Establishment of Strategic Management Plan and Awareness & Change
Management Plans for the Solid Waste Management
The Case Study of Al Fayhhaa cities in North Lebanon

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  - World Bank (W.B.)
  - KfW Development Bank
  - Local authorities/Ministries
  - Waste Management Organizations-Public Utility Companies
  - Private sector
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- Saudi Fund for Development
- OPEC Fund for International Development
- Islamic Development Bank
- European Investment Bank
- KfW Development Bank
- Japan Bank for International Cooperation
## Project background information

<table>
<thead>
<tr>
<th><strong>Project Title:</strong></th>
<th>Provision of Services for The Preparation of Strategic Management Plan and Awareness &amp; Change Management Plans for the Solid Waste Management in Al Fayhaa Cities in North Lebanon.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contracting Authority:</strong></td>
<td>Lebanese host Community Support Project (LHSP/ UNDP).</td>
</tr>
<tr>
<td><strong>Contractor:</strong></td>
<td>Consortium (1) Dar Al Handasah Nazih Taleb &amp; Partners, (2) ENVIROPLAN S.A.</td>
</tr>
<tr>
<td><strong>Project area (location):</strong></td>
<td>Urban Community Al Fayhaa (UCF) composed of the cities of Tripoli, El-Mina, El Baddawi and Al Qalamoun.</td>
</tr>
</tbody>
</table>
| **Beneficiaries:** | The institutions and organizations benefiting from this Project and considered as beneficiaries are:  
• Urban Community Al Fayhaa (UCF);  
• Population of Al Fayhaa cities. |
| **Project Duration:** | 6 calendar months. (31/05/2018-30/11/2018) |
| **Project Purpose:** | The main purpose of the ISWMF Project is to build the capacity in this transitional phase to the local authorities represented by UCF and in the same time to divert the maximum volume of waste possible from the landfill/ dumpsite taking into consideration the social, environmental, and economic limitations of all stakeholders involved. |
| **Project Objective:** | In response to the current situation, the Project being implemented includes various components that help support the Urban Community Al Fayhaa (UCF) in carrying out service provision to citizens. |
| **Project Results:** | Documents delivered:  
• Strategic Management Plans including:  
  - Municipal Solid Waste (MSW) & Commercial Waste Collection Plan and Feasibility Study;  
  - Treatment & Disposal Plan for each type of collected MSW and Feasibility Study and  
  - Sweeping and Street Cleaning Plan and Feasibility Study.  
• Awareness & Change Management Plans (Program). |
The Urban Community Al Fayhaa (UCF): Cities of Tripoli, El Mina, El Baddawi and Al Qalamoun.

Estimated population:
- Approx. 400,000 Lebanese Residents
- More than 63,000 refugees

Waste Generation:
- Approx. 480 t/day

General Characteristics of current waste management:
- Improper handling of MSW
- All types of waste are being mixed
- All the quantities of MSW are disposed in Tripoli dumpsite after partial treatment in an MBT plant.
Transfer and Collection plan for MSW is the building block for proper collection and transfer of all generated municipal solid waste in Al Fayhaa cities. Includes the following sections:

- Project area, Socio-economic aspects, Population Data
- Policy, Legal and Institutional Framework
- Current MSW & Commercial Waste Collection and Transfer and its Deficiencies
- Composition of Waste in Al Fayhaa (Methodology, Obtained results, Comparison)
- Municipal Solid Waste Forecast
- Option Analysis for the Waste Collection and Transfer System—Recommended Waste Collection System in Al Fayhaa Cities
- Calculations of Bins & Trucks for all separately collected waste fractions
- Collection schedule
- Determination of Collection points per zone
- Financial Analysis (CAPEX, OPEX, LUC, Sensitivity Analysis)
- Action Plan for MSW & Commercial Waste Collection
- Monitoring & Supervision Plan for Audit of Collection & Transfer Operations
Policy Framework

Policy Summary on Integrated Solid Waste Management prepared by the Ministry of Environment of Lebanon and approved by the Council of Ministries on 11.01.2018.

Proposed principle: the adoption of integrated solid waste management hierarchy in a way towards circular economy in order to achieve the following objectives:

- Years 2019-2024: min 25% material recovery, min 35% energy recovery and max 40% sanitary landfilling;
- Years 2025-2035: min 35% material recovery, min 50% energy recovery and max 15% sanitary landfilling.

Local authorities are proposed to be responsible for 3R principles (reduce, reuse and recycling), sorting at source, secondary sorting, collection and transfer.

The central authorities shall be responsible for treatment, energy recovery and sanitary landfilling.
Establishment of Strategic Management Plan for Solid Waste Management

- Avoidance of Waste Generation
- Maximization of waste exploitation
- Reducing the waste disposal on the landfills
- Minimization of Environmental Impact
- Protection of public health
- Improving the economy (Circular Economy)
- Better quality of life
Municipal Solid Waste & Commercial Waste Collection Plan

Forecasting of total population

Total population (permanent and refugees) in Al Fayhaa (total 4 cities) for the period 2018-2040.

<table>
<thead>
<tr>
<th>Total population (permanent and refugees)</th>
<th>2017</th>
<th>2021</th>
<th>2025</th>
<th>2029</th>
<th>2033</th>
<th>2036</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tripoli</td>
<td>313,368</td>
<td>309,808</td>
<td>296,025</td>
<td>288,429</td>
<td>287,083</td>
<td>288,918</td>
<td>292,671</td>
</tr>
<tr>
<td>El Mina</td>
<td>72,665</td>
<td>71,841</td>
<td>68,647</td>
<td>66,887</td>
<td>66,576</td>
<td>67,003</td>
<td>67,875</td>
</tr>
<tr>
<td>El Baddawi</td>
<td>49,958</td>
<td>49,391</td>
<td>47,195</td>
<td>45,986</td>
<td>45,772</td>
<td>46,066</td>
<td>46,666</td>
</tr>
<tr>
<td>Al Qalamoun</td>
<td>18,167</td>
<td>17,963</td>
<td>17,166</td>
<td>16,727</td>
<td>16,651</td>
<td>16,759</td>
<td>16,978</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>454,158</strong></td>
<td><strong>449,003</strong></td>
<td><strong>429,033</strong></td>
<td><strong>418,029</strong></td>
<td><strong>416,082</strong></td>
<td><strong>418,746</strong></td>
<td><strong>424,190</strong></td>
</tr>
</tbody>
</table>
# Municipal Solid Waste & Commercial Waste Collection Plan

