IMPACTO CIENTÍFICO EDITORA

URBAN SOLID WASTE MANAGEMENT IN TERESINA-PI: AN ANALYSIS OF CHALLENGES AND GAPS

GESTÃO DE RESÍDUOS SÓLIDOS URBANOS EM TERESINA-PI: UMA ANÁLISE DOS DESAFIOS E LACUNAS

GESTIÓN DE RESIDUOS SÓLIDOS URBANOS EN TERESINA-PI: UN ANÁLISIS DE LOS DESAFÍOS Y VACÍOS

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ABSTRACT

This paper addresses the challenges faced by the municipality of Teresina in implementing the guidelines of the National Solid Waste Policy (PNRS), Law No. 12.305/2010. Teresina, the capital of the state of Piauí, has a population of over 902,644 inhabitants and presents a growing generation of urban solid waste, including recyclable material. The case study made it possible to identify the main advances and obstacles in waste management, considering aspects such as the implementation of selective collection, the participation of waste pickers' cooperatives, the infrastructure of Voluntary Delivery Points (PEVs), environmental education, and the feasibility of public consortia for integrated waste management. Among the most relevant results, the following stand out: limited financial resources, dependence on the work of informal waste pickers for recycling, difficulty in fully implementing the Municipal Integrated Solid Waste Management Plan (PMGIRS), and the need to adapt former waste disposal areas.

Keywords: Challenges. National Solid Waste Policy. Integrated Waste Management. Cooperatives. Teresina. Piauí.

RESUMO

O trabalho aborda os desafios enfrentados pelo município de Teresina na implementação das diretrizes da Política Nacional de Resíduos Sólidos (PNRS), Lei nº 12.305/2010. Teresina, capital do estado do Piauí, possui população superior a 902.644 habitantes e

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apresenta crescente geração de resíduos sólidos urbanos, incluindo material reciclável. O estudo de caso permitiu identificar os principais avanços e obstáculos na gestão de resíduos, considerando aspectos como a implantação da coleta seletiva, participação de cooperativas de catadores, infraestrutura de Postos de Entrega Voluntária (PEVs), educação ambiental e viabilidade de consórcios públicos para a gestão integrada de resíduos. Entre os resultados mais relevantes, destacam-se a limitação de recursos financeiros, a dependência da atuação dos catadores informais para a reciclagem, a dificuldade de implementação plena do Plano Municipal de Gestão Integrada de Resíduos Sólidos (PMGIRS) e a necessidade de adequação de antigas áreas de disposição de resíduos.

Palavras-chave: Desafios. Política Nacional de Resíduos Sólidos. Gestão Integrada de Resíduos. Cooperativas. Teresina-PI.

RESUMEN
El trabajo aborda los desafíos enfrentados por el municipio de Teresina en la implementación de las directrices de la Política Nacional de Residuos Sólidos (PNRS), Ley nº 12.305/2010. Teresina, capital del estado de Piauí, cuenta con una población superior a 902.644 habitantes y presenta un aumento en la generación de residuos sólidos urbanos, incluyendo material reciclable. El estudio de caso permitió identificar los principales avances y obstáculos en la gestión de residuos, considerando aspectos como la implantación de la recolección selectiva, la participación de cooperativas de recicladores, la infraestructura de Puntos de Entrega Voluntaria (PEVs), la educación ambiental y la viabilidad de consorcios públicos para la gestión integrada de residuos. Entre los resultados más relevantes se destacan: la limitación de recursos financieros, la dependencia del trabajo de los recicladores informales para el reciclaje, la dificultad de implementar plenamente el Plan Municipal de Gestión Integrada de Residuos Sólidos (PMGIRS) y la necesidad de adecuar antiguas áreas de disposición de residuos.

Palabras clave: Desafíos. Política Nacional de Residuos Sólidos. Gestión Integrada de Residuos. Cooperativas. Teresina-PI.

1 INTRODUCTION

Urban solid waste management has become a priority on public agendas, especially in a scenario where urbanization and population growth impose increasing challenges for cities. In Brazil, in 2023, according to the IBGE (2023), approximately 60.5% of municipalities have a selective collection service for solid waste and 56.7% have specific legislation for this practice. In Piauí, however, more than 77% of municipalities still dispose of their waste in dumps, demonstrating a significant delay in relation to solid waste management (TERESINA FM, 2024).

In Teresina, the capital of Piauí, although there is progress in several aspects, waste management practices face important gaps. The municipality, over the years, has faced significant problems in relation to the collection, treatment and final disposal of waste, reflecting the reality of many Brazilian cities. The lack of adequate infrastructure and insufficient investments in management technology have contributed to the persistence of inappropriate practices, such as the disposal of waste in irregular areas and environmental contamination.

In the context of the municipality of Teresina, a comprehensive evaluation of current solid waste management practices is urgent, in view of the environmental and social impacts resulting from inadequate management. Among the main associated risks are the contamination of soil and water resources, the emission of greenhouse gases, and the proliferation of disease vectors, which directly affect public health and the quality of life of the population.

The National Solid Waste Policy (PNRS), instituted by Federal Law No. 12,305/2010, establishes guidelines for the integrated management and environmentally appropriate management of solid waste, with an emphasis on shared responsibility between the government, generators and society. The policy adopts as a principle the hierarchy in waste management, prioritizing non-generation, reduction, reuse, recycling and treatment, before final disposal, in line with the principles of sustainability and circular economy.

Additionally, the new Legal Framework for Basic Sanitation (Law No. 14,026/2020) reinforces the importance of proper solid waste management as a fundamental component of the sanitation system, expanding the understanding that its efficient management is indispensable for environmental protection, collective health, and sustainable urban development.

For example, a monthly selective collection of about 118.7 tons of materials was recorded in 2023 (VIAGORA, 2023a), an advance compared to the previous period. Equatorial Piauí's E+ Recycling program has already exceeded one thousand tons in two years, where it exchanges recyclable waste for bonuses on the population's energy bill, including incentives for citizens for proper disposal (EQUATORIAL ENERGIA, 2023). The number of condominiums participating in selective collection went from 15% in 2021 to about 43% currently (VIAGORA, 2022).

