Advantages and Disadvantages of Thermal Treatment and Mechanical and Biological Treatment (MBT)

Zagreb Waste Symposium

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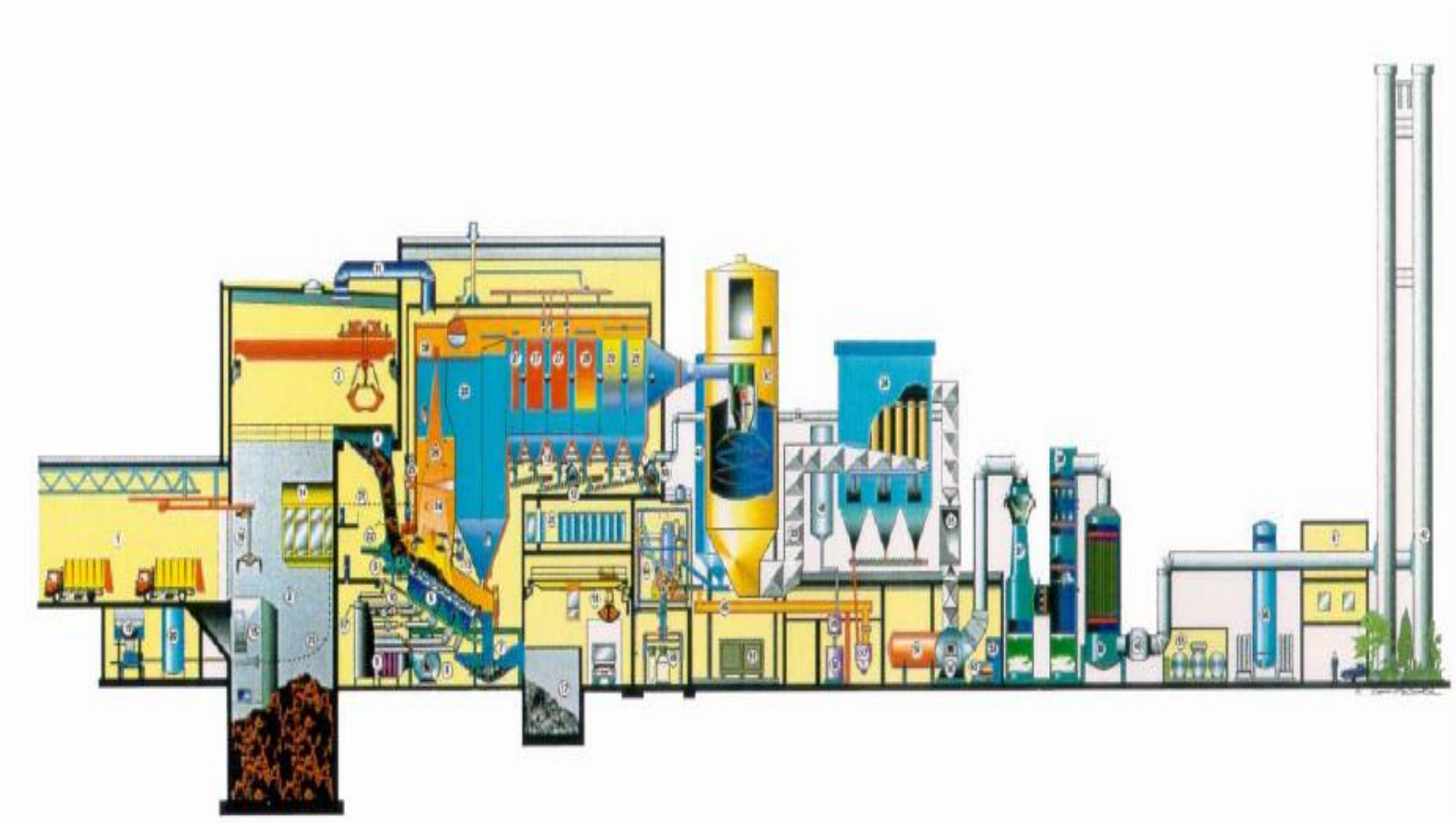
Thermal Treatment



