



Solid Waste Management in Lebanon: Lessons for Decentralisation

Jihad Farah, Rasha Ghaddar, Elie Nasr, Rita Nasr, Hanan Wehbe, Éric Verdeil

► To cite this version:

Jihad Farah, Rasha Ghaddar, Elie Nasr, Rita Nasr, Hanan Wehbe, et al.. Solid Waste Management in Lebanon: Lessons for Decentralisation. 2019, pp.40. halshs-02407660v1

HAL Id: halshs-02407660

<https://shs.hal.science/halshs-02407660v1>

Submitted on 12 Dec 2019 (v1), last revised 21 Dec 2019 (v2)

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Copyright

DEMOCRACY
REPORTING
INTERNATIONAL

Solid Waste Management in Lebanon: Lessons for Decentralisation*

* This report is a collaborative effort by Jihad Farah, Rasha Ghaddar, Elie Nasr, Rita Nasr, and Hanan Wehbe from the Lebanese University, and Éric Verdeil from the Paris Institute of Political Studies. It was edited and revised by Christiana Parreira, PhD candidate at Stanford University, and André Sleiman, DRI Country Representative in Lebanon.

Solid Waste Management in Lebanon: Lessons for Decentralisation

Cover photo: Éric Verdeil

October 2019
Beirut – Lebanon

List of Abbreviations

CDR	Council for Development and Reconstruction
CSO	Civil Society Organisation
DRI	Democracy Reporting International
EU	European Union
IMF	Independent Municipal Fund
ISWM	Integrated Solid Waste Management
MoE	Ministry of Environment
MoIM	Ministry of Interior and Municipalities
MoPH	Ministry of Public Health
MSW	Municipal Solid Waste
NGO	Non-Governmental Organisation
OMSAR	Office of the Minister of State for Administrative Reform
PPP	Public-Private Partnership
SWM	Solid Waste Management
UNDP	United Nations Development Programme
USAID	United States Agency for International Development

Contents

List of Abbreviations	iv
Executive Summary	1
Recommendations for Sustainable and Inclusive ISWM in Lebanon	2
1. Introduction	4
Local Authorities and SWM in Lebanon: A Fraught Relationship	4
Methodology	5
The Geography of SWM in Lebanon	6
2. The Municipality of Bikfaya-Mhaydseh: A Low-Tech Approach with Strong Local Support, Yet Incapable of Scaling-up	10
SWM Background	11
Bikfaya's SWM System	11
Political Dimensions of SWM in Bikfaya	13
Assessment: The Issue of Sustainability	13
3. The Jbeil Union of Municipalities: Managing a Dumpsite Turned Landfill	16
The Jbeil Union SWM System	17
Assessment: Outsourcing to the Private Sector	18
4. The Municipality of Saida and the Union of Municipalities of Saida-Zahrani: A Controversial High-Tech Approach	20
The Saida Region SWM system	21
Political Dimensions of SWM in Saida Municipality	23
Assessment of the Saida-Zahrani SWM Strategy	23
5. The Municipality of Zahlé: A Successful Landfilling Approach that is Reaching its Limits	24
Zahlé's SWM System	25
International, National and Private Actors Involved	27
Assessment: Public-Private Partnerships	27
6. Emerging Dynamics in the Decentralised Management of Solid Waste in Lebanon	29
Waste Capitalism and the Imbalance Between Private and Public Actors	29
SWM Profitability and Financing Schemes	30
Instability of Institutional Frameworks for Managing Solid Waste	30
A Greater Need for Citizen Mobilisation for a Circular Economy	31
Including Informal Recyclers	31
Acknowledgments	31
References	32

Executive Summary

The issue of solid waste management (SWM) in Lebanon has gained much attention among local and international observers since the 2015 “waste crisis”, when the closure of one of the country’s largest landfills in Naameh and the abrupt halt in waste collection led to rubbish piling up in the streets of Beirut and Mount-Lebanon. This situation triggered months-long protests and heated debates around the need to re-organise the sector. Yet, the coverage of these events has overshadowed the SWM challenges faced by peripheral urban areas and the challenges that municipalities are facing in ensuring public service delivery. The approaches to SWM show the remaining issues with decentralisation in Lebanon and how cooperation between and coordination of different tiers of government in public service provision should be improved.

To reduce waste dumping and burning, many disparate policies and technologies for SWM exist in Lebanon. These include different forms of sorting, recycling, landfilling, composting and, most recently, waste-to-energy.¹ Adapting these technologies to local contexts, securing funding, negotiating contracts, constructing facilities, involving citizens in the process and institutionalising best practices are new experiences for most municipal authorities. It is therefore crucial to take stock of these local experiences to draw lessons for a decentralised SWM system and to improve multi-level, integrated SWM (ISWM) in Lebanon.

This report aims to close the existing knowledge gap by documenting local efforts to manage solid waste, analysing the limitations of the strategies pursued, and present conclusions that can inform integrated SWM policies as part of inclusive governance and decentralisation. By analysing SWM at the municipal level, the report will contribute to an analysis of local public policy and decentralisation in Lebanon.

The report identifies two key dynamics underpinning local management of solid waste in Lebanon. The first is the emergence of a “new waste capitalism” different from what has been observed in the 1990s. During that time a so-called “waste capitalism” existed, which outsourced waste collection and landfilling to politically connected businesses ignoring local needs and demands. Since the 2015 “waste crisis”, complex technologies and treatment methods have been favoured that include recycling, composting and

waste-to-energy. Such advanced SWM solutions follow different business models with ambitious expenditures which have led to more complex contractual relations between private service providers and local authorities. Due to the complex SWM technologies involved, local authorities frequently are unable to design, monitor and regulate the terms of the contracts awarded to private companies. According to a DRI survey of 209 Lebanese municipalities in 2018,² 36% of municipalities outsource waste management to a private company while 46% of them said they managed waste directly. This highlights the need to ensure accountability in the relationship of municipalities with the private sector to avoid further emergence of “new waste capitalism”.

The second related issue refers to the limitations of Lebanese local authorities in managing solid waste and the lessons for applying ISWM in a decentralised context. Since 2015, they are playing a bigger role in managing their waste and are spearheading the construction of more advanced treatment and disposal facilities. They are, however, unable to sustain these projects financially and operationally. Unsustainable facilities that are constructed at great cost result not only in a net capital loss for investors, but also in the loss of local employment, along with the health and environmental costs associated with them. The financial consequences of such failures are eventually borne by the municipalities and the local taxpayers.

Some local authorities have conducted sensitisation campaigns for citizens on issues such as sorting-at-source and recycling, but most of them are unable to mainstream and institutionalise citizen participation in an inclusive SWM system. According to DRI’s survey, Lebanese municipalities tend to cooperate the most with municipal unions (57%), citizens (48%), volunteers (40%) and NGOs (38%) on SWM issues. Yet, 39% of mayors consider, on average, that engaging with citizens on SWM issues is a challenge. This proportion is much higher (71%) in municipalities with more than 30,000 residents (DRI, 2019). Three of the four municipalities analysed in this report belong to the latter category.

The report draws lessons and policy recommendations from four case studies of local authorities that have dealt with SWM: (1) the municipality of Bikfaya-Mhaydseh which runs a sorting facility, (2) the Union of

¹ Waste-to-energy includes all technologies that transform waste into energy. It includes thermal technologies (gasification, pyrolysis etc.) and non-thermal technologies (anaerobic digestion, fermentation, mechanical biological treatment).

² DRI. 2019. Are municipalities in Lebanon delivering? Survey results on solid waste management, public safety, and citizen outreach at the local level. Beirut: DRI Lebanon. Available on: https://democracy-reporting.org/dri_publications/are-municipalities-in-lebanon-delivering/.

Jbeil Municipalities, which operates a sorting, composting, and landfilling facility in Hbaline, (3) the Union of Saida-Zahrani, which uses a sorting, composting, and thermal treatment plant for the Saida region and beyond (Jezzine, Nabatieh and Beirut), and (4) the municipality of Zahlé, which manages a sanitary landfill and a sorting and composting facility for the Zahlé area. Based on 22 semi-structured interviews with municipal officials and executives, representatives of facilities, donor agencies, NGOs, and a database on the distribution of SWM facilities across Lebanon that draws information from official sources, including the Council for Development and Reconstruction (CDR), the Office of the Minister of State for Administrative Reform (OMSAR), the Ministry of Public Health (MoPH), the Ministry of Environment (MoE) and donor agencies, the report calls for the adoption of inclusive practices and sustainable regulatory frameworks for SWM to limit the destabilising role of politically connected private companies managing municipal solid waste and makes the following recommendations:

Recommendations for Sustainable and Inclusive ISWM in Lebanon

Local authorities need to be empowered through further deepening the decentralisation process to provide crucial services to their constituents. At the same time, it is imperative that the central government regulates the relationship between the private and public sector in the delivery of public services.

To establish a clear framework and ensure compliance control and sustainable SWM, we recommend the following:

1. Establishing a central regulatory body and strong oversight: There is a need for a strong regulatory authority at the central level that ensures compliance control for the successful decentralisation of any service sector like SWM. To mitigate the effects of the intersection of the provision of public services with informal political networks, these regulations should ensure government transparency in the creation, construction, and maintenance of SWM facilities in which public and private entities are involved. The adoption of standard bidding documents, technical terms of reference to evaluate service delivery, and model templates for SWM contracts could also improve the management of SWM contracts and mitigate their negative effects on municipal budgets.

2. Adopting a national master plan: The MoE must develop a national master plan for Lebanese SWM, as per the provisions of the 2018 ISWM Law. It cannot be left to the private sector to identify sites for the installation of facilities. In the context of rapid urbanisation and limited available space, it is crucial to map existing SWM efforts and identify the geographic locations in which a treatment plant could be established. The master plan should identify different SWM technologies suitable to the Lebanese context, enshrine the pillars of the circular economy (reduce, reuse, recycle) as key strategic objectives, and call for regionalised waste management systems that achieve economies of scale by uniting several local authorities in broader service areas. Local authorities would develop their own master plan in line with the national strategy.
3. Adopting a cost recovery system: Local authorities must be given the mandate to implement cost recovery schemes dedicated specifically to SWM. ISWM should be sustained by a combination of several taxation sources, including property taxes, charges on utility consumption bills, tourist taxes, user charges on households and commercial units, industrial taxes, as well as intergovernmental transfers. This would safeguard the local authorities' autonomy to implement viable solutions in a decentralised context and, at the same time, incentivise waste reduction and sorting-at-source.
4. Involving citizens and informal recycling actors: Greater engagement with citizens should be mainstreamed to promote environmentally sound practices along the three pillars of the circular economy. The MoE and local authorities should organise policy dialogues and debates and involve CSOs and citizen groups in planning and implementing SWM projects. This includes involving them in awareness-raising and sensitisation campaigns about waste reduction, source separation and recycling. Informal waste collectors and recyclers should be registered and included in the SWM process.
5. Capacity-building: The MoE and the Ministry of Interior and Municipalities (MoIM) must provide training and technical guidance to local authorities on best practices for managing solid waste and awarding and managing service contracts sustainably.



Map 1. The four case studies of local authorities dealing with SWM addressed in this report.

1. Introduction

Even in a country familiar with recurrent political gridlock, the so-called “waste crisis” in Beirut and the surrounding Mount-Lebanon area in the summer of 2015 was shocking to local observers with rubbish piling up and being openly burnt in the streets. This waste crisis led to paralysis within the Lebanese political system for the first time since the end of the Lebanese Civil War (1975–1990) which rendered government elites incapable of enacting proactive solutions. Some advocated wholesale privatisation of solid waste management (SWM) at the national level; the opening of a larger landfill in Akkar and the Beqaa or exporting solid waste. The financial interests of key elite players blocked each of these propositions. Meanwhile, groups emerged as political actors who organised popular protests and criticised the government.

Several researchers have since analysed the 2015 Lebanese SWM crisis and its aftermath. They mainly focused on the impact of the crisis and SWM practices on the environment and the economy (Ghadban, Shames, & Abou Mayaleh, 2017) (Morsi, et al., 2017) (Human Rights Watch, 2017) (Verdeil, 2017); on technical solutions that would enable more sustainable approaches (Abbas I. , Chaaban, Al-Rabaa, & Shaar, 2017) (Azzi, 2017) (Karak, 2016) (Hammoud, Kassem, & Mourtada, 2014); and on the roots of the crisis within the Lebanese political system (political economy and new types of social movements) (AbiYaghi, Catusse, & Younes, 2017) (Khalil J., 2017) (El Richani, 2017) (Deets & Skulte-Ouaiss, 2016) (Kraidy, 2016) (Stel & van der Molen, 2015) (Abu-Rish, 2015) (McCornack, 2012), (Atallah, 2015 a, b).

This report is interested primarily in the latter issue – specifically, how SWM can be used as a lens for understanding local public policy and decentralisation in Lebanon. What technologies, processes, and political networks do municipalities and municipal unions mobilise, and to what end? Such discussion is particularly useful for approaching the broader topic of decentralisation in Lebanon, a term referring to the series of policy interventions that would support meaningful financial and administrative autonomy of local government. Decentralisation, in varying forms, is frequently advocated by academics and policymakers as a solution for Lebanon yet has not gained enough political traction to be a practicable alternative. Our report highlights how the analysis of the SWM sector can enhance our understanding of how to effectively support the local authorities in the Lebanese context and how to ensure coordination and cooperation between central and local government. The report also identifies the opportunities and limitations of different SWM techniques.

Local Authorities and SWM in Lebanon: A Fraught Relationship

The distribution of responsibilities and duties between national and local authorities regarding SWM remains ambiguous, with many overlapping mandates. A 1931 French mandate-era decision first delegated responsibility for waste management to municipalities. Since then, several regulations have assigned SWM to local authorities.³ In the post-civil war era, national institutions have been at the centre of SWM administration. The CDR issued the National Emergency Recovery Plan and planned the use of World Bank loans in support of landfilling, before promoting Waste to Energy solutions (2010). Since its creation in 1993, the MoE also developed national strategies for the sector. OMSAR also supported local authorities through EU loans to develop SWM facilities.

In the wake of the 2015 crisis, the government’s strategy has focused on increasing local authorities’ responsibility in SWM. On 9 September 2015, the Council of Ministers approved a waste management plan that, inter alia, endorsed the decentralisation of waste management duties by allocating them to local authorities. It did not, however, formulate a long-term plan for the decentralisation of waste management that takes into consideration the necessary resources and technical competences to carry out such duties. Three years later, the Law on Integrated Solid Waste Management No. 80, issued on 10 October 2018, introduced the principle of integrated SWM, where local authorities are granted large powers for SWM. Despite the principle of administrative decentralisation in waste management being enshrined in Article 9 of the new law, the central government is given large discretion to run its own SWM projects, thus destabilising the decentralised power of local authorities.

This consolidation of the responsibility of Lebanese local authorities in SWM follows a global trend in which local authorities have increasingly been recognised as primary actors in service delivery. Since 1998, when municipal elections were held for the first time since 1963, the number of municipalities and municipal unions has continuously risen, reflecting the increasing importance of their role as key development agents. Yet, their capacity to deliver on their large scope of intervention is limited. There are wide disparities in population size, budgetary power,

³ These include the Decree on Public Cleanliness No. 8735 of 23 August 1974, the Municipal Act No. 118 of 30 June 1977, and Decree No. 9093/2002 that offers financial incentives to municipalities that host a waste management facility. See DRI (2019).

human resources, technical skills, and level of coordination between unions and their member municipalities. Many local authorities have weak or virtually non-existent administrative and financial resources. Some still succeed in conducting ambitious projects, developing long-term strategic plans, and creating complex systems of institutionalisation (Favier, 2001) (Harb & Atallah, 2015). Despite these successes by local authorities in developing their own SWM projects, the necessary know-how to plan and execute an integrated SWM system along the principles of good governance are still missing. Today, 87% of Lebanon's municipalities manage, in one way or another, their own waste. Among those, 93% are involved in waste collection, but as the stages of the SWM cycle become more advanced, requiring more technical sorting and treatment techniques, municipalities are less and less able to fulfil their responsibilities. Aside from the lack of resources, they cite structural challenges as reasons for this, such as ineffective laws and regulations and lack of central government guidance (DRI, 2017; 2019).

