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Implementation of the Brazilian National Policy for Waste Management

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In Brazil there has been great difficulty in politically and administratively integrating the different levels of government that are formulating and implementing these policies, especially in regard to the relationships between the government bodies formulating guidelines at the national level and those at the local level. According to current legislation, the municipalities are responsible for the management of urban solid waste (USW) and urban sanitation. Federal Law 12,305/2010, establishes the Brazilian National Policy on Solid Waste (PNRS), and establishes principles and objectives for the country, but these activities are to be implemented at the municipal level. Are these municipalities capable of fulfilling this task? This article proposes a methodology based on gap analysis using data from the National Sanitation Information System (Snis) to identify the extent to which PNRS has been implemented in the Rio de Janeiro Metropolitan Area (RJMA). The results show an increase in the universality of the service in RJMA municipalities, but most of the PNRS objectives have been ignored and there are no local policy guidelines to be put in place and monitored. In addition to this, we have found that there has been poor implementation of the federal law. By interpreting this finding through the theoretical framework of institutionalism, our conclusions raise new questions and identify possible paths for future research.

Keywords: neoinstitutionalism; management of urban solid waste; Brazilian National Policy on Solid Waste; gap analysis; Rio de Janeiro Metropolitan Area.

Implementação da Política Nacional de Resíduos Sólidos

A dificuldade de integração entre entes federativos na formulação e na implementação de políticas se faz presente nas diferentes esferas política e administrativa no Brasil, sobretudo no que diz respeito às relações entre instâncias de governo formuladoras de diretrizes no nível nacional e as executoras no nível local. De acordo com a legislação vigente, os municípios são os responsáveis pelas atividades de manejo de resíduos sólidos urbanos (RSU) e limpeza urbana. A Lei Federal nº 12.305/2010, que institui a Política Nacional de Resíduos Sólidos (PNRS), estabelece princípios e objetivos, proporcionando um marco para a gestão de RSU no Brasil. Qual é a real capacidade dos municípios de atenderem as determinações da Lei Nacional? Este artigo propõe uma metodologia baseada no método da *análise das lacunas* e nos dados do Sistema Nacional de Informação sobre Saneamento (Snis), para identificar o grau de implementação da PNRS na Região Metropolitana do Rio de Janeiro. Os resultados mostram um incremento na universalização do serviço nos municípios da RMRJ, mas a maioria dos objetivos da PNRS não só é desconsiderada, como também não possui diretrizes políticas ao nível local para serem encaminhadas e monitoradas. O grau escasso de implementação da lei nacional evidenciado pelos resultados vem sendo interpre-

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tado nas conclusões mediante o marco teórico do institucionalismo, o que permite trazer novos questionamentos e possíveis desdobramentos para pesquisas futuras.

Palavras-chave: teorias (neo-)institucionalistas; gestão de resíduos sólidos; PNRS; análise das lacunas; RMRJ.

Implementación de la Política Nacional Brasileña de Gestión de Residuos

Las políticas públicas brasileñas se caracterizan por una brecha entre las instancias que formulan las directrices nacionales y los gobiernos locales, que deberían implementarlas. Los municipios son los órganos encargados de las actividades de gestión de los residuos sólidos y los desechos urbanos (RSU). La Ley Federal nº 12.305/2010, que establece la Política Nacional de Residuos Sólidos (PNRS), establece los objetivos de la gestión de los RSU en todo Brasil, que deben ser implementados a escala municipal. ¿Cuál es la capacidad de los municipios para alcanzar el objetivo de la ley nacional? Esta investigación, centrándose en el área metropolitana de Río de Janeiro (RMRJ), aplica una metodología basada en técnicas de análisis de las deficiencias y usa los datos del Sistema de Información Nacional de Saneamiento (Snis), para ilustrar el nivel de aplicación de las PNRS marco en RMRJ. Los resultados muestran un aumento en el servicio universal en los municipios de RMRJ pero la mayoría de los objetivos PNR no sólo se ignora, sino que también no tiene directrices de política a nivel local para ser abordadas y supervisadas. El grado escaso de implementación de la ley nacional evidenciado por los resultados viene siendo interpretado en las conclusiones mediante el marco teórico del institucionalismo, lo que permite traer nuevos cuestionamientos y posibles desdoblamientos para investigaciones futuras.

Palabras clave: neo-institucionalismo; manejo de residuos sólidos; Política Nacional Brasileña para la Gestión de Residuos Sólidos; análisis de las deficiencias; Área Metropolitana de Río de Janeiro.

1. INTRODUCTION

In the field of Brazilian public policy, there is a distance, physically as well as structurally, between government policy as formulated by national norms and guidelines, and what is implemented in practice. This distance, exacerbated by the difficulty of achieving effective coordination between various governmental bodies, has led to problems of policy integration, in both the vertical sense (between different levels of government) as well as the horizontal sense (within the same level of government between complementary sectors of public policy, such as sanitation and the environment). The difficulties encountered in coordination — examples of failures on the part of the administrative apparatus — become evident not only on a local scale, but on a regional scale as well, where these policies need to be articulated as they become concrete. Various studies have shown that many metropolitan areas, instituted by state governments, lack effective governance and planning, and competition between municipalities frequently prevails over cooperative behavior (Garson, 2009; Costa and Tsukumo, 2013; Klink, 2014).

The management of urban solid waste (USW), the subject of this work, is a particularly relevant field of analysis, not only because of the increase in the production of waste generated by population growth and consumption patterns, but also because it involves innovative public policies (Heber and Silva, 2014) that encourage cooperation between municipalities and the emerging forms of regional governance.

Federal Law no. 12,305/2010, which instituted the National Policy on Solid Waste (PNRS), presents various problems in terms of its effective application, including a lack of budgetary resources and a lack of institutional capacity and management on the part of many Brazilian municipalities, especially small ones (Heber and Silva, 2014). To face these challenges, this law establishes shared management

guidelines, such as the formation of intermunicipal consortiums for managing solid waste. In addition, the PNRS defines the protection of human health and sustainability as the guiding principle for all government actions within this context, identifying targets for the eradication of waste dumps and driving environmentally appropriate solutions for the final disposal of USW (Brasil, 2010).

How have these municipalities, which are legally responsible for the management of urban sanitation services and the handling of solid waste, as envisaged under the National Sanitation Law no. 11,445/2007, performed in the face of the new challenges that have come with Federal Law no. 12,305/2010?

This work seeks to answer this question in terms of the Rio de Janeiro Metropolitan Area. More specifically, this study proposed to examine municipal performance in terms of managing solid waste, and will identify gaps related to the targets established by the PNRS, in terms of some of the principles of the main institutional theories.

