A Climate Calculator for Solid Waste Management

‘SWM-GHG Calculator‘

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GHG emissions and waste management

GHG emissions from waste management

- Debits from direct emissions mainly CO_2, CH_4, N_2O
- Credits for substituting primary materials and/or energy

Waste Management contributes to climate protection

- Minimising or avoiding direct emissions, e.g. methane from landfilling
- Substituting primary materials production through material recycling
  = efficient ressource use
- Substituting fossile energy sources through energy recovery

Two methods to assess GHG emissions:

- IPCC approach (Kyoto protocol: Common Reproting Format (CRF) in accordance with UNFCCC guideline and IPCC Good practice guidance)
- LCA approach (Life Cycle Assessment, ISO 14040/14044, cradle to grave)

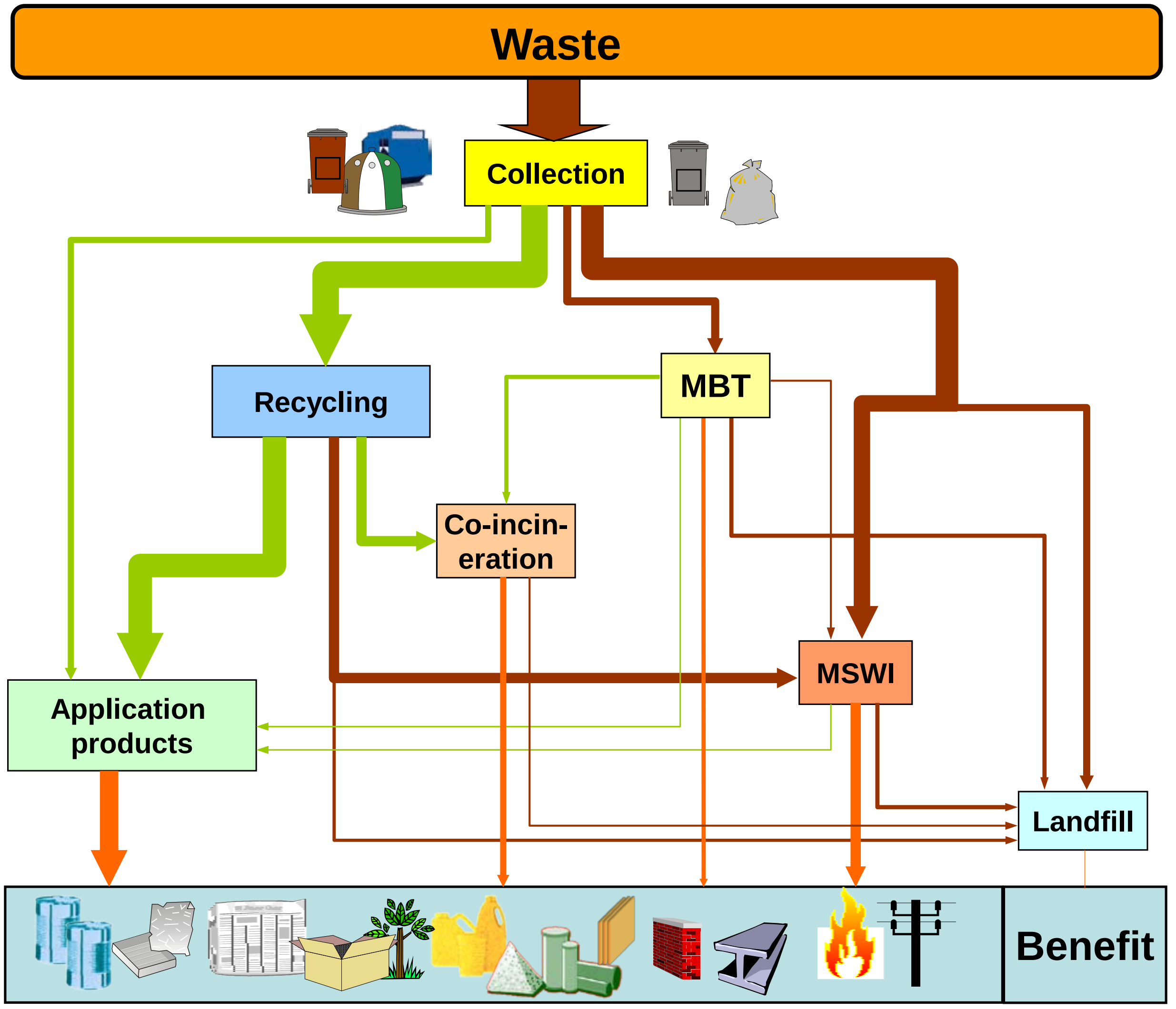
IPCC approach (reporting commitment Kyoto Protocol)