Some analysts have linked the limited capacity of local authorities with the nature of the Lebanese political system and its political economy. Many municipalities and unions fall under the influence of Lebanon's political patrons, sectarian parties, and extended family networks or wealthy regional landowners. The local governance landscape in Lebanon has been characterised as an archipelago of local and regional networks defending the interests of regional and national political patrons (Ishtay, 2001) (Favier, 2001) (Harb & Atallah, 2015) (Abu-Rish, 2016).

Following the civil war, SWM became a highly profitable sector that was monopolised by large firms connected to influential political figures. In the mid-1990s, and in the absence of municipal elections, the Lebanese government entrusted the responsibility for SWM in Beirut and the surrounding region to the CDR. The CDR subsequently awarded a contract for waste collection, sorting, treatment and disposal to a private company, Sukleen. The operational perimeter of Sukleen was later extended to encompass all of Beirut and Mount-Lebanon, except for the Jbeil district. The Lebanese government paid Sukleen through deductions from the equalisation payments of the Independent Municipal Fund (IMF), a major source of financial support exclusive to municipalities and unions, funded through a variety of government transfers and national taxes. This payment arrangement constituted a glaring infringement of the Municipal Act and the Decree No. 1917 of 6 April 1979 establishing the IMF, which stipulate that these funds belong to the local authorities.

Controversy around how the Sukleen contract was awarded, funded, and managed lasted for two decades. Critics denounced low recycling rates and the rapidity with which the capacity of the Naameh landfill was

exceeded, indicating excessive landfilling without prior treatment, contrary to the clauses of the contract. Various contractual issues also emerged: the dollars-per-tonne rate paid through the IMF was exceptionally high (around USD 177 per tonne), rendering Sukleen's rate one of the most expensive in the world. Moreover, the limited financial capacity of local authorities to cover these expenses and their growing dissatisfaction with Sukleen's services were ignored. The health and environmental impacts of the Naameh landfill were also criticised (Verdeil, 2013) (UN-Habitat & Muhanna Foundation, 2015). Outside Sukleen's area, waste dumping and open-air burning was used in various localities, with only a few municipalities engaging in sustainable SWM approaches (Giannozzi, 2017).

In the wake of the 2015 "waste crisis" and the gradual assignment of SWM tasks to local authorities, the "waste capitalism" that was formerly associated with the dominant sectarian factions at the national level started shifting to the local and regional levels.

Methodology

This report builds on the concept of "instrumentation", which is the political process through which technical and operational processes are decided, and how such decisions become integrated in existing institutional structures (Halpern, Lascoumes, & Le Galès, 2014) (Lascoumes & Le Galès, 2004) (Hood, 2007) (Hood & Peter, 2004) (Salamon & Elliot, 2002) (McCormick, 1998) (Varone, 1998) (Lascoumes & Simard, *L'action publique au prisme de ses instruments: Introduction*, 2011). Rather than grounding the analysis of SWM in a macro-level overview of Lebanese politics, the analysis tracks how local political dynamics, legislation and regulations enable and at the same time constrain technical approaches to SWM.

This study relies on two methodological approaches. The first approach involves the construction of a database that details the status of various SWM facilities, including their location, territorial coverage, technology, treatment capacity, and funding source. This database uses data collected by the CDR, along with other sources from OMSAR, the MoPH, key informants at the MoE, international agencies, and local authorities. Where possible, information was verified through multiple sources.

The second approach relies on analysis of four SWM case studies: (1) the municipality of Bikfaya-Mhaydseh, (2) the municipal union of Jbeil, (3) the municipal union of Saida-Zahrani, and (4) the municipality of Zahlé. These illustrate differences in the nature and size of the local authority, the type of contract and of the operator for SWM, the degree of technological sophistication, and the level of citizen engagement. The case studies rely on an extensive data-set that consists of press reports, primary documentation provided by municipalities and

other relevant actors, observations from guided visits to SWM facilities, and 22 semi-structured interviews with mayors, municipal council members, municipal union representatives, engineers, technical employees, facility representatives, employees of funding agencies, local non-governmental organisation members and environmental activists.

The Geography of SWM in Lebanon

Unregulated disposal and open burning are the dominant practices for dealing with solid waste in Lebanon. These practices are most spread in the governorate (muhafaza) of Baalback-Hermel, where no treatment facilities exist. Informal dumpsites are prevalent throughout Lebanon, particularly in the districts of Rashaya, Chouf, Zgharta, Koura, the governorates of South-Lebanon and Nabatieh (Bint-Jbeil, Hasbaya, Marjeyoun and Jezzine), and the urban clusters of Beirut and Tripoli. According to the original data-set, and based on the nature of the treatment and disposal facilities and their capacities, 37% of total non-dumped solid waste in Lebanon in 2018 is planned to be landfilled (formally or informally), 45% to be composted, 16% to be sorted and 2% to be treated in waste-to-energy plants. However, many plants are operating below their capacity.

Disposal and treatment facilities – landfills, composting facilities, and waste-to-energy facilities – are located predominantly in urban areas. Of the six largest facilities, three are in the greater Beirut area: two seaside landfills-reclaimed-on-sea (Bourj Hammoud and Costa Brava), and the Karantina sorting and composting facility.⁴ The three other sites are a sanitary landfill in Zahlé, another in Tripoli, and an anaerobic composting and waste-to-energy plant in Saida. While the treatment plants of Zahlé and Tripoli service only the urban municipality and immediate surrounding villages, the four other facilities in Beirut and Saida service larger territories, including Beirut and surroundings. Bourj Hammoud, Costa Brava and Karantina service the largest areas of the governorates of Beirut and Mount-Lebanon. For Saida, this includes the Saida municipality and its larger agglomeration, as well as the Jezzine district. In the last three years, Saida has been dealing with waste from the Municipality of Beirut as a result of a political agreement. All other facilities in the districts of Sour, Jbeil, Chouf, Metn, Koura, Dannieh and Hasbaya can only process small quantities of waste.

These disposal and treatment facilities have been the target of controversies as to their sustainability as well as their environmental impact. Costa Brava and Bourj Hammoud landfills were initially designed as temporary solutions but are now being managed as de facto permanent facilities. Beyond the greater Beirut area, the regions facing the most pressing challenges are the governorates of Akkar and Baalback-Hermel and the district of West-Beqaa, where the ratio between produced and treated waste is highest. Given the amount of waste these areas produce, their near-total lack operational facilities are concerning. The districts of Batroun, Zgharta, Bint-Jbeil and Rashaya also lack facilities, yet produce less waste, while Sour has operational facilities but is incapable of processing the waste produced by their residents.

According to the data consulted, implementing the planned treatment facilities would likely double the overall waste treatment capacity in Lebanon.⁵ Such facilities would concentrate additional waste treatment capacity primarily in the governorates of the North (31.5%), Akkar (20.5%), and the Beqaa (19.8%). Yet our projections indicate that planned treatment facilities for the governorate of Baalbeck-Hermel and the district of Sour will remain insufficient to meet local SWM needs. Planned treatment facilities in the governorates of Beirut and Mount-Lebanon will also not have enough capacity to treat the quantities of solid waste currently sent to the Costa Brava and Bourj Hammoud landfills.

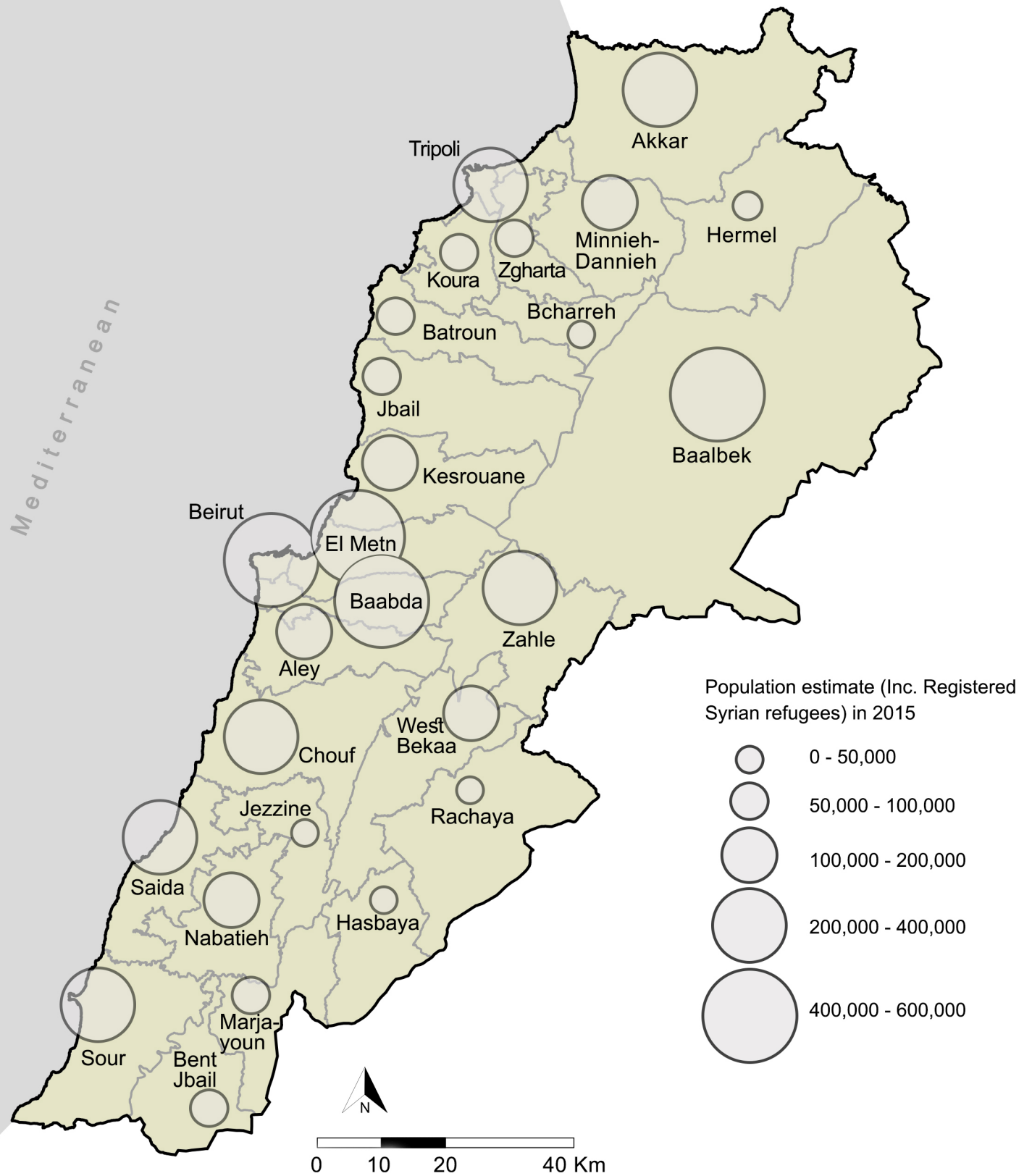
Planned facilities seem focused on developing the composting capacity: composting represents 55% of the total intended new investments in treatment capacity and is the primary investment regarding planned facilities in all governorates except Nabatieh. These investments would raise the total plant's estimated composting capacity by 150%. Waste-to-energy represents 20% of the planned investment and landfilling 19%. New landfills have been planned for Akkar, Dannieh, Jbeil, Baalback, West-Beqaa, Nabatieh, Bint-Jbeil and Sour. Interest in thermal technology exists in the North- and-Mount Lebanon governorates.

The four case studies represent different aspects of this complex, rapidly evolving landscape and offer an in-depth understanding of the strengths and weaknesses of the different strategies employed by local authorities. Waste management facilities in Zahlé, Saida and Jbeil were established before the 2015 crisis, while Bikfaya's facility was established in 2016 as a direct response to the national deterioration in SWM service quality. Most of these facilities struggle to remain financially sustainable and have been the target of popular and political contestations.

⁴ This analysis excludes the now-closed landfill of Naameh.

⁵ The data includes projects listed by the CDR, OMSAR, MoE and several international organisations but may have omitted preliminary projects planned by local authorities, such as the projects of building waste-to-energy plants in Beirut and the district of Jbeil on the Hbaline site.

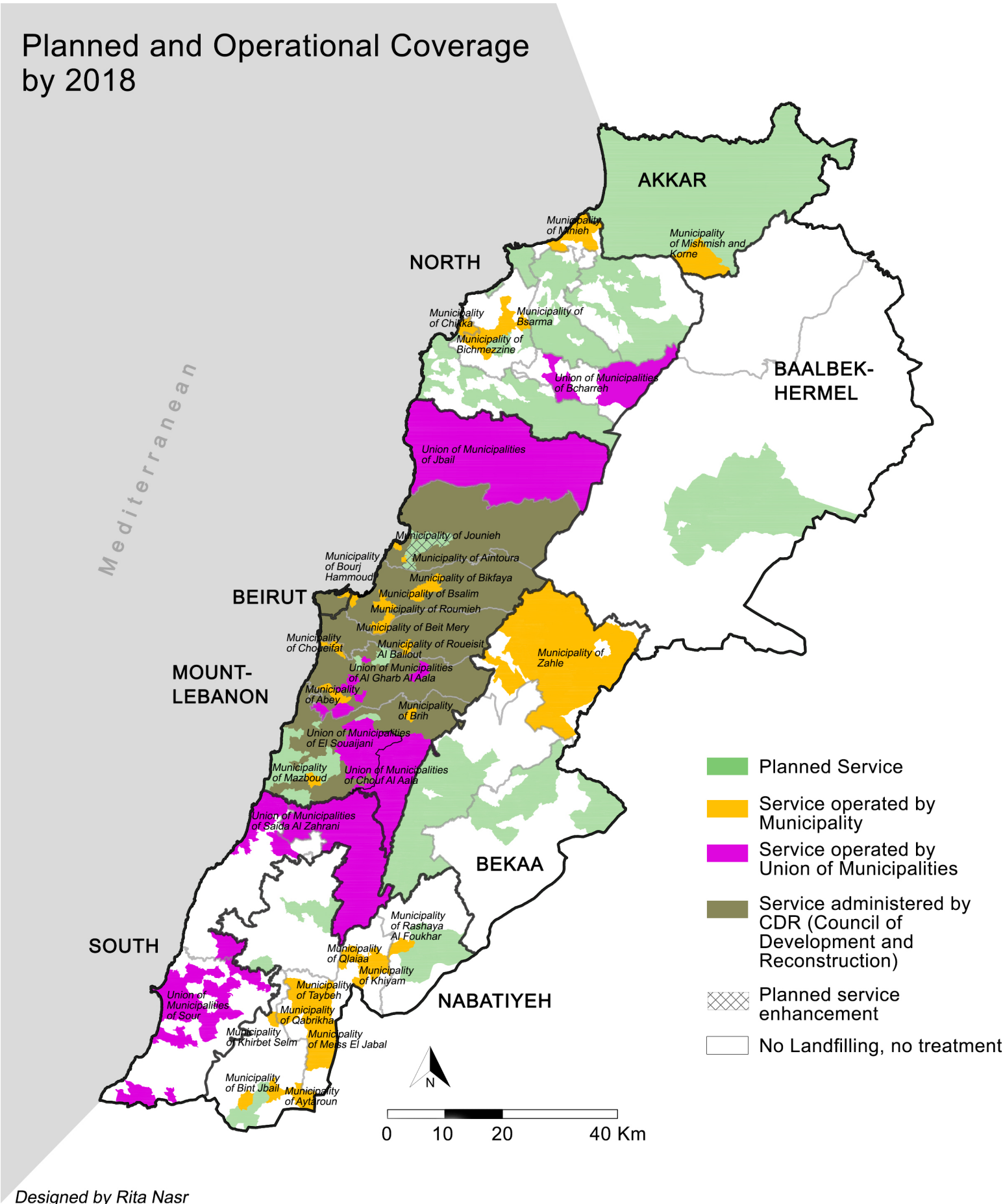
Lebanon Population at District Level by 2015