It should be emphasized from the outset that this is an exploratory and descriptive study by nature, with a predominantly empirical objective, even though its conclusions present various avenues for future research of empirical as well as theoretical nature. Institutionalism as a theoretical reference will be specifically used here as an interpretive tool in the empirical analysis of a given public policy. This theoretical reference is not used in the preliminary analysis of the empirical data; it is used in the following step during the interpretation of the empirical data presented in the conclusions of the study.

This paper contributes to the current academic debate regarding municipal public administration and public policies related to the integrated management of solid waste as follows:

- to prepare an initial balance of the implementation of PNRS on the local level four years after its enactment;
- to reflect on the institutional capacity of local institutions in implementing guidelines and targets defined at upper levels of government;
- to bring the academic debate closer to the practice of public administration through the adoption of a methodology that has emerged from management practices and organizational control.

This article is structured in the following manner: first, it presents a theoretical and conceptual section on institutionalist approaches and the integrated management of solid waste; next it examines the institutional context being studied, the laws regarding solid waste in the Rio de Janeiro Metropolitan Area (RJMA); this is followed by the methodology; a presentation of the results; and finally the conclusions and recommendations for future research.

2. THE THEORETICAL-CONCEPTUAL FRAMEWORK: INSTITUTIONALIST APPROACHES AND THE INTEGRATED MANAGEMENT OF USW

2.1 (NEO-) INSTITUTIONALIST THEORIES: THE ASPECTS RELEVANT TO PUBLIC ADMINISTRATION

Institutionalism can be defined as a group of theories that covers a variety of social science contexts, from sociology to political science and also including economics. Due to their preoccupation with organizations and structures, the main social phenomena observed by institutionalists (Donsbach, 2008), the theoretical as well as the empirical contributions of this broad field of analysis have become

very relevant to administrative studies and especially public administration, where institutionalism has shown great potential in the necessary dialogue between disciplines. In general, it does not constitute a single paradigm, but as pointed out by Donsbach (2008), the common characteristic between institutionalist theories is the vision of the world as a “whole” shaped by rules, practices and structures that establish the conditions of social actions. According to Amenta and Ramsey (2010) what institutionalists have in common is a macroanalytic perspective, or in other words, a tendency to explain social changes based on a systemic point of view, avoiding looking at the level of the individual (actor) as an explanatory variable. As a result, one of the main criticisms of these theoretical models is their incapacity to explain social and political changes that come from exogenous variables that are external to an institutional system which are not discussed. Various authors have sought to revise and organize this broad academic debate by classifying their main authors in two or more schools of thought (Scott, 1987; March and Olsen, 1989; Dimaggio and Powell, 1991; Hall and Taylor, 1996; Tolbert and Zucker, 1999; Amenta and Ramsey, 2010).

One of the most often used classifications in the literature is that between “institutionalists” and “neoinstitutionalists”, featuring the concept of the institution as the central variable of analysis. It is proposed by authors who, beginning in the 1970s and with increasing emphasis in the 1980s returned to this approach, after the field went through a long period of oblivion between the two world wars (Meyer and Rowan, 1977; Dimaggio and Powell, 1983; March and Olsen, 1984; March and Olsen, 1989; Dimaggio and Powell, 1991). According to these authors, the “new institutionalism” diverges from previous theories in that it takes into account the dimension of the interactions between variables such as the individual, behavior, group or class, which up to that point had been considered to be explanatory only in terms of all social processes. However, other authors, sometimes classified as “old,” have criticized this distinction as a useless fragmentation of the theoretical discourse that also isolates important previous contributions that the so-called “neoinstitutionalist” theories seek to extend. This is the opinion, for example, of Selznick, a pioneering sociologist within the institutionalist debate (Selznick, 1996).

A second widely cited classification divides neoinstitutionalists into three schools of thought: rational choice, historical and sociological (Hall and Taylor, 1996). Generally, we can say that each of these schools differs from the others in terms of the focus used to define institutions and the processes involved in their appearance and evolution. Rational choice authors emphasize the role of actors and the attitudes related to maximizing an individual’s utility as well as the calculative behavior of individuals (North, 1990). The historical approach focuses on the concept of path dependence, or in other words, of the long lasting and striking impact of the social processes of the interactions, which are frequently unpredictable, between multiple structural factors such as power relationships, ideas and culture (Immergut, 1998; Immergut and Anderson, 2008; Steinmo, 2008). Finally, the sociological school differs from the other two which are more focused on political science and economics, first of all because they emerged in the discussions of organizational studies and have therefore produced contributions that are more relevant to administrative studies (Hall and Taylor, 1996). This third school, which is characterized by a broader concept of institutions (institutions are not just rules or structures, but also myths, social convictions and social and/or community rituals), emphasizes an interpretive (not based on deterministic or rational causality) and constructivist (Berger and Luckmann, 1978)

point of view of the actions and interactions with other forms of social institutions (March and Olsen, 1984; Greenwood and Hinings, 1996). In this sense, the Weberian concept of “legitimacy” is of central importance to this group (Dimaggio and Powell, 1983; Tolbert and Zucker, 1983).

However, other authors are not pleased with these typologies and identify schools of thought in addition to those described here. Amenta and Ramsey (2010), for example, within historical neoinstitutionalism, distinguish works that are more focused on the State (Skocpol, 1979; Steinmo and Thelen, 1992; Przeworski and Curvale, 2005) by identifying them as a specific school of thought: political institutionalism. To Howlett and partners (2013), these same authors are part of another school they term “statism” (Howlett et al., 2013:52). No matter whether they are classified as “political institutionalists” or as “statists,” all of these authors are recognized for sustaining, like Tocqueville (Amenta and Ramsey, 2010), a vision based on the preeminence of the macrostructure of the state as an institution that molds all other economic and social institutions.

In addition to these schools, we should mention authors such as Ostrom, who have contributed profoundly to the institutionalist discussion, but in a way that cuts across these schools of thought (Ostrom, 2005; 2009; 2011). Ostrom contributes on the normative level, confronting and emphasizing the multiple definitions of the concept of an “institution” (Cavalcante, 2011), as well as on the methodological level by proposing a scheme of analysis known as the Institutional Analysis Development Framework (IAD Framework), used even by Brazilian authors to discuss solid waste (Silva Filho et al., 2009).

Within the Brazilian academic debate about administration and public policies in general, and environmental management in particular, many authors recognize the fundamental role of the institutional dimension, adopting the institutionalist perspective of analysis (Silva Filho et al., 2009; Cavalcante, 2011; Heber and Silva, 2014; Santos and Santos, 2014). Within a multidimensional fluid context under transformation that is characterized by the presence of multiple actors, and therefore, profound uncertainty and instability, such as USW in Brazil, the institutionalist approach offers, as Cavalcante notes, a “guide for analysis” (Cavalcante, 2011:1790), making it possible to focus on the need to construct standards in seeking coordinated and cooperative action on the part of the various organizations involved.

