European Journal of Applied Business Management, 11(1), 2025, pp. 49-75 ISSN 2183-5594

Research paper

An analysis of the criteria used to draw up tendering procedures for waste collection services

Submitted on 15th november 2024
Accepted on 29th january 2025
Evaluated by a double-blind review system

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ABSTRACT

Purpose: Public cleaning services, particularly waste collection services, are extremely costly to public finances, especially when such services are outsourced. According to research conducted by Souza (1999) in municipalities of the southern region in 2006, it was found that the municipal budget allocated for urban cleaning varies according to the population size, ranging from 1.94% to 8.19% of the total budget. Recently, there has been much discussion about the cost of urban cleaning services, as proposals and values for waste collection services provided by outsourced companies or even directly by the municipal government are several times higher than the costs that the Public Administration should bear, being abusive and consequently burdening the public budget. In this sense, this study aims to analyze the criteria for drafting notices for contracting urban cleaning services, focusing on observing criteria that comply with constitutional principles of legality, impersonality, morality, publicity, efficiency, and economy, as well as whether they are based on information regarding cost accounting theory.

Methodology: Initially, a literature review was conducted through keyword searches for "notices," "waste collection," and "urban cleaning" in databases such as Scopus, Spell, and Web of Science to deepen issues related to solid waste management. Subsequently, using a checklist based on bidding laws 8.666/1993 and 14.133/2021, the necessary elements for notices contracting waste collection service providers were identified. Finally, through LicitMais Brasil (a bidding automation manager) and Effective platform for bids, we analyzed a sample of 18 notices prepared for contracting waste collection service companies from January 2023 to August 2024.

Results: The bidding notices for contracting waste collection service companies highlight that the cost of waste has been the subject of various investigations by the Public Ministry, which often considers contracted services abusive and burdensome to a significant portion of municipal budgets. Based on the study analysis, it was found that notices for contracting urban cleaning services lack sufficient criteria to establish the necessary costs for providing this

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service. The absence of these criteria by municipal managers often leads to hiring companies with inflated prices that do not provide proper service because the notices do not detail the contracted services or lack oversight, which can lead to irregularities or fraud.

Research limitations: The study identifies as a limitation the analyzed period and its nature as a case study. Additionally, it notes the variables used for data collection.

Practical implications: With the results presented in this study, we hope that managers involved in the process of contracting waste collection services in public management can use this as a reference for drafting proposals in bidding processes. It should also be utilized in ensuring legality, impersonality, morality, publicity, efficiency, and economy.

Originality: The study discusses tools that can be used in defining service prices and measuring the cost of urban cleaning for Municipal Management. It is research that uses data extracted from the executing agent and confronts it with literary discussions to expand control tools.

Keywords*: Cost of waste, Tendering processes, Waste collection services.*

1. Introduction

Public cleaning services, among which garbage collection services stand out, are extremely expensive to the public coffers, especially when such services are outsourced, because according to a research carried out by Souza (1999) in the municipalities of the southern region of Brazil in 2006, it was found that the Braziliam municipal budget applied to urban cleaning varies according to the size of the population, ranging from 1.94% to 8.19% of the total budget.

In recent times, much has been said about the cost of urban cleaning services in Brazil, due to the proposals and values for the garbage collection service practiced by outsourced companies, or even directly by the municipal government, being several times higher than the costs that the Public Administration should pay, being abusive and consequently burdening the public budget.

A survey by the Brazilian Waste and Environment Association (Abrema) indicates that, in 2022, municipalities and the private sector allocated R$31.2 billion to urban cleaning, an increase of 4.2% on the previous year. On average, municipalities spend R$11.96 per inhabitant per month on services that include sweeping, collecting and transporting waste (Brond, 2024).

A study focusing on the costs of collecting and transporting solid urban waste points out that around 10% of municipalities' annual budgets is allocated to public cleaning. The report highlights that the correct classification and appropriation of costs are fundamental for evaluating the performance of services and for making more efficient decisions. The garbage business is so interesting for the private sector that, according to the newspaper Nova

Democracia (2008), the Queiroz Galvão group has split up, creating a branch to operate solely in the area of sanitation, mainly in the collection and final disposal of garbage in eight states of the federation, a niche that already accounts for 20% of the construction company's revenues, which totaled R$1.2 billion in 2004 (Funasa, 2017).

A study on the cost-effectiveness of municipal solid waste collection and transportation services analyzes the methodologies used to evaluate the costs of these services. The study emphasizes the need for appropriate performance and productivity indicators to ensure efficient and transparent management (Pinheiro & Ferreira, 2017).

A specific study on the cost composition of public cleaning services in the state of São Paulo presents detailed spreadsheets that show how different factors contribute to spending in the area. The analysis aims to guide municipal managers in formulating more accurate budgets and improving operational efficiency (Selur, 2014).

The garbage business is interesting for the private sector that, according to the Nova Democracia newspaper (2008), the Queiroz Galvão group has unfolded, creating a branch to operate only in the area of sanitation, mainly in the collection and final disposal of garbage in eight states of the federation, a niche that already represents 20% of the construction company's revenue, which totaled R$ 1.2 billion in 2004.

Garbage collection is a public service provided by the Municipality or its delegates, under the legal regime of public law, with a view to the sanitation of urban areas and the basic health of the community. As it is a public service, garbage collection, which is generally carried out by private companies, must be chosen through a prior public tender, in compliance with the rule contained in article 5, item XXI, of Brazil's 1988 Federal Constitution.

