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Managing choices of energyware by monetized impacts and resource values

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Introduction

- Monetary values of environmental impacts are easy to apply, without understanding the many ways they can be determined and the many perspectives they may represent.
- Within ISO TC 207/SC1 a working group is presently developing a framework standard to enhance the transparency of monetary values of environmental impacts by requiring relevant metadata to be stated (ISO 14008).
- The work presented here is intended to contribute to the standard by identifying those metadata for which choices between energyware are most sensitive.

The method

The EPS 2015 impact assessment method (1) was used to determine default and alternative monetary values for environmental impacts of the energyware choices in three case studies. The EPS method assesses changes in the natural capital (including human health) from emissions and extraction of natural resources.

Results

- Case 1, waste wooden building material or natural gas: a very robust result. No methodological or data choices was found that can change the priority.

- Case 2, truck powertrain: abiotic resources and climate gases contributed most to the monetary impact values. As both are long term impacts, discounting of future impacts is critical. The ranking of alternatives are also sensitive to which impacts that are included. Figure 1 shows that if resources are excluded from valuation the best alternative shifts from Tallow HVO oil to Wind electricity driven battery electric vehicles.

- Case 3 , energy supply at paper production. The result depends on how scarce renewable resources are valued.
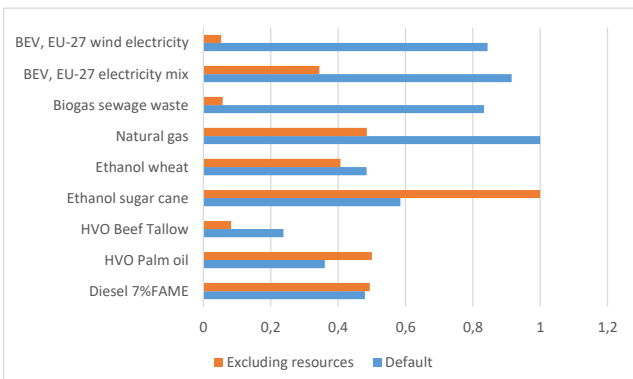
Figure 1 Normalised monetary values of environmental impacts from light trucks with different powertrains and fuels.
BEV = Battery Electric Vehicle, HVO= Hydro treated Vegetable Oil, FAME= Fatty Methyl Esters

Discussion

- The relative values of health effects versus scarce resources is critical to the choice of fuel and powertrain for vehicles.
- In the EPS 2015 method decrease of finite resources are valued as the cost of sustainable alternatives. This principle was proposed already 1925 by John Ise and later supported by Daly (2).
- Other methods (3) only use current commercial values of natural resources, and then the ranking becomes more or less equal to emissions of climate gases.
- Which one to prefer depend on the goal and scope. e.g. which economy that is investigated: the present or the future?

System boundary of the economy matters

Conclusions

Ranking of different energyware with respect to their life cycle sustainability depend to a high degree on the monetary values of environmental impacts from climate gases relative to abiotic resources. This in turn depend on:
1. Which impacts that are included
2. Temporal system boundaries of the economy
3. Assumptions about the future , such as
    a. Discounting of future impacts
    b. Substitutionality
    c. Technology development

Literature

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2. Daly, H. p.344 in Daly and Townsend, ed. Valuing the Earth, MIT,1993
3. Voigtländer, J, Brezet, H and Hendriks, C, Int J LCA 6 2001

Acknowledgements