Waste Management, Circular Economy, and Waste-to-Energy: A Sweden–Turkey Comparison

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Abstract

This study provides a comparative analysis of waste management, circular economy, and waste-to-energy (WtE) policies using the cases of Sweden and Türkiye. The main objective is to examine the waste management systems of both countries in terms of the waste hierarchy, policy integration, institutional capacity, and environmental outcomes, and to assess their alignment with circular economy objectives. The study adopts a mixed-methods approach, combining secondary data analysis, comparative policy analysis, and document-based content analysis.

The findings indicate that landfilling has been almost entirely eliminated in Sweden, where recycling and WtE practices are closely integrated with energy and climate policies. Within the Swedish model, WtE is positioned not as a substitute for recycling but as a complementary mechanism for waste fractions that are technically or economically non-recyclable. In Türkiye, despite notable progress achieved through the Zero Waste policy and the EU harmonization process, waste management remains largely landfill-oriented, and recycling rates continue to be relatively limited. WtE practices in Türkiye are primarily confined to electricity generation from landfill gas, with a comparatively weak level of integration into broader energy policy frameworks.

Overall, the study demonstrates that technical investments alone are insufficient to ensure effective waste management. Policy success is strongly influenced by institutional capacity, economic

instruments, local government performance, and societal behavior. While the Swedish experience illustrates the feasibility of balancing recycling and energy recovery, the case of Türkiye highlights the need for a more holistic, context-sensitive, and integrated policy approach.

Keywords: Waste management; circular economy; zero waste; waste-to-energy.

1. Introduction

Over the past three decades, waste management has evolved beyond a purely technical domain of environmental engineering to become a multidimensional policy field closely intertwined with energy systems, climate policy, and sustainable development strategies (UNEP, 2019; European Commission, 2020). At the global level, rapid population growth, accelerating urbanization, and changing consumption patterns have led to a persistent increase in municipal solid waste generation, thereby exposing the environmental and economic unsustainability of conventional disposal practices more explicitly (EEA, 2024; OECD, 2021).

Traditional waste disposal methods, particularly landfilling and uncontrolled incineration, generate substantial environmental externalities, including greenhouse gas emissions, soil and water contamination, and serious risks to public health (UNEP, 2019). In this context, policy instruments such as recycling, reuse, and waste-to-energy (WtE) technologies are increasingly framed not only as environmental imperatives but also as strategic components of energy security and circular economy transitions (Johansson & Finnveden, 2019; Palm & Larsson, 2020).

In response to these challenges, the European Union (EU) has developed a comprehensive policy framework that systematically integrates waste management into its broader circular economy agenda. The EU Waste Hierarchy prioritizes waste prevention as the foremost objective, while conceptualizing reuse, recycling, and energy recovery as sequential and complementary pathways within an integrated waste management system (European Commission, 2017; European Commission, 2020).

Within this policy landscape, Sweden emerges as a frontrunner in integrating recycling and waste-to-energy recovery into its national energy system. The proportion of waste directed to landfills has declined to below 1%, with the remaining waste streams managed through recycling,

biological treatment, and energy recovery processes (Avfall Sverige, 2024; EEA, 2024). By contrast, Türkiye has focused primarily on expanding sanitary landfill infrastructure since the early 2000s and has more recently sought to promote recycling and source separation through the implementation of the Zero Waste policy framework (ÇŞİDB, 2023; Gökkurt Baki & Ergün, 2021).

Against this background, the present study undertakes a comparative analysis of waste management systems in Sweden and Türkiye, with particular emphasis on circular economy strategies, zero waste policies, and waste-to-energy practices. The central research question guiding the analysis is formulated as follows:
How are recycling and waste-to-energy policies designed in Sweden and Türkiye, and in what ways do their environmental and energy-related outcomes differ?

2. Methodology

This study adopts a qualitative and comparative research design based on secondary data analysis and policy-oriented document review. The methodological framework combines comparative policy analysis, descriptive statistical evaluation, and content analysis to examine waste management, circular economy, zero waste, and waste-to-energy (WtE) policies in Sweden and Türkiye.