The Public Prosecutor's Office has been investigating possible irregularities in bids for the hiring of several companies for garbage collection in several municipalities. As an example, we can cite the Recife City Hall (northeast region), which is undergoing a "special audit" by the Court of Auditors of Pernambuco whose purpose is to investigate the garbage contract signed by the Municipality of Recife and the private company Vital Engenharia Ambiental S/A, of the Queiróz Galvão group, because there are indications of overbilling which led the TCE to propose a special audit of the millionaire contract (Jornal do Comércio, 2009).

According to research FAPESP (2009), the amounts that the cities in São Paulo (southeast region) currently pay to garbage collection companies vary widely: from R$ 13 to R$ 120 per ton, with an average of R$ 37.

The federal government's Secretariat for Logistics and Information Technology discusses the general aspects of contracting cleaning services within the public administration. It also discusses the methodology used to compose the limit values for these services, including recommendations for more efficient management and cost control (Brasil, 2014).

It should be noted that these studies highlight not only the amounts invested in urban cleaning, but also the importance of efficient management of these resources in order to improve the quality of the services provided to the population. In this sense, municipalities can adopt various strategies to reduce the costs of urban cleaning services, such as: (i) planning and efficient management - proper planning of urban cleaning services is fundamental. Cities that invest in structured planning tend to identify opportunities for improvement and increase the efficiency of services, resulting in a reduction in operating costs; (ii) use of technology - the implementation of technology, such as intelligent management systems, can optimize operations. Software that enables real-time monitoring of collection routes and demands can help reduce waste and improve resource allocation. Automation can also be applied to operational activities such as sweeping, allowing for more effective management of teams and equipment; (iii) community participation - establishing Local Mobilizing Nuclei (NML) that involve the community in waste management can be an effective strategy. The active participation of the population in identifying problems and finding solutions can lead to more sustainable management and reduced costs; (iv) environmental education - investing in environmental education programs can encourage the population to adopt behaviors that minimize waste generation, contributing to the reduction of costs associated with waste management. Involving society in the maintenance of urban cleaning is crucial to reducing costs; (v) reviewing contracts and partnerships - continuous analysis of contracts with service providers is essential to ensure that costs are in line with the services provided. Partnerships with waste picker cooperatives can also reduce costs by promoting selective collection and recycling; (vi) professional training - investing in the training of professionals involved in urban cleaning services can increase productivity and efficiency, resulting in an overall reduction in operating costs.

These strategies, when implemented in an integrated manner, can make a significant contribution to reducing the costs of urban cleaning services in municipalities, while at the same time improving the quality of the service provided to the population.

Thus, this article aimed to analyze the criteria for the elaboration of public notices for the contracting of urban cleaning services in Brazil, seeking to observe if there are objective criteria that guarantee compliance with the constitutional precepts of legality, impersonality, morality, publicity, efficiency and economy, as well as if they are supported by information produced based on the theory of cost accounting. Finally, to define the prices of the services and measure the cost of urban cleaning for the Brazilian Municipal Management.

The study addresses a wide range of factors related to urban cleaning costs, such as outsourcing, regional inequalities, irregularities in tenders, and proposals for optimizing services. The various academic sources, historical data and reports lend credibility to the content presented. For example, references to rising costs (Abrema, 2022) and variations in prices per ton in São Paulo (FAPESP, 2009) reinforce the discussion.

The inclusion of strategies such as efficient planning, the use of technology and community participation is a relevant contribution to promoting efficiency and reducing costs in urban cleaning. The text relates urban cleaning services to the principles of legality, efficiency and administrative morality, highlighting the need to comply with the Constitution and bidding laws.

To carry out the research, the method was divided into three stages: (i) a literature review was carried out by searching for keywords such as “public notices”, “waste collection” and “urban cleaning” in the Scopus, Spell and Web of Science databases to deepen the discussion on solid waste management; (ii) a checklist was used based on Brazilian bidding laws (8. 666/1993 and 14.133/2021) was used to identify the necessary elements of calls for tenders for waste collection service providers; (iii) using LicitMais Brasil (a bidding automation manager) and the Effecti bidding platform, the research sample was analyzed for the period from January 2023 to August 2024.

The research is structured in five parts: the first part presents the introduction to the study, which discusses the motivation and research objectives. The second part presents the literature review, which discusses Management of urban cleaning services, Bidding and basic design, and Costs and prices in urban sanitation services. The third part presents the methodology applied to the study in order to achieve the proposed objectives. The fourth part presents the results and

discussions of the study. The fifth and final part presents the conclusion of the study and suggestions for future research.

2. Literature Review

2.1. Management of urban cleaning services

Solid waste can be classified in several ways, and the origin is the main element for the characterization of this waste. According to Fonseca and Gonzaga (2006), the different types of garbage can be grouped into five classes:

a. Household or residential waste: waste generated in daily activities at home, apartments and other residential buildings.
b. Commercial waste: waste generated in commercial establishments, whose characteristics depend on the activity carried out there.
c. Public garbage: is the waste present in public places, generally resulting from nature, such as leaves, and those discarded irregularly and improperly by the population, such as papers, packaging and food scraps, etc.
d. Special household garbage: group that includes construction debris, tires, etc.
e. Garbage from special sources: these are wastes that, due to their peculiar characteristics, deserve special care in their handling, packaging, storage, transportation or final disposal. E.g. waste from health services.

