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Municipal Waste Management in the Post-Pandemic Period: Deficiencies and Risks Revealed by Public External Audit—A Focus on Constanța County (Romania)

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Abstract

Background and aim: The article investigates the systemic deficiencies and risks in Romania's municipal waste management system during the post-pandemic period, focusing on the role of external public audit missions conducted by the Romanian Court of Accounts. The main objective is to assess the risk of infringement procedures against Romania due to persistent non-compliance with EU environmental directives. *Scope and limitations:* The research concentrates on the period 2015–2021, with particular emphasis on the case of Constanța County, and is limited to the analysis of official audit reports and regulatory frameworks. *Methods:* The study employs a qualitative methodology based on document analysis, comparative evaluation of legal frameworks, and synthesis of audit findings, with emphasis on compliance, infrastructure, and institutional performance. *Results:* Findings highlight significant shortcomings: delayed closure of non-compliant landfills, insufficient implementation of selective collection and recycling, lack of a functional electronic traceability system, and weak monitoring by central and local authorities. Constanța County illustrates critical infrastructural and contractual deficiencies that compromise EU compliance targets. *Conclusions:* Romania remains at high risk of EU sanctions due to poor waste management performance, limited strategic coordination, and underuse of European funding. *Originality:* The article provides an integrated perspective by linking external audit findings to broader systemic vulnerabilities in the post-pandemic context. *Practical implications:* The study offers actionable recommendations for improving compliance, strengthening administrative capacity, and ensuring alignment with EU circular economy goals, thus supporting policymakers and practitioners in sustainable waste governance.

Key words:
Municipal waste management, external public audit, Constanța county (Romania), environmental compliance, EU infringement risk.

1. Introduction

The concept of environmental audit is relatively new, referring to the process of determining and examining—through analyses, tests, and confirmations—the extent to which an enterprise as a whole, or certain of its components, complies with legal environmental protection requirements (Artene, 2011; Macoveanu & Ciubotă-Roșie, 2008; Panaite et al., 2007). In countries with a well-developed environmental protection activity, environmental auditing across all categories of enterprises has become a core component of corporate environmental management, thereby complementing the overall management system. The characteristics of this type of audit are presented in Table 1.

Table 1

Characteristics of environmental audit

Objective	Description
Characteristic	Assessment of the compliance of activities, processes, and infrastructure with environmental legislation, applicable sustainability standards, and policies (ISO, 2015).
Typology	• Compliance audit (verifies compliance with legislation and standards) • Performance audit (evaluates the efficiency and effectiveness of environmental policies and programs) • System audit (examines environmental management and the implementation of ISO 14001) (ISO, 2018; OECD, 2005).
Audit criteria	Legal norms (EU directives and regulations, national legislation), international standards (ISO, EMAS), public policies, and strategic environmental objectives (EP, 2009).
Scope of application	Industrial processes, public infrastructure, utility services (waste, water, air, soil), projects funded by public or European resources (ECA, 2021).
Methodology	Documentary analysis, interviews, field observations, sampling, technical testing and verification, use of performance indicators (ISO, 2018).
Frequency	Periodic (planned annually or multi-annually) or thematic (depending on risks, complaints, or priorities) (OECD, 2005).
Actors involved	Central and local public authorities, independent audit bodies, Courts of Accounts, international organizations, economic operators (Bostan, 2010ab).
Results	Audit report containing: findings, deficiencies, recommendations, action plans, and, where appropriate, sanctions (Gray & Bebbington, 2001).
Impact	Increases compliance with environmental legislation, prevents international sanctions (infringement), improves organizational performance, and enhances environmental protection (ECA, 2021).

The environmental management system of an enterprise must ensure that decision-makers are confident that all provisions of environmental protection regulations are observed throughout its activities, and that internal operations, organizational structures, and procedures regarding environmental protection are clearly defined. The same decision-makers must also be assured that the enterprise's environmental risks are known, monitored, and controlled, supported by the existence of financial resources allocated to environmental services. In essence, there must be constant certainty that environmental requirements are applied and kept under control (Rojanschi & Rădulescu, 2015).

