The Transformation of Saida Garbage Mountain

Medcities General Assembly

Tripoli, Lebanon, November 2017

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Municipality of Saida
www.medcities.org
Sidon is located on the eastern coast of the Mediterranean sea and it is the capital of the South Governorate. region.
Saida’s history date back to 6000 years and its name is associated with the Phoenician God of fishing.
Population (Metro 266,000 / City 80,000) with a density of 774 people per square km.
City area is 7km² with a coastal length of 7km and inland depth of 700-850m.

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The Transformation of Saida Garbage Mountain

Saida Garbage mountain removal comes in the process of the development, Rehabilitation and reviving of Saida maritime coast. This project intersects with several objectives in Saida USUDS such as improving socio-economic conditions, solid waste management, sustaining environmental health and connecting the city with its surrounding.

The project aims at:

- Replacing the garbage mountain by a public garden, in addition to developing others.
- Activating the waste treatment and sewage plant thus cleaning the sea shore.
- Constructing a new maritime port and the rehabilitation and reviving the fishermen port.
- Developing saida sea front (Public beach, Zereh, New promenade section & Plantation)

The project budget is around 150 mil dollars
The Transformation of Saida Garbage Mountain

Current state of the project (Cont.):

- The Garbage mountain is replaced by a 35,000 m² garden and the Waste treatment and sewage plants are active.
- Two more gardens are open to public and another is in progress.
- New fishermen port and the sea front plans are developed in coordination with Barcelona in close cooperation with Medcities. Implementation awaiting budget allocation by government/donor.
- New maritime port first phase is executed, second phase awaiting budget allocation.
- Water in vicinity of the old garbage mountain is fresh and clean again with maritime life back.
- Zereh is revived with hundreds of visitors per day.
- Seaside road is planted with trees, flowers and greenery.
The Transformation of Saida Garbage Mountain

Environmental and health risk

The Dumpsite
- Over 30 years in use
- 58m high
- 6 hectares área
- 1.5 million m³ of waste

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The Waste Dump on Fire September 2012
حريق مكب النفايات أيلول 2012

Very limited fire fighting capabilities
قدرات مكافحة الحرائق كانت ضعيفة ومحدودة

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Protecting the city from fires at the dump and health hazards

حماية المدينة من المكب وهو سبب الحرائق والمخاطر الصحية

Protecting the Mediterranean Sea from contamination especially spillage before winter storms

حماية البحر المتوسط من التلوث خصوصا إنجراف النفايات قبل العواصف الشتوية

Loss of the fishermen’s industry (a main source of heritage income)

فقدان صناعة الصيادين (المصدر الرئيسي للدخل التراث)
Build Break Water
بناء حاجز مائي

Close the Dump
إقفال مكب النفايات

Create Public Garden

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- Degasification and sorting of waste
- Testing of samples in the on-site laboratory
- Leachate system to collect dangerous liquids generated by the decomposing garbage
- Gas collection network for extraction and treatment
- Surface leveling to prepare the cells where organic waste will be buried
- Liners of multiple impermeable layers to cover the land and protect soil and sea
- Filling of organic waste in the sanitary landfill cells
- Capping the landfill with isolating membranes
Saida Waste Treatment Plant, IBC

100% Recyclables (Glass, Metals & Cardboard)
12.5% Plastic Recycling Pellets
10% Residue Derived Fuel (RDF)
3.5% Light Rejects
9% Grits
Electricity 2000 kw.hr
Heat 2000 kw.hr
11% Compost Soil enhancer

100% Receiving Mixed Waste
2.5% Oversize Rejects

100% Mechanical Sorting Separation

67% Organic Feed Preparation
56.5% Anaerobic Thermophilic Digestion
18.5% Stabilization
14% Solid Liquid Separation
3% Process Water Treatment

56% Biogas Valorization

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WEIGHING & TRACEABILITY
SORTING & SEPARATION
BIO-CONVERSION PROCESS
IBC OUTPUTS/PRODUCTS
PLANT OPERATION

- Organic components are treated biologically via either aerobic or anaerobic digestion depending on the quality of the waste. Through these processes, organic fertilizer and electrical energy are produced. Other non-organic components such as plastic, paper, glass and metals are recycled.

- The sorting and separation area for the treatment of MSW is designed to handle up to 450 tons of waste daily in three shifts of eight hours each.

- The sorting line includes the following components:
  - Receiving (manual or robotic)
  - Particle size reduction (mechanical and/or biological)
  - Separation (based on magnetism, density, and size)
Saida Waste Treatment Plant, IBC

Treatment of the organic component in an Anaerobic Digester:

- The process is the degradation of organic rich fraction by micro-organisms in an environment starved for oxygen. It can be used to treat organic solid waste and wastewater of almost any kind.

- Anaerobic Digestion is not only a waste management process but also as source of renewable energy where it provokes the conversion of 50-60 % of the organic load to Biogas (Methane and CO2) to be converted into energy, while the remainder can be used as fertilizer.

