



## MUNICIPAL SOLID WASTE MANAGEMENT IN THE LIGHT OF THE BRAZILIAN NATIONAL WASTE POLICY: A CASE STUDY IN THE MUNICIPALITY OF JAPERI, RJ, BRAZIL

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### ABSTRACT

This article aims at analyzing urban waste management (MSW) in the municipality of Japeri, Metropolitan Region of the State of Rio de Janeiro, Brazil, in the light of the National Policy on Solid Waste, created in 2010, identifying obstacles to its implementation. It is a qualitative research conducted between 2015 and 2016. The data collection procedures were: literature review; documentary analysis; interviews with managers; direct observation and use of the focus group technique with community representatives. The study analyzed Japeri MSW management with an innovative and collaborative perspective, using the focus group technique, which emphasized the importance of involving the community in understanding their problems and proved adequate to foster this debate. Among the challenges to be faced by Japeri is: to implement the Municipal Integrated Solid Waste Management Plan (PMGIRS); reduce the dependence of state and federal agencies on management; universal collection of waste; expand the coverage of selective collection; involve society in management, among others. One of the limitations of the study was the poor quality and availability of current data on municipal waste management. The complexity of the topic also did not allow all issues to be addressed in the study. The major contribution of the research was its approach, giving voice to the demands and suggestions of community representatives. For the success of PMGIRS, social participation is essential, in order to prevent its discontinuity or to become a mere political instrument. It is hoped that the focal group technique employed may be adapted to other contexts. Due to the lack of more in-depth studies on the subject, this article may contribute to filling this gap.

**Keywords:** National Policy on Solid Waste; Urban solid waste; Waste management; Municipality of Japeri.



## 1. INTRODUCTION

The municipal management of Urban Solid Waste (MSW) is one of the main current challenges. When it is performed inappropriately it causes risks to the population, causing economic, environmental, and public health impacts (Sharholly *et al.*, 2008; Hoornweg *et al.*, 2012).

The Brazilian National Solid Waste Policy (*Política Nacional de Resíduos Sólidos – PNRS*), established by Law No. 12,305 (Brasil, 2010b), represents a milestone in terms of environmental policy. It brings together various management tools, including the Municipal Plans for the Integrated Management of Urban Solid Waste (*Planos Municipais de Gestão Integrada de Resíduos Sólidos Urbanos – PMGIRS*).

The Law established a deadline for the final disposal of the tailings within four years after its publication, with the closure of the dumps until August 2014, which in fact has not happened until now in much of the country. The PNRS has also established the obligation to prepare the PMGIRS as a prerequisite for the municipalities to obtain access to the resources of the Union by means of incentives (Brasil, 2010b).

In 2013, only 1/3 of the Brazilian municipalities had such plans and 41.7% of MSW were sent to landfills and dumps, showing little change, since in 2009 this percentage was 43.2% (IBGE, 2013; Abrelpe, 2014).

Due to the difficulties of the municipalities to close and repair their dumps, Bill No. 2289 (Brasil, 2015) was proposed, making it possible to extend the deadline for the adequate disposal of the wastes. It was approved in the Senate and is in processed in the Chamber of Deputies until the present time.

The municipalities are responsible for the cleaning, handling and management of MSW, from the collection until its final destination (MMA, 2015). Among its attributions are: elaborating the PMGIRS; closing and repairing the garbage dumpsters and controlled landfills; disposing of only waste in landfills; implementing selective collection with social inclusion; composting; and articulating reverse logistics (Brasil, 2010b; CNM, 2015). However, the responsibility of municipalities is faced with weaknesses such as lack of resources and low technical qualification (Lopes, 2007).

Studies on the implementation of PNRS in different municipal contexts are necessary, making it possible to identify deficiencies and contribute to the democratization of public management, through the formulation and improvement of specific policies for each reality.

Freire (2010) studied MSW management in Belém, Pará, Brazil, noting that it was deficient, that selective collection was not universalized and that the city was far from PNRS standards. Pinho (2011) analyzed the RSU management plans in 18 Amazonian municipalities and verified that the concepts and strategies that supported them were not adequate to the local reality. When evaluating the management of RSU in Natal, Rio Grande do Norte, Brazil, Figueiredo (2013) observed that the municipality has failed in its selective collection program. In the municipality, there was no greater relevance to the socioeconomic inclusion of the collectors, and they were attended in a welfarist manner. Souza (2015), in turn, reported that materials recycling rates were low in the municipality of Rio de Janeiro and that there were delays in the completion of recycling plants.