Designed by Rita Nasr

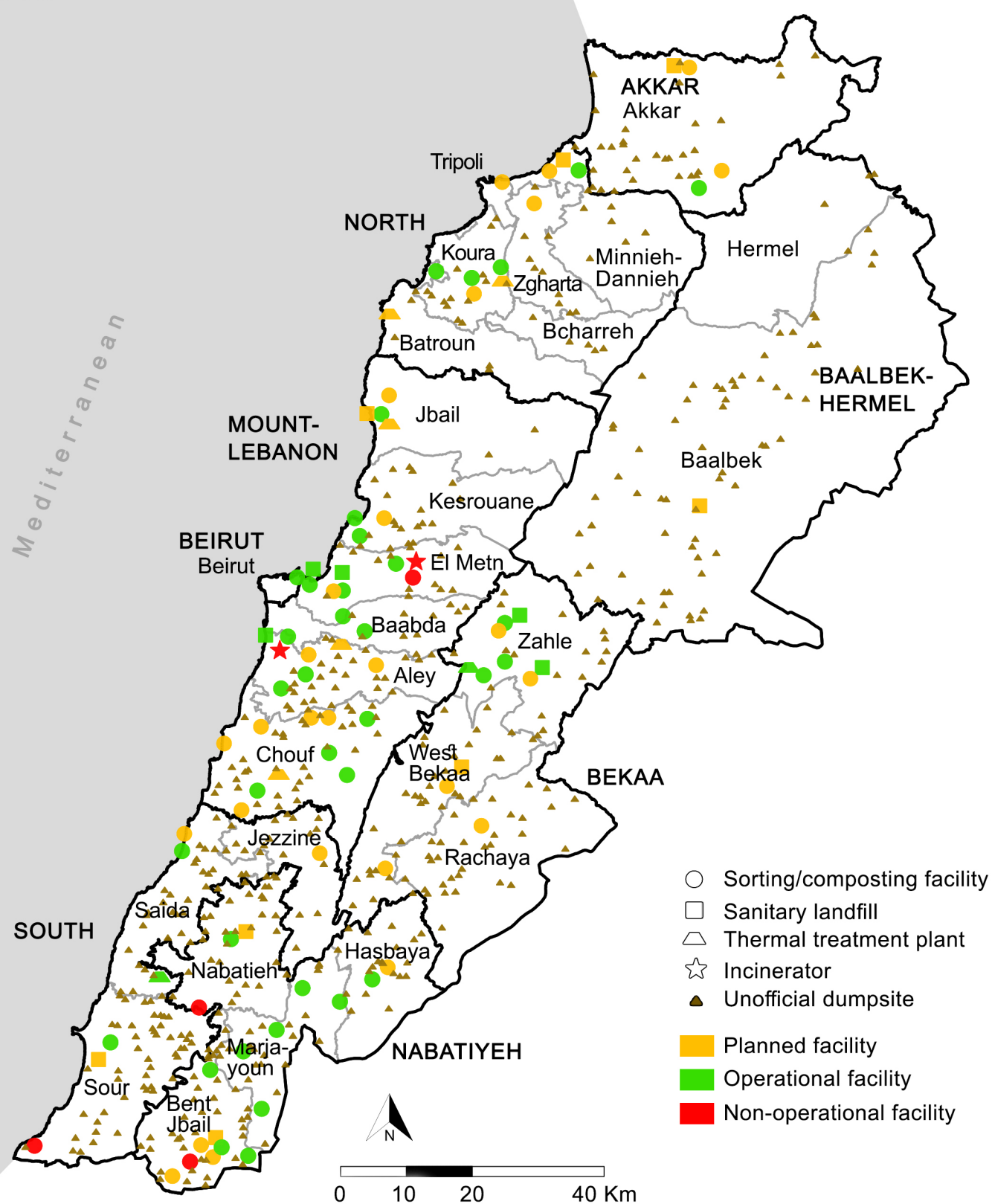
Source: Ministry of Public Health, Lebanese Republic (web), UNHCR (web), 2015

Map 2. Lebanon population at district level.



Map 3. Planned and operational coverage by 2018.

Solid Waste Infrastructure Types by 2018



Designed by Rita Nasr

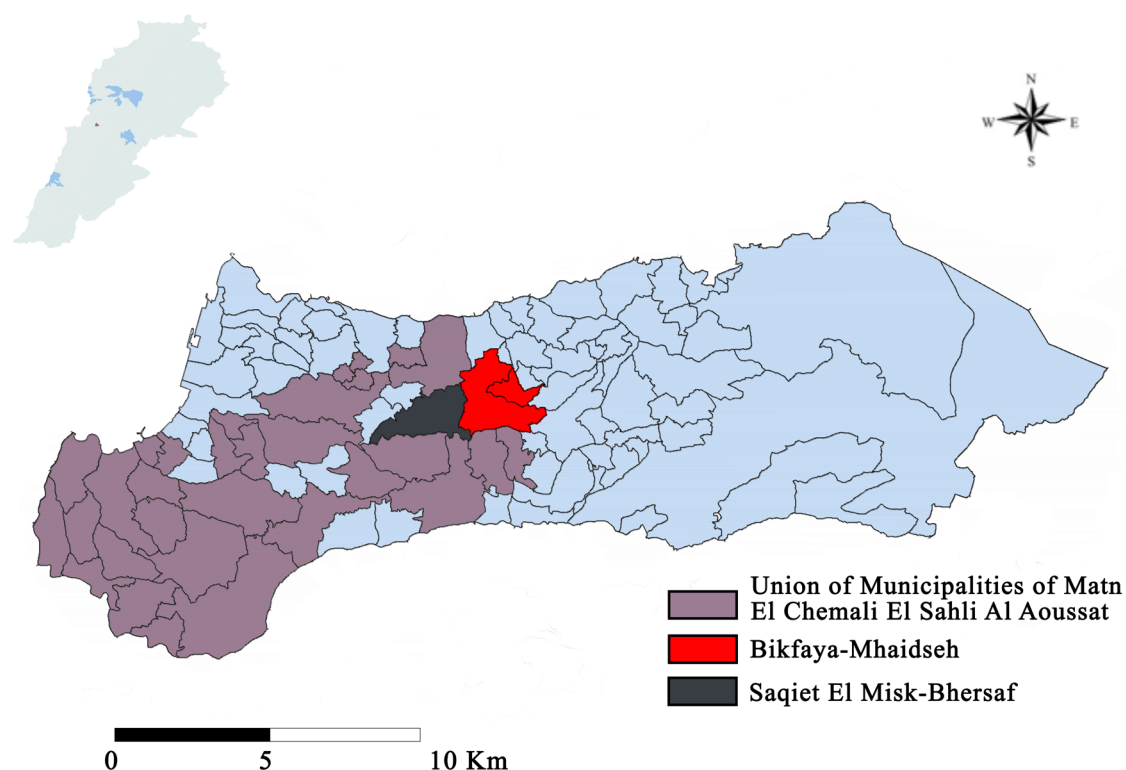
Source: Ministry of Environment, Head of Municipalities, 2018

Map 4. Solid waste infrastructure types in Lebanon.

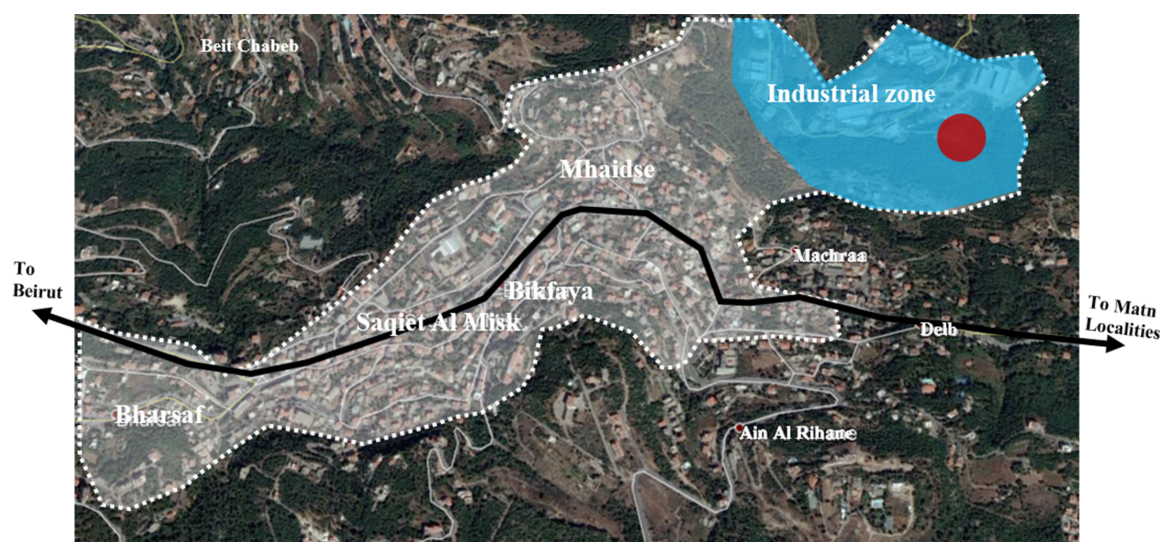
2. The Municipality of Bikfaya-Mhaydseh: A Low-Tech Approach with Strong Local Support, Yet Incapable of Scaling-up

Bikfaya is a town of approximately 10,000 inhabitants located in a mountainous area within the Metn district in the Mount-Lebanon governorate (Maps 5–6). It lies at the heart of an urban cluster of 20,000 inhabitants that includes three other villages: Mhaydseh, Saqiet el-Misk, and Bhersaf. It contains an industrial zone and

many commercial shops. The area consists of two municipalities, Bikfaya-Mhaydseh (henceforth referred to as “Bikfaya Municipality”) and Saqiet el-Misk-Bhersaf, both members of the Union of Municipalities of Coastal and Central Metn.



Map 5. Location of the Bikfaya-Mhaydseh municipality.
Source: Authors (2018).



Map 6. The greater Bikfaya agglomeration.
Source: Authors, based on Google Earth (2018).

SWM Background

Before 1994, Bikfaya, like most localities, disposed of its solid waste through unsupervised dumping and burning. The area began sending waste to the Bourj Hammoud dumpsite during the civil war. From 1994 to 2015, Sukleen treated and collected Bikfaya's waste as part of the Beirut and Mount-Lebanon service area, the cost of which was directly deducted from the municipality's share of the IMF.

After the summer of 2015, the inability of the municipality and the central government to propose viable solutions encouraged residents to propose their own. A group of volunteers (initially without any knowledge of SWM), led by a local figure, Nicole Gemayel, began promoting recycling and sorting at source, later benefiting from guidance and training offered by the environmental NGO Arcenciel. The group's collaboration with the municipality in subsequent months led to the removal of piles of waste from the streets and to a shift in the municipality's discourse, which gradually started prohibiting waste dumping. Lacking a facility that would sort and sustainably dispose of the waste, the municipality designated a 2,000 square metre, municipal-owned land in the industrial zone and hired local engineers to build the facility using a shell container purchased from a UN agency. The facility, dubbed "BiClean" (a portmanteau for Bi-kfaya and Clean, pronounced "Be clean") was created in March 2016.

In May 2016, Gemayel was elected as the head of the municipality. The election perpetuated the historical ties between the municipality and the Kataeb Party, to which she is connected by kinship: her father, Amine Gemayel, is the former party head (and previously the President of Lebanon), and her brother, Samy Gemayel, is the party's current leader and a member of Parliament.

Bikfaya's SWM System

Following her election, Gemayel expanded the municipality's involvement in SWM, further relying on the team of volunteers and CSOs that helped to acquire additional equipment. The municipality led an awareness campaign on the importance of sorting-at-source, which included brochures, door-to-door communication, open meetings and conferences. It also encouraged good practices by marking poorly sorted bags with a red warning sticker.⁶

At the technical level, the Bikfaya SWM system is quite simple. BiClean relies on a collection process based on household (primary) sorting, according to which separate bags for different types of waste are collected daily, excluding weekends, by municipal trucks. Although the system could be better sustained by introducing drop-off stations that would minimise the cost of direct household pick-up, the municipality does not do so because of its incapacity to establish an effective monitoring system on the quality of the incoming waste. To compensate for this, BiClean accepts sorted waste delivered from other sources.

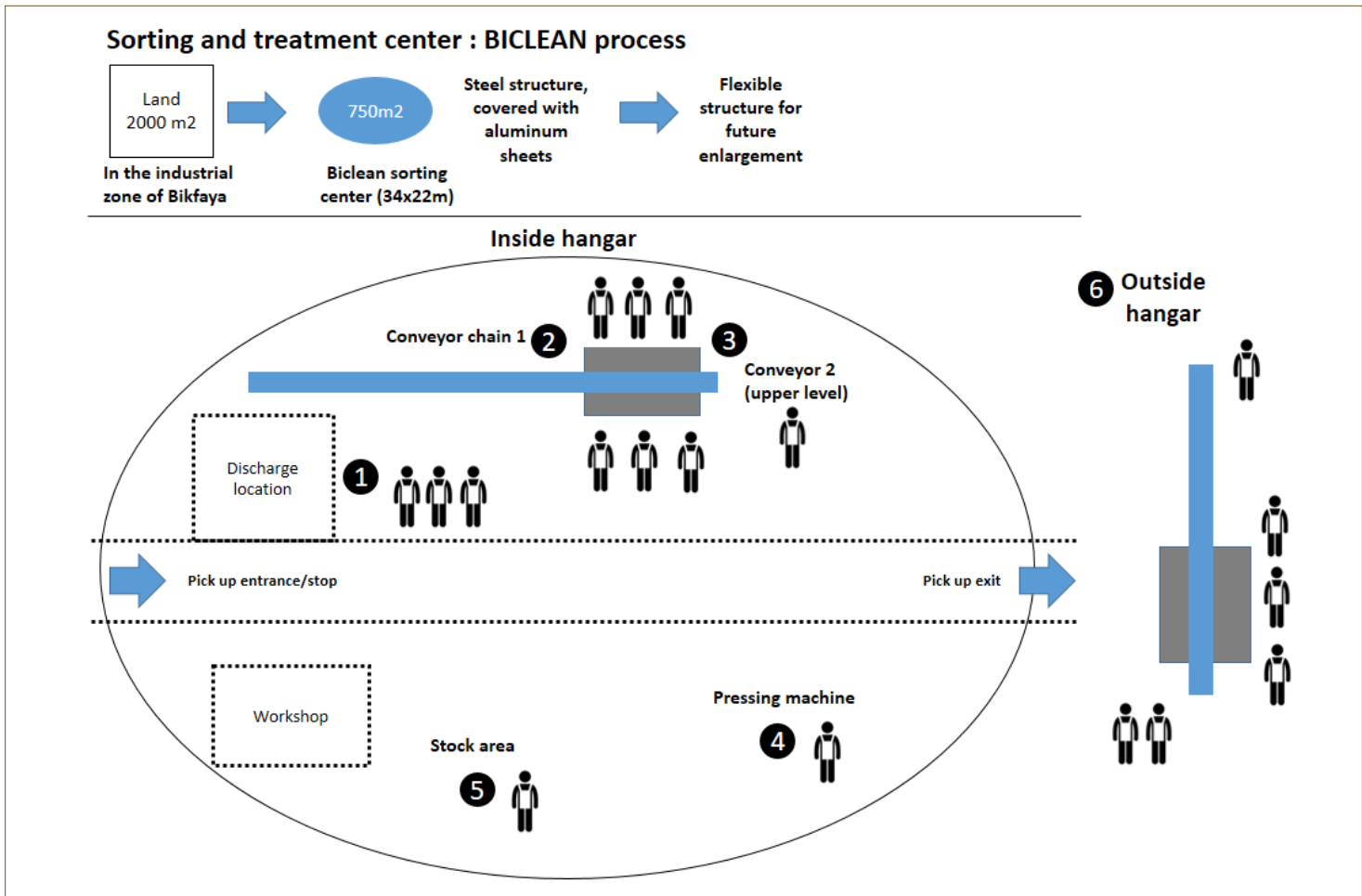
BiClean's role consists of the second round of manual sorting, using conveyors designed by a local team,⁷ followed by compression of separated waste types. The compressed waste is then sold or transported to facilities responsible for their further treatment or final disposal. No incineration or dumping occurs in the process. BiClean has the capacity to sort approximately 10–15 tonnes of solid waste per day.



