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INTEGRATED MANAGEMENT OF SOLID URBAN WASTE IN THE MUNICIPALITY OF BELÉM, PARÁ, BRAZIL: ADVANTAGES AND CHALLENGES OF ITS IMPLEMENTATION

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ABSTRACT

This work aims to describe the management of urban solid waste (USW) in the city of Belém, Pará, Brazil, explaining the advantages and challenges of implementing integrated management. For this purpose, a bibliographic survey has been made in recent journals that address the subject, in addition to a documental analysis of the State Plan for the Integrated Management of Solid Waste in the State of Pará. In addition, semi-structured interviews were carried out between August and November 2018 with representatives of waste management at the state and municipal levels, seeking information on the form of management adopted and the difficulties faced, thus collecting primary and secondary data. The information gathered shows that the management of USW in Belém has flaws, since the municipality does not have an integrated management plan capable of aggregating relevant information for the formulation of programs and actions necessary to minimize the problems provided by high waste generation and its final disposal. The results presented are of great importance as they provide a more detailed discussion focused on waste management in Belém, reinforcing the requirements of the National Policy for Solid Waste as to the financial and environmentally sustainable way of carrying out such management.

Descriptors: Environmental economy; Recycling; Urban Solid Waste; Budget management; Environment.

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1. INTRODUCTION

The technological revolution experienced since the advent of the Industrial Revolution in the 18th century has culminated in new man-man and man-nature relations, increased industrialization, production, consumption, economic development, and has caused various environmental impacts. The unbridled exploitation of natural resources, intensified consumption of products, population growth, urbanization, economic and industrial development aggravate the amount of urban solid waste (USW) improperly discharged into the environment (Costa *et al.*, 2018; Dias, 2012; Viveiros *et al.*, 2015).

The disposal, correct management and selective collection of USW are difficult issues for society to solve and, as far as Brazil is concerned, they have become a serious health, environmental, social and public health problem (Berticelli and Korf 2016; Jacobi and Besen, 2011; Santiago and Dias, 2012). In this sense, there are several problems arising from the increased generation of USW, such as the costs for collection and treatment, the difficulty of finding a suitable place for its final disposal, soil degradation, contamination of the groundwater table, and raw material waste (Conde, *et al.*, 2014).

Currently, this issue is a challenge for the management of cities towards sustainability. In order to solve problems related to the generation, management and eviction of USW, the management of these processes must be carried out in an integrated manner, covering the socio-environmental and behavioral aspects (Berticelli and Korf, 2016; Neves, 2013; Dias, 2012).

A regulatory framework for solid waste in Brazil was Law no. 12,305, of August 2, 2010, creating the National Policy for Solid Waste (PNRS - *Política Nacional de Resíduos Sólidos*) which, based on its guidelines, established the minimum content necessary for the creation of the State Plan for the Integrated Management of Solid Waste (PEGIRS - *Plano Estadual de Gestão Integrada de Resíduos Sólidos*) of each federative unit. With the creation of PEGIRS, also through its guidelines, each municipality becomes responsible for creating its own Municipal Plan for Integrated Management of Solid Waste (PMGIRS). From the creation of these plans, state and municipal, it is possible to collect financial resources from the Union, which are necessary for the execution of programs, urban cleaning actions, waste management and selective collection enterprises (Brazil, 2010; Machado, 2012; State of Pará, 2014).

The PNRS defines that the USW should follow the line of prevention, reduction, reuse, recycling, treatment, and environmentally appropriate disposal in landfills with proper planning and monitoring. In addition, it should address the concepts of shared responsibility, which encompass reverse logistics, advocating the training and valorization of recyclable material scavengers, as well as their insertion in the waste management process, establishing social integration and defining the importance of shared responsibility and natural resource management through social responsibility in waste management, composting, and energy generation. Moreover, it hierarchizes management and disposal, differentiating between waste and recovery of recyclable materials (Jacobi and Besen, 2011; Dias, 2012; Santiago and Dias, 2012; Machado, 2012; Neves, 2013; State of Pará, 2014; Berticelli and Korf, 2016).