## Forecasting of waste generation for Al Fayhaa cities

<table>
<thead>
<tr>
<th>Generated Waste 4 cities (t)</th>
<th>2017</th>
<th>2021</th>
<th>2025</th>
<th>2029</th>
<th>2033</th>
<th>2036</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tripoli</td>
<td>114,688</td>
<td>121,056</td>
<td>123,496</td>
<td>128,467</td>
<td>136,518</td>
<td>141,962</td>
<td>143,806</td>
</tr>
<tr>
<td>Mina</td>
<td>25,080</td>
<td>26,473</td>
<td>27,007</td>
<td>28,095</td>
<td>29,856</td>
<td>31,047</td>
<td>31,451</td>
</tr>
<tr>
<td>Beddawi</td>
<td>19,758</td>
<td>20,855</td>
<td>21,276</td>
<td>22,133</td>
<td>23,521</td>
<td>24,460</td>
<td>24,778</td>
</tr>
<tr>
<td>Qalamoun</td>
<td>6,169</td>
<td>6,513</td>
<td>6,645</td>
<td>6,913</td>
<td>7,347</td>
<td>7,641</td>
<td>7,740</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>165,695</strong></td>
<td><strong>174,897</strong></td>
<td><strong>178,424</strong></td>
<td><strong>185,608</strong></td>
<td><strong>197,242</strong></td>
<td><strong>205,110</strong></td>
<td><strong>207,775</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WGR for 4 cities (t/ca/year)</th>
<th>0.365</th>
<th>0.390</th>
<th>0.416</th>
<th>0.444</th>
<th>0.474</th>
<th>0.490</th>
<th>0.490</th>
</tr>
</thead>
</table>
Sampling and analysis of morphological composition of waste in Al Fayhaa cities has been carried out with waste samples of approximately 500 kg in weight to the landfill site. Samples has been taken from two types of urban zones in each city in Al Fayhaa:

- **urban zone I** - collective housing and commercial areas (settlements with blocks of residential buildings) in the city centers;
- **urban zone II** - Individual houses in suburbs (settlements with houses that own yard /garden)

Waste bins (volume of 50 l) in which the waste is being classified in categories (21 waste fractions).
Qualitative Waste Analysis-Average results for Al-Fahafa cities

<table>
<thead>
<tr>
<th>TYPE</th>
<th>Weighted Average Waste composition including Bulky waste %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garden waste</td>
<td>1.56%</td>
</tr>
<tr>
<td>Other biodegradable waste</td>
<td>46.72%</td>
</tr>
<tr>
<td>Paper</td>
<td>3.92%</td>
</tr>
<tr>
<td>Cardboard</td>
<td>4.16%</td>
</tr>
<tr>
<td>Tetrapak</td>
<td>0.59%</td>
</tr>
<tr>
<td>Glass</td>
<td>2.86%</td>
</tr>
<tr>
<td>Ferrous metal packaging and other</td>
<td>0.78%</td>
</tr>
<tr>
<td>Aluminium (non-ferrous) metal packaging and other</td>
<td>0.68%</td>
</tr>
<tr>
<td>Plastic packaging waste</td>
<td>1.77%</td>
</tr>
<tr>
<td>PE film</td>
<td>18.78%</td>
</tr>
<tr>
<td>PET bottles</td>
<td>2.59%</td>
</tr>
<tr>
<td>Other plastic / Hard plastic</td>
<td>0.72%</td>
</tr>
<tr>
<td>Textile</td>
<td>1.53%</td>
</tr>
<tr>
<td>Diapers</td>
<td>4.25%</td>
</tr>
<tr>
<td>Construction and demolition material</td>
<td>0.83%</td>
</tr>
<tr>
<td>WEEE</td>
<td>0.14%</td>
</tr>
<tr>
<td>Medical Waste</td>
<td>0.35%</td>
</tr>
<tr>
<td>Leather</td>
<td>0.42%</td>
</tr>
<tr>
<td>Wood</td>
<td>0.38%</td>
</tr>
<tr>
<td>Other special waste streams (Elastic - tyres etc.)</td>
<td>0.58%</td>
</tr>
<tr>
<td>Bulky waste</td>
<td>6.38%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>
Municipal Solid Waste & Commercial Waste Collection Plan

Option Analysis for Waste collection and Transfer system

- The new waste collection system in Al Fayhaa: **Green Points, Four-bin system**
- **Four (4) bins collection system.** Separate collection of:
  - organic waste
  - paper and cardboard
  - glass, plastic, and metal in a common bin
  - residual municipal waste

<table>
<thead>
<tr>
<th>Period</th>
<th>Waste fractions (categories)</th>
<th>Garden/Green</th>
<th>Recyclables in Green Points</th>
<th>Hazardous and WEEE in Green Points</th>
<th>Bulky waste</th>
<th>Textile, Wood &amp; Leather in Green points</th>
<th>Recyclable collection bin</th>
<th>Organic waste bin</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018-2020</td>
<td></td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>2021-2024</td>
<td></td>
<td>50%</td>
<td>10%</td>
<td>10%</td>
<td>60%</td>
<td>10%</td>
<td>30%</td>
<td>10%</td>
</tr>
<tr>
<td>2025-2040</td>
<td></td>
<td>60%</td>
<td>10%</td>
<td>10%</td>
<td>100%</td>
<td>15%</td>
<td>30%</td>
<td>10%</td>
</tr>
</tbody>
</table>

- **Green Points (GPs):**
  - Small quantities of recyclables,
  - Wood, Leather and Textile,
  - Waste electrical and electronic equipment (WEEE) and other special waste streams, and
  - Bulky waste
- **Mainly on demand collection (it will be also the ability for collection through GPs):**
  - Garden/Park waste,
  - Bulky waste
Waste Collection System Flow Diagram
The green points are designed to work as complementary facilities of other measures for collection and recycling.