In the state of Rio de Janeiro, the Solidary Selective Collection Program (*Programa Coleta Seletiva Solidária – PCSS*), which is environmental education focused on solid waste, was carried out until 2015 through a partnership between the State Secretariat for the Environment (*Secretaria do Estado do Ambiente – SEA*), the State Environmental Institute (*Instituto Estadual do Ambiente – INEA*) and the State University of Rio de Janeiro (*Universidade do Estado do Rio de Janeiro – UERJ*); this program included the municipality of Japeri as one of its participants.

The PCSS considered that there is a need for the government to continue with the State Solid Waste Plan (PERS) and to support municipalities in the implementation of their PMGIRS. Social participation based on environmental education was seen by the program as the most appropriate way to promote the transformation of socio-environmental reality in favor of the sustainability of municipalities (Mattos *et al.*, 2012; Magalhães, 2017).

Similar studies are scarce, even in municipalities in the state of Rio de Janeiro, according to research by Reis *et al.* (2016). This fact has motivated this research.

## 2. THEORETICAL FOUNDATION

### The National Solid Waste Policy

Among the environmental protection frameworks in Brazil, Law No. 12,305/2010, which establishes the National Solid Waste Policy, was the first exclusively dedicated to the theme and stands out as one of the most important for solid waste management (Maia *et al.* 2014).

The PNRS incorporates new concepts and proposes management tools, such as: Integrated Management of Solid Waste; shared responsibility; Integrated Solid Waste Plans;



selective collect; Reverse Logistics Systems; encouraging the creation and development of cooperatives of reusable and recyclable materials; and environmental education (Brasil, 2010b; MMA, 2015).

It advocates prevention and reduction in the generation of waste, setting priorities in its management, namely: non-generation, reduction, reuse, recycling, treatment and disposal in landfills, which is the last option in the management (ISWA and Abrelpe, 2013; MMA, 2015).

The Integrated Management of Solid Waste consists of the design, implementation and administration of management systems, considering the broad participation of the sectors of society, with a view to sustainable development (World Commission on Environment and Development, 1988).

### Shared responsibility

The shared responsibility, according to item XVII of article 3 of the PNRS, is defined as:

“the set of individualized and chained allocations of manufacturers, importers, distributors and traders, consumers and holders of public urban sanitation, and solid waste management services, to minimize the volume of solid wastes generated, as well as to reduce impacts on human health and environmental quality arising from the product life cycle” (Brasil, 2010b).

Society must contribute to the non-generation, reduction, reuse and recycling of waste and to the local business sector it is appropriate to adapt the projects according to the municipal selective collection system and carry out the reverse logistics of the waste under its responsibility.

### Solid waste management plans

Integrated waste management plans should be implemented at all levels of government and addressed to the following situations: micro-regions; metropolitan regions or urban agglomerations; inter-municipal; municipalities; and private sector (large generators) (Brasil, 2010b).

Chapter II of the PNRS defines the minimum content for each plan, the time horizon and the moments to be updated or revised. It is necessary to publicize its content and define how the social control will be carried out in its formulation, implementation and operationalization.

The inter-municipal integrated waste management consortium is recognized as an important management tool that

allows the scaling up of the facilities and equipment as well as the reduction of costs with the treatment or final disposal of MSW in landfills (Madeira *et al.*, 2013).

For municipalities that are members of public consortia, the Law allows the elaboration of a single Inter-municipal MSW Management Plan, dispensing with individual plans for each municipality (MMA, 2016).

Silva (2015) verified the existence of 79 public consortia for waste management in the Brazilian regions: 40 installed in the Northeast, 11 in the South, 25 in the Southeast, one in the North, and two in the Midwest.

The Protocol of Intent for the creation of the Centro Sul Fluminense I Consortium was established in 2011. As of Law No. 6,362 (Rio de Janeiro, 2012), the State Government and its Regulatory Agency for Energy and Basic Sanitation were included as members of the consortium (Santos *et al.*, 2013).

Costa (2016) has studied the public consortia for MSW management in Rio de Janeiro and identified the following limitations to their formation: political-partisan divergences; lack of training of public managers and responsible technicians; low prioritization of the environmental issue and adequate disposal of solid waste by the government; and lack of awareness and public interest.