According to Neves (2013) and Santiago and Dias (2012), the PNRS emerges as a tool to guide waste management planning and standardization. Such management must be carried out in an integrated manner among all federal, governmental, state and municipal entities, being able to adequately manage waste in a collaborative and participative manner, collecting from municipal estimates to state order information, comprising actions aimed at finding solutions related to the USW problems that will benefit everyone, and considering the PNRS forecast that these problems must be solved and/or minimized from an integrated management. This integrated management system is complex, as it needs to address issues related to the product life cycle, minimizing the use of natural resources, aiming at not generating waste and, thus, collaborating so that there is no overload of landfills, in order to make the most of them and reallocate the waste that can be reused to recycling centers (Neves, 2013; State of Pará, 2014).

In this context, this article aims to describe how the USW management in the city of Belém is done, explaining the advantages and challenges of implementing an integrated solid waste management. As a methodology, the mixed research technique was used, collecting and analyzing quantitative data regarding USW generation and disposal, as well as qualitative data, obtained through bibliographic review, documental analysis and case studies.

At first, the USW management model adopted by the State of Pará is presented, comparing the amount of USW generated in the State with the amount generated by the Northern region of Brazil and the variation in the generation of these residues at the national level, in the years 2014, 2017 and 2018. Next, the USW management model adopted by the state of Pará through PEGIRS is analyzed. Finally, the specific case study of Belém is discussed, pointing out the reasons why the USW management in the municipality is deficient and how an integrated waste management is important to minimize the problems alluding to the generation and disposal of these wastes.

2. METHOD

The research discussed here is of a mixed, qualitative and exploratory nature. It is based mainly on "human perception and understanding" (Stake, 2011, p. 21), and is carried out based on a bibliographic review on the subject addressed and documentary analysis of the information present in PEGIRS in the state of Pará, proposing to study the solid waste matter, its management and problems, then using primary and secondary data to conduct the research.

Field of study

Belém is the capital of the state of Pará, the city-polo of the Metropolitan Integration Regions (IR), with an estimated population of 1,492,745 in 2019 and per capita income of R$ 20,821.46 in 2017. The area of the municipality comprises 1,059.466 Km², covering 71 neighborhoods. In 2010, 67.9% of households had adequate sanitary sewage and 36.1% of public roads were urbanized, with appropriate sidewalks and paving (IBGE, 2020).

Generation of solid urban waste in Pará

The analysis of USW generation was made based on information from the IRs of the municipalities of Pará, which allowed the data collection to be more effective. This method was used to survey the daily amount of USW produced by each IR according to their population. Attention is paid to the metropolitan IR (currently Guajará IR), which includes Belém as a city-polo and to the other municipalities belonging to the Metropolitan Region of Belém (RMB): Ananindeua, Benevides, Marituba, Santa Bárbara do Pará and Santa Isabel do Pará (figure 1) (State of Pará, 2014).

Table 1 refers to data collected in the PEGIRS of the state of Pará regarding the daily amount in tons of USW generation, demonstrating the participation of the Metropolitan IR.

Table 1. Total USW (tons/day) 2014

Region	Total USW (tons/day)
Metropolitan IR	1,902
Pará	4,507

Source: Prepared from the State of Pará (2014)

