Sorting Out the Waste Crisis

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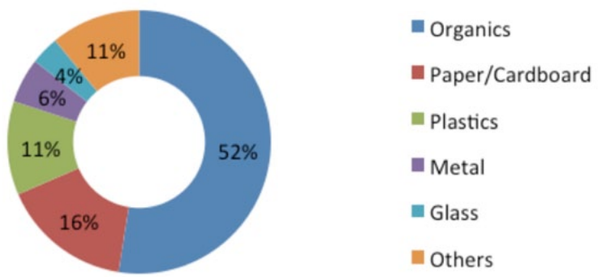
When the Naameh landfill began operation in 1998, it was intended to be a short-term solution to shutting down the Burj Hammoud dump. It was to accumulate 2 million tons of trash by 2004, when it would be shut down, and was assigned to Sukleen for disposing of the trash collected from Beirut and Mount Lebanon. However, Sukleen, Lebanon's main waste contractor, had their agreement renewed year after year by successive Lebanese governments, which failed to come up with sustainable alternatives, and so this went hand in hand with extending the life span of the Naameh site. In the summer of 2015, it was time for another renewal, but this possibility was countered with a series of protests and sit-ins that culminated in shutting down the landfill on July 17. By the time the Naameh landfill finally ceased to operate, it had been expanded at least three times and had accumulated multiple times its original capacity for trash, which was only an omen of the waste crisis that would ensue. **Trash began to pile up on the streets and riverbanks of Beirut and Mount Lebanon, and Lebanon witnessed its first waste crisis in history.**

Desperate to find a solution to the health threat, some people resorted to burning the trash, which was toxic to say the least, while others threw their waste in protected green areas, valleys, and even the sea, which brought about a great deal of concern in environmentalists and officials. With no initiative taken by the government, AUB professors, staff, and students formed a Waste Management Task Force, in order to provide informational tools to those in power, using their argument of choice: science.

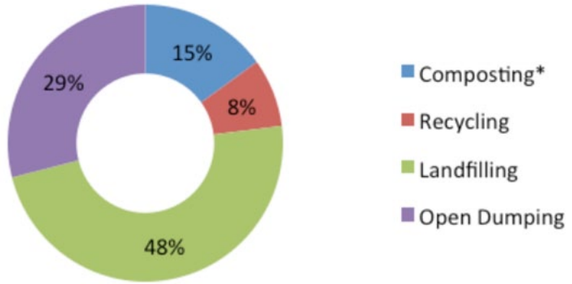
After a series of workshops and debates, and months of work on ten different projects, the Task Force was able to compile a "Road Map" to give pointers to municipalities, NGOs, and homeowners, as to how to tackle the issue most efficiently. These pointers included an informative set of dos and don'ts, as well as an overview of the waste management options available in Lebanon.

Fig 1. Waste Composition in Lebanon



Effectively, the average Lebanese output of waste is by no means colossal. Its majority is made up of organics (cf. fig 1). **This means that the amount of trash to be dealt with can be greatly reduced, if we were to practice sorting and send organic waste straight to composting. Moreover, separating organics from municipal solid waste would reduce its moisture substantially, making what is left easier to treat and process.** The rest mostly consists of recyclables, i.e. paper and cardboard, plastics, metals, and glass. This said, the most important part of the sustainable waste management plan, is to encourage individuals not only to reduce their output of waste, but also their consumption of products with non-recyclable or excessive packaging. This would not only preserve natural resources, but also bypass the need for production processes, treatment, and disposal. Hence, if households make sensible choices and an effort to practice basic sorting, there would be much less management for municipalities to worry about.

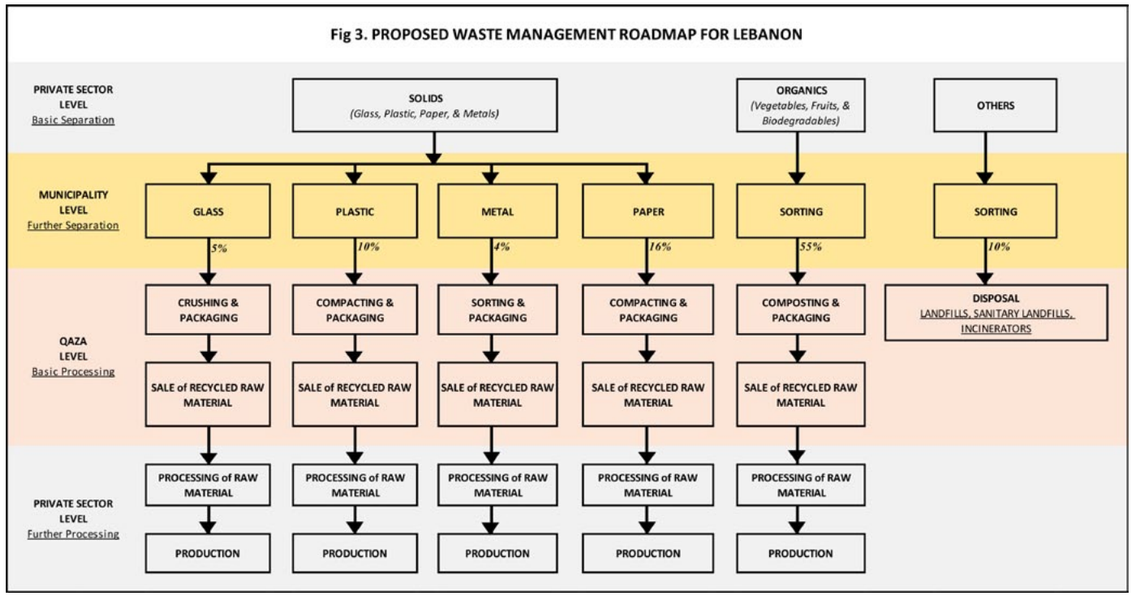
Fig 2. Destinations of Municipal Solid Waste (2015)



