Introduction

Nowadays, as goods are increasingly traded on a global scale [1], the significance of freight transport within the overall environmental impacts of product supply chain is increasing as well. While some goods do not need specific conditions during their transport others, such as food, need to be stored and transported while maintaining a certain atmosphere (temperature, air flow, etc.). The atmosphere control, of course, requires specific infrastructure and energy.

Objectives

Literature suggest [2] that some of the most important variables influencing the final LCIA score of goods transportation in a controlled atmosphere can vary significantly depending on factors such as:

- Type of goods transported.
- Type of refrigerant used and amount of leakage.
- Amount of energy used for operation of the infrastructure (external temperature, duration of the transport, efficiency of the energy supply, etc.).

Therefore the objective of this study is defined as:

- Identification of key variables with the biggest influence on the overall impacts of the transport of goods in need of atmosphere control.
- Creation of a model in the form of interconnected parametrised datasets representing an average global scenario of transport of goods with the key variables present as parameters.

Materials and methods

- Datasets are built as modules which can be connected in different combinations.
- Key variables are modelled as parameters and used to calculate the exchanges using mathematical formulas. All of these are available thanks to the use of ecospold2 format.
- Different technology levels provide different modelling options using different system models (attributional and consequential).

Results

- Difference in final LCIA results depending on the type of refrigerant
- Significance of amount of diesel burned versus type of refrigerant
- Type of engine supplying energy for the operation of the reefer

Conclusion

A parametrised model of transport of goods in need of atmosphere control has been created. This model offers maximal transparency, thanks to the use of mathematical formulas. The parameters represent the most important variables which can be easily edited to represent specific scenario. The set of datasets created in this model can be connected into the supply chain of any product in need of atmosphere control.

References


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