Even so, criticisms persist: leaks and irregular disposal points ("urban dumps"), which highlight weaknesses in inspection (GP1, 2025). Emergency contracts have been questioned for overcosts and poor management (COURT OF AUDITORS OF THE STATE OF PIAUÍ, 2024).

This scenario reflects well the challenges of Brazilian municipalities in meeting the National Solid Waste Policy – PNRS (BRASIL, 2010). The application of the principle of integrated waste management, including environmental education, social participation, reverse logistics, inclusion of waste pickers, municipal plans, eradication of dumps and environmentally appropriate disposal, encounters technical, economic and institutional obstacles in Teresina, as well as in many other municipalities (BRASIL, 2017; GRISA; CAPANEMA, 2018; MAIELLO et al., 2018; NEVES et al., 2021).

According to Boscov and Abreu (2000), in industrialized countries, the generation of municipal solid waste (MSW) is, on average, 0.94 kg per inhabitant per day, and approximately 68.8% of this total has the soil as its final destination. In developed countries, it is estimated that between 60% and 70% of waste is still disposed of inappropriately. This percentage is even more alarming in developing countries, where inadequate disposal can reach rates between 95% and 100%.

In Brazil, about 37% of MSW are still destined for dumps, characterized as open air disposal areas, without any type of environmental or sanitary control (CRGP, 2020). In the specific case of Teresina, the daily production of solid waste is estimated at approximately 1,200 tons, including household, public, and health service waste, among others (CRGP, 2020).

Solid waste management in the capital of Piauí, as well as in other Brazilian municipalities, is linked to the guidelines established by the National Basic Sanitation Plan (Plansab) and the National Solid Waste Policy (PNRS), instituted by Federal Law No. 12,305/2010. This policy defines principles and goals for integrated waste management, with

an emphasis on shared responsibility between the government, generators and society. In addition, it reinforces the hierarchy in waste management, prioritizing non-generation, reduction, reuse, recycling, and treatment, before final disposal (CRGP, 2020).

In line with the PNRS, the municipality of Teresina prepared, in 2018, its Municipal Plan for Integrated Solid Waste Management (PMGIRS), with the objective of universalizing waste collection and urban cleaning services. However, sanitation indicators still reveal structural deficiencies: only 35% of the population has access to an adequate sanitary sewage network, and most of the population depends on individual systems, such as septic tanks (CRGP, 2020).

Although the municipal plan has established specific goals – such as expanding the coverage of the sewage network to 33% of the population by the year 2019, a goal that was achieved – the index still remains below the parameters considered adequate to guarantee public health and environmental protection.

In addition, Teresina has aligned its solid waste management policies with the Sustainable Development Goals (SDGs) of the United Nations (UN) 2030 Agenda, seeking to promote sustainable practices that encourage the reduction, reuse and recycling of waste. The implementation of technologies for waste treatment and environmental education of the population are fundamental to face the challenges that the city faces in the management of MSW.

Additionally, the municipality of Teresina has sought to align its solid waste management policies with the Sustainable Development Goals (SDGs) established by the United Nations (UN) 2030 Agenda, with a focus on promoting environmentally responsible and socially inclusive practices. Among these practices, the reduction in waste generation, the reuse of materials and the encouragement of recycling stand out as a way to mitigate environmental impacts and extend the useful life of landfills.

In this context, the adoption of technologies for the proper treatment of urban solid waste, as well as the implementation of continuous environmental education programs, are fundamental strategies to face the structural and operational challenges faced by the municipality. These actions, integrated with local environmental governance, represent important steps towards building a more efficient, participatory and sustainable waste management.

However, given the complexity and ambition of the legislation to bring the country closer to more advanced European models, several municipalities face serious difficulties in

meeting the legal requirements. Studies show that the limited technical and financial capacity of municipal administrations is one of the main obstacles to the effective implementation of the PNRS (BRASIL, 2017; GRISA; CAPANEMA, 2018; NEVES et al., 2021).

With the objective of analyzing and discussing the difficulties and gaps faced by Brazilian municipalities in the implementation of legislation related to waste management, this study takes as its object of investigation the municipality of Teresina, capital of the State of Piauí. The city stands out for concentrating the largest generation of solid waste in the state and for presenting structural challenges related to both the management and environmentally appropriate disposal of these materials, as pointed out by environmental agencies and local inspection bodies.

The research seeks to create a detailed overview and map the management of Urban Solid Waste (MSW) in Teresina, Piauí, in order to identify the current situation of waste collection, treatment and final disposal practices, allowing a comprehensive understanding of the challenges and conditions faced by the municipality in solid waste management. Thus, it is intended to discuss the main obstacles and advances observed in the context of Teresina, situating them in the broader panorama of solid waste management in Brazil. By documenting the current situation, this work aims to provide technical and scientific subsidies that can guide future waste management actions in the municipality, promoting a healthier and more sustainable environment for the population. Understanding the reality of waste management in Teresina is essential to ensure the improvement of the quality of life of citizens and the protection of the environment.

2 METHODOLOGY

The study area of this research corresponds to the municipality of Teresina, capital of the state of Piauí. With an estimated population of 902,644 inhabitants in 2024 and a territorial area of 1,391.293 km², the municipality has a demographic density of 622.66 inhabitants/km² (IBGE, 2024). In terms of urban solid waste generation, Teresina is the main generator in the state, concentrating significant volumes compared to other municipalities in Piauí, according to records of municipal environmental agencies.

The research was conducted through a methodological approach composed of literature review, document analysis, interviews, case study and application of technological support tools.

Initially, a literature review was carried out with a survey and analysis of technical and scientific literature focused on the management of urban solid waste, with emphasis on collection, treatment and final disposal practices. This survey also included the analysis of the relevant legislation, especially the National Solid Waste Policy (PNRS) and the National Basic Sanitation Plan (PLANSAB), in order to contextualize the waste management scenario in the municipality of Teresina.

