, and increased leachate emissions. The remaining 2,346 tons/day are disposed of in open dumps.

*Table 3–6: Comparison of Waste-Disposal Practices, 2018, and 2022[44]*

| YEAR | TOTAL WASTE GENERATION (T/D) | WASTE DISPOSAL QUANTITY (T/D) | % OF GENERATION DISPOSED | % IN SANITARY LANDFILLS | % IN OPEN DUMPS |
|---|---|---|---|---|---|
| 2018 | 7,342 | 5,674 | 77.3% | 55% | 45% |
| 2022 | 5,600 | 5,528 | 98.7% | 57% | 43% |

- In 2018, around 2,553 tons/day of waste were disposed of in open dumps—equivalent to 45% of total disposal. By 2022, an estimated 2,377 tons/day were being dumped, burned, or littered in open environments, representing about 43% of total disposal. Despite a decrease in total generation, the proportion of uncontrolled disposal remains alarmingly high.
- Access to sanitary landfills and treatment facilities remains severely limited in northern governorates (Koura, Batroun, Zgharta, and Bcharre) and southern areas (Bint Jbeil, Marjaayoun, Hasbaya). Small-scale, donor-funded facilities in these regions operate intermittently, while open dumping and burning remain the prevailing practice. Poor planning and community opposition have prevented certain operational facilities from securing disposal outlets, forcing their residual waste to end up in open dumps even before funding shortages halted operations.
- Although open burning of waste is prohibited under national law, it remains common practice across Lebanon. The number of uncontrolled dumps has increased to over 1,000 sites nationwide. A GIS analysis conducted under the *Marine Litter Baseline (2021)* revealed an expanding number of open dumps located within 500 meters of rivers, increasing the risk of marine litter leakage as rivers act as major transport pathways to the Mediterranean.
- To prevent total system collapse, the Council of Ministers (Decision No. 67, May 2022) approved new landfill locations for critical areas including *Beirut and Metn, Baabda*

[43] MoE/World Bank, 2023, Lebanon Solid Waste Roadmap for 2023-2026
[44] MoE/World Bank, 2023, Lebanon Solid Waste Roadmap for 2023-2026

*Aley, and Tripoli*. However, most existing landfills are reaching full capacity. The recent Jdeideh case, where the landfill reached saturation and required an emergency expansion until 2026, illustrates the critical pressure on disposal infrastructure, underscoring the urgent need for new engineered capacity and regional redistribution of waste loads. Additionally, several of the newly proposed landfill sites have not been accepted by local authorities, limiting the feasibility of establishing new engineered capacity and hindering efforts to rebalance regional waste loads.

- In September 2025, the Lebanese government approved the temporary expansion of the Jdeideh landfill to accommodate waste from Metn, Keserwan and parts of Beirut, with the end of 2026 set as the deadline to cease dumping and permanently close the site
- Other regions in Lebanon continue to be affected by the deficiencies in landfill capacity.

### 3.5.2 Special Streams Disposal

Disposal practices for special and hazardous waste streams remain largely unregulated and environmentally unsound. Lebanon currently lacks a dedicated hazardous waste landfill, hazardous waste treatment facilities, or long-term secure storage facility. Hazardous industrial residues, medical waste, e-waste, tires, and chemical by-products are often co-disposed of with municipal waste, illegally dumped, or burned.

- **Medical Waste:** Treated infectious waste from *arcenciel*'s facilities is typically sent to municipal landfills. Smaller healthcare facilities and home-care sources dispose of waste with regular municipal waste, creating biological and occupational health risks.
- **Industrial Waste:** Hazardous waste generated by manufacturing sectors (including paint, metal plating, and chemicals) is often stored, burned, or mixed with household waste. Only limited volumes are exported abroad under Basel Convention provisions.
- **Construction and Demolition Waste (CDW):** Large volumes from reconstruction and urban development projects, including the 2020 Beirut Port explosion, are dumped in quarries, valleys, and coastal areas without environmental safeguards.
- **Used Tires:** Approximately 20,000 tons/year of tires are generated, with most burned informally or reused for construction barriers.
- **E-Waste:** Around 46,000 tons/year of electronic waste are generated, but less than 1% is treated in environmentally sound facilities. The rest is stockpiled or disposed of in open dumps, releasing heavy metals and persistent pollutants (UNITAR, 2022).

The unregulated disposal of these waste streams increases contamination risks to soil, groundwater, and coastal ecosystems, and poses serious threats to human health and safety.

### 3.5.3 Gaps in Waste Disposal

Lebanon's waste disposal system suffers from deep structural, technical, and institutional weaknesses that threaten both environmental integrity and public health. Despite temporary measures adopted after the 2015 crisis, the disposal stage remains the weakest link in the national solid waste chain.

- **Overcapacity and Aging Landfills**

All six operating sanitary landfills, Costa Brava, Bourj Hammoud–Jdeideh, Zahle, Tripoli, Nabatieh, and Baalbeck, are currently exceeding their design capacity. Overfilling has led to frequent slope instability, increased leachate generation, and odor nuisances. Leachate collection systems are either inadequate or non-functional due to lack of maintenance, while gas management is nearly absent. These conditions shorten landfill lifespan and heighten risks of groundwater contamination and fires.

- **Uneven Geographic Coverage**

Several districts, especially in the North (Koura, Zgharta, Batroun, Bcharre) and South (Bint Jbeil, Hasbaya, Marjaayoun), have no access to any engineered landfill. Municipalities in these areas depend on uncontrolled dumps or ad hoc transfers to remote facilities, which drastically increases costs and collection interruptions. The lack of regional equity in disposal access creates serious environmental disparities and weakens public trust.

- **Proliferation of Open Dumps and Burning Practices**

Over 1,000 active open dumps persist nationwide, with many located within 500 meters of rivers or coastal areas. These sites receive both municipal and special waste, are subject to open burning, and generate substantial air pollution and greenhouse gas emissions. The persistence of open dumping, despite its legal prohibition under Law 80/2018, reflects the absence of enforcement.

- **Lack of Hazardous and Special Waste Disposal Infrastructure**

Lebanon lacks any secure hazardous waste landfill or high-temperature treatment facility. Hazardous industrial residues, untreated medical waste, e-waste, and chemical materials are routinely co-disposed of with municipal waste. The absence of a dedicated system for hazardous waste violates Basel Convention requirements and presents long-term contamination risks for soils and aquifers.

- **Environmental and Health Risks**

Leachate runoff and uncontrolled emissions from open dumps and saturated landfills contaminate surface and groundwater, while uncontrolled burning releases dioxins, furans, and particulate matter. Populations living near major disposal sites are exposed to severe respiratory and carcinogenic hazards. Studies by HRW (2020) and MoE (2023) highlight a marked increase in local respiratory diseases linked to waste combustion.

- **Institutional Fragmentation and Weak Oversight**

The division of responsibilities among the Ministry of Environment, CDR, and municipalities has led to unclear accountability for landfill operation, environmental monitoring, and

closure planning. There is no centralized landfill monitoring program or standardized performance reporting, making regulatory follow-up nearly impossible.

- **Financial Unsustainability**

Disposal operations are heavily dependent on irregular central transfers and donor support. Municipalities can't legally collect waste service fees, while the cost of operating and rehabilitating landfills continues to rise due to inflation and fuel costs. No long-term post-closure funding mechanism is in place.

- **Community Resistance to New Facilities**

Public opposition to landfill sitting remains a major barrier. Past experiences with odor, poor operation, and environmental damage have eroded public trust. Without transparent site selection criteria, compensation mechanisms, and community engagement, new landfill projects face severe delays or cancellation.

- **Data and Monitoring Deficiencies**

Reliable data on waste quantities, landfill inflows, and emissions are lacking. The absence of a national inventory of landfill performance prevents evidence-based planning. Remote sensing and GIS mapping efforts indicate continued spread of uncontrolled sites, but no central authority systematically updates this information.

## 3.6 Legal and Institutional Framework

### 3.6.1 Legal Framework

#### 3.6.1.1 Waste Management Related Policies, Strategies and Plans

Lebanon's SWM framework has evolved considerably since the adoption of Law No. 80/2018 on ISWM, supported by several national roadmaps and policy instruments.
The ISWM Policy (2018) and successive drafts of the National ISWM Strategy (2019, 2021, and 2024) have laid out the foundation for an integrated system based on the waste hierarchy, decentralization, and environmental compliance.
More recently, the Solid Waste Roadmap (2023–2026) has outlined priority actions including institutionalization of the National Solid Waste Management Authority (NSWMA), establishment of service zones, operationalization of a National Solid Waste Management Information System (NSWMIS), and introduction of a cost-recovery mechanism.
In parallel, cross-sectoral strategies such as the National Air Quality Strategy (Decree 6212/2020), the National Renewable Energy Action Plan (NREAP 2021–2025), the National Agriculture Strategy (NAS 2020–2025), and the Sustainable Consumption and Production Action Plan (SCP-NAP) provide important linkages between SWM, climate mitigation, and circular economy objectives. These frameworks collectively demonstrate strong policy

intent; however, they remain only partially implemented, limiting the sector's transition toward sustainability and compliance.

Despite this comprehensive framework, the sector remains characterized by fragmentation and weak policy coherence. Multiple strategies and roadmaps coexist without formal endorsement or integration, creating uncertainty in implementation and institutional accountability. For instance, although the waste sector is recognized within Lebanon's Nationally Determined Contribution (NDC) and the National Air Quality Strategy (2020), integration between SWM and climate mitigation remains limited. Methane recovery from landfills, waste-to-energy options, and composting are not yet systematically incorporated into national emission reduction programs.
Likewise, circular economy and resource efficiency principles have not been mainstreamed into SWM planning. The absence of EPR mechanisms, product standards for recycled materials, and economic incentives for material recovery constrains progress toward waste minimization and recycling targets.

Overall, the sector remains largely reactive focused on collection and disposal rather than prevention, recovery, and resource management.

In addition, the current financing framework for SWM in Lebanon lacks formal financial guarantee mechanisms to secure the payment of treatment and disposal costs, particularly in cases where municipalities or service operators default on contractual or operational obligations.

### 3.6.1.2 Waste Management Related Legislative Framework

Lebanon's SWM legislative framework has undergone a substantial consolidation and modernization process since the adoption of Law No. 80/2018 on ISWM. Anchored in the overarching Environment Code (Law No. 444/2002) and supported by a comprehensive Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) regime (Decrees 8633/2012 and 8213/2012), the framework now provides a solid legal foundation for integrated and environmentally sound waste governance. The framework comprises important milestones, such as:

**Core ISWM Law and policy direction**
Law 80/2018 establishes the waste hierarchy, decentralization to local authorities, prohibitions on random dumping/burning, and a financing chapter, including incentives and penalties, and calls for a national strategy and local SWM programs. It also sets out non-hazardous and hazardous waste management provisions and envisions a National SWM Authority under the MoE. Law 80/2018 constitutes the principal legislative instrument governing the sector. It articulates the waste hierarchy (prevention, reuse, recycling, recovery, and disposal), prohibits random dumping and open burning, and promotes decentralization of waste management responsibilities to municipalities and unions of municipalities (local authorities). The law establishes a framework for economic

instruments, combining incentives, penalties, and service charges to support financial sustainability.

It also mandates the preparation of a National Solid Waste Management Strategy and local SWM programs and envisages the establishment of a National Solid Waste Management Authority to oversee strategic planning, coordination, and regulatory enforcement.

Furthermore, the law delineates the institutional responsibilities of national and local entities, defines control and monitoring mechanisms, and introduces the principle of EPR as a foundation for future circular economy measures. Building on the experience gained since its adoption, the Ministry of Environment is expected to initiate, in 2026, a structured process to review and update Law 80/2018, with the objective of strengthening its implement ability, clarifying institutional arrangements, and aligning the legal framework with evolving national priorities, operational realities, and international best practices.

**Rapid build-out of secondary regulations (2019–2025)**

Following Law 80/2018, MoE has issued a comprehensive series of technical implementation decisions and decrees that operationalize the provisions of the law and fill previous regulatory gaps. These include, inter alia:

- Decision No. 24/1 (2024) on standards for collection and transport of municipal solid waste;
- Decision No. 25/1 (2024) on sorting operations and facilities;
- Decision No. 26/1 (2024) on composting and biological treatment;
- Decision No. 27/1 (2024) on the production and use of alternative fuels;
- Decision No. 28/1 (2024) on thermal treatment and management of residual ash;
- Decisions No. 29/1 and 30/1 (2024) establishing technical and operational standards for sanitary landfills.

Together, these instruments provide detailed technical specifications across the entire waste management chain, ensuring regulatory consistency, environmental control, and compliance with the waste hierarchy.

These are complemented by earlier instruments:

- Decision No. 5605/2019 on sorting at source, which introduces standardized requirements for segregation of municipal waste streams;
- Decision No. 58/2019 on the classification of alternative solid fuels derived from non-hazardous waste residues, which supports energy recovery and cleaner combustion alternatives.

Building on the transition toward circular practices, Ministerial Memo No. 4/1 (4/6/2025) assigns a technical committee to develop and monitor the implementation of national standards for product recycling, including under the UNOPS-supported project framework. This initiative strengthens alignment between industrial specifications, recycling markets, and environmental protection objectives.

Whereas for hazardous waste, Decree No. 5606/2019 and accompanying MoE Decisions (Nos. 59/1, 998/1, 999/1, and 35/1 of 2024) have established a comprehensive chain-of-custody, licensing, and reporting system, ensuring traceability from generation to final treatment or disposal. These instruments align with the Basel Convention and introduce a structured permit and control mechanism for hazardous waste facilities, transporters, and operators.

**Financing reform in progress**

To complement the regulatory reforms, the CoM has transmitted in September 2025 to Parliament an updated version of the cost-recovery law (Amendment of Article 28 of Law No. 80 dated 10/10/2018), intended to operationalize user-based service charges for collection, transport, treatment, and disposal services. This law, once enacted, will provide the financial mechanism needed to ensure cost recovery, transparency, and equitable allocation of responsibilities among waste generators and service providers.

Additionally, Law 80/2018 envisions the gradual introduction of economic and fiscal tools (including incentives, subsidies, and penalties) to promote compliance and encourage investment in waste prevention, recycling, and recovery.

Collectively, these legislative milestones mark a decisive transition from a fragmented, decree-based regime toward a comprehensive, standard-driven, and enforceable legal system. The framework now defines clear institutional roles, establishes robust technical and environmental standards for all major facility types, and lays the groundwork for a functioning ISWM system that aligns with international environmental governance principles and sustainable development objectives.

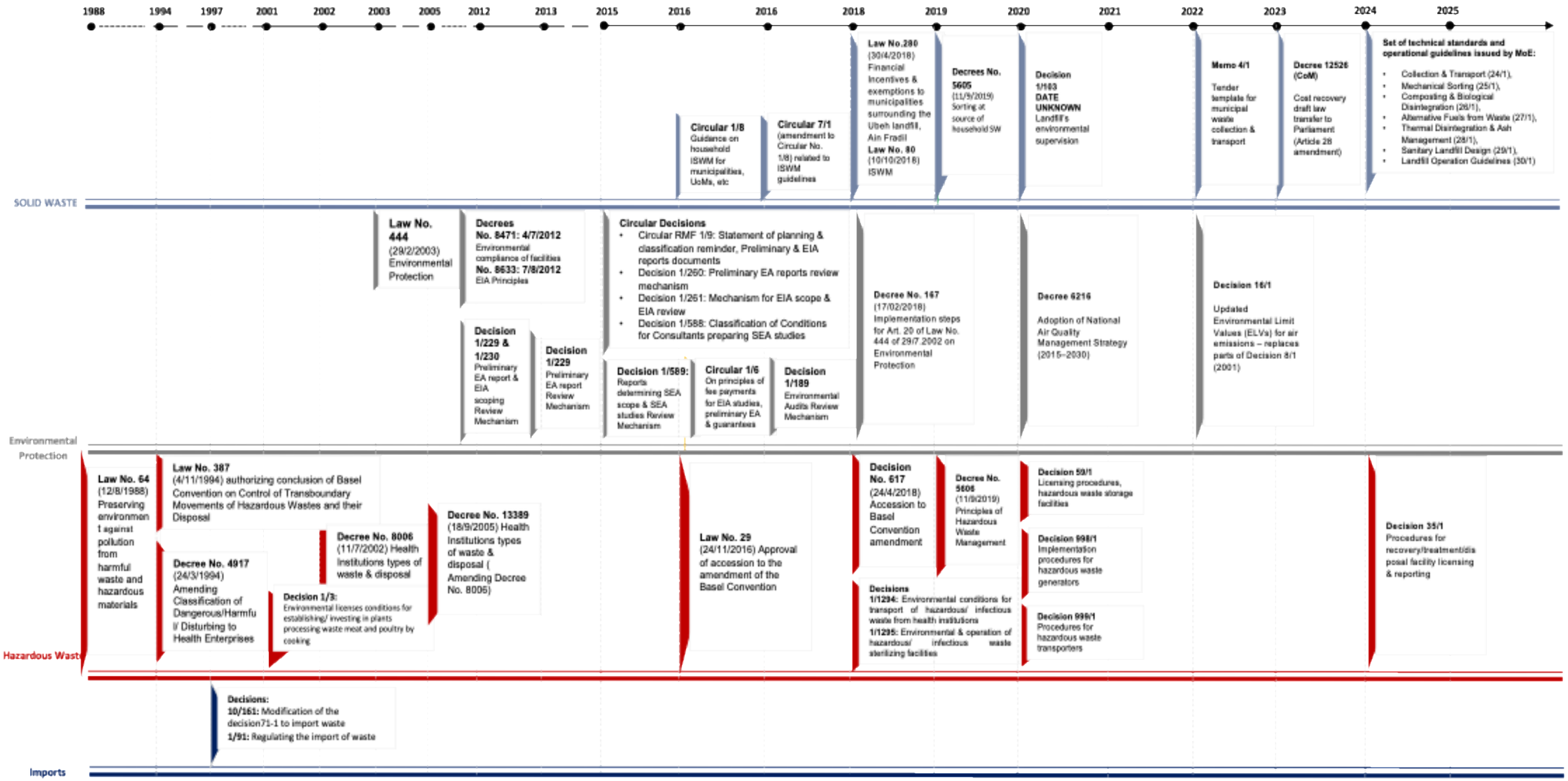



*Figure 3–6: Legislative Framework Timeline*

### 3.6.1.3 Waste Management Related International Conventions, Treaties and Agreements

Lebanon is party to a comprehensive set of multilateral environmental agreements (MEAs) that collectively establish the international legal foundation for environmentally sound SWM. These include the Basel Convention (1989) on the Control of Transboundary Movements of Hazardous Wastes and their Disposal; the Stockholm Convention (2001) on Persistent Organic Pollutants (POPs); the Minamata Convention (2017) on Mercury; the Paris Agreement (2015) and Kyoto Protocol (1997) on climate change; as well as the Barcelona Convention (1976) for the Protection of the Mediterranean Sea.

Together, these conventions define global standards for hazardous waste control, emissions reduction, chemical safety, and pollution prevention, directly influencing national SWM policy and regulatory development. Lebanon's ratification of these treaties demonstrates a clear policy commitment to environmental protection and sustainable waste management.

**Integration of MEA Obligations into the Solid Waste Sector**

Lebanon's engagement in these conventions has contributed to several positive developments in the national SWM framework:

- The Basel Convention has informed the adoption of Decree No. 5606/2019 and subsequent MoE Decisions (59/1, 998/1, 999/1, 35/1 of 2024) on hazardous waste management establishing procedures for licensing, transport, and treatment of hazardous waste.
- The Stockholm Convention supports national efforts to reduce unintentional POPs emissions from open burning of waste and uncontrolled landfills, consistent with Law No. 80/2018 prohibiting random dumping and burning.
- The Minamata Convention underpins ongoing initiatives to manage mercury-containing waste, such as fluorescent lamps and healthcare waste streams, though dedicated regulatory measures are still under preparation.
- Commitments under the Paris Agreement and Kyoto Protocol frame the waste sector as a greenhouse gas mitigation opportunity, particularly through methane recovery from landfills, composting, and waste-to-energy applications.
- The Barcelona Convention reinforces the importance of integrated coastal waste management and prevention of leachate and marine litter discharge from coastal dumpsites.

Collectively, these instruments provide legal and policy direction for developing an integrated, environmentally sound SWM system. However, Lebanon's current level of alignment between international obligations and national implementation remains partial and uneven, with persistent gaps in legislation, implementation, and monitoring.

For instance, most MEAs require regular national reporting on emissions, waste movements, and compliance indicators. Lebanon's monitoring systems, however, remain largely

manual and project-based, with no unified data infrastructure or national waste registry linking convention reporting to domestic data. This constrains Lebanon's ability to fulfill its reporting obligations and participate effectively in global knowledge exchanges under each convention.

### 3.6.2 Legal Framework Gaps

Despite the progress achieved under Law No. 80/2018 and its accompanying regulatory instruments, several institutional, regulatory, and financial gaps continue to hinder the full operationalization of Lebanon's ISWM system and its alignment with international best practices.

**Institutional and Governance Gaps**

The National Solid Waste Management Authority (NSWMA) mandated under Law 80/2018 has not yet been operationalized, leaving a gap in national coordination and oversight. Responsibilities for planning, permitting, and service delivery remain fragmented among the MoE, MoIM, CDR, and municipalities, leading to overlapping functions, weak enforcement, and decision-making delays. This fragmentation results in overlapping mandates, inconsistent practices, and delays in decision-making. There is an urgent need to clearly redefine and formalize the role of the NSWMA so that it provides unified governance, harmonizes approaches, and oversees all SWM projects across the country, not only centralized facilities but also decentralized and municipal-level initiatives, to ensure coherence, efficiency, and national alignment.

At the local level, municipalities and unions—though legally responsible for SWM services—lack the technical, financial, and managerial capacity to meet regulatory standards. This results in uneven service quality and continued reliance on non-compliant disposal practices. Strengthening local institutional and human capacity remains a precondition for effective decentralization and sustainable service delivery.

**Regulatory and Legal Gaps**

**Extended Producer Responsibility (EPR):** Although Law 80/2018 references producer responsibility, no binding regulations exist for priority streams such as packaging, WEEE, tires, lubricants, end-of-life vehicles, or batteries. The absence of a national EPR framework limits traceability, recovery rates, and cost internalization by producers. A national EPR law and sector-specific MoE decisions are required to transition toward a self-financing circular-economy model aligned with EU practices.

**Permitting and Monitoring:** Lebanon lacks a unified, performance-based permitting framework. Operators currently navigate multiple, uncoordinated approval processes—EIA, construction, operation, and ad hoc monitoring—resulting in regulatory overlap and inconsistent enforcement. A single, integrated licensing system would streamline permitting, improve compliance, and align national practice with EU and OECD governance standards.

Landfill Closure and Legacy Sites: Although Law 80/2018 prohibits open dumping and burning, it does not define clear standards or institutional responsibilities for the closure and remediation of legacy dumpsites. The absence of a national decision on landfill closure, rehabilitation, and aftercare has led to fragmented and inconsistently funded remediation efforts. A comprehensive technical decision aligned with MoE Decisions 29/1 and 30/1 (2024) and the EU Landfill Directive (1999/31/EC) is needed to guide future interventions.

**Financial and Economic Gaps**

The cost-recovery law (Decree 12526/2023) remains pending parliamentary approval, leaving municipalities financially dependent on intermittent central transfers and donor funding. Enacting this law and its implementing decrees—defining tariffs, affordability mechanisms, and earmarked accounts—is critical to ensuring financial sustainability and enabling private-sector participation.

In addition, the framework lacks economic and fiscal instruments such as landfill levies, recycling credits, and green procurement to incentivize waste reduction, recovery, and investment. Issuing complementary decisions or amending Law 80/2018 would strengthen these mechanisms and enhance sector competitiveness.

Lebanon's legislative foundation for SWM is comprehensive but remains only partially implemented. The forthcoming phase must focus on consolidating institutional responsibilities through the establishment of the NSWMA, completing the regulatory framework by introducing EPR, unified permitting, and cost-recovery mechanisms, and reinforcing enforcement, financial sustainability, and local capacities. Achieving these reforms is essential to operationalize the integrated system envisioned under Law 80/2018 and to enable a sustainable, decentralized, and compliant SWM sector aligned with international standards.