This approach is in itself limited because it neglects the more dynamic components of public policy, but is appropriate when making a one time evaluation of a public policy, as we are doing in this study. It is beyond the scope of this study to make a complete review¹ and/or critically analyze institutionalism, which is used here as a tool of analysis. Therefore, in line with Selznick’s orientation, we will try to go beyond the divisions presented above. In this sense, we will try to unite and integrate suggestions of various origins in our gap analysis. To accomplish that, we will adopt a broad definition of institution like that suggested by Searle (2005) as “[...] any system that collectively accepts rules (procedures, practices) that enable us to create institutional facts.” Based on the emphasis by this author that we have as many possible meanings of the term “institution” as there are fields of human action (Searle, 2005:18), in this study we consider the political institutions, or in other words,

¹ The field literature offers excellent contributions in this vein and we would like to recommend reading the references that we have used throughout this text (Scott, 1987; Hall and Taylor, 1996).

the field of politics and government. Our unit of analysis is therefore a national law, one of the most relevant political institutions from the statist point of view. Institutionalism, as a research framework, is also used here to deal with policies in their organizational dimension (March and Olsen, 1984).² By identifying the government of these public policies as an organization, it is possible to apply, in an innovative manner, a typical management practice tool to analyze gaps, while at the same time make reflections on a theoretical level. Moreover, the institutionalist framework makes it possible to reflect on the process of policy implementation in the management of solid waste, applying data from various studies, empirical and theoretical, of organizational sociologists such as Tolbert and Zucker (1983) and Greenwood and Hinings (1996), and Selznick himself (1996), who have studied public, private, industrial and governmental-political organizations. These studies enabled us to identify strengths and weaknesses of public policy from a different — and therefore, original — perspective, apart from the political theory.

2.2 THE INTEGRATED MANAGEMENT OF USW AND THE TERNS OF THE PNRS IN BRAZIL

The use of institutional theory to study the management of basic sanitation services, especially solid waste, is not a new approach in the Brazilian literature. Various authors have proposed case studies based on this theoretical-methodological approach (Silva Filho et al., 2009; Cavalcante, 2011; Abreu et al., 2014; Heber and Silva, 2014; Almeida et al., 2015). Four studies that have dealt with environmental management in metropolitan areas or states from an institutionalist point of view are Silva Filho and partners (2009) study of the Porto Alegre Metropolitan Area (RS); Abreu and partners (2014) study of the semiarid Northeast; Heber and Silva's (2014) study of the Aracajú (SE) region; and Almeida and partners (2015) study of Pernambuco. All of them adopt a framework that uses *institutionalism centered on the actor*, to borrow an expression from Fritz Scharpf (1995 apud Howlett et al., 2013), which takes into account formal as well as informal institutions, focusing on various actors and the relationships between them. With the exception of the Porto Alegre case study, in which the authors relate the active role in the elaboration and implementation of environmental programs played by civil society and environmental movements (Silva Filho et al., 2009:624), the other three focus on the incipient nature of the formal institutions and the weak institutionalization of the integrated management processes for solid waste. The present work is distinctive not only in that it deals with a new case, but it also proposes a focused and well-defined analysis, by adopting a unit of analysis by a unique formal institution (a federal law), by relying on a single data source (Snis) and also by conducting an unusual methodological procedure (gap analysis). Even though we are leaving aside the microanalytic dimension of actors for convention and consistency with the purpose of focusing on a specific policy, our approach is not *State-centric*, as Skocpol (1979) would say. Our goal is not to analyze how the law, as policy, has shaped society (Hall and Taylor, 1996), but rather how governmental institutions on the state and municipal level are implementing the law.

² March and Olsen (1989) argue in this sense that one of the main contributions of sociological institutionalism to the institutionalist discussion within political science and public administration is precisely that the way in which politics is organized affects its results, and that in the words of the authors "[...] the organization of political life makes some sort of difference."

The PNRS instituted by Law no. 12,305/2010 in Chapters II and XI defines *integrated management of solid waste* as: “[...] a group of actions related to solving the problem of solid waste, considering its political, economic, environmental, cultural and social dimensions under the premise of sustainable development [...]” (Brasil, 2010).

This portion of the law draws our attention to the multidimensionality and the need to integrate not only the way in which solid waste is understood and “managed”; it is a broad and complex subject that transcends public health because it has social, economic and environmental value (Baptista, 2014). The integrated character of solid waste management refers to the need for intersectoral policies as well as various social, environmental and economic aspects that involve the basic sanitation sector. The multiple impacts that can be caused by problems related to the inappropriate management of USW demonstrate the importance of an integrated approach to the management of these services.

As Pimenteira (2011) points out, when leachate, which is the main subproduct of decomposed waste, and mainly its organic component, is not treated and disposed of in an adequate manner, this causes severe pollution of the soil and even affects the water table, and as a result underwater reservoirs (Gouveia, 2012). The percolation of leachate (its penetration of the subsoil) can occur due to inadequate treatment such as in waste dumps (Gouveia, 2012).

In the same manner, solid waste, when not managed correctly, can affect the air, releasing particles and other atmospheric pollutants. One of the ways in which solid waste affects the air is through the anaerobic decomposition of its organic component which increases the green house effect especially through the production of methane (CH_4), considered one of the main sources of global warming (Gouveia, 2012).

Another cause of the atmospheric pollution caused by solid waste is the burning of discarded materials without any treatment in empty lots due to a lack of awareness on the part of the population, which leaves the soil exposed to erosion due to the loss of vegetation and leads to harmful environmental consequences (Valle, 2009). The practice of burning solid waste can be made less harmful to the environment by using incineration techniques, which are not very widespread in Brazil, in the final step during the disposal of hazardous and hospital waste (Morgado and Ferreira, 2006).

The management of solid waste and its correct disposal is also related to the expansion of urban space. When there is unplanned urban sprawl, involving the construction of living spaces in inappropriate areas, such as river banks, in irregular areas which are not attended by adequate collection services, there is a tendency to have uncontrolled waste harming the subsoil and waterways, making them a risk to public health.

These dynamics demonstrate the need for an integrated approach to USW management which, even being recognized by the fundamental principles of the National Policy on Solid Waste, has not been easily applied to the existing practices of management. Putting in practice the principle of integrated management means reducing the negative impacts of the production of solid waste and finding solutions that produce positive externalities, or benefits, in the various sectors and environments directly or indirectly related to human activity. For example, to solve the question of the green house effect, an integrated management response would be capturing the gases produced by USW decomposition to produce energy. However, at this time only 2% of Brazilian sanitary landfills are equipped for this type of procedure (Gouveia, 2012).