In the document analysis stage, technical reports, environmental impact studies and administrative records related to waste management in the city were collected and examined. Official data regarding the generation and composition of urban solid waste in the municipality were also considered.

In addition, semi-structured interviews were conducted with public managers and technicians responsible for the execution of services, in order to obtain information on practices in force and challenges faced by the municipal administration.

The case study was structured around the management of urban solid waste in Teresina, with details of the practices of collection, treatment and final disposal. This stage included the characterization of the existing infrastructure, the mapping of the areas served by the municipal services, and the identification of gaps and opportunities for improvement.

Finally, the use of QGIS geographic mapping software was used, in order to spatially represent the coverage of waste collection and disposal services in Teresina, allowing the identification of served and unserved areas.

3 DIAGNOSIS OF THE CURRENT SITUATION

3.1 OVERVIEW AND SITUATION OF DOOR-TO-DOOR COLLECTION OF HOUSEHOLD WASTE

In the municipality of Teresina (PI), the management of door-to-door collection of solid waste presents a significant volume of material processed monthly. According to data from the Teresinense Urban Development Company – ETURB (2025), approximately 17,378.13 tons of regular urban solid waste are collected, including those of household, commercial, public markets and street markets. In addition, about 200 tons of special solid waste and 10,215.64 tons from complementary public cleaning services are accounted for. These numbers show the magnitude of the demand for collection services in the municipality and reinforce the need for more efficient management strategies, capable of ensuring the operational and environmental sustainability of the system.

The estimated values for the generation of urban solid waste in Teresina were used, in April 2025, as a reference for the preparation of the hiring process of companies specialized in the execution of Urban Cleaning Services linked to the municipality's Integrated Public Cleaning System. However, the bidding procedure conducted by the Municipality of Teresina was suspended in May of the same year, as a result of a formal complaint filed by the company Recicle Serviços de Limpeza Ltda, responsible at the time for waste collection in the city, which pointed to evidence of favoring the company Litucera Limpeza e Engenharia Ltda (LUPA1, 2025).

Litucera, a São Paulo company with a history of operating in the sector, was hired in two successive six-month periods, between 2023 and 2024, and won three of the four bidding waivers for emergency contracting of urban cleaning services from the integrated public cleaning system of the municipality of Teresina. However, in 2024, the Court of Justice of the State of Piauí (TJ-PI) ordered the suspension of his hiring due to irregularities related to the practice of successive renewals of an emergency nature (COURT OF AUDITORS OF THE STATE OF PIAUÍ, 2024).

According to information released by the G1 news portal (2025), although the contract of the EcoTeresina consortium, composed of the companies Recicle and Aurora, was scheduled to end in June, the provision of collection services remained in operation by judicial determination, due to the essentiality of the continuity of this public service. However, in July, stoppages were recorded by outsourced truck drivers, who denounced irregularities in the payment of contractual remuneration. In August, complaints from the population intensified regarding failures in door-to-door home collection, a situation that led the Teresina City Hall, through the Teresinense Urban Development Company (ETURB), to make a public statement. In an official note, the municipal agency accused the consortium of deliberate conduct to harm the execution of the service, highlighting the practice of intentional shutdown of the GPS tracking system in the collection vehicles.

This situation highlights weaknesses in public governance and in the contractual regulation of urban cleaning services in Teresina. The dependence on outsourced companies for the execution of essential activities, combined with legal obstacles and complaints of contractual mismanagement, compromises the efficiency and regularity of the service. Furthermore, the insufficiency of preventive inspection and continuous monitoring mechanisms reveals a distance between the formulation of the guidelines established by the National Solid Waste Policy (PNRS) and their effective operationalization in the municipal

context. Such conflicts directly impact the population's trust in public administration, reinforcing the need for more transparent contracting models, compliance systems, and strengthening of social control bodies, in order to ensure greater stability and sustainability in the management of urban solid waste.

In view of the worsening crisis in the provision of urban cleaning services, the City of Teresina decreed, at the end of August 2025, an emergency situation in the collection of urban solid waste, with an initial effect of 90 days. The measure aimed to ensure the minimum continuity of the essential service, in view of the stoppages and irregularities verified in the current contract. In this context, the emergency hiring of six private companies was authorized, in addition to the use of trucks owned by local residents, as a provisional measure to reach the minimum fleet estimated at 60 collection vehicles. The adoption of this emergency mechanism occurred on a transitory basis, while waiting for a new bidding process aimed at entering into contracts of longer duration, estimated at 5 to 6 years, which aim to ensure greater stability and predictability in the management of urban cleaning in the municipality.

However, the decree of an emergency situation in essential public services such as solid waste collection exposes important weaknesses in municipal governance. Measures of this nature, even if legally foreseen, tend to increase operating costs, reduce the transparency and competitiveness of contracting processes, in addition to favoring possible practices of clientelism and judicialization. The use of residents' trucks, although strategic in the short term, shows improvisation and the absence of consistent logistical planning, which can compromise both operational efficiency and the safety of the workers involved. In addition, the recurrence of emergency hiring points to the non-existence or failures in the implementation of medium and long-term planning instruments, such as the Municipal Plan for Integrated Solid Waste Management (PMGIRS), established by the National Solid Waste Policy (Law No. 12,305/2010).

In this sense, Teresina's experience highlights the need to strengthen strategic planning, social control, and contractual regulation mechanisms, in order to reduce dependence on emergency solutions and align local management with the guidelines of sustainability, economy, and administrative efficiency.