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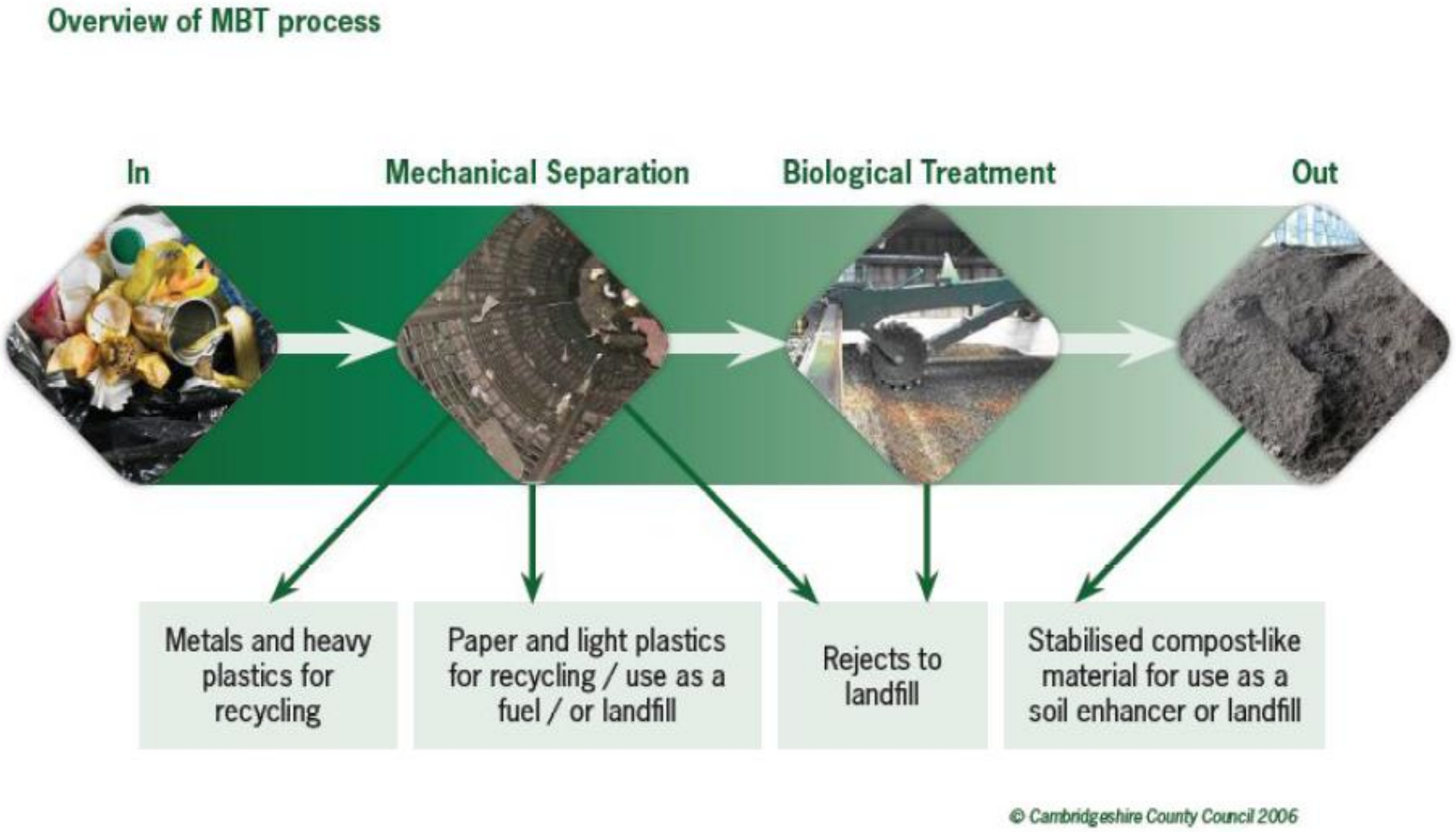
Mechanical Biological