In 2013, it was estimated that the waste generated in Lebanon amounted to about 2.04 million tons, or 5,600 tons a day, including the 2,200 tons that went to Naameh. **Up until the waste crisis, at least 77% of that waste was either dumped randomly or in landfills. Only 8% was recycled, and 15% of waste was to be composted by the end of year, provided certain composting plants became functional (cf. fig 2).**

Open dumping is of course not a viable option, as it not only carries a high risk of soil, water, and air contamination due to leachate, fires, etc., but also attracts birds, who then feed on the waste and can become more serious disease vectors than flies or rodents. As for sanitary landfilling, it is quite a safe way to go, provided that all protocols and collection systems are up to standard. Landfilling is hence cost-effective and the space can eventually be turned into a recreational area, such as a park, sometime after it is capped. Nonetheless, it is difficult to find sufficient land in a small country like Lebanon, not to mention the associated sociopolitical challenges. On the other hand, incineration can be suitable for areas with a dense population and limited space, as it decreases the volume of the waste by up to 95%. However, its ashes and flue gases are toxic if not properly treated, and the investment, operation, and maintenance costs are too high to be implemented on small scales, not to mention that the high moisture content of Lebanese waste reduces the efficiency of incineration. Nonetheless, when coupled with a heat or power-production system, incineration can produce energy, thus decreasing the use of fossil fuels, which implies that further analysis might provide insight into whether or not is should be considered a viable solution. There are currently no Waste to Energy plants or incinerators in Lebanon, except for the anaerobic digester in Saida and some gas collection systems for certain landfills, which help transform greenhouse gases into energy. Finally, composting is of course imperative, not to mention affordable and suitable to the nature of the waste in Lebanon. It has a minimal environmental impact, which is ideal, but its quality must be maintained and its market ensured.

The Task Force's actual Road Map would then expect municipalities to provide their inhabitants with separate containers to dispose of their organic waste and their recyclables. It must be noted that while other countries that require households to sort their recyclables designate up to 9 containers (the UK, as of 2015) or even 44 (Kamikatsu, Japan), it would be better to only ask households to sort into two categories at this point, in order to make the initial transition less drastic. Meanwhile, in municipalities which have already begun sorting, and after a certain amount of time for areas just beginning to sort, more categories can be introduced, for instance by separating paper and cardboard from other recyclables. The municipalities would then be responsible for periodically collecting the organic and recyclable trash and then processing and treating it (cf. fig 3). As for trash that does not fall under either category, such as batteries, they are to be stored aside and delivered to specialized parties by individual homeowners.



The organic waste would be sent straight to composting. Meanwhile, after sorting recyclables into glass, plastics, metals, and paper and cardboard, municipalities would have them crushed, compacted or sorted further, and then have them packaged and sold to the private sector, which would proceed to process the obtained recycled materials and manufacture new products out of them. **In order to implement this portion of the plan, municipalities must acquire the necessary machinery, manpower, and equipment to complete the basic processing of their waste, as well as launch awareness campaigns to educate their inhabitants in reducing and sorting waste at home, emphasizing the importance of these practices using examples such as the fact that recycling just one ton of aluminum conserves the equivalent of 1,234 gallons of gasoline in energy.** They are encouraged to partner up or function together as municipality unions or Qazas, in order to lighten the financial and administrative burden of raising awareness and implementing a sustainable approach to waste management.

Next, municipalities have to choose between the different options available to them. Indeed, although some alternatives are clearly more sustainable than others, they do not necessarily cater to the needs of every single area, so it is best to allow for planning for and by each individual municipality, union, or Qaza, in order to ensure environmentally beneficial, feasible, cost-effective, and socially sensitive practices that work together as the possible integrative waste management strategy for each respective area. The aforementioned options consist of the different technologies available, both to compost the waste and to process and package it to be sold to the industrial sector. For instance, to install a composting plant, a small town of up to 13,500 inhabitants, who produce about ten tons of waste per day would need a small sorting line along with a compost turning machine to mix compost and a screen to refine it, whereas for populations of 40,000 to 135,000, that produce up to a hundred tons of trash a day, it is essential to use more sophisticated sorting and composting techniques, including several screens and a biofilter. **Finally, only what can no longer be reused, recycled, or treated, may be incinerated or landfilled.**

We can thus see that despite its complexity, the waste management problem is largely organizational. Hence, there is by no means a lack of a solution, simply the need for informed decisions to be made and implemented.

Finally, the Task Force would like to thank its members, Mr. Farouk Merhebi, Environmental Engineer and Director of the Environmental Health, Safety and Risk Management Facility at AUB and Dr. May Massoud, Associate Professor in the Department of Environmental Sciences at AUB.

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