From the perspective of the supreme audit institution, which holds the legal mandate to exercise external public audit (PR, 1992; Bostan, 2010ab), based on the national regulatory framework and international agreements to which Romania is a party, the Romanian Court of Accounts also has competences in the field of environmental audit. This orientation aligns with the concerns of the International Organization of Supreme Audit Institutions (INTOSAI) to ensure independent auditing of activities with environmental impact. The Law on the organization and functioning of the Romanian SAI stipulates in Article 22 that "Within the competences provided for in Article 21, the Court of Accounts exercises its specific responsibilities in the following fields: (…) g) the establishment, use, and management of financial resources regarding environmental protection, the improvement of living and working conditions." (PR, 1992).

In fact, the issue of municipal waste management has recently become one of the most pressing challenges for public authorities in Romania, with major implications for public health, the environment, and sustainable economic development (Bold & Maracineanu, 2003; Pălărie & Chirigiu, 2016). In the post-pandemic years, the structural deficiencies of the waste management system have worsened, with the health and economic context driving both an increase in household waste volumes and difficulties in its collection and treatment. By analyzing the external public audit activity focused on this objective, and seeking to estimate the risk of infringement proceedings against Romania concerning municipal waste disposal, several serious deficiencies and systemic risks were brought to light.

The importance of this study emerges in relation to the European Union's strategic objectives on the circular economy, where Romania faces significant delays. According to Eurostat, the recycling rate of municipal waste in Romania was below 15% in 2020, compared to the European average of over 45%, highlighting substantial performance gaps. Thus, analyzing structural deficiencies through the lens of external public audit is important for understanding the post-pandemic context and identifying actionable directions.

In this regard, our approach follows the following structure: (1) Introduction; (2) Material and methods; (3) National regulatory framework and European context in waste management; (4) Design of the external public audit mission addressing the issue of landfills in large cities (2022); (5) Findings and deficiencies identified by the Court of Accounts; (6) Risks identified following the external public audit; (7) Compliance challenges in the management of waste infrastructure in Constanța county; and (8) Conclusions and recommendations.

Finally, the paper includes references to the research Limitations and the Future directions of study on which we intend to focus.

2. Material and methods

The research was grounded in a qualitative approach, based on a documentary analysis of official audit reports issued by the Romanian Court of Accounts (RCA), the national and European legislative framework in the field of waste management, as well as the specialized literature dedicated to environmental auditing and auditing in general. The analysis covered the period 2015–2021, which corresponds to the timeframe considered by external public audit missions that addressed the issue of municipal waste disposal in Romania's large cities.

The research design is illustrated in Figure 1.

