

ESR20-019 - The Future of Urban Waste Management: Integrated modelling in view of circular economy and environmental impacts

Abstract

Why do we sort our waste at home but not in public spaces? This was one of the key questions of UrbanWaste, an interdisciplinary research project that focused on an untapped area in research: the waste we generate in parks, on streets, and in public transport areas. Led by a team of experts from technical science, social psychology, and design, the project sought to understand and improve how waste is managed in public spaces, where convenience consumption and anonymity often dominate behaviour. The project results were striking: even though public waste makes up only a small part of total municipal waste, it contains a high proportion of recyclable materials, which are currently hardly recovered. Public waste composition is a direct reflection of consumption patterns in public space (e.g. to-go packaging). Most of these materials currently end up being incinerated also because public waste bins typically do not provide the option for waste separation. Research combining field experiments, observations, and interviews in Vienna and Krems, together with a representative consumer survey across Austria, found that people separate waste when bins are available in public spaces (field studies showed that 17% were sorted). Moreover, special “forwarding” labels appear to have the potential to further increase participation. However, changing behaviour in public spaces is complex. It's not just about bins —it is about social norms, habits, local infrastructure, arrangement of waste bins, movement pathways, information and communication or the number and type of waste fractions. This was shown through consumer interviews and surveys, interviews with cleaning staff, onsite -observations and discussions with stakeholders. The project went further by applying waste stream modelling and life cycle analysis to examine alternative public waste scenarios and their impacts on resource efficiency and the environment. Key questions guided this work: What is the ideal solution for managing public waste? Could automated sorting of mixed waste offer a better alternative than asking people to separate waste in public spaces? Our results indicate that a significant share of Vienna's public waste could be directed to recycling plants (up to 43% compared to 4% today), if both strategies (increased source separation and automated sorting), are combined. We also found that greenhouse gas savings would be similar when comparing automated sorting with separate collection. Nonetheless, all strategies have their pros and cons. Automated sorting can be useful where consumer engagement in waste separation is limited (e.g. lower engagement in urban settings compared to rural), while source separation remains valuable for preserving highest material quality and encouraging sustainable waste practices. The research results were summarized in various articles and were presented at public events (e.g. a public project exhibition). They offer decision-makers, city planners, and the public fundamental details to rethink how waste is managed in our shared public spaces, providing improvement options and inviting to reflect on our own consumption and behaviour: Do I really need that coffee-to-go? How will I dispose of the cup – and what happens to it afterwards?

Scientific disciplines:

Waste engineering (50%) | Social psychology (35%) | Industrial design (15%)

Keywords:

waste management systems, consumer behaviour, Circular Economy, recycling rates, environmental impact, source segregation, industrial design, waste composition, material flows

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Further links to the persons involved and to the project can be found under
<https://www.wwtf.at/jpeto2.brunner.at/funding/programmes/esr/ESR20-019/>