Waste management in Germany and Saarland

Biomass, sewage sludge and landscape conservancy residues

IZES gGmbH, Prof. Frank Baur, baur@izes.de
1. Waste management in Germany

2. Waste management in Saarland

3. ARBOR objectives
Overall savings from MSW:

- 56 million Mg CO$_2$,eq./a
- approx. 325 PJ/a saving of fossil energy resources

Source: (ifeu & öko-institut, 2010)
Household waste management 1990 - 2007

Source: (UBA, 2011)
Waste management in Germany / Today

- 289 Composting plants
- 66 Biogas plants
- 43 Mechanical biological treatment plants
- 91 Waste incineration plants
- 187 Landfills for pre-treated MSW

Source: (Destatis, 2010)
Waste, a source of (renewable) energy, secondary raw materials and soil conditioner / fertiliser

Methane

No added value

Added value
What do you see here?

50 liters fuel and 600 kg soil conditioner / fertiliser or just waste?
1. Waste management in Germany

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Member and non-member municipalities of EVS in Saarland

- Municipalities with own vehicle pool
- Non-member municipalities
Household waste generation

Household waste generation

Source: (Destatis, 2011)
Biowaste generation and potential

Primary energy potential of 38.005 MWh / a

Based on the current waste management concept there might be an increase:

- 71,3 kg/cap.*a till 2014 (71.485 Mg / a)
- 73,1 kg/cap.*a bis 2019 (71.156 Mg / a)

No energetic utilisation within Saarland!!
Applying the sorting analysis of 2001 (!) the organic content within the household waste fraction is about 41,4 %
Waste incineration plants

**AHKW NK (capacity 150.000 Mg/a):**
- Average heating value in kJ/kg: 10.050
- Annual throughput: 128.508 Mg/a
- Generated electricity: $52.847 \text{ MWh/a} \rightarrow \eta_{el} = 15\%$
- Generated steam: 304.695 MWh/a
- Input to district heating: $30.240 \text{ MWh/a}$

**AVA Velsen (capacity 255.000 Mg/a):**
- Average heating value: 9.070 kJ/kg
- Annual throughput: 238.000 Mg/a
- Generated electricity: $99.446 \text{ MWh/a} \rightarrow \eta_{el} = 16,5\%$
- Generated steam: 737.170 Mg/a

**Primary energy production (biogenic) of 342.070 MWh / a**

Quelle: Homepage ITAD e.V.
98% of population are connected to wastewater treatment

In 2009 ca. **19,200 t dS** sewage sludge resulted from wastewater treatment
Gas utilisation by EVS

Generated gas 2009 = 4,546,650 m³

- Electricity production 4,366 MWh
- Heating 25% (1,176,078 m³)
- Electricity 63% (2,780,590 m³)
- Losses 12% (553,124 m³)
### Overall sewage sludge treatment Saarland

#### 2009

<table>
<thead>
<tr>
<th></th>
<th>Utilisation in agriculture</th>
<th>Thermal utilisation</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>dry (Mg dS)</td>
<td>wet (Mg TS)</td>
</tr>
<tr>
<td>Anaerobic stabilisation</td>
<td>2.750</td>
<td>1.156</td>
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<tr>
<td>Aerobic stabilisation</td>
<td>1.252</td>
<td>2.384</td>
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<tr>
<td>Others</td>
<td>--</td>
<td>44</td>
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<tr>
<td>Total</td>
<td>4.002</td>
<td>3.584</td>
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<td>40 %</td>
<td>60 %</td>
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Primary energy potential of 68.213 MWh / a

Outside of Saarland
In 2009 ca. **87.000 Mg/a** bzw. 85 kg/cap.*a

- Responsibility by municipalities
  
  → Most of the biomass was composted on very low technology and efficiency level
  
  → Only some fractions (woody material) was utilised thermically

About **29.000 Mg/a** are woody material what leads to an overall primary energy potential of ca. **75.400 MWh**

About **58.000 Mg/a** are grass like, what, utilised anaerobically, would lead to a primary energy potential of ca. **27.376 MWh**
Dry fermentation for green and garden waste

Biogas plant for green and garden waste Regen – ZAW Donau-Wald

Quelle: Buchheit
**Utilisation of green and garden waste**

<table>
<thead>
<tr>
<th>Process</th>
<th>Description</th>
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<tbody>
<tr>
<td>Primary conditioning</td>
<td>Thermal utilisation</td>
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<tr>
<td></td>
<td>Screen residues</td>
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<td></td>
<td>Shredding/Screening</td>
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<td>&lt; 50 mm</td>
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<td>Fermentation</td>
<td>Storage</td>
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<td>torch, CHP</td>
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<td></td>
<td>biogas</td>
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<tr>
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<td>electricity, heat</td>
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<tr>
<td></td>
<td>Storage</td>
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<tr>
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<td>press water</td>
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<td>residues</td>
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<tr>
<td>Agriculture</td>
<td>Storage</td>
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<tr>
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<td>dewatering</td>
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<td>residues</td>
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<tr>
<td>Composting</td>
<td>Decomposition</td>
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<tr>
<td></td>
<td>Composting</td>
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<td>Thermal utilisation</td>
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<tr>
<td>Secondary conditioning</td>
<td>Screen residues</td>
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<td>Screening</td>
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<td>Compost</td>
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<td>Marketing</td>
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</tbody>
</table>

Green waste

Energy crops
1. Waste management in Germany

2. Waste management in Saarland

3. ARBOR objectives
1. Mass scenarios
2. Legal framework
3. Constraint analysis
4. LCA
5. Profitability analysis
6. Optimisation scenarios
7. Development of sustainable utilisation strategies
8. Concept study
9. Overall strategy for the Saarland
10. Support regarding the implementation
11. Monitoring and analysis
12. Generalisation and transfer of results
Thank you for your attention!!

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