The analysis relies on secondary data obtained from official national and international sources, including reports and statistical databases published by the European Environment Agency (EEA), Eurostat, the OECD, Avfall Sverige, the Turkish Statistical Institute (TURKSTAT), and the Ministry of Environment, Urbanization and Climate Change of Türkiye.

The comparative assessment focuses on key dimensions such as waste hierarchy implementation, recycling performance, energy recovery practices, landfill dependency, institutional capacity, and policy integration. By systematically comparing these dimensions across the two country cases, the study aims to identify structural differences, policy outcomes, and transferable best practices within the context of sustainable waste management and circular economy objectives.

3. Theoretical Framework and Literature Review

3.1. Waste Management Hierarchy

The waste management hierarchy constitutes one of the most widely accepted normative frameworks in contemporary environmental policy. This hierarchy prioritizes waste prevention at the top level, followed sequentially by reuse, recycling, energy recovery, and landfill disposal as the least preferred option (European Commission, 2017; EEA, 2024).

The fundamental assumption underlying the hierarchy is that each stage does not exclude the subsequent one; rather, these stages are conceived as complementary processes within an integrated system (Palm & Larsson, 2020). Accordingly, energy recovery is not regarded as an alternative to recycling but as a secondary value-generation mechanism for waste fractions that are technically or economically non-recyclable (Krook & Eklund, 2018; Johansson & Finnveden, 2019).

3.2. The Circular Economy Approach

The circular economy represents a systemic alternative to the linear "produce–consume–dispose" model, aiming to retain material and energy flows within the economic system for as long as possible (European Commission, 2020). Within this framework, waste is no longer viewed as a burden requiring disposal but rather as a resource with economic and energy value (UNEP, 2019).

The circular economy literature conceptualizes recycling, reuse, and waste-to-energy recovery as integral components of a holistic system (Palm & Larsson, 2020). In this context, WtE practices are expected to generate value from non-recyclable fractions without undermining the development and effectiveness of recycling infrastructure (Krook & Eklund, 2018).

3.3. Debates on Waste-to-Energy

Waste-to-Energy (WtE) technologies are widely discussed in the literature as a policy instrument that is both supported and contested. Proponents emphasize their potential contributions to reducing landfill dependence, generating energy, and lowering greenhouse gas emissions (Johansson & Finnveden, 2019; World Energy Council, 2020). In contrast, critical perspectives

warn that excessive expansion of WtE capacity may crowd out investments in recycling and create structural disincentives for material recovery (Krook & Eklund, 2018; Palm & Larsson, 2020).

For this reason, the European Commission stresses that WtE should be positioned as a complementary option rather than a substitute for recycling within the waste management hierarchy (European Commission, 2017).

3.4. Positioning Sweden and Türkiye in the Literature

Despite its high WtE capacity, Sweden is among the few countries that have simultaneously succeeded in increasing recycling rates (Johansson & Finnveden, 2019; Avfall Sverige, 2024). In the literature, Sweden is often characterized as a "balancing model" that effectively reconciles energy recovery with recycling without generating structural conflicts between the two (Krook & Eklund, 2018).

The literature on Türkiye, by contrast, predominantly focuses on infrastructure deficiencies, variations in institutional capacity, and limited levels of public participation (Gökkurt Baki & Ergün, 2021; Dedeoğlu & Yonar, 2025). Although the Zero Waste policy is widely regarded as a significant step toward the institutionalization of recycling, empirical studies emphasize persistent inequalities and uneven implementation across regions (Gündüz, 2021; ÇŞİDB, 2023).

Sweden, widely recognized as one of the most successful countries globally in waste management and waste-to-energy recovery, has reduced the share of waste sent to landfills to below 1%, with the majority of waste being valorized through recycling and energy production. Türkiye has entered a notable transformation process in recent years through the implementation of the Zero Waste policy; however, recycling rates remain relatively low, and the volume of waste directed to landfills is still considerable. In this respect, Sweden constitutes a relevant "best practice example" from which Türkiye may derive valuable policy lessons.