### Selective collect

The selective collection consists in the separation of the residues in the generating source, according to its constitution or composition, and it is incumbent on the holder of the urban cleaning services to implant it in the municipalities (Brasil, 2010b).

Selective collection should be considered in the preparation of the PMGIRS, creating economic and technical instruments for its viability through shared responsibility, reverse logistics and the socioeconomic inclusion of the collectors (Deus *et al.*, 2015).

According to a survey of the Business Commitment for Recycling (Cempre, 2016), the selective collection was carried out in 1,055 Brazilian municipalities. There was a 138% increase in the selective collection, from 2010 to 2016, but only 18% of the Brazilian cities had it. The selective collection was concentrated in the Southeast and South regions and was carried out by 81% of its municipalities.

The small scale of the municipal selective collection is explained, in part, by having higher costs than conventional collection and by the low participation of the population. In addition, the informal work of waste pickers, whether in the



dumps or on the streets, is a social problem to be solved in the MSW management as observed by Silva *et al.* (2018).

### Recyclable Waste Pickers

The PNRS prioritizes the access to resources of the Union to the municipalities that implement the selective collection with the participation of cooperatives of collectors (Brasil, 2010b). Law 8666/1993, article 24, item XXVII, allows the waiver of bidding in specific cases of contracting services such as, for example:

“in the collection, processing, and commercialization of recyclable or reusable municipal solid waste in areas with a selective waste collection system, carried out by associations or cooperatives formed exclusively by low-income individuals recognized by the government as collectors of recyclable materials, by means of the use of equipment compatible with technical, environmental, and public health standards” (Brasil, 1993).

This possibility was reinforced in the PNRS; however, it is necessary for the cooperative to have legal and technical competence to provide such services. In fact, many popular cooperatives are unable to be hired due to the inadequate conditions and weaknesses in which they operate, as observed in several studies (Codeço, 2014; Silva, 2014; Besen, 2016).

To improve this context, Sant’Ana et Metello (2016) propose a new cycle of changes in four directions: i) ensuring that cooperatives are hired by the municipalities in the formal selective collection system; ii) signing the Reverse Logistics Sector Agreement, particularly in the packaging and electronics sector; iii) stimulating the increase of the recycling industrial park in Brazil, opening opportunities for cooperatives that could participate in the market as recyclers, and not only as sellers of raw materials; and iv) the strategic direction of public policies to encourage the collection and recycling of the so-called e-waste.

### Reverse logistic

Reverse logistics is an instrument used to enable the collection and restitution of solid waste to the business sector for reuse in its production cycle or others, or for its final disposal to be carried out in an environmentally appropriate manner (Brasil, 2010b).

Manufacturers, importers, distributors and traders of agrochemicals are obliged to structure and implement re-

verse logistics systems for their waste and packaging, as well as for other products whose packaging, after use, constitutes hazardous waste, such as: batteries; tires; lubricating oils, their residues and packaging; fluorescent lamps, sodium and mercury vapor and mixed light; and electronic products and their components (Brasil, 2010b).

A Sector Agreement for the Implementation of the Reverse Packaging Logistics System was formalized in 2015 by the Packaging Coalition. This system registered actions in 422 municipalities in 25 states, reaching 51.2% of the population. Between 2012 and 2016, more than 700 cooperatives had support and 3,151 actions to increase their productive capacity. 2,103 Voluntary Delivery Points were also installed (Lenum Ambiental et Cempre, 2017).

At the time of this agreement, the Packaging Coalition had 20 associations with more than 3,700 companies among producers, users, importers, and merchants of packaging, in general (Lenum Ambiental et Cempre, 2017). Despite the number of participating companies, it would still be reduced considering the Brazilian universe.

Industries are obliged to participate in this process, since they market their products through packaging and, therefore, have the responsibility for the shared management of post-consumer waste and the consolidation of reverse logistics. Failure to comply with PNRS by many companies increases the cost of services for the collection and disposal of waste by municipalities.

In addition to the high operating costs, the lack of environmental education and the scarcity of qualified human resources also make it difficult for the functioning of reverse logistics in Brazil (Ethos, 2012; IPEA, 2012; Thode Filho *et al.*, 2015, Silva *et al.*, 2018).

### Environmental education

Environmental education is an instrument of the PNRS to improve the knowledge of values, behaviors and lifestyles related to waste management (Brasil, 2010b), and should be in line with the provisions of the National Environmental Education Policy (Brasil, 1999).