### 3.6.3 Waste Management Related Institutional Framework in Lebanon

Lebanon's institutional structure for waste management reflects a layered system of central, transitional, and local actors, each with complementary but sometimes overlapping roles. At the core, the Ministry of Environment (MoE) provides the strategic and regulatory backbone, preparing national strategies, setting standards, issuing permits, and enforcing compliance. The National Solid Waste Coordination Committee (NSWCC) was created to harmonize cross-sectoral efforts, while the yet-to-be-established National Solid Waste Management Authority (NSWMA) will eventually assume responsibility for central project implementation, monitoring, and reporting in line with Law 80/2018. Alongside these national institutions, local authorities are mandated to plan, operate, and monitor waste services whenever feasible, while private service providers and PPPs deliver technical expertise and operational capacity.

A defining feature of this institutional setup is the principle of decentralization and subsidiarity, enshrined in Law 80/2018. This principle requires that responsibilities for waste management be devolved to the lowest effective level of governance—primarily

municipalities and unions of municipalities, while the central administration retains oversight and intervenes where local capacities fall short. In practice, this means municipalities are tasked with designing and operating ISWM systems adapted to their local realities, supported by national guidance, financial instruments, and technical assistance. Effective decentralization not only empowers local decision-making but also strengthens accountability, responsiveness to community needs, and opportunities for citizen engagement in waste prevention, source separation, and awareness.

These institutional roles gain further importance when examined through the waste hierarchy. Lebanon's current system remains anchored at the lower tiers of the pyramid, landfilling and dumping, reflecting a legacy of fragmented governance and weak enforcement. The updated strategy seeks to reverse this dynamic by moving toward the inverted hierarchy, prioritizing prevention, reuse, recycling, and recovery over disposal. Achieving this transition requires coordinated contributions: MoE must set the enabling policies and enforce compliance; NSWCC and NSWMA must bridge national and local planning; local authorities must lead on implementation and awareness; and the private sector must innovate in recycling, recovery, and treatment.

In conclusion, aligning institutional roles with the decentralization principle and the waste hierarchy is key to the success of the national master plan. Strengthening municipalities, operationalizing the NSWMA, and fostering effective collaboration between public and private actors will ensure that Lebanon shifts from fragmented, landfill-dependent practices to an integrated system that minimizes

The national government authorities (primary stakeholders) with their corresponding functions and responsibilities on waste management are detailed in the table below; The next table lists primary, transitional and secondary stakeholders and their role in SWM.

***Table 3–7: Key governmental authorities and private actors and their respective responsibilities in Waste Management[45]***

| AUTHORITY | MAIN RESPONSIBILITIES |
|---|---|
| Ministry of Environment (MoE) | Responsible for the preparation of national waste strategies and plans, and the legislation, guidelines, and standards for waste management; sets waste management policies and targets; approves local waste management plans; approves EIAs and SEAs and issues environmental permits for waste management facilities and waste generators; proposes incentives to promote projects relating to ISWM, in particular recycling, reuse and energy recovery. It is also responsible for monitoring and enforcing the implementation of environmental standards and guidelines; setting up a national database; and outreaching to the public. |
| National Solid Waste Coordination Committee (NSWCC) | Appointed through MoE Decision 108 of 2019. In charge of coordinating issues pertaining to the solid waste sector, under the leadership of MoE. It consists of six representatives of the public sector (MoIM, MoF, MoI, |

[45] UNDP, UNHCR, UNICEF, (2021). SOER Report Lebanon State of the Environment and Future Outlook: Turning the Crises Into Opportunities 2020

| AUTHORITY | MAIN RESPONSIBILITIES |
|---|---|
| | MoPH, MoEW, MoA), in addition to CDR and OMSAR, and 6 representatives of economic and academic bodies and environmental NGOs (OEA, ALI, academia, consulting companies, contracting companies and NGOs). |
| National Solid Waste Management Authority (NSWMA) (not established yet) | In charge of preparing centralized projects; supervising the implementation of these projects; and reporting to MoE on the progress of projects and on the achievement of targets. |
| Local Authorities | In charge of planning, implementing, and monitoring local waste management services (including collection and street sweeping in addition to treatment and disposal services, if environmentally and economically feasible); as well as raising awareness. |
| Private Service Providers | In charge of constructing, operating, self-monitoring and reporting on private or PPP WM projects. |

CDR is still conducting the planning, implementation, supervision and monitoring of activities. This role is expected to be transferred to the primary stakeholders once NSWMA is established as required by Law No. 80/2018.

The main stakeholders in waste management along with their targeted responsibilities are presented in the table below. The relationship between the main stakeholders in waste management is presented in the next figure.

*Table 3–8: Main stakeholders in Waste Management*[46]

| | STAKEHOLDER | PLANNING, COORDINATION & INFORMATION MANAGEMENT | IMPLEMENTATION | SUPERVISION & MONITORING | AWARENESS |
|---|---|---|---|---|---|
| Primary[47] | MoE | X | | X | X |
| | NSWCC | X | | X | |
| | NSWMA | X | X | X | |
| | Local Authorities | X | X | X | X |
| | Private Service Providers | | X | X | |
| | Waste Producers | | X | | |
| Transitional | CDR[48] | X | X | X | |

[46] UNDP, UNHCR, UNICEF, (2021). SOER Report Lebanon State of the Environment and Future Outlook: Turning the Crises Into Opportunities 2020

[47] As defined by Law No. 80 (2018)

[48] Relating to solid waste facilities servicing Beirut, Keserwan and part of Mount Lebanon (CoM Decision 1 dated 17/3/2016)

| | STAKEHOLDER | PLANNING, COORDINATION & INFORMATION MANAGEMENT | IMPLEMENTATION | SUPERVISION & MONITORING | AWARENESS |
|---|---|---|---|---|---|
| | OMSAR[49] | | X | X | X |
| Secondary | MoIM[50] | X | | | |
| | MoI[51] | X | | | |
| | MoPH[52] | | | X | |
| | MoET[53] | | X | | |
| | MoF[54] | | X | | |
| | The Informal Sector[55] | | X | | |
| | The Private Sector[56] | | X | | X |
| | NGOs[57] | | X | | X |
| | Funding Agencies[58] | X | X | | X |

The Institutional Chain for Waste Management in Lebanon (see Annex 4) illustrates the interaction between the different actors and their respective responsibilities throughout the waste management cycle, from preparation of legislation and permitting to operation, monitoring, and reporting.

[49] Relating to waste facilities funded by international donors, mainly outside the area serviced by CDR facilities
[50] Relating to local waste management plans, local financial instruments and SWM service fees (Decree 4082 dated 14/10/2000: Regulation of the Ministry of Interior and Municipalities)
[51] Relating to waste facilities permitting, implementation of the Extended Producer Responsibility (EPR) principle and creation of markets for secondary materials (Decree 13173/1998: Regulation of the Ministry of Industry)
[52] Relating to public health protection (Decree No. 8377 dated 30/12/1961: Organization of the Ministry of Public Health).
[53] Relating to the implementation of EPR principle (Decree No. 2896 dated to 16/12/1959: Organization of the Ministry of Economy and Trade).
[54] Relating to its role of managing the Independent Municipal Fund, which is currently financing the collection and management of MSW in areas served by national facilities (Decree 2868 dated 16/12/1959: Organization of the Ministry of Finance).
[55] Relating to their contributing to material recovery and recycling
[56] Relating to the role of industrial, commercial and other businesses in creating secondary material market and advertising for it, as well as valorization of high energy content in energy-intensive industries
[57] Relating to promoting waste prevention and sorting and raising public awareness
[58] Relating to their role in assisting authorities in developing legislation, as well as funding of SW projects, national and local capacity building and awareness raising

### 3.6.4 Institutional Framework Gaps

Lebanon's institutional framework for SWM remains weakened by structural, regulatory, and operational shortcomings that limit effective governance and impede implementation of an integrated national system.

- **Delayed Establishment of the NSWMA**

The NSWMA, mandated under Law 80/2018 to centralize planning, implementation oversight, and reporting, has not yet been established. Its absence prolongs reliance on transitional bodies and prevents the formation of a unified national authority capable of enforcing targets, standardizing operations, and ensuring coherent coordination between central and local levels.

- **Fragmented Responsibilities and Weak Coordination**

While roles are legally defined, the sector remains institutionally fragmented. MoE, CDR, , line ministries, municipalities, and UoMs operate with overlapping mandates and varying degrees of authority. This fragmentation creates inefficiencies, delays in decision-making, parallel reporting systems, and inconsistent enforcement of standards and permit conditions.

- **Weak Operationalization of Decentralization**

Although decentralization and subsidiarity are core principles of Law 80/2018, municipalities and UoMs have not been sufficiently empowered to fulfil their responsibilities. No regulations exist to guide regionalization; and local authorities receive limited technical assistance, financial support, or structured oversight. As a result, local implementation remains irregular, dependent on political dynamics, and vulnerable to capacity shortages.

- **Institutional Weakness of Municipalities and UoMs**

Most municipalities and UoMs lack the organizational structures, qualified staff, financial stability, and managerial systems needed to operate integrated waste management services. Without reorganization plans, dedicated waste units, or sustainable revenue streams, local authorities struggle to plan, manage, supervise, or monitor waste operations effectively.

- **Absence of National Monitoring, Reporting, and Information Systems**

The Management Information System (MIS) and self-monitoring requirements under Law 80/2018 have not been implemented. This results in a lack of reliable data on waste quantities, facility performance, operational compliance, and cost efficiency. The absence of standard reporting weakens oversight, hinders enforcement, and limits evidence-based planning and budgeting.

- **Unregulated and Unintegrated Informal Sector**

The informal sector plays a major role in material recovery yet operates entirely outside regulatory control. Without formal recognition, monitoring, or incentives for integration, informal waste pickers continue to work under unsafe conditions and distort recycling chains, while the formal sector loses valuable materials and cannot track recycling performance.

## 3.7 Financial Mechanisms

Lebanon's SWM financing relies on a hybrid system of central government/CDR-managed contracts, transfers from the Independent Municipal Fund (IMF), limited municipal own-source revenues, and intermittent donor/IFI support. In the absence of ring-fenced user fees and faced with chronic delays and diversion of IMF transfers, most municipalities lack reliable operating funds, causing service interruptions, asset deterioration, and increasing uncontrolled dumping and open burning. Establishing and enforcing a feasible cost-recovery framework, reforming IMF practices, and professionalizing procurement are the most effective measures to stabilize service delivery and reduce overall lifecycle costs.

Lebanon's SWM sector faces a complex mix of financial and institutional challenges that severely threaten its sustainability. The absence of a stable, protected cost-recovery mechanism -since user charges are mostly absent and cost-recovery law remains pending- leaves municipalities without dependable revenues to maintain basic collection, transfer, treatment, and disposal services. This instability worsens due to ongoing delays and misappropriation of IMF disbursements, which are often used to pay central government contracts, leaving municipalities financially strained and triggering arrears, service stoppages, and facility closures.

In parallel, the legacy of centralized contracting, particularly in Beirut and Mount Lebanon, has concentrated market power and reduced competition, and led to inflated costs and poor accountability. The deterioration of the country's macroeconomic situation and foreign exchange volatility have further undermined operators' viability, with depreciation and soaring fuel prices outpacing tariff adjustments, triggering strikes and degraded service delivery.

Meanwhile, Law 80/2018 delegated new responsibilities to local authorities but did not provide the necessary funds, staffing, or institutional support, particularly as key entities like the National SWM Authority remain non-functional.

Finally, the collapse of revenues from recyclables due to post-2019 price volatility and logistical constraints has eliminated even the limited supplementary cash flow that previously helped municipalities sustain operations.

### 3.7.1 Solid Waste Management Financing Architecture

The financing architecture can be described as follows:

- **Central government / CDR-managed contracts:** Historically concentrated in Beirut & Mount Lebanon for collection, treatment, and landfilling; paid using state transfers and, at times, advances from IMF proceeds.
- **Independent Municipal Fund (IMF) transfers:** Pools earmarked state revenues for redistribution to municipalities, but transfers are often delayed, opaque, and sometimes diverted to settle central obligations.
- **Municipal own-source revenues:** Local taxes and fees have significantly declined since 2019; very few jurisdictions levy ring-fenced SWM user charges.
- **Donor and IFI financing:** Useful for capex and emergency operations, but insufficient to cover recurrent O&M at scale.
- **Emerging cost-recovery reform:** Draft legislation aims to enable local SWM service fees; full implementation will require secondary regulations, social safeguards, and phased tariffing.

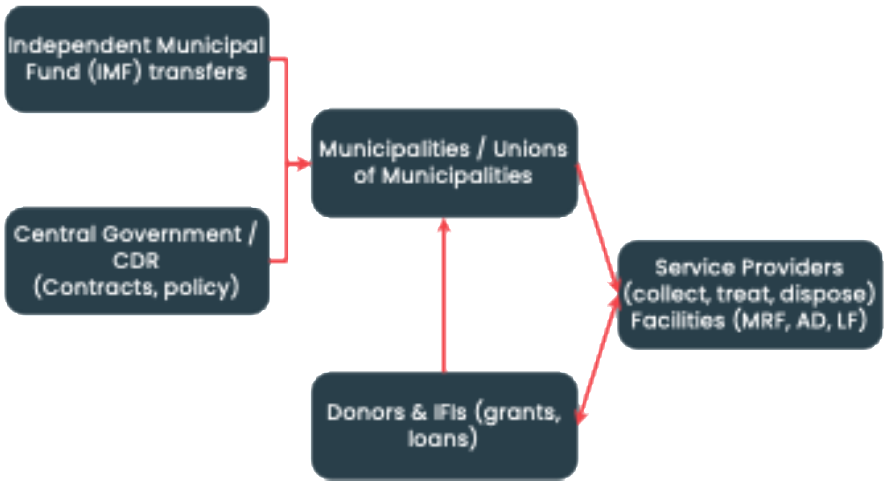



*Figure 3–7: Simplified SWM Financing Flow in Lebanon (indicative)*

### 3.7.2 Public-Private Partnerships

The increasing cost of municipal waste management has prompted local governments in many countries to evaluate whether this service is best delivered by the public sector or could be more effectively managed by the private sector. As a result, public-private partnerships (PPPs) have emerged as a promising alternative, with privately owned enterprises often demonstrating better performance than publicly owned ones[59].

[59] Massoud *et al.,* 2002, Public-Private Partnerships for Solid Waste Management Services, Public–Private Partnerships for Solid Waste Management Services | SpringerLink

Public-Private Partnerships are often understood narrowly as contracts between a municipality and a private operator to run a facility or deliver a service. However, modern PPPs in waste management extend well beyond this operator–municipality model. Effective and resilient partnerships must include research institutions, specialized safety agencies, and universities, ensuring that innovation, environmental safety, and knowledge transfer are embedded in every stage of waste management, from planning and design to operation, monitoring, and capacity building.

As stated in the briefing paper "Lebanon's progress on public-private partnerships and the role of local authorities" [60], several municipalities in Lebanon are transforming waste management services from a public service publicly provided into a public service privately contracted.

Despite the challenges faced by local authorities, several municipalities have successfully implemented public-private partnerships that can serve as models for future projects. Examples include the municipality of Saida and IBC, the Municipality of Bikfaya-Mhaydseh, and Fayhaa Union of Municipalities.

IBC for waste treatment came up with a solution to solve the household municipal solid waste for the city of Saida and its suburbs while producing quality compost, generating energy and avoiding the need for a landfill. The employed mechanical biological treatment results in an organic fertilizer that can be bagged for sale or delivered in bulk[61].

The Municipality of Bikfaya-Mhaydseh and Fayhaa Union of Municipalities are taking the lead in waste management and offering a model for local solutions to Lebanon's waste crisis. The former municipality, in collaboration with neighboring municipalities, planned its own waste management system by sorting and treating eight tonnes of waste daily in a waste-sorting facility inaugurated in March 2016 that is operated by a private company.

In North Lebanon, the central government effectively controls waste management projects while local authorities are assigned a supportive role. The Solid Waste Treatment Plant of Tripoli, the largest in Lebanon, combines sorting, recycling and composting. The facility receives waste from the Fayhaa Union of Municipalities, which includes Tripoli, Mina, Beddawi and Qalamoun municipalities. It was built with an EU grant, is managed by OMSAR and is operated by a private company. The plant, inaugurated in June 2017, is among the first initiatives to establish public private partnership in the field of SWM[62].

Building on these experiences, the updated National Integrated Solid Waste Management Strategy (NISWMS) calls for new approaches for PPPs that move beyond the classical operator–municipality model and instead create multi-stakeholder innovation platforms.

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[60] Democracy Reporting International, 2019, Lebanon's Progress on Public-Private Partnership and the Role of Local Authorities,dri_lebanon_s_progress_on_public_private_partnership_and_the_role_of_local_authorities_2019.pdf (pseau.org)

[61] IBS s.a.l, 2022, About Us – IBC For Waste Treatment (ibc-enviro.com)

[62] Democracy Reporting International, 2019, Lebanon's Progress on Public-Private Partnership and the Role of Local Authorities,dri_lebanon_s_progress_on_public_private_partnership_and_the_role_of_local_authorities_2019.pdf (pseau.org)

These platforms will not only secure private investment and operational know-how but also embed science, safety, and capacity-building at every stage of the waste-management cycle—from policy design and technology selection to daily operation, monitoring, and long-term performance evaluation.

Equally important are Chemical, Biological, Radiological and Nuclear (CBRN) units and specialized safety agencies, which bring the technical expertise required for managing hazardous and war-related waste streams, including healthcare waste and industrial residues. Their involvement strengthens preparedness and response capacity for chemical or radiological incidents, guarantees compliance with national and international safety standards, and ensures that PPP projects incorporate robust risk-mitigation and continuous safety monitoring.

Universities and academic research centres represent a third pillar of this expanded partnership model. They provide advanced research, innovation incubators, and training programs to develop the next generation of environmental engineers and waste-management professionals. By hosting living laboratories and field trials, universities provide independent auditing and monitoring of key performance indicators, thereby reinforcing transparency and public trust.

Integrating CBRN units, and universities transforms PPPs into centres of continuous innovation, knowledge transfer, and robust monitoring. This strengthens Lebanon's ability to climb the waste-management hierarchy. It also supports the creation of green jobs and the development of local industries around recycling and resource recovery.

Through this integrated approach, PPPs become a core driver of Lebanon's transition from crisis management to a circular and climate-resilient waste economy. They will not only deliver essential services but also accelerate technology transfer, strengthen environmental compliance, and establish permanent scientific and institutional monitoring systems that guarantee continuous performance improvement.

This comprehensive partnership model gives practical effect to the updated NISWMS and provides the National Master Plan with the scientific, technical, financial, and oversight foundation required to achieve its long-term objectives.

# 4 Assessment of the Solid Waste Management System

The gap analysis will identify specific deficiencies (gaps) between the current waste management practices and the desired target or best practices. It focuses on pinpointing where current processes fall short and what improvements or changes are needed (operational performance, infrastructure, compliance, resource allocation, etc.).

The SWOT analysis, on the other hand, is broader and strategic. It will assess the internal strengths and weaknesses of the SWS system and the external opportunities and threats it faces. This may include factors like technical capabilities, stakeholder engagement, regulatory environment, financial sustainability, social acceptance, etc.

Together, they provide a comprehensive view:

- Gap analysis highlights what needs fixing or upgrading in practice.
- SWOT analysis helps understand the context and strategic positioning to address those gaps effectively.

Using both enables the development of a targeted, actionable, and well-informed strategy that addresses deficiencies (gaps) while leveraging strengths and opportunities and mitigating weaknesses and threats identified through SWOT.

## 4.1 Gap Analysis Overview

A comprehensive review of Lebanon's SWM system reveals persistent gaps across all stages of the waste value chain, from generation to final disposal, as well as in the overarching legal and institutional framework.
Despite the legislative progress achieved through Law No. 80/2018 and subsequent instruments, implementation remains partial and fragmented. The sector continues to face critical challenges related to data reliability, service equity, financial sustainability, institutional coordination, and environmental compliance.
The following matrix summarizes the main gaps and associated implications, providing a structured overview of the systemic weaknesses that must be addressed to achieve an integrated, efficient, and sustainable waste management system aligned with national priorities and international standards.

| THEMATIC AREA | KEY GAPS IDENTIFIED | IMPLICATIONS / RISKS |
|---|---|---|
| **Waste Generation** | • No national waste data system or coordination mechanism.<br>• Outdated, fragmented, and project-based datasets.<br>• Insufficient data for special and hazardous streams. | • Weak planning and forecasting capabilities.<br>• Inefficient infrastructure and investment prioritization.<br>• Inability to monitor waste generation trends. |

| THEMATIC AREA | KEY GAPS IDENTIFIED | IMPLICATIONS / RISKS |
|---|---|---|
| | • Demographic and crisis impact not integrated.<br>• Lack of regular waste characterization surveys.<br>• No economic or regulatory incentives for waste minimization. | • Limited evidence base for decision-making.<br>• Reduced accountability and transparency in national reporting. |
| **Waste Collection** | • Uneven service coverage, especially in rural areas.<br>• Municipalities face chronic financial and institutional constraints<br>• Absence of source segregation and dedicated collection for special streams<br>• Scattered NGO sorting initiatives<br>• Informal collection unregulated and unsafe.<br>• Municipal waste quantities are inaccurately reported due to mixed collection. | • Inequality in service delivery and accumulation of waste.<br>• Persistent open dumping and burning.<br>• Low recovery and recycling rates due to mixed waste inflows.<br>• Occupational health risks and data gaps from informal recovery.<br>• Weak linkages between local and national collection systems. |
| **Waste Treatment** | • No source segregation at origin.<br>• Limited technological diversity (mostly low-tech sorting and composting).<br>• Absence of national hazardous and industrial waste facilities.<br>• Institutional fragmentation and weak oversight.<br>• Financially unsustainable operations dependent on donors. | • Inefficient treatment processes and contamination of recyclables.<br>• Continued reliance on landfilling and low material recovery.<br>• Environmental and public health hazards from untreated waste.<br>• Lack of investor confidence and private-sector engagement. |
| **Waste Disposal** | • Landfills over capacity and poorly maintained.<br>• Uneven regional coverage and high transport costs.<br>• Persistence of over 1,000 open dumps and frequent open burning.<br>• Absence of secure hazardous waste disposal.<br>• No national landfill monitoring or reporting system.<br>• Strong community opposition to new facilities. | • Environmental degradation and pollution of soil, air, and water.<br>• Health risks to nearby populations. Non-compliance with Law 80/2018 and international conventions.<br>• Escalating social and financial tensions over landfill siting.<br>• Uncontrolled spread of legacy dumpsites. |

| THEMATIC AREA | KEY GAPS IDENTIFIED | IMPLICATIONS / RISKS |
|---|---|---|
| **Legal and Institutional Framework** | • NSWMA not operationalized.<br>• Overlapping mandates between MoE, MoIM, CDR, and municipalities.<br>• Lack of binding EPR and cost-recovery regulations.<br>• Weak permitting, monitoring, and enforcement systems.<br>• Absence of a national framework for landfill closure and rehabilitation. | • Fragmented governance and accountability gaps.<br>• Ineffective policy implementation and regulatory enforcement.<br>• Continued financial dependency on central and donor support.<br>• Limited private-sector participation and investment. |
| **Cross-Cutting Issues** | • Persistent data deficiencies across all stages.<br>• Chronic financial instability of the sector.<br>• Institutional fragmentation and lack of coordination.<br>• Low public awareness and trust.<br>• Weak enforcement of environmental compliance. | • Reduced efficiency and transparency across the ISWM chain.<br>• Difficulty achieving circular economy objectives.<br>• Poor stakeholder engagement and limited behavioral change.<br>• Environmental deterioration and social resistance to new initiatives. |

## 4.2 SWOT Analysis

A comprehensive SWOT analysis was conducted to evaluate Lebanon's current SWM system, highlighting internal strengths and weaknesses, as well as external opportunities and challenges that influence strategic planning and implementation. This assessment serves as a diagnostic tool to identify the enabling factors that can accelerate system improvement and the constraints that must be addressed to ensure a sustainable, resilient, and financially viable waste management framework. The results of this analysis, summarized in the table below, provide the foundation for defining priority actions, guiding policy interventions, and aligning future investments with national objectives and the principles of Law 80/2018.