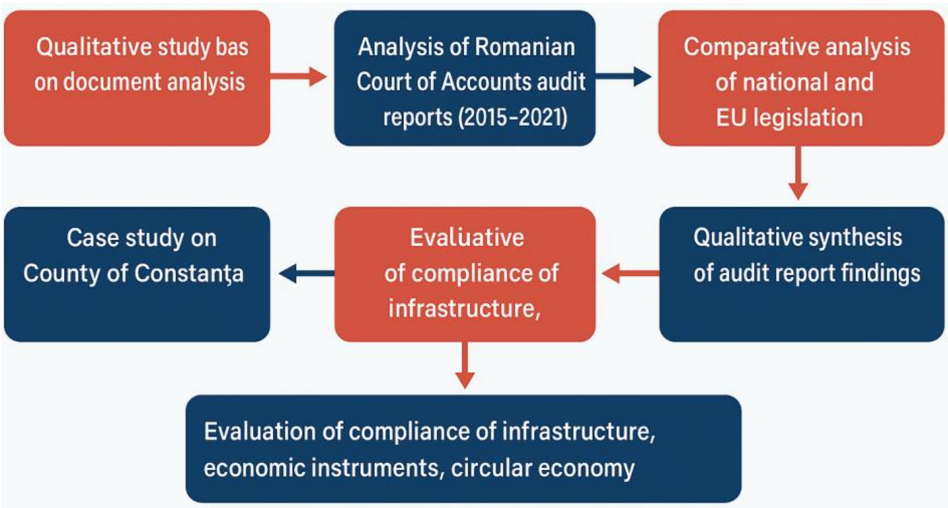

Fig. 1. Research design
Source: Authors' elaboration

The research methodology consisted of: (i) a comparative analysis of relevant national and European legislation, such as Directive 1999/31/EC and Directive 2008/98/EC, Law No. 211/2011, Government Emergency Ordinance (GEO) No. 92/2021, and Government Ordinance (GO) No. 2/2021 (CEU, 1999; EP, 2008; PR, 2011; GR, 2021a); (ii) qualitative synthesis of findings from external public audit reports, with emphasis on structural and institutional deficiencies (Romanian Court of Accounts, 2022; https://www.curteadeconturi.ro); (iii) evaluation of compliance criteria regarding infrastructure, the application of economic instruments, and the degree of implementation of circular economy principles; and (iv) a case study applied to Constanța County, selected due to the relevance and persistence of deficiencies identified in the integrated waste management infrastructure (SMID) (RCA, 2022).

For the validation of interpretations, the research also relied on comparative European reports (Eurostat, European Court of Auditors), which provided a benchmark for assessing performance gaps. This approach did not involve direct quantitative measurements but was instead an exploratory and evaluative methodology, specific to public policy analysis and compliance auditing.

3. National regulatory framework and the European context in waste management

Romania, as a Member State of the European Union, is obliged to comply with the provisions of European directives in the field of environmental protection, in particular Directive 1999/31/EC on landfill of waste and Directive 2008/98/EC on waste (CEU, 1999; EP, 2008). According to these regulations, landfilling is permitted only for pre-treated waste and under conditions that do not endanger human health or the environment. Upon accession in 2007, Romania committed itself to aligning its national legislation and waste management practices with these EU standards.

At the national level, the legal framework has been further developed through Law No. 211/2011 on waste regime, Government Emergency Ordinance (GEO) No. 92/2021, and Government Ordinance (GO) No. 2/2021 (PR, 2011; GR, 2021ab). However, the enforcement of these regulations has been characterized by delays and inconsistencies. The National Waste Management Plan (PNGD), approved in 2017, set ambitious objectives: 100% coverage of sanitation services by 2018, a 10% reduction in household waste by 2025, recycling of 50% of municipal waste by 2025, and reducing the amount of biodegradable waste landfilled to 35% of the 1995 level. It must be noted that these targets were not achieved, which confirms persistent deficiencies in implementation.

In the following section, we provide references to Romania's situation in the field of environmental protection and the associated risk of infringement, as reflected in the years immediately following the outbreak of the Covid-19 pandemic. These issues are graphically illustrated in Figure 2.

Fig. 2. Romania's environmental protection context and risk of infringement

Source: Authors' elaboration

Our analysis highlights the persistence of structural and institutional vulnerabilities that amplify the risk of new infringement proceedings at the European level. Despite repeated opportunities to attract EU funds for the development of Integrated Waste Management Systems (SMID), local authorities have not succeeded in implementing such projects across all counties. Similarly, although the European Union provided resources for financing the closure of non-compliant landfills, the Environmental Fund Administration failed to access these programs, leading to reliance solely on state budget resources.

Another critical weakness concerns improper waste collection, characterized by mixing fractions, lack of sorting, and absence of pre-treatment, all of which contravene European principles and set the premises for new infringement procedures. Regarding landfill management, the existing legal framework stipulates the creation of a closure and post-closure monitoring fund, but the absence of legally established amounts and the relatively low level of sanctions create a high risk that these obligations are treated superficially by operators. Moreover, both central and local authorities have undertaken insufficient monitoring and control actions, thereby perpetuating major deficiencies in waste management.