Authors such as Layrargues (2012), Loureiro (2012), and Leff (2008) seek to reflect on environmental education from a critical political-pedagogical perspective. This current is seen as an alternative to traditional environmental education, which would not add significant changes to the transformations necessary for the 21<sup>st</sup> century society.

Layrargues (2012, p 399) argues that traditional education would be “simplistic and naive in the critical



analysis of the system," without reflecting or intervening on the true causes of the environmental crisis. Loureiro (2004) considers that critical environmental education questions the behaviorist, reductionist and dualistic approaches in understanding the relation between culture and nature.

In school contexts, in general, environmental education programs present a reductionist view of problems, particularly in terms of the waste issue. A part of these programs places selective collection as one of the main solutions to environmental problems, without proposing further reflection on their real causes. In a way, this makes environmental education more informative than a substantial agent of changes in terms of habits and values needed to mobilize societal transformations for sustainability, as might be expected.

### 3. OBJECTIVE

This article aims to analyze waste management in the municipality of Japeri, located in the Metropolitan Region of Rio de Janeiro/RJ, in the light of the PNRS, seeking to identify the main obstacles to its implementation.

### 4. MATERIALS AND METHODS

The research is characterized as exploratory, with a qualitative approach. Initially, the review of the literature was done through the consultation of scientific articles, dissertations and theses available electronically in the Portal of Periodicals and Bank of Thesis and Dissertations of the Coordination of Improvement of Higher Education Personnel (Capes) and in the Science Direct database. The keywords used were: Municipal solid waste management, Waste management, Waste management evaluation; and National Solid Waste Policy.

#### Case study planning

The case study consists of an in-depth research of one or a few objects, in order to allow their comprehensive and detailed knowledge (Tognetti, 2006). The choice for the case study arises from the desire to understand contemporary phenomena in some real-life context (Yin, 2001). In studies with these characteristics, we search for both what is common and what is particular, and the final result may be original because of one or more aspects such as: nature and history of the case, the context in which it is inserted, other cases by which it is recognized, and the informants by which it may be known (Ventura, 2007).

This research was based on the case study, in order to better understand how MSW management occurs in the municipality of Japeri, state of Rio de Janeiro, Brazil, investigating legal, operational, social, environmental and financial aspects, according to their adequacy to PNRS.

The study comprised the diagnosis of the municipality and the description of the programs and actions developed in the management of MSW, according to the guidelines of the Ministry of the Environment and attributions that the municipality of Japeri should assume in waste management, according to the PNRS and also listed by the CNM (2015). These attributions were systematized in Table 1.

In order to obtain information on the perceptions of the problems in the municipality by the residents, the focal group technique was used. Conceptually, this technique holds collective interviews through interactions, in order to gather information on a specific topic, from a group of participants, enabling the understanding of perceptions, beliefs, opinions, feelings and attitudes about a theme, product or services (Morgan, 1997; Kitzinger, 2000; Trad, 2009).

One of the important steps in the planning of the focus group is to establish the session purpose (Barbour et Kitzinger, 1999). According to Trad (2009), the planning should consider the needed resources, the definition of the number of participants, the profile of the participants, the selection process, the duration, the rules, and the script. The number of participants should range from six to fifteen. Regarding the duration of the activity, the variation between 90 (minimum time) and 110 minutes (maximum time) should be considered.

The dynamics used in this study was based on the following rules proposed by Gondim (2002): one person speaks at a time; avoid parallel discussions so that everyone can participate and freely say what they think; avoid dominance of the discussion by one of the members; maintain the attention and the discourse in the subject in question.

According to Gaskell (2002), there are advantages associated with the use of this technique: to provide criteria about the emerging consensus and the way people deal with the divergences; to enable the exploration of metaphors and images; to build a framework of common interests and concerns based on sharing and contrasting experiences in certain cases experienced by all, which are rarely articulated by a single individual. Among its limitations are: not to identify more precise causal and correlational links between variables, since it is a transversal cut technique with low variable control (Trad, 2009); have an intentional and convenient composition of the sample, which limits the possibilities of generalization to the population under investigation (Gondim, 2002).



The script of the questions is the guiding instrument of the discussion. It should contain few items and be flexible, enabling the registration of unanticipated but relevant topics.

The initial guiding question of the discussion was: what are the main problems related to garbage in the municipality of Japeri, their causes and how could they be solved?