The main benefit from GPs is the diversion and recovery of special waste streams (household hazardous waste, Waste of Electronic and Electric Equipment, batteries, bulky items, Green Wastes etc.), which otherwise would be disposed in ordinary landfill sites.

<table>
<thead>
<tr>
<th>City</th>
<th>Number of GPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tripoli</td>
<td>5</td>
</tr>
<tr>
<td>El Mina</td>
<td>2</td>
</tr>
<tr>
<td>El Baddawi</td>
<td>1</td>
</tr>
<tr>
<td>Al Qalamoun</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9</strong></td>
</tr>
</tbody>
</table>
Municipal Solid Waste & Commercial Waste Collection Plan

Separate collected waste fractions – Calculation for bins

- Calculations were made for the following types of bins:
  - Mixed waste bin of 1.1 m³
  - Paper/cardboard bin of 0.66 m³
  - Glass-plastic-metal bin of 1.1 m³
  - Organic waste bin of 0.12 m³

- The average densities which have been used:
  - Density for mixed waste 180 kg/m³
  - Density for paper/cardboard 112 kg/m³
  - Density for glass 270 kg/m³
  - Density for plastic 40 kg/m³
  - Density for metal 50 kg/m³
  - Density for biowaste 500 kg/m³

<table>
<thead>
<tr>
<th>Phase 1 (2021-2024)</th>
<th>Tripoli (all Zones)</th>
<th>El Mina (all Zones)</th>
<th>El Beddawi (all Zones)</th>
<th>Al Qalamoun (all Zones)</th>
<th>Al Fayhaa (Total 4 cities)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed waste (Bins 1.1 m³)</td>
<td>1,433</td>
<td>346</td>
<td>336</td>
<td>81</td>
<td>2,196</td>
</tr>
<tr>
<td>Paper/Cardboard (Bins 0.66 m³)</td>
<td>231</td>
<td>73</td>
<td>56</td>
<td>27</td>
<td>387</td>
</tr>
<tr>
<td>Glass-Plastic-Metal (Bins 1.1 m³)</td>
<td>631</td>
<td>185</td>
<td>144</td>
<td>60</td>
<td>1,020</td>
</tr>
<tr>
<td>Biowaste (Bins 0.12 m³)</td>
<td>291</td>
<td>69</td>
<td>53</td>
<td>17</td>
<td>430</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,586</strong></td>
<td><strong>673</strong></td>
<td><strong>589</strong></td>
<td><strong>185</strong></td>
<td><strong>4,033</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase 2 (2025-2040)</th>
<th>Tripoli (all Zones)</th>
<th>El Mina (all Zones)</th>
<th>El Beddawi (all Zones)</th>
<th>Al Qalamoun (all Zones)</th>
<th>Al Fayhaa (Total 4 cities)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed waste (Bins 1.1 m³)</td>
<td>90</td>
<td>23</td>
<td>30</td>
<td>6</td>
<td>149</td>
</tr>
<tr>
<td>Paper/Cardboard (Bins 0.66 m³)</td>
<td>24</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>Glass-Plastic-Metal (Bins 1.1 m³)</td>
<td>66</td>
<td>19</td>
<td>15</td>
<td>6</td>
<td>106</td>
</tr>
<tr>
<td>Biowaste (Bins 0.12 m³)</td>
<td>31</td>
<td>7</td>
<td>6</td>
<td>2</td>
<td>46</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>211</strong></td>
<td><strong>57</strong></td>
<td><strong>57</strong></td>
<td><strong>16</strong></td>
<td><strong>341</strong></td>
</tr>
</tbody>
</table>
Separate collected waste fractions - Calculation for trucks

- Calculations were made for the following types of trucks:
  - Trucks of 14 m³ for mixed waste,
  - Trucks of 14 m³ for recyclable waste (Paper/cardboard and Glass-plastic-metal waste)
  - Trucks of 14 m³ for organic waste bin,
  - Trucks of 6 m³ for garden/park waste
  - Specialized trucks for slaughterhouse waste
  - Trucks with hook lift for bulky waste

- The average densities which have been used:
  - Density for mixed waste 0.45 t/m³
  - Density for recyclables 0.30 t/m³
  - Density for organic waste 0.8 t/m³
  - Density for garden waste 0.22 t/m³

- Truck utilization:
  - 85% for mixed waste, recyclable waste and garden/park waste
  - 65% for organic waste

### Phase 1 (2021-2024)

<table>
<thead>
<tr>
<th>Waste Type</th>
<th>No. of trucks in Al Fayhaa (Total 4 cities)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed waste (truck 14 m³)</td>
<td>21</td>
</tr>
<tr>
<td>Paper/Cardboard (truck 14 m³)</td>
<td>3</td>
</tr>
<tr>
<td>Glass-Plastic-Metal (truck 14 m³)</td>
<td>7</td>
</tr>
<tr>
<td>Biowaste (truck 14 m³)</td>
<td>2</td>
</tr>
<tr>
<td>Garden-Park (truck 6 m³)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>33</strong></td>
</tr>
</tbody>
</table>

### Phase 2 (2025-2040)

<table>
<thead>
<tr>
<th>Waste Type</th>
<th>No. of trucks in Al Fayhaa (Total 4 cities)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed waste (truck 14 m³)</td>
<td>9</td>
</tr>
<tr>
<td>Paper/Cardboard (truck 14 m³)</td>
<td>1</td>
</tr>
<tr>
<td>Glass-Plastic-Metal (truck 14 m³)</td>
<td>1</td>
</tr>
<tr>
<td>Biowaste (truck 14 m³)</td>
<td>-</td>
</tr>
<tr>
<td>Garden-Park (truck 6 m³)</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>
Each collection zone is divided into Collection points and will have:

