

LCA-Modeling of Waste Management System of DHL Relay Event in Copenhagen

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INTRODUCTION

The Copenhagen Municipality (Københavns Kommune) aims to improve the sustainability of large events. The DHL Relay event is used as a case study to examine the impacts of various waste handling methods. Using the LCA methodology, supported by the EASETECH model and data from Ecoinvent, three different waste management scenarios are examined and compared. In the baseline scenario all the waste is incinerated, scenario 2 includes waste sorting into 5 recyclable fractions: cardboard, paper, hard plastic, soft plastic and organic. It also introduces reusable cups and the delivery of the unopened food to homeless people. Finally, scenario 3 adds 5 more waste minimization initiatives to the proposals in scenario 2.

Goal & scope

The functional unit is the management, treatment and minimization of the amount of waste generated (in kg) during the entire period (5 days) of this event by 5000 participants. Collection, transport, treatment and disposal of the waste constitute the system's boundaries. The secondary materials and energy produced in the system are considered as substitution for products with the same functions. The consequential approach is adopted. The marginal electricity production is assumed to be coal-based power plants in Denmark, while the marginal district heating is assumed to be the average heat mix in Denmark. A general overview of various impact categories is given, with special attention on global warming potential, acidification, human toxicity, ecotoxicity and resources depletion.

Life cycle inventory

For the waste characterization, data obtained during the 2014 DHL Relay event was provided by the Copenhagen Municipality.

Uncertainty assessment

An uncertainty assessment was implemented including a sensitivity analysis, a scenario analysis and an uncertainty propagation assessment.

Results and discussion

The alternative scenarios (2 & 3) perform better in almost all the impact categories. The global outcome of the comparison between them remains unclear as there are still some uncertain parameters and assumptions modeled that could unbalance this comparison on both sides. The avoided production of food and other products proves to be the main contributor to the savings. Therefore all the waste minimization strategies are found to be optimal solutions and further application and innovation in this field is suggested. Recycling options proved to contribute to the savings as well, especially plastics recycling. The effect of heavy metals on the positive impact of the biogasification process is discussed. The weight of the waste transport is negligible in all the scenarios.