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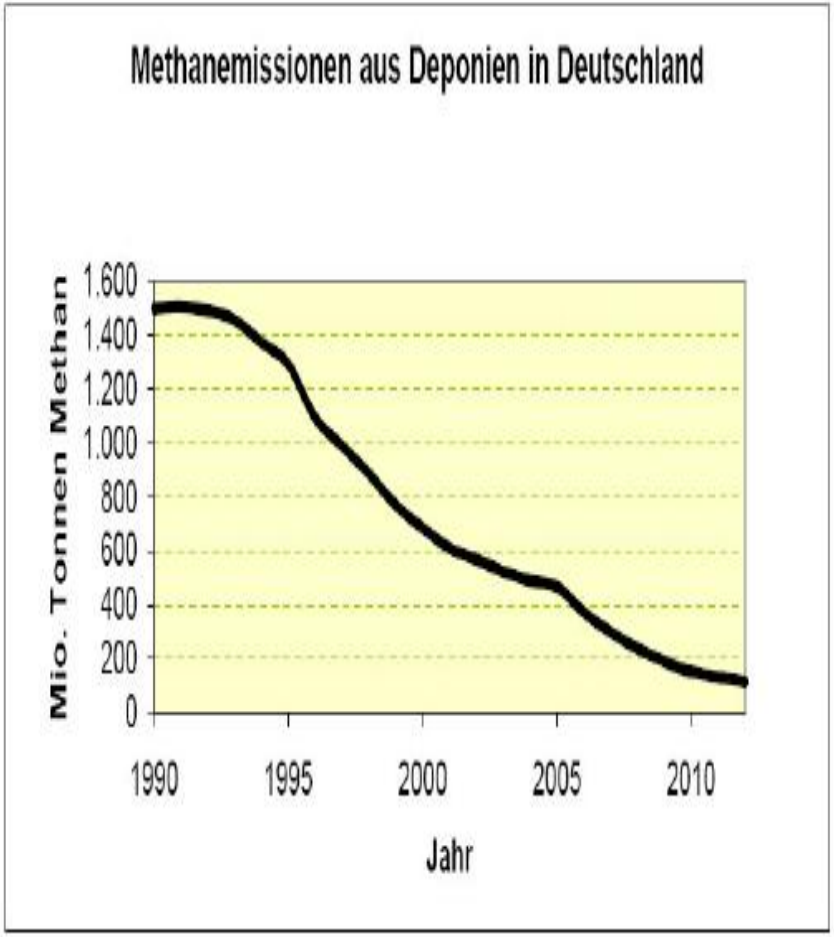
Regulatory Drivers

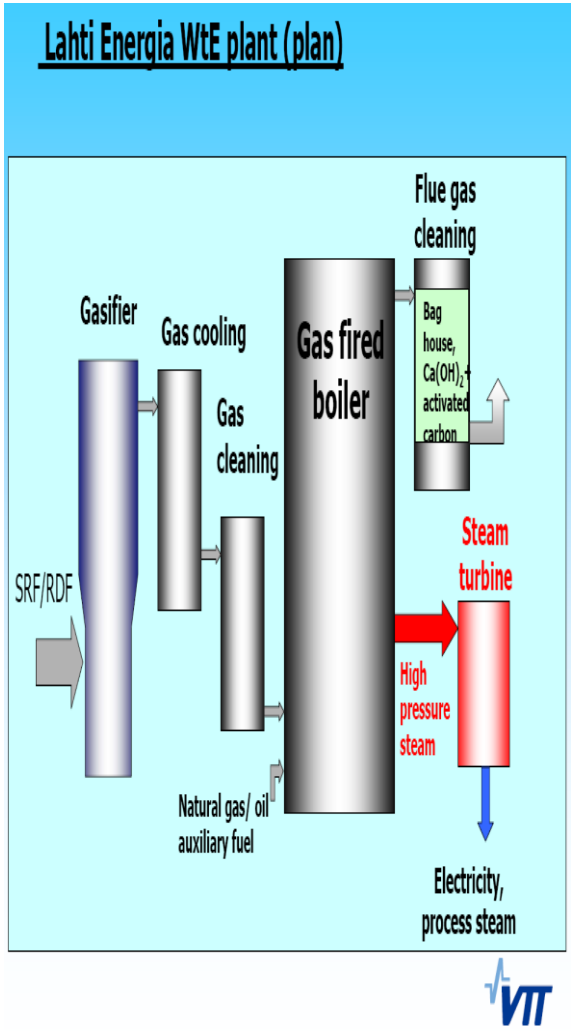
- **Landfill Directive – To reduce:**
  - **Methane Emissions (21 times more global warming than CO_2).**
  - **Land damage.**
  - **Water contamination.**
  - **Odours and vermin.**
- **Phase out of landfill in Germany (TASi) has saved almost 30 million tonnes per annum of CO_2 equivalent ≈ Croatia's total annual emissions.**