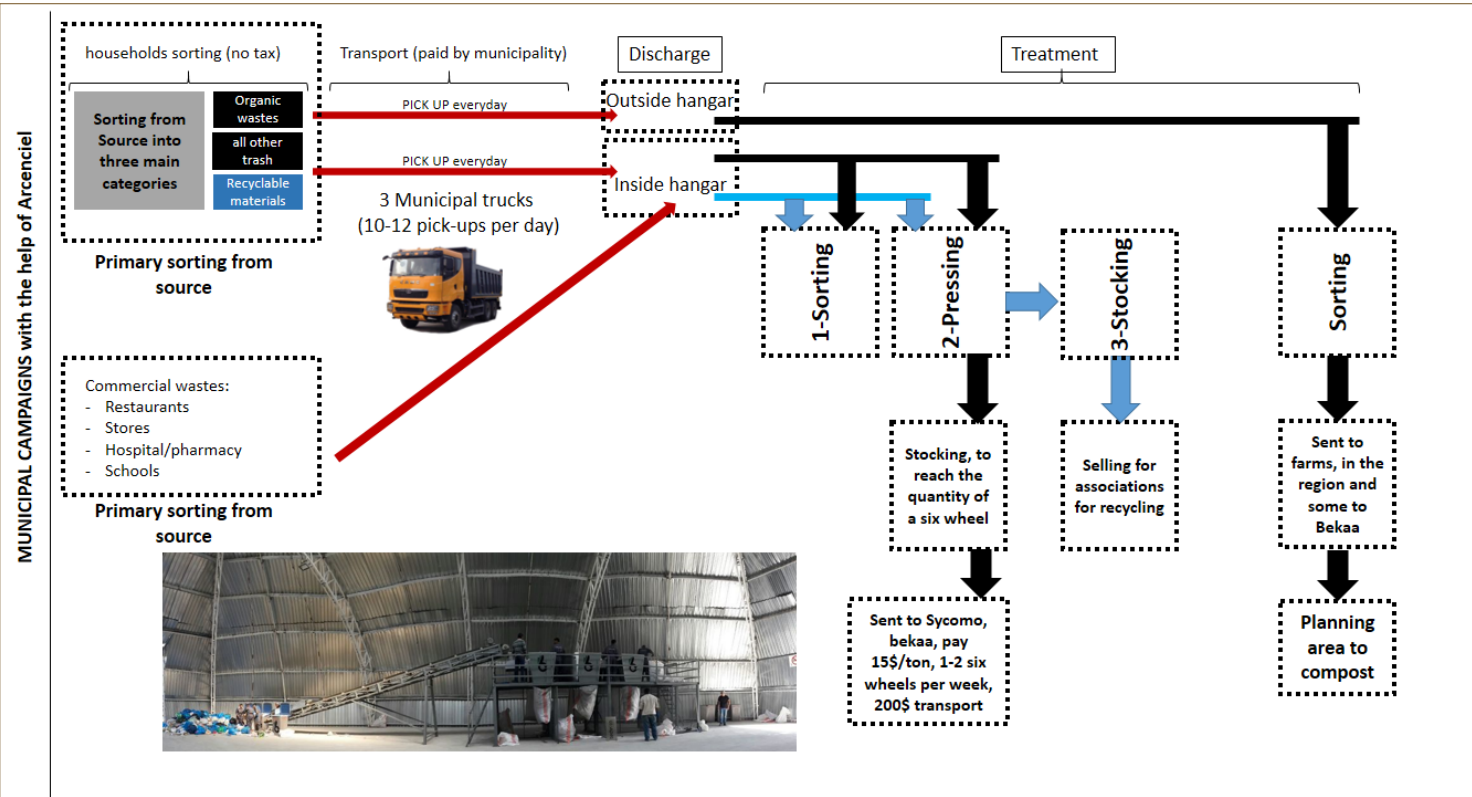
Figure 1. "BiClean" recycling facility. Source: Based on Google Earth.

⁶ Interview with Lina Gemayel, Manager of BiClean sorting facility, 28 March 2018.

⁷ Interview with the head operator of BiClean sorting facility (6 March 2018).



Graph 1. BiClean Work Process. Source: Authors (2018).



Graph 2. Sorting and Treatment Process. Source: Authors (2018).

The BiClean facility employs approximately 30 individuals, including manual sorting workers, truck drivers, pickers, and managers. The municipality monitors waste sorting and collection and manages the facility. In each of these tasks, municipal personnel are assisted by international and local organisations as well as the Kataeb Party. BiClean's physical infrastructure, equipment and all operational costs (salaries, maintenance, collection and transportation) are financed by the municipality. Although the municipal council has considered the idea of a local tax or fee to recover the cost of waste management, this is not foreseen in the current legal framework and would likely be resisted by the local population.

Political Dimensions of SWM in Bikfaya

On the political level, the Kataeb party represents the success of Bikfaya's SWM system as a result of its efforts. The kinship and political ties to the party make it difficult to demarcate where local government begins and where the party's influence ends. Current party head, Samy Gemayel, has marketed this experience as a successful example of the party's approach to SWM, along the principles of "expanded decentralisation", government transparency and environmental responsibility, in opposition to Sukleen's performance (Baaklini, 2016).



Figure 2. The head of the Kataeb party at the inauguration of the BiClean facility, March 2016. Source: <https://www.facebook.com/BiCleanleb/>.

The initiative necessitated not only the learning of technical competence, but also a sustained, collective effort. The political backing of the Kataeb party was crucial to marketing such efforts to residents. Given that neighbouring municipalities are under the influence of other political actors, they do not acknowledge Bikfaya as a model or cooperate with the Kataeb party to replicate it. The Union of Municipalities of Coastal and Central Metn, led by Mirna Murr, daughter of Metn MP Michel Murr, has, for instance, not been supportive. Instead, she has advocated a "waste-to-energy solution" for the Metn district by establishing a thermal power plant in Bourj Hammoud.

Assessment: The Issue of Sustainability

As with most local SWM initiatives, financial sustainability is a key challenge. Initially, revenues from sold recyclables covered a mere 15% of the facility's operational costs, and the expansion of the network of buyers only increased it to 20%, also considering the additional cost of transporting the recyclables. Yet, for the municipality, the financial burden of waste management is much less than what it used to be under the Sukleen contract: the facility's operational costs are estimated at 77–80 USD per tonne, a small part of which is paid for through revenues from recyclables, compared to the 177 USD per tonne the municipality previously paid Sukleen.⁸

Financial support and close oversight by Bikfaya's municipality were key to ensure the viability of the BiClean facility. Historically, the close relations with the neighbouring municipality of Saqiet el-Misk-Bhersaf have also been beneficial, allowing both to pool resources to serve a larger agglomeration. Other actors, such as local NGOs, schools, companies, and trained volunteers, have also contributed to the municipality's awareness campaign and the development of BiClean. The NGO Arcenciel has provided training and technical guidance, along with MercyCorps, USAID, UK Aid, and ACTED. Their roles, however, seem to have diminished in later stages of the project development.

Key conclusions can be derived from the Bikfaya example. Firstly, a recycling and sorting approach has enabled the municipality to face the 2015 waste crisis more effectively than most others. Secondly, Bikfaya's SWM model has generated considerable savings compared to the cost of Sukleen's services. Thirdly, the BiClean SWM system was made possible thanks to a rare model of cooperation between individuals and organisations sharing similar social, economic and political backgrounds in a relatively small area. This may mean that similar initiatives could be more difficult to implement in larger or more politically fractured areas, provided they have the resources and sustained will to implement this model. It is noteworthy that this project did not benefit from any guidance or support from the central government.

The BiClean facility has faced several technical challenges. In March 2018, the facility generated noise and odour from organic waste that affected the surrounding area, and flies could be seen around the facility, mainly due to open composting. This led the BiClean managers to stop open composting and start another project aiming to transform organic waste into liquid fertilisers, while considering sending organics to a farm in the Beqaa. The location of BiClean in a sparsely populated industrial zone, however, has meant that local complaints remained limited.

⁸ Interview with BiClean manager (28 March 2018) and the mayor of Bikfaya-Mhaydseh (17 January 2019).

A more overarching technical concern is the degree to which it relies on the disposal of recyclables, non-recyclables and organic materials by sending them, after sorting, to clients that subsequently re-use or dispose of them. When scaled, this dynamic may be unsustainable on the long term: as waste sorting in the country increases, the growing quantity of recyclables demanded by industries and enterprises may drive the price down and reduce the facility's revenues.

The sorting and recycling approach of Bikfaya's SWM also points to additional structural limitations in the financial ability of municipalities to implement such projects. BiClean currently relies on a private industrial waste-to-energy plant in the Beqaa to dispose of its non-recyclables (approx. 20–30% of the treated waste). The municipality planned to develop its own industrial facility for thermal treatment of non-recyclables with the same private investor, but such a facility requires a minimum of 100 tonnes of waste per day, which Bikfaya does not currently generate. Even if Bikfaya's surrounding towns would join the project, the break-even point would be only in 14 years. Most surrounding towns preferred to maintain their current SWM contracts, managed by the central government, because they could not ensure the stability of their financial resources, mostly coming from delayed transfers from the IMF. Because of these budgetary limitations, the municipality of Saqiet el-Misk-Bhersaf has stopped sending its waste to BiClean, thereby threatening the viability of the facility.

One of the financial limitations of the Bikfaya model stems, paradoxically, from one of its core strengths, the reliance on efficient sorting at source. The mayor describes an effective cycle, which was set off once households started sorting: "When people realised that the solution was effective, they stopped dumping." She also recalls the difficulties of convincing residents to change their behaviour before seeing the results of collective efforts (AlKantar, 2016). Municipal outreach encouraging youth participation in recycling-centric art projects (Figures 3–5) facilitated the initiative's success as did their reliance on the expertise of NGOs together with learning by trial-and-error. Though an impact evaluation has yet to be conducted, staff and local observers state that such campaigns have been effective in encouraging residents to sort at their households.⁹

Prior to the 2015 waste crisis, the Bikfaya municipality was neither particularly active nor innovative in SWM. After the crisis, however, it leveraged local political ties and communal enthusiasm to produce an environmentally conscious and relatively efficient SWM model. Yet issues of financial sustainability, scalability, and replicability highlight the challenges local governments face in managing solid waste within the Lebanese institutional landscape. While this model has proven both technically and politically successful at the micro-level, technical, financial and political considerations limit its potential to serve as an example for other areas, particularly larger, more densely populated and politically diverse ones. The example shows that costly development projects that would be more financially efficient if scaled up need to cultivate social and political cooperation. This is often impossible in the current state of the decentralisation process.



Figure 3. Participation of Scouts and School Students in the BiClean Process. Source: BiClean Facebook Page.

⁹ According to the mayor, all inhabitants sort their waste. But the quality of this sorting is medium, hence the necessity to reprocess it in the facility (interview, 17 January 2019).



Figure 4. Construction of Wall with Unused Tyres. Source: BiClean Facebook Page.

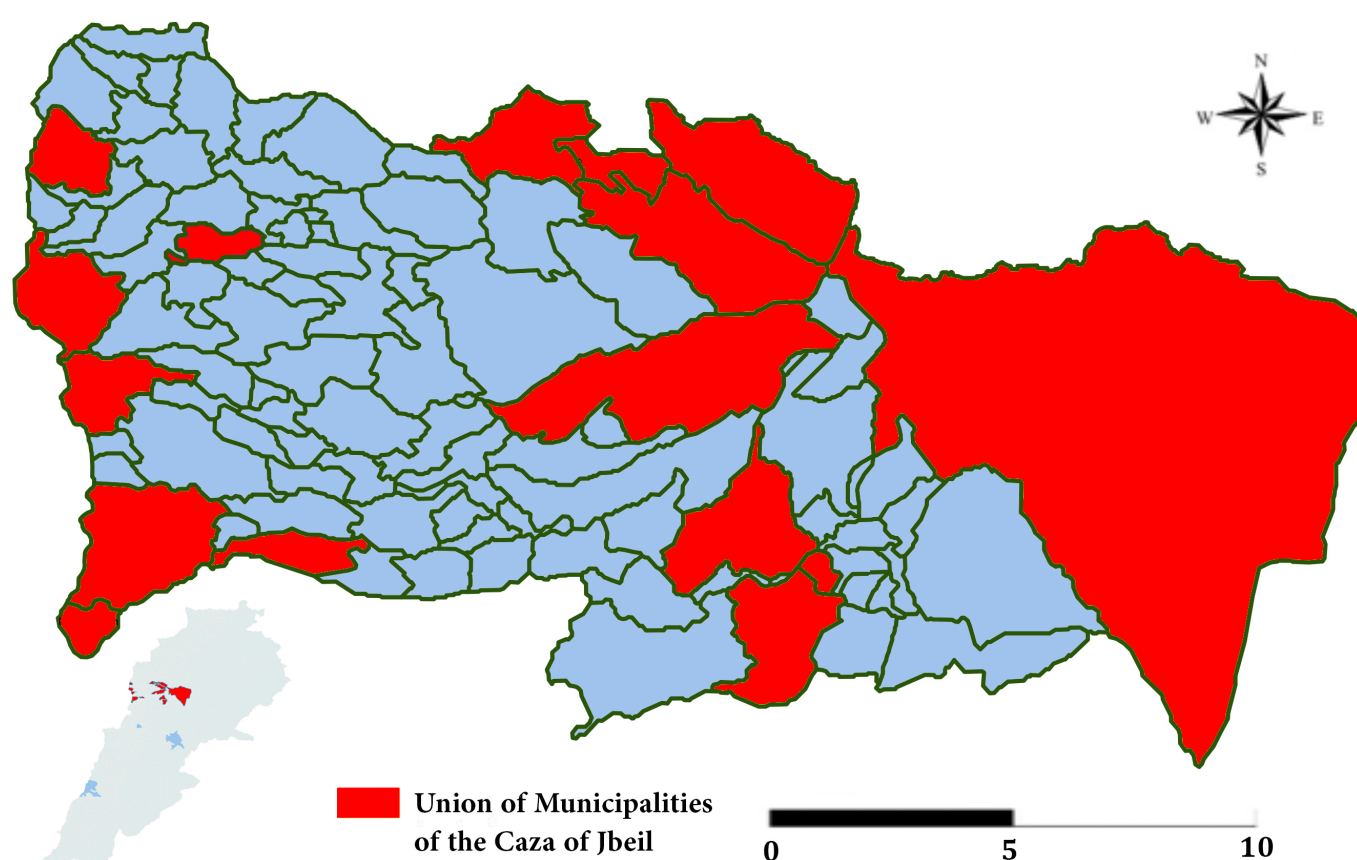


Figure 5. Different Usage of Recyclables Source: BiClean Facebook Page.

3. The Jbeil Union of Municipalities: Managing a Dumpsite Turned Landfill

The SWM treatment and disposal facility located in Hbaline is owned by the Jbeil Union of Municipalities (henceforth referred to as the “Union”). The district of Jbeil, part of the Mount-Lebanon governorate, contains 85 towns and villages across 380 square kilometres, with approximately 70,000 residents. The coastal areas have been increasingly urbanised over the last decade, while the mountainous inland remains rural. The administrative and economic centre of the district is the city of Jbeil, a key tourist destination in Lebanon.

The Union, one of the oldest in Lebanon, was founded in 1981 and is headquartered in Jbeil. It has a council of 14 members representing each of the member municipalities. The Union has a small number of employees, including two in its administrative department and six in its engineering section.¹⁰ In charge of the SWM within the Union territory is a council member, representing the municipality of Jbeil, who follows up on monthly reports, issued by the Hbaline facility managers, detailing the facility’s operations and finances.



Map 7. The Jbeil District showing the Hbaline dumpsite and the union’s area. Source: Authors (2018).

¹⁰ Interestingly, the municipality of Jbeil has far greater financial resources and more employees (approximately 110) than the Union and is more closely connected to international donors.

The Jbeil Union SWM System

In 1983, the Hbeline facility was established on 10,000 square metre land purchased by the municipality of Jbeil, with the aim to use it as an open-air dump replacing dumpsites near Jbeil's old city. In 1984, the management of the Hbeline dumpsite was transferred from the municipality to the Union, allowing member municipalities to dispose of their solid waste there. In the post-war years, confident that the dump would be a reliable solution to their problems, the Union decided not to be part of Sukleen's service area.

In 1998, the World Bank provided a USD 55 million loan to the Lebanese government, managed by the CDR, which aimed to transform major dumpsites into sanitary landfills. USD 6.5 million of this loan were allocated to the Hbeline dumpsite. Union officials claim that this funding was never delivered and that the Union later used USD 1 million from its own budget to expand the dump from 10,000 to 120,000 square metres.

Between 2004 and 2007, donations from the European Union (EUR 1.1 million), and USAID (USD 1.3 million) allowed the construction of a disposal and treatment facility to replace the one in Hbeline. The facility became operational in 2007 and was managed by the Union, with a processing capacity of 77 tonnes per day servicing approximately 105,000 residents. It initially aimed to recycle 20% of the waste received and to start composting, but its recycling capacity could not exceed 3% nor did the intended composting technique (using fermentation tunnels) ever materialise. Moreover, the facility did not end the entrenched practice of informal dumping and open-air incineration. Protests about local pollution as a result of waste burning eventually forced local authorities to close the dumpsite.