| STRENGTHS | WEAKNESSES |
|---|---|
| • Law 80/2018 provides a foundation for ISWM, embedding principles like polluter pays, decentralization, and waste hierarchy.<br>• Existing infrastructure: 6 engineered landfills, several MRFs, composting and recycling plants with a theoretical capacity of ~6,390 t/day.<br>• International donors continue to fund CAPEX for facilities and technical studies. | • ~80% of waste goes to landfills, most at or beyond capacity; one-third ends up in open dumps with widespread burning.<br>• Less than 10% of waste is processed; facilities operate as Dirty MRFs, often idle due to poor maintenance and lack of OPEX financing.<br>• Hazardous and special waste unmanaged; C&D, e-waste, industrial, and healthcare waste |

| | |
|---|---|
| • Local NGOs and informal sector already contribute to recycling and awareness, creating a base for scaling up. | (excluding infectious) are not properly treated and are often mixed with MSW.<br>• Multiple overlapping authorities, scattered responsibilities, and a non-activated NSWMA hinder enforcement and coordination.<br>• Municipalities depend on unreliable IMF transfers and allocate most of their budgets to SWM.<br>• Limited land availability and outdated facilities, unprepared for crises such as war debris, refugee influx, or pandemics.<br>• Low confidence in government and strong NIMBY opposition complicate facility siting.<br>• Informal waste pickers work without safety, regulation, or social protection.<br>• Multiple overlapping authorities, poor coordination, and an inactive NSWMA. Key decrees under Law 80/2018 were never developed, leaving gaps in enforcement. |
| **OPPORTUNITIES** | **CHALLENGES** |
| • Significant potential to increase materials recovery and reduce landfilling through technology diversification (e.g., RDF, WtE, advanced recycling) and specialized treatment of hazardous and special streams.<br>• Establishment of the National Solid Waste Management Authority (NSWMA) and activation of monitoring and programming mechanisms can improve governance, oversight, and accountability.<br>• Introduction of structured cost recovery systems, Pay-As-You-Throw (PAYT) schemes, and Extended Producer Responsibility (EPR) can ensure system sustainability. Donor funding, PPPs, and private-sector investment remain strong avenues for expanding infrastructure and services.<br>• Service areas and municipal clusters can localize solutions, reduce transport costs, and enhance resilience if adequately supported with technical and financial resources.<br>• Opportunities exist to strengthen awareness programs, promote reduction and reuse and sorting at the source.<br>• Integration with circular economy goals, and climate commitments positions Lebanon to access international climate funds and green financing mechanisms. | • Ongoing crises (currency collapse, war impacts, municipal insolvency) threaten continuity of services.<br>• Strong opposition to siting new landfills or WtE plants; social acceptance remains a barrier.<br>• Household waste fee law and EPR frameworks remain pending; without them, financial sustainability is at risk.<br>• Continued open dumping, hazardous waste mismanagement, and landfill overflows risk severe pollution and public health crises.<br>• Delayed activation of NSWMA and weak municipal capacities undermine decentralization goals.<br>• If targets remain aspirational without realistic implementation, future funding could decline.<br>• Unavailability of effective monitoring mechanisms to control the SWM sector<br>• unmanaged methane emissions, rising GHG levels, and failure to meet international compliance obligations could increase health burdens and jeopardize access to climate finance. |

## 4.3 Conclusion - Strategic Objectives

The gap and SWOT analyses make clear that Lebanon's SWM system requires a decisive shift from fragmented, reactive practices toward a more coherent, resilient, and future-oriented framework. While Law 80/2018 provides a strong legal foundation, delayed institutional activation, weak municipal capacities, insufficient financing mechanisms, and the absence of monitoring and data systems continue to undermine performance across the entire value chain. These systemic weaknesses have resulted in low recovery rates, overstretched disposal sites, unmanaged special waste streams, and persistent environmental and public health risks.

At the same time, the assessment highlights significant opportunities for building a more stable and efficient system, through improved governance, structured cost recovery, regionalized service delivery, technology diversification, and stronger integration with circular economy and climate agendas. Realizing this potential requires a clear, coordinated direction that responds to the most urgent shortcomings while also steering the sector toward longer-term transformation.

This creates the basis for defining the strategic objectives that Lebanon must adopt to address immediate system failures and advance the broader shifts needed to ensure an integrated, financially sustainable, and environmentally sound waste management system for the years ahead.

# 5 Immediate Strategic Interventions/ Priority Early Actions

To accelerate Lebanon's transition towards a sustainable and circular SWM system, the updated national strategy identifies a set of Priority Early Actions designed to yield immediate, visible improvements while laying the institutional and operational foundations for long-term reform. These actions, often referred to as "quick wins", are carefully selected to address the most pressing systemic constraints in the sector, unlocking change across governance, financing, and operations. Together, they will generate early successes that restore public confidence, mobilize investment, and build the momentum needed for the gradual implementation of more complex reforms. The four Priority Early Actions are:

1. Strengthening decentralization in SWM,
2. Implementing Extended Producer Responsibility (EPR),
3. Targeting special and hazardous waste streams, and
4. Diversifying waste treatment technologies.

## 5.1 Strengthening Decentralization

Decentralization represents one of the most transformative reforms envisioned by the updated National Solid Waste Management Strategy. In line with the provisions of Law 80/2018, it entails the transfer of decision-making, financial authority, and operational responsibility from central entities to local governments—specifically municipalities and unions of municipalities. This shift redefines municipalities from passive service recipients into active managers of their local waste systems, enabling them to design, implement, and monitor tailored waste solutions that respond to local needs and realities.

At present, roles and responsibilities among the Ministry of Environment (MoE), the Ministry of Interior and Municipalities (MoIM), unions, and municipalities remain fragmented and often overlapping, leading to gaps, inefficiencies, and decision paralysis. Local authorities lack sufficient control over contracts, budgets, and operational planning, resulting in delayed responses and weakened accountability. The absence of fiscal autonomy further constrains municipalities' ability to plan or invest effectively, while centralized contracts frequently overlook local waste characteristics, creating inefficiencies and elevated service costs. Moreover, the sector continues to suffer from limited transparency and political influence, which have eroded citizen trust and participation.

To address these challenges, decentralization will be supported through three key implementation pillars. First, at the legal and institutional level, ministerial circulars will be enacted to clarify municipal and union mandates under Law 80/2018, while the National Solid Waste Management Authority (NSWMA) will be formally activated as a coordinating and oversight body rather than an operational actor. Second, fiscal and administrative mechanisms will be established to ensure direct and predictable financial transfers from the Independent Municipal Fund (IMF) to municipalities for SWM operations. This will be complemented by standardized financial accountability, covering budgets, reporting

formats, and expenditure tracking, to strengthen transparency and performance monitoring. Importantly, this framework will be reinforced by the forthcoming Cost Recovery Law**,** which will legally empower municipalities to recover service costs through equitable user fees or integrated billing systems, securing a sustainable financing base for decentralized operations. Finally, strong political endorsement from the MoE, MoIM, and the Ministry of Finance (MoF) will be sought to institutionalize the decentralization framework, alongside structured stakeholder dialogues with municipalities and unions to align expectations, responsibilities, and coordination mechanisms.

The decentralization reform will generate wide-ranging impacts. Institutionally, it will clarify governance roles, strengthen municipal accountability, and reduce bureaucratic delays by empowering local decision-making at the service-zone level. Financially, it will enable direct fund allocations from the IMF and, in the future, from EPR revenues, improving municipal cash flow and budgeting reliability**.** Municipalities will also be able to introduce Pay-As-You-Throw (PAYT) schemes—designed based on waste management costing principles to remain socially equitable, as a means of strengthening cost recovery without overburdening households, while incentivizing waste reduction and source separation. Operationally, it will allow the design of collection systems, treatment solutions, and awareness campaigns that are better adapted to local contexts, thereby improving service performance and cost efficiency. Socially and in terms of governance, it will foster transparency, build public trust, and encourage active community participation. Moreover, a decentralized system will enhance resilience to crises, facilitate private-sector engagement and innovation, and create the enabling environment required for the successful rollout of other strategic reforms.

## 5.2 Implementing EPR

Extended Producer Responsibility (EPR) constitutes a cornerstone reform for establishing a financially sustainable and circular SWM system in Lebanon. EPR ensures that producers or importers finance the collection, recycling, and treatment of their products once they reach the end of their life cycle. By shifting financial and operational responsibility from municipalities and citizens to producers, EPR creates a sustainable revenue stream for local authorities and stimulates innovation and circular economy practices across industrial sectors.

The introduction of EPR responds to long-standing financial and governance challenges in Lebanon's waste sector. Municipalities currently rely on unstable and delayed central transfers, constraining their ability to operate and invest effectively. The financial burden of waste management is borne almost entirely by local authorities, while producers and importers remain unaccountable for the waste generated by their products. The absence of a structured mechanism for recycling incentives, eco-design, and material recovery discourages industrial responsibility, while the lack of transparent financing frameworks limits private-sector participation and donor confidence.

To overcome these barriers, EPR implementation will follow a comprehensive institutional, fiscal, and governance framework. Legally, an EPR Decree needs to be drafted and issued

under Law 80/2018 to define the system's scope and governance architecture. The decree will specify the priority waste streams, along with the fee-setting principles, reporting obligations, and roles of the Ministry of Environment (MoE), Producer Responsibility Organizations (PROs), and municipalities. Institutionally, one or more PROs will be established to collect and manage obligated producer contributions.

Financial and operational mechanisms will include the introduction of an eco-contribution fee for imported goods through customs declarations, ensuring fair treatment between imported and domestically produced products. For imported materials that already fall under active EPR schemes in their countries of origin, Lebanon will explore coordination mechanisms with international Producer Responsibility Organizations (PROs) to ensure fair financial treatment and avoid double charging. This approach will enhance the financial sustainability of the Lebanese EPR system while maintaining compliance with international trade and circular economy principles. Financial transfer mechanisms between PROs and municipalities need to also be defined to ensure predictable, performance-based funding for local operations.

To ensure accountability and build trust, robust governance and enforcement measures will be introduced. These include auditing and verification protocols to monitor producer compliance, transparent reporting and disclosure requirements, and performance monitoring by the MoE and the National Solid Waste Management Authority (NSWMA). Early stakeholder engagement will be critical to ensure effective participation of producers, importers, and private operators.

The impacts of EPR implementation will be substantial across several dimensions. Financially, EPR will generate a stable, producer-funded revenue stream that covers a substantial share of operational costs, reducing dependence on unpredictable central transfers and stabilizing municipal budgets. Economically, it will stimulate investment in recycling, reuse, and green industries while promoting eco-design and waste reduction in manufacturing and import sectors. Governance-wise, EPR will enhance transparency through audited Producer Responsibility Organizations and traceable fund flows, strengthening confidence among producers, municipalities, and donors alike. Systemically, it will integrate fiscal, industrial, and environmental policies into a coherent framework that promotes long-term circular economy growth and reinforces the foundations of decentralized waste governance.

Ultimately, implementing EPR will enable municipalities to achieve greater financial autonomy, provide private-sector operators with predictable funding opportunities that enhance service quality and innovation, and establish a sustainable financing mechanism that strengthens decentralized governance without disrupting existing institutional frameworks.

## 5.3 Technology Diversification

Lebanon's heavy dependence on landfilling and dumping, where over 80% of collected waste ends up, poses one of the most pressing challenges in the sector. Landfills are reaching capacity, and uncontrolled dumping continues to generate methane emissions,

leachate pollution, and community opposition. Many of these dumpsites are also susceptible to illegal open burning, generating highly toxic dioxins and furans emissions that threaten public health and the environment. At the same time, many existing sorting and treatment facilities operate well below potential because of outdated technology, poor maintenance, and limited integration within the national waste management system. The absence of incentives and a clear policy direction have further discouraged private investment and innovation in waste treatment technologies.

Diversifying and modernizing Lebanon's treatment landscape is therefore a strategic priority to enable the country to progress along the waste hierarchy and move toward a circular-economy model. The objective is to shift from a system reliant on landfilling to one that recovers value from waste through a mix of complementary processes, including material recovery, biological treatment, and energy recovery. While landfilling will remain necessary for residual waste, direct landfilling of untreated mixed waste would no longer be the primary disposal route. This transformation requires an enabling policy framework, a sound investment environment, and strong technical and institutional capacities.

The first step will be to streamline permitting procedures for new treatment technologies such as mechanical-biological treatment (MBT), anaerobic digestion, composting, and refuse-derived-fuel (RDF) production, while also considering waste-to-energy (WtE) solutions for some specific streams. The MoE is in the process of preparing a decree governing the use of RDF in cement industries and other industrial facilities. These efforts should be directly informed by the local master plans, which will identify the appropriate treatment technologies at the service-zone level and ensure a complementary, integrated approach across regions**.** Environmental and technical standards will need to be updated to reflect best available techniques and to align with circular-economy principles. In parallel, the government will adopt a standardized Public-Private Partnership (PPP) model to facilitate transparent engagement between the public sector and private developers, combining public land allocation with private capital investment and shared gate-fee structures. To further broaden investment options and encourage private participation, Build-Operate-Transfer (BOT) modalities may also be incorporated, particularly for medium- to large-scale treatment and recovery facilities, offering long-term operational clarity and investment security.

The success of this diversification depends on establishing clear quality standards for output products such as compost, recyclables, RDF, and biogas. The Ministries of Environment (MoE) and Industry (MoI) will issue product certification systems to ensure market confidence and traceability, while universities and research institutions will play an active role in validating technologies, conducting life-cycle assessments, and supporting continuous innovation. Building national capacity will also be essential: local operators, engineers, and plant managers will receive training on process optimization, quality assurance, and monitoring systems.

The diversification of waste treatment technologies will generate multiple benefits. Environmentally, it will reduce greenhouse-gas emissions and landfill dependency while promoting renewable-energy generation through biogas and RDF utilization. Economically, it will create green jobs, strengthen local supply chains, and demonstrate the financial

viability of circular-economy investments, thereby attracting private and donor capital. Operationally, it will expand national treatment capacity, improve resource efficiency, and reduce pressure on existing landfills by substituting recovered materials and energy within the industrial and agricultural sectors. Strategically, it will realign Lebanon's waste management system with the upper tiers of the waste hierarchy—moving the country decisively from a linear model of disposal to one based on circular resource utilization and sustainable growth.

## 5.4 Targeting Special Waste Streams

Lebanon's current waste management system lacks a structured and traceable framework for handling special and hazardous waste streams, except for infectious healthcare waste. Other categories, such as electronic waste, used oils, batteries, industrial residues, and construction and demolition (C&D) waste, are largely unmanaged and often mixed with municipal waste. This co-disposal contaminates recyclables and compost, increases pollution, and exposes waste workers and nearby communities to significant health risks. The absence of licensed treatment facilities limited regulatory coverage, and weak coordination among the concerned institutions have led to unsafe handling practices, illegal dumping, and open burning across the country.

This quick win aims to establish a dedicated and traceable national system for the management of non-household special and hazardous waste streams, ensuring proper classification, collection, treatment, and disposal in compliance with the Basel Convention and international best practices. This measure is essential not only to reduce environmental and public health risks but also to enhance the performance, credibility, and safety of Lebanon's entire waste management system.

To achieve this, the strategy calls for the development of stream-specific decrees for priority waste categories, each defining clear classification, permitting, and operational requirements. National standards will be updated to reflect international environmental and occupational safety guidelines, ensuring consistency with the Basel Convention. A coordinated institutional framework will be established, bringing together the Ministry of Environment (MoE), the Ministry of Interior and Municipalities (MoIM), the Ministry of Industry (MoI), and the Ministry of Public Health (MoPH) to clarify mandates, avoid overlap, and ensure coherent oversight and enforcement.

At the operational level, regional treatment, transfer stations and storage facilities will be identified and licensed through public-private partnerships, BOT, and donor-supported investments. These will allow for the controlled collection, interim storage, recovery, and treatment of hazardous and special waste in environmentally sound conditions. A national database and manifest tracking system needs to be established to record generation, movement, and final treatment, providing full cradle-to-grave traceability. Developing and operationalizing this system will require dedicated resources, institutional strengthening, and targeted technical assistance to design the digital platform, support implementation, and ensure consistent nationwide use. Parallel to this, inspection authorities and local operators will be trained in hazardous waste identification and classification, and targeted

awareness programs will be implemented for waste generators, particularly hospitals, garages, workshops, and laboratories, to strengthen compliance and promote safer practices.

The expected outcomes of this intervention are substantial. Environmentally, it will prevent hazardous substances from contaminating soil, air, and water resources while improving the quality of recyclables and compost by reducing contamination. Operationally, it will improve the efficiency and reliability of municipal sorting and treatment facilities by removing incompatible materials from the waste stream. Institutionally, it will strengthen coordination among government entities and establish Lebanon's first integrated system for hazardous and special waste control, ensuring compliance with international obligations and building donor confidence. Over time, this initiative will complement other priority reforms, particularly decentralization, EPR implementation, and technology diversification, by promoting a safer, more efficient, and environmentally responsible waste management system across the country.

## 5.5 An Integrated and Reinforcing Reform Cycle

The four Priority Early Actions are not isolated measures but form an integrated reform mechanism that collectively transforms Lebanon's SWM landscape. Decentralization provides the governance framework and local ownership necessary for sustainable operations. EPR creates the financial stability and incentives for producers and municipalities to invest in efficiency and circularity. Special and hazardous waste management safeguards environmental integrity and public health, while technology diversification provides the physical and technical means to close the loop on waste and resource flows.

Together, these actions constitute a mutually reinforcing system in which governance, financing, infrastructure, and environmental performance are interlinked. Progress in one area accelerates advancement in the others, EPR revenues strengthen decentralized management; decentralized systems enable effective implementation of technology and enforcement of special waste controls; and improved treatment capacities, in turn, support financial and regulatory sustainability. This self-reinforcing cycle marks the foundation of Lebanon's transition from a reactive, landfill-dependent model to a proactive, circular, and accountable SWM system.

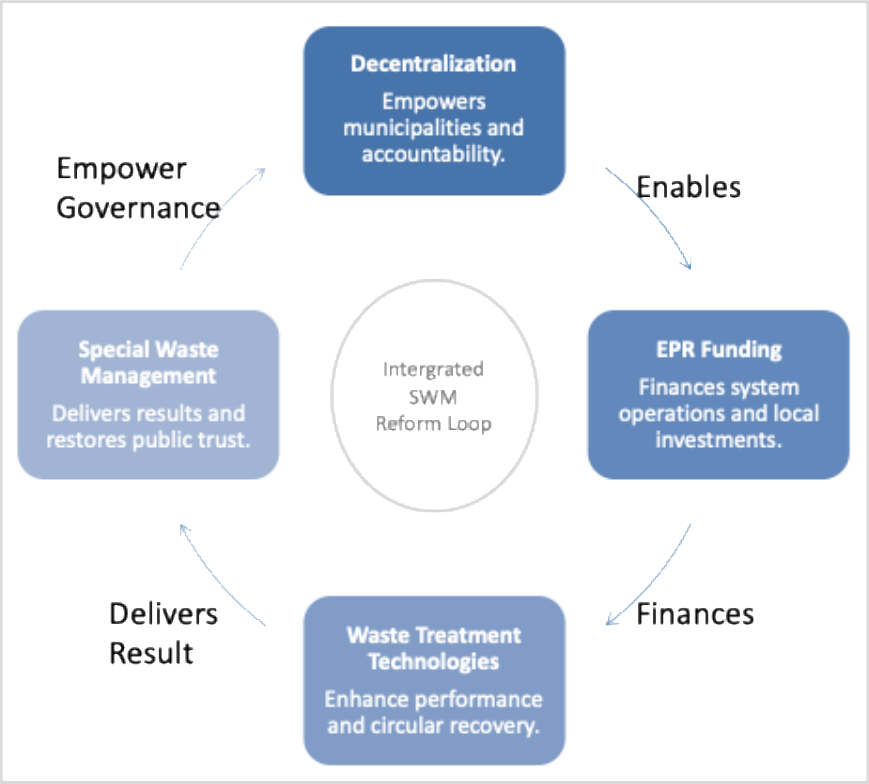



*Figure 5–1: Integrated and Reinforcing Reform Cycle*

# 6 Financial Sustainability for the SWM Sector

Ensuring the financial sustainability of the SWM sector in Lebanon is a central pillar of the national strategy, as it determines the sector's capacity to provide reliable, equitable, and environmentally sound services across all regions. The system must move from fragmented, crisis-driven financing to a predictable and diversified financial model capable of covering the full life-cycle cost of waste management: collection, transfer, treatment, recovery, disposal, and aftercare, while remaining socially equitable and economically viable. Financial sustainability requires both a stable supply of funding and a transparent, efficient structure for cost recovery. This approach aligns with the polluter-pays principle and the transition toward a circular economy, while recognizing Lebanon's economic constraints and the need for gradual, realistic implementation. The financial architecture of the SWM sector must rely on diversified, resilient, and predictable funding sources that reduce dependency on irregular political transfers or emergency donor support. Transfers from the Independent Municipal Fund should be regular, formula-based, and tied to performance indicators such as service coverage, operational compliance, and waste diversion outcomes. In this context, decentralization must also be accompanied by decentralized financial empowerment, strengthened cost-recovery systems, and expanded economic instruments—particularly Extended Producer Responsibility (EPR) and other circular-economy incentives and financial resources to ensure that local authorities can sustainably manage their waste systems and achieve long-term sector resilience.

By establishing a coherent financial framework before defining targets, the Strategy ensures that future performance commitments are realistic, implementable, and aligned with Lebanon's current and projected fiscal capacities.

## 6.1 Sources of Funding

At the core of this system, user charges and municipal financing will constitute the baseline revenue stream. Households and non-household waste generators (commercial, industrial, institutional) should contribute through service fees that reflect the real cost of handling the waste they produce. These fees may combine a fixed service charge with a variable component linked to the volume/weight, typology and environmental risk of waste generated, while ensuring affordability protections for vulnerable groups. Municipal budgets, including earmarked revenues from local taxes and duties, must allocate a dedicated portion to SWM, deposited in ring-fenced accounts that cannot be diverted to unrelated uses. Supplementary financing sources are essential to cover infrastructure investments and strengthen system resilience. Central government contributions, when financially feasible, should target capital investments that municipalities or unions cannot cover alone. Donor and international financial institution (IFI) support—whether grants, concessional loans, credit guarantees, or results-based financing—should be aligned with national priorities and structured to minimize foreign-currency exposure. Public–private partnerships (PPPs) may be used for regional infrastructure such as sorting plants, composting facilities, or sanitary landfills, where private operators recover costs through

availability payments, gate fees, or hybrid models combining public support with user charging. Extended Producer Responsibility (EPR) mechanisms, once phased in, will provide additional funding streams by requiring producers and importers of specific materials to finance collection, sorting, and recycling operations. Finally, climate and circular economy financing—including methane avoidance credits, plastic credits, and carbon finance through Article 6 mechanisms—can provide additional revenue to support municipal facilities and operational stabilization.

Cost recovery must be introduced progressively to maintain social acceptability and economic feasibility. In the early phase, predictable transfers and stabilized municipal budgets will secure basic operations. As infrastructure expands and monitoring improves, tariffs, gate fees, and producer funding will provide an increasing share of cost recovery. In the long term, the sector must achieve full coverage of operational expenditures and reserve funding for asset renewal, ensuring long-term financial resilience.

### 6.1.1 Investment Costs

Investment costs represent the foundational element of Lebanon's national SWM system, covering all capital expenditures required to plan, build, upgrade, and maintain the facilities and infrastructure that ensure safe, efficient, and environmentally sound waste management. These costs include land acquisition; engineering and feasibility studies; environmental and construction permits; civil works; procurement of machinery and equipment; electrical and mechanical installations; IT and monitoring systems; road access and utility connections; environmental protection features; commissioning; and operator training. Investments span the entire waste chain: primary collection points, vehicle fleets, transfer stations, regional sorting and material recovery facilities, composting and anaerobic digestion plants for organic waste, healthcare and hazardous waste treatment platforms, construction and demolition waste recycling sites, engineered sanitary landfills, and—where justified and economically feasible—waste-to-energy (WtE) facilities that form part of an integrated resource recovery system.