Regulatory gaps are also evident in the application of economic instruments. The central authority has not established the framework for collecting the necessary financial resources to cover Romania's contribution to the European Union for unrecycled plastic packaging waste. In this context, Romania committed only to the EU minimum recycling target of 22.5% of plastic placed on the market, leaving 77.5% unaddressed. The direct consequence is that the Romanian state is obliged to pay an annual contribution of €0.8/kg of unrecycled plastic waste, creating additional pressure on the public budget and further demonstrating the inadequacy of national plastic waste management policies.

4. Design of the external public audit mission on the issue of municipal landfills in large cities (2022)

An audit mission of this type—focusing on compliance over a relatively long period (January 2015 to December 2021)—requires the elaboration of an audit framework based on clear criteria, such as: the existence and adequacy of waste management infrastructure, the degree of implementation of European environmental principles, the application of extended producer responsibility, the use of performance indicators in waste management, the issuance and monitoring of environmental authorizations, the effectiveness of sanctioning non-compliant operators, and the suspension of illegal activities. Naturally, the auditors involved applied specific tests, calibrated to the profile of the audited entities, in order to provide a comprehensive and objective picture of the deficiencies affecting Romania's national system of municipal waste management. The design of the external public audit mission addressing the issue of landfills in large Romanian cities (2022) is illustrated in Figure 3.

Fig. 3. Schematic representation of the external public audit mission addressing the issue of landfills in large Romanian cities
Source: Authors' elaboration

The study of official documents issued by the Romanian Court of Accounts (RCA, 2022) shows that the general objective of this audit mission was to evaluate the risk of infringement proceedings against Romania, triggered by persistent deficiencies in the management of municipal landfills in large cities, as well as to identify the main factors amplifying this risk.

The immediate context was the receipt, on 12 November 2021, of the letter of formal notice from the European Commission, a document anticipating the imminence of formal sanctioning proceedings. The specific objectives of the mission were: (i) evaluation of policies and instruments adopted in the field of waste management; (ii) regulation and authorization of landfill activities; (iii) analysis of the existence and functionality of technical and utility infrastructure for collection, transport, and treatment; (iv) evaluation of the organization and operation of municipal waste management systems at local level; and (v) monitoring and control exercised at central level over operators in the sector. As shown in Figure 3, the audit targeted both the central level of public administration and local structures involved in waste management. The main audited entities were: the Ministry of Environment, Waters and Forests, the National Environmental Protection Agency, the National Environmental Guard, the Environmental Fund Administration, county environmental protection agencies, and county and local administrative-territorial units. It should be noted that an important methodological element was the decision to approach the audit through the perspective of processes preceding final disposal (collection, transport, sorting, recycling, recovery), these being considered decisive factors influencing both the likelihood and the level of infringement risk.

5. Findings and deficiencies identified by the Romanian Court of Accounts

Romania committed to closing all non-compliant landfills by 2017; however, this objective was not achieved, leading to the initiation of infringement procedures. A major long-standing deficiency is the absence of a functional electronic waste traceability system, required by Directive 2008/98/EC. Although Government Ordinance No. 2/2021 transposed this obligation, by 2022 no steps had been taken to implement it. This situation creates a significant risk of inaccurate data reporting, with direct impact on Romania’s relationship with European institutions.

5.1 At the level of central public authorities

The audit found deficiencies at the Ministry of Environment, Waters and Forests (MMAP), which failed to prepare a new waste management strategy after the expiration of the previous one in 2020 (RCA, 2022). These findings are schematically represented in Figure 4.