- GHG source categories:
  1. Energy; 2. Industrial processes; 3. Solvent and other product use; 4. Agriculture; 5. Land use, land use change and forestry; **6. Waste**; 7. Other
- Sector '**Waste**' = only GHG emissions from landfill, composting and incineration without energy recovery
  - Resulting in 2.8% contribution of solid waste management to GHG emissions
  - Contribution of GHG mitigation of recycling and energy recovery is reported in other sectors

→ GHG mitigation of waste management (sector waste) is underestimated

→ LCA approach to assess the total contribution of waste management to climate protection

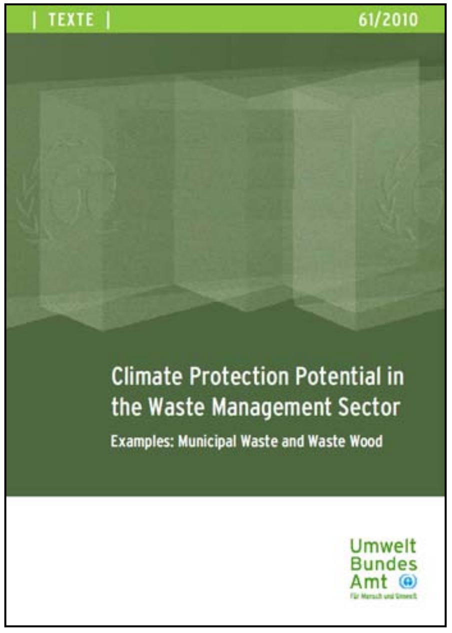
LCA-approach (ISO 14040/14044, cradle to grave)



10-15% reduction possible

E.g. results from UBA study GHG mitigation potential of selected countries:

Turkey	13%
Tunesia	16%
Mexico	10%



Potential of GHG mitigation
– target group for the SWM-GHG Caclulator

Developing countries and emerging economies:

- Mainly dumping = high potential for GHG mitigation (methane)
- Have few information to estimate GHG mitigation effects of alternative waste management activities
- Have few information about associated costs

→ SWM-GHG Calculator to provide orienting information on GHG mitigation effects of alternative waste management activities and associated costs

→ Sustainable waste management systems can significantly contribute to improve public health conditions and environmental protection

SWM-GHG Calculator

SWM-GHG Calculator

TOOL FOR CALCULATING GREENHOUSE GASES (GHG)
IN SOLID WASTE MANAGEMENT (SWM)

Developed by

ifeu

Sponsored and financed by

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giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

kfw ENTWICKLUNGSBANK

SWM-GHG Calculator

Goal:

- Simple manageability - excel, instructions given in the tool
- Low effort on data collection - default values
- Provision of background information - Manual

Features:

- Up to 4 scenarios can be compared at one time
- System approach (total waste amount and whereabouts):
  avoiding / minimising methane emissions, recycling, energy recovery
- Key aspect disposal routes
- Rough cost data / CO_2 mitigation costs

Required input data:

- Waste amount (total)
- Waste composition
- Emission factor electricity grid
- Share of recycling
- Kind of disposal of residual municipal solid waste

Band width / default values given as recommendation for all input data

SWM-GHG Calculator

Considered disposal routes

- Scattered waste with and without open burning
- Wild dumps / unmanaged disposal sites
- Controlled dump / landfill without gas collection
- Sanitary landfill with gas collection
  parameters: - efficiency of gas collection
  - treatment of collected landfill gas
- Simple biological stabilisation and landfill
- MBT – RDF in cement kiln, MBT-residue to landfill
- MBS/MPS – RDF in cement kiln
- MSWI, parameters: - net efficiency of energy utilization