Given Lebanon's exposure to natural disasters, wars and climate hazards, capital investments must incorporate resilient design standards (earthquake resistance, flood protection, fire safety, and energy redundancy). All new infrastructure should be accompanied by structured asset management plans, including lifecycle costing, preventive maintenance schedules, and mandatory contributions to a national sinking fund to ensure long-term rehabilitation and replacement

To secure sustainable infrastructure development, Lebanon must prioritize stable, predictable, and domestically anchored investment sources before relying on donors. The recommended hierarchy is as follows:

A) Private Sector Capital (Primary Source)

The private sector should become the leading investor in SWM infrastructure, particularly for revenue-generating activities such as sorting, recycling, processing, treatment and waste recovery. Investments may take the form of: Build-Operate-Transfer (BOT)

concessions; Design-Build-Operate (DBO) contracts; Long-term lease/operation agreements; Equity investment in specialized recycling industries; Industrial co-processing partnerships (e.g., cement plants for SRF/RDF); Private financing for WtE components where viable.

B) Producer and Importer Financing Through Extended Producer Responsibility (EPR) (Second Source)

EPR is a policy and financial mechanism through which producers, importers, and distributors assume direct financial and operational responsibility for the post-consumer stage of their products, thereby shifting the waste management burden from municipalities and taxpayers to those placing products on the market.

In practice, EPR systems rely on Producer Responsibility Organizations (PROs), which collect eco-contributions from producers and organize take-back schemes, logistics, sorting, and treatment while financing recyclers and awareness programs. Under this system, producers are responsible for financial contributions that fund waste management, operational organization of collection and recovery, and transparent reporting on quantities placed on the market and recycled. Implemented under Law 80/2018, a robust EPR framework in Lebanon would create dedicated, predictable financial flows for sorting, recycling, and valorization infrastructure, allowing the country to move away from donor dependency and municipal budget constraints.

Eco-contributions paid by producers and importers would finance the recovery chain covering capital investments in treatment plants, composting, e-waste and plastic recycling units, and operational subsidies for collection and processing while guaranteeing purchase or treatment fees that stabilize market demand for recyclables and attract private investors. Such a system would significantly reduce landfill dependency by channeling recyclable and recoverable materials into specialized valorization streams, thus diverting waste and reducing methane emissions, while formalizing the activities of informal collectors and integrating them into transparent, traceable, and socially protected recovery chains.

It would also align Lebanon with European circular economy standards, facilitating exports of recovered materials and compliance with Basel Convention frameworks for transboundary waste movement. Furthermore, EPR would act as a self-financing mechanism for industrial recovery and valorization, funding innovation, R&D, and market development for recycled products, and enabling the creation of marketing and export logistics channels for local recyclers. A particularly strategic advantage lies in international reciprocity: many countries already collect eco-contributions on products exported to Lebanon, meaning that eco-taxes have been paid to foreign PROs even though the end-of-life management occurs in Lebanon.

By establishing nationally accredited PROs and joining international alliances such as EXPRA, WEEE Forum, or EUROPEN, Lebanon could claim compensation or offset payments from foreign PROs corresponding to the quantities of imported goods for which eco-fees were already paid abroad. This “cross-PRO compensation” would recover funds to support

local recycling and awareness campaigns, effectively internalizing the environmental costs embedded in imported products.

To realize this potential, Lebanon must operationalize the EPR decrees of Law 80/2018, as a priority objective establish accredited national PROs for priority waste streams such as packaging, EEE, batteries, oils, and tires, create a transparent producer registry with reporting obligations and set recycling obligations per prioritized waste stream. It must also negotiate mutual recognition agreements with regional and European PRO alliances to enable financial transfers and data exchange, while ensuring strict governance, auditing, and ring-fencing of eco-fees for waste management and valorization investments. In doing so, EPR would become Lebanon's most powerful instrument for sustainable waste diversion, industrial activation, and recovery financing transforming waste from a fiscal liability into a generator of environmental, social, and economic value, and positioning the country within the global circular economy network.

C) Municipal and Union Investments (Third Source)

Municipalities and unions of municipalities must contribute to capital investments using:

Local tax revenues; SWM service fees; Ring-fenced municipal environmental funds; Shared inter-municipal investment pools

D) Central Government Capital Allocations (Fourth Source)

The central government should focus its limited resources on infrastructure of national strategic importance, such as: Engineered sanitary landfills, crisis-response infrastructure (debris management, hazardous waste storage), large regional treatment hubs.

These allocations should be programmed within a multi-year public investment plan for the environment sector.

E) IFI and Climate-Linked Concessional Loans (Fifth Source)

International financial institutions may support large regional projects through concessional loans with: Low interest rates; long maturities; partial risk guarantees; performance-based financing

F) Donor Grants and Technical Assistance (Last Resort)

Donor support should not be the primary source of investment. Grants should be used strategically for: High-risk or pioneering projects, crisis response and reconstruction, innovation pilots, capacity building, institutional strengthening, and regulatory reform

## 6.2 Economic Instruments for Operational expenditure and Capital investment Cost Recovery

Ensuring the financial sustainability of Lebanon's SWM sector requires a coherent, diversified, and predictable framework of economic instruments capable of covering both operational expenditure (OPEX) and capital investment (CAPEX). Given the recurrent fiscal crises and heavy reliance on donor support, Lebanon must shift toward a model in which the SWM system is increasingly self-financed, market-oriented, and integrated into

national economic development priorities. Effective cost recovery mechanisms not only secure long-term service continuity but also reinforce accountability, operational efficiency, and environmental performance across municipalities, private operators, and industries.

Operational costs include collection, transport, sorting, treatment, landfilling, and environmental monitoring. To ensure their sustainable financing, Lebanon should deploy a combination of tariff-based and incentive-based instruments:

A) Municipal Service Fees

- Introduction or update of household and commercial SWM service fees based on the user-pays principle
- Integration of SWM fees into electricity, water, or municipal billing systems to enhance collection rates and ensure financial sustainability.
- Application of differentiated tariffs for commercial entities according to business category and waste profile.
- Gradual pilot introduction of PAYT schemes in municipalities with adequate operational capacity.
- Provision of financial incentives for households and businesses to reduce mixed waste and increase sorting at source.
- Use of digital monitoring tools and standardized bags or weighing systems, where feasible, to support transparent and efficient PAYT implementation.

B) Gate Fees and Tipping Fees

- Uniform gate fees for sorting, treatment, material recovery, anaerobic digestion, composting, and sanitary landfilling.
- Indexed to true operational and environmental compliance costs.
- Mandatory for all public and private operators to eliminate informal disposal practices.

C) Revenues from Valorization Activities

- Sales of recyclables, compost, RDF/SRF, biogas/energy, and by-products from material recovery facilities.
- Establishing national minimum standards and quality labels to strengthen market demand.
- Encouraging public–private partnerships (PPPs) to share revenue risks and improve market efficiency.

D) Financing Through Extended Producer Responsibility (EPR)

- Eco-contributions would finance the full recovery chain OPEX subsidies for collection and processing—while guaranteeing stable treatment fees that attract private investors and reduce landfill dependency through large-scale waste diversion.
- Through international reciprocity and cross-PRO compensation, Lebanon could reclaim eco-fees already paid abroad on imported goods, provided it establishes accredited PROs, a national producer registry, mutual recognition agreements, and strict

governance ensuring that eco-fees are ring-fenced for waste management and valorization investments.

## 6.3 Material or Non-Material Incentives

Incentives, both material and non-material, are essential instruments for enabling the transition toward an integrated and financially sustainable SWM system in Lebanon. They support behavior change, encourage private sector participation, and enhance operational performance at municipal and operator levels. Lebanese legislation already provides a foundation for incentives through Law 444/2002 (environmental incentives), Decree 167/2017 (tax and customs reductions for environmentally friendly products and activities), Law 280/2014 and Decree 1117/2008 (financial incentives), and Article 29 of Law 80/2018 (non-material incentives). Building on this framework, the strategy introduces a structured package of PPP, behavioral, and operator-level incentive

### 6.3.1 PPP Incentives

| Incentive Type | Description / Strategic Purpose | Legal Basis (Lebanon) | Beneficiaries | Mechanism / How It Works | Expected Behavioural Effect |
|---|---|---|---|---|---|
| **Tax Reductions for Environmental Investments** | Encourage private investment in recycling, treatment, and recovery facilities | Decree 167/2017 (Art. 20 of Law 444/2002) | Private operators, PPP consortia | Income tax reductions for investments meeting environmental criteria | Increased investment in waste management system |
| **Subsidies / Grants for Pilot PPP Projects** | Support innovations (e.g., source-separation systems, small MRFs, composting) | Law 280/2014; Decree 1117/2008 | Private entities partnering with municipalities | Grants based on achieving measurable diversion or recycling KPIs | Accelerates deployment of new technologies and business models |
| **Long-Term Concession Incentives** | Increase PPP attractiveness through financial/security guarantees | PPP Law 48/2017 | Private waste operators | Guaranteed minimum tonnage, tariff stability mechanisms | Encourages investment in medium/large-scale WM facilities |
| **Performance-Based Payments** | Reward private operators achieving recycling, diversion, and environmental KPIs | Strategy-level reform (aligned with Law 80/2018 Art. 27 on performance oversight) | Private operators | Payments triggered by achieving set diversion, recycling, or emissions thresholds | Drives efficiency and innovation; reduces landfill reliance |
| **Land Allocation & Fast-Tracked Permitting for PPPs** | Remove logistical barriers to infrastructure deployment | Law 80/2018 (institutional framework) | Private investors in PPP structures | Public land allocation, expedited permitting for high-compliance environmental projects | Faster project development; supports regional ISWM deployment |

### 6.3.2 Behavioral Engagement Incentives

| Incentive Type | Description / Strategic Purpose | Legal Basis (Lebanon) | Target Group | Mechanism / How It Works | Expected Behavioral Effect |
|---|---|---|---|---|---|
| **Source Separation Discounts** | Encourage households & businesses to segregate recyclables/biowaste | Could be enabled under Law 80/2018 tariff provisions | Households, SMEs, institutions | Reduced waste tariffs for separate bins; PAYT where feasible | Higher participation in separation; reduced contamination |

| | | | | | |
|---|---|---|---|---|---|
| **Green Procurement Obligations** | Shift public demand toward green products/services | Decree 167/2017 | Public agencies, large corporates | Required inclusion of green products in tenders | Stimulates recycling markets; reduces waste |
| **Landfill Ban on Organics (Phased)** | Divert organics to composting/AD to reduce landfill burden | Implement via strategy after infrastructure readiness | All waste generators | Organics prohibited from landfills after transition period | Major landfill diversion; improved resource recovery |
| **Social & Communicative Incentives (Campaigns)** | Influence behavior through knowledge & social norms | Decree under Law 80/2018 Art. 29 (in preparation) | General public | Nationwide behavior change campaigns, school programs | Long-term cultural shift toward waste prevention & recycling |
| **Awards, Recognition, Certification** | Motivate institutions and businesses through non-material awards | Strategy-level instrument | Schools, universities, businesses | Eco-labels, "Zero Waste Champion", waste audit scores | Improved waste management culture; peer competition |

### 6.3.3 Operator/Municipality Incentives

| Incentive Type | Description / Strategic Purpose | Legal Basis (Lebanon) | Beneficiaries | Mechanism / How It Works | Expected Behavioral Effect |
|---|---|---|---|---|---|
| **Performance-Based Municipal Transfers** | Reward municipalities achieving diversion, recycling & cleanliness KPIs | Inspired by Law 80/2018 (Art. 27) | Municipalities & unions | Additional IMF/disbursements tied to set KPIs | Drives local innovation and proper service delivery |
| **Operational Bonuses for Waste Contractors with High Compliance** | Improve operator performance and quality of service | Contractual aligned with Law 80/2018 oversight | Private collection operators & contractors | Bonus payments for meeting/ exceeding collection coverage, frequency, safety KPIs | Better service quality; less littering |
| **Reduced Tariffs for Operators Using Green Technologies** | Encourage adoption of clean and efficient technologies | Decree 167/2017 | Waste operators investing in clean machinery | Reduced customs/import duties on low-emission equipment | Modernization of fleet; reduced emissions |
| **Incentives for Reporting & Monitoring Compliance Data** | Encourage operators to provide reliable data (quantities, diversion rates, emissions) | Law 80/2018 monitoring obligations | Municipalities & private operators | Tariff advantages or contract extensions for transparent data reporting | Stronger national M&E system |

# 7 Priority axes and objectives for Integrated Solid Waste Management

The updated NISWMS connects strategic intent with practical delivery. Five interlinked requirements shape its design and ensure that it can be implemented, monitored, and adapted over time:

- **Accounts for SWM Principles**

The strategy embeds the hierarchy, sustainability, proximity, precautionary, polluter-pays, and decentralization principles as foundational considerations that shapes decisions.

- **Aligns with the National Framework and Climate Change Commitments**

It is anchored in Lebanon's development vision, climate change strategy and adaptation commitments**,** and legal framework, particularly Law 80/2018, while providing a platform for legislative upgrades and institutional reforms.

- **Reflects the Reality on the Ground**

A baseline assessment of waste quantities and composition, infrastructure capacity, stakeholder capabilities, and financial constraints informs all targets.

This evidence-based approach prevents overly aspirational goals and enables adaptive management in the face of shocks such as the September 2024 Israeli war on Lebanon, which generated unprecedented construction and demolition debris and damaged key infrastructure.

- **Defines Rational and Measurable Targets**

Targets are phased, time-bound, and directly linked to implementation mechanisms. Clear key performance indicators (KPIs) and monitoring protocols allow progress tracking, course correction, and accountability.

- **Leads to Implementation Mechanisms**

The strategy specifies roles, mandates, and governance structures, and identifies regulatory, financial, and operational instruments—such as cost-recovery systems, Extended Producer Responsibility (EPR), Pay-As-You-Throw (PAYT) schemes, and public-private partnerships—that turn principles and targets into action.

A critical insight shaping the updated strategy is the recognition that Lebanon operates in a high-risk environment where natural disasters, wildfires, armed conflicts, industrial accidents, and public-health emergencies can rapidly disrupt the ISWM system.

Events such as the 2020 Beirut Port explosion, large-scale wildfires, the COVID-19 pandemic, economical failures, and the September 2024 Israeli war on Lebanon have demonstrated that crisis-generated waste streams, healthcare waste, debris, hazardous materials, and mixed municipal waste, can overwhelm existing infrastructure within hours.

These shocks expose the vulnerability of local authorities, disrupt collection and transport routes, damage facilities, and create acute public-health risks.

For these reasons, the updated NISWMS introduces a new Strategic Objective dedicated to strengthening national resilience through crisis waste-management preparedness and response, ensuring that Lebanon is equipped with contingency systems, emergency protocols, institutional coordination mechanisms, and temporary waste-handling capacities that can be activated immediately during emergencies.

Another defining feature of the updated strategy is its reliance on the waste-management hierarchy as the organizing spine.

This is illustrated by the inverted pyramid of waste management in the figure below, which ranks actions from most to least desirable:

- Waste prevention (reduce)
- Reuse
- Recycle and compost
- Conversion / transformation and waste-to-energy recovery
- Landfill (final disposal)

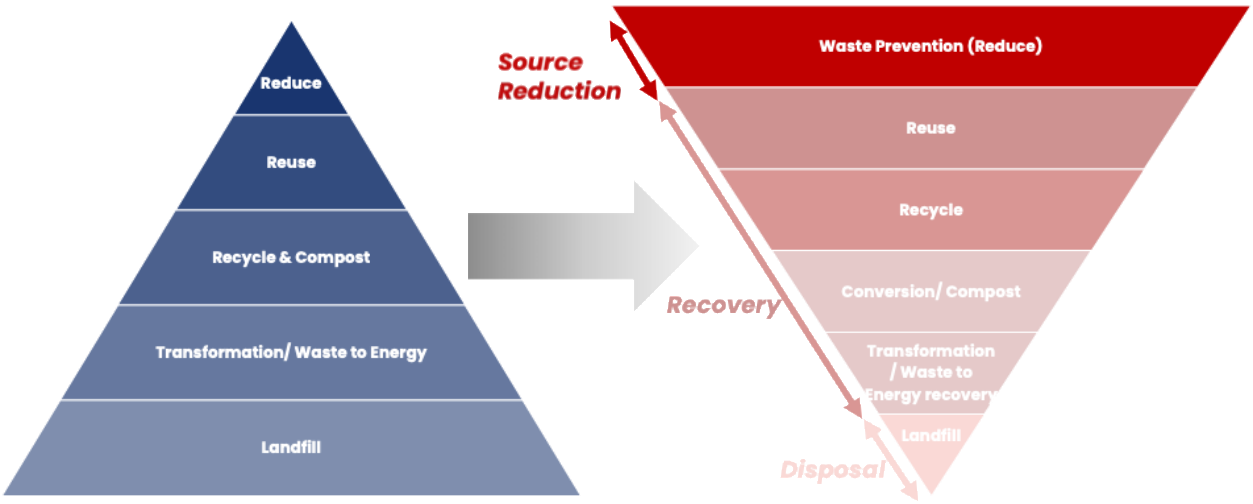



*Figure 7–1: Inverted Waste Hierarchy for Sustainable SWM*

Lebanon's current system remains heavily dependent on landfilling and illegal open dumping.

The strategy reinforces Lebanon's progression up the waste hierarchy, deepening the national commitment to prevention, source separation, reuse, and recycling, while ensuring that disposal is confined solely to the unavoidable residual fraction.

Municipalities play a central role in enabling source separation, public awareness, and partnerships that support this transition in accordance with Law 80.

A successful transition up the waste hierarchy requires a coordinated and simultaneous advancement of reduction, reuse, and recycling. These upstream tiers are mutually reinforcing and cannot be implemented effectively in isolation. Reduction efforts depend on public confidence that separated materials will be properly managed; reuse systems require reliable collection and redistribution channels; and recycling depends on efficient sorting, quality control, and viable end-markets for secondary materials.

Accordingly, behavioral measures and infrastructure development must progress in parallel. Awareness, enforcement, and institutional actions need to be accompanied by targeted investments in collection systems, sorting facilities, and market mechanisms. Advancing these foundations together strengthens public trust, enhances participation, and ensures that material recovery becomes operationally and economically viable. Within this integrated framework, landfilling is positioned as a secondary stage, used only for the residual fraction that cannot be reduced, reused, or recovered.

At the lower tiers of the hierarchy, conversion technologies and the gradual reduction of landfilling represent long-term objectives. Their implementation requires substantial investments, the completion and enforcement of regulatory instruments, and the establishment of stable market conditions for energy recovery and residual waste treatment. These components will therefore mature more gradually, as they depend on both technological readiness and sustained institutional and financial commitments

Accordingly, four 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
4. Strengthen national resilience of ISWM in time of crisis

## 7.1 Strategic Objective 1: Complete, Upgrade & Operate ISWM Infrastructure

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[63] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| **STRATEGIC OBJECTIVE 1: COMPLETE, UPGRADE & OPERATE ISWM INFRASTRUCTURE** | | | | | | | |
| **Sub-Objective 1.1: Establish an Effective Waste Collection and Transportation System** | | | | | | | |
| 1.1.1. Design and implement a waste collection and transportation system based on waste segregation | MoE / NSWMA / Local Authorities | 2026-2046 | • Achieve equitable and reliable collection coverage across all urban and rural areas (≥70%) at ST<br>• Introduce separate collection in ≥30% of municipalities for household waste (MT)<br>• Introduce separate collection in ≥50% for non-household waste (MT)<br>• Replace/upgrade outdated vehicles and equipment in ≥50% of service zones (MT) | • Achieve equitable and reliable collection coverage across all urban and rural areas (100 %)<br>• Complete the separate collection in ≥50% of municipalities for household waste<br>• Complete the separate collection in ≥70% for non-household waste<br>• Complete the replacement/upgrading outdated vehicles and equipment in ≥100% of service areas | • Collection coverage (% of households and non-household served)<br>• Separate collection coverage (% of households and non-household)<br>• Collection frequency consistency (% of areas meeting planned collection schedule) | • Coverage is uneven, with quasi- full service in urban areas, but many rural and remote areas underserved (collection frequency varies from daily to twice a month).<br>• Limited separate collection system in place | • Coverage = (Households served/ Total households) × 100<br>• Coverage = (non-household served /Total Non-households) × 100<br>• Household waste quantity (t/yr or t/d) = Total generated waste - non-household waste quantity<br>• Separate collection = (Households with segregation system/Total households) × 100<br>• Separate collection = (non-households with segregation system/ Total non-households) × 100<br>• Frequency consistency = (Areas with regular collection/ Total areas) × 100 |
| 1.1.2. Design, construct, O&M Transfer Stations | MoE / NSWMA / Local Authorities | 2026-2046 | • Conduct national mapping and to identify regional sites for transfer stations for special streams (ST)<br>• Construct and operationalize the needed regional transfer stations (100% of national service zones) (MT)<br>• Establish transparent O&M and cost recovery mechanisms. (MT)<br>• Integrate all transfer stations into a digital logistics management system for route optimization | • Enforce transparent O&M and cost recovery mechanisms | • Number of functional transfer stations<br>• % of waste passing through transfer stations | • No dedicated transfer stations for waste handling in most areas; waste is directly transported to final disposal.<br>• No integrated logistics system for optimizing routes and collection points. | • Functionality = (Operational transfer stations /Planned stations) × 100<br>• Flow coverage = (Tons of waste handled by transfer stations/Total collected waste tons) × 100 |
| 1.1.3. Design and implement a hazardous waste collection system for household and non-household | MoE / NSWMA / Local Authorities | 2026-2046 | • Develop and adopt a national hazardous waste (HW) management plan (ST)<br>• Study a HW national baseline (ST)<br>• Prioritize HW collection stream (ST)<br>• Establish HW collection plan for all of HW streams (ST)<br>• Achieve 40% HW collection for non-household for prioritized streams (MT) | • Achieve 70% HW collection of non-households for all HW streams<br>• Achieve 30% HW collection of households for all HW streams | • HW Collection System Coverage (% of regions with HW collection points) OR % of identified HW generation sources covered by a functional HW collection and tracking system<br>• HW collected vs. generated (% traceability) | • Limited dedicated HW collection system in place. Most HW is either improperly disposed of or handled informally.<br>• Limited regulated infrastructure for safe collection, handling, or disposal. | • Coverage = (Number of collected HW streams/ Total HW Streams)<br>• Traceability = (HW collected through system / Total HW generated) × 100 |

[63] According to Law 80/2018, the NISWMS should be amended after a maximum of 10 years

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[63] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| **Sub-Objective 1.2: Establish Reuse, Recycling[64], Material Recovery Facilities, Treatment for Separately Collected Waste** | | | | | | | |
| 1.2.1. Design, construct, O&M Drop Off, Reuse and Repair centers for non-hazardous special streams of waste | MoE / NSWMA / Local Authorities | 2026-2046 | • Conduct national mapping to identify local sites for drop-off/reuse/repair centres in alignment with the transfer station mapping (ST)<br>• Establish the needed local sites for drop-off/reuse/repair centres to cover 100% of national service zones (ST/MT)<br>• At least 20% by weight for household waste (MT)<br>• At least 50% by weight for non-household waste (MT) | • At least 50% by weight for household waste<br>• At least 80% by weight for non-household waste (MT) | • % of municipal waste diverted to reuse and repair channels<br>• Number of operational drop-off/reuse/repair centres | • Limited and unorganised municipal drop-off, reuse and repair centres<br>• Informal and other limited, small-scale private/ non-governmental initiatives<br>• Reuse and recycling rate is negligible | • Diversion= (Tons collected at drop-off centres/Total municipal waste generated in the same area) × 100<br>• Operational centres=(Total functioning centres/Total planned centres) × 100 |
| 1.2.2. Design, construct/upgrade, O&M Material Recovery Facilities for non-hazardous special streams of waste | MoE / NSWMA / Local Authorities | 2026-2046 | • Rehabilitate and re-commission existing clean MRFs to restore 50% of theoretical capacity to cover 40% of waste generation (ST)<br>• Achieve at least 80% operational functionality to reach 70% of waste generation (MT) | • Maintain ~~Reach~~ a sustainable national network of functional clean MRFs covering 70% of waste generation, operating under sound O&M and cost recovery models. | • % of theoretical clean MRF capacity restored and operational<br>• % of clean MRFs operational (continuous operation ≥80% of scheduled days)<br>• Material recovery rate (%)<br>• % of municipal waste processed in functional clean MRFs | • Limited clean MRFs; | • Infrastructure = (Number of MRFs restored and operational/Total existing MRFs) × 100<br>• Capacity = (total capacity of operational MRFs/total capacity of all existing MRFs) × 100<br>• Operational MRFs = (Number of MRFs operating ≥80% of scheduled days/Total number of MRFs) × 100<br>• Material Recovery = (Tons of recyclables recovered and sold/ Total tons of waste entering the MRF) × 100<br>• Coverage = (Tons of municipal waste processed by functional MRFs /Total waste generated) × 100 |
| 1.2.3. Design, construct/upgrade, O&M biowaste valorization with climate smart investments[65] | MoE / NSWMA / Local Authorities | 2026-2046 | • Conduct national mapping and to identify regional sites for biowaste waste valorisation (ST)<br>• Implement/Operate at least 1 biowaste valorisation facility within each service zone in alignment with the conducted mapping (ST)<br>• Expand to cover 30% of biowaste (MT) | • Achieve national biowaste valorisation facilties capacity covering at least 50% of biowaste. | • Number of new operational biowaste valorisation facilities<br>• % of biowaste treated through biowaste valorisation facilities | • One operational anaerobic digestion plant in Saida (MoE/ UNDP/ UNICEF/ UNHCR, 2020)<br>• Most of composting facilities currently operational generate compost like output, while a limited number generates compost | • Infrastructure = (Number of operational facilities/Total number of facilities planned) × 100<br>• Treatment coverage = (Tons of biowaste treated at facilities/Total estimated biowaste generated) × 100 |
| 1.2.4. Design, construct/upgrade, O&M HW Management and Treatment Facilities - HWRF | MoE / NSWMA | 2026-2046 | • Establish HW management and treatment facilities for prioritised of HW streams (ST/MT) | • Establish HW management and treatment facilities for all HW streams (MT/LT)<br>• Operate/maintain functional HW management and treatment for at | • Number of operational HW management and treatment facilities.<br>• % of identified HW generation sources | • No national HW management and treatment system; only small-scale or project-based initiatives for | • Infrastructure = (Number of HW management and treatment facilities operational/Number of facilities planned) × 100 |

[64] 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.