- 3 bins for mixed waste,
- 1 bin for glass-plastic-metal,
- 1 bin of biowaste for every 3 collection points and
- 1 bin of paper/cardboard for every 3 collection points
Treatment & Disposal Plan

Integrated Waste Management System (IWMS)

The internationally approved ways of waste management include:

- Waste Prevention
- Re-use and Preparation for Re-use
- Recycling/Material Recovery
- Treatment of the Organic Wastes (Aerobic Composting/Aerobic Digestion)
- Landfilling of residues
- Mechanical Biological Treatment (MBT)
- Thermal treatment – Waste to Energy
  - Mass burn (Incineration)
  - Advanced Thermal Treatment technologies (Gasification, Pyrolysis)
Treatment & Disposal Plan

Separate Collection of Waste Streams

- Mixed Municipal Solid Waste
- Paper/ Cardboard Waste
- Glass/ Plastic/ Metal Waste
- Organic Waste

Awareness Raising
Treatment & Disposal Plan

Separate Collection of Waste Streams

The separately collected fractions in the proposed Waste Management System will be the following:

1) Garden/park waste (Green Points and on demand collection);
2) Recyclables in Green Points;
3) Household hazardous waste, WEEE, Wood, Textile, Leather and Bulky Waste in Green Points;
4) Organic waste in Organic Waste bin;
5) Plastic, Metals, Glass in Recyclable collection bin;
6) Paper/Cardboard in separate bin;
7) Waste that should be collected in Mixed Waste bin.

Achievement of the following objectives according to "Policy Summary on Integrated Solid Waste Management", prepared by Ministry of Environment of Lebanon:

- Years 2019-2024: 25% material recovery, 35% energy recovery and 40% sanitary landfilling
- Years 2025-2035: 35% material recovery, 50% energy recovery and 15% sanitary landfilling
Waste Treatment Options

- Materials recovery facilities (MRF) and recycling - sort and separate materials to produce products that meet defined specifications and so can be marketed.

- Treatment of organic waste - treated by either of two biological processes - aerobic and anaerobic.

- Mechanical Biological Treatment (MBT) - a combination of mechanical sorting and biological treatment of MSW, which may be configured to produce a variety of outputs.

- Thermal treatment options / Waste to Energy
## Treatment & Disposal Plan

<table>
<thead>
<tr>
<th>Examined Scenarios</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scenario 1</strong></td>
<td>Mechanical separation (Fe, Al), biodrying (SRF) and WtE plant for exploitation of produced RDF/SRF</td>
</tr>
<tr>
<td><strong>Scenario 1A</strong></td>
<td>Mechanical separation (Fe, Al) and biodrying (SRF) and exploitation of produced RDF/SRF in cement industry</td>
</tr>
<tr>
<td><strong>Scenario 2</strong></td>
<td>Mechanical separation (Recyclables, RDF), aerobic composting for production of CLO and WtE plant for exploitation of produced RDF</td>
</tr>
<tr>
<td><strong>Scenario 2A</strong></td>
<td>Mechanical separation (Recyclables, RDF), aerobic composting for production of CLO and exploitation of produced RDF in cement industry</td>
</tr>
<tr>
<td><strong>Scenario 3</strong></td>
<td>Mechanical separation (Recyclables, RDF), anaerobic digestion followed by aerobic composting of digestate (CLO) and WtE plant for exploitation of produced RDF</td>
</tr>
<tr>
<td><strong>Scenario 3A</strong></td>
<td>Mechanical separation (Recyclables, RDF), anaerobic digestion followed by aerobic composting of digestate (CLO) and exploitation of produced RDF in cement industry</td>
</tr>
</tbody>
</table>
Multi-criteria analysis involves three main phases (a) the setting of criteria (financial, technical, environmental, and social-Institutional), (b) the weighting of criteria according to their significance and (c) the ranking of the alternative schemes (scenarios).
Evaluation of Alternative Scenarios by using the Method of Multicriteria Analysis

Treatment & Disposal Plan

- Equal Value of all the groups of criteria
- Focus on financial criteria
- Focus on environmental criteria

Evaluation of Alternative Scenarios by using the Method of Multicriteria Analysis
The estimation of investment cost of each development scenario is one of the main evaluation criteria, which is affected by several parameters:

- the capacity of the unit
- the type and complexity of the technology
- the degree of automation of production processes
- the required infrastructure

Unit costs have been used in order to estimate the Investment cost of the treatment facilities.
## Investment Cost

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Investment Cost Phase A</th>
<th>Investment Cost Phase B</th>
<th>Cost of Intangible components</th>
<th>Grand Total ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scenario 1</strong></td>
<td>124,291,719</td>
<td>1,210,949</td>
<td>1,506,700</td>
<td>127,009,368</td>
</tr>
<tr>
<td><strong>Scenario 1A</strong></td>
<td>27,642,767</td>
<td>1,210,949</td>
<td>1,506,700</td>
<td>30,360,415</td>
</tr>
<tr>
<td><strong>Scenario 2</strong></td>
<td>90,338,744</td>
<td>757,198</td>
<td>1,506,700</td>
<td>92,602,643</td>
</tr>
<tr>
<td><strong>Scenario 2A</strong></td>
<td>31,526,218</td>
<td>757,198</td>
<td>1,506,700</td>
<td>33,790,117</td>
</tr>
<tr>
<td><strong>Scenario 3</strong></td>
<td>106,226,108</td>
<td>1,664,705</td>
<td>1,506,700</td>
<td>109,397,513</td>
</tr>
</tbody>
</table>
The operating cost of each scenario is estimated for each waste management component: i.e. collection cost, mechanical sorting plant, biological plant, landfill, infrastructure works, etc. The assumption for calculation of operating cost:

**Maintenance cost:**
- 4% for mechanical sorting & biological treatment
- 4% for thermal treatment
- 2% for landfills and 1% for infrastructure

**Labour cost:** The labour cost has been calculated based on typical salaries for different staff categories, including in the various insurances, taxes, employers’ contribution, etc.