In 2010, the then-newly elected mayor of Jbeil, Ziad Hawat, a prominent local business leader, was elected as the head of the Union. Dissatisfied with the management of the Hbeline site, he decided to outsource SWM operations and ensure a more professional management of the facility by contracting Sanitek, a private company. Its poor performance led the Union to close the facility again in 2011 but Sanitek continued to manage the dumpsite without running the facility. As a result, waste piled up in the dumpsite as high as nearly 50 metres, causing a landslide into the river, contaminating the groundwater of the region (ELARD, 2011).

The politicisation of the solid waste issue in Lebanon in the summer of 2015 sparked a controversy around the mismanagement of the Hbeline dump.¹¹ Under the pressure of local politicians and activists affiliated with the "You Stink" movement, the Union terminated Sanitek's contract for managing the dumpsite.



Figure 6. Local Protesters Denouncing Waste Mismanagement in Jbeil. Source: Greenarea.me.



Figure 7. Solid waste piling up in Hbeline dump which led to a landslide. Source: Authors (2018).

In 2016, a private company, Batco, won a new tender for managing the Hbeline facility and transforming the dumpsite site into a sanitary landfill. To finance the operation, the Union contracted a USD 6.7 million loan,¹² sparing its member municipalities a heavy financial burden. Although the treatment facility was operational

¹¹ Politicians suggested disposing of the waste of Metn and Keserwan districts in Hbeline and a landmark study made by the Danish firm Ramboll suggested using the dumpsite to dispose of the fly ash generated by the incinerator planned in Beirut's Karantina area.

¹² According to the Union, the funding was contracted as an advance loan from the MoF against a 40% deduction from the Union's share of the IMF.

again, it could not accommodate the quantity of incoming waste (approximately 170 tonnes per day). Given that Batco charges the Union 30 USD per tonne of waste, the loan will likely sustain the costs for four years only. The collection and transportation of waste to Hbaline remain the responsibility of individual municipalities, of which only Ehmej and Jbeil sort at source. Had sorting at source been mainstreamed in the Jbeil area, the facility would have had higher chances of viability.

The current SWM system meets the basic collection needs of the Jbeil district. The Union and every municipality in the district pay Sanitek for waste collection on a per-tonne basis, with Batco running the facility to this day. The treatment method consists of separating organic waste from recyclables through visual checks, manual and mechanical sorting, then landfilling organic materials. Today, around 10% of the surface of the dumpsite has been transformed into a sanitary landfill. Only 4% of the incoming solid waste is sorted,¹³ partly because of the absence of municipal initiatives encouraging sorting at source. The facility has around 30 workers supervised by the landfill director who oversees operations and helps to develop a database for incoming and outgoing waste. The operations are also overseen by the Union representative.

In 2018, the Union launched a tender to expand the sanitary landfill and the sorting facility and build 21 fermentation tunnels for composting. The successful bidder should bear the responsibility of the facilities' financial sustainability, while the cost of waste collection, no longer borne by the Union but the member municipalities will rise from USD 30 to USD 35 per tonne. The contract has not been awarded yet (August 2019).

Assessment: Outsourcing to the Private Sector

Since Hbaline's inception, the Union has remained the chief decision-maker in SWM. Despite political rifts between the political factions that compose the Union's council,¹⁴ all SWM-related decisions were taken by consensus between the Union's municipalities.

Local activism has played a minor role, only noticeable in the aftermath of the "You Stink" movement when a group of protesters blocked the entrance of the Hbaline facility to oppose the import of waste from outside the area.

Little conflict existed around the facility's technical specifications and the issue of waste-to-energy. Overall, the rehabilitation of the site and its gradual transformation into a sanitary landfill has been accepted by the Union as the optimal solution to regional SWM, although its financial sustainability was recognised as a major challenge. In 2010, the Union reached a quick consensus to outsource the management of Hbaline to the private sector believing in the superiority of privatised management. The results have proved this assumption wrong, but the municipality of Blat decided separately, in 2016, to establish its own treatment plant that would be built, owned and managed by a private company based on sorting and gasification technology, treating 200 tonnes of waste per day for Blat and neighbouring areas (Kazzi, 2018).



Map 8. Hbaline dumpsite. Source: Google Earth, adjusted by the authors, 2018.

¹³ Interested companies and factories purchase sorted materials on site.

¹⁴ Five supporters of the Free Patriotic Movement, three supporters of the Lebanese Forces, one Hezbollah supporter, and five supporters of former MP Fares Souaid.

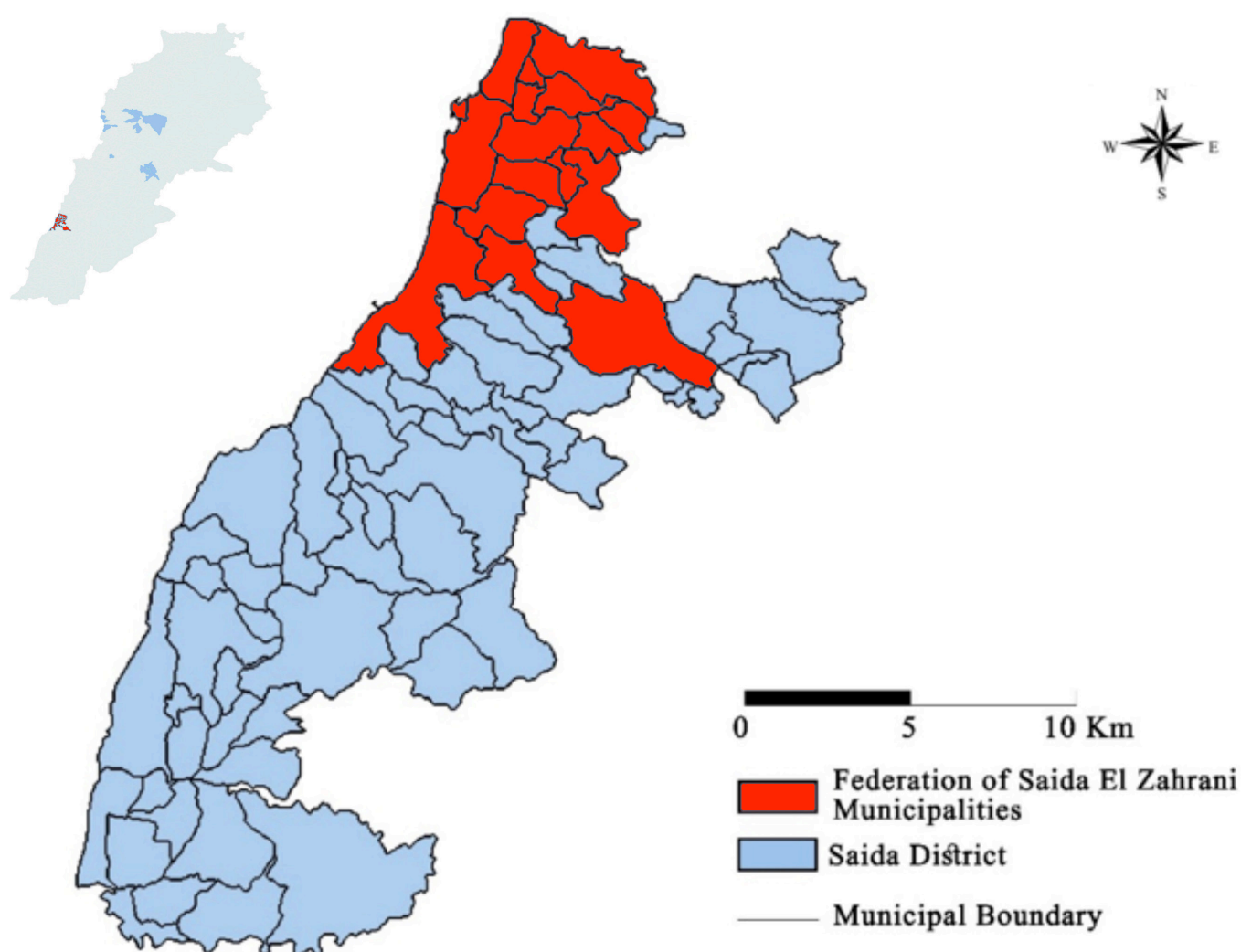
In terms of technical and administrative design, the current system cannot address the needs of the serviced area. Without sorting at source and the full rehabilitation of the dumpsite into a sanitary landfill Hbaline is environmentally and financially unsustainable. The current plans to expand the sanitary landfill and create fermentation tunnels for composting would improve Hbaline's operational efficiency.

The Jbeil Union's management of Hbaline since the mid-1980s demonstrates that local authorities still lack the financial, human and technical capacities to manage their solid waste. Despite being one of the old municipal unions in the country, and one that was subjected to central government interference in SWM, the Union could not devise a structured framework to manage its waste. Beyond purely technical, administrative, financial and political decision-making issues, the case of Jbeil Union suggests that a master plan for SWM is absent. This highlights the importance of planning and inter-municipal coordination as decisive success factors. The DRI 2019 survey report shows that, while most Lebanese local authorities advocate integrated solutions for SWM in which they play a major role, they still lack a concrete vision for it. This is especially true of municipalities, 50% of which have no plan for SWM, compared to 12% of municipal unions (DRI, 2019).

4. The Municipality of Saida and the Union of Municipalities of Saida-Zahrani: A Controversial High-Tech Approach

The district of Saida, located in the South-Lebanon governorate, has an estimated population of 250,000 spanning 47 towns and villages along the coast and hilly interior. The eponymous capital of the district and its financial and administrative centre has approximately 65,000 inhabitants and with its outlying areas constitutes the third-largest urban area in Lebanon in terms of population, after Beirut and Tripoli. The Saida-Zahrani Union of Municipalities, established in 1978, is the sole union in the district and encompasses most of the greater Saida city area, along with several nearby villages, including 16 municipalities in total. Historically, the municipality of Saida city has played the leading role in managing the Union and its mayor is typically elected as the Union president.

The SWM system in the Saida area consists mainly of two sites. The first is an open-air dump along the coast, which was rehabilitated in 2015 by private companies hired by the municipality with international donor funding. The second is a waste treatment facility, again financed by external donors and managed by a private company, IBC, established in 2004.



Map 9. The Saida District and the Union of Municipalities of Saida-Zahrani. Source: Authors (2018).

The Saida Region SWM system

An open-air dump established in 1975 on the southern shore of Saida city (only 200 metres away from residential areas) and managed by the municipality constituted its primary mode of managing solid waste for a long time. Soon after its establishment, the dumpsite became overloaded by rubble and demolition waste from buildings destroyed during the civil war. It still was used for solid waste disposal from neighbouring municipalities in the district (EJAtlas, 2015). By the time it was dismantled in 2015, the so-called “rubbish mountain” contained approximately two million cubic metres of solid waste and received 300 tonnes of waste per day without maintaining a basal lining barrier or leachate¹⁵ collection system, both vital requirements of a sustainable landfilling system.

The dump reached nearly 55 metres high and covered an area of 60,000 square metres. High summer temperatures caused recurrent fires, due to methane generated by decomposing organic waste, and fumes from the site exposed nearby residents to toxic air. There were concerns about environmental and health repercussions, and the stench prompted complaints from fishermen and city residents, and even an official warning from Cyprus (UNDP, 2013). The Saida dump was ranked first (for or concerning) its environmental risk potential (UNDP/MoE, 2016).

In part due to calls for action from government officials, civil society, the private sector, and the media, the municipality of Said, in collaboration with UNDP, decided to close the dumpsite in 2012. With support from UNDP, the Saudi Arabian government, and the Prince Walid Bin Talal Humanitarian Foundation (UNDP, 2017), the dumpsite was transformed into a sanitary landfill using a “mining” technique that consists in treating waste at the dumpsite. The rehabilitation process also tackled the issue of leachate as well as gas emanations. In April 2016, a 33,000 square metre park was opened on the reclaimed land at the site.

The rehabilitation project was part of a larger plan for SWM in greater Saida. The city’s waste was redirected to a new site opened south of the urban centre, where the private company IBC built a mechanical biological treatment plant for organic waste in 2010, after the plan’s initial conception in 2002 and the designation of a 38,000 square metre site by the municipality in 2005.

The IBC-run treatment plant did not begin operating until 2012, after five years of contract negotiations with the Saida-Zahrani Union. Currently, the IBC facility employs approximately 200 employees. Unlike the facilities of Bikfaya and Jbeil, the Saida facility has the necessary technical expertise to operate such a complex plant, including managers capable of interfacing between numerous partners, clients, sub-contractors and consulting firms.

The treatment plant includes seven stages. Around 500–600 tonnes of waste are delivered daily to the plant. NTCC, a private company contracted by the Union to collect and transport the waste within its area (including the Palestinian refugee camp of Ain el-Helweh), delivers approximately 230 tonnes per day; the Union of Municipalities of Jezzine delivers approximately 12 tonnes, and the municipality of Beirut sends about 200 tonnes daily. The waste is then sorted, treated through a process of anaerobic digestion, and then processed to generate electricity. Organic materials are packaged as organic fertilisers, plastics are recycled, and refuse-derived fuel is sent to cement plants.

Capacity issues have consistently plagued the Saida treatment facility, largely because of contractual shortcomings. Initially, the contract with IBC stipulated the sorting and treatment of 200 tonnes of waste daily, generated by Saida and the 15 municipalities constituting the Union, for 20 consecutive years, based on a feasibility study conducted by IBC to forecast the project’s profits from selling the generated compost and recyclables. In this scenario, IBC would not charge the municipalities for treating the incoming waste.

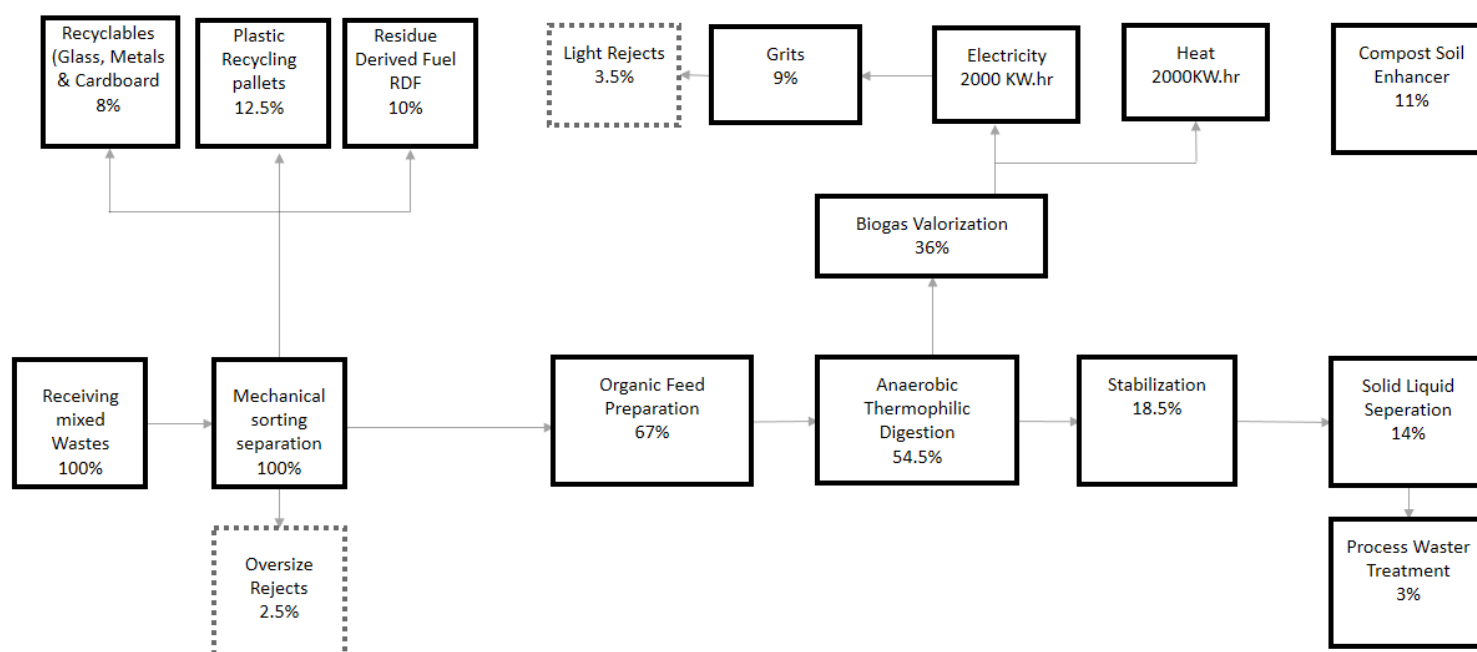
During the construction of the plant, IBC reported inaccuracies in its feasibility study. It claimed that the activity of informal waste collectors reduced its profit margin and that the revenues from the produced compost are too small given its poor quality, thus not enabling the recovery of operational costs. IBC raised this concern to the municipality of Saida and local politicians and froze its investment to negotiate new prices for incoming waste.