[65] 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.

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[63] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| | | | • Achieve 40% priority HW treatment through licensed facilities or services. (MT) | least 70% of identified HW generation sources through licensed facilities or services. | covered by licensed management and treatment facilities or services<br>• % of HW diverted from landfill or open dumping | certain streams (e-waste, batteries, healthcare waste). Arcenciel's infectious waste treatment regional facilities, Abbassiyeh Municipality's autoclave, unlicensed pyrolysis facility in Choueifat; Ecoserv's E-waste and battery waste processing facility; IMC sarl and Arayby Co. as lead recycling facilities, etc. | • Recovery = (Tons of HW managed or treated at licensed facilities / Total tons of HW generated nationally) × 100 |
| **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 [66] and Energy Recovery Facilities – MWTF | MoE / NSWMA / Local Authorities | 2026-2046 | • Rehabilitate and re-commission existing wet MRFs to restore 50% of theoretical capacity to cover 40% of waste generation (ST)<br>• Achieve at least 80% operational functionality to reach 70% of waste generation (MT)<br>• Establish energy recovery capacity to accommodate 50% of the service zones needs in alignment with waste hierarchy and masterplan | • Reach a sustainable national network of functional wet MRFs covering 70% of waste generation, operating under sound O&M and cost recovery models.<br>• Establish energy recovery capacity to accommodate 100% of the service zones needs in alignment with waste hierarchy and masterplan | • % of planned waste treatment and energy recovery facilities constructed, upgraded, or operational<br>• % of municipal solid waste (MSW) generation covered by waste treatment and energy recovery facilities service areas<br>• % of commingled MSW recovered or treated at waste treatment and energy recovery facilities<br>• % of MSW diverted from landfilling or open dumping due to waste treatment and energy recovery facilities operations<br>• Energy recovered from energy recovery facilities operations (MWh/year) as % of potential recoverable energy from MSW | • One energy recovery facility in in the Bekaa (SICOMO - capacity of ~200 tons/day) (MoE/ UNDP/ UNICEF/ UNHCR, 2020).<br>• More than 18+ wet MRFs exist, [67] ; most non-operational or operating below design capacity. | • Infrastructure= (Number of MWTFs constructed, upgraded, or operational / Total number of MWTFs planned) × 100<br>• Coverage = (Tons of MSW generated within MWTF service areas / Total tons of MSW generated nationally) × 100<br>• Recovery/Treatment = (Tons of MSW recovered or treated at MWTFs/ Total tons of MSW received by MWTFs) × 100<br>• Diversion= (Tons of MSW treated or recovered at MWTFs / Total tons of MSW previously disposed in landfills or dumpsites) × 100<br>• Energy recovery (MWh of energy generated from MWTF operations /Total potential MWh recoverable from treated MSW) × 100 |

[66] 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.
[67] Sources: Draft ISWM Strategy, 2019 and MoE/CDR/ELARD, 2020 (Business Plan for Combating Pollution of the Lower Litani River Basin)

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[63] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| 1.3.2. Design, construct, O&M Sludge Treatment Facilities-STF | MoE / NSWMA / Local Authorities | 2026-2046 | • Plan, build and operate STF to cover 20% national sludge treatment capacity (ST)<br>• Plan, build and operate STF to cover 50% national sludge treatment capacity (MT) | • Plan, build and operate STF to cover 80% national sludge treatment capacity | • % of planned STF constructed, or operational<br>• % of WWTPs connected to operational STF or equipped with on-site sludge treatment<br>• % of generated sludge treated at licensed STF facilities<br>• % of sludge diverted from uncontrolled disposal | • No sludge treatment capacity | • Infrastructure= (Number of STF constructed, , or operational/Total number of STF planned) × 100<br>• Coverage=(Number of WWTPs with access to STF services / Total number of WWTPs generating sludge) × 100<br>• Treatment/Recovery= (Tons of sludge treated at STF/ Total tons of sludge generated nationally) × 100<br>• Diversion= (Tons of sludge treated, at STF /Total tons of sludge previously disposed in uncontrolled sites) × 100 |
| 1.3.3. Design, construct/upgrade, O&M Agricultural Waste Treatment Facilities - AWTF | MoE / NSWMA / Local Authorities | 2030-2046 | • At least 20 % of planned AWTF capacity established and operational within 10 years (MT) | • At least 40 % of national agricultural waste generation managed through operational AWTF within 20 years. | • % of planned AWTF constructed, upgraded, or operational<br>• % of agricultural waste generation covered by AWTF service areas<br>• % of agricultural waste treated or recovered at licensed AWTF<br>• % of agricultural waste diverted from open burning or uncontrolled dumping<br>• % of treated agricultural waste converted to beneficial products (e.g., compost, briquettes, etc.) | • Agricultural waste largely unmanaged; no systematic recovery or treatment facilities in place. | • Infrastructure = (Number of AWTF constructed, upgraded, or operational / Total number of AWTF planned) × 100<br>• Coverage = (Tons of agricultural waste generated within AWTF service areas / Total tons of agricultural waste generated nationally) × 100<br>• Treatment/recovery = (Tons of agricultural waste treated or recovered at AWTF / Total tons of agricultural waste generated) × 100<br>• Diversion = (Tons of agricultural waste treated or recovered at AWTF / Total tons of agricultural waste previously disposed through uncontrolled means) × 100<br>• Resource utilization = (Tons of agricultural waste converted to beneficial use / Total tons of agricultural waste treated) × 100 |
| **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 | MoE / NSWMA / Local Authorities | 2026-2046 | • Achieve 100% sanitary landfill coverage for residues of municipal waste requiring final disposal (MT)<br>• Divert up to 25% of total MSW from engineered sanitary landfills while progressively increasing it and implement gas recovery where applicable. | • Divert up to 60% of total MSW from engineered sanitary landfills while progressively increasing it and implement gas recovery in all sanitary landfills | • % of MSW generation covered by operational sanitary landfills<br>• % of MSW disposed of in engineered sanitary landfills<br>• % of MSW diverted from landfilling through recovery, recycling, or treatment<br>• % of sanitary landfills with operational landfill gas capture and utilization systems | • 8 operating sanitary landfills, receiving approximately 3,182 tons/day, which exceeds original design capacity, leading to overfilling, shortened service life, and increased leachate emissions. | • Coverage = (Tons of MSW generated within areas covered by sanitary landfills / Total tons of MSW generated within area) × 100<br>• Controlled disposal = (Tons of MSW disposed in sanitary landfills / Total tons of MSW generated) × 100<br>• Landfill Gas Utilization = (Number of sanitary landfills with active gas utilization/Total number of operational sanitary landfills) × 100 |

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[63] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| 1.4.2. Design, construct/upgrade, O&M CDW Sanitary Landfills | MoE / NSWMA / Local Authorities | 2026-2046 | • Plan, construct and operate CDW sanitary landfills in prioritised sevice zones (ST)<br>• Achieve at least 30% of total non-recoverable CDW disposed in engineered CDW sanitary landfills (ST)<br>• Plan, construct and operate CDW sanitary landfills to cover all sevice zones (MT)<br>• Achieve at least 50% of total non-recoverable CDW disposed in engineered CDW sanitary landfills (MT) | • Achieve 80% of total non-recoverable CDW generation disposed in engineered CDW sanitary landfills | • % of planned CDW sanitary landfills constructed, or operational<br>• % of national CDW generation covered by sanitary landfill<br>• % of service zones areas served by operational CDW sanitary landfills | • CDW mostly dumped or mixed with MSW; no dedicated engineered sites operational. | • Infrastructure= (Number of CDW landfills constructed, , or operational / Total number of CDW landfills planned) × 100<br>• Controlled disposal= (Tons of CDW disposed in sanitary landfills ÷ Total tons of CDW generated nationally) × 100 |
| 1.4.3. Close and rehabilitate uncontrolled dumpsites (ST/MT) | MoE / NSWMA / Local Authorities | 2026-2046 | • Achieve 100% closure and of all identified uncontrolled dumpsites (MT)<br>• Achieve rehabilitation of at least 30% of identified uncontrolled dumpsites (MT) | • Achieve rehabilitation of at least 60% of identified uncontrolled dumpsites<br>• Maintain rehabilitation and gradual restoration of closed sites | • % of identified uncontrolled dumpsites closed<br>• % of closed dumpsites rehabilitated or under environmental restoration<br>• % of waste previously disposed in uncontrolled dumpsites redirected to compliant facilities<br>• % of rehabilitated dumpsites under active post-closure monitoring and maintenance | • Over 1,500 illegal dumps persist nationwide with 2,346 waste tons/day disposed of in open dumps. | • Closure implementation = (Number of uncontrolled dumpsites officially closed / Total number of uncontrolled dumpsites identified) × 100<br>• Rehabilitation progress = (Number of dumpsites rehabilitated or under rehabilitation/Total number of closed dumpsites) × 100<br>• Disposal substitution = (Tons of waste redirected to compliant disposal or treatment facilities / Total tons of waste previously disposed in uncontrolled dumpsites) × 100<br>• Post-closure monitoring = (Number of rehabilitated dumpsites with ongoing monitoring / Total number of rehabilitated dumpsites) × 100 |
| 1.4.4. Design, construct, O&M HW Disposal Sites | MoE / NSWMA / Local Authorities | 2026-2046 | • Plan, construct and operate hazardous sanitary landfills to cover all service zone needs (MT)<br>• Achieve at least 50% of national hazardous waste disposal capacity established and operational prioritizing industrial zones and major urban centers. (MT) | • Achieve 80% national coverage of compliant hazardous waste disposal capacity, integrated with HW collection, treatment, and tracking systems. | • % of planned HW disposal sites constructed, or operational<br>• % of national HW generation covered by operational disposal facilities<br>• % of hazardous waste disposed of at licensed disposal sites<br>• % of hazardous waste diverted from uncontrolled disposal, open dumping, or co-disposal with municipal waste | • No disposal sites dedicated to HW | • Infrastructure= (Number of HW disposal sites constructed, or operational / Total number of HW disposal sites planned) × 100<br>• Controlled disposal= (Tons of HW disposed at licensed disposal sites / Total tons of HW generated nationally) × 100<br>• Diversion from uncontrolled disposal= (Tons of HW managed through compliant treatment or disposal facilities / Total tons of HW previously disposed in uncontrolled or mixed sites) × 100 |
| 1.4.5. Close and rehabilitate areas contaminated with HW and existing/historical | MoE / NSWMA / Local Authorities | 2026-2046 | • Complete national inventory and risk assessment of contaminated and historical HW disposal sites (ST). | • Achieve 70% closure and rehabilitation of all identified contaminated HW sites ensuring | • Mapping of contaminated or historical HW sites identified and assessed | • Survey needed to identify contaminated sites | • Closure and rehabilitation implementation= (Number of HW-contaminated sites closed, contained, or remediated / Total |

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[63] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| HW disposal sites after conducting any needed inventory | | | • Initiate closure and containment of high-risk priority sites. (ST)<br>• Achieve closure, containment, or remediation of at least 30% of identified contaminated or historical HW sites based on environmental risk prioritization (MT) | long-term monitoring and prevention of recontamination. | • % of identified HW-contaminated sites closed, contained, or remediated<br>• % of total contaminated land area remediated or under rehabilitation<br>• % of rehabilitated HW sites under long-term environmental monitoring programs | • No comprehensive national inventory<br>• Scattered contamination known at legacy waste sites<br>• Informal HW disposal areas. | number of HW-contaminated sites identified) × 100<br>• Area-based rehabilitation= (Total area of HW-contaminated land rehabilitated or under remediation / Total area of HW-contaminated land identified) × 100<br>• Post-closure monitoring= (Number of rehabilitated HW sites under active monitoring plan / Total number of rehabilitated HW sites) × 100 |

## 7.2 Strategic Objective 2: Enhance Community and Private Sector Stewardship Towards a Circular Economy

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[68] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| **STRATEGIC OBJECTIVE 2: ENHANCE COMMUNITY AND PRIVATE SECTOR STEWARDSHIP TOWARDS A CIRCULAR ECONOMY** | | | | | | | |
| **Sub-Objective 2.1: Engage Community in Waste Reduction and Sorting at Source** | | | | | | | |
| 2.1.1. Develop a plan for waste reduction – including marine, coastal and street litter prevention (ST) and implement measures such as reducing packaging materials, reducing single-use plastic use, promoting reusable products | MoE / NSWMA | 2026-2046 | • develop and adopt a National Waste Reduction and Litter Prevention Plan addressing both marine and street litter, with targeted measures promoting packaging reduction and plastics reuse (ST)<br>• Achieve at least 3% reduction in per-capita municipal waste generation through waste prevention and reuse initiatives (MT) | Achieve at least 6% reduction in per-capita municipal waste generation through waste prevention and reuse initiatives (MT) | • Existence of an approved National Waste Reduction and Marine Litter Prevention Plan<br>• % reduction in per-capita MSW generation compared to baseline year<br>• % reduction in single-use plastic products placed on the market<br>• % reduction in packaging materials used or marketed nationally<br>• % of products or packaging replaced by | • Not in place | • Waste generation reduction = ((Per-capita MSW generation in baseline year – Per-capita MSW generation in reporting year) / Per-capita MSW generation in baseline year) × 100<br>• Single-Use Plastic reduction= ((Quantity of single-use plastic products in baseline year – Quantity in reporting year) / Quantity in baseline year) × 100<br>• Packaging Materials reduction= ((Tons of packaging material placed on the market in baseline year – Tons in reporting year) / Tons in baseline year) × 100<br>• Marine litter prevention= ((Items of litter recorded in baseline surveys – Quantity items recorded in current |

[68] According to Law 80/2018, the NISWMS should be amended after a maximum of 10 years

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[68] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| | | | | | reusable alternatives (by volume or units)<br>• % reduction in coastal and marine litter items recorded in monitoring surveys<br>• % reduction in street litter items recorded in monitoring surveys | | surveys) / Number in baseline surveys) × 100<br>• Street litter prevention = ((Litter density (items/100 m) recorded in baseline surveys - Litter density (items/100 m) recorded in reporting year)/ (Litter density (items/100 m) recorded in baseline surveys × 100 |
| 2.1.2. Promote home composting | MoE / Local Authorities | 2026-2046 | • Launch national awareness and pilot home composting initiatives (ST)<br>• Achieve at least 5% diversion of household biowaste through home composting (MT) | • Achieve at least 10% diversion of household biowaste through home composting (LT). | • % of municipalities conducting awareness or training programs on home composting<br>• % of households using home composting bins through municipal or national initiatives<br>• % of household biowaste diverted from collection and disposal through home composting | • Not common | • Composting programs= (Number of municipalities conducting home composting programs / Total number of municipalities) × 100<br>• Equipment distribution= (Number of households receiving composting bins / Total number of households targeted) × 100<br>• Household participation= (Number of households practicing home composting / Total number of households generating organic waste) × 100<br>• Diversion= (Tons of biowaste composted at home / Total tons of household biowaste generated) × 100 |
| **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) | MoE | 2026-2031 | • Complete a national study on the informal waste sector, including mapping of actors, socio-economic assessment, and proposed integration modalities and recommendations (ST). | | • Issuance of national study on informal sector integration<br>• % of municipalities or regions covered by the informal sector mapping | • Informal sector not integrated<br>• No integration study available | • Coverage = (Number of municipalities included in the study/ Total number of municipalities) × 100<br>• |
| 2.2.2. Implement recommendations for the integration of the informal sector | MOE / NSWMA / Local Authorities | 2026-2046 | • Gradual implementation of integration recommendations, prioritizing formalization pilots, capacity building, and social protection mechanisms (ST/MT). | • Advanced integration of informal sector actors into formal ISWM value chains, through licensing, cooperatives, or contractual arrangements. | • % of identified informal sector workers integrated into formal ISWM systems<br>• % of municipalities/contractors formally engaging informal workers in waste collection, sorting, or recycling service | • Informal sector not integrated<br>• No integration study available | • Integration= (Number of informal workers formally registered, contracted, or organized into cooperatives / Total number of informal workers identified) × 100<br>• Service inclusion = (Number of municipalities/contractors with formal engagement mechanisms / Total number of municipalities) × 100 |

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[68] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| **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) | MoE | 2026-2031 | • Prepare and approve standardized PPP guidelines including incentive schemes, model tender documents, and contract templates for waste management projects, ensuring alignment with national PPP law and procurement regulations. (ST)<br>• Assess PPP feasibility and prioritize waste streams and value-chain segments for PPP investment (ST). | • Review, assess, and update national waste management guidelines and templates, as needed to remain aligned with evolving regulatory and operational requirements | • Issuance of PPP guidelines for waste management<br>• % of waste management subsectors (collection, transfer, treatment, disposal) covered by PPP model documents | • No unified official tender documents and contracts | • Sector coverage= (Number of subsectors with PPP model documents developed/total number of targeted subsectors) × 100 |
| 2.3.2. Provide increased Return of Equity in order to make the PPP approach attractive to the private sector for the investment in the waste management value chain | MoE / NSWMA / Ministry of Economy | 2026-2046 | • Improvement of financial and risk-sharing mechanisms (e.g. increased RoE, viability gap funding, feed-in tariffs for RDF/energy recovery) to enhance private sector participation. | • Adoption of financially attractive PPP models ensuring sustainable private investment across all major waste management infrastructure categories. | • % increase in average RoE for PPP waste management projects<br>• % of total waste management investments financed or co-financed by the private sector | • Low RoE resulting from the economic crisis | • Private sector participation= (Value of private investments in waste projects / Total investment value in waste management sector) × 100<br>• Investor confidence= ((Number of private bidders in reporting period – Number of bidders in baseline period) / Number of bidders in baseline period) × 100 |
| 2.3.3. Provide incentives for the design, construction, O&M of Recycling Infrastructure | MoE / NSWMA / Ministry of Economy / Ministry of Indusrty | 2026-2036 | • Develop standards to ensure reliable recycling feedstock (ST).<br>• Implementation of incentive mechanisms to promote private sector investment in specialized recycling infrastructure (MT) | | • % of planned financial or fiscal incentives for recycling infrastructure established and operational<br>• % increase in private investment in targeted recycling sectors | • Non existent | • Incentives mechanism implementation= (Number of incentive schemes operational / Total number of incentive schemes planned) × 100<br>• Private sector uptake= ((Private investment in reporting year – Private investment in baseline year) / Private investment in baseline year) × 100 |
| **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, open dumping & burning | MOE / NSWMA / Local Authorities/ Ministry of Education | 2026-2036 | • Develop and adopt a National ISWM Public Awareness and Education Program, including objectives, key messages, stakeholder mapping, and implementation plan (ST)<br>• Ensure 100% coverage, i.e., the program is fully operational at national and local levels and integrated into ISWM planning and municipal outreach (MT). | • Evaluate and update the National ISWM Public Awareness and Education Program | • Issuance of ISWM Public Awareness and Education Program<br>• % of ISWM thematic areas (reduction, reuse, sorting, recycling, treatment, disposal) included in the program<br>• % of targeted stakeholder groups (households, schools, industries, NGOs) represented in the awareness program | • Non existent | • Program development= (Status of program approval [1 = approved, 0 = not approved])<br>• Topics coverage= (Number of ISWM themes included / Total number of targeted themes) × 100 & (Number of themes with detailed key messages, tools, and materials / Total number of themes included) × 100<br>• Stakeholder engagement= (Number of stakeholder groups engaged / Total number of targeted groups) × 100 |
| 2.4.2. Implement the ISWM Public Awareness & Education Program | MOE / NSWMA / Local Authorities | 2026-2036 | • 100% implementation, ensuring full rollout of national and local campaigns, training activities, and public outreach tools under the | • Carry out regular, measurable assessments to track changes in cultural behavior (MT/LT) | • % of planned awareness and education activities implemented | • Non existent | • Implementation progress= (Number of awareness activities implemented / Number of awareness activities planned) × 100 |

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[68] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| | | | • approved ISWM Awareness and Education Program.<br>• Design and Establish partnerships with community groups, businesses, and media to support continuous outreach in alignment with the developed education and awareness program (ST/MT) | | • % of population reached by awareness and education activities<br>• % of schools incorporating ISWM topics into curricula or extracurricular activities | | • Population reach= (Estimated population reached through campaigns / Total national population) × 100<br>• Schools= (Number of schools implementing ISWM education activities / Total number of schools) × 100 |
| 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. | MOE / NSWMA / Local Authorities | 2026-2036 | • Prepare a communication plan that lays out an action plan for events and dialogues (ST)<br>• Achieve 100% implementation, ensuring all targeted ISWM issues are discussed with active multi-stakeholder participation (MT). | • Continuously review and re-assess dialogue approaches to evaluate their impacts | • % of planned events conducted<br>• % of governorates or municipalities hosting ISWM dialogue sessions<br>• % of targeted stakeholder categories participating (citizens, municipalities, private sector, NGOs, academia, etc.)<br>• % of dialogue recommendations reflected in ISWM planning or decision-making | • Non existent | • Events held= (Number of dialogue events held / Number of events planned) × 100<br>• Geographic coverage = (Number of governorates-municipalities with eventss / Total number of governorates-municipalities) × 100<br>• Stakeholder participation= (Number of stakeholder categories represented / Total number of targeted categories) × 100<br>• Policy uptake= (Number of recommendations adopted in ISWM policy / Total number of recommendations generated) × 100 |
| 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 | MOE / NSWMA / Local Authorities | 2026-2046 | • Strengthen national capacity for responsible hazardous waste generation and management by ensuring that all major producer sectors receive consistent and authoritative guidance (ST)<br>• Build long term partnerships with industry groups, health institutions, and research bodies to embed hazardous waste prevention into routine operations (MT)<br>• 100% implementation of awareness and training campaigns targeting HW producers (industrial, healthcare, institutional) on their legal obligations, safe practices, and prevention technologies (MT) | • Establish a culture of accountability among hazardous waste producers by raising awareness of responsibilities, liabilities, and sustainability expectations | • % of planned HW producer awareness campaigns conducted<br>• % of identified HW-producing sectors reached by awareness or training programs<br>• % of licensed HW generators participating in awareness/training activities | • Non existent | • Sector coverage= (Number of sectors covered / Total number of HW-producing sectors identified) × 100<br>• Participation= (Number of participating HW generators / Total number of licensed HW generators) × 100 |
| 2.4.5. Collaborate with Universities, , and other national research institutions to mainstream ISWM concepts into academic programs. Incl. developing or updating curricula, establishing | MOE / MoEHE /NSWMA / Local Authorities | 2026-2036 | • At least 50% of higher education institutions (HEIs) integrate updated ISWM-related modules into existing environmental engineering, public health, biology, chemistry, and policy programs (ST)<br>• A national ISWM curriculum framework is jointly developed by MoE, MoEHE, and a consortium of universities (ST) | • | • % of HEIs integrating ISWM-related curriculum content into relevant academic programs.<br>• Status of National ISWM curriculum framework preparation and endorsement. | • Non existent | • ISWM Module Integration= (Number of HEIs that have integrated updated ISWM modules / Total number of HEI targeted) × 100<br>• Curriculum framework status= (Status of program approval [1 = approved, 0 = not approved])<br>• Mandatory ISWM Course Adoption= (Number of universities adopting a |