Quelle: Umweltbundesamt

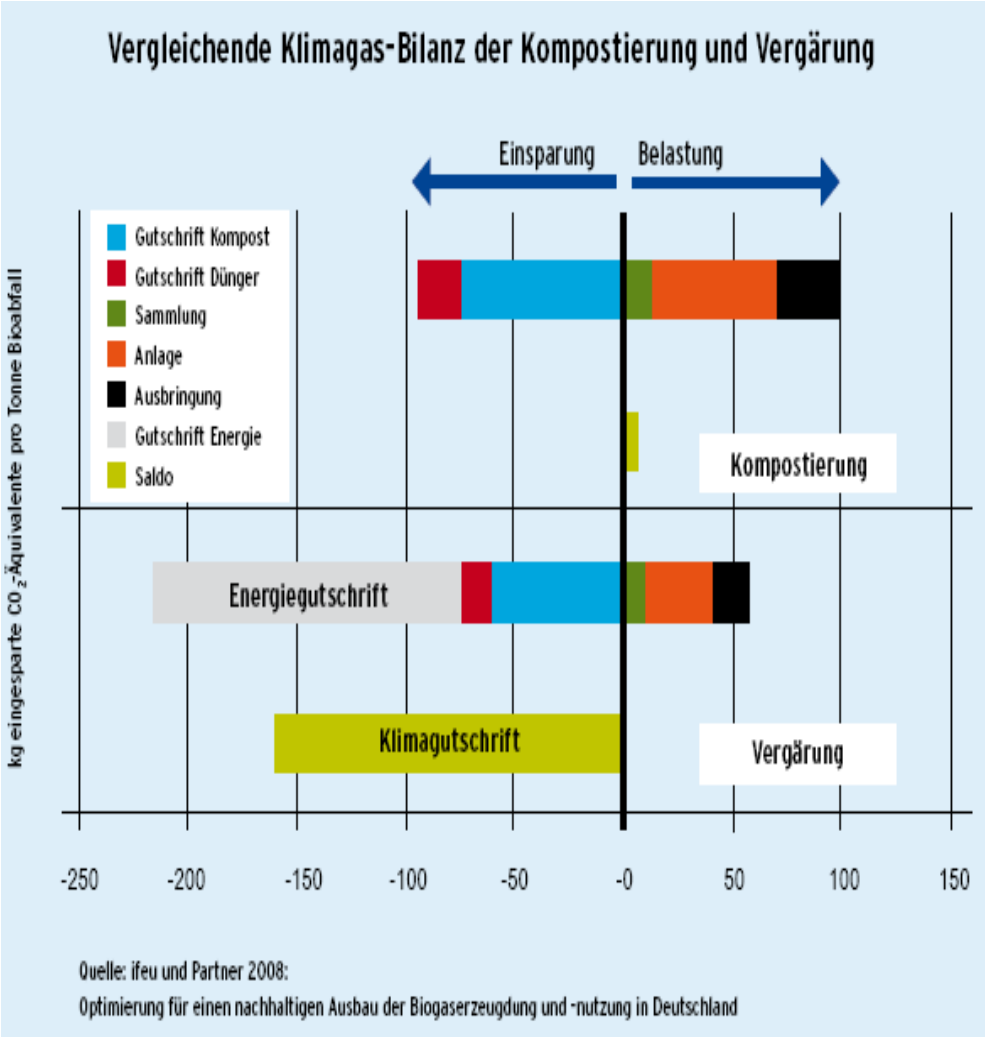
Energy Recovery - Thermal Treatment

- **Municipal Solid Waste (≈30% moisture) – Calorific Value: 9 to 10 MJ/kg.**
- **Standard incinerators recover ≈ 22% of energy as electricity, plus equivalent amount of district heat.**
- **≈ 50% of energy recovery is renewable.**
- **German incinerators produce energy equivalent to that required by Berlin.**
- **Emerging technologies in gasification with electrical efficiency > 35%**