According to Schübeler (1996), urban solid waste includes household waste, as well as solid waste considered non-hazardous from industries, commerce and institutional establishments (including hospitals), etc. Due to its peculiarities, industrial and medical waste are not components of municipal solid waste, having a differentiated treatment and not being the object of this study. Even so, the definition of solid waste for the purpose of collection by the regular collection service varies from one city to another. A municipality's public cleaning laws and regulations seek to define the concept of solid waste for the purpose of removal.

Urban cleaning services, according to Fonseca and Gonzaga (2006), are the responsibility of the municipal government, which can perform them directly or through third parties through bidding and service provision contracts. Such services, according to these authors, indicate that, on average, ten percent of the annual budget of the municipalities are spent on public cleaning,

which includes the services of collection, sweeping, weeding, scraping, washing of fairs, final disposal and treatment of waste, etc.

According to Schübeler (1996), urban solid waste management is a major responsibility of municipal governments, and it is a complex task that depends both on the organization and cooperation between families, communities, private companies and municipal authorities and on the selection and application of appropriate technical solutions for waste collection, transportation, recycling and disposal. In addition, waste management is an essential task that has important consequences for public health and welfare, the quality, the sustainability of the urban environment, as well as the efficiency and productivity of the urban economy.

Also according to Schübeler (1996), in most cities in developing countries, waste management is insufficient: a significant portion of the population does not have access to waste collection services and only a fraction of the waste generated is collected. Systems for transferring, recycling, and/or disposing of solid waste are unsatisfactory from an environmental, economic, and financial point of view.

Solid waste management is a cyclical process of setting objectives, which institutes long-term plans, programming, budgeting, execution, operation and maintenance, monitoring and evaluation, cost control, review of objectives and plans, and so on, according to Ferreira and Carvalho (2007), which allow the efficient execution of the urban cleaning service.

Urban infrastructure management services is a basic responsibility of the municipal government, according to Mugagga (2006), this task can be performed in partnership with private companies and/or with users of the services (participation), but the ultimate responsibility remains that of the government.

Private companies can, under certain conditions, provide urban cleaning services efficiently, i.e. at lower costs than the public sector. However, private sector involvement alone does not guarantee effectiveness and low cost. Problems arise when, in the contracting, the conditions under which the service will be provided to the municipality are not clear, when the base cost for carrying out the service is not specified in the bidding documents and when competition between suppliers is non-existent, or even when there is a cartel or agreement between the participants in said bidding.

A recent study focused on analyzing society's participation in urban solid waste (MSW) management. The research developed a data collection instrument to assess how citizens

generate and dispose of their waste, using a questionnaire applied in Bertioga, SP. The aim is to contribute to effective MSW management, emphasizing the importance of the population's participation in decisions related to waste management (Araújo et al., 2016).

IBGE (2023), on advances and challenges in urban cleaning, reveals that almost all Brazilian municipalities (99.8%) have urban cleaning services, but 31.9% still use dumps as the final disposal of waste. This diagnosis points to the need for more effective public policies on waste management to improve the situation for the population.

According to Logatti et al. (2023), in order to achieve efficient solid waste management, it is essential to invest resources that promote the social well-being and public health of the population. In this context, by carrying out a diagnosis of the solid waste collection system, it is possible to identify operational shortcomings and direct efforts towards achieving positive results.

Ferreira and Barros (2021) investigated the panorama of municipal public spending between 2009 and 2017 on urban cleaning services in 31 municipalities in the metropolitan region of Belo Horizonte (MG), and concluded that the results revealed significant differences in the per capita cost that municipalities invest in urban solid waste management services, varying between the population groups analyzed. For example, spending by municipalities in the “over 500,000 inhabitants” population bracket was considerably higher than in the other brackets.

Barcia and Veiga (2023) suggest that urban cleaning, highlighting the regulation of the sector and the growing participation of the private sector in the provision of services, should be the responsibility of the municipality and not the regulatory agency, as is the case in some municipalities. This responsibility guarantees the efficiency and financial sustainability of the contracts. And that the lack of financial incentives is identified as one of the main barriers to implementing solutions.

These studies highlight both the advances in the management of urban cleaning services and the persistent challenges that need to be addressed to ensure more efficient and sustainable solid waste management in Brazilian cities. Likewise, the involvement of the community in solid waste management reinforces the responsibility of public managers in implementing public policies to overcome the challenges of waste management.

2.2. Bidding and basic design

For the hiring of outsourced companies, the public entity conducts a bidding process, which is the formal administrative procedure in which the Public Administration summons, under conditions established in its own act (notice or invitation), companies interested in submitting proposals for the offer of goods and services (Crispim, Alberton & Ferreira, 2024).

The objective bidding, in accordance with Law No. 8,666/93 and its subsequent amendments, is intended to ensure compliance with the constitutional principles of isonomy, legality, impersonality and efficiency, in order to select the most advantageous proposal for the Administration, in order to ensure equal opportunity for all interested parties and enable the participation of the largest possible number of competitors.

Law No. 8,666 of 1993, by regulating article 37, item XXI, of the Federal Constitution, established general rules on bidding and administrative contracts pertaining to works, services, including advertising, purchases, disposals and leases within the scope of the Powers of the Union, the States, the Federal District and the Municipalities.

In order for the administration to be able to contract a collection service that meets the best interests of the municipality (legality, impersonality, morality, publicity and efficiency, in addition to lower cost), it is necessary that the bidding notice is well formulated, containing all the indications that ensure the proper understanding of the object of the bidding and consequently the effective fulfillment of this object. In view of this, the bidding law establishes that every bidding for a work or service must be preceded by the preparation of the basic project[5].

