

The EEA waste model

Past, Present & Future

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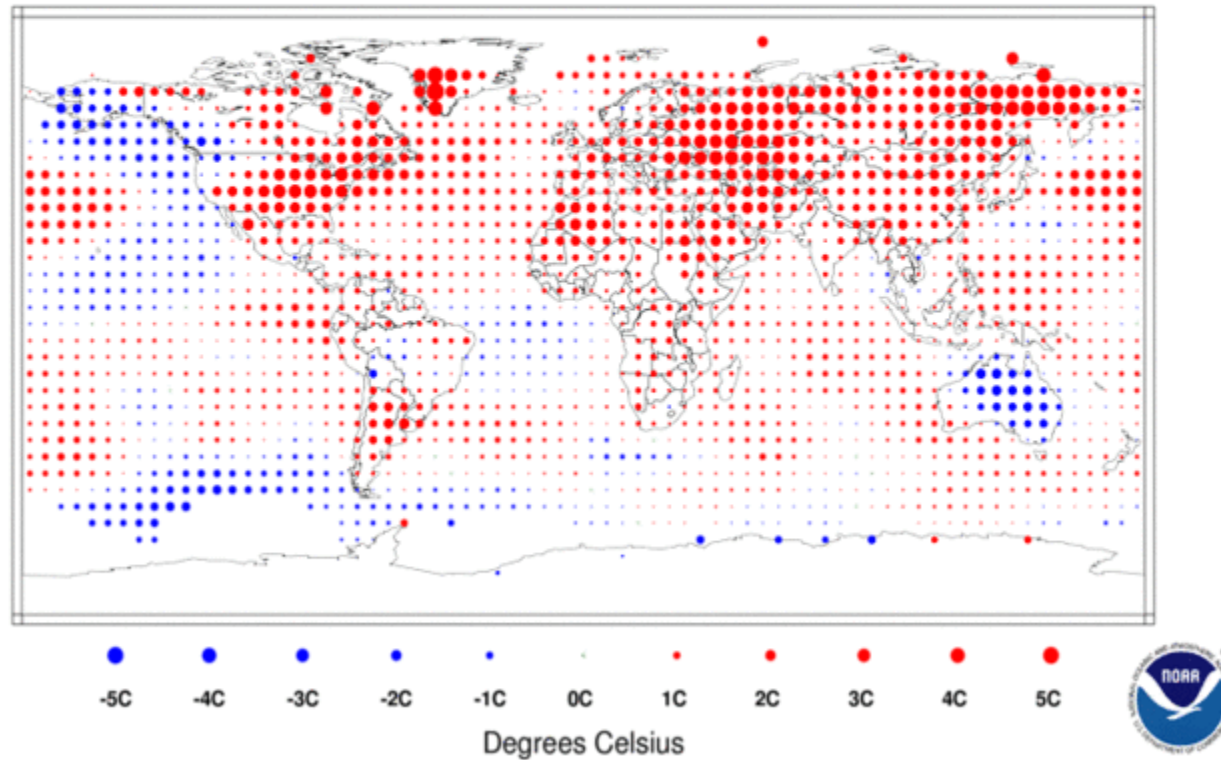
WASTE · CONSUMPTION · PRODUCTION

Christian Fischer and Emmanuel Gentil

Temperature Anomalies May 2012

(with respect to a 1971-2000 base period)

National Climatic Data Center/NESDIS/NOAA



Warmest May on record in northern hemisphere



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WASTE • CONSUMPTION • PRODUCTION

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?