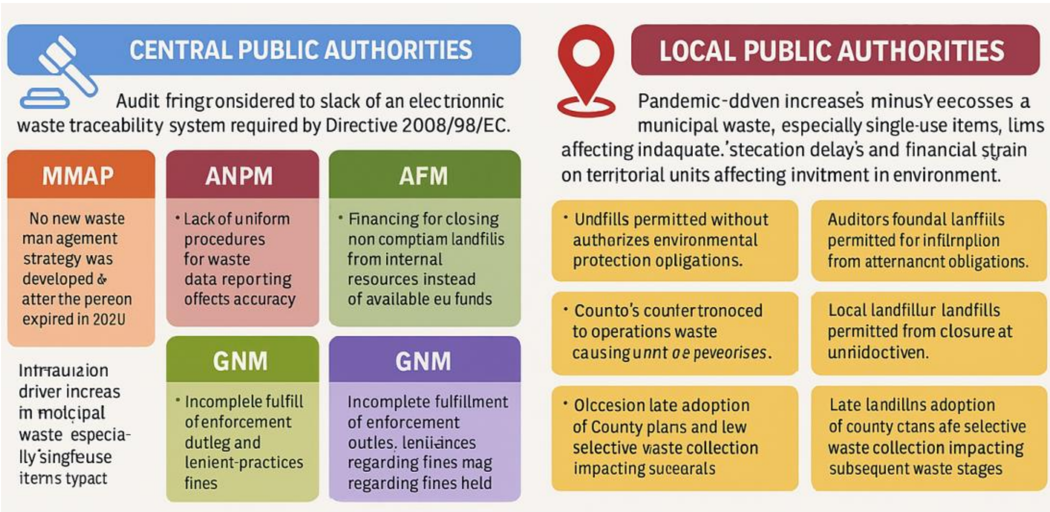

Fig. 4. Findings and deficiencies identified by the mission of the Romanian Court of Accounts

Source: Authors’ elaboration

The lack of an updated strategic framework led to delays and incoherence in policy implementation. Similarly, the National Environmental Protection Agency (ANPM) did not develop uniform procedures for reporting waste data, which undermined the accuracy of figures submitted at European level. The Environmental Fund Administration (AFM) financed the closure of non-compliant landfills from internal resources, without accessing available European funds. The National Environmental Guard (GNM) did not fully exercise its control and sanctioning duties. Its practice of replacing legally prescribed penalties with warnings ran contrary to the national objective of preventing the initiation of European judicial cases against Romania.

5.2 At the level of local public authorities

As is well known, at the territorial level, the COVID-19 pandemic generated a significant increase in household waste, particularly packaging and single-use products. Sanitary restrictions led to delays in separate collection and a reduction in recycling capacities. Moreover, the financial resources of territorial administrative units were negatively affected, reducing investments in environmental infrastructure. These factors further amplified the structural deficiencies already present in the waste management system. At the same time, at the level of local public authorities, the audit revealed delays in the implementation of county waste management plans, a low degree of separate collection, and inadequate infrastructure for sorting and treatment (RCC, 2022).

In many counties, integrated waste management systems (SMID) were either not completed or only partially operational, forcing waste to be transported to other counties. In the capital city, landfill capacity is limited, and a significant share of waste is disposed of directly in landfills without prior treatment. More seriously, auditors found that there were cases in which county authorities authorized the establishment of landfills that were not required to comply with environmental protection standards. In an entirely abnormal development, the closure of landfills—due to the absence of financing from local budgets or from economic operators with administrative responsibilities—ended up being covered financially by the Environmental Fund, contrary to the purpose for which the fund was originally created.

It was also noted that county waste management plans were adopted with delays and that separate waste collection is carried out at a low rate, thereby affecting subsequent stages of the waste management chain. Furthermore, municipal waste treatment and sorting facilities remain insufficient, while significant amounts of untreated waste continue to be directed to landfills, in contravention of legal requirements.

6. Risks identified following the external public audit

In the absence of rapid corrective measures, Romania risks remaining on the periphery of European policies concerning the circular economy. The audit conducted by the Romanian Court of Accounts (RCC) serves not only as a warning signal but also as a guidance tool for policymakers. Strict implementation of the recommendations formulated is very important, not only for avoiding sanctions but also for ensuring a cleaner environment and sustainable long-term development.