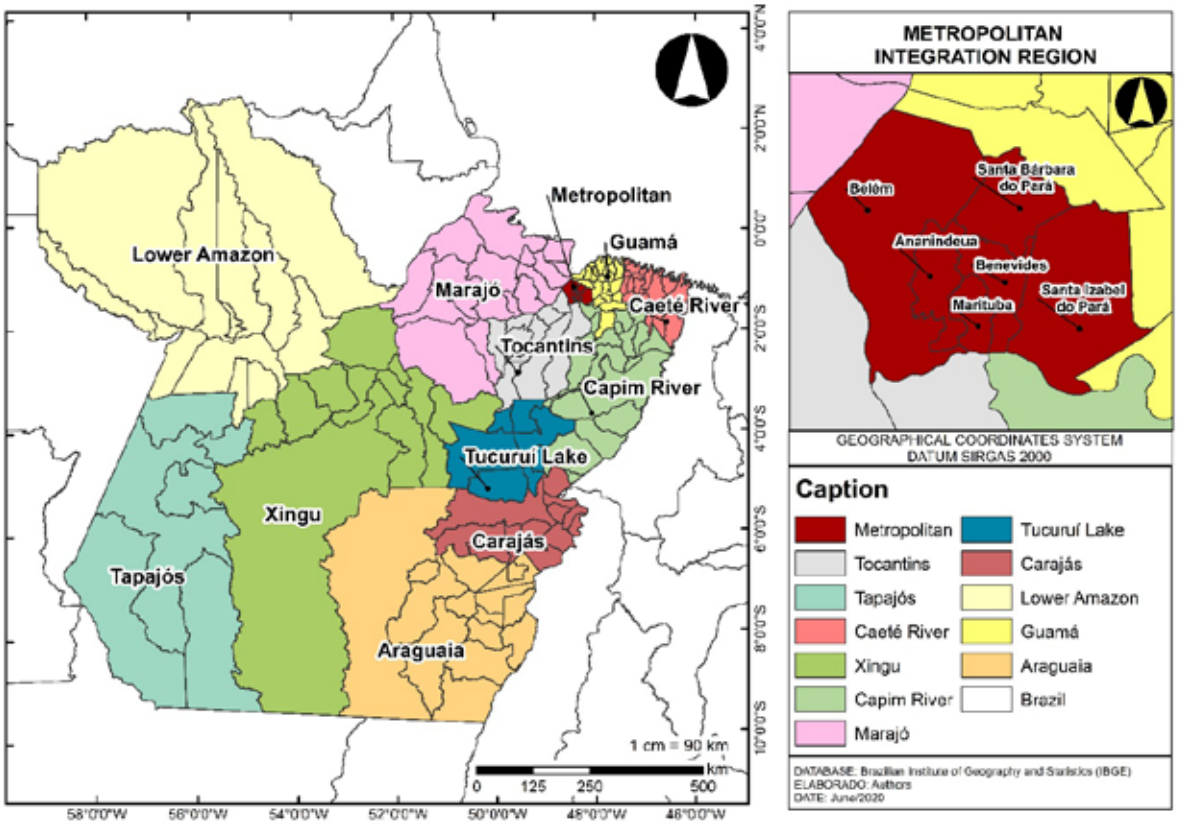

Figure 1. Integration Regions of the State of Pará

Source: The authors themselves.

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Expenditure on solid urban waste management in Belém

Table 2 shows the amounts spent by the Belém City Hall on USW management in the municipality from 2016 to 2018. These values collected are in the transparency portal of the referred city hall, detailing the amount spent with the collection, management and final disposal of USW in landfill, in addition to the amount spent with the structuring of a deactivated selective collection shed.

Table 2. Expenditure on USW management by the City Hall of Belém (2016-2018)

Type of expenditure	Value (R$)
Collection, handling and final disposal	370,623,752.02
Shed for the screening of selective collection deactivated	143,079.00

Source: Elaborated from the Transparency Portal of Belém City Hall (2020)

Table 3 has primary data collected in interviews with those responsible for USW management in the municipality, identifying Belém as the municipality that most forwards waste to landfill.

Table 3. Disposal of USW in landfill

Region	(t/month)
Belém	30,000
Ananindeua, Marituba	10,000
Total	40,000

Source: Authors.

In addition to the regional perspective on USW generation and management, data representing USW and its national distribution in terms of generation and destination are presented. It then mobilizes the data collected and analyzed at the same time to support the objective of the work of investigating the advantages and challenges of implementing integrated management, given the need for efficient management in view of the growing generation of these wastes and the way they are disposed of (Creswell, 2010; Freitas; Jabbour, 2011; Lima *et al.*, 2012).

According to data from 2020 made available by the Brazilian Association of Public Cleaning Companies and Special Waste (*Associação Brasileira de Empresas de Limpeza Pública e Resíduos Especiais* - ABRELPE), the amount of USW collected in Brazil in the year 2018 was 72.7 million tons of the 79 million tons generated in the year. The distribution according to the destination given to these residues is shown in Table 4.

