

“Subjective Valuation: the example of **long-term emissions** in the Life Cycle Assessment of waste disposal systems”

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“Subjective Valuation: the example of **long-term emissions** in the Life Cycle Assessment of waste disposal systems”

Contents

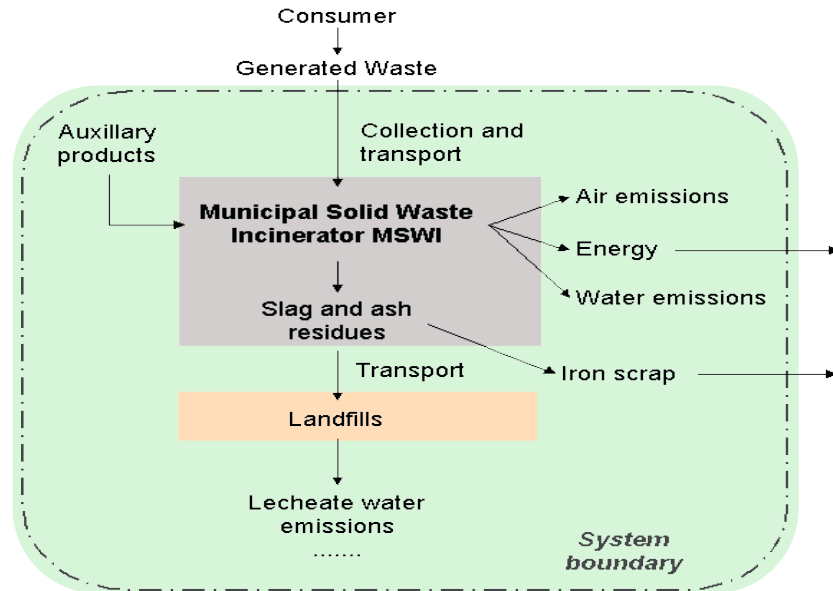
- LCA of municipal waste incineration including slag landfills
- Contribution of long-term leachate emission from landfills
- How to deal with long-term emissions
- Possible preferences
- Conclusions and suggestions



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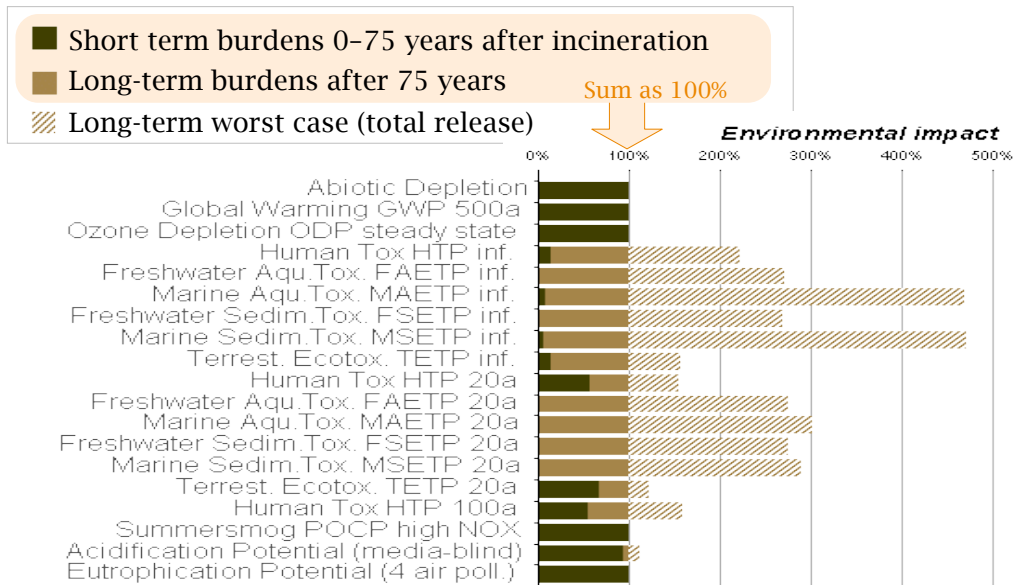
Life Cycle Assessment of waste incinerators



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LCA results of average Swiss municipal solid waste incineration for some CML'01 categories



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The question:

Are **long-term emissions** equal to **short-term emissions** in their **damage potential** ?

Or should there some relative **weighting (temporal discounting)** be **involved**?



