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Policy briefs in the framework of the « Prospective Research »

Valorisation potential of waste streams for a more sustainable and circular Brussels' economy

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Key messages

› The circular economy is about preserving and maximizing the value of resources and materials which is much more than just boosting waste stream recycling rates.

› A comprehensive view on the full life cycle of products and materials, from cradle to grave, comprising all stakeholders and decision makers along it, is essential.

› A harmonized open access reporting system of waste and materials' data can help to find the best valorisation potential for BCR waste streams.

› Stronger involvement of social economy organisations is important in both the collection, sorting, refurbishing phase, but also in the marketing of refurbished goods and recycled materials.

› Using a system-wide approach, the BRUCETRA team recommends joint collection of green and food waste to be processed in a closed system bio-gas co-composting plant with biofilters.

Introduction
Summary of the problem

Circular economy and sustainable materials' management is very high on the agenda of policy makers at different policy levels ranging from the OECD and EU (e.g. European Green Deal) to the national, regional and city level (e.g. le Programme Régional en Economie Circulaire in Brussels). Negative environmental impacts of growing waste streams (e.g. plastics), looming exhaustion of some critically important resources in the long run (e.g. indium) and short and medium term supply risks as a result of, among others, political developments (e.g. rare earths) have spurred interest in an alternative concepts of managing waste and materials. Circular Economy (CE) is a buzzword but there are many overlapping and sometimes conflicting definitions of the concept. The general aim of the BRUCETRA project was to analyse the economic and environmental potential of the waste streams for a transition towards a circular economy model of materials' management in the Brussels Capital Region (BCR).

Therefore, the starting point for the BRUCETRA team is that the circular economy should focus on preserving and maximizing the value of resources and materials for society, taking into account environmental impacts along the entire life cycle. Hence, CE is more than only "closing loops" without considering possible negative side effects like energy use and pollution that might result from a narrow focus on boosting recycling rates. And thus, a comprehensive view on the full life cycle of products and materials in the BCR, from cradle to grave, comprising all stakeholders and decision makers along it, is essential for the BRUCETRA team. To measure this location impact and net mobility effect, this project entails a field study among the actors in Brussels and the development of a simulation model.

The BRUCETRA project team made use of different state-of-the art methodologies to derive its conclusions. First, in order to determine relevant and comparable peers of the Brussels Capital Region, a quantitative methodology was used to compare waste management performance indicators (e.g. waste recycling rates) taking into account relevant background variables (e.g. population density, tourisms pressure, ...). Freiburg, Darmstadt, Hamburg and Luxembourg were selected as peers with comparable background variables that can serve as inspiration for developing ambitious sustainable and circular economy strategies for the BCR.

Second, in order to have a system-wide perspective on the problem of selecting appropriate waste and material management strategies, the team combined Life Cycle Assessment (LCA) techniques with numerical optimisation methods to minimise societal costs (e.g. minimal environmental externalities at minimal logistical costs) of alternative waste and materials' valorisation routes. LCA is a methodology for assessing in a consistent way environmental impacts arising in all the stages of the life-cycle or value chain of a product, process, or service. The LCA methodology was complemented with detailed optimisation models of collection and transport modes taking into account both private costs (capital, labour, fuel, ...) and societal costs (air pollution, greenhouse gas emissions, ...). This combination of methods enabled the BRUCETRA team to make detailed recommendations regarding the organisation of the waste management for streams with high valorisation potential, in particular bulky waste, WEEE (computers) and bio waste. The research also shows the need for involving more deeply social economy organizations in different stages of the waste and materials' management system.

Methods, approaches and results/body

Conclusion

BRUCETRA research has demonstrated the importance and potential of system-wide optimisation in order to maximize the valorisation possibilities of Brussels waste streams. System-wide optimisation requires a life cycle perspective on goods and materials from cradle to grave. It should take into account both private and societal costs (e.g. air pollution and greenhouse gas emissions) and benefits (e.g. extra employment opportunities for low-skilled labour). A coherent and integrated waste and materials database is a necessary input for such optimisation exercises. The BRUCETRA team applied this approach for selecting a proper bio-waste management strategy in Brussels. The conclusion is that joint collection of green and food waste that is processed in a closed system bio-gas co-composting plant is the preferred management option if the compost by-product can be used for example to replace multi purpose compost containing peat.

Policy recommendations

Based on all the research undertaken in the consortium over the last four years, the BRUCETRA team formulates the following policy recommendations.

1. Invest in a harmonized open access reporting system of waste data

While a lot of useful waste data are collected in the BCR, the rationale behind the collection efforts is often not the support of policy making/evaluation, but rather compliance with (higher level) legislation and (inter)national data reporting obligations. In addition, available waste data in the BCR is scattered over different sources and data managers, each with its own monitoring system, nomenclatures, time intervals, geographic detail etc. In order to exploit the full potential of a waste database, we recommend a more harmonized reporting and management system of waste data in which:

- All data are centralized in one database;
- The data are made publicly available and easily accessible;
- Figures of waste generated by economic activities are made available;
- A harmonization protocol allows for comparability between the different sources.
- For each data series, the most detailed geographical resolution is reported.

2. Involve social economy organisations stronger

- In order to increase material recovery, invest in increased sorting efficiency at the source, expand the options of separate sorting and redirect more waste flows from the incinerator towards material reuse or recycling.
- Social economy organisations (SEO's) can play a vital role in extending local sorting/dismantling activities and in finding re-use applications (e.g. redirecting potentially reusable bulky waste or EoL desktop computers to social economy organizations (SEOs) or similar reuse centers channels shows to improve the environmental performance of their management system). In particular, involve more SEO's and decentralized initiatives in bulky waste and WEEE management. Separate collection coupled with quality-based sorting, repairing and/or dismantling by SEO's has the potential to redirect those flows from incineration towards re-use and material recovery options. In addition, SEO's can be engaged in a flexible system, where local demand for second-hand and refurbished products determines whether sorting and repairing is to be preferred over dismantling and material recovery.

3. Use a system-wide approach to select the best alternative

An isolated assessment of waste collection can lead to the selection of a treatment facilities whose treatments lead to higher overall environmental impacts. The same applies to selection methodologies that are based on labour cost minimization for the waste treatment which makes hardly sense without considering optimised waste collection with the labour intensive waste collection phase. Therefore, BRUCETRA pleads for, and executed, a system-wide, multi-criteria approach. Such an approach should involve life cycle thinking (environmental and cost-related) and economic assessment of both private and social externality costs and benefits, as this allows to identify the overall best performing options.

For the BCR the use of a system-wide approach has, in BRUCETRA, resulted in several specific recommendations. After benchmarking the BCR against comparable regions in the EU, it became clear that within the BCR improvements should be made in the area of recycling and especially bio-waste treatment. Using a system-wide approach reveals that to minimise environmental externalities and logistical costs for biowaste collection and treatment in the BCR:

- A combined collection of green and food waste should be considered;
- A bio-gas co-composting plant is the better alternative;
- Facilities with closed systems and biofilters are recommended to proper manage process emissions.

List of publications

Towa, E., Zeller, V., Degrez, M., & Achten, W.M.J. (2019). *Data mining of the waste collected in the Capital Region* [Deliverable WP1 - BRUCETRA Project]. Brussels

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Zeller, V., Lavigne, C., D'Ans, P., Towa, E., Achten, W.M.J. (2020) *Assessing the environmental performance for more local and more circular biowaste management options at city-region level.* Science of the Total Environment (in press)

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