Table 4. Quantity of USW according to its destination in the year 2018

Destination	USW million (t/year)
Controlled landfills and dumps	29.5
Landfill	43.3
Total collected	72.2

Source: Adapted by ABRELPE (2020)

Table 5 presents data regarding the USW coverage index (collection) in the year 2018 according to the regions of Brazil. It is verified that the Southeast region is the one that collects more USW, approximately 98.07% of its generated amount per day. This may be related to the fact that it is also the most populated region in Brazil, with approximately 88.37 million inhabitants (ABRELPE, 2020; IBGE, 2020).

Table 5. Amount of USW collected in the year 2018

Region	USW (tons/day)
North	13,069
Northeast	43,753
Midwest	14,941
Southeast	105,977
South	20,387
Brazil	198,127

Source: Adapted by ABRELPE (2020)

Table 6 addresses the destination of USWin the Northern region of Brazil in 2018, showing the amount in tons/day of waste sent to a controlled landfill, sanitary landfill and dump.

Table 6. USW destination - North region in the year 2018

Destination	USW (tons/day)
Controlled landfill and dump	8,456
Landfill	7,617

Source: Adapted by ABRELPE (2020)

The research strategy chosen to support the work was to conduct a case study which, according to Lima *et al*. (2012), is appropriate to investigate a particular event, process or set of people. The case study addressed the management of USW in Belém, with the objective of describing the operation and problems related to it, gathering information in visits to the Department of Solid Waste (Dres - *Departamento de Resíduos Sólidos*), member of the Municipal Sanitation Secretariat (Sesan - *Secretaria Municipal de Saneamento*), responsible for solid waste management and selective collection in the municipality (Yin, 2015).

In order to deepen the results, quantitative and qualitative data were collected concomitantly, allowing for a better interpretation of the question presented (Creswell, 2010).

The justification for the need to adopt integrated USW management is reinforced by the amount of waste generated at the national, state and metropolitan IR levels.

3. RESULTS AND DISCUSSION

Urban solid waste management in the state of Pará

In terms of area, Pará is the second largest federal state in Brazil, occupying approximately 15% of the national territory. Located in the North region, it has an area of nearly 1,247,690 km², with 145 municipalities separated by 12 IRs, according to State Decree No. 1,066, of June 19, 2008, in order to assist the execution and planning of public policies. In the state, an average of 1,646,055 tons of USW is generated annually, but this study is concerned with the provision of daily generation provided by the 2014 PEGIRS (State of Pará, 2014).

Belém and the other municipalities of the Metropolitan Region of Belém (RMB) are part of the Metropolitan IR (or IR Guajará), and are responsible for generating 1,902 tons/day of USW production, out of the total of 4,507 tons/day generated in Pará in 2014, corresponding to approximately 19.20% of the state's daily generation. Thus, Belém and RMB have a significant participation in the total waste generated by Pará, and it is pertinent to analyze how the management of these municipalities occurs.

Table 7 presents data of the total USW generation in tons/day. In 2014, the Northern region had 15,413 tons/day, while the total generation of Pará was 4,507 tons/day, corresponding to 29.24% of the quantity produced by the region, while the metropolitan IR generated 1,902 tons/day of waste, representing 26.5% of the state's total.

Table 7. Total USW (tons/day) 2014

Region	Total USW (tonnes/day)
North	15.413
Northeast	55.177
Midwest	16.948
Southeast	102.431
South	22.328
Brazil	212.297

Source: Adapted by ABRELPE (2015)

The same types of data are presented in Table 8, now from 2017. In the Northern region, USW generation was 15,634 tons/day. It can be seen that, comparing 2014 and 2017, there was an increase in the state and national levels, which may be related to cultural, economic and social factors. It is worth noting that the way in which these residues are managed and disposed of also suffers interference from this increase.

Table 8. Total USW (tons/day) 2017

Region	Total USW (tonnes/day)
North	15,634
Northeast	55,492
Midwest	15,519
Southeast	105,794
South	21,327
Brazil	213,766

Source: Adapted by ABRELPE (2018)

Comparing Table 6 with Table 7, which expresses the USW generation data for the year 2018, it was found that there was a negligible increase in the total waste generated; however, the USW collection increased by 1.66%, from 196,050 thousand tons collected per day to 199,311 thousand.