The RCC highlighted the high risk of new infringement procedures being initiated against Romania due to non-compliance with obligations on recycling, reduction of biodegradable waste disposed of in landfills, and waste traceability (RCC, 2022). Moreover, financing the closure of non-compliant landfills from the Environmental Fund budget, rather than from European or local funds, generates budgetary pressures and potential state aid issues.

In other words, the central risk identified is financial, stemming from possible sanctions imposed by the Court of Justice of the European Union, which could exceed several hundred thousand euros per day of delay. At the same time, increased costs for transporting waste to other counties negatively affect local budgets and may lead to higher tariffs for the population, with significant social consequences.

7. Compliance difficulties in the case of waste management infrastructure in Constanța county

The aforementioned audit mission established that the Integrated Waste Management System (SMID) Project in Constanța County was not operational, even though the collection, transport, transfer, and sorting infrastructure was formally organized in line with legal provisions and had the potential to cover the waste management needs of the county’s three zones. However, at the local level, the collection infrastructure was found to be undersized for separate collection, while the sorting infrastructure was both undersized and outdated, particularly in the city of Constanța.

The infrastructure for preparatory operations prior to recovery or disposal of waste was deemed insufficient, requiring an additional treatment capacity of 60,000 t/year and the expansion of the existing composting capacity with an additional facility of 10,000 t/year. These measures are necessary to reduce the volume of waste disposed of in landfills and to meet the targets assumed by national and EU policies.

Table 2

Compliance difficulties in waste management infrastructure in Constanța county

Analyzed Domain	Findings / Main Deficiencies
Waste landfills	• Operate according to environmental authorizations, but the closure and post-closure fund is not aligned with the approved projects. • The Tortoman ecological landfill (SMID) is not operational due to delays in awarding the sanitation service concession. • Non-compliant landfills covered by Government Decision no. 349/2005 were closed, but post-closure monitoring has been missing (2018–present), leading to degradation.
Contracts and financial management	• Local administrative units (ATUs) did not include clauses on covering closure and post-closure costs through landfill tariffs. • Lack of requirement for environmental financial guarantees from operators. • Delegation contracts did not include clear obligations regarding landfill safety and environmental protection.
SMID infrastructure	• SMID infrastructure (Tortoman, Ovidiu, Costinești) not operational, with degradations identified by the National Environmental Guard (GNM). • Investments worth 31 million lei (fixed assets acquired in 2015) remain unused, at risk of moral and physical wear. • Additional needs: +60,000 t/year TMB capacity and +10,000 t/year composting capacity.
Environmental performance	• 88% of municipal waste ends up in landfills (2019–2021). • Extremely low recycling rate (1.5%), far below EU targets. • Existing sorting capacities theoretically sufficient, but used at less than 50% of potential.
Regulation and control	• Issuing of environmental agreements complies with legislation, but monitoring of the closure fund is missing. • Operators complied with reception procedures and reported refusals to accept waste. • GNM found degradations in the absence of post-closure monitoring.
Organization of ATU services	• 12% of ATUs do not have sanitation regulations with anti-dumping measures. • 34% did not organize separate collection (paper, plastic, metal, glass). • 66% did not include clauses on sorting and treatment in sanitation contracts. • ADI Dobrogea submitted documentation for improving the delegation framework and for continuous awareness campaigns.

Source: Prepared by the authors based on data extracted from RCC, 2022

The implementation of the economic instrument “pay-as-you-throw” is in a deficient stage, as approximately 60% of the administrative-territorial units (ATUs) have not established concrete modalities for its application. Moreover, sanitation services have been delegated to authorized operators in the absence of clear regulations, without performance indicators, and without ensuring the necessary infrastructure for selective collection, which has led to the non-achievement of environmental objectives and to negative economic and social effects.

Another critical aspect is that two-thirds of the ATUs (66%) have not concluded contracts with Producer Responsibility Organizations (OIREPs) for the takeover and recovery of packaging waste, even though the SMID documentation explicitly provides for this obligation (RCC, 2022). Furthermore, the delegation of sanitation service management through SMID had not yet been finalized, while at the local level, six ATUs failed to adopt measures for sanctioning waste abandonment outside designated collection points.