3.2 MAPPING OF COLLECTION POINTS AND SOLID WASTE DISPOSAL SERVICES

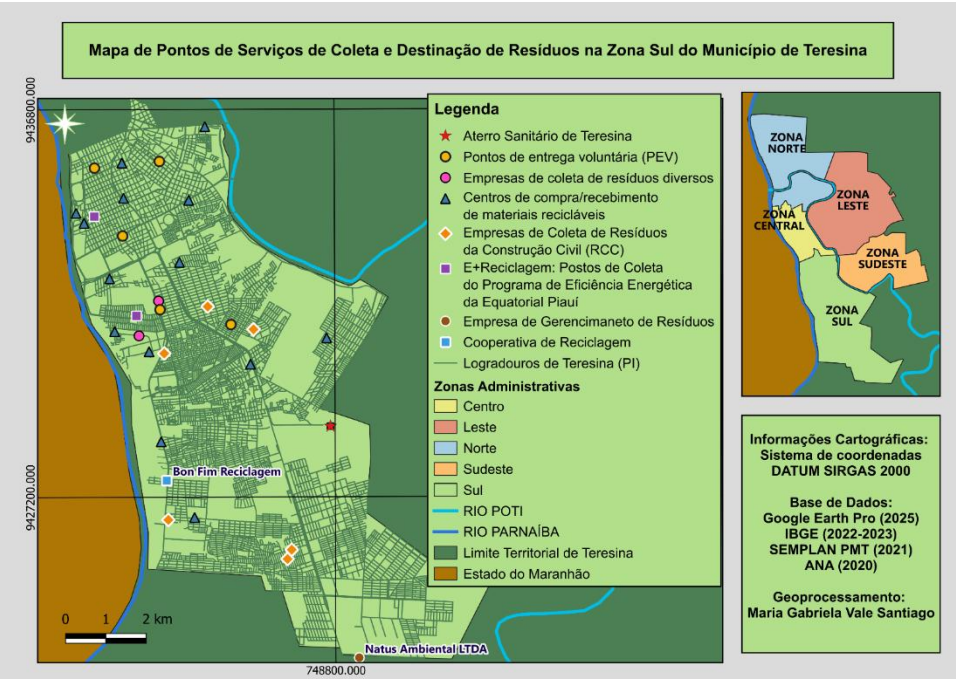
3.2.1 South Zone

The South Zone of Teresina concentrates the municipal Sanitary Landfill, configuring itself as the main area of final disposal of urban solid waste in the capital. This region also has a significant concentration of sorting and receiving centers for recyclable materials, as well as companies specialized in the collection and disposal of Civil Construction Waste (RCC), which makes it strategic for waste management in the municipality.

However, there is an uneven spatial distribution of services, especially in the eastern and southern extremes of the region, where there is a lack of support equipment and the absence of Voluntary Delivery Points (PEVs). This shortage directly affects peripheral and socially vulnerable neighborhoods, such as *Torquato Neto* and *Vamos Ver o Sol*, which remain disadvantaged in terms of access to alternatives for proper waste disposal. The absence of infrastructure in these areas compromises the effectiveness of selective collection and hinders the inclusion of the population in recycling practices and environmentally appropriate disposal, revealing a significant challenge for the universalization of urban cleaning services and for the promotion of territorial equity. Figure 1 shows the Solid Waste Collection and Disposal Service Points in the South Zone of Teresina-PI.

Figure 1

Solid Waste Collection and Disposal Service Points in the South Zone of Teresina-PI



Source: The authors, 2025.

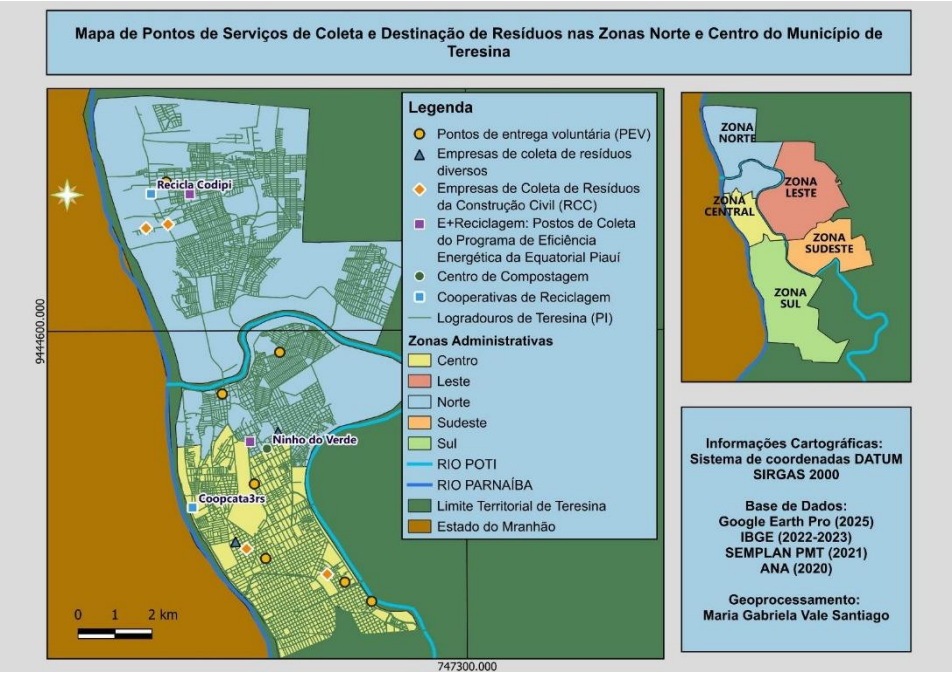
3.2.2 North and Center Zone

In the North and Central zones of Teresina, there is also an unequal distribution of solid waste collection and disposal services, characterized by the absence of Voluntary Delivery Points (PEVs), structured recycling cooperatives and composting units in several neighborhoods and allotments. This gap compromises the effectiveness of integrated waste management, especially considering the high population density of these areas.

According to the 2022 Demographic Census of the Brazilian Institute of Geography and Statistics (IBGE), two of the ten most populous neighborhoods in the capital, *Santa Maria* and *Parque Brasil*, are located in the North region, which is geographically separated from the central area by the Poti River (IBGE, 2022). Despite this demographic relevance, there is the availability of only one PEV to meet all the demand in the North Zone, which reveals a discrepancy between the supply of infrastructure and the real needs of the population. This spatial asymmetry reflects weaknesses in the planning of selective collection and makes it difficult to include large population contingents in sustainable waste disposal practices. Figure 2 shows the Solid Waste Collection and Disposal Service Points in the North and Center Zones of Teresina-PI.