→ Parameters allow more accurate calculation of GHG emissions;
Disposal via MBT/MBS/MPS is based on data for Germany

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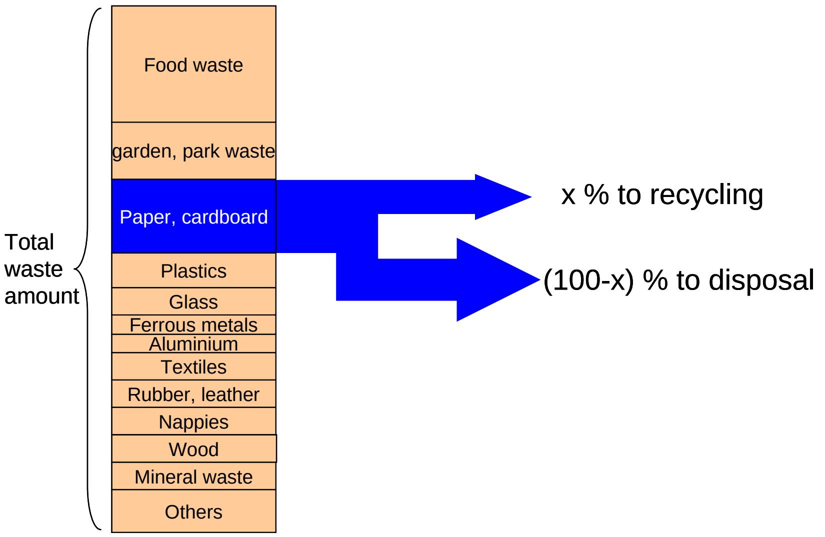
Recyclable fractions included

- Paper, cardboard
- Plastics
- Glass
- Ferrous metals
- Aluminium
- Textiles
- Food waste and garden, park waste
  - to composting
  - to anaerobic digestion