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Possible solutions

Answer 1: Weigh future **lower** than present emissions
(positive temporal discounting)

Answer 2: Weigh future **equal** than present emissions
(no temporal discounting)

Answer 3: Weigh future **higher** than present emissions
(negative temporal discounting)



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Answer 1: Weigh future **lower** than present emissions

Possible rationalisations (selection):

- ⊙ Pure time preference: Individuals might rather have damages later than now (or they'd rather have a benefit now than later).
- ⊙ Future damages are „cheaper“, because money to remediate them could be accumulated (fund).
- ⊙ Uncertainties are too big: Future emissions are not predictable enough to include them in LCA.



Answer 2: Weigh future **equal** than present emissions

Possible rationalisations (selection):

- ⊙ This is the default in LCA
ISO 14042: “*LCIA excludes temporal information and combines emissions over time*”.
- ⊙ Treat the future generation equal than the present generation (Brundtland sustainability)
- ⊙ Pollution must be fully accounted to causing process (Polluter pays principle).



Answer 3: Weigh future **higher** than present emissions

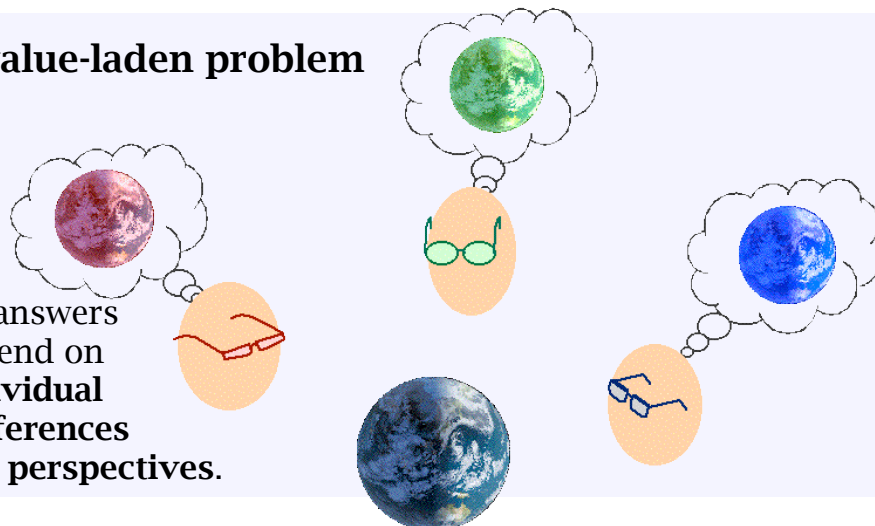
Possible rationalisations (selection):

- ⊙ Increasing background burden of pollutants makes future emissions to a more critically polluted environment more damaging.
- ⊙ Increasing population density: increased exposure.
- ⊙ Damage compensation costs increases for future wealthy individuals.
- ⊙ Uncertainties are too big: Uncertain emissions are much more risky than known, manageable emissions.



A value-laden problem

All answers depend on **individual preferences and perspectives.**



But are all of those perspectives compatible with the intentions of LCA?



Is discounting compatible with the intentions of LCA?

1. LCA is a tool for the environmental part of the sustainability discussion by **pointing out less burdening options**.
2. Thus, LCA should **show** problems or damage potentials and not **obscure** them.
3. Hiding or discounting (future) problems or assuming that they will somehow be solved (by future generations)
 - is contradictory to the very motivation to conduct environmental analysis at all,
 - is unethical (for pure time preference),
 - potentially creates *new* future problems whilst solving *current* problems,
 - is obstructive to the development of improved technologies.

⇒ Discounting is *not* appropriate in LCA.



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Conclusions and suggestions

- The current default practice in LCA to sum up environmental burdens **without temporal discounting is appropriate**.
- Landfill models in LCA should **model very long time horizons** of > 100a to include potential long-term emissions.
- **Sensitivity calculations** assuming different landfill developments are advisable.
- The uncertainties of modelled long-term landfill emissions shall be addressed in **uncertainty analysis**.
- LCIA could develop temporally resolved characterisation factors to account for changes in the future environment.

Additional publication: Hellweg et al. forthcoming:
“Discounting and the Environment: Should Current Impacts be weighted differently than Impacts harming Future Generations?”
Accepted by *International Journal of LCA*.



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