**Administrative costs:** Administrative costs are calculated as a percentage of labor costs, i.e. to 20% of labor costs.

**Energy - Fuel:** The consumption values per t of incoming waste are presented

**Monitoring:** For the necessary environmental monitoring (noise, dust, odors, etc.) at work / perimeter of the site has been estimated for each scenario.

**Aftercare/Insurance:** The aftercare/insurance cost has been calculated as a given percentage of the investment cost, i.e. 0.70% of investment cost

**Transportation cost for RDF:** The respective transportation cost for RDF/SRF at a suitable cement industry has been calculated in each scenario.
<table>
<thead>
<tr>
<th>Scenario</th>
<th>O&amp;M for the operation of Waste Management facilities ($/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 1</td>
<td>9,103,875</td>
</tr>
<tr>
<td>Scenario 1A</td>
<td>5,071,639</td>
</tr>
<tr>
<td>Scenario 2</td>
<td>8,462,409</td>
</tr>
<tr>
<td>Scenario 2A</td>
<td>5,607,425</td>
</tr>
<tr>
<td>Scenario 3</td>
<td>9,452,908</td>
</tr>
<tr>
<td>Scenario 3A</td>
<td>6,597,924</td>
</tr>
</tbody>
</table>
Revenues from the operation of WMC include:

i) Sale of recyclables derived from Sorting plant,
(ii) Sale of recyclables derived from Mechanical treatment of mixed waste bin

1. Revenues from sales of recyclables derived from Sorting plant

<table>
<thead>
<tr>
<th>Material</th>
<th>Revenue (€/t)</th>
<th>Revenue ($/y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al</td>
<td>601 €/t</td>
<td>697 $/y</td>
</tr>
<tr>
<td>Fe</td>
<td>343 €/t</td>
<td>398 $/y</td>
</tr>
<tr>
<td>Plastics</td>
<td>137 €/t</td>
<td>159 $/y</td>
</tr>
<tr>
<td>Paper/Cardboard</td>
<td>29 €/t</td>
<td>33 $/y</td>
</tr>
<tr>
<td>Glass</td>
<td>29 €/t</td>
<td>33 $/y</td>
</tr>
</tbody>
</table>

2. Revenues from sales of recyclables derived from Mechanical Treatment of Mixed waste bin

<table>
<thead>
<tr>
<th>Material</th>
<th>Revenue (€/t)</th>
<th>Revenue ($/y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al</td>
<td>601 €/t</td>
<td>697 $/y</td>
</tr>
<tr>
<td>Fe</td>
<td>343 €/t</td>
<td>398 $/y</td>
</tr>
<tr>
<td>Plastics</td>
<td>69 €/t</td>
<td>80 $/y</td>
</tr>
<tr>
<td>Paper/Cardboard</td>
<td>14 €/t</td>
<td>17 $/y</td>
</tr>
<tr>
<td>Glass</td>
<td>29 €/t</td>
<td>33 $/y</td>
</tr>
</tbody>
</table>

3. Concerning the produced electricity (for Sc 1, 2 & 3), it will cover the energy needs of the plant. The surplus electricity will be distributed to the grid without revenues.
The economic analysis has been elaborated according to the guidelines of New Guide to cost – benefit analysis of investment project by European Commission, December 2014. The following table summarizes the economic costs and benefits and the result of profitability calculations, ENPV.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Present Value of Economic Benefits ($)</th>
<th>Present Value of Economic Costs (Investment) ($)</th>
<th>Present Value of Economic Costs (O&amp;M) ($)</th>
<th>Net Economic Benefits ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 1</td>
<td>247,818,289</td>
<td>140,671,338</td>
<td>56,386,164</td>
<td>50,760,788</td>
</tr>
<tr>
<td>Scenario 1A</td>
<td>220,832,427</td>
<td>37,057,149</td>
<td>23,432,380</td>
<td>160,342,898</td>
</tr>
<tr>
<td>Scenario 2</td>
<td>249,354,911</td>
<td>105,440,469</td>
<td>62,215,455</td>
<td>81,698,988</td>
</tr>
<tr>
<td>Scenario 2A</td>
<td>225,680,422</td>
<td>42,495,205</td>
<td>38,728,178</td>
<td>144,457,039</td>
</tr>
<tr>
<td>Scenario 3</td>
<td>225,014,864</td>
<td>125,381,032</td>
<td>59,202,710</td>
<td>70,431,122</td>
</tr>
<tr>
<td>Scenario 3A</td>
<td>227,688,078</td>
<td>62,632,455</td>
<td>36,014,660</td>
<td>129,040,963</td>
</tr>
</tbody>
</table>
Sweeping & Street Cleaning Plan and Feasibility Study aims to set the clear grounds for proper sweeping and street cleaning of avenues, streets, pedestrian roads, squares, and parks in Al Fayhaa cities.

It includes the following aspects:

- Each type of roads + pedestrian walkways should be divided into either mechanical or manual sweeping plans;
- Al Fayhaa should be divided into sweeping zones as per geographical distribution + red zones (souks, restaurants, corniche, etc.);
- Each zone should have its own sweeping daily, weekly, and monthly plan;
- A sweeping schedule & proposed route for mechanical sweepers for each zone;
- Specifications, capacity & count of each type of sweeping vehicles;
- Specifications & Count of tools required for manual sweeping for each zone;
- Suggested locations of street sweeping personnel toolboxes in each zone;
Demarcation of zones
Identification of the zones in UCF areas, in which there would be an increased need for cleaning services management.