→ Calculation simplified with emission factors for recycling, representing the average situation in Germany, 2006

SWM-GHG Calculator

Information (sheet ‚Calculations‘):

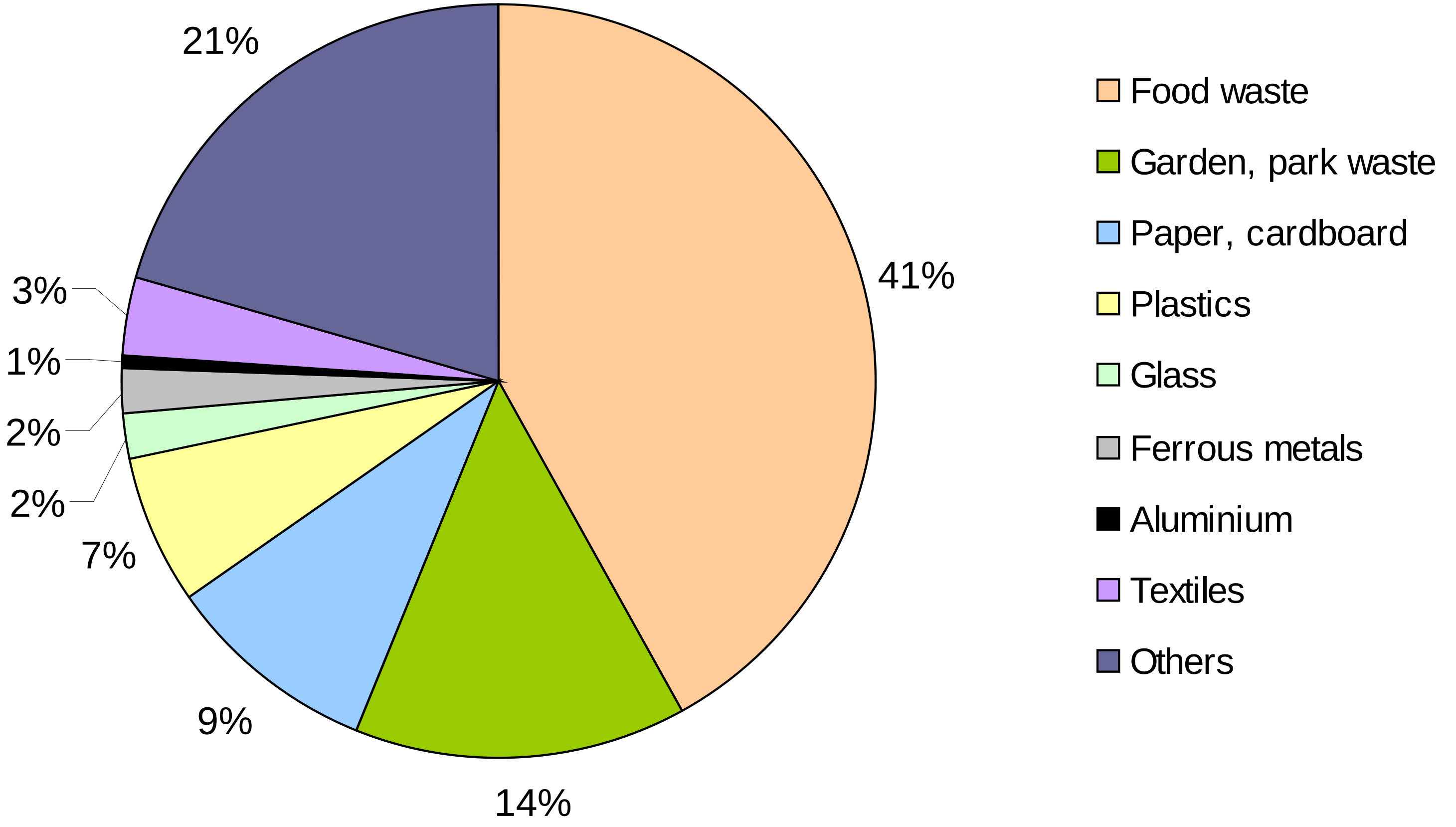
- Emission factors for energy demand
- Carbon content and calorific value
- Calculated waste characeristics for total waste and residual waste
- GHG emission factors for recycling (representing German situation)
- Calculation