In this research, the focus group was composed of nine participants, mostly belonging to the Residents Associations and the Municipal Council of the Environment. They were residents of the following locations: Centro, Chacrinha, Jardim Marajoara, Jardim Primavera, Nova Belém, Santa Amélia and São Jorge. The activity lasted 110 minutes.

In addition to the use of the focal group used in the search for information and perceptions of the community, the data collection also occurred as follows: consultation of documents and records in archives of the Municipal Secretariat of Environment and Sustainable Development (*Secretaria Municipal de Ambiente e Desenvolvimento Sustentável* – SEMADES); direct observations on visits to SEMADES, on the streets of the city, in the area of the old dump, in the current area of final disposition of the waste and in the shed of the recycling cooperative; structured interviews, according to the model proposed by D'Almeida et Vilhena (1995), and semi-structured, applied to the municipal secretaries of environment and works, SEMADES employees and collectors of recyclable materials.

### Study area

The municipality of Japeri is located in the Metropolitan Meso-region of the state of Rio de Janeiro (IBGE, 1995). It has an area of 81.9 km<sup>2</sup>, and is limited by the municipalities of Paracambi, Seropédica, Queimados, Miguel Pereira and Nova Iguaçu. Its population is 99,144 inhabitants (IBGE, 2015).

The Human Development Index (HDI) is 0.7, considered average and is among the ten lowest in the state (PNUD *et al.*, 2013). The gross domestic product (GDP) per capita in 2012 was R\$ 10,542.88, the third lowest in the state of Rio de Janeiro (IBGE, 2015).

Japeri is important in ecological terms, with 53% of its territory located in the buffer zone of the Tinguá Biological Reserve. The city faces the same problems as other municipalities in the Fluminense Metropolitan Region, such as: deforestation, disorderly occupation of slopes, accumulation of garbage in water courses, floods, etc. (Costa, 2001).

## 5. RESULTS AND DISCUSSION

### Organizational aspects

The Japeri waste management and cleaning system is managed by direct management under the coordination of SEMADES and the Municipal Secretariat of Public Works and Services (*Secretaria Municipal de Obras e Serviços Públicos* – SEMOSP), which is responsible for the cleaning of public places and public roads and sweeping, among others, and they are provided by an outsourced company. SEMADES, in turn, carries out the inspection of the collection and final disposal of MSW, environmental education activities and selective collection.

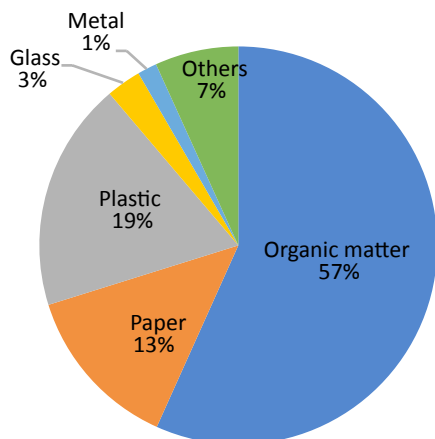
Japeri is part of the Intermunicipal Consortium for Waste Management Centro Sul Fluminense I. The Solid Waste Treatment and Disposal Complex of Paracambi was designed to serve the municipalities of the consortium; however, until August 2017 it had not been completed and did not have the operating license (Rio de Janeiro, 2016).

Concerning the viability of the Consortium, the main difficulty was identified as the meeting of the representatives of municipalities and there was insecurity on the part of the municipalities with regard to the consortium solution for the final disposition of the residues.

According to Japeri's environment secretary, the disposal of the waste was done at the Waste Treatment Plant (*Central de Tratamento de Resíduos* – CTR) in Nova Iguaçu. From the operational point of view, it would be satisfactory and safe. On the other hand, the disposition in the landfill consortium caused insecurity due to the risk of paralyzation by eventual default of some municipality of the consortium.

### Waste characterization

Each inhabitant of Japeri produces 0.8 kg/day of MSW, which corresponds to the generation of 79.3 tons/day, in 2015 (Ecologus et SEA, 2013; IBGE, 2015). Data on the generation of MSW in Japeri are presented in Figure 1. It is observed that more than half of MSW is composed of organic matter (57%) and the rest is composed by other materials, recyclable or not.



**Figure 1.** Composition of solid urban waste in the municipality of Japeri, Rio de Janeiro, Brazil  
 Source: Prepared from Ecologus et SEA (2013).