Figure 2

Solid Waste Collection and Disposal Service Points in the North Zone and Center of Teresina-PI



Source: The authors, 2025.

3.2.3 Southeast and East Zone

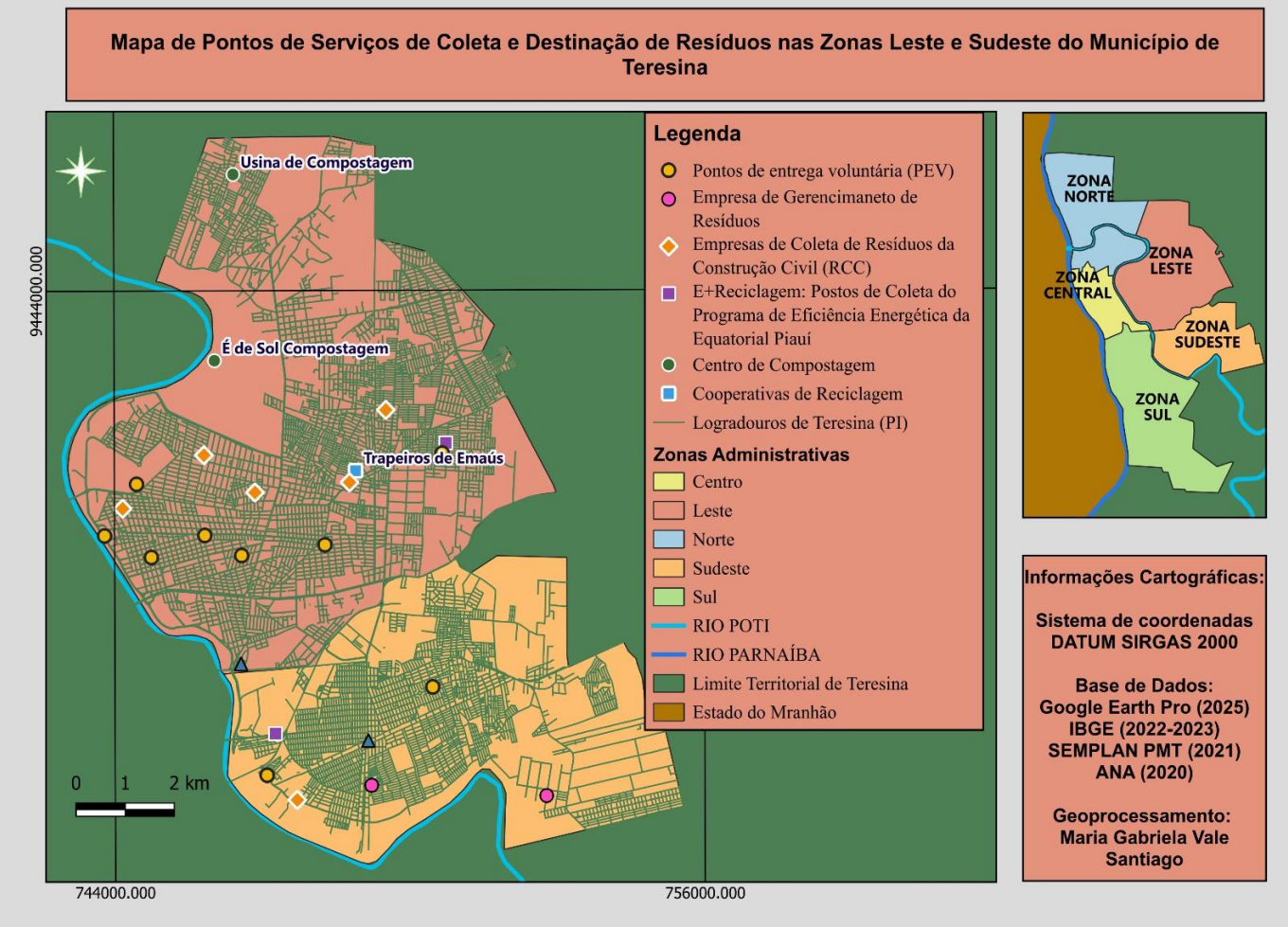
In the municipality of Teresina there are only three formally structured composting centers. Of these, two are located in the East Zone (*Usina Comcompost* and *É de Sol Compostagem*), while the third, called *Ninho do Verde*, is located near the airport, in the North Zone. Therefore, the absence of this type of infrastructure is observed in the South, Southeast and Central regions, which limits the decentralization and universalization of this practice of environmentally appropriate disposal.

The distribution of Voluntary Delivery Points (PEVs) also presents strong inequality. In the East Zone, these facilities are mostly concentrated in neighborhoods with higher purchasing power, such as *Jóquei* and *São Cristóvão*. On the other hand, PEV was not made available in the Vale Quem Tem neighborhood, one of the most populous areas of the capital, which shows a mismatch between the planning of services and the socio-spatial demands of the city.

The Southeast Zone, in turn, is the most underserved region, both in relation to selective collection alternatives and waste treatment and disposal units, revealing a scenario of more accentuated environmental and social vulnerability. This territorial asymmetry reinforces the need for management strategies that consider equity criteria in access to urban cleaning services, expanding coverage beyond central and higher-income areas. Figure 3 shows the Solid Waste Collection and Disposal Service Points in the East and Southeast Zone of Teresina-PI.

Figure 3

Solid Waste Collection and Disposal Service Points in the East and Southeast Zone of Teresina-PI



Source: The authors, 2025.

3.3 RECYCLING COOPERATIVES

The National Solid Waste Policy (PNRS) establishes, in its minimum content, the mandatory implementation of selective collection with the active participation of cooperatives and associations of collectors of reusable and recyclable materials, composed mostly of low-income people. In this context, it is up to the government to foster the organization of these social groups through the implementation of adequate physical infrastructure, the acquisition of equipment and the development of training and socioeconomic inclusion actions (BRASIL, 2010).