The law establishes that the basic project must be attached to the convening act, being an integral part of it, and must be prepared according to its requirements. This project is the set of necessary and sufficient elements, with an appropriate level of precision, to characterize the work or service, or complex of works or services, which must be prepared based on the indications of preliminary technical studies. The basic project aims to ensure the technical feasibility and adequate treatment of the environmental impact of the project and enables the evaluation of the cost of the work or services and the definition of the methods and the deadline

[5] Item IX, article 6 of Law No. 8,666/93.

for execution. As an example, a well-designed basic project, for contracting preventive and corrective maintenance services, must provide, among other essential information:[6]

a. object detailing;
b. frequency of visits; whether daily, weekly, bi-weekly, monthly, etc.
c. time of solid waste collection;
d. deadline for answering calls;
e. minimum team/composition of the technical team, registered with the competent professional entity;
f. amount of equipment needed;
g. detailed budget of the overall cost of the work, based on quantities of services and supplies properly evaluated;
h. list of the spare material that should be covered by the future contract;
i. minimum material required for on-site inventory of services;
j. a place for the disposal of solid waste.

According to Nunes (2009), the basic project, in addition to being an essential part for the execution of a work or service, is the document that provides the Administration with full knowledge of the object that is to be bid, in a detailed, clear and precise way. It must provide the bidder with the information necessary for the proper preparation of its proposal, according to rules established by the Administration, to which it will be subject.

Public tenders for environmental services, such as waste collection and treatment, are frequently reviewed and updated. These processes are crucial to ensure that the services offered meet the established criteria and the needs of local communities. Transparency and efficiency in tendering procedures are fundamental to effective environmental management (Conke and Nascimento, 2018).

Oliveira and Rodrigues (2023), investigated the effect of the municipal solid waste plan on urban waste recovery, among other objectives met through the National Solid Waste Policy (PNRS) between 2014 and 2020 for Brazilian municipalities. The results indicate that the creation of the PMGIRS promotes an increase in adherence to the National Solid Waste Policy, as well as in the treatment of solid waste in the municipality.

[6] Items "a" to "f" of item IX, article 6 of Law No. 8,666/93.

In various tenders for basic sanitation works in Brazil, there are frequent flaws and non-compliances that jeopardize the selection of companies to carry out the projects. Even when a company is chosen, the bidding process may have been conducted improperly, resulting in delays, stoppages or jeopardizing the completion of public works. Therefore, planning and managing the Preliminary and Internal phases of a tender are extremely important. This justifies the need for a digital tool to help minimize errors and interruptions in the bidding processes, as well as ensuring that the works are not affected by a lack of proper planning (Pereira, 2020).

Pereira (2020), with the aim of helping to control bidding processes, created a digital tool called LicitaScan, designed to check documentation in the preliminary and internal stages of the bidding process. This tool allows users to check the bidding process using a checklist with twenty-nine questions, capable of identifying possible inconsistencies. Using LicitaScan helps to detect irregularities, enabling corrections to be made before the tender notice is published. This results in greater precision in the bidding process and improved effectiveness of the investments made.

According to Vieira et at. (2022), tender notices for waste collection services often include strict requirements, such as the presentation of technical capacity certificates, environmental licenses and financial guarantees. Companies must bear all the costs related to carrying out the services, including labor and equipment. These points reflect the complexity and importance of tendering processes in the management of waste collection services, highlighting both the opportunities and challenges faced by Brazilian municipalities.

Wermann et al. 2023 state that the bidding process for garbage collection in Brazilian municipalities faces a number of criticisms that reflect the complexity and challenges of solid waste management: (i) lack of transparency - in many cases, decisions on renewing contracts are made without proper public consultation or critical analysis, as observed in the renewal of garbage collection contracts in São Paulo, where the extension was approved without a new tender, raising concerns about the participation of society and the legitimacy of the process; (ii) irregularities and pending issues - the companies responsible for collection in São Paulo, for example, do not fulfill contractual commitments, such as the construction of composting plants. These failures compromise the quality of the services provided and raise questions about the effectiveness of inspection; (iii) suspensions and judicial interventions - several bidding processes have been suspended by decisions of the Court of Auditors, as happened in Campo Novo dos Parecis/Curitiba. These suspensions indicate problems in the preparation of calls for

tenders or in the execution of proposals, reflecting a lack of planning and rigor in the preparatory stages; (iv) questionable selection criteria - contracted companies are often not rigorous or transparent. The disqualification of companies in Porto Alegre, for example, exposed flaws in the process that could harm competition and the quality of services; (v) dependence on private companies - the excessive dependence on private companies to carry out waste collection services raises concerns about public control and social responsibility.

These criticisms highlight the urgent need for reforms in the bidding processes related to waste collection, with a view to greater transparency, accountability and efficiency in the management of solid waste in Brazilian municipalities.

The bidding process and the importance of the basic project for the contracting of outsourced services by the public administration, as established by Law 8.666/93, is essential to guarantee transparency, efficiency and compliance with the rules, detailing the technical and financial aspects necessary for the execution of works or services, such as the collection and treatment of solid waste. Despite this, recurring challenges in tendering processes, such as a lack of transparency, irregularities, inadequate planning and excessive dependence on private companies, which compromise the effectiveness of waste management in Brazilian municipalities, require control, inspection and legislative reform. Reforms to tendering processes, greater oversight and digital tools such as LicitaScan are proposals to improve the efficiency and quality of contracted services.

2.3. Costs and prices in urban sanitation services

The costs and prices of public cleaning systems differ from region to region of our country, and the quantities and characteristics of the equipment used also influence these values, according to Fonseca and Gonzaga (2006).

