

Seasonal variation of paper and plastic collection in the city of Brno – how lockdown influenced the performance?

M. Struk¹

¹Sustainability and Circularity Institute, Masaryk University, Brno, Czechia

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Presenting author email: struk@muni.cz

Effective waste separation is a key component of sustainable waste management, supporting the transition to a circular economy and contributing to the achievement of EU waste reduction and recycling targets. The European Union's Circular Economy Action Plan emphasizes the importance of increasing recycling rates and minimizing landfill waste. In this context, understanding the factors and changes that influence waste generation and separation behavior is crucial for optimizing waste management policies. One such factor is the impact of external disruptions, such as the COVID-19 pandemic, which significantly altered consumption patterns and waste production of the population.

The impact of external disruptions on waste generation and separation aligns with the shock-response model of consumption behavior (Sheth, 2020), which argues that crises can trigger temporary or permanent shifts in household consumption and disposal practices. The COVID-19 pandemic represents a large-scale, exogenous shock that disrupted established routines and led to increased household waste generation (Van Fan et al., 2021). Following these theoretical perspectives, this study situates the pandemic-driven shifts in waste generation within broader behavioral, economic, and policy-related frameworks, offering insights into more resilient and adaptive municipal waste management strategies.

The COVID-19 pandemic had a profound impact on municipal waste management systems worldwide. The lockdown-induced shifts in consumption – including higher demand for packaged goods, and increased plastic waste from home deliveries – underscore the interconnectedness of consumer behavior and municipal waste flows (Klemeš et al., 2020). These changes in consumption and behavior patterns contributed to shifts in waste generation, particularly in the composition of household waste. Studies like Kalina & Tilley (2020) have documented an increase in plastic waste due to higher demand for packaged goods and personal protective equipment, while paper waste patterns fluctuated due to reduced office activity and increased online shopping. In Czechia, strict lockdown measures were implemented in multiple waves from March 2020 to mid-2021, limiting mobility, closing non-essential businesses, and shifting a significant portion of economic activities to residential areas. These measures likely influenced both the total volume and seasonal variation of recyclable waste streams, particularly paper and plastic that would otherwise not occur or occur outside of residential areas.

This study aims to assess how the separate collection of paper and plastic waste evolved before, during, and after the COVID-19 lockdowns using an example of the city of Brno, Czechia. The dataset for this study includes waste collection records obtained from municipal waste management authorities in Brno, complemented by national statistics from the Czech Statistical Office. Additional sociodemographic indicators are integrated to contextualize the findings. By analyzing seasonal trends from 2019 to 2023, we examine whether the pandemic-induced shifts in consumption and mobility patterns had a lasting impact on waste separation performance. This research builds upon previous studies that investigated pandemic-related waste trends in urban settings (e.g., van Fan et al., 2021; Klemeš et al., 2020) and provides additional empirical insights into the specific context pandemic impacts on waste generation.

Preliminary analysis suggests distinct shifts in waste generation patterns corresponding to different phases of the pandemic. During the main lockdown periods (2020 and 2021), waste generation increased, driven by higher residential waste production. Paper and plastic collection, however, did not exhibit similar patterns. After initial increase during the main lockdown period, data indicate a gradual return to almost pre-pandemic production in case of paper, while in case of plastic stable permanent increase in the production can be observed. Comparing 2019 and 2023, key differences emerge in overall waste composition, potentially linked to behavioral shifts induced by the pandemic.

This study highlights how the COVID-19 lockdowns influenced waste separation trends in Brno, with implications for municipal waste management strategies. The findings suggest that pandemic-induced changes in consumption and disposal behaviors had both temporary and lasting effects on waste generation. For policymakers, this underscores the importance of adaptive waste management strategies that account for external shocks and evolving consumption patterns. Potential improvements include enhancing public awareness campaigns on sustainable waste practices, optimizing collection frequency and infrastructure, and reinforcing policies that promote circular economy principles. Future research should continue monitoring waste trends to assess long-term behavioral shifts and inform policy development aimed at improving waste separation performance in urban settings.

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