4. Waste Management and Waste-to-Energy in Sweden

4.1. Institutional Structure and Policy Framework

Waste management in Sweden is governed through a multi-layered governance structure in which national environmental policies are closely integrated with energy policy objectives. The Swedish Environmental Protection Agency (Naturvårdsverket) defines the overarching framework for waste management, while local authorities are responsible for the implementation of waste collection, source separation, and disposal processes (Naturvårdsverket, 2023). From an energy perspective, waste-to-energy (WtE) facilities are fully embedded in the national energy system and are directly connected to district heating networks, which play a central role in Sweden's energy infrastructure (Avfall Sverige, 2024).

The Swedish waste management system operates within a decentralized governance model whereby the central government establishes environmental policy targets and strategic objectives, while municipalities design and execute implementation plans, infrastructure investments, and monitoring mechanisms in accordance with these goals (Naturvårdsverket, 2023).

In line with the EU Waste Framework Directive, Sweden's waste policy is structured around the hierarchy of waste prevention, reuse, recycling, energy recovery, and landfill disposal as the least preferred option (European Commission, 2017). Regulatory interventions, including the ban on landfilling combustible waste introduced in 2002 and the prohibition of landfilling organic waste enacted in 2005, have significantly accelerated investments in both recycling and waste-to-energy infrastructure (Johansson & Finnveden, 2019).

4.2. Waste Flows and Treatment Methods

According to data from Avfall Sverige (2024), per capita municipal solid waste generation in Sweden is approximately 395 kg per year. Of this amount, roughly 35% is allocated to recycling, 16% to biological treatment processes such as composting and biogas production, 48% to waste-to-energy recovery, and less than 1% to landfill disposal (Avfall Sverige, 2024; EEA, 2024).

This distribution indicates that the lower tiers of the waste hierarchy have been almost entirely eliminated from the system. The marginalization of landfill disposal not only reduces environmental risks but also plays a critical role in mitigating methane emissions associated with waste management (EEA, 2024).

4.3. Waste-to-Energy and Integration into the Energy System

In Sweden, waste-to-energy (WtE) facilities function not merely as electricity-generating plants but primarily as multifunctional energy installations integrated into district heating systems. Thermal energy recovered from waste incineration is used to heat approximately 20% of residential buildings nationwide (World Energy Council, 2020; Avfall Sverige, 2024).

Johansson and Finnveden (2019) identify the strong integration of WtE within national energy policy as the key factor underpinning Sweden's success in this field. Through this integration, WtE facilities have evolved beyond waste disposal infrastructure to become an integral component of national energy supply security.

Table 1. Waste-to-Energy Production in Sweden (2010–2022)

Year	Treated Waste (million tonnes)	Heat (TWh)	Electricity (TWh)
2010	5,2	14,8	2,1
2015	5,8	16,3	2,4
2020	6,1	17,5	2,6
2022	6,3	18,1	2,8

Source: Swedish Energy Agency (2022); Avfall Sverige (2023).

These data indicate a steady expansion of waste-to-energy (WtE) capacity in Sweden over time. In particular, within the context of reducing fossil fuel consumption, waste-based energy production is increasingly regarded as a viable alternative to carbon-intensive energy sources (OECD, 2021).

Table 2. Comparison of Waste Management Practices in Sweden and the EU (2022)

Waste Management Method	Sweden (%)	EU-27 Average (%)
Recycling	33	29

Biological Treatment	17	13
Energy Recovery (WtE)	49	13
Landfilling	<1	45

Source: EEA (2022); Eurostat (2023).

These data demonstrate that the Swedish model achieves a high level of energy recovery without suppressing recycling performance (Krook & Eklund, 2018). Compared with other EU member states, this model serves as a benchmark in terms of both energy security and the attainment of circular economy objectives.

Nevertheless, the literature also highlights that even in Sweden, excessive expansion of WtE capacity may pose potential risks to long-term recycling targets. Krook and Eklund (2018) emphasize that the continuous feedstock demand of large-scale incineration facilities may, over time, conflict with recycling-oriented policies. For this reason, Swedish waste governance incorporates regulatory measures that restrict the incineration of recyclable waste fractions, thereby safeguarding material recovery priorities (Naturvårdsverket, 2023).