The financial aspects of garbage collection management are analyzed from the perspective of costs related to public cleaning services, these costs are related to the purchase of equipment, such as collection trucks, construction of sorting stations, transshipment, landfill and other improvements in collection, treatment and final disposal. Costs can be defined, according to D'Almeida (2000, p.65), as: "the sum of the instruments (labor, energy, materials, equipment, facilities, etc.), what is necessary to perform a certain service or operation".

In the city of São Paulo, Calderoni (1998) mentions that in August 1996 35 million reais were consumed with collection, transportation and final disposal, with collection representing 26% of total expenditures.

One of the methodologies for estimating the operating costs of waste collection and transportation services is the standard cost, in which, according to D'Almeida (2000, p.66), "for each cost item, a unit technical coefficient is defined that is multiplied by a price or unit cost of that item".

Azambuja (2005) gives an example to estimate the costs of cleaning services: to determine the cost of fuel, the technical coefficient is the unit consumption (measured in liters/km) multiplied by the unit price of fuel (R$/liter) resulting in the unit cost of fuel.

Also according to the author, the fixed costs that are usually related to the collection activity are: (1) costs related to the vehicle fleet – depreciation of the vehicles (expense with vehicle depreciation), remuneration of the capital invested in the fleet (establishes the return on investment in the fleet) and other costs related to the fleet, such as taxes, compulsory fees and insurance; (2) costs related to equipment installations – buildings, garages, machinery, auxiliary vehicles and furniture; and (3) labor costs – direct and indirect (wages, benefits).

Variable costs are those that vary according to the increase or decrease in activities: cost per kilometer traveled ($/km); Cost per hour of operation of the vehicles (Crispim, Ferreira & Rodrigs).

To defray the expenses arising from public cleaning services, the municipality can charge under different legal forms of collection, such as fees for the provision of public services, according to the municipality's legislation, usually charged together with other taxes such as Urban Territorial Property Tax – IPTU. However, the expenses with public cleaning services are not always fully covered by the revenues from the collection of these fees, requiring the city to supplement resources or even seek other sources of financing for this service.

According to Fonseca and Gonzaga (2006), the terminology of fixed and variable costs is widely used in spreadsheets that determine bus fares, however, in the calculations of costs and prices in public cleaning activities, although correct, it is not common to come across such definitions.

According to Fonseca and Gonzaga (2006), the cost of providing public cleaning services basically consists of the sum of expenses related to the activities necessary for its execution, which are:

- operational and administrative labor (wages, social laws, and benefits);
- uniforms and personal safety equipment (PPE);
- operation and maintenance of vehicles, fuel, tires, lubrication, taxes (IPVA), insurance, licensing; and
- remuneration and depreciation of the investment, and other equipment used, such as containers.

In the case of outsourcing services, in order to determine the prices, it is necessary to calculate the direct costs, adding the rate of Benefits and Indirect Expenses (B.D.I.), which cover the expenses incurred with the central administration of the company that provides the service and the profit margin of the contracted company.

In the case of the services being performed directly by the government, it is also necessary to identify the expenses with the administration of such service (costs of the agency that will control this service, such as rent of the property in which it will operate, telephone, electricity, water and sewage bills, office supplies and warehouse, among others);

Among the public cleaning activities, the collection and regular transportation of urban solid waste is the one that generates the most complaints from the population when it is not carried out. It is the system that has the largest number of equipment/trucks. Their budget is estimated to be 35% to 50% of all costs for a street cleaning system. If these services are not properly equated, they cause excessive expenses.

Below are the aspects considered most important by Schübeler (1996) for the composition of the cost of collection:

a) Collection vehicles: Compactor trucks are usually used in household collection, and the number of vehicles has a direct influence on the cost of services. In order to calculate the fleet of these trucks, it is necessary to know several peculiarities, such as the amount of garbage to be collected, the distance from the collection center to the final destination system, the capacity of the compactor trucks, the collection route, the frequency and time of collection, among others;

b) Garrison: In a solid waste collection and transportation system, the set of machinery (collection trucks) and labor (collection garrison) must be very well thought out for the success of the services. There is no point in having a good collection truck if there are no good collection garrisons (drivers and street sweepers).
c) Frequency of Collection: Brazilian cities that adopt a daily frequency for all household solid waste collection spend considerable resources, such as: equipment, personnel, fuel, tires, lubricating oil and others. These resources could be better applied in other public cleaning services, if there were a collection of solid waste with a mixed frequency, that is, part daily, part alternate or even periodic.

The trimmings of a rear compactor collector truck range from two to four street sweepers per vehicle. According to surveys carried out, the solid waste collector can collect 5 to 6 tons of waste in 7.33 hours of work usually divided into two shifts without great physical effort.

The total manpower (operational and administrative) in a privatized system, whose contractor operates only the solid waste collection activity, usually represents 50% of its total costs. Hence the importance of the smallest possible number of garrisons without affecting the degree of quality that a city requires in terms of the provision of these services.

Daily household collection is only necessary on public roads with a large production of solid waste, such as the central area of the city, streets of intense commerce (even those located in neighborhoods) and roads of intense traffic and access to the city center. In public places with medium and low waste production, for economic reasons, alternate collection is more advisable.

The frequency mentioned above brings savings of around 30% to 40% compared to the daily collection. In places with a small amount of solid waste, which are usually areas very far from city centers, we can think of a periodic collection. This periodicity can be twice a week.