Table 9. USW (tonnes/day) 2018

Region	Total USW (tonnes/day)
North	16,073
Northeast	53,975
Midwest	15,932
Southeast	108,063
South	21,561
Brazil	216,629

Source: Adapted by ABRELPE (2020)

According to ABRELPE (2020), the Northern region has the highest rate of USW that is managed for landfills. In 2018, the amount of USW reached approximately 35% (table 4) of the amount generated, and was higher than the other regions of the country. According to Ribeiro and Mendes (2018), the amount generated by a certain population is inconstant, varying according to income, lifestyle, time of the year, and the conditioning of goods. Therefore, it is important to have an efficient management of these residues, which have been increasing over the years, causing problems.

According to the PNRS, the integrated USW management plans, whether state or municipal, should establish targets for non-generation, reduction, reuse and recycling, so that the amount of waste sent to landfills is reduced. This is because many of these materials that can be recycled require a period for their decomposition and when they are dumped in landfills they occupy a space that could shelter a greater amount of non-recyclable and organic waste, also contributing to the useful life of the landfill (Neves, 2013; State of Pará, 2014).

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The PNRS was created in accordance with the National Environmental Policy (Law No. 6,938 of August 31, 1981), National Environmental Education Policy (Law No. 9,795 of April 27, 1999) and Federal Basic Sanitation Policy (Law No. 11,445 of January 5, 2007). However, the plans do not define the forms of management or implementation of public policies, but only provide support for municipalities to obtain financial resources from the Union for waste management and for it to be done in an integrated manner between the state secretariats and the municipal agencies (Oliveira; Galvão Junior, 2016).

An important point addressed in the PNRS is shared responsibility: consumers, manufacturers, importers and distributors have an obligation to carry out proper disposal of products, while the responsible public sector must ensure public cleaning and waste management. According to article 6 of Law no. 12,305/2010, consumers must correctly and differently condition the solid waste generated, in addition to making the reusable and recyclable waste properly available for collection or return. Article 7 defines the responsibilities of the public authorities, including the effectiveness of actions aimed at ensuring compliance with the PNRS (Brazil, 2010; Machado, 2012; Neves, 2013; State of Pará, 2014).

The Pará State Government created PEGIRS in 2014 in partnership with Consultoria em Meio Ambiente Ltda. (Brencorp). It contains the consolidated diagnosis that portrays the situation of USW in the state and in the 12 IRs mentioned above. This diagnosis was important to portray the reality of the municipalities in Pará regarding the production, management and destination of USW, allowing the collection of primary and secondary data necessary for the development of the plan, with the participation of the secretariats of the municipalities that are part of the IR and state government agencies (State of Pará, 2014).

PEGIRS has the following responsibilities: collection of information on USW generation; selective collection and its implementation; final destination of waste; municipalities with landfills, dumps and controlled landfills; landfill projects in the municipality-polo of the IRs; system of recovery of recyclable materials and existence of selective collection, sorting sheds in the municipality-polo implanted or projected; estimate or census of collectors in street situation, associations, cooperatives or dumps; PMGIRS, its existence in the Municipality-Polo and state of its elaboration; financial sustainability; existence of a collection system in the Municipality-Polo regarding selective collection services and final destination of USW (State of Pará, 2014).

The body responsible for preparing public policies and solid waste management plans in Pará is the Secretary of State for Urban Development and Public Works (Sedop - *Secretaria de Estado de Desenvolvimento Urbano e Obras Públicas*), while the Secretary of Environment and Sustainability (Semas - *Secretaria de Meio Ambiente e Sustentabilidade*) is the body that oversees the execution of plans and public policies. According to information provided by Sedop, the state of Pará is lagging behind in the implementation of USW and sanitation public policies.

As mentioned above, the state plan exists and completed four years in 2018. The PNRS decrees that all state and municipal plans must undergo analysis and re-evaluation of their operation every four years, until they reach the horizon of 20 years, when they are forwarded for review (Brazil, 2010; State of Pará, 2014).

A PEGIRS is not a law, but a guideline document. It is a planning tool from which the state establishes a guide for investment in public policies and actions related to waste management – there is not yet a specific law in Pará to deal with the issue. The law is important in the management of USW, but its non-existence does not prevent the plan from being prepared or executed.