### Regular collection and selective collection

In 2015, 15,781 tons of MSW were collected, corresponding to 54% of the total generated in the municipality (Ecologus et SEA, 2013; IBGE, 2015). In August 2014, the door-to-door selective collection system was started, with the inclusion of waste pickers. Until 2015, the collection of recyclables occurred only in Area 1, in the neighborhoods Mucajá I, II and III, Vila Central, Santa Terezinha, Bonfim, Jardim Marajoara, Parque Guandu, Cosme and Damião, and Maria José. In 2015, 123.9 tons of recyclable materials were collected annually, corresponding to 0.4% of the total RSU generated in the municipality (SNIS, 2015).

### Final disposal

Until July 2014 the final disposal of the waste was made in the Japeri dump, which has operated for 20 years receiving 76 tons/day. About 40 scavengers worked on the dump. After its closure, the waste was disposed of at the CTR of Nova Iguaçu.

### Perception of population

The accumulation of garbage in points in the city was considered by the participants in the focus group as one of the main problems for MSW management in the municipality, provoking floods and proliferation of vectors of diseases.

The lack of environmental awareness and the lack of information on the part of the population would be among the main causes of the problems. The practice of bad habits, such as throwing trash anywhere or dispose of the waste for

collection on time and schedule outside the established by the City Hall aggravate problems even more.

These perceptions are highlighted in the following reports:

“The population is not educated about garbage. You can see it when you walk on the street: junk everywhere.” (Participant 1)

“The truck passes regularly on the right days, but there are people who put the garbage in the street after the truck is gone.” (Participant 2)

“The truck goes by, picks up the trash, the person wakes up late, forgets to put the garbage out, and then it will take two more days for the garbage to be collected, so it gets spread out on the street.” (Participant 8)

Participants also cited the problem of construction waste. According to Participant 6, rubble, when not collected, accumulates in “garbage points” such as sidewalks and vacant lots. This leads people to associate these rubbish-containing sites with a garbage dump, thus, they start dumping their household waste there.

In the perception of the group, several improvements are necessary, especially regarding environmental inspection and education, which should be integrated with health agencies and reach the whole society. According to Participant 8, “educational actions should involve schools and health agencies. Such mobilization should include community centers, churches, spiritist centers, etc.”

They were confident about the population’s receptivity to educational actions, as in the speech of Participant 1: “I am sure that if the City Hall starts an environmental education project, the population will embrace it because they will see that the attitude is originally coming from the public Power”.

The need for greater communication between the public power and society was addressed through audio-visual resources such as leaflets and sound cars. Participant 6 suggested that educational activities should also be done on weekends, as this municipality is a “dormitory city”. The importance of the increase in selective collection was cited by Participant 1: “Garbage is rich and this wealth needs to be recovered”.

### Social participation

In Japeri, the social participation in the MSW management takes place in the Municipal Council of the Environment, where the residents associations forward their claims.



SEMADES provides a telephone number and e-mail for contact, filing a report and complaints. Social participation is considered fundamental in the process of implementation and improvement of MSW management in this municipality.

### Environmental education

To achieve the objectives of the PNRS, according to article 77 of Decree No. 7,404/2010 (Brasil, 2010a), which regulated Law No. 12,305/2010 (Brasil, 2010b), one of the measures concerns educational actions aimed at consumers, in order to stimulate sustainable practices of consumption and disposal and involve society in shared responsibility for waste management.

Japeri did not have specific team for environmental education; however, it has developed specific actions, according to the demands. The difficulties in mobilizing the population in the selective collection were evidenced in the reports of the city officials, as well as in the residents' speeches. The need for permanent educational actions to find solutions to environmental problems was explicit. As Japeri is in the process of elaborating its PMGIRS, this would be the moment to insert critical and participative environmental education in planning.

The municipality and the main legal requirements defined in the PNRS

Table 1 presents the results regarding compliance with the main legal attributions related to the management of solid waste, according to the PNRS and listed by CNM (2015), by the municipality of Japeri.

### Municipal Solid Waste Management Plan

SEA and Inea supported the preparation of PMGIRS through workshops in 2012. A bid was made by Japeri to hire a company to prepare its plan; however, its immediate onset

was not determined. The municipality waited for the INEA until the beginning of 2016, when the works were restarted.