In addition to these, there is also the opportunity cost of the capital invested (rate of return on the capital invested) and the profit margin desired by the entrepreneur, at a level sufficient to cover the risk of the venture.

The lack of clarity in the information made available about contracts and bidding processes makes it difficult for civil society to monitor them. The absence of clear and objective criteria in decisions related to tenders can lead to arbitrary choices, favoring certain companies over others. In many municipalities, decisions on waste collection contracts are made without the consultation or participation of the population. The opacity of tendering processes increases the

risk of corruption and fraud, since the lack of supervision and control allows illicit practices to go undetected. This jeopardizes not only public resources, but also the quality of the services provided (Carvalho, 2024).

Lack of transparency can result in decisions that do not take into account local specificities, leading to the implementation of services that do not adequately serve the population and generating dissatisfaction. Among public cleaning activities, the regular collection and transportation of solid urban waste is the one that generates the most complaints from the population when it is not carried out. It is the system that has the most equipment/trucks. Its budget is estimated at 35% to 50% of all the costs of a street cleaning system. If these services are not properly matched, they cause excessive expenses (Santos & Mendes, 2024).

According to the National Sanitation Information System (SNIS), the average cost of solid waste collection in Brazil varies, with some cities spending more than R$300 per ton collected, while others have lower figures, but often with less coverage or efficiency. Selective collection is even more expensive, but can pay off over time by reducing the amount of waste sent to landfills. Overall, the main challenge is to balance collection costs with service quality and environmental sustainability, promoting practices that minimize waste generation and increase the efficiency of municipal systems (Wetler et al., 2025).

Although waste collection is essential, the way costs are managed often shows a lack of transparency, efficiency and commitment to sustainability. There is an urgent need to review management models, with a focus on improving oversight of public contracts, encouraging the circular economy (recycling and reuse), investing in adequate infrastructure, especially in peripheral areas, and environmental education as a central policy. Without a more strategic and sustainable approach, municipalities will continue to face high costs and ineffective results, damaging both the environment and public finances (Conceição et al., 2025).

For Diogo and Manuel (2025), the high cost of traditional collection means that many municipalities still don't prioritize selective collection and the reuse of materials. The lack of effective public policies to encourage recycling has a double impact: waste of resources that could be reused and high costs due to inadequate waste disposal. This scenario reflects a lack of strategic vision and commitment to sustainability. In this sense, the role of citizens and environmental education is fundamental. The high cost of waste collection is also partly a reflection of the population's lack of awareness and participation. Low adherence to practices such as separating waste at home, reducing consumption of disposable materials and home

composting increases the volume of waste to be collected and disposed of. This lack of engagement is indicative of the failure to implement effective environmental education campaigns.

The costs and prices of urban sanitation services, with a focus on solid waste collection, the subject of this study, vary depending on the region and factors such as the equipment used and financial management. Fixed costs include fleet, facilities and labor costs, while variable costs depend on the intensity of operations. Tax revenue, such as IPTU, often does not cover total expenses, requiring municipal funds to be supplemented. Lack of transparency in bidding processes, absence of clear criteria and limited participation by society aggravate the scenario, favoring inefficient practices and corruption. In addition, the low prioritization of selective collection and reuse of materials reflects the lack of effective public policies and public awareness. To achieve greater efficiency and sustainability, the text highlights the need to review management models, invest in infrastructure, monitor contracts and promote environmental education as key policies.

3. Methodology

The first step in the elaboration of the article was a literature review, with the purpose of deepening the issues related to solid waste management. This step involved consulting books, specialized magazines, publications in electronic media, articles, periodicals and essentially the appropriate legislation.

Based on the literature review, a checklist was prepared (see Appendix 1), which defines the criteria used to evaluate each public notice, related to the definition of the costs of providing urban cleaning services. These criteria were defined in the light of accounting theory, Brazilian legislation on bidding and empirical studies, with the objective of evaluating whether the public notice guaranteed to ensure efficiency, effectiveness and economy in the contracting of urban cleaning services.

The checklist was applied to a sample of 18 public notices, prepared for hiring companies providing garbage collection services. The public notices were obtained by searching the internet, specifically on research sites such as Google, by consulting key words, such as: "public notices", "garbage collection" and "urban cleaning".

4. Analysis of Public Notices, Bidding Processes for Hiring Companies for the Urban Cleaning Service

A total of 18 bidding notices were analyzed, prepared by 18 different municipalities, for the hiring of companies for the urban cleaning service, in order to verify if they are prepared in a clear manner, evidencing the object of the bidding. The analysis of these is presented below.

4.1. Bidding modality

As can be seen in Table 1, most of the municipalities surveyed (55%) used the "Price Taking" to carry out the bidding process for hiring the company responsible for urban cleaning. Pricing is the bidding modality used for contracts that have an average estimated value, up to the amount of R$ 650,000.00, for the acquisition of materials and services, and R$ 1,500,000.00 for the execution of engineering works and services.

Table I: Bidding Modality

Mode	Quant.	%
Invitation (for contracts up to R$ 150,000.00)	1	5,56%
Price Taking (for contracts from R$ 150,000.01 to R$ 1,500,000.00)	10	55,56%
Competition (for contracts over R$ 1,500,000.00)	4	22,22%
Face-to-face Trading Session (any amount)	3	16,67%
Total Notices analyzed	18	100,00%

Source: Federal Law N. 8.666/1993

4.2. Requirements to participate in the bidding process

It was verified in the public notices which requirements were most used for companies to participate in the bids, such as company size, accounting indicators and experience. In the analyses, it was observed that the size of the companies was not used as a criterion for the company's participation in the bidding process, since large, medium or small companies could participate, as long as they had all the regular certificates.