The PNRS provides the necessary guidelines for the elaboration of the state plan, which in turn determines the macro guidelines that the municipalities must adopt for the creation of their integrated management plans. In Belém, the agency responsible for the plan is Sesan. The issue of USW management and handling in Belém will be addressed in the next section, which deals with the aforementioned case study.

The plan is structured based on the diagnosis previously made, which has all the demographic, geographic, socioeconomic and physical information of the region for which it is intended, providing relevant instructions for the USW issue, such as the form of collection and storage, the types of waste, and the amount of waste collected. After the diagnosis, the prognosis is made, from which the possible solutions to the problems found in the diagnosis and the elaboration of future scenarios are pointed out, defining objectives and goals to be achieved. The last stage of the plan concerns its essence and what it is used for. It is here that we find the proposals, the specific guidelines, the guidelines achieved, the strategies, programs, objectives, projects and actions (Berticelli; Korf, 2016; State of Pará, 2014).

PEGIRS of Pará has a consortium to meet the investment demand of the municipalities, in which the management of the resource is under the responsibility of the mayor of the city to which it refers, organizing the logistics of the waste destined to the municipality-polo of IR from other municipalities of the IR and encouraging the expansion of collection services, implementation of a delivery service and transfer of solid waste. It also encourages the strengthening of public solid waste management, helping municipalities to develop their own interregional plans for disposing of these resources.

The PNRS was an important milestone for the management and suitability of the management of all types of waste, especially USW. It is a necessary tool for the state to create its regionalized waste management plan and thus obtain resources from the Union that will help in actions and projects related to management. Based on the plan structured by the state, each municipality, also relying on its economic and social characteristics, elaborates a regionalized waste management plan capable of providing valuable information so that the management is done in an effective and integrated manner among all the federative entities.

Urban solid waste management in Belém

Among the PNRS requirements are the elaboration of PEGIRS and the implementation of landfills as an environmentally correct solution for the final disposal of waste generated in cities. Currently, Belém has the Guamá Waste Treatment Landfill (GTR - *Guamá Tratamento de Resíduos*), managed by the company Solutions for Life (Solvi - *Soluções para a Vida*), which has 28 landfills spread throughout Brazil, in addition to three landfills abroad, located in Argentina, Bolivia and Peru.

The company works with the treatment of solid, liquid and gas waste, and began operations on June 25, 2015, having its operations delayed due to social and political issues. The collections received are made daily, separated into even collections (Monday, Wednesday, and Friday) and odd collections (Tuesday, Thursday, and Saturday). The landfill receives approximately 40 thousand tons of USW per month and Belém is responsible for 75% of the total received.

The ton of solid waste costs R$ 110 for the private sector and R$ 90 for the municipalities of Belém and Ananindeua. Marituba does not pay to deposit its waste, due to an agreement established with the company because the landfill is located in the municipality. The rate of 5% of the amount collected monthly is paid in Service Tax (ISS - *Imposto Sobre Serviço*), a Brazilian municipal tax levied on the municipality's competence for services rendered to the company. In the case at hand, this amount is paid to the municipality of Belém, as it is responsible for the inspection and regulation of the landfill, and 5% of the environmental compensation rate is paid for possible damage to the environment in an ecologically balanced manner.

In 2017, more than R$ 7 million were assigned to the Belém City Hall for payment of these taxes and fines imposed by Semas for irregular operation of the landfill in 2015. The invoice for the landfill is R$ 2,500,000.00 per month.

GTR has faced social, political and economic problems. The company operated for a year without treatment for the slurry produced on the site, which generated environmental problems and revolt in the population of the municipality of Marituba, located in RMB, where the landfill is situated. The discussion that began in the year of implementation continues to this day.

The fact that the landfill is located at the RMB is a problem that Dias (2012) discusses. According to the author, no one wants to live near a landfill because of the unpleasant odors exhaled, the contamination of water bodies and soil and the slurry produced. This landfill, in Belém and the entire RMB, is an aggravating factor due to the high rainfall in the region, the local climatic characteristics and the non-treatment of slurry, which generates significant damage to the water bodies near the landfill, and discomfort for the population.