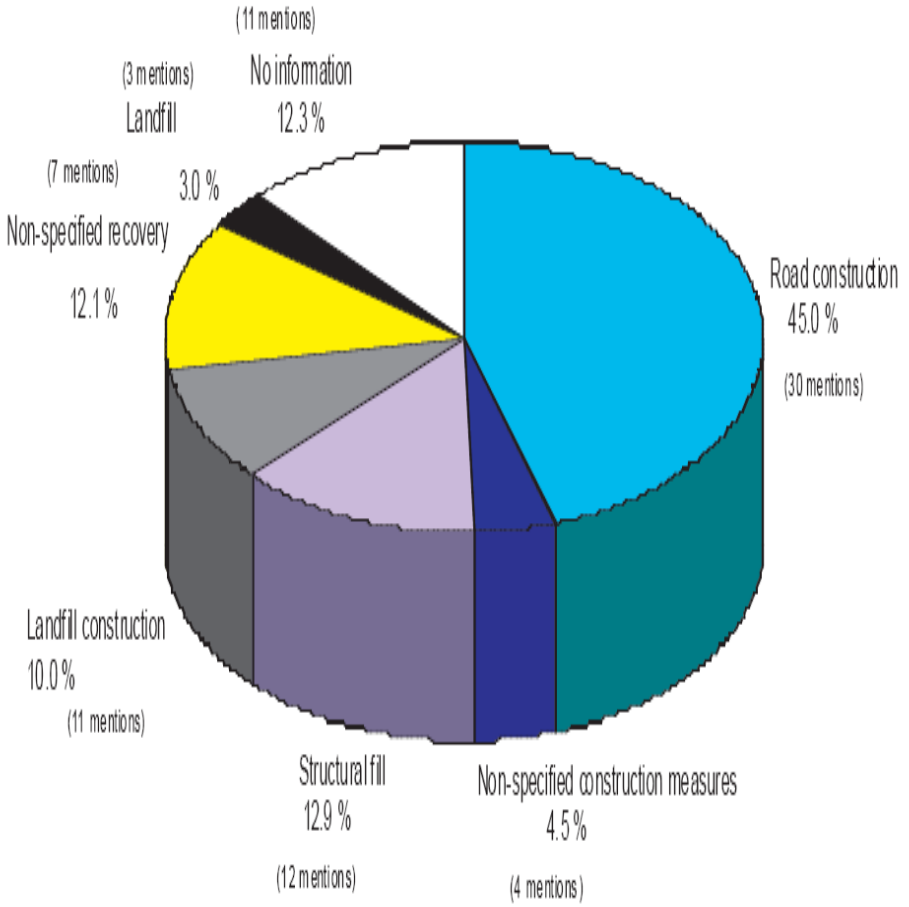
Energy Recovery - Biological

- **Composting - Energy DEMAND: ≈ 15 to 80 kWh of electricity per tonne waste input.**
- **Anaerobic digestion – Energy OUTPUT: 190 – 150 kWh of electricity per tonne waste input plus equivalent quantity of low grade heat.**



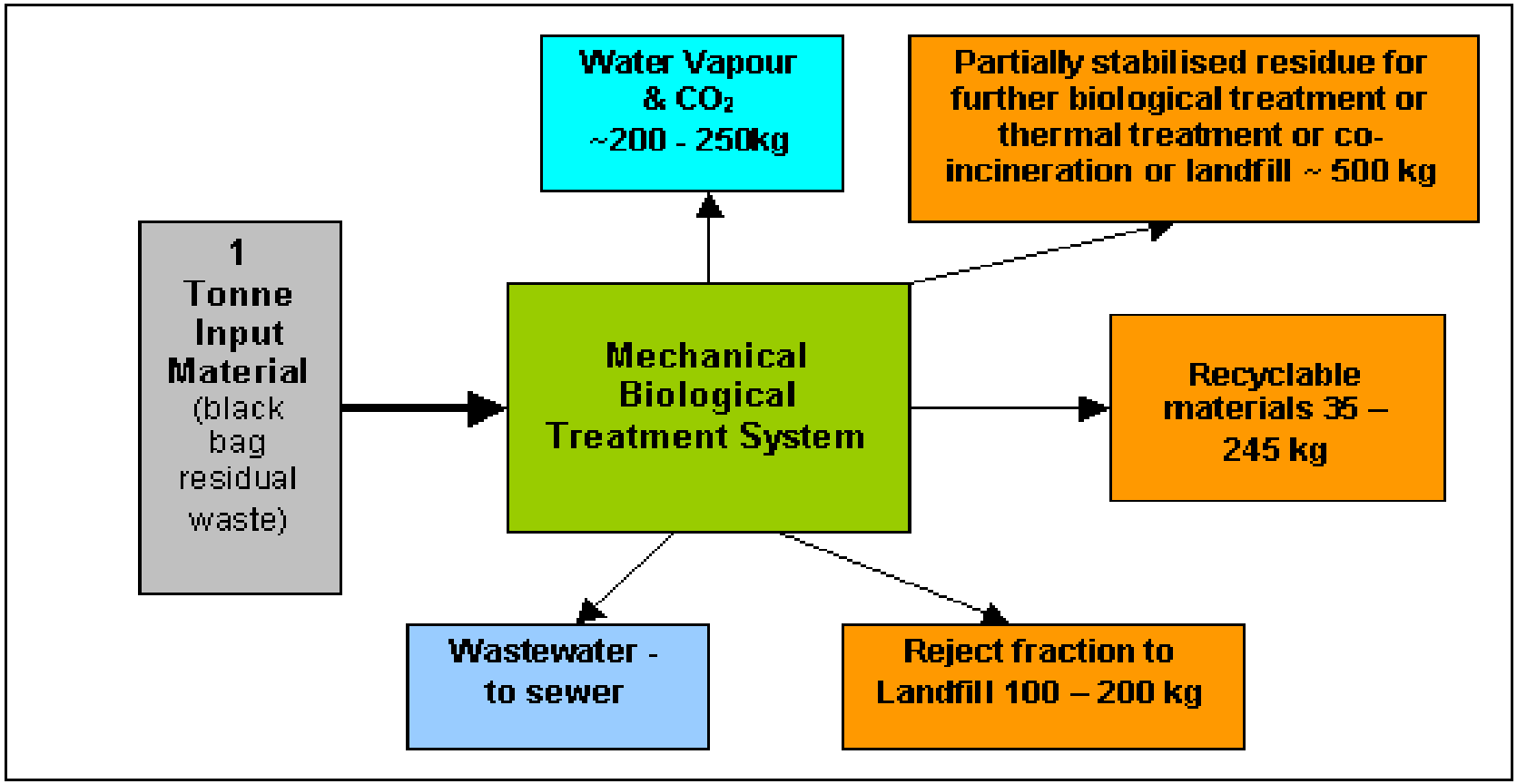
Disposal of Residues – Thermal Treatment

