THE LINK BETWEEN DATA CHOICES AND REALITY IN LIFE CYCLE ASSESSMENT MODELLING OF WASTE MANAGEMENT TECHNOLOGIES

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Environmental models, e.g. life cycle assessment (LCA), are widely used to support decision-making. A model is a way to try and reproduce reality, it is therefore important to consider the reliability and usefulness of this representation of reality. In an assessment it is therefore important to consider the influence by the representativeness of the input data and the model itself, as this will control how wide or narrow the result interpretation can become.

There are specific challenges for LCA of waste management systems related to the collection of representative data. Site-specific conditions affect the quality of the waste and the waste composition due to local waste separation and collection schemes, why there is a high need for site-specific data.

The objective of this study is to evaluate the influence of input data choices in LCAs of waste management systems. The hypothesis is that data choices affect the LCA such that end result can vary with orders of magnitude. This is evaluated by analysing and comparing the range of results calculated on basis of the modelling of a case study, where combinations of different data choices are implemented in the same model. The case study is landfilling of Danish residual household waste with the functional unit being landfilling of 1 tonne of wet waste.
A mechanistic landfill model was applied, where sub-processes are represented by modules and emissions are linked to the fractional and chemical waste composition. In the model, data choices were varied based on known ranges to represent different options for landfill gas and leachate generation and different types of technical collection and treatment solutions. A total of 864 different data combinations were obtained, hence resulting in 864 results per impact category; from this total set of combinations, a subset of 576 realistic combinations were created to represent the different choices taken when constructing the landfill (e.g. gas collection and utilization, cover types, geographical location).

The figure below show the results of the modelling for the climate change impact category, where the range of results is given as person equivalents depending on how specific a case can be described. Knowledge from a case, can be anywhere from just a general technology category, to the main types of the specific technology, to info on location and technology parameters for the specific site. The results show that in order to narrow the range of results a modeler needs to know information on the site very well, else the conclusions needs to consider the range of results and not present very precise values with no link to reality.
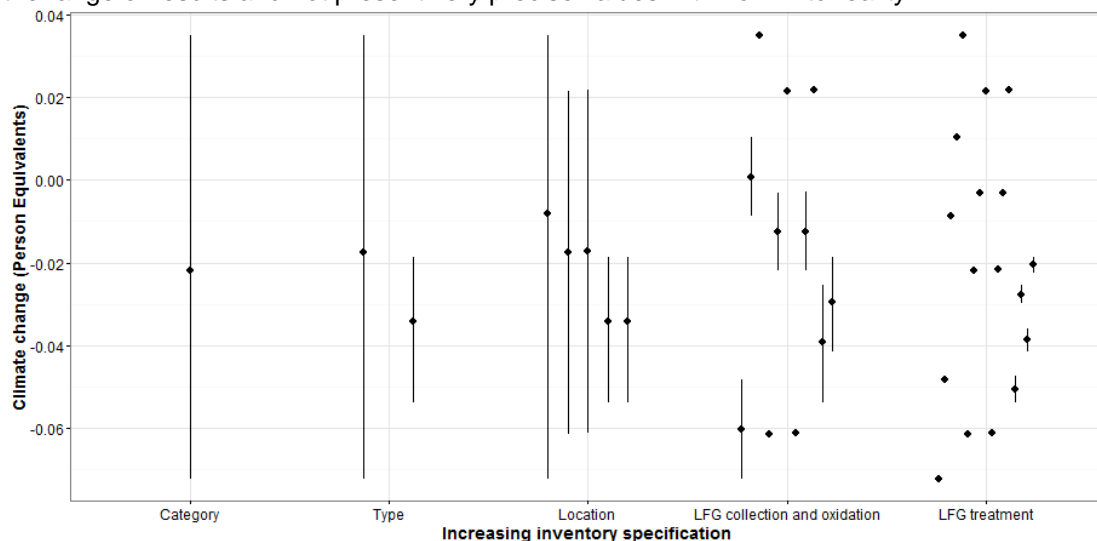

Figure 1: Range of results for climate change in person equivalents as linked to data choices