With regard to operational landfills, these generally complied with the conditions set in the integrated environmental authorizations; however, the awarding of the operating service for the landfill included in the SMID infrastructure remains unfinished. Figure 5 also suggests the existence of additional weaknesses within the specific waste management infrastructure of Constanța County.

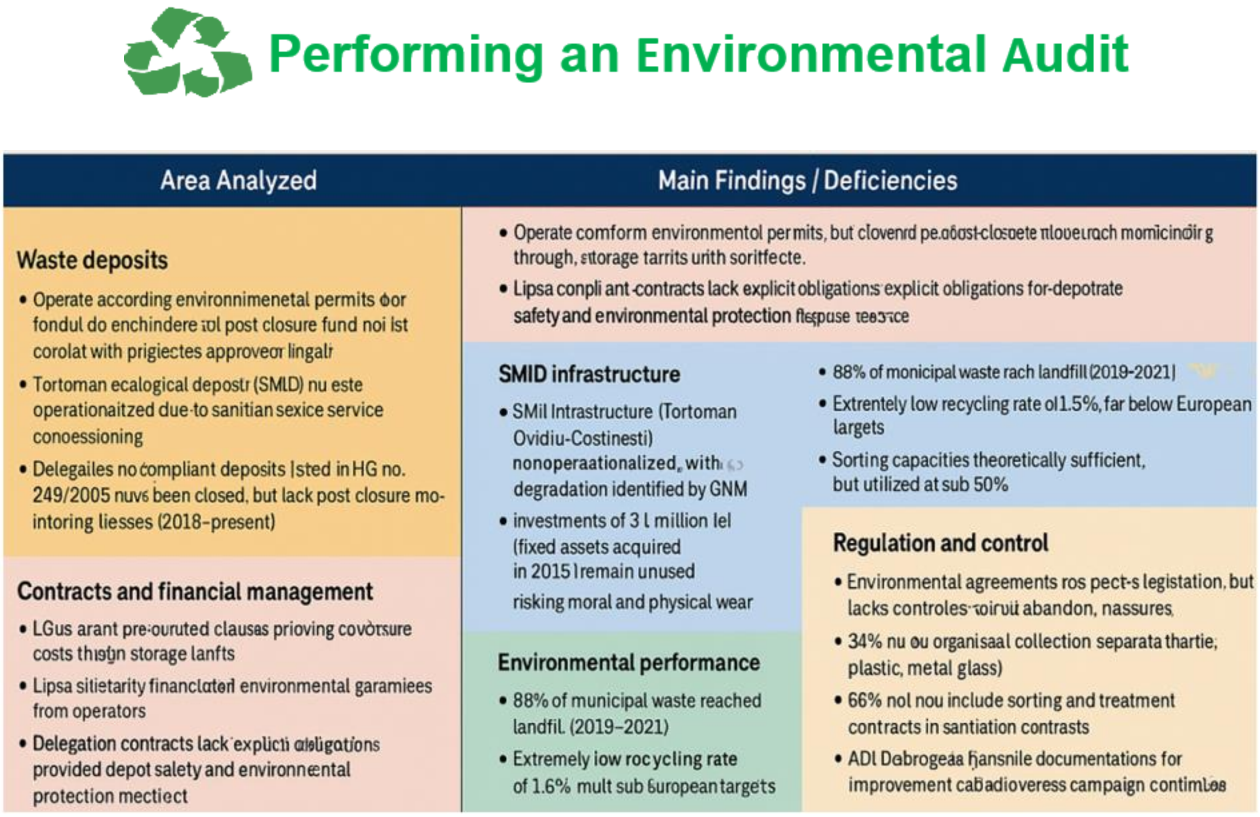

Fig. 5. Various weaknesses of municipal waste management (Constanța County)
Source: Authors' elaboration

In conclusion, regarding the analyzed county, it can be observed that the environmental regulatory authority has, in general, complied with the legal provisions concerning the authorization of landfills, which have operated in line with the conditions set by legislation. However, an important exception was identified: the Constanța Environmental Protection Agency failed to verify whether the value of the closure and post-closure monitoring fund corresponded to the amount established in the landfill's technical project. This shortcoming raises significant concerns regarding the long-term management and sustainability of such facilities.