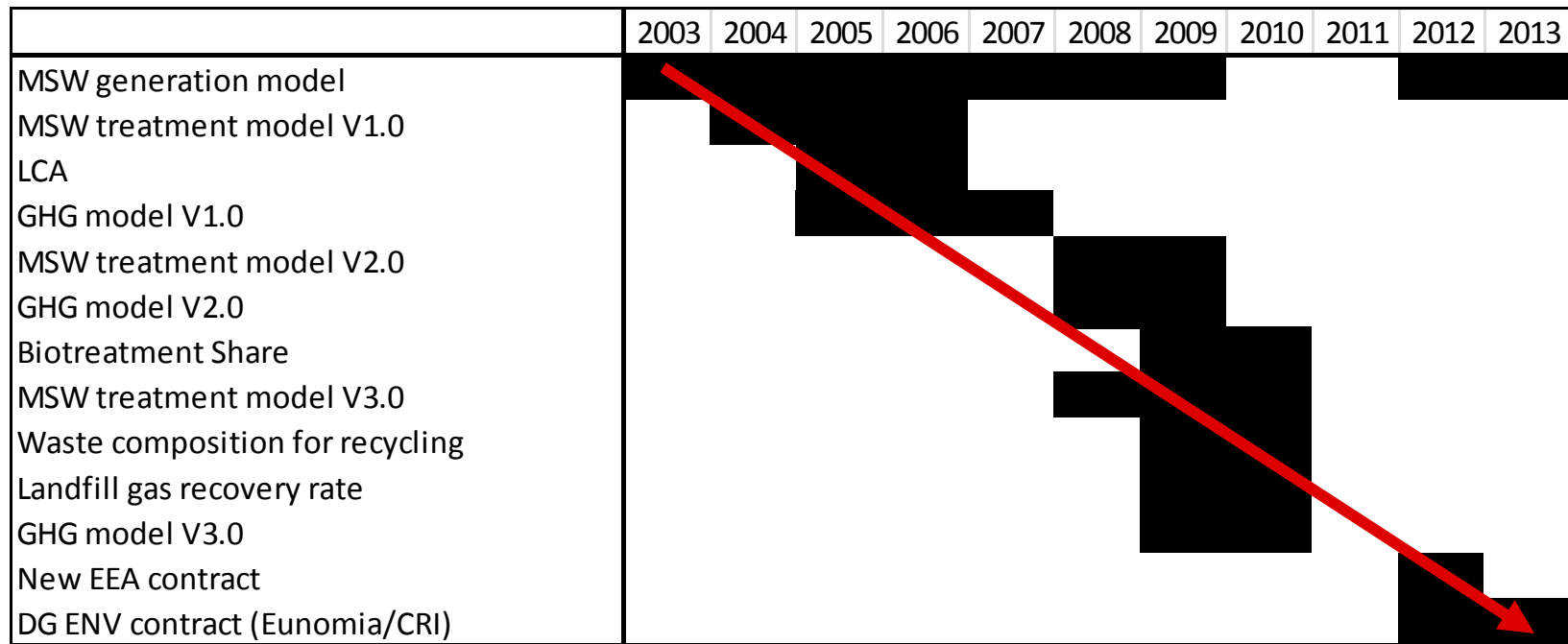


Model Backbone

- Time series 1950-2008
- MSW generation per year
- Waste management share per year
- Composition (fraction level)
- GHG modelling



