The EEA waste model
Past, Present & Future

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Warmest May on record in northern hemisphere
Original scope of the model

- EU-wide (EU 27+ NO+ CH)
- Are waste quantities increasing?
- Is waste management getting better?
- What is the potential for climate pollution reduction?
Model Backbone

- Time series 1950-2008
- MSW generation per year
- Waste management share per year
- Composition (fraction level)
- GHG modelling
A long story started in 2003

- MSW generation model
- MSW treatment model V1.0
- LCA
- GHG model V1.0
- MSW treatment model V2.0
- GHG model V2.0
- Biotreatment Share
- MSW treatment model V3.0
- Waste composition for recycling
- Landfill gas recovery rate
- GHG model V3.0
- New EEA contract
- DG ENV contract (Eunomia/CRI)

→ 4 reports published
A big model...

- 40 files
- 25 worksheets / file
- 32,400,000 cells (mostly linked)
- A bit tricky to find the information...
Time series of emissions vs avoided emissions
Boundaries of the model

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<th>Upstream impacts (electricity use, ...)</th>
<th>Direct Operational impacts (Landfill emissions, ...)</th>
<th>Indirect Downstream impacts (Avoided emissions)</th>
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<td>Excluded WM infrastructure</td>
<td>Limitations Europe wide parameters</td>
<td>Limitations Same EF for Europe</td>
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- Only municipal waste
- Only greenhouse gases

- Life cycle thinking
- WRI/WBCSD (Scope 1, 2, 3)
- IPCC

Excluded WM infrastructure

Limitations Europe wide parameters

Limitations Same EF for Europe

- Boundaries
- Upstream impacts
- Direct Operational impacts
- Indirect Downstream impacts (Avoided emissions)

- Material & energy recovery
- Aluminium recycling

- Excluded
- WM infrastructure

- Limitations
- Europe wide parameters

- Limitations
- Same EF for Europe

- Only municipal waste
- Only greenhouse gases

- IPCC

- WRI/WBCSD (Scope 1, 2, 3)

- Life cycle thinking
Waste Management

- Amount of waste generated (Eurostat)
- Landfill (Eurostat + IPCC + LCA)
- Incineration (Eurostat + IPCC + LCA)
- Biotreatment (Eurostat + IPCC + LCA)
- Recycling (Eurostat + LCA)
- Transport (LCA)
- No MBT 😞
- No waste prevention 😞

- Recognised methodologies
- Official sources of data
- Assumptions transparency
The limitations of the model

- It is not...
  - A LCA model
  - A technology comparison tool
  - A ’what if’ model

- It is...
  - A waste statistics model using life cycle data
  - A ’snapshot’ of a country / EU situation
  - An attributional system
  - Yearly time series
MSW generation time series

- Backcasting (Based on GDP increase)
- Historical (Eurostat)
- Forecasting (Econometric projection)
Landfill module: challenging

- First order decay method
  - IPCC Tier 2 (IPCC, 2006)
- Calculated time series (1950-2008)
  - Municipal waste quantities & composition
  - Backcasting (based on GDP growth)
  - Forecasting (based on private consumption forecast)
- Many assumptions (some controversial...)
  - We don’t know much about the past...
  - Better to have inaccurate data than no data
Delayed emissions from landfills

Methane emissions

Waste to landfill

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Landfill: challenges

- Composition of waste
  - Assumed constant over time 😞

- Landfill gas recovery
  - Reported (IPCC) + expert assessment
  - Assumed 100% of recovery to electricity
  - Assumed 0% flaring

- Carbon sequestration excluded

- Landfill electricity substitutes country mix
  - Country mix constant over time
Direct landfill emissions: IPCC vs EEA model

- **IPCC**
  - MSW + Industrial organic waste
- **EEA model**
  - MSW only (Directive definition)
- $\text{CH}_4 = 25 \times \text{CO}_2$
- Cannot compare directly with IPCC...
Incineration (1990-2020)

- Same waste composition as landfill
- Efficiency factor (same for all countries)
- 100% assumed to recover energy
  - Electricity (subst. Average country mix)
  - Heat (subst. Average European mix)
Incineration: challenges

- 2 types of incinerators only
  - Country average efficiency needed
- Substitution of energy
  - Need to change the mix when needed
- Ancillary material for completeness
Biotreatment

- Anaerobic digestion
- Centralised composting
- Home composting
  - Weak home composting data
- Methane produces electricity
  - Include other end uses (Vehicle fuel)
Recycling

- Benefits of recycling based on LCA
  - Needs update (emission factors)
- Question: what does recycling substitute?
  - 100 % virgin?
    - High C virgin? Low C virgin? World average?
  - 100 % virgin (after reject has been subtracted?)
    - Eq to substitution ratio
  - A ratio virgin / recycled?
How should we communicate outside the waste sector?

- According to IPCC...
  - All industries have direct emissions
    - Except forestry and landfilled wood (sink)
  - GHG mitigation = direct emissions reduction
    - No ’benefits’ or negative number
- Benefit ← waste = mitigation in other sectors
  - Reduction of direct emissions