Results:

- Waste amount and composition (in table form, grafically)
- Calculated GHG emissions per scenario
  (total and sectoral for recycling and disposal)
- Calculated total costs and specific costs per scenario
- Comparison of the calcualted GHG emissions for the 4 scenarios
  (total and for recycling and disposal separatly)
- Calcualted total costs and mitigation costs compared to the Status Quo

Example

Waste composition



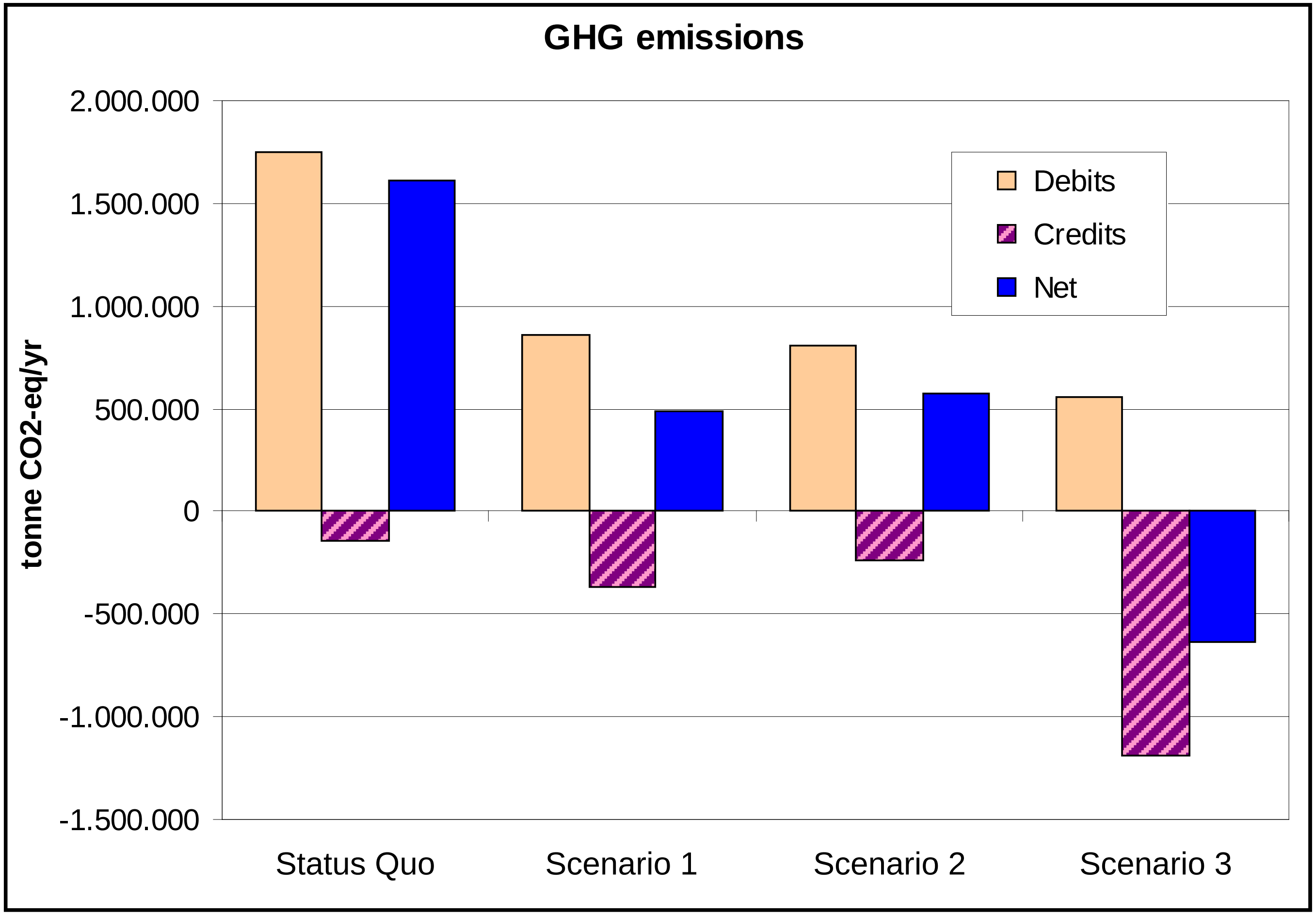
Example

Scenarios – treatment of total waste

	Status Quo	Scenario 1	Scenario 2	Scenario 3
Scattered waste not burned	9.4%	9%	9%	
Open burning of scattered waste	9.4%			
Wild dumps / unmanaged disposal site	75.0%			
Sanitary landfill with gas collection		80%		
Simple biological stabilisation, landfill			80%	
MBS/MPS, RDF cement kiln				85%
Recycling	6%	11%	11%	15%