Another aspect that the PNRS, its related norms and its subordinate plans emphasize in terms of integrated management is the leading role that waste collectors play in selecting recycling materials, and they highlight the need to protect this category of workers and offer them better working conditions, in alignment with the principles of sustainability. The inclusion of waste collectors is present in the objectives and the fundamental targets of the PNRS (art. 7, XII; art. 17, V). In addition, all of Title V of the PNRS is oriented towards encouraging the participation of these workers in reverse logistics and selective collection processes. If, on one hand, the law recognizes the relevance of selective collecting and these collectors as a group, on the other, it does not deal with issues of health and human dignity related to their work, only recommending, in general terms, their economic integration (art. 15, V).

In relation to the integrated nature of management, the relevance of intermunicipal management as well as sanitation and USW consortium management should be mentioned. Many Brazilian municipalities have difficulties that are almost impossible to solve in isolation in terms of planning, regulating and promoting the proper operation of solid waste handling services. It is, mainly due to the need to overcome these structural deficiencies, necessary to consider regional management through public consortiums, to try to achieve sustainable investments (Brasil, 2014:27). This model of interinstitutional cooperation, whose legal framework is provided by Law no. 11,107/2005, has advanced in recent years in terms of the number of formal consortiums, especially in the solid waste sector (Britto, 2014). In fact, cooperative arrangements for the handling and final disposal of solid waste already existed before the law, given that many municipalities do not possess the technical and financial resources necessary to implement the appropriate infrastructure for the final disposal of USW. Nevertheless, the law has strengthened these models, providing judicial and institutional support to intermunicipal cooperation. According to Britto (2014), the universe of solid waste consortiums is vast, with there being a total of roughly 200 very heterogeneous consortiums. There are consortiums formed exclusively to share a sanitary landfill; there are consortiums that have broader activities in the management of solid waste; there are consortiums involved in other sectors of basic sanitation; and there are consortiums with broad objectives in terms of regional and multipurpose development that incorporate part of the functionality associated with solid waste management. According to this author, the southeastern region is the one that presents the largest number of institutionalized consortiums in operation. The cooperative model offers a series of advantages for municipal USW management, such as greater control over its treatment and final disposal; greater reuse potential, increased collection capacity, triage and recycling; incentives for the organization of waste collectors in cooperatives which in turn offer them improved working and living conditions as a result (Moraes, 2012). However, there are various impediments to the implementation of public solid waste consortiums and their timely functioning, such as a lack of educated and trained professionals (Milanez et al., 2012), a municipal lack of technical and administrative support, and instability caused by the cycles of municipal government (Britto, 2016). Overall, integrated USW management, even though it represents a widely recognized and institutionally desirable objective, still faces many challenges.

The PNRS, even though it is ambitious, provides crucial legal content for achieving this objective. But why does this integrated USW management, so desired by laws and plans, not occur in practice? The reflections of the institutionalist theories help us find paths to explaining this by introducing environmental diagnostics and reports, typical of the managerial discussion of USW, as well as

variables such as culture and relationships (Hodgson, 2006; DiMaggio and Powell, 1983). Policies, plans and programs establish principles and objectives through laws, but these norms can only become institutions if they find legitimacy within the community of actors that apply them (Hodgson, 2006). To achieve this, various institutionalists argue that establishing targets is not enough, and that habits need to be created (Hodgson, 2006). The PNRS is a formal institution, in Searle's sense, whose broad and neutral definition, explained above, constitutes a social structure formally codified (written) and legitimized (Searle, 2005; Hodgson, 2006). However, in this article's analysis, adopting a vision suggested by various organizational sociologists (Tolbert and Zucker, 1983; Selznick, 1996), we will emphasize the difference between an institution and institutionalization. The process of institutionalization is defined by Tolbert and Zucker (1983:27) as: "[...] the process through which the components of the formal structure become widely accepted as appropriate and necessary and serve to legitimize organizations [...]".

Selznick, in identifying the process of legislation and normalization as a specific form of institutionalization, points out that the creation of a law does not always lead directly to the 'legalization' of social activities that it intends to regulate (Selznick, 1996). Along these lines, Hodgson (2006:17), using an even clearer form, distinguishes the term institution from the term rule. Defining rules as "socially transmitted regulatory injunctions", this author understands that not all rules become institutions.

The question presented here has to do with the reasons why a "strong" institution (Howlett et al., 2013), such as a national law, has had difficulties in its institutionalization according to results of the present study. The reflections that Selznick offers in analyzing the reality of big industry (Selznick, 2011) indicate paths to organizational responses to this question, and also help interpreting the gaps found in this study.

3. USW MANAGEMENT: AN INSTITUTIONAL PORTRAIT OF THE STATE OF RIO DE JANEIRO

The PNRS constitutes the main object of this analysis, but it is not the only institution that this study takes into account. Given that the geographic scale being covered is the metropolitan area, this analysis should contemplate the legal structure on the state level as well.

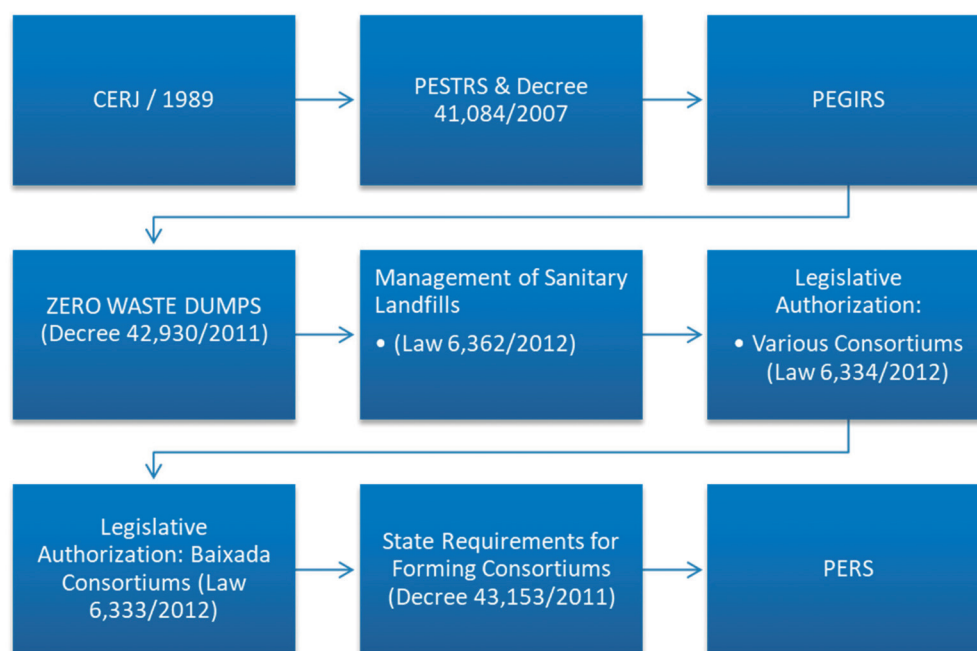
In the state of Rio de Janeiro, since the enactment of its Constitution in 1989 (Cerj), several policies, plans and programs devoted to the organization of the solid waste sector have been instituted (Figure 1). Law no. 4,191, of September 30, 2003 established Rio de Janeiro's State Policy on Solid Waste. This policy, as a regulatory act for this sector, stipulates definitions, norms, procedures and criteria for accompanying all the phases of solid waste management, from its generation until its final disposal, passing through the phases of collection and transportation. It prohibits leaving open waste (Art. 3, 1.1), and provides management guidelines and instruments for planning, environmental certification and auditing activities, as well as incentive programs for the reduction of packaging and the use of recyclable products (Art. 15, I, II, III, IV). Law no. 6,805/2014 broadens and integrates with Law no. 4,191/2003, introducing the discipline of reverse logistics and listing, beforehand, categories for manufacturers and wholesalers (importers and distributors in Brazil), who are required to implement it. The State Plan for Solid Waste (Pers), launched in January 2014, details the policy guidelines and strategies to achieve its targets in the given timeframes. The Pers identifies 11 categories of goals based on different types of waste (for example: urban solid, agroforestry, civil construction and health