4.4. Economic Instruments and Behavioral Policies

In Sweden, waste management is supported not only by technical infrastructure but also by a comprehensive set of economic incentives and behavioral policy instruments. The deposit–refund system has achieved a high level of effectiveness in the recovery of packaging waste, with recycling rates exceeding 85% for plastic and metal beverage containers (Avfall Sverige, 2024).

In addition, high landfill taxes are imposed, rendering landfill disposal economically unattractive and thereby reinforcing upper tiers of the waste hierarchy (European Commission, 2017). Municipalities that achieve higher recycling rates are able to realize financial advantages, which in turn creates an indirect form of competition among local governments to improve waste management performance (Palm & Larsson, 2020).

4.5. Environmental and Social Impacts

The environmental impacts of Sweden's waste management policies are assessed as largely positive. The substantial reduction in landfill use has led to a significant decline in methane emissions (EEA, 2024). At the same time, waste-to-energy (WtE) facilities contribute to the mitigation of greenhouse gas emissions by partially substituting fossil fuel–based energy sources (Johansson & Finnveden, 2019).

At the societal level, source separation practices have been widely internalized by households. Palm and Larsson (2020) emphasize that in Swedish society, recycling has evolved from being perceived as an environmental responsibility into a routine component of everyday life.

5. Waste Management, Zero Waste, and Waste-to-Energy in Türkiye

5.1. Institutional Structure and Legal Framework

Waste management in Türkiye is coordinated by the Ministry of Environment, Urbanization, and Climate Change (MoEUCC). Municipalities constitute the primary actors responsible for the collection and transportation of waste. The legal framework has been largely harmonized with the European Union environmental acquis. Key regulations, including the Waste Management Regulation (2015) and the Regulation on the Control of Packaging Waste, establish the principles governing recycling and source separation practices (MoEUCC, 2023).

Waste-to-energy (WtE) refers to the conversion of non-recyclable waste fractions into energy through processes such as incineration, gasification, pyrolysis, or biogas production. WtE technologies are increasingly regarded as a strategic instrument, particularly in countries with a high dependence on landfilling, as they contribute both to reducing environmental risks and to enhancing energy supply security (Alma & Salan, 2025).

For many years, the waste management literature in Türkiye focused predominantly on technical landfill solutions; more recently, it has expanded to incorporate the concepts of circular economy and zero waste. Early studies by Özkan (2000) and Yücel (1997) revealed that material recovery in Türkiye was highly limited and that waste management relied largely on uncontrolled disposal practices. These studies identified inadequate infrastructure, institutional weaknesses, and low public awareness as the main barriers to the diffusion of recycling.

With the 2000s, the process of alignment with the EU environmental acquis marked the beginning of a structural transformation in waste management. While sanitary landfilling was initially limited, landfill facilities were gradually expanded nationwide in the post-2020 period. However, this expansion primarily emphasized landfill capacity rather than waste prevention or recycling-oriented policies (Gökkurt Baki & Ergün, 2021).

More recent studies have increasingly adopted a circular economy perspective. Bilgili (2025), for instance, argues that the waste banking model in Türkiye could accelerate the transition toward a circular economy by employing economic incentives that promote recycling. The study demonstrates that monetary or point-based reward systems for waste separation significantly enhance individual participation rates.

5.2. Waste Generation and Disposal Structure

According to data from the Turkish Statistical Institute (TURKSTAT), the total volume of municipal waste collected in Türkiye amounted to approximately 32 million tonnes in 2022. Per capita municipal solid waste generation ranged between 380 and 400 kg annually (TURKSTAT, 2023; MoEUCC, 2023).

The majority of this waste continues to be directed to landfill facilities. Recycling and composting rates remain within the range of 15–20%, while the remaining share is largely managed through landfilling or irregular disposal practices (Gökkurt Baki & Ergün, 2021; MoEUCC, 2023).

This structure indicates that Türkiye remains at a landfill-centered stage of waste management. The upper tiers of the waste hierarchy—namely prevention, reuse, and recycling—are implemented only to a limited extent (Dedeoğlu & Yonar, 2025).