As for the financial situation, the accounting indicators are evaluation criteria in 72% of the notices analyzed, highlighting the indicators of liquidity and general degree of indebtedness as a criterion for the participation of companies in the process. In addition to the financial indicators, a minimum amount of capital stock is required to participate in the bidding, which varies from a percentage of the object or a stipulated value.

Regarding the experience of the companies, 72% of the notices required technical qualification, requesting that the companies prove that they were able to perform the technical service, as well as that they prove that they had previously performed these services, by means of a declaration.

4.3 Is there a minimum price or reference price?

The research investigated whether the municipalities established maximum values for the hiring of companies. Ten of the eighteen public notices analyzed (55%) define reference prices, that is, they establish upper limits for the contracting of companies. In the public notices with reference prices (see Table 2), these minimum prices differ greatly, ranging from 2,200 to 179,296,946.26. The municipality with the lowest reference price has 40,063 inhabitants and the municipality with the highest reference price has 218,080 inhabitants.

Table II: Existence of minimum prices or reference price (classified by cost per inhabitant)

Municipality	**Reference price**	**Nº of inhabitants1**	**Value Per Inhabitant In R$**
Municipality 1	R$75,00/ton	2.440	-
Municipality 2	2.200,00	40.063	0,05
Municipality 3	3.350,00	15.041	0,22
Municipality 4	70.000,00	34.487	2,03
Municipality 5	8.000,00	2.484	3,22
Municipality 6	88.077,50	23.000	3,83
Municipality 7	5.000,00	1.000	5,00
Municipality 8	348.000,00	14.254	24,41
Municipality 9	546.000,00	10.751	50,79
Municipality 10	179.296.946,26	218.080	822,16

Source: IBGE (2010)

4.4. Existence of a spreadsheet detailing the costs of garbage collection services

Of the public notices analyzed, 78% do not contain a detailed spreadsheet of the costs for the garbage collection service (see Table 3), and therefore there is no breakdown of the fixed and variable costs necessary to perform the service. In other words, most public notices leave it up to the contracted companies to establish the costs that make up the service.

Table III: Worksheet detailing the Costs

	Quant.	%
Yes	4	22%
No	14	78%
Total	18	100%

Source: Prepared by the authors (2020)

The Costs and Services Worksheet summarizes the budget and must contain, at least, a breakdown of each service, unit of measure, quantity, unit cost and partial cost and total budgeted cost, represented by the sum of the partial costs of each service. The absence of this data, together with the lack of reference price establishments, may give rise to the contracting of services with overvalued prices.

4.5. Existence of a basic project

It was observed that of the public notices analyzed, 78% did not contain the basic project (Table 4), violating Law 8.666/93, which requires the preparation of the project in order to make clear the object of the bidding, defining all the elements necessary for the full identification of the work or service and, consequently, all the information that allows bidders to formulate their proposals under equal conditions. The lack of this instrument does not ensure the technical feasibility and adequate treatment of the environmental impact of the project and does not allow the evaluation of the cost of the service and the definition of the methods and the deadline for execution.

Table IV: Existence of Basic Project

	Quant.	%
Yes	4	22%
No	14	78%
Total	18	100%

Source: Prepared by the authors (2020)

4.6. Request for a description of the service performed

Of the public notices analyzed, 61% do not request that the companies present the methodology for the execution of the services, through which the company shows the procedures for performing the service (Table 5). This point is important, as the municipality will be able to

confront the company's proposal with its work plan and after hiring, the manager can charge that the services are carried out according to the work plan and proposal. The lack of a description of the execution methodology may cause the execution of the service not to be carried out in the desired way and, consequently, the entity will not have parameters to compare what was performed with the contractor.

Table V: Request for description of services performed

	Quant.	%
Yes	7	39%
No	11	61%
Total	18	100%

Source: Prepared by the authors (2020)

4.7. Existence of a term of reference

Of the public notices analyzed, only 39% have a term of reference (table 6), which serves to reference the object of the bidding, listing the services that are being contracted. Some notices list the services to be contracted in the basic project, but as previously seen, most notices do not have a basic project. This point in the public notice is important, as it serves to specify the object of the bidding, as well as to make it clear to the interested companies.

Table VI: Terms of Reference

	Quant.	%
Yes	7	39%
No	11	61%
Total	18	100%

Source: Prepared by the authors (2020)

4.8. Is there any technical specifications for the equipment?

It was observed that in addition to the majority of the notices not presenting a cost sheet, 67% of the notices do not contain specifications about the equipment that will be used to carry out the garbage collection service of the Municipality, such as, for example, the number of collection vehicles, size of the dumpsters, volume of the garbage bags, etc. (see Table 7).

Table VII: Technical Specifications

	Quant.	%
Yes	6	33%
No	12	67%
Total	18	100%

Source: Prepared by the authors (2020)

Establishing the technical characteristics of the equipment is important, as it reduces the costs of the services, since the amount and equipment appropriate to the size of the city and the volume of garbage generated by it are determined. But in order to reduce the cost of this service, it is necessary that the managers together with their technical team prepare the basic project, as well as detail all the costs in the cost sheet. Therefore, managers will be able to contract the services at fair prices, since all the costs and maximum price for contracting the service are already outlined in the notices.