To make the facility profitable, IBC said it would need to invest an additional sum of USD 15 million from its own funds to expand the facility, with a required minimum input of 350 tonnes of incoming waste and USD 85 per treated tonne in the first two years (instead of no cost, as initially projected), to be increased to USD 95 in the third and fourth years. This tariff would be revised every two years. After the intervention of Saida’s dominant political actors, mainly the Future Movement, the Union of Saida-Zahrani agreed to this new contract. To reach the required minimum input, the Union of Jezzine and the municipality of Beirut send their waste to the facility. IBC expanded the facility to treat 500 tonnes of waste per day.

¹⁵ Liquid, which may be partly produced by decomposition of organic matter, that has seeped through a landfill or a compost pile and has accumulated bacteria and other possibly harmful dissolved or suspended materials. Uncontrolled leachate can contaminate groundwater and surface water.

Quantities arriving since 2015, however, have far surpassed this capacity, leading to the accumulation of waste near the facility. The temporary closure, for rehabilitation purposes, of an industrial waste-to-energy facility in the Beqaa that received IBC's residual waste after the treatment, led to further waste accumulation at the Saida site. IBC subsequently began shredding the residuals with gravel and dumping it in a nearby sea site enclosed by a breakwater, dubbed the "pond".

The foul smell emanating from the contaminated "pond" led to protests organised by civil society activists and political opponents of the Future Movement-backed municipal council. An expert commissioned by the activists to determine the causes of air pollution concluded that the dumping of residuals in the "pond" was the main source of pollution. Activists then filed a lawsuit against IBC for breach of contract and encroaching on the public maritime domain. In the summer of 2018, protesters occupied the IBC plant, causing it to suspend its activity. Waste began piling up in the streets of Saida, which prompted the municipality and the Union to stop importing waste from outside the district and ask IBC to treat the waste appropriately. As of June 2019, the situation does not seem to have stabilised.



Graph 3. Original Design of the Sorting and Treatment Process. Source: Authors (2018).

Political Dimensions of SWM in Saida Municipality

The Union of Saida-Zahrani, the municipality of Saida, and IBC are the central actors of the SWM system in the area. The fact that the mayor of Saida is also the Union president has caused some confusion and ambiguity as to the respective responsibility of the Union and municipality: while the Union is the main contracting authority, all negotiations with IBC were undertaken by the municipality. So far, the relationship between the municipality and IBC has been characterised by conflict and miscommunication.

Negotiations between the municipality and IBC's general manager began in 2003, when no adequate municipal-owned land was available. The proposed solution was to allow the company to reclaim the needed land from the seaside, and to compensate the company with USD 8 million for this investment by offering ownership of the land after 20 years of operations. As this land is public maritime domain, its assignment to a private company is conditional upon the execution of a project of public interest. As such, IBC and the municipality agreed in 2012 that the land would be used only for SWM purposes. The contract also stipulates that, should the company fail to respect these terms, the municipality shall be entitled to take control of the plant's operations at IBC's cost. Additionally, the company would have to treat the 200 tonnes of daily waste received from the district of Saida for no cost.

Founded by the late Prime Minister Rafiq Hariri and led by his son, current Prime Minister Saad Hariri, since 2005, the Future Movement has its strongest base of electoral and popular support in the city of Saida, where the Hariri family originates from. Bahia Hariri, Rafiq's sister, has been representing Saida in Parliament since 1992, and the municipal councils elected in 1998, 2010 and 2016 are endorsed by the Movement.

Since 2010, the mayor of Saida has led various SWM initiatives, in part due to a campaign promise that he would solve the city's SWM problems. He has leveraged the support of the Future Movement, along with local prominent business leaders and other international investors. The mayor has marketed these efforts as part of a larger vision for Saida's future, in which economic opportunity and quality of urban governance are mutually enhanced via public-private partnerships.

As the mayor of Saida, IBC's general manager is a close affiliate of the Future Movement, which has strong relations to political and economic elites in Saudi Arabia. Given how the SWM treatment facility in Saida was funded (through Saudi assistance) and contracted (to IBC), dismantling the "rubbish mountain" and the creation of the facility is often framed as a Future Movement project. The project was suspended when opponents to the Future Movement camp won the 2004 municipal elections, to be reinitiated when the Movement regained control in the municipal council in 2010. Saudi funding, mediated through Future Movement channels, has played a role in the funding of the SWM project. When contractual issues marred the relationship between the municipality and IBC, the party-affiliated Minister of Interior and Municipalities at the time intervened to broker a resolution. To assist in the renegotiation of the contract with IBC, the municipality of Saida was relying on a legal consultant affiliated to the Hariri Foundation, the philanthropic wing of the Future Movement.

The implementation of SWM in Saida since 2010 has largely depended on local and national political networks, calling the system's sustainability into question. A change of political control of the municipal council in 2022 could result in a radical change in the current SWM system.

Assessment of the Saida-Zahrani SWM Strategy

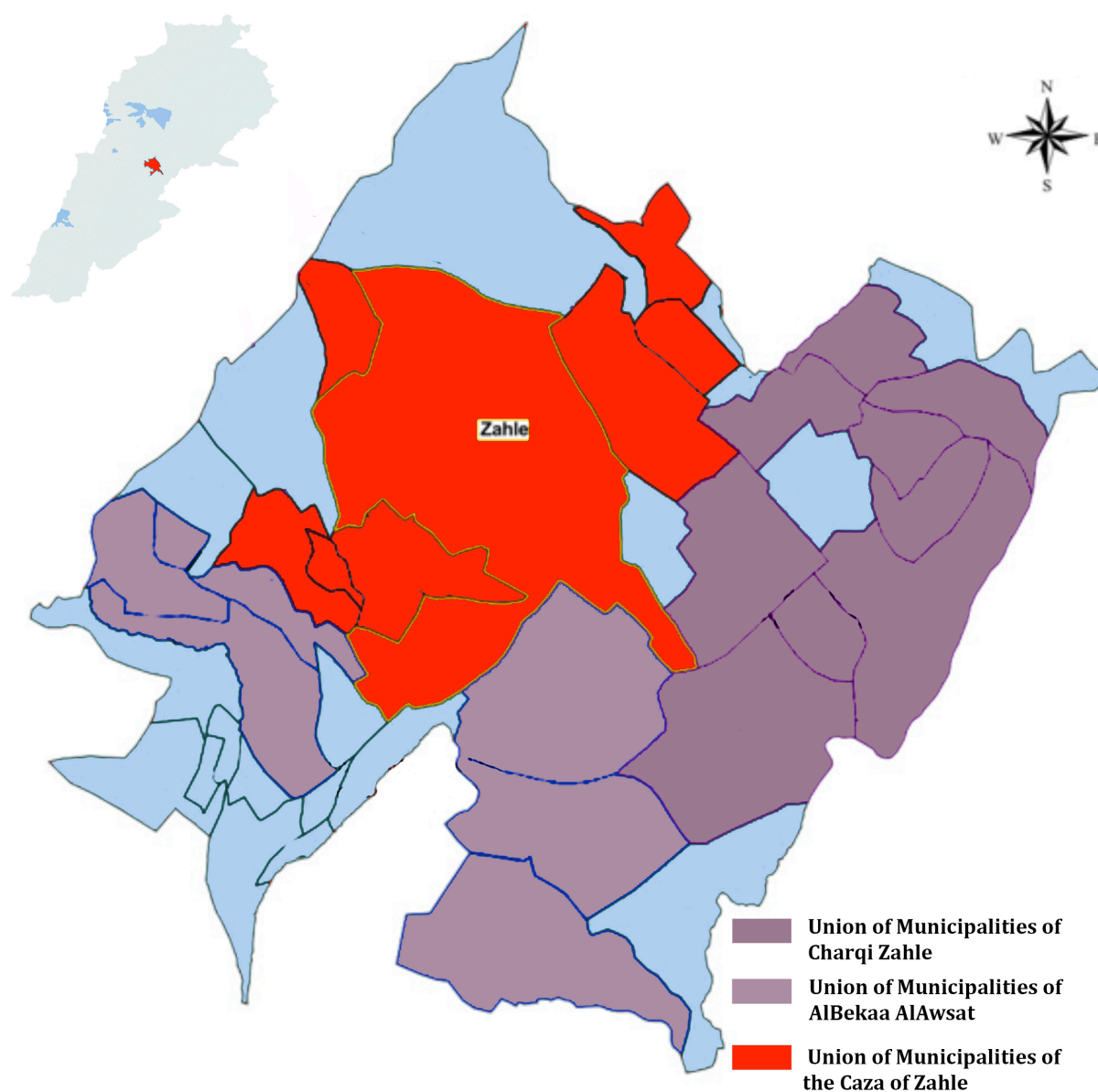
According to its political backers, the Saida treatment facility and rehabilitation of the city's "rubbish mountain", have turned a catastrophic situation into an environmentally friendly and sustainable SWM system. Privatisation is praised for ensuring efficient management of solid waste. In this sense, IBC has consistently represented itself as a technological innovator and as adopting a more advanced treatment method than the landfilling or sorting facilities in other areas.

To its critics, the Saida treatment facility represents an effort by the Future Movement to maintain control over the local authority. Activists have criticised the position of the local authority towards the private contractor, which is sometimes perceived as keeping the local authority on a leash by offering limited choices or withdrawing when the terms and conditions did not result in a satisfactory profit. The local authority accepted contractual terms that, in addition to being not financially optimal, expanded the initial service area to ensure the operational and financial stability of the model proposed by the contractor. Activists also criticised that the local authority has not made enough efforts to encourage sorting at source.

5. The Municipality of Zahlé: A Successful Landfilling Approach that is Reaching its Limits

Zahlé is Lebanon's fourth-largest city with approximately 72,000 residents and an urban cluster of approximately 157,000 people that extends far beyond the city's municipal boundaries. It is located in the Beqaa Governorate. Currently, more than 160,000 refugees from Syria are residing there. The district of Zahlé contains 29 municipalities and 3 municipal unions: the Union of Zahlé District, the Union of East Zahlé, and the Union of Central Beqaa.

The municipality of Zahlé has a relatively large administration of 225 employees; its council has 21 members and 35 municipal committees. It owns a sorting and composting facility and a sanitary landfill in Haouch el-Oumara, a flatland area just outside the city. Both facilities are managed by a private company contracted by the municipality and overseen by the mayor and a committee appointed by the municipal council.



Map 10. The district of Zahlé and its Unions of Municipalities.
Source: Authors, based on the Localiban map (2018).

Zahlé's SWM System

In the 1960s, the municipality of Zahlé created a dumpsite in Haouch el-Oumara, just outside the city limits, which reached its maximum capacity in the mid-1990s. In 1998, the World Bank's Household Solid Waste Management Plan (SWEMP) funded the acquisition of waste collection and street sweeping equipment for Zahlé and other cities, where construction works of sanitary landfills and rehabilitation of uncontrolled dumpsites were completed.

As part of this project, Zahlé's new sanitary landfill was built on another municipal-owned land closer to the Litani river, where Zahlé's wastewater treatment plant is hosted today. This landfill's capacity was estimated to be reached in 2025. With USAID support (USD 2.4 million), the municipality later enlarged the site by establishing a sorting facility and a methane flaring unit. In 2014, the municipality used EU funding to develop a composting facility in the same area, which reduced landfill by 70%.

The rehabilitation of the 1960's-era Haouch el-Oumara dumpsite proceeded in several steps. While the original contract required excavation and transfer of 103,000 cubic metres of solid waste, the actual amount of waste removed exceeded 225,000 cubic metres. The operator designed and installed a system to extract the biogas from the decomposing waste and burn it under controlled conditions. Once the solid waste was removed to below ground level, a cap consisting of compacted fill was placed over the entire site. Proposals aim at transforming the site for future public use, e.g. into a park, playground, sports field or vegetable market.

Recent concerns about the finite capacity of the Zahlé treatment and landfilling facilities have led the municipality to explore an alternative SWM system based on waste-to-energy technologies.

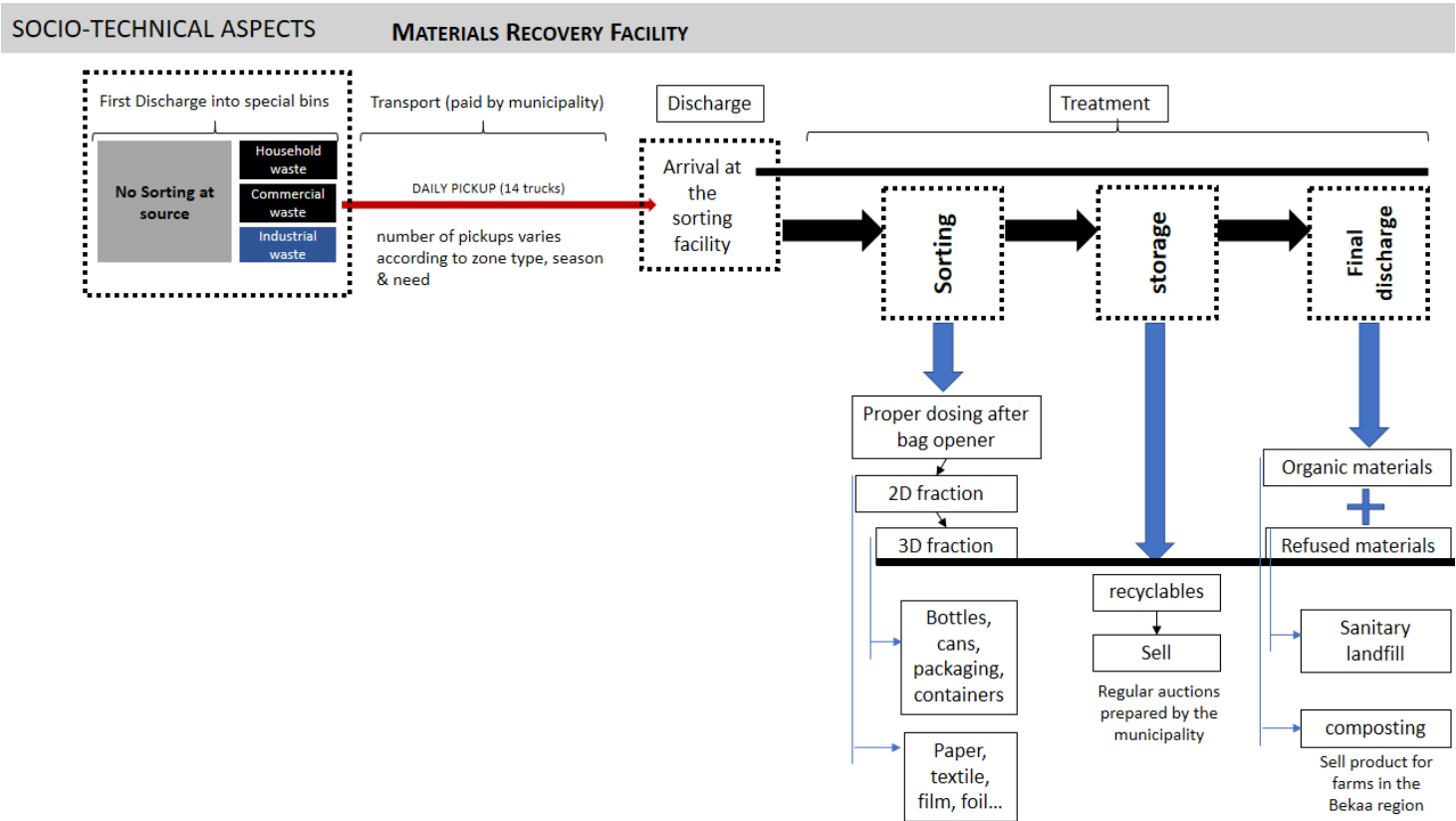
The waste management services provided by the municipality of Zahlé cover most municipalities of the district – a unique feature given the district's sectarian and political diversity, the multiplicity of municipal unions, and the high number of refugees in the area, who have generated unexpected additional quantities of waste. Zahlé's facility does not service the neighbouring towns of Qab Elias and Bar Elias, which dump and burn large quantities of waste.