5.3. The Zero Waste Policy

The most significant recent policy initiative in Türkiye’s waste management system is the “Zero Waste” approach. Launched in 2017, this policy aims to reduce waste generation, promote source separation, and increase recycling rates. The Zero Waste policy has been made mandatory for

public institutions, universities, hospitals, and large-scale enterprises. Its core objectives include source separation, material recovery, and the enhancement of public awareness (MoEUCC, 2023).

Gündüz (2021) notes that the Zero Waste initiative has played an important role in increasing recycling awareness in Türkiye; however, implementation remains uneven due to limitations in institutional capacity and enforcement mechanisms. While metropolitan municipalities and large institutions have achieved relatively successful outcomes, smaller municipalities and rural areas lag behind (Gökkurt Baki & Ergün, 2021).

5.4. Waste-to-Energy Practices

Waste-to-energy applications in Türkiye have expanded rapidly over the past decade. Facilities generating energy from waste have been established in major metropolitan areas such as Istanbul, Ankara, Izmir, and Adana. These facilities are predominantly based on the conversion of methane gas captured from landfill sites into energy (MoEUCC, 2023; CMS Legal, 2022).

Incineration-based WtE facilities, by contrast, remain limited in number and are subject to public debate due to concerns over their environmental impacts. Dedeoğlu and Yonar (2025) emphasize that WtE investments in Türkiye have expanded more rapidly than recycling infrastructure, potentially creating long-term conflicts with recycling objectives.

5.5. Economic Instruments and the Social Dimension

Economic incentive mechanisms in Türkiye’s waste management system remain limited. Although the deposit–refund system has been debated for many years, its implementation has been delayed, resulting in weak performance in the collection of packaging waste (Gökkurt Baki & Ergün, 2021).

At the societal level, recycling awareness has increased; however, source separation behavior has not yet become widespread or sustained. While Zero Waste practices have been relatively successful within public institutions, comparable levels of success have not been achieved at the household level (Gündüz, 2021).

5.6. Environmental Impacts

The landfill-oriented structure of waste management in Türkiye results in a substantial share of methane emissions originating from waste disposal sites (UNEP, 2019; MoEUCC, 2023). Although energy recovery from landfill gas partially mitigates this problem, environmental risks persist as long as reliance on landfilling remains predominant.

6. Comparative Analysis of Sweden and Türkiye

6.1. Comparison of Key Indicators

The waste management performance of Sweden and Türkiye can be compared across several core indicators, including total waste generation, recycling rates, energy recovery, and landfill disposal.

Table 3. Treatment Methods of Municipal Waste in Sweden and Türkiye (2022–2023)

Treatment Method	Sweden (%)	Türkiye (%)
Recycling	~35	~18
Biological Treatment	~16	~5
Waste-to-Energy (WtE)	~48	~11
Landfilling	~1	~62

Source: Avfall Sverige (2024); EEA (2024); TURKSTAT (2023); MoEUCC (2023).

Table 3 indicates that the most pronounced divergence between the two countries lies in their landfill disposal structures. While landfilling has been almost entirely eliminated in Sweden, a substantial share of municipal waste in Türkiye continues to be disposed of in sanitary landfills (EEA, 2024; MoEUCC, 2023).

6.2. Comparison in Terms of Policy Integration

In Sweden, waste management is closely integrated with energy and climate policies. Waste-to-energy facilities operate as an essential component of district heating systems and contribute directly to national energy supply strategies (Avfall Sverige, 2024; Johansson & Finnveden, 2019). In Türkiye, by contrast, waste management is predominantly addressed within the scope of

environmental policy, with limited integration into broader energy policy frameworks (Dedeoğlu & Yonar, 2025).

As a result, WtE applications assume fundamentally different roles in the two countries. In Sweden, WtE constitutes an integral element of energy supply security, whereas in Türkiye it functions primarily as a mitigation tool aimed at reducing the environmental impacts of landfill disposal (Gökkurt Baki & Ergün, 2021).

6.3. Institutional Capacity and Local Governments

Municipalities in Sweden possess strong financial and technical capacities, enabling them to develop innovative waste management practices and effectively implement centrally defined policies at the local level (Palm & Larsson, 2020).