Special criteria for the zoning of areas:

- Highways
- Main roads
- Major roads
- Minor roads
- Urban road network
- Local network
- Pedestrian network
- Planned roads
- Stairs
- Open places
- Roundabouts
- Commercial activity
**Sweeping & Street Cleaning Plan**

**Recommended level of cleaning services**

- 3 categories (zones) based on the level of needed cleaning services

<table>
<thead>
<tr>
<th>Cleaning Zone</th>
<th>Areas included</th>
<th>Total street network covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>• Highways, • Main roads, • Bridge, • Cities entrances</td>
<td>37 km</td>
</tr>
<tr>
<td>B</td>
<td>• Secondary network (major roads), • Major commercial roads</td>
<td>28 km</td>
</tr>
<tr>
<td>C</td>
<td>• Urban areas road network (minor roads), • Local network, • Pedestrian network,</td>
<td>Urban street network covered: 315 km</td>
</tr>
<tr>
<td></td>
<td>• Planned roads, • Stairs, • Open areas</td>
<td>Total open spaces area: 925.800 m² (92,58 ha), Stairs: 5,265 km</td>
</tr>
</tbody>
</table>

**Note:** The Palestinian Gatherings and Official UNRWA Camps in the area of Al Fayhha is excluded from sweeping & cleaning plan.
Sweeping & Street Cleaning Plan

Route Maps—Al Fayhaa Cities
Sweeping & Street Cleaning Plan

Main Roads Category A
- Riad El Solh - Rachid Karami, MMR1: 2200m (Mechanical Cleaning)
- Tripoli - Batroun Highway, MMR2: 1600m (Mechanical Cleaning)
- Main Road 3, MMR3: 500m (Mechanical Cleaning)
- El Istiklal Road, MMR4: 2000m (Mechanical Cleaning)
- Jamal Abdul Nasser Road, MMR5: 800m (Mechanical Cleaning)

Secondary Roads, Category B
- El Mountazah Road, MSR1: 800m (Mechanical Cleaning)
- Iben Khaldoun Road, MSR2: 700m (Mechanical Cleaning)
- Palestine Road, MSR3: 1000m (Mechanical Cleaning)
- Secondary Road 4, MSR4: 500m (Mechanical Cleaning)
- Secondary Road 5, MSR5: 600m (Mechanical Cleaning)
- Secondary Road 6, MSR6: 600m (Mechanical Cleaning)

Individual Urban Areas, Category C
- Mina Area 1, MA1:
  - Urban Roads: 11350m
  - (9100m Mechanical Cleaning, 2250m Manual Cleaning)
  - Urban & Pedestrian Network: 3200m
  - (1600m Mechanical Cleaning, 1600m Manual Cleaning)
- Mina Area 2, MA2:
  - Urban Roads: 18450m
  - (14750m Mechanical Cleaning, 3700m Manual Cleaning)
  - Urban & Pedestrian Network: 5100m
  - (2550m Mechanical Cleaning, 2550m Manual Cleaning)
- Mina Area 3, MA3:
  - Urban Roads: 9500m
  - (7600m Mechanical Cleaning, 1900m Manual Cleaning)
  - Urban & Pedestrian Network: 2400m
  - (1200m Mechanical Cleaning, 1200m Manual Cleaning)
Sweeping & Street Cleaning Plan

Individual Urban Areas, Category C

Tripoli Area 1, TA1:
Urban Roads: 13500m
(2000m Mechanical Cleaning, 2700m Manual Cleaning)
Urban & Pedestrian Network: 3100m
(1500m Mechanical Cleaning, 1550m Manual Cleaning)

Tripoli Area 2, TA2:
Urban Roads: 11500m
(9500m Mechanical Cleaning, 2350m Manual Cleaning)
Urban & Pedestrian Network: 2700m
(1350m Mechanical Cleaning, 1550m Manual Cleaning)

Tripoli Area 3, TA3:
Urban Roads: 15100m
(10500m Mechanical Cleaning, 2600m Manual Cleaning)
Urban & Pedestrian Network: 3000m
(1500m Mechanical Cleaning, 1500m ManualCleaning)

Tripoli Area 4, TA4:
Urban Roads: 22450m
(18000m Mechanical Cleaning, 4450m Manual Cleaning)
Urban & Pedestrian Network: 5400m
(2700m Mechanical Cleaning, 2700m Manual Cleaning)

Tripoli Area 5, TA5:
Urban Roads: 25800m
(20550m Mechanical Cleaning, 5150m Manual Cleaning)
Urban & Pedestrian Network: 6800m
(3400m Mechanical Cleaning, 3400m Manual Cleaning)

Tripoli Area 6, TA6:
Urban Roads: 21800m
(17450m Mechanical Cleaning, 4350m Manual Cleaning)
Urban & Pedestrian Network: 5700m
(2850m Mechanical Cleaning, 2850m Manual Cleaning)

Tripoli Area 7, TA7:
Urban Roads: 17000m
(13600m Mechanical Cleaning, 3400m Manual Cleaning)
Urban & Pedestrian Network: 4100m
(2050m Mechanical Cleaning, 2050m Manual Cleaning)

Tripoli Area 8, TA8:
Urban Roads: 26300m
(21000m Mechanical Cleaning, 5300m Manual Cleaning)
Urban & Pedestrian Network: 6800m
(3300m Mechanical Cleaning, 3300m Manual Cleaning)

Tripoli Area 9, TA9:
Urban Roads: 14900m
(11900m Mechanical Cleaning, 3000m Manual Cleaning)
Urban & Pedestrian Network: 3200m
(1650m Mechanical Cleaning, 1650m Manual Cleaning)
Sweeping & Street Cleaning Plan

Qualamoun

Main Roads, Category A
Coastal Highway, QMR1: 3640m (Mechanical Cleaning)
Seaside Road, QMR2: 3600m (Mechanical Cleaning)

Secondary Roads, Category B
Secondary Road 1, QSR1: 2450m (Mechanical Cleaning)
Secondary Road 2, QSR2: 660m (Mechanical Cleaning)
Secondary Road 3, QSR3: 665m (Mechanical Cleaning)

Individual Urban Areas, Category C
Qualamoun Area 1, QA1:
Urban Roads: 3400m
(2720m Mechanical Cleaning, 680m Manual Cleaning)
Urban & Pedestrian Network: 750m
(375m Mechanical Cleaning, 375m Manual Cleaning)