- **A grate incinerator will produce 200 to 300 kg of bottom ash per tonne of waste.**
- **Grate ash is non-hazardous and much is re-used, see German figures attached.**
- **Fly ash and gas cleaning residues are about 30 kg per tonne and go to a hazardous waste landfill.**



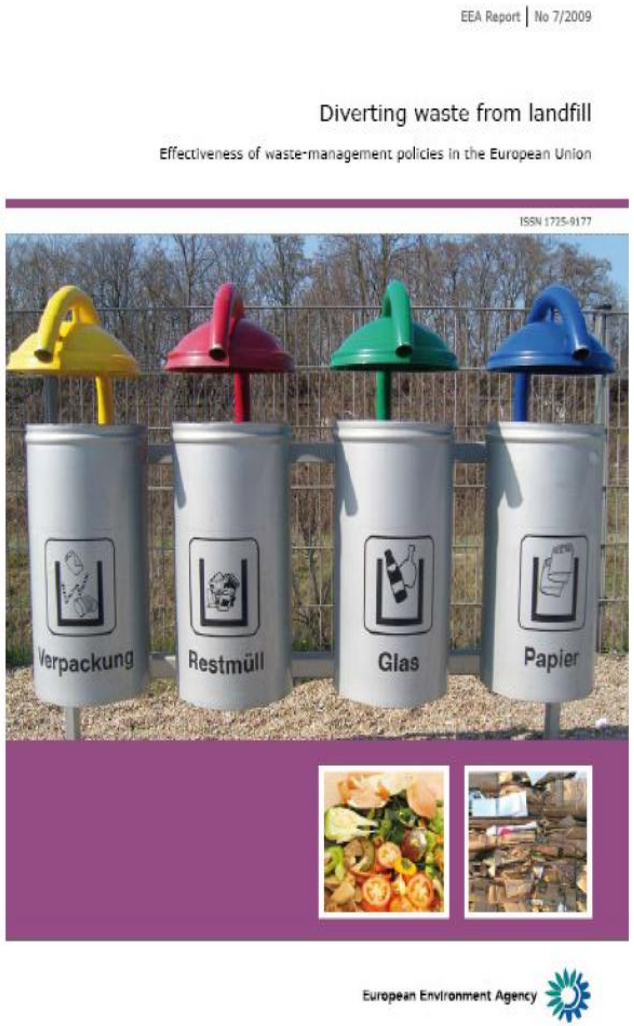
Disposal of Residues - MBT

- **Theoretical performance of MBT.**



Disposal of Residues - MBT

- **“Mechanical-biological treatment (MBT) is usually used to treat mixed municipal waste. Materials suited for incineration or recycling are separated and biological treatment is then used to reduce the volume and organic content of the remaining fraction. The quality of the biologically treated waste fraction is usually poor and therefore it is landfilled or used as low quality compost, e.g. as landfill cover”.**