Moreover, delays in awarding contracts for the delegation of sanitation service management within the SMID infrastructure threaten the achievement of strategic objectives established at the county level. In the absence of efficient and timely operation, there is a considerable risk that: (i) the collection and treatment of waste, including biodegradable waste, will not be carried out in compliance with national legislation and the County Waste Management Plan; and (ii) persistent economic, social, and environmental risks will continue to negatively affect the administrative-territorial units.

8. Conclusions and recommendations

Our analysis highlights that municipal waste management in Romania continues to be characterized by major structural and institutional deficiencies, which persist despite the commitments undertaken at the European level. The post-pandemic context has further accentuated these vulnerabilities, through the increase in household waste volumes and additional pressures on local collection and treatment infrastructure. Several findings of the Romanian Court of Accounts confirm the lack of coherence in policy planning and implementation, as well as the insufficiency of monitoring and sanctioning measures applied by central and local authorities.

A central issue identified is the generalized delay in applying the principles of the circular economy. The persistently low levels of separate collection and recycling, coupled with the continued reliance on landfilling as the primary method of waste disposal, keep Romania in a vulnerable position with respect to European Union standards. The delayed finalization of Integrated Waste Management Systems (SMIDs) and the blockages related to the delegation of sanitation services contribute to the perpetuation of non-compliance. Moreover, the obligation of operators to establish the funds necessary for the closure and post-closure monitoring of landfills remains only partially respected, due to the absence of clear regulations on amounts and the lack of sanctions proportional to real costs, which risks making this requirement merely formal.

In our view, overcoming these difficulties requires strengthening the institutional and regulatory framework, accompanied by an acceleration of investments in waste management infrastructure. The study suggests that the completion and operationalization of SMIDs, the modernization of sorting and treatment facilities, and the expansion of composting capacities are key measures to reduce dependence on landfilling and bring Romania closer to EU objectives. Equally important is strengthening monitoring and control capacity at both central and local levels, to ensure consistent enforcement of legislation and the sanctioning of non-compliant operators.

We also argue that the implementation of economic instruments, such as the "pay-as-you-throw" principle and extended producer responsibility, can foster behavioral change at both institutional and individual levels, driving Romania toward a functional circular economy. At the same time, making full use of available European funds for the closure of non-compliant landfills and the development of modern infrastructure remains a necessary condition.

In conclusion, reducing the risk of new infringement procedures and ensuring Romania's alignment with the objectives of the European Green Deal require an integrated approach, grounded in strategic planning, institutional accountability, and the efficient use of resources. Without such a model, a sustainable waste management system capable of responding to European standards and societal needs cannot be built.

Research limitations and future research directions

This study is subject to certain limitations. The analysis relied primarily on secondary literature, official audit reports, legislative frameworks, and qualitative synthesis, without employing quantitative measurements of waste management performance at the local level. Furthermore, the research timeframe provides a relevant yet partial perspective, as it does not fully capture the effects of recent European environmental policies or the implementation of the European Green Deal.

Future research will therefore focus on up-to-date longitudinal analyses of waste management performance, with particular emphasis on Romania's capacity to comply with newly adopted EU requirements. Comparative studies with other EU Member States could also be valuable in identifying transferable best practices and governance models.

We believe that such research can contribute to a deeper understanding of systemic vulnerabilities and provide evidence-based recommendations for policy reform.

Author Statement on AI Use

The authors declare that AI-based tools (ChatGPT-5) were employed solely for assistance in language editing, style improvement, translation verification, text refinement, and illustration enhancement, under the full supervision of the authors. The entire content has been thoroughly reviewed and finally approved by all authors of the paper.

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