A Novel Approach to Characterize Data Uncertainty in Material Flow Analysis and its Application to Plastics Flows in Austria

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Supporting information is available on the *JIE* Web site

Summary

Material flow analysis (MFA) is widely used to investigate flows and stocks of resources or pollutants in a defined system. Data availability to quantify material flows on a national or global level is often limited owing to data scarcity or lacking data. MFA input data are therefore considered inherently uncertain. In this work, an approach to characterize the uncertainty of MFA input data is presented and applied to a case study on plastics flows in major Austrian consumption sectors in the year 2010. The developed approach consists of data quality assessment as a basis for estimating the uncertainty of input data. Four different implementations of the approach with respect to the translation of indicator scores to uncertainty ranges (linear- vs. exponential-type functions) and underlying probability distributions (normal vs. log-normal) are examined. The case study results indicate that the way of deriving uncertainty estimates for material flows has a stronger effect on the uncertainty ranges of the resulting plastics flows than the assumptions about the underlying probability distributions. Because these uncertainty estimates originate from data quality evaluation as well as uncertainty characterization, it is crucial to use a well-defined approach, building on several steps to ensure the consistent translation of the data quality underlying material flow calculations into their associated uncertainties. Although subjectivity is inherent in uncertainty assessment in MFA, the proposed approach is consistent and provides a comprehensive documentation of the choices underlying the uncertainty analysis, which is essential to interpret the results and use MFA as a decision support tool.

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