
Eddy Wille, OVAM
Outline of this presentation

• Statistics on landfills in EU and Flanders
• Data collection and database structure
• Assessing risks and resource potential
• Decision Support Tool Flaminco
• Gaps and Upgrading DST Flaminco
Statistics on Landfills

Data on landfills (often hard to get).

- EU-level: ~ 150,000 – 500,000 (Hogland)
  ~ 600,000 – 800,000 (based on # municipalities, Wille)
- NW Europe: ~ 100,000 (Eurelco)
- Flanders: 2,226 landfills registered (OVAM, 2017)

Notice: last 2 decades: strong decline of operating landfills (higher recycling rates, waste incineration, large scale landfills). However, landfilled MSW in EU varies from 1% to 99%.
Statistics on Landfills

Waste management and landfilling in Flanders.

Household waste per inhabitant of Flanders

The amount of residual waste we produce is decreasing much more slowly than the waste that is collected separately. Therefore, OVAM wants to improve separate collection even more.

<table>
<thead>
<tr>
<th>Year</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>555</td>
</tr>
<tr>
<td>2013</td>
<td>503</td>
</tr>
</tbody>
</table>

How is residual household waste processed?

950,000 TONNES

This is the amount of non-separated residual waste collected in Flanders each year.

- **7%** incinerated with energy recuperation
- **1%** to landfill site
- **92%** dried or separated

Contents of the household waste bag

- Wood waste: 3 kg
- Plastic: 3 kg
- Glass: 24 kg
- Small hazardous waste: 3 kg
- Paper & cardboard: 19 kg
- Metals: 2 kg
- Plastic bags: 11 kg
- Domestic waste: 13 kg
- Solid and non-combustible waste: 9 kg
- Total: 110 kg

Number of landfills

<table>
<thead>
<tr>
<th>Category</th>
<th>1985</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cat 1 (Hazardous waste)</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Cat 2 (Non-hazardous waste)</td>
<td>34</td>
<td>9</td>
</tr>
<tr>
<td>Cat 3 (Inert waste)</td>
<td>73</td>
<td>4</td>
</tr>
</tbody>
</table>

RAWFILL
Data collection and database structure

Sources of data:
- environmental permits;
- soil investigations;
- former mines;
- archives;

Type of data:
- alpha-numerical / geographical;
- Digital / hard copy
Data collection and database structure

OVAM-data on landfills: accessibility and availability for Decision Support Tools.

- **Digital: alphanumerical-geographical**
  - Mistral
    - MR
    - LIR

- **Digital: alphanumerical**
  - GWA

- **Hard copy files**
  - LF

Landfill query

Landfills database

MR=Municipal Register; LIR=Land Information Register; GWA=General Waste Archives; LF= Landfill Archives
Data collection and database structure

3-steps to collect data:
- Mapping: regional scale;
- Surveying: local scale;
- Mining: detailed LF investigation
Data collection and database structure
Moreover 2,000 landfills and nearly 90 Km² to manage over a long period. Support needed!

Introduction of a decision support tool because of specific constraints reflected in the basic laws of Enhanced Landfill Management & Mining (ELFM²):
#1 : all landfills are equal, but some are more equal.
#2 : relatively importance of the fourth dimension (time).
Decision Support Tool
Flaminco

OVAM-data on landfills: accessibility and availability for Decision Support Tools.

- Digital: alphanumeric-geographical
  - Mistral: MR, LIR

- Digital: alphanumeric
  - GWA

- Hard copy files

Landfill query

Landfills database

- RuimteModel
- Flaminco
- Reclaf
- DST...

MR=Municipal Register; LIR=Land Information Register; GWA=General Waste Archives; LF=Landfill Archives
Flaminco (Flanders Landfill Mining, Challenges & Opportunities): decision support tool to manage landfills in a sustainable way.

2 main components:
- Mining potential;
- Potential environmental impact.

6 criteria to determine ELFM-potential (grade):
- Type of landfill
- Period of landfilling
- Volume of landfill
- Land use of landfill
- Distance to transport modi (roads, waterway, railway)
- Proximity of other landfills
## Decision Support Tool

Flaminco

<table>
<thead>
<tr>
<th>Category</th>
<th>Score</th>
<th>Weighing factor</th>
<th>Maximum overall score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kind of LF</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSW</td>
<td>70</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>IW</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dredging sludge</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flyash</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Size of LF</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small (≤ 6500 m²)</td>
<td>30</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Medium (6500 m² ≤ X ≤ 15000 m²)</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large (6500 m² ≤ X ≤ 15000 m²)</td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extra Large (&gt; 43000 m²)</td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Maximum overall score:**

- Kind of LF: 300
- Size of LF: 100

**Design**

[Image of Interreg North-West Europe]
Decision Support Tool
Flaminco

Output:
Ranking of Landfills
by using Flaminco
(Decision Support System)

Data collection

OVAM datamining

ELFM-programme

Surveys
Remote sensing, Geophysical methods, Drillings, trial pits, ...

Archives
Environmental permits, Land Information Register, Mining records, ...

Maps
Topographical maps, Geological maps, Hydrological maps, ...

Dataprocessing

Meta-Data

Recycling of Materials

Recovery of Energy

Reclaiming of Land

Preserving of Drinkwater supplies
Gaps and upgrading Flaminco

Traditional Conceptual Site Model sets focus mainly on impacts and risks. Seldom data on waste (quality and quantity), infrastructure, geotechnical characteristics,...
Gaps and upgrading Flaminco

Dynamics of the environment underestimated:
- ecological;
- economy;
- urban sprawl;
- ...
Gaps and upgrading Flaminco

Lack of standards on metadata of landfills effects:
- Data exchange;
- Stock management;
- Innovation;
- ...
Gaps and upgrading Flaminco

Upgrade Flaminco requires more attention on:

- Economy;
- Resource management;
- Interim use and monitoring

<table>
<thead>
<tr>
<th>development target</th>
<th>Land use</th>
<th>Activity</th>
<th>Accessibility</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature</td>
<td>-2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open space</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential land use</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Industrial</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commerce and services</td>
<td>-5</td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Constructed land use</td>
<td>10</td>
<td>10</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Buildings</td>
<td></td>
<td>-5</td>
<td></td>
<td>-1</td>
</tr>
<tr>
<td>Employment (density)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Villa (urban) roads</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Public transport</td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Constructed land use</td>
<td>2</td>
<td>10</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Destination</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

' transitie potentieel' vh Ruimtemodel = sterk beïnvloed door de ruimtelijke invulling van de onmiddellijke omgeving
Analyse van de onmiddellijke omgeving van stortplaatsen