waste, etc.), to be achieved in different timeframes, within an overall period of 10 years (2013-23), articulated in four different scenarios: immediate, short term, medium term and long term.

The Pers recognizes the strategic value of the regional scale and promotes a process of regionalization in the management of solid waste and uses the formation of intermunicipal consortiums as its primary instrument. Target I of the Pers proposes a regionalization study to identify the proper criteria and methodology of analysis to establish territorial arrangements that promote the constitution of public consortiums.

In this manner, this Plan for the state of Rio de Janeiro provides continuity with previous programs such as the Sanitation Pact (Rio de Janeiro, 2011) and its subprogram Zero Waste Dumps, and the State Policy on Solid Waste instituted by Law no. 4,191/2003). Thus the regionalization proposal contained in the Pers of October 2013 divides the 92 municipalities of the state of Rio de Janeiro into “institutionalized consortium areas,” with these areas being appointed as the locations for the final disposal of urban solid waste.

FIGURE 1 LEGAL FRAMEWORK FOR USW IN THE STATE OF RIO DE JANEIRO



Source: Araujo (2013).

The arrangements identified in the Pers regionalization proposal should be implemented in accordance with State Law no. 6,362/2012 which separates them into four possible types of sanitary landfills:

- a) *municipal public*: operated by the municipality itself or an integral entity under its indirect administration;

- b) *public concession*: whose operation has been approved under a concession or permission regime;
- c) *regional*: constituted in the context of metropolitan areas, urban and microregional agglomerations;
- d) *authorized*: private venture whose operation has not been approved under a concession or permission by a government body, but has an environmental license and a license to take care of the final disposal of solid waste.

The Pers also establishes that urban non-hazardous household (HW) and cleaning product waste landfills cannot receive industrial, health industry or hazardous waste, if the landfill's structure is not equipped for this. In general, the Plan indicates a focus on the final disposal of USW and the management of the downstream process, in which integrated management will require action in terms of the production of waste, related to its reduction, as well as aspects related to planning, regulation and oversight. This in fact implies greater integration between policy and both the state and municipal plans, which for the most part are still in its developmental stage.

4. MATERIALS AND METHODOLOGY

This work uses data from the National System of Basic Sanitation Information (Snis) as its main source of information on the management of solid waste (Snis, 2013). The Snis data is based on a sample of municipalities from each of the 26 Brazilian states and the capital district. Of the 21 municipalities that make up the Rio de Janeiro Metropolitan Area, Snis uses data from 15 municipalities, namely: Rio de Janeiro, Duque de Caxias, Itaboraí, Japeri, Magé, Mesquita, Nilópolis, Niterói, Queimados, São Gonçalo, Seropédica, Itaguaí, Cachoeiras de Macacu, Belford Roxo and Rio Bonito. This article uses this sample to apply its gap analysis methodology.

Gap analysis has emerged as a management control tool and is mainly used to monitor business performance vs. target values (for example, UNI/EN/ISO). Being a typical method of organizational practices, it has been rarely applied to scientific studies and frequently in business case studies. For a review of this technique as a managerial tool, Balm's study (Balm, 1996) can be used as a reference. We were not able to identify previous studies that have applied this method of analysis to public policy. In Kochhar and Suri (1992), gap analysis is defined as "a comparison between the way a given function should be conducted to achieve an efficient implementation, and [the way] that it is actually conducted or planned" (Kochhar and Suri, 1992:20). In general, gap analysis can be quantitative or qualitative. In the latter form, it is not possible to obtain a precise measurement between the target and the current status, but it is still possible to observe the absence of certain essential requisites and identify guidelines for correcting future progress (Kochhar and Suri, 1992).

Given the absence of quantitative goals defined by the PNRS, we propose here a qualitative gap analysis. Within the PNRS, 15 main objectives were identified and codified, and the law leaves it up to the state plans to define detailed goals (table 1). Next we created our variables of analysis by selecting from the indicators of the Snis database those that best contribute to measure the levels of implementation of the Pers in each municipality (table 2).

The selected Snis indicators were categorized into qualitative or quantitative. The qualitative ones are represented by dichotomous variables with YES/NO (Y/N), indicating the existence or

absence of a service (table 3). For the quantitative variables, percentages were calculated based on the data supplied by the Snis (table 4). Once all of these quantitative variables were transformed into percentages, it was possible to calculate the average value for the Rio de Janeiro Metropolitan Area. Finally, using a synthesis to represent the gaps related to these indicators, we defined a qualitative scale [0-5],³ associating the five percentage ranges with five attributes — from insignificant to satisfactory — related to the achievement of the law's objectives (table 5). The quantitative indicators have been aggregated into three macro-indicators related to the PNRS objectives according to the following scheme:

- 1) Appropriate Environmental Destination = % Destined for Triage + % Disposal in Landfill
- 2) Reutilization and Recycling = % Selective Collection + % Recyclable Recovery Rate
- 3) Integration of Waste Collectors = % of USW Collected by Waste Collectors
- 4) Universality of the Service = % Pop. Served + % Collection Coverage Rate
- 5) Integrated Management and Sustainability (Economic Sustainability) = % Spending

To reduce distortions related to the absence of data and in order to construct macroindicators, we calculated the mean of the means, based on the previous means calculated on the regional level. This data was finally represented in the radar graph shown in the results section (graph 1).

Finally, the results for the qualitative and quantitative information were analyzed together to obtain a complete description of the gaps identified.