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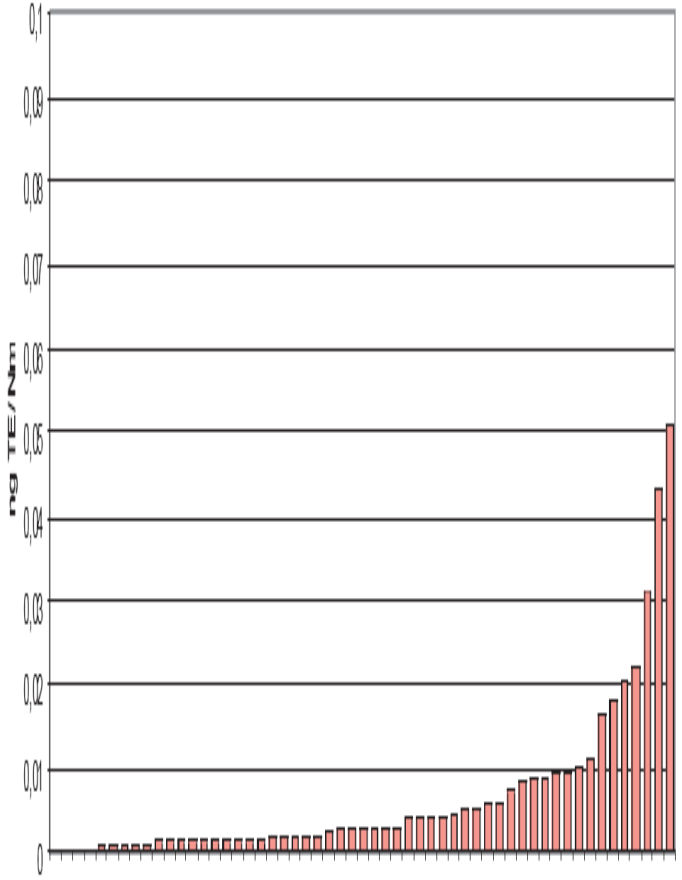
Health Related Impacts – Thermal Treatment

- **Dioxin (2,3,7,8-TCDD) is a human carcinogen – World Health Organisation (IARC) Group 1.**
- **So are alcoholic beverages, it is the dose that counts.**
- **Emission limit (0.1 ng/m³), results for Germany attached.**
- **Testing for 0.1 part in a trillion (note: there are a trillion seconds in 33,000 years).**
- **Dioxins are ubiquitous, more dioxin emissions in bonfires and fireworks.**



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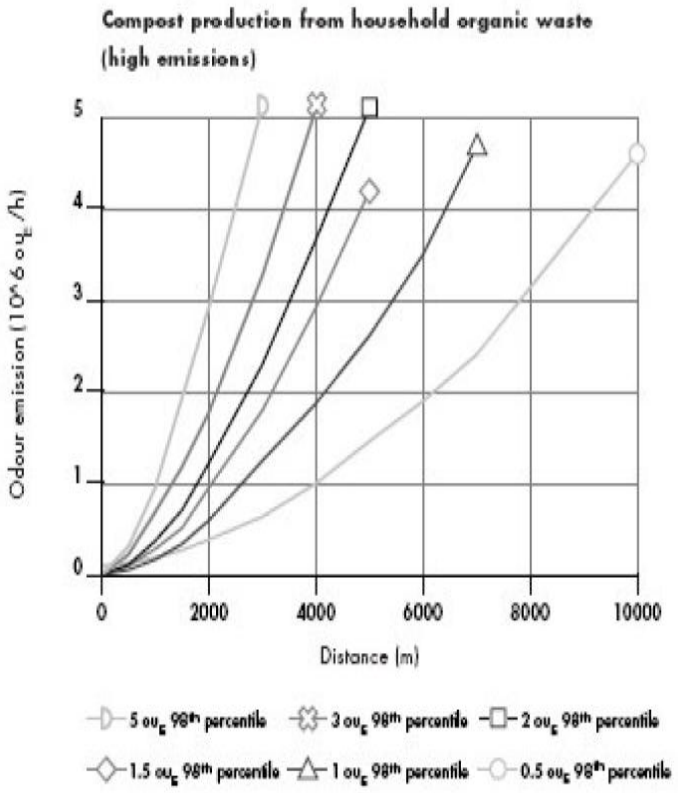
Health Related Impacts – MBT

- **Composting produces fungal spores and endotoxins – these trigger allergic reactions and irritate the mucous membranes.**
- **High concentrations lead to Aspergillosis and Extrinsic Allergic Alveolitis (commonly called Farmer's Lung).**
- **Netherlands recently set an Occupational Exposure Limit for Endotoxins of 90 EU/m3.**
- **Concentrations of 200 EU/m^3 are normal in composting facilities with frequent readings ten fold higher. Elevated concentrations in the surroundings have been reported.**