Example

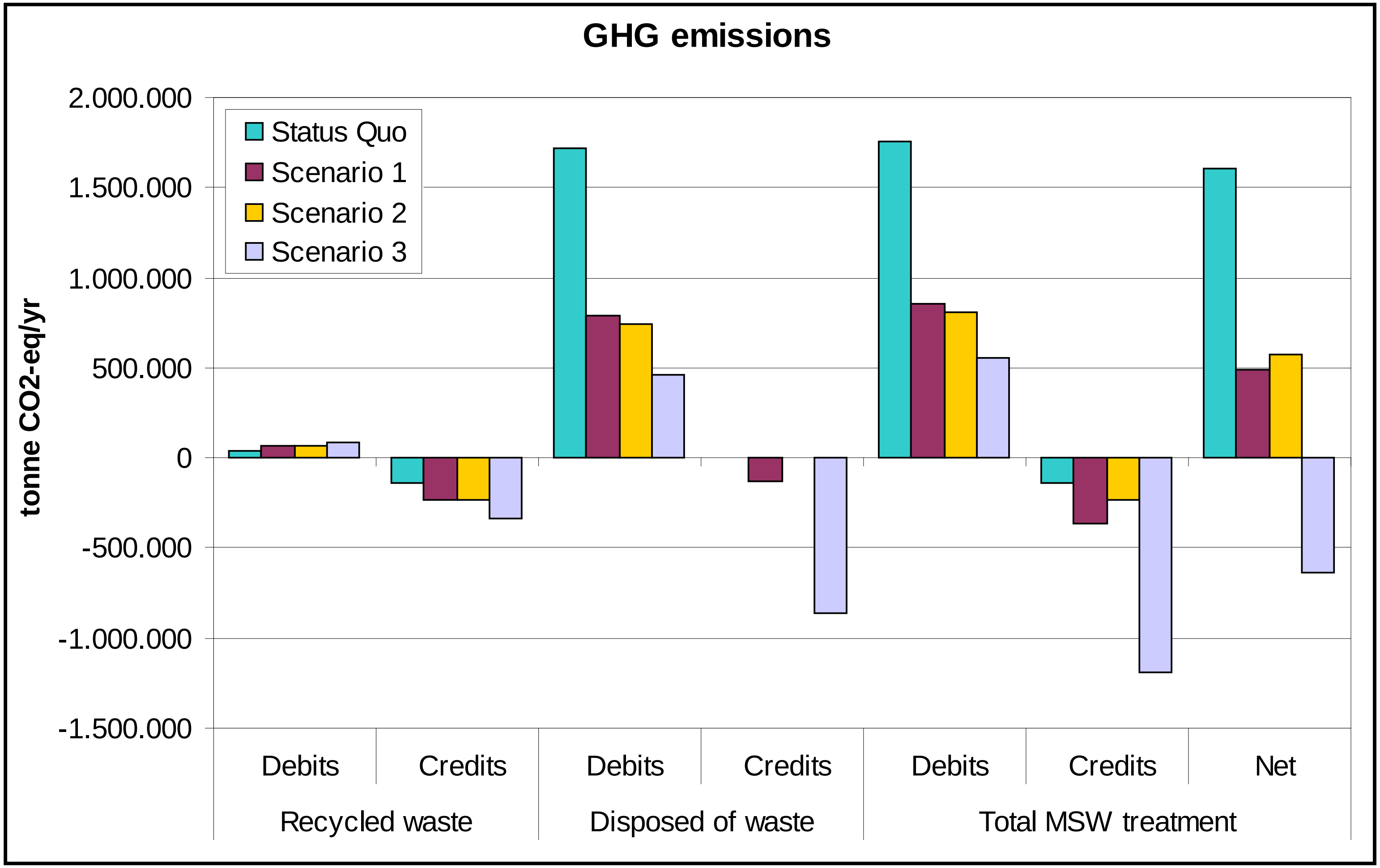
Results comparison of scenarios - total



Note: No C-sink taken into account. Although the amount is quantifiable, it is not included in the greenhouse gas inventory under IPCC (1996, 2006). Furthermore, including the C-sink as standard for landfill sites is problematical in that this would only be correct if the C-sink were taken into account in all other possible areas, e.g. in furniture or books as well. Such comprehensive inclusion of the C-sink is not feasible, however.