In the municipality of Teresina, since 2023, recyclable waste collected through Voluntary Delivery Points (PEVs) has been destined to four cooperatives selected through a

public call held in the second half of 2022 (PREFEITURA MUNICIPAL DE TERESINA, 2023). They are:

- Association of Women Recyclable Recovery Agents (AMAVARE)
- Cooperative of Entrepreneurial Work and Collectors of Recyclable Materials of Piauí (COOTERMAPI)
- Emmaus Rageiros Movement of Teresina
- Codipi Recyclable Work Cooperative (Recicla Codipi)

These organizations are also part of the set of 25 cooperatives operating in the state of Piauí, according to data from the State Secretariat for the Environment and Water Resources (SEMARH). In the local context, Teresina's cooperatives represent a strategic axis for the operationalization of selective collection and reverse logistics, while configuring an instrument of social inclusion and income generation for populations in vulnerable situations.

The cooperatives located in the capital are systematized in Table 1 presented below, allowing a visualization of their spatial distribution, operational capacity and scope of action.

Table 1

Recycling cooperatives located in Teresina-PI

Organization Name	CNPJ	Registered Address	Neighborhood
Cooperative of work and solidarity economy of solid and organic waste collectors of Teresina – COOPRENAT	35.980.191/0001-80	R Francisco Nunes da Rocha, 1951	Santa Maria
Emmaus Movement – Rag Trappers of Teresina	**02.718.366/0001-26**	**Rua Jenipapo, nº 2389, Lot. Rising Sun**	**SAMAPI**
Cooperative of entrepreneurial work and collectors of recyclable materials of the state of Piauí (COOCAMASA)	13.767.628/0001-69	R E, S/N, Lot 81 and 82,	Industrial District
Codipi Recyclable Work Cooperative (Recicla Codipi)	**43.381.131/0001-79**	**Avenida Poti Velho, 5543**	**Old Poty**
Association of Women Recyclable Recovery Agents (AMAVARE)	48.654.930/0001-95	Avenida 01, nº 6352, Quadra AA, Lote 05,	South Pole Allotment

Cooperative of Entrepreneurial Work and Collectors of Recyclable Materials of the State of Piauí (COOTERMAPI)	13.767.628/0001-69	Rua Desembargador Pires de Castro, nº 173, Sala 05, Edíficio MIka Carvalho.	Center
Cooperative of Work in Solidarity Economy of Recyclable Material Collectors of the Northern Territory (COOPCATA 3R's)	**39.497.602/0001-31**	**Rua Pastor Antonio Pedreira S/N**	**Slaughterhouse**

Source: Adapted from the Department of the Environment, 2025.

Organizations with an updated address were included in the maps of solid waste collection and disposal points and are highlighted in bold. The others, because they presented outdated data, could not be incorporated into the mapping due to the lack of accurate information.

3.4 CONSTRUCTION WASTE COLLECTION COMPANIES (RUBBLE STRIP)

Civil construction waste (CCR) has a different composition and volume from household waste, although it is not classified as hazardous. Therefore, its proper disposal excludes household waste landfills and vacant land (BRASIL, 2002). In the municipality of Teresina, control over the transport of these materials is carried out through a register of transporters, which includes companies responsible for the collection of RCC, vegetable waste and roughage. These registered companies have an Electronic Transport Certificate (CTE), allowing the issuance of a manifest, a document that records information about the materials collected and the places of origin, being used for authorization of disposal in registered areas. As shown in Table 2, it is observed that some companies, although registered, are currently closed or with outdated information, making it difficult to locate and include them in the mapping.

Table 2

Companies registered by SEMDUH/CELIMP

COMPANIES REGISTERED BY SEMDUH / CELIMP (TRANSPORTER OF RCC, VEGETABLES AND ROUGHAGE)			
COMPANY NAME	**TYPES OF WASTE TRANSPORTED**	**CONTACT**	**SITUATION**
ARCON CONSTRUCTIONS	ROUGHAGE/VEGETABLE WASTE AND RCC	(86) 98814-3596	CLOSED COMPANY
DEBRIS COLLECTION	ROUGHAGE/VEGETABLE WASTE AND RCC	(86) 3211-4600	UPDATED INFORMATION -

			INSERTED IN MAPEMANETO
"O MENDES" DEPOSIT	ROUGHAGE/VEGETABLE WASTE AND RCC	(86) 99509-3837	UPDATED INFORMATION - INSERTED IN MAPEMANETO
RUBBLE ENTERPRISES	ROUGHAGE/VEGETABLE WASTE AND RCC	(86)3213-3131	UPDATED INFORMATION - INSERTED IN MAPEMANETO
ESTÁCIO ISAIAS DE MELO NETO ME (C+ENTULHO)	ROUGHAGE/VEGETABLE WASTE AND RCC	(86) 98836-5807	OUTDATED INFORMATION - NOT INCLUDED IN THE MAPPING
Good game CONSTRUCTIONS	ROUGHAGE/VEGETABLE WASTE AND RCC	(86) 99988-8034	UPDATED INFORMATION - INSERTED IN MAPEMANETO
GM SERVICES	ROUGHAGE/VEGETABLE WASTE AND RCC	(86) 99901-5374	OUTDATED INFORMATION - NOT INCLUDED IN THE MAPPING
DEBRIS CLEANER ESPLANADE	ROUGHAGE/VEGETABLE WASTE AND RCC	(86) 99924-1465	UPDATED INFORMATION - INSERTED IN MAPEMANETO
LOC RUBBLE	ROUGHAGE/VEGETABLE WASTE AND RCC	(86) 99999-4176	UPDATED INFORMATION - INSERTED IN MAPEMANETO
M J RUBBLE	ROUGHAGE/VEGETABLE WASTE AND RCC	(86) 98816-4167	OUTDATED INFORMATION - NOT INCLUDED IN THE MAPPING
ENVIRONMENTAL NATUS	RSS (HEALTH SERVICE WASTE), BULKY/VEGETABLE WASTE, AND RCC; DOMICILIARY/EXTRADOMICILIARY; CLASS I WASTE (HAZARDOUS AND INDUSTRIAL).	(86) 99831-0008	UPDATED INFORMATION - INSERTED IN MAPEMANETO
NORTE FRUTAS / TERESINA REMOVES RUBBLE	ROUGHAGE/VEGETABLE WASTE AND RCC	(86) 9405-1681	UPDATED INFORMATION - INSERTED IN MAPEMANETO
SHOPPING DAS MADEIRAS	ROUGHAGE/VEGETABLE WASTE AND RCC	(86) 3218-3630	UPDATED INFORMATION - INSERTED IN MAPEMANETO
SOUTH DEBRIS	ROUGHAGE/VEGETABLE WASTE AND RCC	(86) 3218-3630	OUTDATED INFORMATION - NOT INCLUDED IN THE MAPPING
TIRENTULHO JAS	ROUGHAGE/VEGETABLE WASTE AND RCC	(86)3233-9191	UPDATED INFORMATION - INSERTED IN MAPEMANETO
TRANZORÃO CONSTRUÇÕES	ROUGHAGE/VEGETABLE WASTE AND RCC	(86)98861-9073	UPDATED INFORMATION - INSERTED IN

