D8.6: Circularity in the bio-based packaging industry (NOVA)

AUTHORS: Florian Dietrich, Christopher vom Berg

SUMMARY:
This case study investigates the potential of monitoring the circularity of bio-based packaging via the calculation of the Material Circularity (MCI) and the Biomass Utilization Factor (BUF) indicators. The BUF regards the different applications of biomass starting at the sourcing of the material. The MCI focuses on the linear versus circular use of materials and on the overall influence on the carbon equilibrium in the biosphere. To calculate these indicators, two-pronged approach for data collection was undertaken, obtaining data via personal interviews and via official statistics and literature resources. Three examples are used to test both indicators and explore the availability of data.

RESEARCH QUESTIONs:
To which extent the circularity of the biobased packaging industry can be described by using proper indicators?

CASE:
The monitoring of bio-based packaging circularity

BIO-BASED PATHWAYs:
Wood packaging, bio-based plastic packaging, paper/recycled plastic packaging

DEVELOPMENT STAGEs:
Drive to maturity; Mature

DATA SOURCEs:
Official statistics, literature, and interviews

DATA ANALYSIS:
Qualitative and quantitative analysis

INDICATORs:
Material Circularity Indicator; Biomass Utilization Factor

GEOGRAPHICAL SCOPE:
All EU member states

TIME REFERENCE:
From 2012 and 2016

AUDIANCE:
Researchers; Policymakers; Statistical offices

KEY RESULTS:
- Both indicators are helpful for monitoring the circularity of the bio-based packaging industry.
- The selected indicators complement each other by accounting for the biobased aspect on the one hand and the circularity of other materials, product lifetimes, and recycle feedstocks on the other hand.
- MCI values range from 0.63 (wood pallet) and 0.69 (bio-based plastic packaging for toilet paper) to 0.89 (plastic/paper dishwasher tab packaging), which are all moderate values considering the MCI can take values from 0.1 to 1 (with one accounting for a fully circular product).
- Overall, the MCI can be described as being a good indicator for quantifying the circular equilibrium of all materials on an economic level and the circular carbon equilibrium on a biosphere level.
- MCI is not useful when comparing different products with different lifetimes.
- Certain values for the MCI calculation are very complicated to estimate, such as the feedstock efficiency.
- BUF values range from 0.79 (bio-based plastic toilet paper packaging) to 2.15 (wood pallet) and 2.16 (plastic/paper dishwasher tab packaging).
- Overall, the BUF can be especially helpful for considering and incentivizing the useful consumption of all parts of the biomass used for a product.
- BUF does not account for the time of use/lifetime, which makes the comparison of products with different lifetimes complicated.
- BUF only accounts for the bio-based part of materials not considering the circularity of other materials used in the product.
- BUF calculation could be too complicated for companies considering the high amount of required information.

CONTEXT and DRIVERS:
- The future policy framework is an important factor for the bio-based materials in the packaging sector, in particular in the light of the Green Deal, the Circular Economy Action Plan, the EU plastics strategy, and the Single-Use Plastics Directive.

LIMITATIONS:
- Data availability and communications are the major problems when measuring the circularity of products.

GOOD PRACTICES:
- Data gaps could be overcome by implementing an interactive database that tracks, calculates, and predicts material flows based on product sourcing and manufacturing, ensuring anonymity and incentivizing competition.
- Since these indicators can offer only a glimpse on one aspect of sustainability, it is important to couple them with additional analysis, like Life Cycle Assessments.

FEEDBACK and RECCOMANDATION to other WPs

WP1 Indicators:
Both indicators qualify for their use in the Biomonitor project as they account for the circularity of materials that preserves the environment by reducing environmentally harmful sourcing and reducing land use. However, they do not account for other relevant sustainability measurements like CO2 production, water use, energy use, or material scarcity. One last disadvantage is that closed loops are not favoured by the indicators.

WP2-3 Data collection:
Data need to be delivered in a more detailed (e.g., product groups for a specific country) and on a regular basis. The pathway to collect data via personal interviews do not yield any useful results for these indicators. Companies are not willing to collect and share data regarding the material composition or circularity of their products due to confidentiality or lack of relevance for their daily business.

WP4-5 Model Toolbox:
When the circularity of a product or production stream is modelled to project its development in future years the model relies on a valid and proven methodology. The case study analysed and applied two of these methodologies to measure circularity and assessed the results accordingly.

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