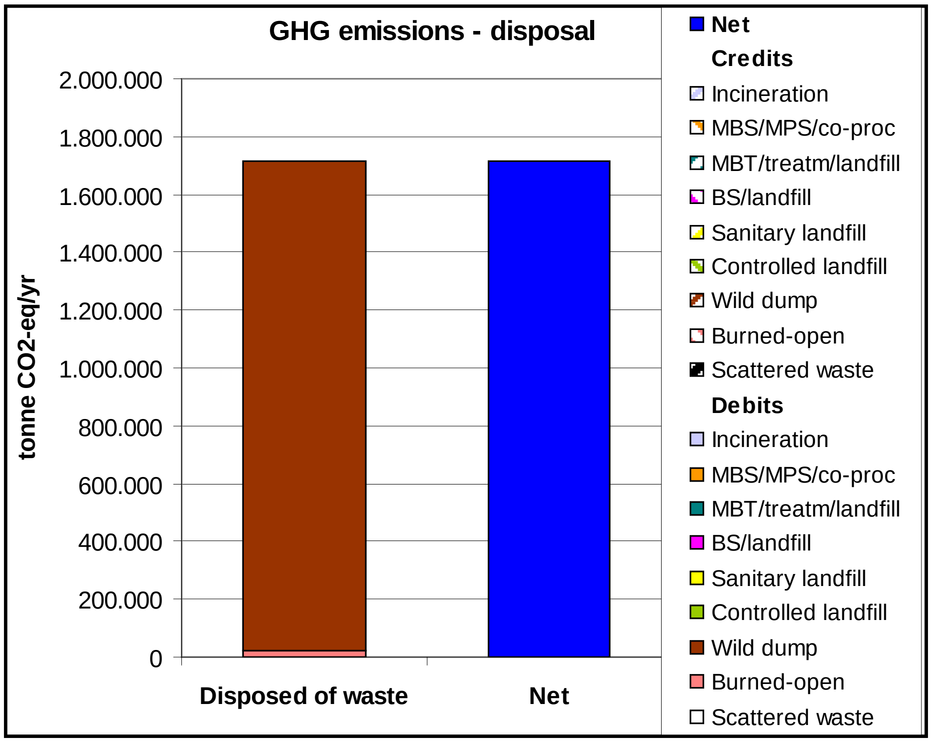
Example

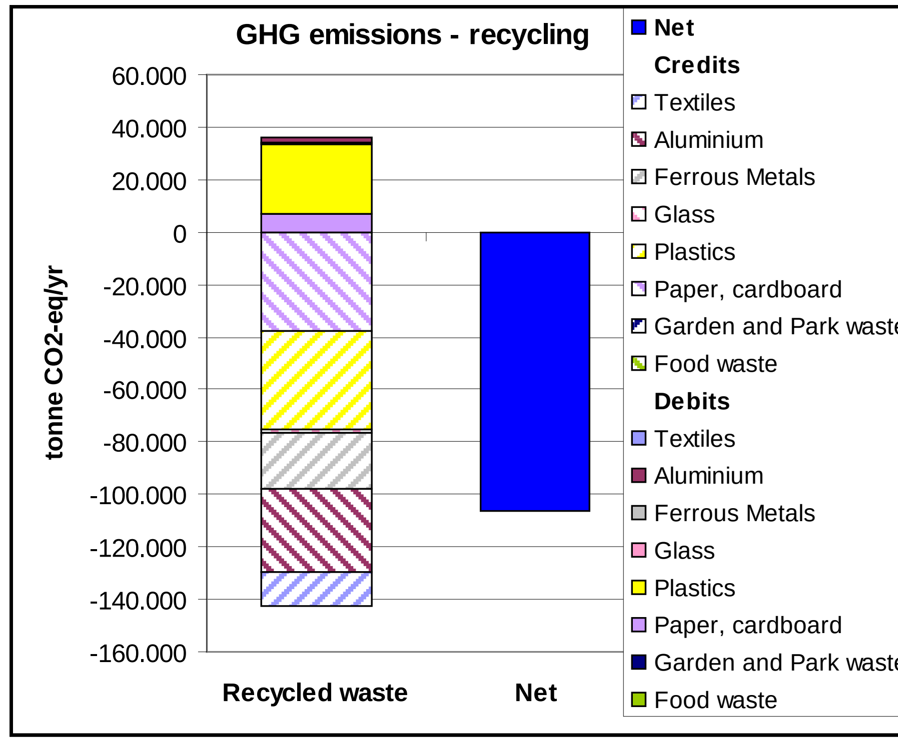
Results comparison of scenarios
– recycling, disposal separately



Example

Results Status Quo - sectoral





SWM-GHG Calculator

Limitations of the SWM-GHG Calculator

- No LCA according to ISO 14040 and 14044, because
  - only Global Warming Potential
  - Emission factors for recycling, MBT/MBS/MPS are only representative for the average situation in Germany, 2006
  - Using of recommended values (default values) is a strong simplification
- Waste prevention cannot be assessed
- Not applicable for calculating GHG mitigation in CDM projects

But: perspective

- Using emission factors for recycling is a possible approach to evaluate the effects of national action plans and programs (NAMA, PoA)
- Effort must be adequate = e.g. national data sets
- Sufficient representativeness must be given = emission factors can only be used if in compliance with specific conditions

Thank you

Download:

www.ifeu.de/SWM-GHG-Calculator

- SWM-GHG Calculator
- Example (protected)
- Manual

- Also Spanish version available

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www.ifeu.de