This picture is similar to that described by Pinho (2011) on MSW management in the Amazon Region, where municipalities continued to wait for the State Governments, which in turn awaited the collaboration of the Federal Government. This practice is common because of the centralization of power and financial resources, especially at the federal level.

The PNRS has in planning one of its main instruments, but the absence of the PMGIRS leads to the lack of clear goals, as well as well-defined and long-term schedules.

It should be noted that the Municipal Master Plan establishes in its art. 83 that the implementation of the Japeri Solid Waste Collection and Disposal Program should be integrated with the other Sanitation, Health, Education and Culture Programs. It was observed that this integration, in practice, was restricted to specific actions.

### Dumping closure and remediation

The municipality closed its dump in the period established by the PNRS. For this, the secretary of environment had to overcome internal resistance and operational difficulties, being necessary to make the managers aware of the legal adequacy of the municipality.

As a result of the cost increase, a budget debate has been held since 2012 on the need to include the final waste disposal in the Municipality Multi-Year Plan. The landfill remediation project is being prepared, and resources are needed for its implementation.

According to the PERS of Rio de Janeiro, resources from the State Fund for Environmental Conservation and Urban Development (FECAM) are used for the elaboration of projects and works for the recovery of degraded areas. The goal was to recover all these areas by 2018 (Ecologus et SEA, 2013).

**Table 1.** Compliance with the main legal requirements according to the Brazilian National Solid Waste Policy (PNRS), by the municipality of Japeri, RJ, Brazil

Municipal attributions established by the PNRS (Law No. 12.305/2010)	Reference in Law	Meeting the requirement	
		Yes	No
Elaborate Municipal Plans for Integrated Solid Waste Management	Art. 18 and art. 55		x
Shut down dumpsters and controlled landfills	Art. 54 and art. 36, VI	x	
Remedy dumpsters and controlled landfills	Art. 19, XVIII		x
Deploy selective collection with social inclusion	Art. 36, II, § 1st	x	
Implement a composting system	Art. 36, V		x
Only dispose of waste in landfills	Art. 54 and art. 36, VI		x
Articulate reverse logistics	Art. 36, III		x

Source: The authors themselves





### Selective collection with social inclusion

The municipality of Japeri carried out the selective collection with the inclusion of the collectors from the old dump. In the year of 2013, the Working Cooperative of the Collectors of Recyclable Materials of the Municipality of Japeri (*Cooperativa de Trabalho dos Catadores de Materiais Recicláveis do Município de Japeri – CooperJaperi*) was created. It was supported by the Technological Incubator of Popular Cooperatives (ITCP), linked to the Federal University of Rio de Janeiro, and the State Program for Selective Collective Solidarity.

According to the Secretary of the Environment, in order to comply with Law No. 163 (Japeri, 2013), which instituted the Municipal Solidarity Selective Collection Program, the city government invested resources from the transfer of the Tax on the Circulation of Goods and Provision of Services (the Ecological ICMS) in the hiring of the pick-up truck, as well as in the payment of rent and adequacy of the shed.

The selective collection covered only a specific region of Japeri (Area 1), serving approximately 1/3 of the districts, which generated about 1/3 of RSU. According to the CNM (2015), in a first moment, the PNRS does not oblige the selective collection to cover the whole municipality, thus enabling it to be initiated with a pilot project for its later enlargement.

According to the PERS (Ecologus et SEA, 2013), the progressive goals to increase the selective collection in the municipalities of Rio de Janeiro are: 10% of the total population of the municipality served until 2014; 20% by 2018; 50% by 2024; and 100% by 2033.

The selective collection door to door in Japeri served 4,993 inhabitants (SNIS, 2015), with a coverage percentage of 5%, not covering the entire Municipal Area 1. Therefore, the percentage coverage of the selective collection in Japeri did not meet the goal of PERS.

The municipal managers reported the difficulty in mobilizing the population for the selective collection. As for the separation of recyclables, a common questioning of the municipal residents' employees used to be "what do I get out of it?"

According to Santos et Rocha (2015), when commenting on the experience of CooperJaperi, one of the obstacles in its installation was the difficult relationship among the cooperative members in the first months of operation.

Hamada (2011) states that in the implementation of recycling plants organized in the form of cooperatives, the frequent demand for assistance of psychologists and social

workers in the solution of conflicts between cooperatives has been observed.

Santos et Rocha (2015) found in CooperJaperi that a part of the conflicts was associated with the financial question and the difficulty of the workers in perceiving protagonists of the process, as well as in recognizing the power of their knowledge. This second factor led to the dependence of cooperatives on the municipality.