			MAPEMANETO

Source: Adapted from SEMDUH/CELIMP, 2025.

Some companies, although not registered, remain active and have been located, allowing their inclusion in the mapping. They are:

- Pega Entulho: R. Gênes Celeste, 2330 - Horto
- Qualix Environmental Services: Rua E, s/n, lotes 83/84
- Papa Entulho: Av. Ininga, 1721 - Fátima
- Disk Entulho LTDA: Av. Poty Velho, 4680 - Santa Maria
- Cometa Entulhos: R. Prof. José Amável, 600 – Cabral
- Hello Rubble: Av. Maria Antonieta Burlamaqui, 4959 – Piçarreira

3.5 SPECIAL PROGRAMMES AND INITIATIVES

3.5.1 Voluntary Delivery Stations (PEVs)

The management of the Voluntary Delivery Points (PEVs) in Teresina involves the direct participation of the companies responsible for urban cleaning services. These companies are delegated the responsibility for the collection and transportation of recyclable solid waste voluntarily delivered by the population at these points. After collection, the waste is sent to the Teresina Sanitary Landfill, where it is weighed and later distributed among the four recycling cooperatives mentioned in Section 3.3.

Currently, the municipality has 21 PEVs in operation, strategically distributed across different regions of the city. All points are active, georeferenced and were duly included in the mapping presented in Section 3.2.

Figure 4

Voluntary Delivery Station (PEV Red)

Source: The authors, 2025.

3.5.2 E+ Recycling

The **E+ Recycling** project, promoted by the Equatorial Energia Group, consists of an initiative that converts recyclable solid waste into bonuses on the electricity bill. This action is part of the Energy Efficiency Program of the National Electric Energy Agency (ANEEL) and aims to encourage sustainable practices through the valorization of recyclable waste and the reduction of energy costs for participating consumers (EQUATORIAL ENERGIA, 2022).

To enjoy the benefit, the citizen must go to one of the collection points made available by the program, carrying recyclable waste, an official document with a photo and a recent energy bill. The collection points are divided into fixed and itinerant, as described below:

Fixed posts:

- **Assaí Atacadista** – Avenida José Francisco de Almeida Neto, nº 11. *Hotspot is included in the mapping.*
- **Avenida Presidente Kennedy, nº 501 – Bairro São Cristóvão.** *No updated information on its operation.*

Itinerant collection points:

- **Monday**: Training Center, Itaperu neighborhood. *Hotspot is included in the mapping.*
- **Tuesday**: Professor Valter Alencar Municipal School, Planalto Uruguai neighborhood. *Hotspot is included in the mapping.*
- **Wednesday**: Production Center of Parque Wall Ferraz, Parque Wall Ferraz

neighborhood. *Hotspot is included in the mapping.*

- **Friday**: MP3 Project Headquarters, São Pedro neighborhood. *Hotspot is included in the mapping.*

3.6 BUYING AND SELLING LOCATIONS / RECYCLING CENTERS

Currently, the Teresina City Hall, through the Teresinense Urban Development Company (ETURB) or the Municipal Department of Urban Development and Housing (SEMDUH), does not have an updated official register of recycling centers or companies that purchase and receive recyclable materials.

However, from a survey carried out through field research and available public sources, it was possible to identify several companies and establishments that operate in the recycling sector in the municipality. All the units located were georeferenced and included in the mapping. The identified centers are presented below.

Companies and recycling points:

- **Expert Collections** – Conjunto Morada Nova I, Quadra 5, Bloco 01, Apto. 101.
- **João do Lixo Reciclagem** – Rua Quintino Bocaiúva, nº 1700, Bairro Vila Operária.
- **J. M Recycling** – Joaquim Nelson Avenue, Redonda Neighborhood.
- **New Recycling Cycle** – Avenida 001, Quadra AA, nº 6352, Bairro Pedra Miúda.
- **NF Recycling** – Avenida José Soares, nº 1707, Bairro Angelim.
- **P.R.B.M. Recycling** – Rua José Marquês da Rocha, Bairro Memorare.
- **Recycling in Teresina (CPR Lima)** – Avenida Industrial Gil Martins, nº 2750, Bairro Três Andares.
- **Recycling "O Feitosa"** – Avenida Prefeito Wall Ferraz, nº 11248, Bairro Santo Antônio.
- **Recycling São Francisco** – Rua C, Bairro Distrito Industrial.
- **Reciclart** – Haroldo de Carvalho Couto Street, Recanto das Palmeiras Neighborhood.
- **RM Recicle** – Rua G, Bairro Distrito Industrial.
- **Scrap Railroad** – Avenida Professor Valter Alencar, nº 296, Bairro Três Andares.
- **"Magão" scrap** – Avenida Maranhão, nº 2381, Bairro São Pedro.
- **Scrap "O Antônio"** – Rua Cajueiro, nº 4335, Bairro Santa Luzia.
- **"O Wagner" scrap** – Avenida Higino Cunha, nº 1940, Bairro Ilhotas.
- **Teresina Recycling** – Avenida Miguel Rosa, nº 5057, Bairro Macaúba.
- **Theresina Recicle** – Avenida Bahia, nº 971, Bairro Pirajá.