Collection and transportation of solid waste to Zahlé's facility fall under the responsibility of the 26 municipalities using it. The city of Zahlé is estimated to generate approximately 115 tonnes of waste per day, collected by 14 trucks donated by the World Bank. The facility accepts five types of solid waste: household waste, retail waste, organic waste from parks and gardens, market waste, and demolition waste from households. Hazardous medical and industrial wastes are not accepted.

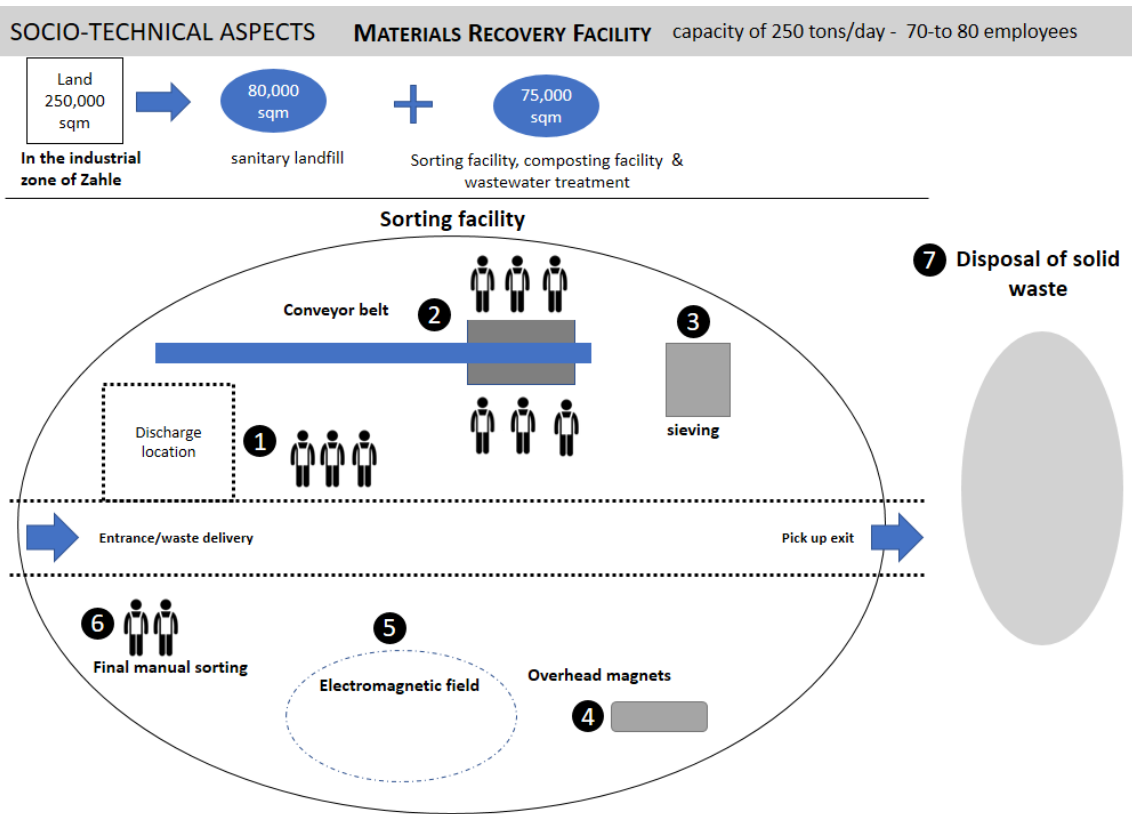
All non-recyclable materials, mainly organic waste, are either landfilled or composted. As the quality of the produced compost has not yet reached the desired standard to be commercialised, the compost is currently used as soil for the treatment of the landfill. Leachate is collected and sent to Al-Ghadir's wastewater treatment station (south of Beirut), because the leachate treatment plant is not yet operational.

The treatment and disposal facilities of Zahlé include several technical components: (1) a sorting and processing plant with an average capacity of 250 tonnes per day, (2) a composting facility with an average capacity of 90 tonnes per day, (3) a five-cell sanitary landfill, (4) a leachate treatment plant with a treatment capacity of 35 cubic metres per day, (5) a gas flaring unit with a maximum capacity of 300 Nm³ (normal cubic metre) per hour, and (6) a non-operational sorting and processing facility with an average capacity of 60 tonnes per day, which stopped its operations following the construction of the abovementioned processing plant.

In 2001, the municipality contracted a private company, SERDIM-SCS, to rehabilitate the old dumpsite, complete the construction and run the new sanitary landfill. It contracted another company in 2015, EES, to operate the waste sorting and composting facilities. A consulting firm, MORES, oversees the facility's operations for the municipality on-site since 2011. The development of the Zahlé facility relied heavily on international donor funding, while the management of the facility is funded through revenues generated by processing incoming waste. The total cost per treated tonne is around USD 30, which is covered by the investment (USD 17 per tonne, financed by an international donor) and the revenues from operations (around USD 13–18 per tonne, paid by the municipalities). There is a very small profit margin. Revenues from the selling of recyclables are only USD 400–500 per month.



Graph 4. Solid waste management in Zahlé. Source: Authors (2018).



Graph 5. The Sorting Process. Source: Authors (2018).

International, National and Private Actors Involved

The municipality of Zahlé has maintained close relations with national and international actors to develop its SWM system. National authorities like the CDR, OMSAR and MoE have acted as mediators between the municipality and international donors, such as the World Bank, the EU, USAID, UK Aid, MercyCorps, and CHF International. Private contractors and consulting companies have also been involved in the process, usually operating on 3–5-year contracts. Assaad Zogaib, the mayor of Zahlé from 1998 to 2010 and again since 2016, has supported public-private partnerships and maintains strong relations with the city's economic actors. Recently, he has been advocating waste-to-energy as an alternative to landfilling.

The municipal council elected in 2016 was supported by a coalition of the three major Christian parties (Kataeb, Free Patriotic Movement, and Lebanese Forces), which defeated the list backed by Zahlé's large families. The mayor does not seem to abide by partisan lines but promotes a technocratic approach. He claims the credit for ending waste dumping and open burning, and for introducing a very low price for waste treatment for municipalities (USD 13–18 per tonne depending on the municipality's waste quantity), only reflecting the operational cost. These amounts contrast with the excessive prices and sub-par quality of services that characterised Sukleen's contract with the central government. Indeed, Zogaib garnered popular support in 2007 to safeguard the municipality's autonomy by rejecting the imposition of the CDR-run SWM contract for Zahlé. Despite joining the District of Zahlé Union of Municipalities in 2016 and the fact that the SWM facility services most towns and villages of the district, he also maintains that the municipality of Zahlé, rather than any of the district's three unions, should maintain responsibility for the management of solid waste.

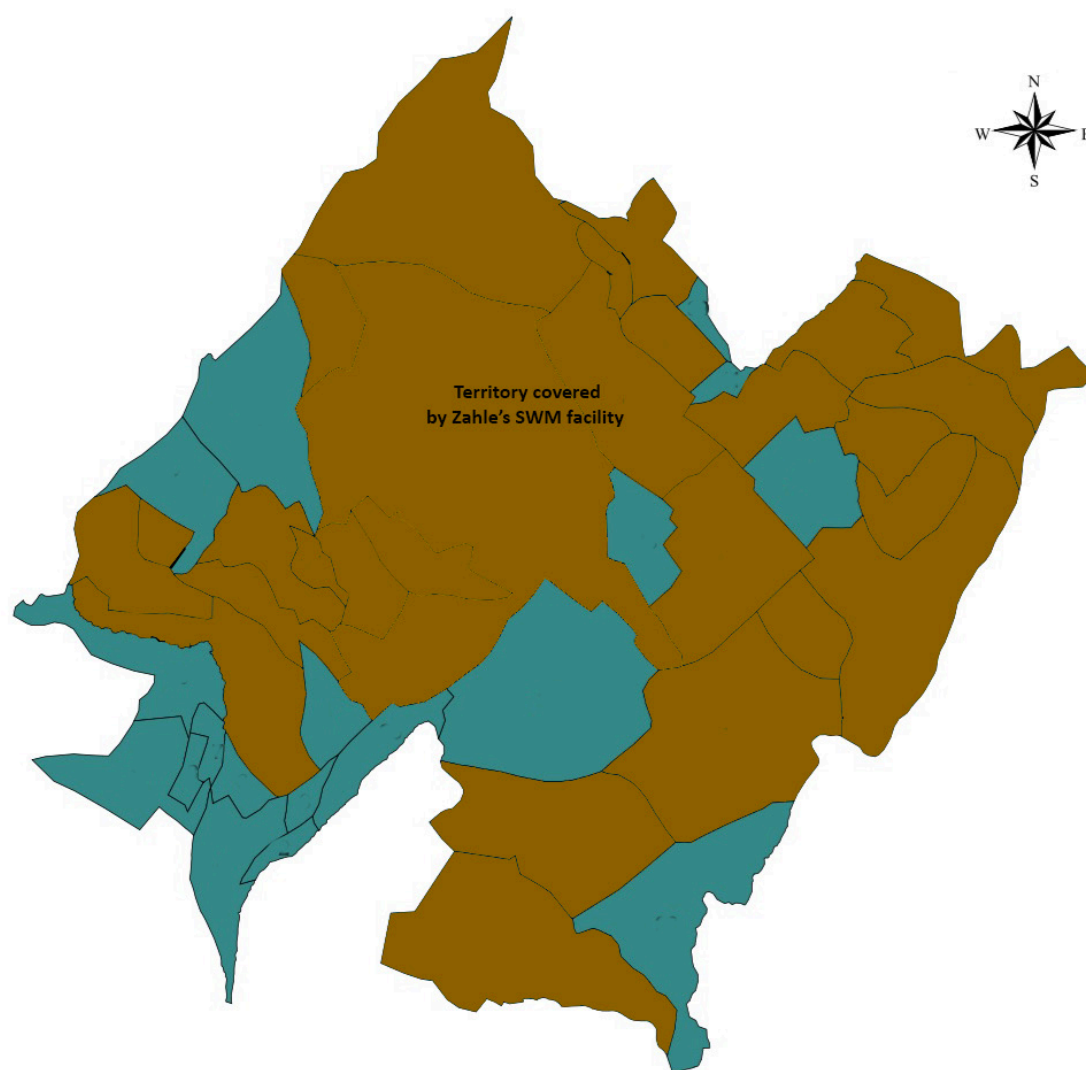
Assessment: Public-Private Partnerships

Like many others, Zogaib sees in SWM a potentially lucrative sector where the private sector should play a major role, particularly for financing investments, rather than relying on the support of international donors. Public-private partnerships allow local authorities to remain the steering force in developing the SWM sector. Mr. Zogaib is currently consulting with different actors and investors to launch a new PPP company that would build a waste-to-energy facility and generate electrical power by using a waste-energy alternative.

Zahlé and the surrounding villages have managed to effectively control the impact of waste on underground water and the soil. Proper functioning of the sanitary landfill has prevented waste odours from spreading in the region around the landfill. The landfill's location in an agricultural and industrial zone relatively far from residential areas has also helped minimise its toxic impact on the population, but these environmental achievements are not the result of innovative environmental technologies.

However, the presence of a strong municipal government and political leadership are not enough to ensure sustainability. Local authorities remain dependent on revenue transfers from central government authorities and international donors. They also depend more on the personal networks of their leadership rather than an institutionalised system: when Zahlé's mayor lost his seat between 2010 and 2016, the SWM facility was mismanaged and fell into disrepair, similar to the situation in Saida after the electoral loss of the Future Movement. The dependence of municipal efficacy on individuals rather than on institutions is a sign of fragility.

Finally, it is striking that the municipality of Zahlé has been inactive, throughout this long process, in encouraging sorting at source. This is reflective of a paradox. According to DRI's survey of 209 municipalities, 91% of Lebanese municipalities favour sorting-at-source, primary sorting and simple recycling techniques to mitigate the effects of the waste management crisis. However, only a quarter of them said they had started this process. In the case of Zahlé, the municipality has claimed that exorbitant resources would be necessary to lead awareness campaigns and modify citizens' behaviours. The experience of Bikfaya, however, shows that grassroots initiatives do not require enormous resources if they tap into volunteer networks and are led by the municipality.



Map 11. Service area of the Zahlé waste facility.
Source: Authors, based on Localiban map of the Zahlé district (2018).

6. Emerging Dynamics in the Decentralised Management of Solid Waste in Lebanon

The municipalities of Bikfaya, Saida, Zahlé and the Union of Municipalities of the Jbeil district showcase the innovative approaches and inclusive practices local authorities have used to manage solid waste, particularly against institutional, economic and financial challenges.

The case studies offer a view of the diverse landscape of SWM policies and technologies but also local public policy in Lebanon. They show that, without an overarching institutional framework, policies and technical solutions are vulnerable to local geographies, the economy, politics, financial parameters, community engagement, and involvement of powerful local officials. Even if those frameworks are adopted, such factors will likely continue to wield a destabilising influence.

Several trends can be identified in decentralised management of solid waste since 2015. The first trend is the shift, at the level of local authorities, towards the outsourcing of waste management by contracting private firms interested in more sophisticated technologies and therefore in more lucrative contracts. The second one is the adoption of only some good practices such as waste reduction, sorting-at-source, recycling and citizen engagement despite more encouraging initiatives. The third are structural challenges that local authorities grapple with to develop sustainable, scalable and economically viable solutions.

Waste Capitalism and the Imbalance Between Private and Public Actors

Since the Lebanese government's contracting of Sukleen for the management of solid waste in greater Beirut and Mount-Lebanon in the 1990s, SWM became a highly profitable sector that was monopolised by large firms connected to influential political figures.

In recent years, we observe the emergence of a new dynamic in SWM that we label here as “new waste capitalism” because of the dominance of private sector companies in shaping solutions to SWM in Lebanon. While the waste capitalism of the 1990s, still present in the SWM contracts awarded for Beirut and Mount-Lebanon, is associated with the dominant sectarian factions at the national level, the new one is developing at the local and regional levels and involving an increasing number of large private firms connected to political interests or motivated by profitability, at the expense of municipal interests. Central authorities, like the CDR, are less involved in the planning and the operation of new waste plants, which are now increasingly financed, implemented, and managed by

non-public actors (especially private companies) through formal and informal arrangements with local authorities – as in the case of Saida and as is planned in other municipalities like Blat, Beit Mery and Hbaline.¹⁶

While “conventional” waste capitalist ventures largely focused on waste collection and dumpsite management, the new investors are less interested in waste collection than in highly profitable treatment technologies that are new to Lebanon, such as composting and waste-to-energy solutions through thermal or biological treatment, because they anticipate that legal and regulatory frameworks will allow them to profit more from these types of waste management. Such frameworks include the laws regulating the role of the private sector in the sectors of energy and water and the Public-Private Partnership (PPP) Law No. 48 issued on 7 September 2017.

In Saida, the solution provided by the private company was not adequate to the nature of waste, which required costly adjustments, the price of which had to be borne by the local taxpayers. In Zahlé, the variability of solid waste composition has made it impossible to produce high-quality compost that can be commercialised. This negatively affected the performance of the private companies, which depend on the profits generated from solid waste. This quest for profitability often leads to the imposition of new contractual arrangements over which local authorities seem to have limited control. In the end, the informality and the ad hoc nature of local SWM policies often lead to an escalation between municipal and private actors, in which the latter maintain the upper hand.

Lebanese local authorities have reacted to this in two ways. Most commonly, they limited themselves to the role of a client and abdicated their responsibility to implement policies serving the interest of its constituency and ensuring the most affordable price. This carries the risk of local authorities adapting their policies to maintain or optimise the investors' profit margins. In rare cases, they have clashed with private contractors over environmental, health, and urban planning concerns. In the contract negotiations and controversies arising from these concerns, the local authorities had to strike an unsteady balance between public and private interests.

