

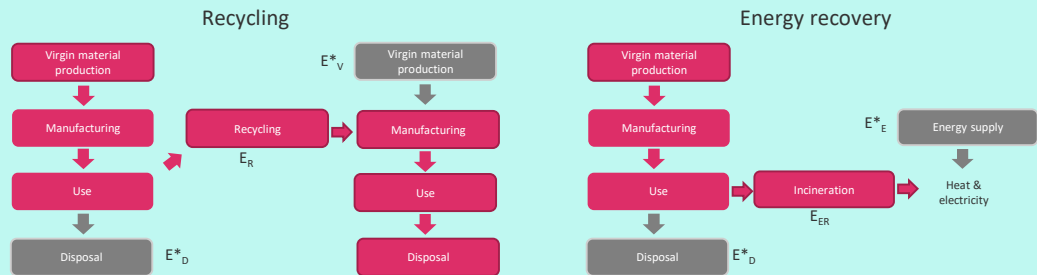
The risk of Product Environmental Footprints incorrectly recommending energy recovery

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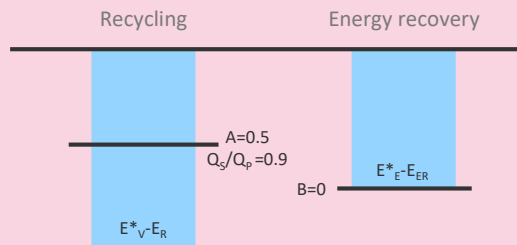
Background

The net environmental benefit is for...
 recycling: $E^*_V + E^*_D - E_R$
 incineration: $E^*_E + E^*_D - E_{ER}$
 Recycling is better when
 $E^*_V - E_R > E^*_E - E_{ER}$



The problem

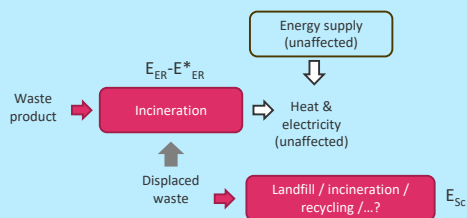
PEF assigns less than half of the net benefit of polymer recycling to products recycled after use ($A=0.5$; $Q_s/Q_p=0.9$). For paper products, the share is higher ($A=0.2$), but for textiles it is even lower ($A=0.8$). PEF assigns 100% of the net benefit of incineration, to products incinerated after use.



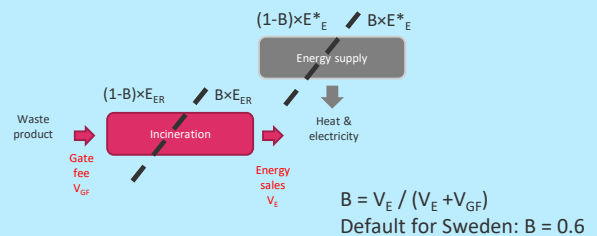
=> PEF results can incorrectly recommend energy recovery over recycling.

Potential solutions

1. Include the alternative treatment of waste displaced at the incinerator; account for the uncertainty with scenarios (E_{Sc}).



2. Assign part of the environmental benefit of incineration (B) to the use of energy from waste, based on the revenues of incineration.



Conclusions

- The solutions both make the comparison between incineration and recycling more balanced. They are applicable in LCAs beyond PEF.
- $B = 0.6$ makes the comparison between incineration and recycling accurate for polymers; however, Factor A varies with materials while B varies over time and space.
- Short-term impacts of incineration are modelled with displaced waste, where the alternative treatment is likely to be landfill disposal.
- Long-term impacts of incineration can be modelled with a combination of Factor B and displaced waste, where the alternative treatment can be a wide range of technologies.

Further reading:

- Ekvall T, Gottfridsson M, Nilsson J, Nellström M, Rydberg M, Rydberg T. (2021) Incentives for recycling and incineration in LCA: Polymers in Product Environmental Footprints. Report 2021:02. Swedish Life Cycle Center, Gothenburg, Sweden.
- Ekvall T, Gottfridsson M, Nilsson J, Nellström M, Rydberg M, Rydberg T. (2021) Modelling incineration for more accurate comparisons to recycling in PEF and LCA. Manuscript submitted to *Waste Management*.