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[68] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| mandatory foundational courses on waste management, promoting applied research on reduction, recycling, and hazardous waste compliance, and fostering partnerships between academia, municipalities, and the private sector for innovation and capacity development. | | | • A mandatory introductory ISWM or environmental compliance course included in undergraduate programs across 50% of universities (MT)<br>• Operational academic–municipal research partnerships established in at least three regions to pilot innovative waste management practices (MT) | | • % of universities adopting a mandatory introductory ISWM or compliance course<br>• % of targeted thematic ISWM subjects integrated into each updated curriculum<br>• % of municipalities engaged in cooperation with academic institutions on ISWM topics | | mandatory ISWM/compliance course ÷ Total number of HEI targeted) × 100<br>• Curriculum Topic Coverage= (Number of ISWM thematic subjects incorporated into curricula / Total identified priority themes) × 100<br>• Municipal Partnership Coverage= (Number of regions with active academic–municipal ISWM partnerships / Total number of municipalities) × 10 |

## 7.3 Strategic Objective 3: Enable an Effective Governance Framework to Implement the ISWM System

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[69] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| **STRATEGIC OBJECTIVE 3: ENABLE AN EFFECTIVE GOVERNANCE FRAMEWORK TO IMPLEMENT THE ISWM SYSTEM** | | | | | | | |
| **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) | MoE | 2026-2027 | • All decrees on NSWMA governance framework (bylaws, recruitment, remuneration, and Board appointment) are, endorsed. (ST) | | • % of required NSWMA bylaws and decrees adopted and published<br>• % of internal regulatory and procedural instruments approved (operating, recruitment, wage/salary, HR procedures)<br>• Status of NSWMA Board of Directors appointment | • NSWMA not established | • Bylaws adoption = (Number of bylaws/decrees adopted / Total number of required bylaws/decrees) × 100<br>• Institutional framework = (Number of approved internal instruments / Total number of instruments required) × 100 |
| 3.1.2. Provide staff for the National Solid Waste Management Authority | MoE | 2026-2027 | • NSWMA fully staffed according to its approved organizational structure and functional requirements.(ST) | | • % of approved staff positions filled<br>• % of female staff in NSWMA workforce<br>• % of NSWMA departments operational with assigned personnel | • NSWMA not established | • Staffing= (Number of staff recruited / Total number of approved positions in NSWMA structure) × 100<br>• Gender = (Number of female staff/Total staff) × 100 |

[69] According to Law 80/2018, the NISWMS should be amended after a maximum of 10 years

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[69] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| | | | | | | | • Functional readiness= (Number of operational departments/ Total number of departments planned) × 100 |
| 3.1.3. Provide Technical Assistance to support the National Solid Waste Management Authority | MoE | 2026-2028 | • Ensure NSWMA's institutional capacity, systems development, and initial implementation support. (ST)<br>• | | • % of planned technical assistance activities initiated<br>• % of deliverables produced under TA (e.g., procedures, manuals, databases, templates) | • NSWMA not established | • TA mobilization= (Number of TA activities initiated / Total number of TA activities planned) × 100<br>• TA delivered= (Number of TA deliverables completed / Total number of TA deliverables planned) × 100 |
| **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 | MoE / MoF | 2026-2036 | • Draft law on cost recovery and financial instruments adopted and entering into force; implementation decrees (ST)<br>• Develop guidelines for implementing the cost recovery law to ensure that local authorities clearly understand the law and how to apply it effectively. (ST)<br>• Deliver a series of trainings and facilitated dialogues with local authorities to strengthen their understanding of the law, improve their technical and administrative capacities, and support consistent and effective implementation across all municipalities (ST/MT)<br>• At least 40% of municipalities and service providers apply functional cost recovery mechanisms that align with national guidelines. (MT) | • Full implementation of cost recovery mechanisms nationwide, | • Status of adoption of cost recovery law and regulations<br>• % of municipalities applying approved cost recovery mechanisms<br>• % of total waste management costs recovered through user charges, service fees, or producer contributions<br>• % of waste service users (households, businesses, institutions) covered by established tariff systems<br>• Ratio of cost recovery revenues to operational and maintenance (O&M) costs of ISWM system | • Cost recovery system non existent | • Municipal coverage = (Number of municipalities implementing cost recovery mechanisms / Total number of municipalities) × 100<br>• Cost recovery coverage = (Total revenues collected from cost recovery mechanisms /Total cost of waste management services) × 100<br>• Tariff implementation= (Number of service users billed under cost recovery system / Total number of service users) × 100<br>• Financial sustainability index = (Annual cost recovery revenue / Annual O&M costs of ISWM) × 100 |
| 3.2.2. Prepare guidelines for the full cost accounting of waste management activities and related tariffication schemes | MoE / MoF | 2026-2036 | • National guidelines on full cost accounting and tariffication schemes developed, validated, and disseminated along with training materials and toolkits that simplify key concepts for non-technical users (ST)<br>• Full cost accounting guidelines applied by at least 40% of municipalities, unions, and waste service providers (MT) | Full implementation of cost recovery mechanisms nationwide, | • Status of preparation and endorsement of full cost accounting and tariffication guidelines<br>• % of municipalities or unions applying full cost accounting guidelines<br>• % of NSWMA and local authorities trained in cost accounting and tariff formulation<br>• % of municipalities with established and approved waste management tariffs based on full cost accounting | • Cost recovery system non existent | • Coverage = (Number of municipalities/unions using full cost accounting guidelines / Total number of municipalities/unions) × 100<br>• Capacity = (Number of trained entities trained in cost accounting and tariff formulation /Total number of targeted entities) × 100<br>• Tariff system development = (Number of municipalities with full cost accounting -based tariffs / Total number of municipalities) × 100<br>• |

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[69] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| 3.2.3. Develop, implement and enforce regulations and guidance documentation on the EPR system for packaging waste and special waste stream(s) | MoE / NSWMA | 2026-2046 | • Draft the EPR regulatory text (Law/Decree), initiate national consultations, and conduct a prioritization study to identify which packaging waste streams will enter EPR first (ST).<br>• Develop and adopt the EPR regulatory and operational frameworks for the prioritized waste streams, including PRO design options (product-specific or multi-material) (ST/MT).<br>• Develop and publish EPR guidelines, reporting templates, and compliance procedures, and conduct national capacity-building and training programs (MT).<br>• Pilot and test EPR implementation on the selected priority waste streams to assess technical, institutional, and financial readiness (MT).<br>• Establish at least one operational PRO per waste stream and ensure 40% coverage of identified priority streams by EPR systems (MT). | • 60 % implementation and enforcement of EPR systems across all priority waste streams, achieving effective collection, recovery, and recycling performance in line with circular economy targets.<br>• All PROs fully operational, submitting compliance and financial reports to NSWMA and functioning under a harmonized national monitoring and auditing framework.<br>• EPR rolled out to additional special waste streams, based on performance of the initial priority streams.<br>• EPR system fully integrated into national solid waste planning, with cost coverage ensured through producer contributions and transparent financial reporting. | • % of priority waste streams covered by EPR mechanisms<br>• Number of established and operational PROs per waste stream<br>• % of PROs submitting compliance and financial reports to NSWMA<br>• % of EPR-covered waste collected, recovered, or recycled<br>• % of EPR system operational costs covered through producer contributions<br>• % increase in recovery and recycling rates for EPR waste streams relative to baseline | • EPR legislation and Systems not available | • EPR integration = (No. of priority streams under EPR systems / Total identified) × 100<br>• PRO establishment = (No. of operational PROs / Total required PROs) × 100<br>• PRO reporting compliance = (No. of PROs submitting reports / Total operating PROs) × 100<br>• Cost coverage = (Producer contributions / Total operational costs) × 10<br>• Circularity = ((Current recovery rate – Baseline rate) / Baseline rate) × 100 |
| **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[70] | MoE | 2026-2036 | • Drafting, consultation, and adoption of all pending decrees and ministerial decisions under Law 80/2018 completed (ST)<br>• All decrees and ministerial decisions in force and operational, supporting implementation of the ISWM Law (ST/MT) | | • % of pending decrees and ministerial decisions drafted and adopted<br>• % of legal instruments with implementation mechanisms (guidelines, procedures) developed | • Incentives not available and decisions not in place | • Legal completion= (Number of decrees/decisions adopted / Total number of decrees/decisions required under Law 80/2018) × 100<br>• Implementation readiness= (Number of instruments with supporting mechanisms / Total number of adopted instruments) × 100 |

[70] 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)

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[69] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| 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 | MoE / NSWMA | 2026-2036 | • ISWM training and capacity building program developed and launched and supported by a dedicated communication and outreach plan to engage central and local authorities (ST)<br>• Program fully implemented covering all relevant authorities and ensuring measurable improvement in capacity (MT) | | • Status of ISWM training and capacity-building program development<br>• % of targeted central and local authorities participating in training<br>• % of targeted personnel trained across institutions<br>• % of planned training sessions or workshops conducted<br>• % of women participants in ISWM training activities | • Central and local authorities capacities in waste management require building | • Institutional coverage = (Number of authorities trained/ Total number of targeted authorities) × 100<br>• Participant coverage = (Number of participants trained / Total number of targeted personnel) × 100<br>• Training delivery = (Number of sessions conducted / Total number of sessions planned) × 100<br>• Gender inclusion = (Number of women participants / Total number of participants) × 100 |
| 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 | MoE / NSWMA | 2026-2036 | • Strengthen MoE's internal structures and procedures for compliance monitoring and enforcement (ST).<br>• Achieve full operational enforcement mechanisms ensuring effective control over hazardous and non-hazardous waste management (MT) | • Full deployment of a national compliance information system that enables real time monitoring and data driven decision making (LT) | • % of permitted facilities inspected annually<br>• % of identified violations followed by enforcement actions<br>• % of MoE inspectors trained on waste legislation and enforcement protocols<br>• % of enforcement data and inspection reports entered the MoE compliance database | • Current capacities (mainly human resources and funds) not sufficient | • Compliance monitoring = (Number of facilities inspected / Total number of permitted facilities) × 100<br>• Enforcement actions = (Number of enforcement actions taken / Total number of violations identified) × 100<br>• Capacity building = (Number of trained inspectors / Total number of inspectors) × 100<br>• Data reporting = (Number of inspection reports uploaded in MoE database / Total number of inspections conducted) × 100 |
| **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 | Local Authorities | 2026 | • Prepare, consult upon, finalize, and submit local Waste Management Plans (LWMPs) to the MoE/NSWMA for review and approval within 3 months from updated NISWMS endorsement<br>• | • Local Waste Management Plans (LWMPs) regularly reviewed, updated, and reapproved to reflect changes in waste generation, technologies, and local priorities | • % of LWMPs drafted<br>• % of LWMPs formally approved and adopted by the competent authorities<br>• % of national population covered by approved LWMPs<br>• % of total waste quantities covered by approved LWMPs | • Plans not in place and law 80/2018 not properly enforced | • Plan preparation = (Number of LWMPs drafted / Total number of LWMPs required) × 100<br>• Plan adoption = (Number of LWMPs adopted / Total number of LWMPs required) × 100<br>• Population coverage = (Population served under approved LWMPs /Total national population) × 100<br>• Waste quantity coverage = (Tons of waste generated within service zones covered by approved LWMPs / Total tons of waste generated nationally) × 100 |
| 3.4.2. Develop action plans for priority waste streams | MoE / NSWMA | 2026-2031 | • Prepare sector-specific action plans for all identified priority waste streams (ST) | | • % of priority waste stream action plans drafted<br>• % of action plans approved<br>• % of national priority waste streams with an operational action plan | • Plans currently under development under EU and WB initiatives | • Action plan development = (Number of action plans drafted / Total number of priority waste streams identified) × 100<br>• Action plan adoption = (Number of action plans approved / Total number of action plans required) × 100<br>• Waste streams coverage = (Number of waste streams covered by approved |

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[69] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| | | | | | | | action plans / Total number of national priority waste streams) × 100 |
| **Sub-Objective 3.5: Establish and Operationalize a Waste (including 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) | MoE | 2026-2031 | • Draft, consult on, and formally adopt the ministerial decision and accompanying technical guidelines related to WMIS (ST) | | • % of WMIS legal and technical documentation drafted<br>• % of WMIS documents officially approved and published<br>• % of relevant institutions and stakeholders consulted during drafting | • Guidelines related to WMIS not available | • Drafting progress= (Number of WMIS regulatory and technical documents drafted / Total number of required documents) × 100<br>• Adoption status= (Number of WMIS documents adopted / Total number of required documents) × 100<br>• Stakeholder engagement= (Number of consulted institutions / Total number of relevant institutions identified) × 100 |
| 3.5.2. Establish & implement the WMIS through a training program on the use of the WMIS (registry and reporting, storing, verifying, analysing, evaluating and providing data & information, reporting & monitoring) | MoE | 2026-2031 | • Design, establish, and deploy a fully functional national WMIS covering both household and non-household (ST)<br>• Ensure that 100% of targeted institutions and operators are trained (ST)<br>• Ensure that 60% of trained local authorities and service providers are using the WMIS for reporting and analysis (MT) | • Ensure that 100% of trained local authorities and service providers are using the WMIS for reporting and analysis (LT) | % of targeted institutions (MoE, municipalities, facilities) connected to and using WMIS<br>• % of national waste quantities recorded in the WMIS<br>• % of obligated entities submitting data within required reporting periods | • WMIS not in place | • System development= (Number of<br>• Institutional coverage= (Number of institutions using WMIS / Total number of targeted institutions) × 100<br>• Data coverage= (Tons of waste reported in WMIS / Total tons of waste generated nationally) × 100 |

## 7.4 Strategic Objective 4: Strengthen National Resilience for Solid Waste Management in Time of Crisis

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[71] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| **STRATEGIC OBJECTIVE 4: STRENGTHEN NATIONAL RESILIENCE FOR INTEGRATED SOLID WASTE MANAGEMENT IN TIMES OF CRISIS** | | | | | | | |
| **Sub-Objective 4.1: Ensure Continuity of Essential Waste Services During Emergencies** | | | | | | | |
| 4.1.1. Develop and operationalize contingency plans for waste collection, transfer, and disposal continuity during crisis | MoE / DRMU / Local Authorities / Private Operators / LAF / MoF | 2026–2036 | • Develop and test contingency plans in all service zones (ST)<br>• Establish emergency contracting mechanisms (ST)<br>• 100 % of national service zones integrated into crisis-response network (MT) | | • % of service zones with validated contingency plans | None | • Validated contingency plan coverage = (Number of service zones with plans / total number of service zones) × 100 |

[71] According to Law 80/2018, the NISWMS should be amended after a maximum of 10 years

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[71] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| 4.1.2. Pre-position emergency resources (fuel, PPE, mobile units) | MoE / DRMU / Civil Defense | 2026–2036 | • Establish national emergency resource stockpiles (MT)<br>• Ensure coverage of all high-risk areas (MT) | • Maintain a fully resourced and updated national crisis-response pool | • % of critical areas covered by emergency assets | | • Emergency asset coverage = (number covered zones / total zones) × 100 |
| **Sub-Objective 4.2: National Disaster Waste Management Contingency System** | | | | | | | |
| 4.2.1. Create a permanent national command & coordination structure for disaster waste | MoE / MoIM / MoPH / LAF / Civil Defense / Local Authorities | 2026–2036 | • Define roles and responsibilities for all crisis stakeholders (ST)<br>•<br>• Conduct annual emergency response simulations (MT) | | • Existence of Functional National Disaster Waste Coordination Platform (NDWCP)<br>• % of crisis-response stakeholders with defined and approved roles & responsibilities | | • NDWCP status= (1 = fully functional, 0 = not functional]<br>• Stakeholder role definition = (Total number of identified stakeholders Number of crisis stakeholders with approved roles-responsibilities / Total number of identified stakeholders) x 100 |
| 4.2.2 Designate emergency landfill cells and temporary debris storage areas | MoE / Municipal Unions / Private Sector | 2026–2036 | • Identify and design at least three regional emergency waste zones (MT) | | • % of regions with designated emergency waste zones<br>• Number of designated emergency landfill cells and temporary debris storage areas<br>• % of designated emergency zones meeting minimum readiness standards (preparedness, access, equipment)<br>• % of emergency zones validated through field inspections | | • Emergency zone coverage = (Number of regions with at least one designated emergency waste zone /total number of regions) x 100<br>• Designated emergency zones progress= (Number of emergency zones designated / Target number (3))/100<br>• Readiness = (Number of designated emergency zones meeting all readiness standards / Total number of designated emergency zones)x100<br>• Validation = (Number of designated zones validated through official inspection/ Total number of designated emergency zones)x100 |
| **Sub-Objective 4.3: Protect Public Health and the Environment** | | | | | | | |
| 4.3.1. Develop and enforce emergency environmental and occupational safety standards | MoE / MoPH / Civil Defense | 2026–2036 | • Approve and implement standards for temporary sites (MT)<br>• Deploy mobile treatment units when required (MT) | | • Existence and official approval of emergency environmental & OHS standards<br>• % temporary sites compliant with approved emergency standards | | • Standards approval status= [1 = approved, 0 = not approved]<br>• Compliance = (number of compliant sites / total temporary sites) × 100 |
| **Sub-Objective 4.4: Strengthen Legal and Institutional Readiness** | | | | | | | |
| 4.4.1. Adopt legal provisions enabling rapid activation of emergency protocols | MoE / Council of Ministers | 2026–2029 | • Draft and approve legal amendments for emergency waste operations (ST) | | • Legal instruments adopted | | • Legal instruments approval status= [1 = approved, 0 = not approved] |
| 4.4.2 Establish mobile environmental | MoE / NSWMA / MoIM | 2026–2036 | • Deploy minimum 1 pilot mobile inspection units (MT) | | • Number of mobile inspection units | | • Units Deployed=Count of mobile inspection units operational |

| MEASURES | RESPONSIBLE ENTITY(IES) | TIME-SCHEDULE | TARGETS ST (1-5 YEARS) & MT (6-10 YRS) | TARGETS LT (11-20 YEARS)[71] | INDICATORS | BASELINE (2025) | CALCULATION METHOD |
|---|---|---|---|---|---|---|---|
| inspection and reporting units | | | | | | | |
| **Sub-Objective 4.5: Coordination, Communication, and Public Engagement** | | | | | | | |
| 4.5.1 Implement national emergency communication campaigns | MoE / Media / Local Authorities | 2026–2036 | • Roll out at least 3 major national emergency waste campaigns covering all service zones (MT) | | • Existence of approved national communication campaign plan (Yes/No)<br>• % of planned campaigns implemented annually | | • Campaign status= [1 = approved, 0 = not approved]<br>• Campaign implementation=(Number of campaigns conducted/Planned number of campaigns)x100 |
| **Sub-Objective 4.6: Build National Resilience (Capacity, Resources, Data)** | | | | | | | |
| 4.6.1. Establish Emergency Waste Fund and equipment pools | MoE / MoF / Donors / Municipal Unions | 2026–2036 | • Establish the fund and secure initial capitalization (MT) | • Ensure annual funding sustainability and equipment renewal | • Fund establishment and capitalization status<br>• Annual fund utilization and sustainability | | • Fund status= [1 = established, 0 = not established]<br>• Sustainability= (annual funding secured / annual funding required) × 100 |
| 4.6.2. Develop national training programs & crisis data systems | MoE / Civil Defense / Training Centers | 2026–2036 | • Train municipal and operational teams nationwide<br>• Establish real-time crisis waste information system aligned with NWMIS | | • % of municipal and operational teams trained<br>• Existence and operational status of real-time crisis waste information system | | • Training coverage = (number of trained teams / total number of target teams) × 100<br>• Crisis data system status= [1 = established, 0 = not established] |