A long story started in 2003



→ 4 reports published

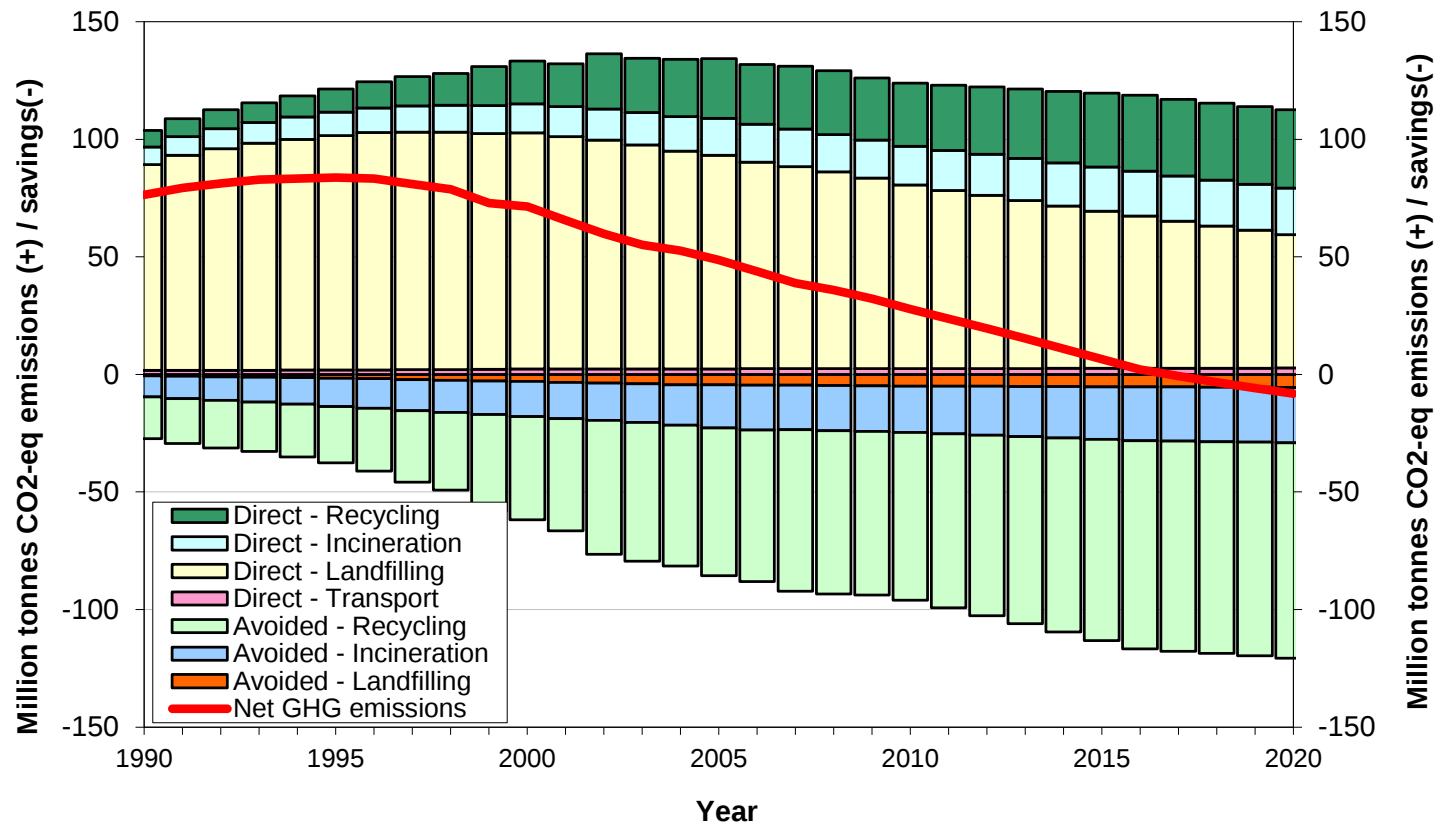


A big model...

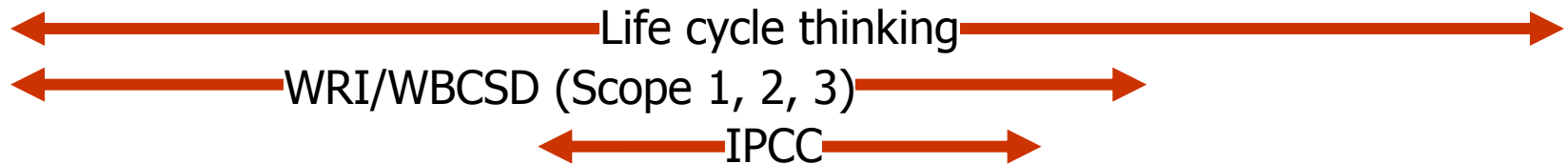
- 40 files
- 25 worksheets / file
- 32,400,000 cells (mostly linked)
- A bit tricky to find the information...



