Compositional data analysis of household waste recycling centres in Denmark

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Abstract

The Danish government has set a target of 50% recycling rates for household waste by 2022. To achieve this goal, the Danish municipalities should increase the source separation of household waste.
Presently, the Danish citizens increasingly dispose their waste at recycling centres. International experiences suggest that the organization (e.g. layout, signage, staffing) and containerisation of materials (i.e. placement of containers) as well as sorting guidelines can potentially influence the recycling rates and the purity of recyclables collected at recycling centres. In connection to this, several recycling centres have significantly reorganized their systems with the aim of facilitating source separation and thereby increasing the recycling rates (WRAP, 2012).
While significant knowledge and experiences were locally gained, lessons learnt have not been extensively exploited country-wise, an important reason being that the influence of these changes has not been rigorously investigated and quantified, meaning that generalized conclusions could not be drawn so far. One of the reasons is that a consistent calculation method to assess and document the effect of these projects on the recycling rates does not exist.
Data handling is a particularly critical issue because using different metrics on the same data can provide contradicting results (Martín-Fernández et al., 2015). For example, when choosing the waste composition for traditional statistical analysis, using either a percentage composition or a mass composition is highly critical and may generate different and often contradictory results. Consequently, the interpretation of the results appears inconsistent, while comparison with other studies is not possible.
The main goal of this work is to develop, implement and establish a procedure for study of data on waste composition and total generation based on compositional data analysis. Data on waste collected from 2000 to 2015 in four Danish municipalities were analyzed. Data were recorded on monthly basis for both the total generation and composition of waste. The relationship between initiatives and the variation in the total generation and composition of individual waste fractions was analyzed by means of compositional data analysis.

References

Martín-Fernández, JA, J Daunis-i-Estadella, and G Mateu-Figueras. (2015). On the Interpretation of Differences between Groups for Compositional Data. Sort 39 (2015): 1–22.

WRAP, 2012. “Household Waste Recycling Centre (HWRC) Guide,” no. October: 127.