- **Vergalhão Reciclagem** – Avenida Henry Wall de Carvalho, nº 8840, Bairro Angelim.

With regard to **composting**, an essential practice for the environmentally appropriate disposal of organic waste, only three companies operating in the city were identified. The identification also occurred through digital research and all are included in the following mapping.

Companies operating in composting:

- **It is from Sol Comcomposting** – Disposal management service, located at Rodovia PI-112, Bioparque Zoobotânico, Avenida Presidente Kennedy.
- **Ninho do Verde – Composting Yard** – Avenida União, nº 2639, Bairro Memorare.
- **Composting Plant** – Rua Engenheiro José Costa Filho, nº 95, Bairro Tabajaras.

The absence of an official register of recycling centers and composting units by the Municipality of Teresina, either by ETURB or SEMDUH, highlights a significant gap in the management of solid waste in the municipality. This fact compromises not only the transparency and strategic planning of the sector, but also hinders the integration and strengthening of the local recycling production chain.

Despite this, the field research allowed the identification of a relevant number of companies operating in the recycling of various materials, with a total of 18 recycling centers or companies located and mapped. However, the spatial distribution of these points and the absence of standardized data on receiving capacity, types of waste accepted, and volumes processed make it difficult to more accurately assess the efficiency and scope of these operations.

Another critical point is the limitation of initiatives aimed at composting, with only three units identified in the entire municipal territory. Considering the potential for generating household, commercial, and institutional organic waste, this number is considerably low. The low representativeness of the sector compromises compliance with the guidelines established by the National Solid Waste Policy (PNRS), especially with regard to the proper disposal of the organic fraction and the promotion of composting as a sustainable practice.

In addition, it is observed that the initiatives identified were located without direct institutional support from the government, which shows a predominantly private or community-based action. This reinforces the need for public incentive policies, including:

- Promotion of public-private partnerships (PPPs) to expand the network of recyclers and composters;
- Creation and maintenance of an official municipal registry with georeferencing and updated information on capacity, typology and operational status of each point;
- Development of environmental education and public awareness programs, aimed at the correct separation of waste and the valorization of recyclable and organic materials.

Finally, the analysis demonstrates that there is an operational base in operation in the city, but that it lacks systemic organization, institutional support and integration with solid waste management plans. The lack of a unified and transparent plan limits the ability to monitor, evaluate performance, and plan corrective actions.

3.7 MUNICIPAL LANDFILL OF TERESINA

The Teresina Sanitary Landfill consists of two cells: Cell I, older, currently operates as an aggregate landfill; and Cell II, planned to operate, since 2020, as a unit for the final disposal of urban solid waste. However, in practice, this structure has always been marked by the presence of waste pickers, who, informally, extract recyclable materials for subsistence, contrary to the operational principles of a controlled sanitary landfill.

The precariousness in the control and security of the place resulted in a tragedy that was widely repercussions. On June 22, 2025, 12-year-old David Kauan Silva da Costa died when he was hit by a tractor while sleeping inside the landfill (CIDADE VERDE, 2025). The episode brought to light not only the social vulnerability of families who depend on informal recycling, but also the fragility in the public management of solid waste in the municipality

According to information from civil engineer José Robispierre, representative of ETURB, Cell II is currently in the process of deactivation, and the entire complex will operate exclusively as an aggregate landfill, with an estimated useful life of a maximum of seven years. From this process, urban solid waste must be redirected to licensed landfills in the neighboring cities of Altos and Nazária, which implies an increase in logistical and environmental costs for the municipality of Teresina.

It should be noted that, even in the deactivation phase, Cell II still receives treated hospital waste, whose collection and treatment are carried out by the company Natus Ambiental LTDA, through autoclaving. After treatment, the waste is disposed of in the landfill,

according to current practices of final disposal. The company was duly identified and included in the mapping described in Section 3.2.

The situation of the Teresina Sanitary Landfill reveals a picture of institutional negligence in waste management, marked by the absence of social control, environmental inspection and productive inclusion measures for waste pickers. The coexistence between informal activity, public health risks, and human rights violations requires an urgent review of municipal public policies, with an emphasis on safety, a just transition for informal workers, and investment in adequate infrastructure for the final disposal of waste.

4 FINAL CONSIDERATIONS

From the mapping carried out and the analysis of the data obtained, it is found that the alternatives currently existing for the proper disposal of reusable, recyclable and organic waste in the municipality of Teresina are insufficient in view of its territorial extension and population density. This limitation reflects the lack of structural and strategic investments in a sector with high socioeconomic and environmental potential.

The negligence observed is systemic and manifests itself from the absence of updated and reliable data on the actors in the recycling chain to the fragility of administrative processes, marked by irregular bidding, repeated emergency hiring, and frequent questioning by control agencies. This context compromises the predictability, continuity and efficiency of essential urban cleaning and waste management services.

Although legally foreseen, emergency hiring becomes an obstacle when adopted on a recurring basis. The short terms of these contracts — between six and twelve months — make it difficult to make lasting investments and implement structural solutions, in addition to generating institutional insecurity for service providers and the population served.

The Dagmar Mazza community, located in the vicinity of the Teresina Sanitary Landfill, represents an emblematic case of the social and environmental impacts resulting from the absence of an effective public policy for solid waste management. The current operational structure is limited to partial collection and final disposal in landfills, neglecting priority actions such as reduction at source, reuse, recycling and adequate treatment of the organic fraction.

In view of this panorama, it is concluded that the implementation of an efficient urban solid waste management system in Teresina requires structural changes in the posture of the municipal government. Such changes include strengthening governance, long-term planning, improving transparency in hiring, valuing the work of waste pickers, and adopting

technological and environmentally appropriate solutions. Only with this commitment will it be possible to align local management with the guidelines of the National Solid Waste Policy and promote a just and sustainable transition for the entire population.

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