In this perspective, efforts to qualify and encourage the involvement of collectors, especially in decision-making, have proved to be important in reducing conflicts. One of the decisions taken by the cooperative was to create working groups to use the equipment collectively and to associate gains with individual productivity.

Buyers of recyclable materials sorted by CooperJaperi were located in the municipalities of Duque de Caxias, Rio de Janeiro and São Gonçalo, about 50 km away, and this represented more increase in terms of transportation costs.

### Composting system

There was no organic composting system in the municipality. This activity is fundamental for reducing residues in the landfill, since 57% of the generated RSU are composed of organic matter.

The PERS aims to implement and operate systems of treatment of the organic fraction of MSW in all municipalities of Rio de Janeiro until 2033. Among other actions, it provided technical support to the consortia and municipalities in the preparation of composting projects. During the research, the Consortium Centro Sul Fluminense I was constructing composting units in the Solid Waste Treatment and Disposal Complex of Paracambi.

According to the PNRS, besides the implementation of the system, the municipality must articulate with the economic and social agents the ways of using the compound produced. In Japeri there is a demand for the product that could be used in local agriculture, which collects annually, approximately, R\$ 8 million.

### Reverse logistic

The municipality of Japeri did not have reverse logistics systems. The Municipal Law No. 163/2013 foresees its implementation and the creation of a management group to establish a schedule for the implementation of reverse logistics systems (Japeri, 2013). However, it had not been put into practice until the moment of this research.



The participation in the reverse logistics of the business sector is fundamental, for, without it, the commercialization of packaging, for example, continues to be carried out by the merchant traders who operate in the region, imposing their conditions almost always unfavorable to the scavengers. For this reason, reverse logistics must be linked to municipal selective collection and rely on the effective participation of waste collector cooperatives (CNM, 2015).

## 6. CONCLUSIONS

This study made it possible to present the general picture of the MSW management of the municipality of Japeri at a time prior to the implementation of its PMGIRS, giving support for the construction of this important instrument, according to what establishes the PNRS.

From the promulgation of the PNRS, a process of change in the waste management in Japeri began. The closure of the dump, the disposition of the MSW in the CTR and the beginning of the selective collection with the inclusion of the collectors evidences the search for a sustainable management, in view of the adequacy to the current legislation.

In the majority of Brazilian municipalities, selective collection initiatives are not very comprehensive, with a low rate of coverage and recovery of recyclable materials, and Japeri has also encountered these same difficulties.

It is necessary to consider that the current political, social and economic crisis experienced by Brazil, particularly the state of Rio de Janeiro, has aggravated the situation of municipalities, since social and environmental demands were neglected, especially those related to PNRS, which further complicates the consolidation of PMGIRS.

There are many challenges to be faced by the municipality, among them: to implement the PMGIRS; reduce the dependence of state and federal agencies on waste management; universalize regular collection; increase the source of income and the coverage of the selective collection; involve society in management; invest in permanent communication and environmental education campaigns; encourage reverse logistics with the participation of collector cooperatives; remedy the old dump; and to compost organic waste.

The application of the focus group technique evidenced the importance of community involvement in the diagnosis of MSW management in Japeri and made possible a better understanding of environmental problems from the perspective of their representatives.

This technique was also adequate to be applied as a tool for social participation in the construction and monitoring of public policies related to solid waste or to other contexts.

One of the limitations of the study was the low quality and the low availability of updated data regarding municipal waste management in general. In addition, the complexity of the subject did not allow all issues to be fully addressed in this study.

The main contribution of the research was in its approach, which sought to allow the manifestation of the wishes, concerns and suggestions from the representatives of the community that participated in the focus group.

Social participation and citizenship are indispensable in the exercise of democracy and social emancipation, since they are *sine qua non* conditions in the construction of a substantive sustainability and in the success of any public policy, in order to prevent its discontinuity or to transform it in a mere political instrument.

Critical environmental education is an important instrument in the consolidation of this participation, whether in the fight against aggressive practices to the environment, with damages to the social welfare, or in the search for access to public goods and services, such as urban cleaning, waste collection and appropriate destination.

It is hoped that the focus group technique employed in the diagnosis of municipal waste management can also be adapted to other realities. Due to the lack of further studies on this topic, this article may contribute to filling this gap.

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