Qualamoun Area 2, QA2:
Urban Roads: 4800m
(3840m Mechanical Cleaning, 960m Manual Cleaning)
Urban & Pedestrian Network: 500m
(250m Mechanical Cleaning, 250m Manual Cleaning)
Sweeping & Street Cleaning Plan

### Beddawi

**Main Roads, Category A**
- Main Road 1, BMR1: 2740m
  - Tripoli-Batroun Highway, BMR2: 2000m (Mechanical Cleaning)
  - Tripoli-Mineh Highway, BMR3: 2650m (Mechanical Cleaning)

**Secondary Roads, Category B**
- Secondary Road 1, BSR1: 2200m (Mechanical Cleaning)
- Secondary Road 2, BSR2: 910m (Mechanical Cleaning)
- Secondary Road 3, BSR3: 1370m (Mechanical Cleaning)
- Secondary Road 4, BSR4: 1400m (Mechanical Cleaning)
- Secondary Road 5, BSR5: 2200m (Mechanical Cleaning)

**Individual Urban Areas, Category C**
- **Beddawi Area 1, BA1:**
  - Urban Roads: 5300m
  - 1200m (4200m Mechanical Cleaning, 1100m Manual Cleaning)
  - Urban & Pedestrian Network: 1100m
  - 550m Mechanical Cleaning, 550m Manual Cleaning)
- **Beddawi Area 2, BA2:**
  - Urban Roads: 4000m
  - 3200m Mechanical Cleaning, 800m Manual Cleaning
  - Urban & Pedestrian Network: 400m
  - 450m Mechanical Cleaning, 450m Manual Cleaning
- **Beddawi Area 3, BA3:**
  - Urban Roads: 7000m
  - 5600m Mechanical Cleaning, 1400m Manual Cleaning
  - Urban & Pedestrian Network: 2100m
  - 1050m Mechanical Cleaning, 1050m Manual Cleaning
- **Beddawi Area 4, BA4:**
  - Beddawi Camp is excluded from the sweeping plan by UCP
  - Urban Roads: 1200m
  - 960m Mechanical Cleaning, 240m Manual Cleaning
  - Urban & Pedestrian Network: 400m
  - 290m Mechanical Cleaning, 200m Manual Cleaning
- **Beddawi Area 5, BA5:**
  - Urban Roads: 4000m
  - 3700m Mechanical Cleaning, 900m Manual Cleaning
  - Urban & Pedestrian Network: 900m
  - 450m Mechanical Cleaning, 450m Manual Cleaning
- **Beddawi Area 6, BA6:**
  - Urban Roads: 6700m
  - 5400m Mechanical Cleaning, 1300m Manual Cleaning
  - Urban & Pedestrian Network: 1000m
  - 950m Mechanical Cleaning, 950m Manual Cleaning
- **Beddawi Area 7, BA7:**
  - Urban Roads: 3700m
  - 3000m Mechanical Cleaning, 700m Manual Cleaning
  - Urban & Pedestrian Network: 800m
  - 400m Mechanical Cleaning, 400m Manual Cleaning
- **Beddawi Area 8, BA8:**
- **Urban Roads: 7300m**
  - 5800m Mechanical Cleaning, 1500m Manual Cleaning
  - Urban & Pedestrian Network: 2300m
  - 1100m Mechanical Cleaning, 1100m Manual Cleaning

---

**Legend:**
- **Main Roads**
- **Secondary Roads**
- **Existing Urban Roads**
- **Planned/New Urban Roads**
- **Individual Urban Areas Boundaries**
- **Stairs**
Sweeping & Street Cleaning Plan

Sweeping Plan Zones

**Zone A:** It is proposed to be cleaned *once a day* (morning or afternoon)

**Zone B:** It is recommended to be cleaned *every third day* (e.g. Monday - Thursday - Sunday or Tuesday - Friday - Monday or Wednesday - Saturday - Tuesday etc)

**Zone C:** Zone C is proposed to be cleaned *every fourth day*

---

<table>
<thead>
<tr>
<th>Plan schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Zones</strong></td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>A zone</td>
</tr>
<tr>
<td>B zone</td>
</tr>
<tr>
<td>C Zone</td>
</tr>
</tbody>
</table>
Scenarios for the cleaning system

1. The extreme case of the whole burden covered with pedestrian street cleaners (with or without a pedestrian-controlled sweeper) and

2. The opposite extreme scenario, that all of the street cleaning is carried out using large compact or chassis sweepers

<table>
<thead>
<tr>
<th>Sweeping Scenarios</th>
<th>CAPEX ($) (excl. VAT)</th>
<th>OPEX ($/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Full manual sweeping</td>
<td>658,900</td>
<td>3,857,870</td>
</tr>
<tr>
<td>2. Full mechanical sweeping</td>
<td>4,240,200</td>
<td>734,513</td>
</tr>
<tr>
<td>3. Optimized</td>
<td>2,892,084</td>
<td>2,060,583</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>FNPV ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Full manual sweeping</td>
<td>17,468,011</td>
</tr>
<tr>
<td>2. Full mechanical sweeping</td>
<td>7,282,282</td>
</tr>
<tr>
<td>3. Optimized</td>
<td>11,772,542</td>
</tr>
</tbody>
</table>
1. A short video which highlights all existing sorting at source initiatives in Al Fayhaa + interviews with the launchers of those initiatives.

2. Eight (8) Public Awareness & education short videos on how to reduce, reuse, and sort different types of waste:
   • In a restaurant
   • At home
   • In the office
   • In school
   • Bulky waste
   • In the vegetable market
   • In a Greenpoint
   • In the street
Awareness & Change Management Program

Integrated Solutions

Prepared Videos
Awareness & Change Management Program

Integrated Solid Waste Management in Al Fayhaa
Reduce, Reuse, Sort at the office
Reduce
Switch From Disposable to Reusable
The usage of papers

Reuse

Sort

Choose one for your Future

START THE CHANGE FROM YOUR SCHOOL!

Integrated Solid Waste Management in Al Fayhaa
Reduce, Reuse, Sort at School

How to Handle Bulky Waste
Plenty of old, large stuff.
What to do!?