TABLE 1 SELECTION OF THE MAIN OBJECTIVES AND TARGETS OF THE PNRS

General principles and main specific objectives of the PNRS/Corresponding Targets of the Pers		
PNRS Law no. 12,305/2010	Guiding principles	
	Interinstitutional cooperation	
	Ecological efficiency	
	Objectives	
	Not generating waste/Reducing the quantity of waste produced	1
	Protection of public health	2
	Reducing hazardous solid waste	3
	Economically appropriate final disposal	4
	Reutilization and recycling	5
	Integrated management and sustainability	6
	Technical capacity	7

Continue

³ The [0-5] scale was chosen based on the methodology developed by Cetesb in São Paulo, which annually publishes a Quality Index of Waste Landfills (IQR) and an annual Inventory of the state of São Paulo based on it.

General principles and main specific objectives of the PNRS/Corresponding Targets of the Pers		
	Reverse logistics	8
	Integration of waste Collectors	9
	Sustainable public purchases	10
	Clean technology	11
	Using waste to produce energy	12
	Environmental labeling	13
	Sustainable consumption	14
	Regularity, continuity, functionality and the universality of services provided	15
	Dispositions of subordinate plans — Pers	
	Reduction, reutilization and recycling	5
Pers Objectives/ Goals	Using waste to produce energy	12
	Recovery and reduction of waste dumps	2/4
	Promotion of consortium and/or shared management	6
	Guidelines for USW management on metropolitan and microregional scale	6

Sources: PNRS and State Plan for Solid Waste.

TABLE 2 SELECTED SNIS INDICATORS

Selected variables based on Snis indicators	PNRS objectives /Goals of related Perss
Responsible government body	-
% population served	2/6/15
% recovery of recyclables in relation to the quantity of household waste and public waste	5
Existence of waste dumps	2/4/6
Integration of water and sewage services	4/6
% landfill disposal (t)	2/4/6
% destined for triage (independent of whether it originates from selective collection or not) (t)	2/5
Collection of fluorescent lightbulbs	5
Collection of small and large batteries	5
Collection of electronic waste	5
Selective collection (existence of service)	2/5
Participation in a consortium	4/6
Involvement of waste Collectors	4/6
Waste picker organization (existence)	4/6
Spending (%)	6
Recyclable recovery rate in relation to the urban population	5

Sources: PNRS and State Plan for Solid Waste.

TABLE 3 QUALITATIVE INDICATORS FOR GAP ANALYSIS OF RJMA BASED ON 2013 SNIS SOLID WASTE DATA

Municipalities in RMRJ for SNIS dataset 2013															
	Cachoeiras de Macacu	Duque de Caxias	Itaboraí	Japeri	Magé	Mesquita	Niterói	Nilópolis	Queimados	Itaguaí	Rio de Janeiro	Seropédica	Belford Roxo	Rio Bonito	São Gonçalo
Indicators based on 2013 NSSI data							Private-Public Organization Operating with Local Public Administration	Direct Public Administration	Direct Public Administration	Direct Public Administration	Private-Public Organization Operating with Local Public Administration	Direct Public Administration	Direct Public Administration	Direct Public Administration	Direct Public Administration
Integration of Water and Sewage Services	Authority	Direct Public Administration	Direct Public Administration	Direct Public Administration	Direct Public Administration	Direct Public Administration	Local Public Administration	Direct Public Administration	Direct Public Administration	Direct Public Administration	Local Public Administration	Direct Public Administration	Direct Public Administration	Direct Public Administration	Direct Public Administration
Sent to Other Municipality	N	N	N	N	N	N	N	S	N	N	N	N	N	S	N
Existence of Landfills	S	S	N	N	N	S	S	S	S	S	S	N	N	S	N
Collection of Fluorescent Lamps (Existence of Service)															
Collection of Small and Large Batteries (Existence of Service)	N.D.	N.D.	N	S	N	N.D.	N	N.D.	N.D.	N.D.	N	N.D.	N	N.D.	N
Collection of Electronic Waste (Existence of Service)	N.D.	N	N.D.	N	N	N.D.	N	N	N.D.	N	N.D.	N	N.D.	N.D.	N
Collection of Electronic Waste (Existence of Service)	N.D.	N	N.D.	N	N	N.D.	S	S	N.D.	N.D.	N.D.	N	N.D.	N.D.	N
Selective Collection (Existence of Service)	N.D.	N	N.D.	N	N	N.D.	S	S	N.D.	N.D.	N.D.	N	N.D.	N.D.	N
Collection of Health Waste (Existence of Service)	S	N	N	N	S	S	S	S	N	S	S	N	N	N	N
Processing Unit in Municipal Operation (Existence)															
Charges for this Service	S	S	S	S	S	S	S	S	S	N.D.	S	S	S	S	S
Type of Processing Unit	N.D.	CTR	CTRI	V	CTR	ASS/UT/COOP	UT/CS/AC ETR/UTI	N.D.	N.D.	N.D.	U/CTR/ETR/ATT/CSR	CTR	LUXÃO/UTR	AS	CEN/CPG/OI
Receive from Other Municipalities	N.D.	N.D.	S	N	N	N	N	N.D.	N.D.	N.D.	S	S	S	N.D.	S
Participation in Consortium	N	N	N	S	N	S	N	N	Em elaboração	N	N	N	N	N	N
Involvement of Waste Pickers (Even if isolated)	N.D.	S	N.D.	N.D.	S	N.D.	S	S	N.D.	S	N.D.	S	N.D.	S	S
Waste Picker Organization	N.D.	S	N.D.	N.D.	S	N.D.	S	S	N.D.	N	N.D.	S	N.D.	N	S

Source: Elaborated by the authors based on 2013 Snis data.

* only for providing water; ** only for treated sewage

TABLE 4 QUANTITATIVE INDICATORS FOR GAP ANALYSIS OF RJMA BASED ON 2013 SNIS SOLID WASTE DATA

	RJMA Municipalities included in the 2013 SNIS sample														Average for RJMA
	Cachoeiras de Macacu	Duque de Caxias	Itaboraí	Japeri	Magé	Mesquita	Niterói	Nilópolis	Quemados	Itaguaí	Rio de Janeiro	Seropédica	Belford Roxo	Rio Bonito	São Gonçalo
<i>Indicators based on 2013 SNIS data</i>															
Declared population served	75%	99%	99%	100%	85%	100%	100%	100%	93%	96%	90%	75%	90%	73%	99%
% recyclables recovered in relation to quantity of household and public waste	0,20%	N.D.	N.D.	N.D.	0,29%	1,39%	1,02%	0,36%	N.D.	0,53%	0,21%	N.D.	N.D.	N.D.	0,60%
% disposal in landfills	97%	100%	100%	0%	100%	0%	100%	13%	N.D.	99%	84%	92%	100%	100%	100%
% USW destined for triage (independent of whether it originates from selective collection or not)(t)	0%	N.D.	N.D.	N.D.	0%	1%	1%	0%	N.D.	1%	0%	N.D.	0%	N.D.	1%
% Selective collection	0%	N.D.	N.D.	N.D.	0%	1%	1%	0%	N.D.	1%	0%	N.D.	N.D.	N.D.	1%
% health SW collected	1%	N.D.	0%	0%	0%	N.D.	N.D.	N.D.	0%	N.D.	0%	0%	N.D.	0%	0%
% SW collected by waste pickers	0%	N.D.	N.D.	N.D.	0%	1%	1%	0%	N.D.	0%	0%	N.D.	2%	N.D.	N.D.
% coverage of HW collection in relation to total population	75,50%	99,38%	98,83%	100%	85%	100%	100%	100%	93,28%	95,52%	100%	74,87%	90,08%	72,58%	99,09%
Spending	N.D.	N.D.	N.D.	10,09%	2,06%	N.D.	12,17%	N.D.	3,43%	N.D.	6,86%	5,55%	N.D.	3,85%	4,72%

Source: Elaborated by the authors based on 2013 Snis data.