## 7.5 Overview of Implementation Time-Schedule

| MEASURES | TIME-SCHEDULE | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **STRATEGIC OBJECTIVE 1: COMPLETE, UPGRADE & OPERATE ISWM INFRASTRUCTURE** | | | | | | | | | | | | | | | | | | | | | | |
| **Sub-Objective 1.1: Establish an Effective Waste Collection and Transportation System** | | | | | | | | | | | | | | | | | | | | | | |
| 1.1.1 Waste collection and transportation system based on waste segregation | 2026-2046 | | | | | | | | | | | | | | | | | | | | | |
| 1.1.2 Transfer Stations | 2026-2046 | | | | | | | | | | | | | | | | | | | | | |
| 1.1.3 Hazardous waste collection system | 2026-2046 | | | | | | | | | | | | | | | | | | | | | |
| **Sub-Objective 1.2: Establish Reuse, Recycling, Material Recovery Facilities, Treatment for Separately Collected Waste** | | | | | | | | | | | | | | | | | | | | | | |
| 1.2.1 Drop Off, Reuse & Repair centers | 2026-2046 | | | | | | | | | | | | | | | | | | | | | |
| 1.2.2 Material Recovery Facilities | 2026-2046 | | | | | | | | | | | | | | | | | | | | | |
| 1.2.3 Biowaste valorisation | 2026-2046 | | | | | | | | | | | | | | | | | | | | | |
| 1.2.4 HW Management & Treatment Facilities | 2026-2046 | | | | | | | | | | | | | | | | | | | | | |
| **Sub-Objective 1.3: Establish Climate-Smart Waste Treatment and Energy Recovery Facilities** | | | | | | | | | | | | | | | | | | | | | | |
| 1.3.1 MWTF | 2026-2046 | | | | | | | | | | | | | | | | | | | | | |
| 1.3.2 Sludge Treatment Facilities | 2026-2046 | | | | | | | | | | | | | | | | | | | | | |

| MEASURES | TIME-SCHEDULE | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.3.3 Agricultural Waste Treatment Facilities | 2030-2046 | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | |
| **Sub-Objective 1.4: Establish Climate-Smart Final Disposal Facilities and Close/Rehabilitate Open Dumps** | | | | | | | | | | | | | | | | | | | | | | |
| 1.4.1 Municipal sanitary landfills | 2026-2046 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 1.4.2 CDW sanitary landfills | 2026-2046 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 1.4.3 Close & rehabilitate uncontrolled dumpsites | 2026-2046 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 1.4.4 HW disposal sites | 2026-2046 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 1.4.5 Rehabilitate HW contaminated areas | 2026-2046 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| **STRATEGIC OBJECTIVE 2: ENHANCE COMMUNITY AND PRIVATE SECTOR STEWARDSHIP TOWARDS A CIRCULAR ECONOMY** | | | | | | | | | | | | | | | | | | | | | | |
| **Sub-Objective 2.1: Engage Community in Waste Reduction and Sorting at Source** | | | | | | | | | | | | | | | | | | | | | | |
| 2.1.1 Waste reduction plan | 2026-2046 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 2.1.2 Home composting | 2026-2046 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| **Sub-Objective 2.2: Integrate the Informal Sector in the ISWM System** | | | | | | | | | | | | | | | | | | | | | | |
| 2.2.1 Informal sector study | 2026-2031 | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | |
| 2.2.2 Implement informal sector recommendations | 2031-2046 | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| **Sub-Objective 2.3: Promote Private Sector Participation and Investment in Waste Management** | | | | | | | | | | | | | | | | | | | | | | |
| 2.3.1 PPP tender guidelines | 2026-2031 | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | |
| 2.3.2 Return of Equity for PPP | 2026-2046 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 2.3.3 Incentives for recycling infrastructure | 2026-2036 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| **Sub-Objective 2.4: Enhance Public Awareness and Education** | | | | | | | | | | | | | | | | | | | | | | |
| 2.4.1 Public awareness program development | 2026-2036 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| 2.4.2 Public awareness implementation | 2026-2036 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| 2.4.3 National/local ISWM dialogues | 2026-2036 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| 2.4.4 HW producers awareness | 2026-2046 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| 2.4.5 Academic & research ISWM integration | 2026-2036 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| **STRATEGIC OBJECTIVE 3: ENABLE AN EFFECTIVE GOVERNANCE FRAMEWORK TO IMPLEMENT THE ISWM SYSTEM** | | | | | | | | | | | | | | | | | | | | | | |
| **Sub-Objective 3.1: Establish and Operationalize the National Solid Waste Management Authority (NSWMA)** | | | | | | | | | | | | | | | | | | | | | | |
| 3.1.1 NSWMA decrees | 2026-2027 | ■ | ■ | | | | | | | | | | | | | | | | | | | |
| 3.1.2 Staffing NSWMA | 2026-2027 | ■ | ■ | | | | | | | | | | | | | | | | | | | |
| 3.1.3 Technical assistance NSWMA | 2026-2028 | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | |
| **Sub-Objective 3.2: Establish and Implement Cost Recovery System and the Extended Producer Responsibility (EPR)** | | | | | | | | | | | | | | | | | | | | | | |
| 3.2.1 Cost recovery law | 2026-2036 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| 3.2.2 Full cost accounting guidelines | 2026-2036 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| 3.2.3 EPR system regulations | 2026-2046 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| **Sub-Objective 3.3: Complete and Enforce the Waste Management Legislative Framework** | | | | | | | | | | | | | | | | | | | | | | |
| 3.3.1 SWM legal incentives decree | 2026-2036 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| 3.3.2 ISWM capacity building program | 2026-2036 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| 3.3.3 MoE compliance strengthening | 2026-2036 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| **Sub-Objective 3.4: Complete and Implement the Planning Framework at National and Local Level** | | | | | | | | | | | | | | | | | | | | | | |
| 3.4.1 Local Waste Management Plans | 2026 | ■ | | | | | | | | | | | | | | | | | | | | |
| 3.4.2 Action plans for priority streams | 2026-2031 | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | |
| **Sub-Objective 3.5: Establish and Operationalize a WMIS** | | | | | | | | | | | | | | | | | | | | | | |
| 3.5.1 WMIS legal decision | 2026-2031 | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | |
| 3.5.2 WMIS implementation | 2026-2031 | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | |
| **STRATEGIC OBJECTIVE 4: STRENGTHEN NATIONAL RESILIENCE FOR SOLID WASTE MANAGEMENT IN TIMES OF CRISIS** | | | | | | | | | | | | | | | | | | | | | | |
| **Sub-Objective 4.1: Ensure Continuity of Essential Waste Services During Emergencies** | | | | | | | | | | | | | | | | | | | | | | |
| 4.1.1 Contingency plans for essential services | 2026-2036 | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | |
| 4.1.2 Pre-position emergency resources | 2026-2036 | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | |
| **Sub-Objective 4.2: National Disaster Waste Management Contingency System** | | | | | | | | | | | | | | | | | | | | | | |

| MEASURES | TIME-SCHEDULE | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.2.1 Disaster waste coordination structure | 2026-2036 | | | | | | | | | | | | | | | | | | | | | |
| 4.2.2 Emergency landfill & debris areas | 2026-2036 | | | | | | | | | | | | | | | | | | | | | |
| **Sub-Objective 4.3: Protect Public Health and the Environment** | | | | | | | | | | | | | | | | | | | | | | |
| 4.3.1 Emergency OHS and environmental standards | 2026–2036 | | | | | | | | | | | | | | | | | | | | | |
| **Sub-Objective 4.4: Strengthen Legal and Institutional Readiness** | | | | | | | | | | | | | | | | | | | | | | |
| 4.4.1 Legal provisions for emergency protocols | 2026-2029 | | | | | | | | | | | | | | | | | | | | | |
| 4.4.2 Mobile inspection units | 2026–2036 | | | | | | | | | | | | | | | | | | | | | |
| **Sub-Objective 4.5: Coordination, Communication, and Public Engagement** | | | | | | | | | | | | | | | | | | | | | | |
| 4.5.1 Emergency communication campaigns | 2026-2036 | | | | | | | | | | | | | | | | | | | | | |
| **Sub-Objective 4.6: Build National Resilience (Capacity, Resources, Data)** | | | | | | | | | | | | | | | | | | | | | | |
| 4.6.1 Emergency Waste Fund | 2026-2036 | | | | | | | | | | | | | | | | | | | | | |
| 4.6.2 Training programs & crisis data systems | 2026-2036 | | | | | | | | | | | | | | | | | | | | | |

# 8 Annexes

## 8.1 Annex 1: List of Consultation Meetings

| Engagement meeting | Numbers of meetings |
|---|---|
| **ELARD** | 2 |
| **World Bank** | 4 |
| **UNDP** | 2 |
| **EU Delegation** | 1 |
| **Civil Society** | 2 |
| **Waste Cluster Berytech** | 1 |
| **Ministry of Industry** | 1 |
| **Ministry of Public Health** | 1 |
| **Ministry of Agriculture** | 1 |
| **Ministry of Enconomy and Trade** | 1 |
| **Ministry of Finance** | 1 |
| **Ministry of Interior and Municipalities** | 1 |
| **Ministry of Energy and Water** | |
| **Association of Lebanese Industrials** | 1 |
| **Municiaplities** | 3 |
| **CDR** | 3 |
| **Waste Management Operators** | 3 |

## 8.2 Annex 2: MW Projections

Table 9: Waste generation in Lebanon, 2018, 2022, 2024 [72]

| Mohafaza | Caza | Waste Generation for 2018 (t/d) | Waste Generation for 2022 (t/d) | Waste Generation for 2024 (t/d) |
|---|---|---|---|---|
| **Akkar** | Akkar | 430 | 325 | 369 |
| **North Lebanon** | Minieh | 629 | 475 | 236 |
| | Tripoli | | | 423 |
| | Denniyeh | 229 | 173 | 202 |
| | Zgharta | | | 78 |
| | Bcharre | | | 33 |
| | Koura | 191 | 144 | 88 |
| | Batroun | | | 75 |
| | Jbeil | 533 | 400 | 140 |

[72] MoE/World Bank, 2023, Lebanon Solid Waste Roadmap for 2023-2026

| Mohafaza | Caza | Waste Generation for 2018 (t/d) | Waste Generation for 2022 (t/d) | Waste Generation for 2024 (t/d) |
|---|---|---|---|---|
| **Beirut and Mount Lebanon** | Keserwan | | | 317 |
| | Beirut | 1,409 | 1,057 | 527 |
| | Metn | | | 682 |
| | Baabda | 1,033 | 775 | 527 |
| | Aaley | 730 | 548 | 395 |
| | Chouf | | | 232 |
| **South Lebanon** | Saida | 263 | 197 | 238 |
| | Tyre | 274 | 206 | 235 |
| **Nabatiyeh** | Nabatieh | 237 | 178 | 190 |
| | Bent Jbeil | 294 | 221 | 100 |
| | Marjaayoun | | | 99 |
| | Hasbaya | | | 53 |
| **Bekaa** | West Bekaa | 243 | 182 | 155 |
| | Rashayya | | | 53 |
| | Zahle | 497 | 373 | 426 |
| **Baalbek-Hermel** | Baalbek | 350 | 263 | 257 |
| | Hermel | | | 43 |
| **Total** | | **7,342** | **5,514** | **6,173** |

## 8.3 Annex 3: Composition of the Municipal Waste

According to the Circular No. 7/1 (2017) amending Circular No. 8/1 dated 16/11/2015 on Guidelines Concerning the Integrated Management of Domestic Solid Waste to the Attention of Municipalities, Unions of Municipalities, Caimacams and Governors, and according to the Decree 5605/2019, household waste in Lebanon is made up of the following material:

*Table 8–10: Composition of the Municipal Waste*[73]

| PRODUCTS | COMPONENTS | UTILITY |
|---|---|---|
| Organic waste | Dead leaves, leftover food, fruits, vegetables, tissues, etc. | • Recycling (Composting) |

[73] MoE Circular 7/1, 2017. Guidelines Concerning the Integrated Management of Domestic Solid Waste to the Attention of Municipalities, Unions of Municipalities, Caimacams and Governors.

| PRODUCTS | COMPONENTS | UTILITY |
|---|---|---|
| Plastic | Nylon (PA), Polycarbonate (PC), Polyesters (PS), Polyethylene (HDPE, PET, LDPE), Polypropylene (PP), Polyvinyl Chloride (PVC), Acrylonitrile butadiene styrene (ABS), Polystyrene (PS), etc. | • Recycling<br>• Alternative fuel<br>• Sanitary landfill |
| Paper | Papers, boxes, cardboards, tissues, newspapers, etc. | • Recycling<br>• Alternate Compound |
| Minerals | Iron, Zinc, Aluminum, Copper, Stainless Steel, Bronze, etc. | • Recycling |
| Glass | Armored glass, "safety" glass, glass bottle, etc. | • Recycling<br>• Landfill |
| Textile | Cotton, satin, linen, wool, nylon, etc. | • Recycling<br>• Alternate Compound<br>• Landfill |
| Electronic waste | Computers, radio, phone, television, etc. | • Recycling<br>• Landfill |
| Non-recyclable waste | All non-recyclable products such as: Diapers, aluminum foil, etc. | • Landfill |

## 8.4 Annex 4: Institutional Chain for Waste Management in Lebanon

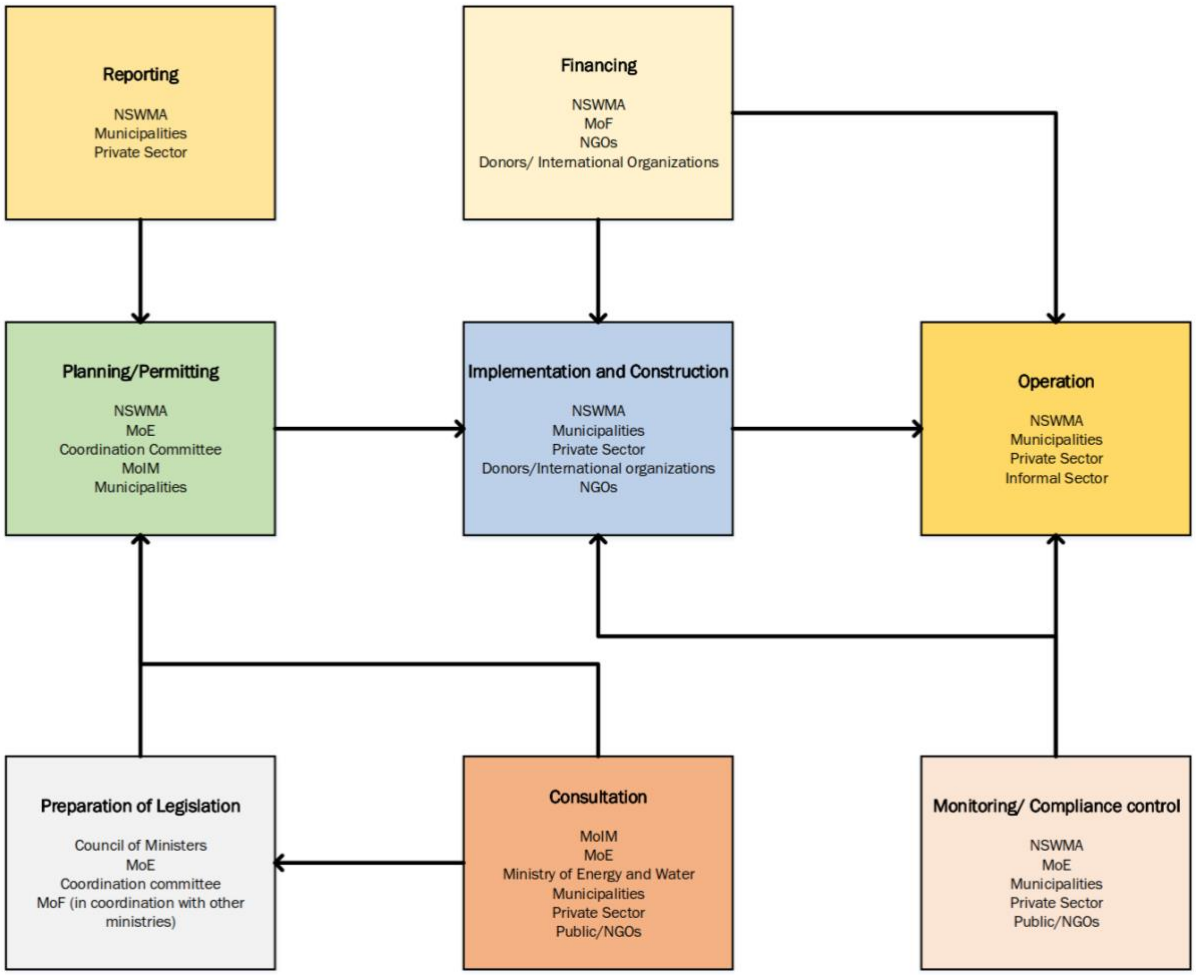



*Figure 8–1: Relationship between the main stakeholders in waste management*

### Public Awareness and Education Programs

Public awareness and education are essential pillars of an effective ISWM system. In Lebanon, such initiatives have played a critical role in fostering behavioral change toward source separation, recycling, and circular economy practices. Over the past decades, a wide range of awareness, education, and community-based actions have been implemented across the country, targeting households, schools, universities, municipalities, youth, vulnerable groups, and specific waste generators. These efforts have taken diverse forms, including door-to-door outreach, school- and university-based programs, digital tools and mobile applications, public events, clean-up campaigns, training workshops, and pilot demonstrations linked to collection, sorting, recycling, composting, healthcare waste treatment, and e-waste management.

Given the limited outreach and communication efforts by public authorities, most awareness initiatives have been undertaken by private entities, NGOs, universities, research institutions and community-based organizations, often in partnership with municipalities, donor-funded projects, or the Ministry of Environment (MoE). These actors have contributed not only to awareness raising but also to practical engagement through mechanisms such as collection points, exchange schemes for recyclables, incentive-based systems, and localized treatment or sorting facilities, thereby reinforcing behavioral change through direct participation. Awareness efforts have addressed both general waste practices and specific streams, including recyclables, organic waste, healthcare waste, electronic waste, and batteries, as well as plastic reduction and safe disposal behaviors.

Lebanon's universities and research centers have increasingly taken part in environmental awareness and waste management education. Universities, including the American University of Beirut (AUB), the Lebanese University (LU), and others, have integrated sustainability and waste management into curricula, organized student-led environmental clubs, and partnered with municipalities and NGOs on community outreach. The CNRS-L has contributed through applied research, data dissemination, and environmental monitoring projects that support evidence-based awareness campaigns and encourage science-based decision-making at the municipal and national levels.

The collective engagement of these actors demonstrates an emerging culture of cooperation between academia, civil society, and the private sector in promoting responsible waste practices and empowering communities toward a circular economy mindset. However, sustained coordination and national frameworks remain limited, underscoring the need for a centralized public awareness strategy led by the MoE and NSWMA to harmonize messages, leverage academic expertise, and institutionalize education and communication as part of Lebanon's ISWM system.

## 8.5 Annex 5: Waste Management Related Legislative Framework

### 8.5.1 Waste Management Related National Legislative Framework

| Legislation Type and No. | Year | Reference Entity | Relevant Provisions |
|---|---|---|---|
| Decision 35/1 | 2024 | MoE | This decision pertains to chapter 2 of part 3 of the hazardous waste management decree (decree no. 5606/2019); it specifies the procedures and principles governing the facilities for recovery, and/or treatment, and/or final disposal of hazardous waste, in terms of licensing, licensing renewal, licensing revision, facility registration within the ministry's database, halt of the facility operations, accidents reporting, periodic reporting, and timelines. |
| Decision 24/1 | 2024 | MoE | This decision specifies the standards and conditions related to solid waste collection and transport. |
| Decision 25/1 | 2024 | MoE | This decision specifies the standards and conditions related to mechanical sorting. |

| Legislation Type and No. | Year | Reference Entity | Relevant Provisions |
|---|---|---|---|
| Decision 26/1 | 2024 | MoE | This decision specifies the standards and conditions related to composting and biological disintegration. |
| Decision 27/1 | 2024 | MoE | This decision specifies the standards and conditions related to the production of alternative fuels from solid waste. |
| Decision 28/1 | 2024 | MoE | This decision specifies the standards and conditions related to thermal disintegration and management of the resulting ash. |
| Decision 29/1 | 2024 | MoE | This decision specifies the standards and conditions related to the specifications of sanitary landfills for non-hazardous, hazardous, and inert waste. |
| Decision 30/1 | 2024 | MoE | This decision specifies the standards and conditions related to non-hazardous sanitary landfill operation guidelines. |
| Decree 12526 | 2023 | CoM | The decree transfers the cost recovery draft Law to the Parliament for approval and enactment. The draft law aims to amend article 28 of Law 80/2018, to impose a service charge for household waste haz, transport, treatment and final disposal through environmentally sound methods. |
| Decision 16/1 | 2022 | MoE | Updated Environmental Limit Values for air pollutant emissions (updates relevant sections of Decision 8/1 of 2001). The decision specifies the Environmental Limit Values of air pollutants and will be in force and implemented as of February 10, 2023, over two phases. The first phase ends in December 2026, and the second phase begins as of January 2027. The decision sets standards and requirements covering the following topics:<br>▪ List of air pollutants that have to be measured and monitored based on the nature and type of the facility;<br>▪ Environmental Limit Values for air pollutants;<br>▪ Environmental Limit Values for air pollutants emitted from particular sectors and industries. |
| Memo 4/1 | 2022 | MoE | This memo sets for the municipalities, union of municipalities, qaemaqams and governors, a tender document template for waste collection and transport. |
| Decision 26/1 | 2021 | MoE | Conditions for imports of waste (paper or cardboard that could be recycled, waste) from European Union (EU) countries |
| Decree 6212 | 2020 | CoM | Adoption of the National Strategy for Air Quality Management (2015-2030) |
| Decision 58 | 2020 | MoE | Classification of RDF resulting from non-hazardous waste |
| Decision 59/1 | 2020 | MoE | The decision specifies the procedures and principles for hazardous waste storage facilities licensing in Lebanon.<br>▪ Article 1: Hazardous waste storage facility licensing mechanism<br>▪ Article 2: Hazardous waste storage facility license renewal mechanism<br>▪ Article 3: Hazardous waste storage facility license modification mechanism<br>▪ Article 4: Electronic database for hazardous waste storage facility<br>▪ Article 5: Permanent cessation of hazardous waste storage facility<br>▪ Article 6: Accident Reporting Procedure<br>Article 7: Reporting to the Ministry of Environment |

| Legislation Type and No. | Year | Reference Entity | Relevant Provisions |
|---|---|---|---|
| Decision 998/1 | 2020 | MoE | The decision specifies the measures and principles of application of the section of Decree 5606/ 2019 relating to hazardous waste generators and their duties (procedure for declaring hazardous waste generation/ suspension of generation, withdrawal of generated hazardous waste, and periodic reporting.<br>▪ Article 1: Hazardous waste generation reporting mechanism<br>▪ Article 2: Electronic database for hazardous waste generators<br>▪ Article 3: Permanent cessation of hazardous waste generation from facilities<br>▪ Article 4: Recall of hazardous waste from allocated storage facilities and/or treatment facility<br>Article 5: Reporting to the Ministry of Environment |
| Decision 999/1 | 2020 | MoE | The decision specifies the procedures and principles for hazardous waste transporters in Lebanon.<br>▪ Article 1: Hazardous waste transportation licensing mechanism<br>▪ Article 2: Hazardous waste transportation license renewal mechanism<br>▪ Article 3: Hazardous waste transportation license modification mechanism<br>▪ Article 4: Electronic database for hazardous waste transporters<br>▪ Article 5: Permanent cessation of hazardous waste transportation<br>▪ Article 6: Accident Reporting Procedure<br>Article 7: Reporting to the Ministry of Environment |
| Decree 5606 | 2019 | CoM | The decree specifies the principles of management (sorting, storage, transport, and disposal) of hazardous waste.<br>Section 2- Wastes Generation and Transport; in specific chapter 1 (Articles 8, 9, 10, 11 12, 13, 14, 15, 16, and 17) defines the obligations of the waste generator |
| Decree 5605 | 2019 | CoM | The decree specifies the principles for sorting domestic solid waste at the source into three categories: organic waste, recyclables, and inert waste.<br>Section 2:<br>▪ Article 3: Sources of Domestic Solid Waste<br>▪ Article 4: Composition of Domestic Solid Waste<br>▪ Article 5: Responsibility for waste sorting<br>▪ Article 6: Separation of waste according to the suitable colour<br>Article 8: Sorting mechanism and its stages |
| Decision 108/1 | 2019 | MoE | Appointing the ISWM Coordination Committee |
| Law 80 | 2018 | Parliament | Integrated Solid Waste Management Law - sets the framework for Integrated Solid Waste Management based on the principles of Law 444/2002. It combines the ISWM draft law of 2006 with thermal treatment waste to energy plants to be constructed in big cities (Tripoli, Beirut, Saida and Jiyeh).<br>The ISWM law includes the below:<br>▪ Article 4: Priorities of integrated solid waste management (considers |

| Legislation Type and No. | Year | Reference Entity | Relevant Provisions |
|---|---|---|---|
| | | | the principle of preventive action and minimizing solid waste generation as a priority)<br>▪ Article 7: Preventing random disposal, open dumping and burning of solid waste<br>▪ Article 8: The "Polluter Pays Principle"<br>▪ Article 10: National Strategy for SWM<br>▪ Article 11: Local SWM programs<br>▪ Articles 14 to 16: Responsibilities resulting from SWM<br>▪ Article 20: Solid waste collection and transfer<br>▪ Article 21: Sorting at source<br>▪ Article 22: Solid waste treatment: reuse, recycling, composting, digestion, and energy recovery<br>▪ Article 24: Final Disposal<br>▪ Articles 25 to 27: Hazardous waste management<br>▪ Article 28: Financing sources for ISWM<br>▪ Article 29: non-monetary incentives<br>▪ Articles 30 to 33: Responsibilities<br>▪ Articles 34 to 37: Enforcement and penalties |
| Law 78 | 2018 | Parliament | Framework law for the protection of air quality |
| Law 77 | 2018 | Parliament | The water resources law aims to organize, develop, and protect water resources. It also aims to promote sustainability by strengthening water establishments. It covers the following: Master plan for water resources and water basins, preserving the quality of water, financial regulations of the water sector, sanitation, and compensation for pollution, management of public water utilities, addressing natural hazards that can affect the water sector, and violations and penalties |
| Decision 45 | 2018 | MoE | Sets a new Integrated Solid Waste Management (ISWM) policy for Lebanon having the following targets:<br>▪ Achieving 35% material recovery, 50% energy recovery and 15% sanitary landfilling by 2035;<br>▪ Devolving to the municipalities the responsibilities of reduction, re-use, sorting at source in addition to sweeping and waste collection. Municipalities will also be responsible for treatment and final disposal in part or in whole based on environmentally and economically viable projects.<br>▪ Creating sanitary landfills in Beirut, Mount Lebanon, North and South Governorates<br>▪ Building three interim storage plants for different types of waste including expired drugs, healthcare waste (hazardous and non-infectious and those<br>requiring special management) |
| Circular 7/1 | 2017 | MoE | Amends and updates Circular 8/1 issued in 2015 (Guidelines Concerning the Integrated Management of Domestic Solid Waste to the Attention of Municipalities, Unions of Municipalities, Caimacams and Governors) |