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The power plant, first of its kind in Lebanon, is utilizing biogas for the production of electricity and heat to support facility operations. Two systems generate 2.12 MW of electricity and 2.38 MW of thermal output, at an overall efficiency of 84.8% power to run the Center.

The organic sludge is moved to the maturation area. At the end of the maturation period 43,000 t/day of organic fertilizer is used by farmers to cultivate their farms.
PLANT OPERATION

- **Recyclables: Metals, Glass, Plastic & Carton:**

Recovered recyclables including cardboard, plastic and glass are ultimately transferred respectively to paper mills, foundries and kilns. Plastic and PET is sorted and separated into LDPE, HDPE, and PET then recycled internally to produce pellets as prime raw materials for industry.

- **Power generation:**

Resources are used to generate heat and electricity. The anaerobic digestion of the organic fraction produces biogas and water leaving a partially stabilized wet organic mixture.

The biogas; a mixture of methane, carbon dioxide and other gases, is cleaned from potential pollutants such as hydrogen sulfide and impurities in compliance with the highest international emission standards.

It is used to fuel generators to produce electricity and heat. This energy recovery process saves the local environment from toxic gases.
Saida Waste Treatment Plant, IBC

- **Soil improver amendment:**

  The organic fraction remaining after the intricate mechanical sorting and separation process is anaerobically treated in digesters. The resulting digestate is then stabilized, dewatered and sent for maturation. The resulting compost is used as a soil amendment to improve soil quality structure and characteristics. The compost obtained is odorless.

- **Refuse derived fuel**

  Light rejects of mixed waste such as styrofoam, pieces of cardboards, mixed paper, and used textiles are separated and treated to produce a high calorific value fuel substitute; refuse derived fuel (RDF). It is used in high temperature kilns in heat intensive industries. The RDF currently produced contains about 15% moisture with a calorific value of 26 mega joules per kg (MJ/kg).

- **Silica/ construction products:**

  Silica compounds derived from the dense fraction of the waste are finely graded ceramic inert materials. These grits are used as backfill materials and sub-base in roads as well as in mixes for concrete building products such as building stones, sidewalk tiles, and hourdi blocks and slabs. These products are lighter in weight, have improved mechanical properties and thermal and acoustic insulation capacities.

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New garden of 35,000 m² was constructed in place of the old garbage dump site to be expanded to 100,000 m² after 7 years after the total vaporization and release of the gas providing:
- Wonderful scenery to occupy the coastline
- Accessible to visitors for leisure and fun
- Amphitheatre to hold celebratory events
Three other gardens:
- 2 opened for public
- 1 in progress
- 35,000 m² of green space to enjoy
- Wonderful scenery to occupy the coastline
- Accessible to visitors for leisure and fun
- Amphitheatre to hold celebratory events
Maritime life is back after removal of garbage mountain

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WATER SAMPLING AFTER REMOVAL OF GARBAGE MOUNTAIN

Sampling points of Saida coastal sea water

<table>
<thead>
<tr>
<th>Stations</th>
<th>Latitude (N)</th>
<th>Longitude (E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saida 125</td>
<td>33° 34.501'N</td>
<td>35° 22.797'E</td>
</tr>
<tr>
<td>Saida 13</td>
<td>33° 34.341'N</td>
<td>35° 22.084'E</td>
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<td>Saida 14</td>
<td>33° 33.316'N</td>
<td>35° 21.797'E</td>
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<td>Saida 15</td>
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<td>35° 21.615'E</td>
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<td>Saida 16</td>
<td>33° 32.713'N</td>
<td>35° 21.564'E</td>
</tr>
<tr>
<td>Saida 17</td>
<td>33° 32.352'N</td>
<td>35° 21.566'E</td>
</tr>
</tbody>
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Fecal coliform

1- مواقع اخذ العينات هي (الخريطة مرفقة):

- شرق حديقة البيئة
- شمال الحاجز المحيئ
- جنوب الحاجز المحيئ

2- تم اخذ عينات المياه

- خلال الثلاثة في 10 من نوفمبر 2015 من المواقع التالية:
  - SDA-14, SDA-13, SDA-12S, SDA-12M, SDA-12N

- خلال الحميم في 12 من نوفمبر 2015 من المواقع التالية:
  - SDA-17, SDA-16, SDA-15

3- ان نتائج الفحوصات تدل على نوعية المياه تاريخ اخذ العينات

4- للمعدلات المسموح بها حسب منظمة الصحة العالمية (WHO) وبرنامج الأمم المتحدة للبيئة

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Operation of sewage pumping plant

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Sewage and rain water were combined in the city network going directly to the sea
PROJECT IMPACT ON THE MUNICIPALITY

Lessons learned:
- Environment is very precious to loose (Health and economy is jeopardized at large)
- Patience is a virtue (Slow funding process, hammered by opposition)
- Engaging community members with different political agenda is a must

Major difficulties:
- Municipality is receiving waste from Beirut & Jezzine; Hence more rejects.
- Additional Sanitary Lanfill.
- Recession and funding.
- Waste management culture and introducing several treatment technologies
- Develop a framework for true cooperation among the municipalities.

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THANK YOU