Waste management in the EUSAIR: an overview of the performance of the Adriatic-Ionian Countries

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Introduction

Waste management (WM) represents one of the most significant challenges for the regions and countries within the EU Strategy for the Adriatic and Ionian Region (EUSAIR). Effective WM not only contributes to improving the environment and public health but also plays a crucial role in achieving sustainability goals at both regional and global levels. In this context, WM policies vary considerably across the different countries of EUSAIR, largely due to socio-economic, infrastructural, regulatory, and governance differences.

Recent studies have highlighted the need for comprehensive and context-specific waste management policies to address the diverse challenges faced by countries within the EUSAIR region (Hondroyiannis et al., 2024; Liuzzi et al., 2022). Accordingly, regional differences in socio-economic conditions and governance structures significantly influence the design and implementation of WM strategies (Cifrian et al., 2015; Ignjatović et al., 2024; Nadazdi et al., 2022). Moreover, quantitative assessments, such as those examining waste recycling rates and per capita waste generation, reveal considerable variability in performance across the region (Nadazdi et al., 2022). Evidence underscores the importance of tailoring waste management policies to local needs while fostering cooperation across borders.

This research project aims to explore the main differences in waste management policies across the various EUSAIR countries and regions, examining how these policies have been developed and implemented over time. The analysis will focus on how national approaches to waste management influence performance, with particular attention to key quantitative indicators such as recycling rates, per capita waste production, and municipal solid waste treatment. Furthermore, a comparison will be drawn between the major countries in the EUSAIR area, highlighting the discrepancies in outcomes at national level. Through this review, the goal is not only to better understand the current challenges and opportunities for waste management in the different territorial contexts but also to provide insights for improving regional policies while promoting more effective waste management within the EUSAIR area.

Material and Methods

The methodology employed in this study follows a mixed-method approach based on the framework outlined in the Scientific Procedures and Rationales for Systematic Literature Reviews (SPAR-4-SLR) protocol (Paul et al., 2021), in line with the four stages recommended in a literature review (designing, conducting, analysing, and writing (Snyder, 2019)), with adaptations made to align with the objectives of the current research. Moreover, the research also assesses the current state-of-play of WM within the EUSAIR countries against specific WM Key Performance Indicators (KPIs). The KPIs that the study uses (which are summarised in Table 1) are based on published datasets (Eurostat, 2024; WBG, 2024) and studies (Deus et al., 2019; Domenech & Borrion, 2022; Moreno Solaz et al., 2023; Pappas et al., 2021; Ram & Bracci, 2024; Voukkali et al., 2023).

Table 1 WM KPIs Introduction

KPI Category	Indicator
General Waste Management	Waste Generation per Capita
	Municipal Solid Waste (MSW) Treatment
Recycling	Recycling Rate
Sustainability	Waste to Landfill
Environmental Impact	Greenhouse Gas Emissions from Waste
Economic Performance	Waste Management Cost per Capita
Regulatory Compliance	Compliance with EU Waste Directives

Results and Discussion

Results of the study will underscore the significant impact of socio-economic, regulatory, governance, and infrastructural factors on waste management performance within the different EUSAIR countries. The results will also help to assess different hypotheses. H1. Wealthier regions tend to have more established waste management systems, higher rates of recycling, and better access to modern technologies. Conversely, poorer regions might

face difficulties in funding infrastructure or may have limited public awareness about recycling. H2. Strong regulatory frameworks (e.g., waste sorting laws, recycling mandates) are associated with better performance. Countries with well-enforced regulations tend to have higher recycling rates and more effective waste processing. H3. Regions with more developed waste infrastructure (e.g., advanced waste treatment plants, efficient collection systems) tend to manage waste better. Countries without such infrastructure often struggle with accumulating waste in landfills and poor recycling rates.

Several challenges hinder the effective management of waste in certain regions. Many countries lack sufficient waste treatment plants, sorting facilities, or landfills, which impedes their ability to manage waste efficiently. Weak enforcement of environmental laws and the absence of financial incentives for recycling also slow progress, despite existing regulations. Economic constraints further exacerbate the issue, as low-budget countries struggle to build or maintain modern waste management systems, often relying heavily on landfills and unsustainable practices. Additionally, a lack of public education and engagement on waste sorting and recycling contributes to low participation in waste management programmes, perpetuating poor waste handling practices. These challenges collectively highlight the need for targeted investments, stronger regulations, and greater public awareness to improve waste management across the region.

Finally, the findings will provide key insights for improving waste management policies across the macro-region, emphasising the need for policy integration and efficiency, and infrastructure development. Regional cooperation and the sharing of best practices could enhance waste management systems, allowing successful strategies in recycling or hazardous waste management to be adapted across borders. Additionally, investing in modern waste treatment infrastructure is crucial, particularly in underperforming areas, to improve waste management outcomes. Strengthening regulatory frameworks, such as enforcing stricter waste separation, recycling, and hazardous waste disposal laws, could lead to better regional performance. Furthermore, the development of cross-border regulatory frameworks would encourage improved coordination and cooperation, fostering more effective and integrated waste management solutions across the EUSAIR countries.

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