| Legislation Type and No. | Year | Reference Entity | Relevant Provisions |
|---|---|---|---|
| Decision 1295/1 | 2017 | MoE | Environmental conditions for the establishment and operation of sterilizing facilities for hazardous and infectious waste from health institutions, and defining the principles for granting an environmental license to operate such facilities |
| Decision 1294/1 | 2017 | MoE | Environmental conditions for the transport of hazardous and infectious waste from healthcare institutions |
| Decision 1 | 2016 | CoM | Reinforces the rights of all municipalities and municipal federations to take responsibility for the management of their solid waste.<br>Appoints the Ministers of Finance (MoF) and Interior and Municipalities (MoIM) to prepare a law incorporating incentives for municipalities which have a waste treatment facility, or a sanitary landfill commissioned within their cadastral boundaries. While this called-for law is being developed, each of the municipalities currently hosting a landfill or waste treatment facility will be allocated 8 million USD. Municipalities sending their waste to the facility shall contribute to this amount to the municipality hosting the facility.<br>Dispenses six (6) USD to be paid for every ton of waste transported to the Naameh landfill by the municipalities who send their wastes to the landfill.<br>Commissions a temporary sanitary landfill (to remain operational for a maximum of 4 years) located in Bourj Hammoud which will receive a maximum of 1,200 tons of sorted waste daily. Also, commissions two other treatment and sanitary landfill sites at the Ghadir River estuary in parallel with the construction of treatment sites and the removal of solid waste dump near Bourj Hammoud and the Construction and Demolition Waste (CDW) piles near the Ghadir River estuary. |
| Decision 1 | 2015 | CoM | Modifies the guidelines for Integrated Solid Waste Management in Lebanon.<br>States that any municipality can implement a SWM project under the supervision of a technical team led by the Minister of Interior and Municipalities. The team should include representatives from the Ministries of Environment, Finance and OMSAR, as well as the CDR and a number of specialists. |
| Circular 8/1 | 2015 | MoE | Sets guidelines concerning the Integrated Management of Domestic Solid Waste to the Attention of Municipalities, Unions of Municipalities, Sub-Governors (Qa'em maqams) and Governors (Mohafez).<br>Includes guidelines on sorting at source and composting. Includes a list of recycling centers throughout Lebanon. |
| Decision 589/1 | 2015 | MoE | Defines the procedure for the review of Strategic Environmental Assessment scoping (SEA scoping) reports and Strategic Environmental Assessment (SEA) reports |
| Circular 9/1 | 2014 | MoE | Specifying documents to be submitted with Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) Reports |

| Legislation Type and No. | Year | Reference Entity | Relevant Provisions |
|---|---|---|---|
| Law 251 | 2014 | Parliament | Establishing an Environmental Prosecutor to handle environmental crimes associated with the violation of regulations |
| Decree 8471 | 2012 | CoM | Environmental compliance for establishments |
| Decree 8157 | 2012 | CoM | Establishing the National Council for the Environment and specifying its mandates and organization |
| Decree 8213 | 2012 | MoE | Strategic Environmental Assessment (SEA) in the public sector. This Decree aims at determining mandatory procedures to be followed for the assessment of potential environmental impacts of any policy, plan, program, study, investment or organization proposal that tackles an entire Lebanese region or an activity sector, in order to ensure that these activities are compliant with conditions related to health, public safety, the protection of the environment and the sustainability of natural resources. |
| Decree 8633 | 2012 | MoE | Environmental impact assessment (EIA) procedures, issued under the Framework Environment Law. It stipulates the EIA procedure and regulations related to all development projects with potential impacts on the environment. |
| Law 690 | 2005 | MoE | Organization of the MoE. MoE is responsible for all matters related to the environmental sector. It holds the following tasks (among others):<br>▪ Develop strategies, policies, projects and action plans, activities and studies for environmental protection and sustainability of natural resources<br>▪ Prepare legislation, specifications and standards for environmental protection and sustainability of natural resources<br>▪ Participate in the development of preventive plans to respond to disasters.<br>▪ Determine the environmental conditions for licensing the establishment and operation of institutions<br>▪ Determining the environmental conditions related to land use and to the protection of beaches, rivers, springs, lakes, marshes and valleys<br>▪ Conducting tests and analyses to determine the pollution rates of air, soil and water and propose and follow up the implementation of measures<br>taken by the concerned authorities. |
| Decree 11802 | 2004 | CoM | Regulating occupational prevention, safety and health in all enterprises subject to the code of labour |
| Decree 13389 | 2004 | CoM | Amends Decree 8006/2002 Classifies solid waste resulting from healthcare institutions into 4 categories: Waste similar to municipal waste, hazardous and infectious waste, hazardous and non-infectious waste, and waste that need special treatment and disposal.<br>Specifies procedures for the reduction, segregation, collection, storage, recycling and recovery, treatment, and disposal of the various types of healthcare waste., |

| Legislation Type and No. | Year | Reference Entity | Relevant Provisions |
|---|---|---|---|
| Decree 8006 | 2002 | CoM | Definition and Classification of the Types of Health Care Institution Wastes and their Methods of Disposal; amended by Decree No. 13389/2004 |
| Law 444 | 2002 | Parliament | Sets the framework for environmental protection. Provides the principles and rules for protecting different environmental matrices (air, water, soil…) from pollution with wastewater, hazardous wastes, chemicals, and noise, etc.; and specifies the penalties for violating environmental laws.<br>▪ Section 1 (Basic Principles and General Provision)<br>▪ Section 2 (Organization of Environmental Protection), paragraph 4 (environmental pollution monitoring mechanisms)<br>▪ Section 3 (Environmental Information System and Participation in Environmental Management and Protection)<br>▪ Section 4 (Environmental Impact Assessment)<br>▪ Section 5 (Environmental Protection)<br>Section 6 (Responsibilities and Sanctions) |
| Decree 9093 | 2002 | CoM | Amends decree No. 1917 of 1979.<br>States that any municipality that constructs a sanitary landfill or a waste treatment facility on its lands will get 5 times its allotted share of municipal funds from the Independent Municipal Fund, and if this municipality accepts wastes from 10 other municipalities its share will be 10-fold its allotted share |
| Decree 5243 | 2001 | CoM | Classification of Industrial Establishments (Amending Decree 4917 of 1994). |
| Decision 8/1 | 2001 | MoE | National Standards for Environmental Quality (NSEQ)<br>▪ Provides standards for stack emission levels and air pollutants emissions discharge limits from the SWM facility's generators. Appendix 1 (ELVs)- Tables 1 to 3) and Appendix 2-9 (minimum stack height for generators) – updated by Decision 16/1 (2022)<br>▪ Provides ELVs for wastewater discharged into different receiving media<br>(sewerage system, surface water, sea). |
| Decision 52/1 | 1996 | MoE | ▪ Specifying the National Standards for Environmental Quality (NSEQ) and the Environmental Limit Values (ELVs) for air, water, and noise:<br>▪ Section 10 (Noise Standards)<br>Section 14 (Ambient Air Quality standards) |
| Decree 4917 | 1994 | CoM | Classification of facilities that are dangerous, harmful to health, and causing nuisance |
| Law 64/88 | 1988 | Parliament | Environmental protection against hazardous waste that could harm air, water, biodiversity, soil, and people; states fine for activities that result in pollution and hazards to the environment and public health. |
| Law 118 | 1977 | Parliament | Municipalities are responsible for the management of solid waste within the municipal cadastral limits |

| Legislation Type and No. | Year | Reference Entity | Relevant Provisions |
|---|---|---|---|
| Law 973/74 | 1974 | Parliament | Relating to solid waste pollution; followed by application Decree No. 8735 of 1974 |
| Decree 8735 | 1974 | CoM | Protection against pollution from solid and liquid waste (prohibiting the digging of wells for the disposal of raw sewage, banning sewage infiltration from septic tanks and the use of untreated sewage for the irrigation of vegetables and some fruit trees), and assigning solid waste management to municipalities |
| Decision 425/1 | 1971 | MoIM | Municipalities are responsible for the collection of waste. These must be placed in plastic bags for disposal. Waste must not be dumped on the street or other public places |
| Decree 6341 | 1951 | CoM | Sets the principles of health protection and prevention in all establishments that are subject to the Labor Law |
| Decree 7975 | 1931 | CoM | Stipulates that solid waste should not be dumped randomly around residential areas but be removed and managed by the municipalities. |

### 8.5.2 Waste Management Related National Social Legislative Framework

Key legislation is discussed below and a summary of all relevant social legislation mentioned throughout this section is provided in the table below.

| Legislation Type and No. | Year | Reference Entity | Brief Description |
|---|---|---|---|
| Decree 10598 | 2022 | CoM | Raises the salaries of all employees and workers (in the private and public sectors) subject to the Labor Law by an amount of LBP 600,000 unless they are benefiting from social assistance. |
| Decree 9129 | 2022 | CoM | Raises the salaries of employees and workers (as set by Decree 7426/2012) by the following amounts:<br>• For salaries below LBP 4,000,000/month: an increase of LBP 1,325,000/month<br>• For salaries exceeding LBP 4,000,000: the amount specified in agreements and collective negotiations in line with the ILO Convention number 131 as specified in Legislative Decree 70/1977.<br>• For daily remunerations not exceeding LBP 182,000LBP: an increase of LBP 61,000/day |
| Law 205 | 2020 | Parliament | Criminalizes sexual harassment at any location. |
| Decision 291 | 2018 | MoL | Restricts a substantive number of jobs to Lebanese citizens in order to protect the workforce and reduce unemployment. |
| Law 28 | 2017 | Parliament | Stipulates the right for any natural or legal person to have access to public information in Lebanon from any governmental institution. This law also obligates governmental administrations to publish and make available all financial and administrative data for the citizens. |

| | | | |
|---|---|---|---|
| Law 340 – Penal Code (Abolishment of Article 522) | 2016 | Parliament | Abolishment of Article 522 of the Penal Code that exempts a rapist from punishment if he marries his victim. |
| Decree 3791 (amending Decree 7426 of 2012) | 2016 | CoM | Set and apply the official minimum wage for employees and workers subject to the labour law and the cost-of-living ratio. Raises the minimum daily wage to 26,000 LBP. |
| Law 293 | 2014 | Parliament | Law on the Protection of Women and Family Members from Domestic Violence. Advances women's rights and safety. Establishes important protection measures and related policing and court reforms. |
| Decree 8987 | 2012 | MoL | Forbids the employment of adolescents and children under 18 years of age in jobs that pose a risk to their health, safety and behaviour. |
| Decree 7426 | 2012 | MoL | Sets the minimum wage at 675,000 LBP. |
| Law 28 | 2007 | Parliament | All public institutions are instructed to activate administrative self-monitoring and to enhance transparency and positivity in the communication between the administration and the citizens, within one month from the date of the circular. |
| Decree 11802 | 2004 | CoM | Organizes occupational safety, safety and health in all institutions subject to labour law, and provides the general regulations for occupational health and safety |
| Law 400 | 2002 | Parliament | Ratification of ILO Convention No. 138: Minimum age of employment on tasks and works that pose risks or hazards to health and safety |
| Law 335 | 2001 | Parliament | Ratification of ILO Convention No. 128: Does not allow the employment of children and protects them from engaging in any work activities that could harm their health and safety. |
| Law 220 | 2000 | Parliament | Stipulates the civil rights of people with a disability. |
| Law 207 | 2000 | Parliament | Prohibits all forms of discrimination between men and women in the workplace concerning employment type, remuneration, employment, promotions and raises, vocational training and attire. |
| Decision 49/1 | 1997 | MoL | Forbids the employment of adolescents and children under 18 years of age in non-industrial settings unless a medical examination proves them apt to perform such work. |
| Law 58 | 1991 | Parliament | Expropriation law which was modified later on by the Law enacted on 12/08/2006 |
| Decree 6341 | 1951 | CoM | Sets the principles of health protection and prevention in all establishments that are subject to the Labor Law |
| Labor Code and its amendments | 1946 | MoL | Sets the framework for the terms and conditions of employment, and rules governing the relationship between employers and employees. The law includes but is not limited to:<br>▪ Terms and conditions of employment<br>▪ Maternity and family leave<br>International labour standards. |

### 8.5.3 Waste Management Related National and International Environmental Standards

The main legislative texts that stipulate environmental standards in Lebanon and the international standards are listed in Table 11.

*Table 11: Waste management related national and international environmental standards*

| Environmental Media | National Standard | International Standard |
|---|---|---|
| Ambient air quality | MoE Decision 16/1 of 2022 (ELVs for air pollutants), applicable as of February 2023<br>MoE Decision 8/1 (2001) (National Standards for Environmental Quality (NSEQ) – provides general emission limit values, standards for stack emission levels and air pollutants emissions limits from generators and municipal waste incinerators. | International Finance Corporation-World Bank Group (IFC-WBG) EHS General Guidelines – Air Emissions and Ambient Air Quality<br>World Health Organization (WHO) Air Quality Guidelines, global update 2005<br>World Health Organization (WHO) Air Quality Guidelines for Europe, Second Edition (2000) (for odor threshold) |
| Noise | MoE Decision 52/1 (1996) – Appendix 10 | International Finance Corporation-World Bank Group (IFC-WBG) EHS General Guidelines – Noise<br>WHO Guidelines for Community Noise, 1999 |
| Groundwater quality (for drinking) | Decree 1039 of 1999 (standards for drinking water) | International Finance Corporation-World Bank Group (IFC-WBG) EHS General Guidelines – Wastewater and Ambient Water Quality<br>WHO Guidelines for Drinking-water Quality, Fourth Edition, 2011 |
| Groundwater (ambient) | - | International Finance Corporation-World Bank Group (IFC-WBG) EHS General Guidelines – Wastewater and Ambient Water Quality<br>EU Groundwater Directive 2006/118/EC |
| Surface water quality | Decision 8/1 (2001) (National Standards for Environmental Quality (NSEQ) – ELVs for wastewater discharged into surface water)<br>MoE Decision 52/1 (1996) – Appendices 2, 3 | International Finance Corporation-World Bank Group (IFC-WBG) EHS General Guidelines – Water Conservation<br>US EPA National Recommended Water Quality Criteria<br>Mekong River Commission: Technical Guidelines for the Protection of Aquatic Life<br>Mekong River Commission Technical Guidelines for the Protection of Human Health |
| Wastewater Effluent quality | Decision 8/1 (2001) (National Standards for Environmental Quality (NSEQ) – ELVs for | International Finance Corporation-World Bank Group (IFC-WBG) EHS General |

| Environmental Media | National Standard | International Standard |
|---|---|---|
| | wastewater discharged into surface water, seawater and sewerage system)<br>Proposition for Lebanese wastewater reuse guidelines (2010) (based on water quality guidelines for agriculture developed by FAO) | Guidelines - Wastewater and Ambient Water Quality |
| Soil quality | Proposition for Lebanese guidelines on sewage sludge use in Agriculture | Dutch soil quality regulation (latest version 2012) (Dutch Soil Quality Standards) |
| Leachate management | No specific regulation on leachate standards<br>Decision 8/1 (2001) (National Standards for Environmental Quality (NSEQ) – ELVs for wastewater discharged into surface water, seawater and sewerage system) | IFC-WBG EHS Guidelines for Waste Management Facilities |

Since there are no current national standards for leachate management / treatment in Lebanon, the IFC-WBG EHS Guidelines on Waste Management Facilities shall be the basis for leachate management.

Based on the IFC-WBG EHS Guidelines on Waste Management Facilities, Table 12 lists the recommendations on prevention, minimization, and control of leachate generation in municipal solid waste dumpsites/landfill sites.

***Table 12: EHS Guidelines on Municipal Solid Waste Measures for Leachate Management/Treatment[74]***

| **Landfill Siting** |
|---|
| ▪ Must have stable geology<br>▪ Must avoid being near particularly vulnerable/sensitive ecosystems<br>▪ Must avoid being near groundwater / surface water resources |
| **Design and Operation** |
| ▪ Must follow existing national requirements and international standards to minimize leachate generation<br>▪ Use of low-permeability landfill liners to prevent leachate migration and landfill gas<br>▪ Use of leachate drainage and collection system<br>▪ Minimize infiltration by using landfill cover (daily, intermediate, and final)<br>▪ Minimize the daily exposed portion of the sanitary landfill facility where solid wastes are unloaded<br>▪ Reduce infiltration of rainfall into deposited waste using perimeter drains and landfill cell compaction, slopes and daily cover materials |

[74] IFC, WBG (2007). Environmental, Health and Safety General Guidelines.

| |
|---|
| ▪ Prevent run-on of precipitation into the active area of the landfill by using berms or other diversions[75]<br>▪ Collect and control run-off from the active area of the landfill |
| **Leachate Treatment** |
| ▪ Must be done onsite and/or discharge to municipal wastewater system<br>▪ Treatment methods may include aerated lagoons, activated sludge, anaerobic digestion, artificial wetlands, re-circulation, membrane filtration, ozone treatment, peat beds, sand filters, and methane stripping |

Based on the IFC-WBG EHS Guidelines on Waste Management Facilities, the following measures have been recommended for groundwater and leachate monitoring.

*Table 13: EHS Guidelines on Municipal Solid Waste Measures for Leachate Monitoring[76]*

| |
|---|
| **Groundwater Monitoring Wells** |
| ▪ Must be installed outside the landfill perimeter<br>▪ Location and depths must be sufficient to evaluate leachate migration from the landfill into the uppermost groundwater unit<br>▪ Monitoring network must include one (1) monitoring well in the upgradient groundwater flow direction from the landfill and two (2) monitoring wells in the downgradient direction<br>▪ Must follow existing national requirements and international standards |
| **Sampling** |
| ▪ Measure and record quantity and quality of leachate generated<br>  ○ Changes in leachate quantity/quality not attributable to weather or other factors may indicate changes in the liner, leachate collection, or landfill cover systems<br>▪ Monitoring wells must be regularly sampled and analysed for constituents, selected based on:<br>  ○ Types, quantities, and concentrations of constituents<br>  ○ Mobility, stability, and persistence of waste constituents their reaction products in the unsaturated zone beneath the waste management area<br>  ○ Detectability of indicator parameters waste constituents, and reaction products in groundwater<br>  ○ Constituent concentrations in the groundwater background |

### 8.5.3.1 Waste Management Related International Conventions, Treaties and Agreements

In addition to the national legislative framework, Lebanon has ratified several conventions related to the protection of the environment. The conventions that are of most relevance to the waste management sector are presented in Table 14.

*Table 14: Waste management related international conventions, treaties and agreements*

[75] Systems should be designed to handle the peak discharge from a 25-year storm; Run-off is typically treated with leachate from the site ( (IFC-WBG, 2007)
[76] IFC, WBG (2007). Environmental, Health and Safety General Guidelines.

| Agreement | Objective | Relevance to Waste Management |
|---|---|---|
| Minamata Convention on Mercury-August 2017<br><br>Accession by Lebanon on 13/10/2017 | To draw attention to a global and ubiquitous metal that, while naturally occurring, has broad uses in everyday objects and is released to the atmosphere, soil and water from a variety of sources.<br><br>This convention bans new mercury mines, obliges phasing-out existing mines, the phasing-out and phasing-down of mercury use in a number of products and processes; sets control measures on emissions to air and on releases to land and water; regulates the informal sector of artisanal and small-scale gold mining; addresses interim storage of mercury and its disposal once it becomes waste, sites contaminated by mercury as well as health issues. | Control the use of mercury and its release into the environment |
| Parties to the UN Framework Convention on Climate Change (UNFCCC) Paris Agreement - 2015 | To reaffirm the goal of limiting global temperature increase well below 2 degrees Celsius;<br><br>To establish binding commitments by all parties to make "nationally determined contributions" (NDCs), and to pursue domestic measures aimed at achieving them;<br><br>To commit all countries to report regularly on their emissions and "progress made in implementing and achieving" their NDCs, and to undergo international review;<br><br>To commit all countries to submit new NDCs every five years, with the clear expectation that they will "represent a progression" beyond previous ones;<br><br>To extend a mechanism to address "loss and damage" resulting from climate change; and<br><br>To call for a new mechanism, similar to the Clean Development Mechanism under the Kyoto Protocol, enabling emission reductions in one country to be counted toward another country's NDC. | Culminates a four-year negotiating round, the new treaty ends the strict differentiation between developed and developing countries that characterized earlier efforts, replacing it with a common framework that commits all countries to put forward their best efforts and to strengthen them in the years ahead.<br><br>The ultimate aim is to reduce GHG emissions |
| Kyoto Protocol -1997 | To reduce greenhouse gas emissions in an effort to prevent anthropogenic climate change | Control GHG emissions |

| Agreement | Objective | Relevance to Waste Management |
|---|---|---|
| Ratified by Lebanon in 2006 | | Implement Energy Efficiency measures |
| Vienna Convention for Protection of the Ozone Layer – 1985<br><br>Montreal protocol on ozone-depleting substances - 1987 and its amendments Ratified by Lebanon (1993-1999) | To protect human health and the environment from any activity that modifies the ozone layer<br><br>Adopt measures to control human activities found to have adverse impacts on the ozone layer. | Regulate the use of ODS (ozone depleting substances) |
| Stockholm Convention on Persistent Organic Pollutants (POPs) - 2001<br><br>Signed by Lebanon in 2001 | To reduce intentional and unintentional production of POPs;<br><br>To develop country-specific implementation plans for this purpose | Regulate the emissions of POPs from waste burning, including dioxins and furans; as well as the leaching of POPs from waste into the environment. |
| Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal- 1989<br><br>Ratified by Lebanon in 1994 | To control the transportation of dangerous non-radiant materials and their disposal across the border | Regulates the transfer of potentially hazardous wastes across national boundaries |
| The Framework Convention on Climate Change, or Global Warming Convention (UNFCCC)– 1994<br><br>Ratified by Lebanon in 1994 | To achieve stabilization of greenhouse gas concentrations in the atmosphere in order to prevent dangerous anthropogenic interference with the climate system | Regulates GHG from operations |
| Convention on Biological Diversity, Rio de Janeiro - 1992 | To conserve biological diversity<br><br>To use biological diversity in a sustainable way | Aims at the protection and conservation of biodiversity during |

| Agreement | Objective | Relevance to Waste Management |
|---|---|---|
| Ratified by Lebanon in 1994 | To share the benefits of biological diversity fairly and equitably. | strategy implementation |
| International Labor Convention No. 139, 120 and 136<br><br>Lebanon has ratified 50 International Labor Conventions (48 actually in force) | To prevent vocational risks ensuing from cancer causing materials and tools<br><br>Deals with sanitation in offices<br><br>To protect workers against the risks of intoxication ensuing from benzene | Protects workers health and ensures proper sanitation and hygiene for base camps, work environment and offices |
| Barcelona Convention of 1976 | The Barcelona Convention of 1976, amended in 1995, and its Protocols aim at protecting and improving the marine and coastal environment in the Mediterranean while promoting regional and national plans contributing to sustainable development. | Aims at the protection of the Mediterranean in case of transferring potentially hazardous wastes across national boundaries, and its protection from waste discharges, leachate, etc. |
| International Convention for the Prevention of Pollution from Ships (MARPOL)-1973<br><br>Accession by Lebanon on 18/07/1983 | To prevent and minimize pollution from ships, both accidental pollution and that from routine operations. It sets standards for stowing, handling, and shipping and lays down rules regarding the disposal of ship-generated hazardous waste, such as cleaning agents and cargo hold washing water. | Prevents the pollution of the marine environment. |
| UN Water Convention on the Protection and Use of Transboundary Watercourses and International Lakes-1992<br><br>Accession by Lebanon is underway | ▪ To strengthen national measures for the protection and ecologically sound management of transboundary surface waters and groundwaters.<br>▪ To prevent, control and reduce water pollution from point and non-point sources. | Prevents the pollution of transboundary surface waters and groundwaters. |

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