The Lebanese political economy has long been oriented around political affiliations and been influenced by the country's main political parties and their patrons, who are mostly wealthy landowners. Therefore, Lebanon's

¹⁶ A recent article suggests that corruption might be considerable in this sector (Jay, 2019).

emerging SWM market rarely follows values like free competition, fairness, transparency and merit-based contract negotiation. The politicisation of SWM policies has been detrimental to good governance and the sustainability of these projects (Saida), but in some cases it also played a consolidating role (Bikfaya).

SWM Profitability and Financing Schemes

In recent years, solid waste management has been marketed as potentially profitable, based on the assumption that resource recovery – using waste as an input material to create valuable products (in this case, generating revenues from selling compost products and recyclables) – could cover capital expenditures and operational costs. The case studies show that the break-even point is far from being reached. This is caused by the absence of SWM financing and cost recovery systems rather than by technical shortcomings, i.e. inefficient treatment and recycling methods. Usually, SWM is funded by several sources levied from property taxes, charges on utility consumption bills, tourist taxes, user charges on households and commercial units, industrial taxes, and inter-governmental transfers. Without these, SWM is hardly sustainable.

Policymakers and municipal officials are reluctant to consider cost recovery schemes as a standard system to recoup capital expenditures and operational costs, anticipating a lack of acceptance from the Lebanese public towards the imposition of waste-related fees. Willingness-to-pay among households and businesses may indeed pose a challenge, but taxpayers' resistance is usually lower in "waste aware" societies where the "polluter pays" principle and Extended Polluter Responsibility (EPR) are regulated and mainstreamed. Although these are present in Lebanese legislation, they are not implemented. Increasing waste awareness through sensitisation campaigns and citizen-led initiatives should, therefore, be a priority for local authorities.

The paucity of the financing sources stipulated in Article 28 of the ISWM Law No. 80 is another example of policymakers' distaste for cost recovery schemes: these sources are not yet established (National Environment Fund, National SWM Authority), not available (national budget and budget of local authorities), poorly regulated (loans and donations), or not efficiently managed (private sector investments). This contributes to maintaining the current status that is unfavourable to the introduction of local taxation and the emergence of new behaviours (i.e. waste reduction and source separation).

Because of the small revenues from SWM facilities from resource recovery and the irregularity of IMF transfers (which are largely insufficient to fund advanced facilities), local authorities are in a constant state of financial precarity. Strong political backing was key to

establish these facilities with external funding (from donor agencies or the central government), with some financial contribution by the local authorities that could afford it. But without a cost recovery system, there are no guarantees for SWM sustainability after the funding stops, even if economies of scale are achieved.

Land availability is also a crucial condition to establish SWM facilities, access foreign funding and benefit from the support of other parties. Buying land at relatively low prices before the urban sprawl was key in the local authorities of Zahlé and Jbeil. In a small, mountainous country like Lebanon where buildable land is limited, disposing of waste is a major issue for central and local governments alike (as is the case in Bikfaya, Saida and particularly Beirut). This has not only implications on the economy of SWM but also, like in Saida, environmental and political consequences. This calls for an upscale of SWM projects and implements them at the regional level in accordance with a national master plan for the sector. In the long-term, countries, where land is scarce like Lebanon, will reach a dead-end if they do not follow the path of the circular economy, based on the slogan: "Reduce, Reuse, Recycle".

Instability of Institutional Frameworks for Managing Solid Waste

In the absence of a national master plan for SWM that sets key strategic objectives and determines areas where new facilities can be established and who they should serve, new waste capitalism can further destabilise the institutional relations between local, regional and central levels of government, especially since the facilities planned and implemented lack evidence-based feasibility and strategic planning. This could happen in Blat and Hbaline as outlined above as both are part of Jbeil district and the Union.

The new ISWM Law No. 80, issued on 10 October 2018, is likely to further destabilise multi-level governance of solid waste. Even though Article 9 of the law enshrines the decentralisation principle for managing waste, it entrusts central government authorities with large powers to run SWM projects. This is further consolidated in Article 4 of the law. In addition, the regulatory role of the National Solid Waste Management Authority to be established applies, as per Articles 13 and 16, only to centrally run projects, thereby omitting the necessity of institutional linkages between local authorities and a national regulatory body.

If a form of PPP is implemented at a local level, local authorities could become leading partners in establishing and running SWM facilities, as may be the case for Zahlé's (or even Beirut's) envisioned waste-to-energy plan. This can only happen when SWM policies are supported by rigorous technical feasibility studies, inclusive strategic planning and sound contract management.

A Greater Need for Citizen Mobilisation for a Circular Economy

Local mobilisation proved to be a determining parameter in shaping SWM policies. In Zahlé, Saida, and Jbeil, mismanagement has led, at different stages, to public protests as a reaction to the deterioration of services. Because SWM is one of the most tangible aspects of municipal governance (it can be seen and smelt), public mobilisations and media controversies have criticised health and environmental issues arising from mismanagement of solid waste. In view of the recent mobilisations against “waste-to-energy” and waste incineration facilities, controversies around municipal policies in this regard are expected to heighten (Yan, 2019).

Sooner or later, public actors will have to address the use of incineration methods in Lebanon. There is scepticism regarding thermal treatment technologies and their potentially harmful consequences for public health and the environment. As the case of Saida shows, waste-to-energy treatment technologies have considerable challenges related to uncertainty regarding capacity and profitability. Even composting, a less controversial technology from an environmental point of view, has proven to be problematic given the lack of sorting-at-source initiatives and the difficulty of producing high-quality, profitable compost.

In this emerging landscape, Bikfaya stands out as an exception. The municipality was directly involved in the entire SWM cycle, from sorting-at-source to the managerial and technical aspects of BiClean, while having a long-term strategic objective towards waste reduction. The Bikfaya experiment shows that when public engagement is at the core of the SWM strategy, success rates are higher. Successful SWM does not only depend on strong relations with community actors and awareness campaigns, but it also requires a cost recovery system to foster behavioural change.

Including Informal Recyclers

While overlooked in the capitalist approaches to waste management, informal actors of waste collection and recycling play an important role in the transition towards a circular economy. In Lebanon, these actors constitute between 5–15% of the SWM system and depend on private recycling companies to generate income from selling recyclables. For informal actors, unlike local authorities and private companies, collecting and selling recyclables is a matter of survival, not of profitability. Developing a strategy for integrating them into the SWM system has, therefore, a social dimension that goes beyond the mere environmental necessity of sorting and recycling.

Acknowledgments

The authors would like to thank the CEDRE programme for the financial support it provided to the research project “Solid Waste Crisis in Lebanon: Controversies and New Forms of Urban Management” on which this publication is based. The authors also thank the staff and students of the Department of Urban Planning at the Lebanese University for their contributions to the project, particularly Raed Jouni, Racha Serhal, Eliane Chamoun, Jad Al-Hajj, Rachid Al-Hajjar, Makram Chehayeb and Issam Chmaytelli. Special thanks to the head of the department, Salaheddine Sadeq, for his support and continuous assistance in this project.

ABOUT DEMOCRACY REPORTING INTERNATIONAL

Democracy Reporting International (DRI) is a non-partisan, independent, not-for-profit organisation registered in Berlin, Germany. DRI promotes political participation of citizens, accountability of state bodies and the development of democratic institutions world-wide. DRI helps find local ways of promoting the universal right of citizens to participate in the political life of their country, as enshrined in the Universal Declaration of Human Rights and the International Covenant on Civil and Political Rights.

<http://www.democracy-reporting.org>

This publication was produced with the assistance of the German Foreign Office. The contents of this publication are the sole responsibility of Democracy Reporting International and can in no way be taken to reflect the views of the German Foreign Office.



References

- Abbas, I., Chaaban, J., Al-Rabaa, & Shaar, A. (2017). Solid Waste Management in Lebanon: Challenges and Recommendations. *Journal of Environment and Waste Management*, 4 (2), 53–63.
- Abbas, I., Chaaban, J., Al-Rabaa, A.-R., & Shaar, A. (2017). Solid Waste Management in Lebanon: Challenges and Recommendations. *Journal of Environment and Waste Management*, 4 (3), 235–243.
- Abi Khalil, C. (2017). A National Energy Strategy for Lebanon. Lebanese National Energy Conference. Beirut: Ministry of Energy and Water.
- AbiYaghi, M.-N., Catusse, M., & Younes, M. (2017). From isqat an-nizam at-ta'ifi to the Garbage Crisis Movement: Political Identities and Anti-Sectarian Movements. In R. Di Peri, & D. Meier, *Lebanon Facing the Arab Uprisings*, 73–91. London: Springer & Palgrave-Macmillan.
- Abu-Rish, Z. (2015). Garbage Politics. *Middle East Report*, 45 (277).
- Abu-Rish, Z. (2016). Municipal Politics in Lebanon. *Middle East Report* (280).
- Al-Kantar, B. (2016). Thumbs up Bikfaya BiClean helps one municipality take the lead by example. *Beyond Magazine*.
- Azzi, E. (2017). Waste Management Systems in Lebanon. Stockholm: KTH Royal Institute of Technology.
- Baaklini, S. (2016). Les ministres Kataeb contestent fermement le plan de gestion des déchets et son impact sur le Metn. *L'Orient-LeJour*.
- Deets, S., & Skulte-Ouaiss, J. (2016). Jumping Out of the “Hobbesian Fishbowl” and into the Fire: Lebanon, Elections and Chronic Crisis. *Demokratizatsiya*, 24 (4), 513–530.
- DRI. (2017). Public Service Provision in Lebanese Municipal Unions: National Survey Report. Beirut: DRI.
- DRI. (2019). Are Lebanese municipalities delivering? Survey results on solid waste management, public safety, and citizen outreach at the local level. Beirut: DRI.
- EJatlas. (2015). Retrieved from EJatlas: <https://ejatlas.org/conflict/garbage-mountain-saida>
- El Richani, D. (2017). This is Not a Revolution: The Sectarian Subject's Alternative in Postwar Lebanon. Ottawa: University of Ottawa.
- ELARD. (2011). Provision of Consultancy Services for the Preparation of a Master Plan for the Closure and Rehabilitation of Uncontrolled Dumps Throughout the Country of Lebanon. Beirut: CDR.
- Farah, J., & Gemayel, E. (2016). Les Municipalités, de Nouveaux Acteurs du Développement Local. In E. Verdeil, G. Faour, & M. Hamze, *Atlas du Liban: Les Nouveaux Défis*, 96–97. Beirut: CNRS & IFPO.
- Favier, A. (2001). Introduction. In A. Favier, *Municipalités et pouvoirs locaux au Liban*, 11–26. Beirut: CERMOC.
- Gazel, H., Harre, D., & Moriconi-Ebrard, F. (2011). Liban, tableauborddel'urbanisation. *MENAPOLIS/e-geopolis*.
- Ghadban, S., Shames, M., & Abou Mayaleh, H. (2017). Trash Crisis and Solid Waste Management in Lebanon-Analyzing Hotels' Commitment and Guests' Preferences. *Journal of Tourism Research & Hospitality*, 6 (3), 151–169.
- Giannozzi, E. (2017). On the Decentralisation of Solid Waste Management in Lebanon: A Viable Solution to the “Waste Crisis”? Beirut: Heinrich Böll Stiftung.
- GIZ. (2014). Cost of Environmental Degradation Due to Solid Waste Management Practices in Beirut and Mount-Lebanon. Beirut: GIZ.
- Halpern, C., Lascoumes, P., & Le Galès, P. (2014). *L'instrumentation de l'action publique*. Paris: SciencesPo Presses.
- Hammoud, A., Kassem, M., & Mourtada, A. (2014). Solid Waste to Energy Strategy in Lebanon. 2nd Renewable Energy for Developing Countries Conference, 75–82. IEEE.
- Harb, M., & Atallah, S. (2015). Lebanon: A Fragmented and Incomplete Decentralization. In M. Harb, & S. Atallah, *Local Governments and Public Goods: Assessing Decentralization in the Arab World*, 241. Beirut: LCPS.
- Hood, C. (2007). Intellectual Obscelence and Intellectual Makeovers: Reflections on the Tools of Government after Two decades. *Governance*. 20 (1), 127–144.
- Hood, C., & Peter, G. (2004). The Middle Aging of New Public Management: Into the Age of Paradox? *Journal of Public Administration and research*. 14 (3), 267–282.
- Human Rights Watch. (2017). “As If You’re Inhaling Your Death”: The Health Risks of Burning Waste in Lebanon. Human Rights Watch.

- Ishtay, C. (2001). Les partis politiques dans les conseils municipaux: Nature et dimensions de la participation. In A. Favier, *Municipalités et pouvoirs locaux au Liban*, 60–78. CERMOC.
- Jay, M. (2019, May 11). Growing Link between Lebanon's Cancer Surge and EU Abetted Corruption. *International Policy Digest*.
- Karaki, J. (2016). *Transforming Municipal Waste into a Sustainable Material and Energy in Lebanon (Saida)*. Oxford: University of Oxford.
- Kazzi, L. (2018, October 15). Blat's Waste Treatment Facility: Incinerator or Scapegoat? Beirut: Al-Akhbar.
- Khalil, J. (2017). Lebanon's waste Crisis: An Exercise of Participation Rights. *New Media & Society*, 19 (5), 701–712.
- Kraidy, M. (2016). Trashing the sectarian system? Lebanon's "You Stink" movement and the making of affective publics. *Communication and the Public*, 1 (1), 19–26.
- Lascombes, P., & Le Galès, P. (2004). *Gouverner par les instruments*. Paris: SciencesPo Presses.
- Lascombes, P., & Simard, L. (2011). L'action publique au prisme de ses instruments: Introduction. *Revue Française des Sciences Politiques*. 61 (1), 5–22.
- McCormick, J. (1998). *Carrots, Sticks and Sermons Policy Instruments and Their Evaluation*. New York: Routledge.
- McCornack, A. (2012). Strengthening Local Governance Through Effective Waste Management: The "Sustainable Environmental Practices and Policies" Program in South Lebanon and the Bekaa Valley. *Consilience: The Journal of Sustainable Development*. 8 (1), 188–199.
- Ministry of Environment. (2018). *Policy Summary on Integrated Solid Waste Management*, as approved by the Council of Ministers in its meeting of 11 January 2018. Beirut: Ministry of Environment.
- Morsi, R., Safa, R., Baroud, S., Fawaz, C., Farha, J., El-Jardali, F., & Chaaya, M. (2017). The protracted waste crisis and physical health of workers in Beirut: a comparative cross-sectional study. *Environmental Health*, 16 (39), 1–6.
- Order of Engineers in Lebanon, T. t. (2017). *Wastes in Lebanon, Treatment and ways*. Beirut.
- Salamon, L., & Elliot, O. (2002). *The Tools of Government: A Guide to the New Governance*. Oxford: Oxford University Press.
- Stel, N., & van der Molen, I. (2015). Environmental vulnerability as a legacy of violent conflict: a case study of the 2012 waste crisis in the Palestinian gathering of Shabriha, South Lebanon. *Conflict, Security & Development*, 15 (4), 387–414.
- UNDP. (2013). *The Rehabilitation of Saida Dumpsite*. Saida: UNDP.
- UNDP. (2017). *The Rehabilitation of Saida Dumpsite final report*. Beirut: UNDP.
- UNDP/MoE. (2016). *Master Plan for the Closure and Rehabilitation of Uncontrolled Dumpsites throughout the country of Lebanon*. Beirut: UNDP.
- UN-Habitat & Muhanna Foundation. (2015). *Wasteless Lebanon 2022: Integrated Waste Management Policy Paper*. Beirut: UN-Habitat.
- Varone, F. (1998). *Le choix des instruments des politiques publiques*. Bern: Haupt.
- Verdeil, E. (2013). *Les services urbains à Beyrouth: entre crise infrastructurelle et réformes contestées*. Géosphères, 33–58.
- Verdeil, E. (2017). *Des Déchets aux Remblais: Imaginaire Aménageur, Corruption et Dérèglement Métabolique à Beyrouth*. Retrieved from Jadalliyya: www.jadaliyya.com/Details/34432/Des-déchets-aux-remblais-imaginaire-aménageur,-corruption-et-dérèglements-métaboliques-à-Beyrouth
- Yan, V. (2019). "Beirut pushing ahead with incinerator despite concerns". *The Daily Star*. Beirut. 30 July 2019. Available at: <https://www.dailystar.com.lb/News/Lebanon-News/2018/Jul-30/458370-beirut-pushing-ahead-with-incinerator-despite-concerns.ashx>.
- Yin, R. (2009). *Case study research: design and methods*. London: Sage.