4.9. Description of the technical, administrative and operational organisation?

It was observed that 78% of the notices did not have a description of the technical, administrative and operational organization to be adopted for the execution of the services and quantitative dimensioning of the operational workforce by category, with a description of the main functions. The technical, administrative and operational description is part of the composition of the cost of garbage collection services, so it is important that the notices establish all the criteria for the composition of the cost, in order to make a more economical contracting for the Municipality.

Table VIII: Description of the technical, administrative, and operational organization

	Quant.	%
Yes	4	22%
No	14	78%
Total	18	100%

Source: Prepared by the authors (2020)

4.10. Description of how the cost was determined?

Most of the public notices analyzed (78%) do not establish costs, do not have a reference price, and only determine that companies present their proposals in terms of monthly cost (see Table 9).

Table IX: Cost Determination

	Number of Notices	**%**
Cost Per Ton	3	17%
Cost per M2	1	6%
Monthly fixed amount	14	78%
Total	18	100%

Source: Prepared by the authors (2020)

The lack of definition of how the costs are formed demonstrates that there is no concern with objectivity in the public notice, failing to consider important variables that affect the formation of collection costs, such as the size of the Municipality, which directly affects the volume of garbage generated. As a result, reference is lost to evaluate the economics of the contract to be signed. Therefore, it is difficult to establish the average cost per ton of garbage, making it difficult for managers to analyze whether they are paying a fair price or not, and consequently transparency and the possibility of accountability (control and accountability to citizens).

4.11. Is there a memorial to the sections of road travelled per trip?

In the public notices analyzed, 67% do not have a descriptive memorial sequentially presenting the stretches of road traveled per trip, including the start and end time of the journeys, the estimated time for the passage of the collection vehicle on each road. Table 10 summarizes the results of the research.

Table X: Descriptive Memorial

	Quant.	%
Yes	6	33%
No	12	67%
Total	18	100%

Source: Prepared by the authors (2020)

Indication of the productive (collecting) and unproductive (not collecting) mileage of each trip (km/trip), the productivity of the trip (weight/trip). This type of memorial allows you to establish the cost per trip traveled for the day's collection, which helps in the composition of the total cost of urban cleaning.

4.12. Are there criteria for assessing the quality of the services provided?

Of the public notices analyzed, 61% do not contain criteria to evaluate the quality of urban cleaning services or criteria to inspect whether the execution of these services was in accordance with the contract. Of the notices that addressed some topic of inspection of the service, none indicates the criteria, only informing that it would be the responsibility of the contractor, that is, of the Municipality. And of the public notices analyzed, there are no criteria for evaluating the quality of the services provided, and there is no definition of performance indicators for the evaluation of the services provided.

Table XI: Evaluation Criteria

	Quant.	%
Yes	7	39%
No	11	61%
Total	18	100%

Source: Prepared by the authors (2020)

The analysis of 18 tender notices from different municipalities for urban cleaning services revealed significant gaps in compliance with the guidelines of Law 8.666/93 and in the clarity of contract specifications. The majority of municipalities used the “Price Tender” modality (55%), with 72% requiring financial indicators and technical experience from the companies.

However, 78% of the invitations to tender did not include detailed cost spreadsheets or basic projects, hindering the assessment of the technical and economic viability of the services. Only 39% included terms of reference and 33% specified the necessary equipment, impacting on the definition of fair costs and contractual efficiency.

In addition, 78% of the calls for tender did not detail the technical and operational organization, and 67% did not include descriptive memoranda of the routes covered, making it difficult to calculate collection costs. The absence of criteria for assessing the quality of services was observed in 61% of the calls for tender, compromising supervision and control. The lack of clear standards, such as the execution methodology and performance indicators, suggests low transparency and the risk of inefficiency in contracting, highlighting the need for greater technical rigor and detail in bidding processes.

5. Conclusion

This article sought to study the importance of the existence of more detailed criteria in the bidding notices for contracting companies providing garbage collection services, since the cost of garbage has been the target of several investigations by the Public Prosecutor's Office, which has often considered the contracted services to be abusive, thus burdening a significant part of municipal budgets.

Based on the analysis of the work, it was found that the public notices for contracting urban cleaning services do not have sufficient criteria to establish the costs necessary for the provision of this service. The lack of elaboration of these criteria by municipal managers often leads to the hiring of companies with overvalued values and that do not provide the service correctly, because the notices do not detail the contracted services or there is a lack of inspection, which can lead to irregularities or fraud.

In view of the above it is concluded that: (i) the public notices for the contracting of urban cleaning services are poorly prepared, as they do not contain sufficient criteria for establishing the costs of the services and establishing the fair price for the service. To this end, municipal managers should seek to prepare the public notices for contracting urban cleaning services, establishing all the necessary criteria to understand the object of the bidding, as well as carry out a study on the existing costs for the provision of services, in order for the contracting and provision of the service to be carried out efficiently, effective and economical; (ii) the

insufficient drafting and lack of detailed criteria in calls for tenders for urban cleaning services jeopardizes the efficiency, cost-effectiveness and transparency of contracts. This deficiency not only facilitates the contracting of overpriced services, but also impairs supervision and the quality of execution, directly impacting municipal budgets. In order to overcome these challenges, it is essential that municipal managers improve calls for tenders, detailing costs, services and performance indicators, ensuring greater clarity in the bidding process and promoting fair and effective contracting. In addition, future research can make a significant contribution by comparing international practices, broadening the temporal scope of analyses and exploring shared management models, such as regional consortia, to optimize costs and results.

As a suggestion for future research, we suggest: (i) comparing the results with other Latin American countries; (ii) extending the period of analysis of the research; (iii) investigating the cost per ton of waste considering the consortium method with several local governments.

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