On average, 1,200 tons of residues are received daily at the landfill, except on Mondays and Tuesdays, when this average can reach 1,700 tons, as a result of the total accumulated on weekends. During festive periods, this volume reaches 2,000 tons daily, between 180 and 200 trucks circulating in the landfill 24 hours a day.

GTR has continuous waterproofing of the waste to avoid soil contamination, covering of slurry pre-treatment ponds, where the slurry to be translated is temporarily stored, installation of new osmosis machines in which the slurry is treated, installation of burners for the transformation of methane into less polluting gas, and a system of sprayers capable of encapsulating the smell in the air, minimizing odor dispersion.

Slurry is an extremely toxic and harmful liquid, formed by the infiltration of rainwater into the landfill. If left untreated, it can contaminate soil, air and water resources (Conde *et al*., 2014). After the treatment process, the slurry is available for use on the landfill premises, and is used to wash equipment, wet the asphalt and even be dumped in the vicinity of the landfill.

According to those responsible, this water is not as harmful as the slurry itself, so it can be poured into the rivers, into the forest, but under no circumstances can it be consumed. It is precisely the dumping or leaking of slurry in the municipality region that causes the most socio-environmental and economic problems for the landfill.

The body responsible for the management of USW in Belém is Sesan. According to information collected in interviews with its representatives, the municipality's waste management plan is under development, and it will contain the guidelines for selective collection and basic sanitation required by the PNRS. However, despite the non-existence of the plan, the Belém City Hall does not fail to act when trying to make selective collection feasible and this is done through the Solid

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Waste Department (Dres - *Departamento de Resíduos Sólidos*), which provides support to the Águas Lindas Recyclers Association (Aral - *Associação dos Recicladores das* Águas *Lindas*) and the Belém Selective Collection Association (ACCSB - *Associação de Coleta Seletiva de Belém*), which are located inside the only screening shed in Belém, located on the São Joaquim Channel, acting according to PNRS guidelines.

For unregistered scavengers, the city provides help by providing sporadic transportation for the collection of recyclable materials. It also works with another association through a contract, so that it is responsible for the selective collection of the Nazareth neighborhood. This association was the only one to win a bid published by the city, as it was regularized according to what was required. Because it received a fee for the performance of the service, it did not receive any other support, such as providing transportation, drivers, fuel, etc.

Based on the information collected, in order for Belém to formulate an integrated waste management plan, it is necessary to conduct a survey on their generation, management and disposal in the municipality, so that the prognosis regarding goals and actions to be taken can be prepared, minimizing the problems related to USW. The fact that the city government assists some associations and collectors of recyclable materials is still not enough to ensure that selective collection is in fact being implemented, because the number of associations for which it provides support is lower than the total number of associations and/or cooperatives of collectors of recyclable materials, which reaches nearly 24 enterprises.

Without a municipal plan, integrated USW management will not occur. Socio-environmental and economic problems related to this waste will not be minimized, and the municipality will not raise the necessary resources for this management.

Thus, in the period from 2016 to 2018, the data shows that R$ 370,623,752.02 was spent on collection, transportation and disposal of waste, in addition to street cleaning. In the same period, R$ 143,079.00 was spent to make viable and structure the screening shed located at the Aurá dump, which received the waste produced in Belém and RMB until mid-2015; currently, the Aurá dump receives only civil construction waste. However, this shed, which has been receiving investments since 2016, is deactivated and there is no forecast for its activation (Belém City Hall, 2019). There is a discrepancy in values between waste management and the amount spent on infrastructure for recyclable material collectors, a structure that is unused.

If there were efficient integrated management, these values would possibly be minimized, since all planning would precede decision making, prioritizing cost reduction and the inclusion of waste pickers in the decision making process, as well as better accomplishment of the work done by these workers, maximizing the utility of resources. Thus, one of the alternatives for the solution and/or improvement of the USW issue in Belém is the elaboration, planning and execution of the PMGIRS.

