

Exploring sustainable strategies in municipal waste management: A preliminary social life cycle assessment of a pay-as-you-throw pilot program

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Abstract

In the pursuit of a sustainable future, communities worldwide are reevaluating their waste management practices to reduce environmental impact (Vardopoulos & Zorpas, 2021) and promote responsible citizen participation (Poulos et al., 2018). An initiative within the "Circular Economy Implementation in Greece" project (LIFE18 IPE/GR/000013, www.circulargreece.gr) is currently unfolding in the Municipality of Voula-Varkiza-Vouliagmeni (VVV) in Attica, Greece (LIFE-IP CEI-Greece, 2021, 2022). This initiative is poised to revolutionize waste management in the region through the implementation of an integrated pay-as-you-throw (PAYT) system (Hadzi-Nikolova et al., 2021; Maragkaki et al., 2023). PAYT represents a holistic approach involving comprehensive changes in waste management methodologies, aiming to maximize results while promoting responsible waste disposal (Emmanouil et al., 2022; Vardopoulos et al., 2019).

In summary, a pilot waste management scheme in VVV takes into account the unique characteristics of the municipality's building stock and proposes a tailored PAYT approach, ensuring efficient waste collection and encouraging responsible waste disposal practices. Buildings in the municipality have been classified into three categories based on their respective waste generation levels. The first group comprises of buildings with low waste production, encompassing residential, commercial, and office structures. The second group includes buildings with moderate waste production, mainly businesses. The third group encompasses buildings with high waste production, including hospitality establishments, hospitals, and other large enterprises. These categories guide the implementation of different waste management approaches, ensuring compatibility with the area's diverse building types. The majority of the buildings, which are in the first and second groups and collectively account for approximately 60% of the total waste, following an in-depth multi-level analysis, shall adopt a PAYT scheme utilizing pre-paid bags. This choice aligns with the dispersed geographical nature of these buildings and the relatively low number of households per building seen in VVV. The collection of pre-paid bags can occur through door-to-door collection outside the buildings, with or without individual bins. For larger buildings or enterprises with higher waste production

(the third group), the PAYT scheme with pre-paid bins is a more efficient and cost-effective solution. Furthermore, a concurrent PAYT system will be introduced for plastic, metal, and drink cartons, paper, and glass, as well as organic waste from both the kitchen (food waste) and the garden. Finally, this pilot initiative encompasses a comprehensive citizen information program covering all fundamental aspects of integrated waste management (LIFE-IP CEI-Greece, 2021, 2022).

To assess the social impacts of the pilot project, a Social Life Cycle Assessment (S-LCA) approach is being adopted in accordance with the Guidelines released by the United Nations Environment Programme (UNEP)/ Society of Environmental Toxicology and Chemistry (SETAC) Life Cycle Initiative (Benoît-Norris et al., 2011; UNEP, 2021). A S-LCA is a multi-step process involving, in layman's terms, defining the assessment's objectives, scope, and boundaries, collecting data on various social aspects throughout the project's life cycle, evaluating potential social impacts, and finally interpreting the results in the context of the goals and objectives set (Abeliotis et al., 2018; Tsalidis et al., 2023). Additionally, the process could involve formulating recommendations and guidelines, undergoing external review and verification to bolster credibility, and adapting the assessment to reflect changes and enhancements within the project.

The findings hold significant promise in delivering invaluable insights into the intricate social ramifications of the PAYT pilot project in VVV, a pioneering endeavor in the implementation of a PAYT waste management system within Greece. Insights could provide crucial information to decision-makers, ranging from governmental authorities to environmental organizations and waste management experts, for better informed strategic decisions by shedding light on the multifaceted dimensions of municipal management (Vardopoulos et al., 2023). Moreover, this preliminary approach, beyond helping to establish a foundation for an effective PAYT waste management system in Greece, also serves as a valuable reference for other countries facing similar challenges on their sustainability journey.

Keywords: circular economy, waste management, waste prevention, sustainability, social impacts

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