TABLE 5 QUALITATIVE SCALE FOR INTERPRETATION OF PERCENTAGES

0-20	Insignificant
21-40	Minimal
41-60	Intermediate
61-80	Sufficient
81-100	Satisfactory

Source: Elaborated by the authors.

5. RESULTS AND ANALYSIS

Of the 15 objectives of the National Policy on Solid Waste (table 1), only four indicators were identified as corresponding with the many indicators proposed by the Snis (Snis, 2013). These are: the universality of service; environmentally appropriate final disposal; reutilization and recycling; integrated management and sustainability. This limitation may be attributed to the experimental nature of the methodology here proposed which attempts to combine two entities — national policy and a database elaborated by the Ministry of Cities — which operate on different scales, with the PNRS being much broader and the Snis being very specific. The Snis may not correspond directly with the PNRS, but it does supply a broad database which in order to analyze the law requires further elaboration. In this sense, this study's effort lies in selecting and analyzing a part of this data in order to perform gap analysis.

In presenting the results, we first describe the qualitative data organized in table 3, together with the quantitative information presented in table 4.

5.1 A PORTRAIT OF USW MANAGEMENT IN THE RJMA ACCORDING TO THE 2013 SNIS DATA

In most cases, the indicators were created based on data for the specific quantity of total waste collected in a municipality, expressed in the Snis in terms of tons (t), with the exceptions of *population served*, *recyclable recovery percentage* and *municipal spending*. The data shows negligible percentages in relation to: selective collection, reutilization of recyclable material (in relation to the total quantity of household and public waste collected), the percentage of solid waste destined for screening, and the percentage of waste collected by waste collectors associations supported by the municipal government. According to the Snis, the recovery rate for recyclable material in 2013 in the Rio de Janeiro Metropolitan Area was below the national average with a value of 1% for the RJMA and a value of 1.4% for all of Brazil. In relation to this indicator, which corresponds to one of the goals explicitly contemplated by the PNRS (*Reutilization and Recycling*), the Snis data expresses the lack of representivity of smaller municipalities in its sample, which could negatively affect the national scenario. On the other hand, the data points out the low recycling capacity of Brazil given that on the national level, just 4.7% of potentially recoverable material is returned to the market, instead of being disposed in sanitary landfills (Snis, 2013).

For the RJMA, this data regarding recovery seems to be confirmed by the average percentage for selective collection which is also equal to 1%. The PNRS identifies selective collection as the main tool used to separate recyclable materials at the source and gives municipalities responsibility for this service, besides requiring that they be included in municipal plans for the integrated management of USW (Section II, arts. 35, 36; Section III, art. 16.3; Section V, art. 42). As shown by the qualitative data in table 5, only 7 of the 15 municipalities surveyed the Snis in the RJMA have adopted programs of selective collection. Only two of these seven declare that they separate electronic goods as well as used batteries at the source. None of the 15 municipalities, however, separates fluorescent lamps. The remaining eight municipalities, which represent the majority of the sample, declare that they do not practice any selective collection (table 3). However, all 15 of them declare that waste collectors are involved in selective collection, which points to a contradiction in the indicators. Even though the *quantity collected by waste collectors* in relation to the total waste collected is apparently derisory, this indicator cannot be used to evaluate the gap related to the *Integration of Waste Collectors* goal, because the Snis does not provide the exact number of tons derived from selective collection. It is not possible, therefore, to calculate the proportion of quantities collected by waste collectors as a portion of the total tons collected. In general, as has been shown by the qualitative data (table 3), 53% of the sample municipalities declare that they integrate waste collectors in their collection, while the other municipalities have not presented any data. Here is an appropriate point to analyze this information together with the *Organization of Waste Collectors* indicator which shows that the integration of waste collectors does not always involve an association, because it can also involve isolated waste collectors. This result confirms a concern of a previous study about waste collectors cooperatives in the municipality of Rio de Janeiro (Baptista, 2014), which points out the lack of institutionalization in this sector (despite its consideration by the PNRS) and the problem that this gap entails.

[...]. There's a distance between the offices of the policy formulators and the warehouses of the cooperative. There need to be institutions, or in other words, norms recognized by all which induce participation in the policy. [Baptista, 2014]

The data for the environmentally appropriate final disposal of solid waste also requires careful interpretation. In fact, the average of 39% represented in graph 1 is based on the responses of the municipalities, as is the majority of Snis data, and does not take into consideration the differences, conceptions and above all, the attributes of *environmentally appropriate destinations* which are judged to be inappropriate. The PNRS in Art. 3, VII, defines the environmentally appropriate final disposal of solid waste as:

[...] a waste destination that includes reutilization, composting, recovery and the production of energy or other destinations approved by the competent System government bodies, of Sisnama, SNVS and Suasa, for example [...], observing specific operational norms to avoid damage and risks to public health and safety and minimize adverse environmental impacts. [Brasil, 2010]

In fact, the Law sends them again to Sisnama and, *if they exist*, to the municipal plans for the specification of this appropriate form of final destination (Art. 33, III, §6º). However, waste dumps

would be excluded by this definition, though controlled landfills would not necessarily be excluded. For this study's calculations the waste dumps were omitted, which are present in only one of the 15 municipalities surveyed in the RJMA, namely the municipality of Japeri. However, in many cases, controlled landfills, used by three of the 15 municipalities — São Gonçalo, Niterói and Magé — indeed present the characteristics of waste dumps; therefore the percentage of 39% overestimates the achievement of this PNRS objective. The gaps found in the qualitative data (line five of table 3), where more than 50% of the sample data is not available, confirms the need to be careful in terms of the interpretation of this result. There is, in relation to this aspect, a problem with the origin of the measurement standardization process, as well as the characteristics of urban solid waste as well as the types of final disposal on the municipal level, as emphasized by Andrade and Ferreira (2011). The authors point out to the lack, all over Brazil, of weighing machines in the majority of municipalities to weigh the waste and also identify sanitary landfills: “[...] open air waste dumps are termed ‘sanitary landfills’: these are conditions which complicate and make official statistics problematic [...]” (Andrade and Ferreira, 2011).