In Türkiye, however, substantial disparities exist among municipalities in terms of institutional capacity. While metropolitan municipalities are able to establish relatively advanced waste management systems, small- and medium-sized municipalities frequently face infrastructure and financing constraints (Gökkurt Baki & Ergün, 2021; Dedeoğlu & Yonar, 2025).

6.4. Economic Instruments and the Behavioral Dimension

In Sweden, behavioral outcomes in waste management are strongly shaped by economic instruments such as deposit–refund schemes, landfill taxes, and recycling incentives (Avfall Sverige, 2024). In Türkiye, the use of economic instruments remains limited, and recycling behavior largely relies on voluntary participation (Gündüz, 2021).

Consequently, recycling behavior in Sweden has evolved into a well-established social norm, whereas in Türkiye it remains largely contingent upon individual awareness and motivation (Palm & Larsson, 2020; Gündüz, 2021).

6.5. Comparison of Environmental Outcomes

In Sweden, the near-elimination of landfill disposal has resulted in a substantial reduction in methane emissions (EEA, 2024). Moreover, waste-to-energy facilities contribute to climate policy

objectives by partially substituting fossil fuel–based energy sources (Johansson & Finnveden, 2019).

In Türkiye, by contrast, a significant share of methane emissions continues to originate from landfill sites. Although energy recovery from landfill gas partially mitigates these impacts, environmental risks persist as long as landfill-centered waste management remains predominant (UNEP, 2019; MoEUCC, 2023).

7. Discussion and Conclusions

7.1. Discussion

This study has undertaken a comparative analysis of waste management, circular economy, and waste-to-energy (WtE) policies using the cases of Sweden and Türkiye. The findings reveal pronounced differences between the two countries not only in terms of technical practices, but also with respect to institutional capacity, policy integration, and levels of societal participation.

In Sweden, waste management is designed as an integrated system that extends beyond environmental sustainability objectives to encompass energy optimization, climate policy goals, and local development strategies. The near-elimination of landfill disposal, well-established source separation systems, and the integration of WtE facilities into district heating networks constitute the core elements underlying Sweden’s high performance in waste management (Avfall Sverige, 2024; Johansson & Finnveden, 2019).

In Türkiye, by contrast, waste management has undergone a significant transformation in recent years. The Zero Waste policy and alignment efforts with the EU environmental acquis have contributed to the strengthening of recycling infrastructure (MoEUCC, 2023). Nevertheless, landfill disposal continues to account for the largest share of waste treatment, thereby sustaining environmental risks. Recycling rates remain substantially below those observed in Sweden (Gökkurt Baki & Ergün, 2021; EEA, 2024).

Marked differences also emerge in the field of waste-to-energy. While Sweden utilizes high-capacity combined heat and power (CHP) facilities to process non-recyclable waste fractions and

supply district heating networks, WtE applications in Türkiye are largely confined to electricity generation from landfill methane gas (Dedeoğlu & Yonar, 2025; MoEUCC, 2023).

7.2. Conclusions

The analysis yields the following key conclusions:

1. The Swedish model represents a high-capacity, well-balanced system that effectively operationalizes all levels of the waste hierarchy and is closely aligned with circular economy objectives (Palm & Larsson, 2020; Avfall Sverige, 2024).
2. Although Türkiye has taken important steps toward sustainable waste management, it continues to rely predominantly on landfill disposal and has not yet fully achieved the expected level of integration between recycling and WtE policies (Gökkurt Baki & Ergün, 2021; MoEUCC, 2023).
3. Achieving an effective balance between recycling and WtE requires not only technical investments, but also the deployment of economic instruments, behavioral policy tools, and broad societal acceptance (European Commission, 2017; Gündüz, 2021).
4. The success of waste management policies depends on the simultaneous functioning of multiple factors, including institutional arrangements, local government capacity, financing mechanisms, and public awareness (Palm & Larsson, 2020; Dedeoğlu & Yonar, 2025).

7.3. Policy Recommendations

In order to enhance waste management performance in Türkiye and move closer to circular economy objectives, the following policy recommendations are proposed:

7.3.1. Strengthening Institutional Capacity

- Technical and financial support mechanisms should be expanded for municipalities.
- The planning and implementation capacity of local governments in waste management should be systematically reinforced.