Fix & Reuse
Recycle

and many others
Integrated Solid Waste Management in Al Fayhaa
Reduce, Reuse, Sort in the Vegetables Market

Follow the food chain steps:

In the morning

3 days later

Integrated Solid Waste Management in Al Fayhaa in the Street

Keep your environment clean and stay healthy...

What will you choose?

Restaurants Sorting their food waste:

Make a SAFER Environment

Make Better Economy

Integrated Solid Waste Management in Al Fayhaa
Reduce, Reuse, Sort at the Restaurant

الإدارة المتكاملة للنفايات الصلبة في بلديات الفيحاة

الإدارة المتكاملة للنفايات الصلبة في بلديات الفيحاة
Awareness & Change Management Program

Prepared Handbook

Sorting at Source and Waste Recycling

Let's Reduce, Reuse & Recycle Handbook

*Note: Characterisation Study By Our Table - Esmekube, Al-Tayshaat Environment, UNDP, 2018*
Awareness & Change Management Program - Several Workshops
### Perform Street Surveys

#### Awareness & Change Management Program

#### Performed Street Surveys

![Image of people conducting surveys](image)

### 行政部门：《公共设施管理》

《公共设施管理》是一项旨在提高公众对公共设施管理的意识和参与度的项目。项目的目标是通过开展街头调查，收集公众对公共设施管理的意见和建议，从而改进和优化公共设施管理。

#### 街头调查：《公共设施管理》的改善

<table>
<thead>
<tr>
<th>调查项目</th>
<th>是</th>
<th>否</th>
<th>未回答</th>
</tr>
</thead>
<tbody>
<tr>
<td>公共设施管理是否透明？</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>公共设施管理是否公正？</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>公共设施管理是否有效？</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>公共设施管理是否易于理解？</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 行政部门：《公共设施管理》的完善

《公共设施管理》是行政部门的一项重要工作。通过街头调查，行政部门可以了解公众对公共设施管理的满意度，并据此进行改进。街头调查结果将有助于行政部门制定更有效的公共设施管理策略，提高公众对公共设施管理的满意度和参与度。

#### 行政部门：《公共设施管理》的完善

《公共设施管理》是行政部门的一项重要工作。通过街头调查，行政部门可以了解公众对公共设施管理的满意度，并据此进行改进。街头调查结果将有助于行政部门制定更有效的公共设施管理策略，提高公众对公共设施管理的满意度和参与度。
Street Surveys
Community Perception on Waste Management

- Are you satisfied with the current waste collection & disposal system in your area?
  - Yes: 21.5%
  - No: 3.1%
  - DN: 0.0%
  - N/A: 75.4%

- Do you know how to prevent waste generation? (waste prevention & minimization)
  - Yes: 40.0%
  - No: 5.4%
  - DN: 0.2%
  - N/A: 56.4%

- Are you familiar with the advantages of sorting the waste at the source of its production?
  - Yes: 79.3%
  - No: 9.4%
  - DN: 0.5%
  - N/A: 16.4%

- Do you reuse and/or repair any of your products (plastic bottles, electric appliances...)
  - Yes: 54.5%
  - No: 4.3%
  - DN: 0.2%
  - N/A: 44.3%

- Are you familiar with home composting?
  - Yes: 76.1%
  - No: 1.0%
  - DN: 1.8%
  - N/A: 18.8%

- Would you participate in prevention, reuse, and sorting at source?
  - Yes: 90.4%
  - No: 0.2%
  - DN: 1.3%
  - N/A: 8.0%

- Would you support the implementation of an improved waste management system according to international guidelines?
  - Yes: 93.5%
  - No: 1.2%
  - DN: 0.2%
  - N/A: 5.1%
Street Surveys
Community Acceptance & Willingness to pay for Waste Management

Do you know how much money you pay today for Waste Management?

- 57.35%; 57.35%
- 35.18%; 35.18%
- 6.99%; 6.99%
- 0.48%; 0.48%

Would you accept a waste treatment plant near your residence?

- 74.70%
- 21.69%
- 2.17%
- 1.45%
- 0.48%
<table>
<thead>
<tr>
<th>GENDER:</th>
<th>67%</th>
<th>Male</th>
<th>32%</th>
<th>Female</th>
<th>1%</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMPLOYED:</td>
<td>41%</td>
<td>Yes</td>
<td>24%</td>
<td>No</td>
<td>35%</td>
<td>Retired</td>
</tr>
<tr>
<td>AGE GROUP:</td>
<td>1%</td>
<td>12-17</td>
<td>8%</td>
<td>18-24</td>
<td>13%</td>
<td>25-34</td>
</tr>
<tr>
<td>LEVEL OF EDUCATION:</td>
<td>3%</td>
<td>Elementary</td>
<td>50%</td>
<td>High School</td>
<td>34%</td>
<td>University</td>
</tr>
<tr>
<td>RESIDENCE:</td>
<td>80%</td>
<td>City Centre</td>
<td>14%</td>
<td>Suburbs</td>
<td>6%</td>
<td>Village</td>
</tr>
</tbody>
</table>
قصر القدوة التقى مجلس إدارة المستشفى الإسلامي واستمع إلى خطة معالجة اللفائات من وفد "دار الهندسة نزهه طالب"

استقبل رئيس بلدية طرابلس المهندس أحمد قمر الدين في مكتبه في القصر البلدي، وفدًا من "دار الهندسة نزهه طالب وشركاه"، ضمن المهندسين زياد نشابة، الوعيي عون وجو جاد، رفقة ناشط المجتمعون "بهدف خطة معالجة اللفائات من المصدر ضمن مساحة قبالة الدائري لاتحاد بلدات الفجاء، طرابلس، الميناء، القلمون والبدياوي".

وقت الوفد بعد اللقاء، "ان دار الهندسة تجربة الدراسة المطلوبة بناءً لعقد موقع مع برنامج الأمم المتحدة للتنمية الإسمنتي، وقد
Role of the Civil Society Organizations
Thank you for your attention!!
Christos Tsompanidis
cr@enviroplan.gr