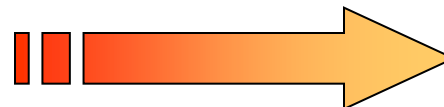
Time series of emissions vs avoided emissions



Boundaries of the model



Upstream impacts (electricity use, ...)	Direct Operational impacts (Landfill emissions, ...)	Indirect Downstream impacts (Avoided emissions) material & energy recovery (Aluminium recycling)
Excluded WM infrastructure	Limitations Europe wide parameters	Limitations Same EF for Europe

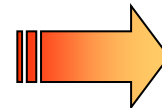


Only municipal waste
Only greenhouse gases



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

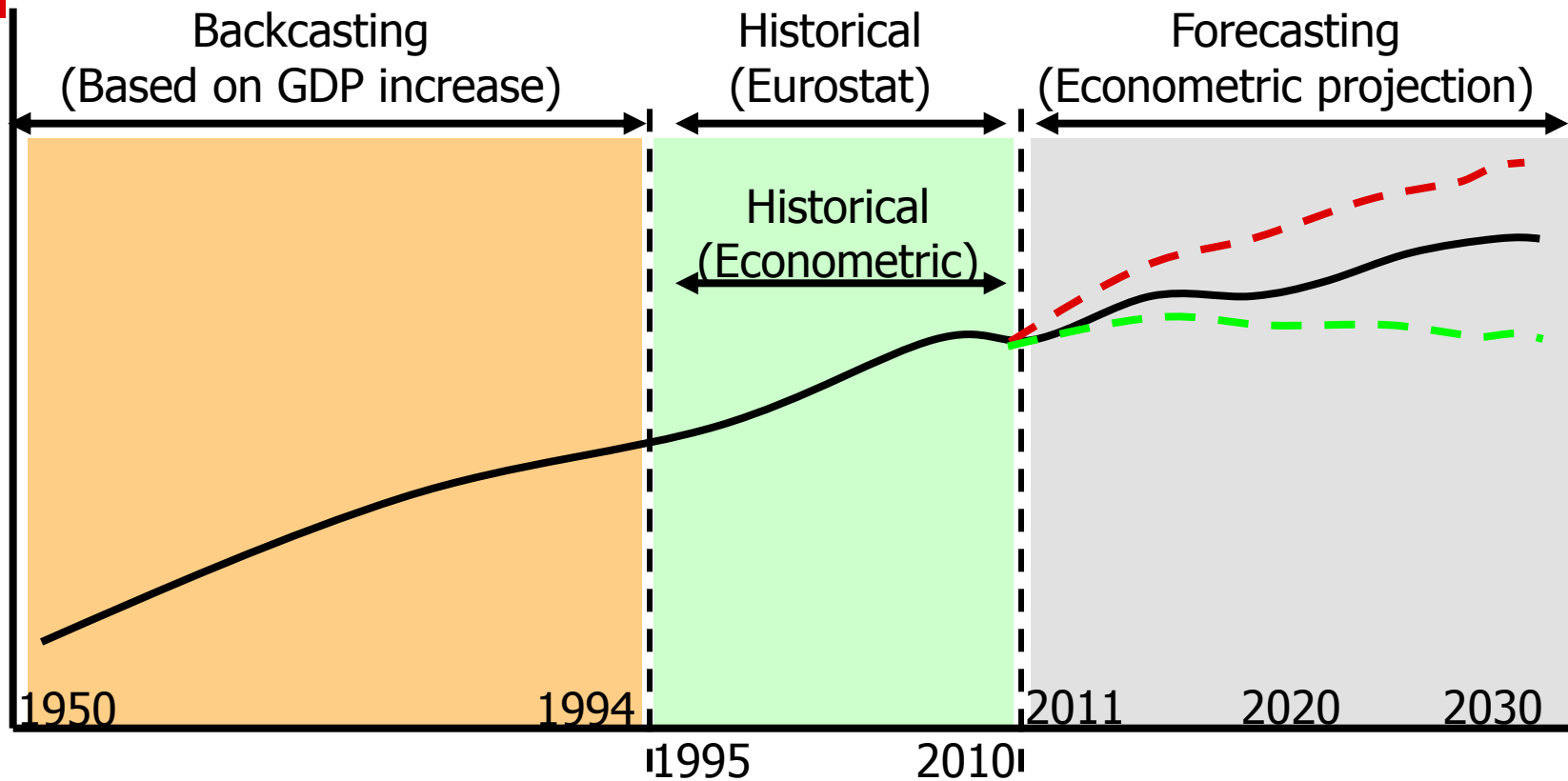


The limitations of the model

- 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

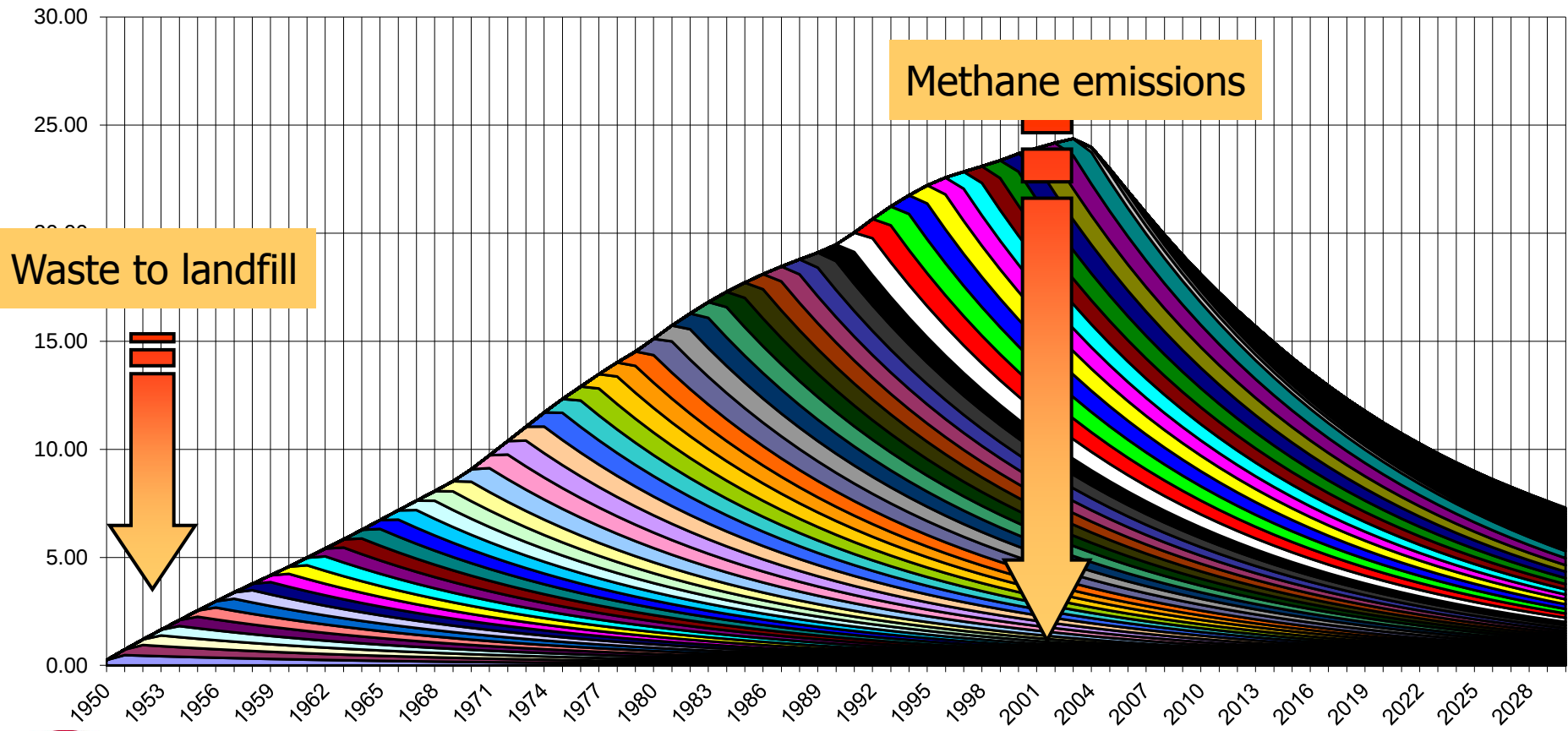


Landfill module: challenging

- 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



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