7.3.2. Source Separation and Incentive Mechanisms

- Source separation should be made mandatory, with enforcement measures applied in cases of non-compliance (European Commission, 2020).
- Economic incentives, such as deposit–refund schemes, should be expanded and effectively implemented.

7.3.3. Integration of Waste-to-Energy (WtE)

- WtE facilities should be positioned strictly as complementary instruments that support, rather than substitute for, recycling activities (Krook & Eklund, 2018).
- Integration between energy policy and waste policy should be strengthened to ensure the compatibility of WtE facilities with district heating systems.

7.3.4. Public Awareness and Education

- Public awareness of waste management should be enhanced through educational programs in schools, public institutions, and media campaigns (Gündüz, 2021).
- Zero Waste practices should be extended more effectively to the household level.

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Extended Abstract

This study provides a comparative analysis of waste management, circular economy, zero waste, and waste-to-energy (WtE) policies through the cases of Sweden and Türkiye. The primary objective is to examine and contrast the waste management systems of the two countries in terms of the waste hierarchy, policy integration, institutional capacity, economic instruments, and environmental outcomes, and to assess their degree of alignment with circular economy objectives. The study adopts a mixed-methods research design that combines secondary data analysis, comparative policy analysis, and document-based content analysis. The empirical material is drawn from reports and official statistics published by institutions such as the European Environment Agency (EEA), Eurostat, the OECD, Avfall Sverige, the Turkish Statistical Institute (TURKSTAT), and the Ministry of Environment, Urbanization and Climate Change of Türkiye.

The findings indicate that landfilling has been almost entirely eliminated in Sweden, where the majority of municipal waste is treated through recycling, biological processes, and waste-to-energy recovery. In the Swedish model, WtE facilities are closely integrated with district heating systems and operate predominantly under a combined heat and power (CHP) framework, achieving high levels of energy efficiency. Consequently, WtE is positioned not as an alternative to recycling but as a complementary instrument for waste fractions that are technically or economically non-recyclable. Furthermore, deposit–refund schemes, landfill taxes, and strong local government capacity have contributed to the institutionalization of recycling behavior as a social norm.

In Türkiye, waste management policies have undergone a significant transformation in recent years, particularly following the introduction of the Zero Waste initiative. Measures such as source separation, the expansion of recycling infrastructure, and public awareness campaigns have gained momentum. Nevertheless, a substantial proportion of municipal waste continues to be directed to landfills, and recycling rates remain considerably lower than those observed in Sweden. Waste-to-energy practices in Türkiye are largely limited to electricity generation from landfill gas, indicating that energy recovery has not yet been fully integrated into national energy policy frameworks.

The comparative analysis demonstrates that the key differences between the two countries are not confined to technical infrastructure alone but also stem from institutional arrangements, local government capacity, economic incentives, and social behavior. In Sweden, a high degree of coherence exists between clearly defined national policy objectives and the strong implementation capacity of local governments. In Türkiye, by contrast, pronounced disparities in municipal capacity give rise to regional inequalities in policy implementation. Moreover, while economic instruments in Sweden—such as deposit–refund systems, waste taxes, and financial incentives—play a decisive role in shaping individual behavior, recycling practices in Türkiye remain largely dependent on voluntary participation.

From an environmental perspective, the near-elimination of landfilling in Sweden has led to a substantial reduction in methane emissions, while WtE facilities contribute indirectly to climate mitigation by substituting for fossil fuel–based energy sources. In Türkiye, a significant share of methane emissions continues to originate from landfill sites. Although energy recovery from landfill gas partially mitigates these impacts, environmental risks persist as long as landfill-oriented waste management remains dominant.

Overall, the study concludes that technical investments alone are insufficient to ensure effective and sustainable waste management. Policy success depends on the combined functioning of institutional capacity, economic incentives, strong local governance, and societal participation. While the Swedish experience illustrates that recycling and energy recovery can be implemented in a balanced and complementary manner, the Turkish case underscores the need for a more holistic, context-sensitive waste management approach that is more closely integrated with energy and environmental policies.