According to Juliatto *et al*. (2011), an integrated management plan is part of the improvement of environmental performance in public administration, involving several public sectors that, in their activities, are important economic agents, because they are consumers of goods and services in their several activities, generating environmental impacts. The authors explain that integrated waste management involves different public bodies and civil society, taking into account geographical, demographic, climatic, cultural, economic and social characteristics of generation and type of waste, which are the main sources of generation and destination given to this waste. The plan aims at raising the population's quality of life and comprises normative, operational, financial and planning actions that are widely interlinked, in addition to being engaged in (Martins *et al.*, 2017).

It is at this point that the waste management in Belém presents flaws, since, in spite of the actions directed to the selective collection, to the support of the collectors of recyclable materials, to the urban cleaning, and to the collection of the waste, there is still no management plan that integrates all the environmental, social and economic problems related to the generation of waste. An important point addressed in integrated management, defined by PNRS, article 19 (Brazil, 2010), and PEGIRS of Pará, is the investment in training, inclusion and social insertion of recyclable material collectors, as well as the practice of selective collection.

Informal waste pickers must be included in the process and, to this end, the focus must be on separating the source of waste to make selective collection feasible, which is part of the shared responsibility guideline and environmental education programs that can be implemented (Machado, 2012; Martins *et al*., 2017; Neves, 2013). Thus, these properly segregated materials would be sent to the sorting/support centers.

According to the Ministry of the Environment (Brazil, [*S.d.*]), selective collection is the differentiated collection of materials that were previously separated according to their constitution or composition. In other words, waste with similar characteristics is selected by the generator (which can be the citizen, a company or another institution) and made available for collection separately.

The selective collection allows for greater preservation of natural resources, already exhausted, in addition to reducing the growing costs of obtaining raw materials, and may even save on energy production, since materials such as paper would be reused. In addition, it can reduce the increasing costs of maintaining the landfill, because with the increasing amount of waste it will reach its operating capacity. In addition, as many recyclable materials require a period of time to decompose,

this space occupied by them could be filled by other organic waste or any other non-recyclable materials, increasing the life of the landfill.

It also contributes to reducing pollution and improving public health: as more material is recycled, less is dumped into the environment. Furthermore, it can generate income for those who need it, as is the case of the solid waste collectors established in Belém and RMB (Brazil, [*S.d.*]; Neves, 2013).

4. CONCLUSION

When dealing with USW in Brazil, it is possible to verify that the creation of the NSWP and the implementation of solid waste management plans at state and municipal levels are extremely important for effective and collaborative management, which is conditioned by the distribution of financial resources of the Union. The focus of the research discussed here was to address local USW management in the municipality of Belém (PA), regarding the absence of a PMGIRS, considering how the implementation of the plan would be advantageous for the management of the municipality's waste and how its absence harms this management, in which it represents a concern with the environment, public health, and the social and economic environment.

Therefore, the management of USW in Belém is still deficient due to the lack of a plan that covers all the municipalities of RMB, thus not allowing the management to be done correctly between the state and municipal entities, and is consequently in disagreement with the NSWP. It is worth saying that one of the problems for the creation of this plan in the RMB is the lack of a diagnosis by the Belém City Hall capable of gathering all the data related to selective collection and waste generation, among other items that are part of the NSWP.

On the one hand, there are many challenges to be overcome, ranging from the right investment in materials, space, support for cooperatives and associations of recyclable materials to increasing the amount of recyclables, in addition to reducing the volume of waste generated through environmental education actions. On the other hand, the benefits of an integrated solid waste management are many, including the economic benefits, because through selective collection, less recyclable waste is sent to landfills, optimizing their useful life and reducing the high costs to dispose of the waste. It is also necessary to consider social benefits, by generating income for those in need, as well as environmental and public health benefits, by making an adequate treatment of waste, decreasing its irregular disposal on the streets.

From NSWP and its article 19 (Brazil, 2010), it is explicit that municipalities should implement municipal waste management plans as a management improvement tactic. Its elaboration promotes enhancements in selective collection and in the quality of life of collectors, with PMGIRS being an environmental management tool.

Finally, it is proposed for future studies an analysis of the current changes in the NSWP, the current state of planning of the PMGIRS in the municipality of Belém, as well as whether there is a deadline for it to be implemented and in which state it is formulated. As limitations of the work, difficulties were encountered in obtaining information during the interviews, in addition to the few data available at the Belém City Hall portal that would exemplify the expenses incurred with waste.

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