Odours Nuisance – Physical and Mental Effects

- **Thermal treatment plants are enclosed with the air drawn into the furnace chamber.**
- **Composting produces significant odours, see Dutch guidance.**
- **EU JASPER report:**
  - **"Since a MBT facility handles and treats a waste stream containing kitchen waste there is always a need to consider and manage volatile emissions / odours generated in the different processes. Location at sufficient distances from inhabited areas is a first and important measure".**

Figure 2 Distances to contour lines representing 0.5, 1.5, 3 and 1.5 ou_E/m^3 as 98th percentile in the case of various odour nuisance levels in the range 0–5 (10^9 ou_E/h)



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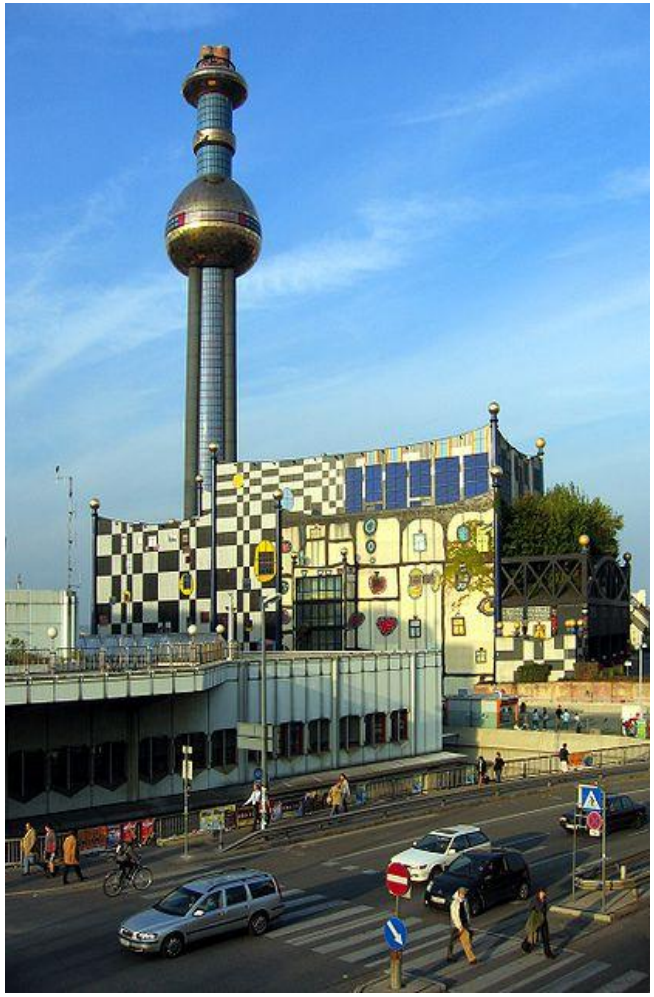
Land-use Planning

- **Thermal Treatment – no restrictions, usually built in urban areas.**
- **MBT:**
  - **UK Environment Agency require a minimum of 250 m from dwellings or workplaces due to risk from bioaersols.**
  - **German TA Luft specifies distance of 300 m for enclosed composting and 500 m for open composting.**
- **Detailed odour assessment essential.**



Conclusions - Switzerland

- **Switzerland has 28 municipal incinerators and no MBT plants – it phased out landfill in 2000.**
- **Swiss Federal Environmental Agency on MBT in 1999:**
  - **“The problem is that the fractions obtained are generally of poor quality which makes their recycling somewhat difficult. The compost, for instance can often not be used for agricultural production. The combustible fraction is rarely of good quality. Its incineration in cement works or industrial boilers is, therefore, rarely possible. In addition, working conditions on sorting lines (industrial sorting can never become totally automatic) presents health and ethical problems. Finally, however well the sorting is carried out, there always remains a fraction (or residue), frequently highly polluted, which needs to be incinerated or landfilled”.**

Conclusions

- **Incineration plants are only commercial at about 200,000 t/a.**
- **There is therefore a need for pre-treatment steps for municipal waste for smaller communities – but it needs to be well thought through.**
- **Incineration facilities need to be permitted, designed, specified and procured to a high standard – holistic integrated approach!**

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Thank you very much for your Attention!

Hvala lijepa!