Andrade and Ferreira's consideration is confirmed by the results of our study. As the data in line 12 of table 3 for the municipality of Duque de Caxias, where the Jardim Gramacho waste dump, the largest in Latin America, was located until closing down in June 2012, shows by declaring that it has a deactivated landfill in 2013. In addition, multiple denominations are used and the Snis's own nomenclature presents redundancies, as shown in table 6, which uses the ministry's database glossary. An example of this is that within the same nomenclature it is possible to find the term “landfill” (without any adjective) as well as “sanitary landfill” and “controlled landfill,” generating misunderstanding in the data analysis.

The data shows that almost 100% of the sample separates health industry waste (table 5), even though 33% of these do not provide information in terms of quantities (table 4). In the other cases, the quantitative data shows very low percentages of this type of waste in terms of the total waste collected. This information contributes to the overall picture of USW in the RJMA, but does not help in the gap analysis of the PNRS, because these figures are not relative, but rather absolute, and are calculated in relation to the total quantities produced by each municipality.

The economic sustainability indicator (graph 1) shows a low average investment for the RJMA, with average spending of 6% by these municipalities in the management of solid waste. This indicator attracts our attention because it also shows how one of the highest values of spending is related to a single municipality in this sample that sends its waste directly to waste dumps, this being Japeri, which is also the municipality with the lowest revenues in the RJMA; 10% of the spending for a municipality with low revenues is a considerable percentage, which shows that the inadequate management of USW⁴ is not necessarily associated with lower management costs. Andrade and Ferreira, using data from IBGE (the Brazilian Institute of Geography and Statistics) argue that low investment in USW is a problem throughout Brazil, since more than half of Brazilian municipalities

⁴ Japeri does not provide data about selective collection, recycling and the involvement of waste collectors, but just the inappropriate disposal of 100% of the waste it produces.

do not charge for USW collection services and sanitation, which makes it impossible to provide quality services (Andrade and Ferreira, 2011). This also does not encourage, according to the authors, investment in USW management, since this activity normally does not have its own funding, and financial resources are usually found in other areas of the municipal budget, because they are not prioritized by the local administrations (Andrade and Ferreira, 2011). However, observing table 5, it is possible to verify in the Snis sample that 80% of the RJMA municipalities charge for their USW management services, with only three municipalities declaring that they do not charge for this service: Duque de Caxias, Queimados and Seropédica. The Snis, however, does not specify the way in which these services are charged: whether it is a part of the IPTU real estate tax or whether there is a specific charge for waste. The qualitative data also shows that in 80% of the RJMA sample municipalities, it is the municipal public administration that directly manage these services, with there being only three cases of separate entities engaging in direct administration and two mixed private-public organizations, and these, in any event, also involve the local government. This result draws our attention if we look at the data for the population served and the percentage of coverage provided by the household waste collection service compared to the total population (table 4). “Population served” and “Charge for the service” are the only indicators with complete data out of the Snis data selected for this study. The former indicator expresses high percentages for the entire sample with an average of 92% for the entire Metropolitan Area. It is outside of the specific objectives of this study to focus on the financial aspects of USW management in the RJMA, but it should be noted that it is incongruous that there is a low level of investment and spending on the part of the municipalities of the RJMA, and the fact that most citizens are charged for this service, even in an indirect manner, with all of these municipalities having populations above 50 thousand inhabitants, and with Rio de Janeiro having more than 6 million (6,429,923 inhabitants). In four of the 15 municipalities considered, the value of taxes is added to the revenues from receiving waste from other municipalities. This is the case with Itaboraí, Rio de Janeiro, São Gonçalo and Seropédica. These are units for the final disposal of SWU, most of them being landfills, which generally receive a quota, and not a total of the waste produced by neighboring municipalities. In fact, 60% of the sample municipalities declare that they have active processing units within their territory. Finally, in relation to the *Integrated management and sustainability* indicator, besides the data previously presented for economic sustainability in terms of the definition cited by the law, we should also note the data for the participation of consortiums presented in table 3. Just 13% of the sample municipalities declare that they participate in intermunicipal consortiums to handle solid waste, with the two municipalities of Japeri and Mesquita being the only ones, according to the most recent Snis data, to declare that they are part of this type of intermunicipal institution. However, this information conflicts with the declarations reported by investigative journalists (Thuswohl, 2014) and official information distributed by the state government (Inea, 2015), as will be explained in the next paragraph.

In considering this information as a reference for the implementation of the PNRS in the RJMA, the absence of some data must be taken into account. For six of the nine indicators considered, roughly 40-50% of the data is missing; between five and seven municipalities for each indicator have not provided information.

TABLE 6 ABBREVIATIONS FOR LINE 12 OF TABLE 3

Industrial Waste Treatment Center	CTRI
Sanitary Landfill	AS
Waste Dump	L
Waste Dump	V
Association	ASS
Controlled Landfill	AC
Triage Plant	UTr
Sanitary Cell	CS
Incineration Treatment Unit	UTI
Treatment Station	ETR
Overflow and Triage Area	ATT
Plant	U
Landfill	A
Cooperative	COOP
Debris Center	CEN
Branch and Trimming Center	CPG
Incinerator Operation	OI
Landfill	CTR

Source: Abbreviations elaborated by the authors for 2013 Snis nomenclature.

5.2 GAP ANALYSIS

Evaluating the Snis data in terms of the implementation of the PNRS objectives and identifying the gaps, as mentioned above, means observing whether the guidelines of national policy have been adopted by local governments and in fact implemented. This type of question has been addressed before by other institutionalist researchers in other contexts and in other areas of policy (Tolbert and Zucker, 1983). For example, Tolbert and Zucker (1983) have analyzed the institutionalization process of the National Reform of the American Civil Service between 1880 and 1935. The authors define the term “adoption” as the local government’s acquisition of each of the legal requirements solicited by law and find that in most cases the municipalities acquired only a part of these norms. In the case of the study presented here, the federal law identifies guidelines and not specific norms to be applied. Thus, the process under discussion shows, through the Snis indicators used, how difficult it is to find municipal policies that apply the content of these guidelines.

By aggregating six of the quantitative Snis indicators, it was possible to create three macroindicators and, combining these with the spending percentage, we were able to obtain four indicators to be complemented by the qualitative information collected for the gap analysis. The result is summarized in table 7 (a summary of the gaps in the implementation of the law’s objectives), which shows that the Snis does not contemplate indicators for 7 of the 15 identified by the PNRS. Some of these, like *Reverse logistics* and *Environmental Labeling*, are in fact more related to market actors, such as individual producers and companies, but others like *Sustainable public purchases* and *Technical capacity* are strictly associated with local governments, the object of this study. Thus, the objective of

not generating waste cannot be evaluated through this database. On the other hand, the objective *Reducing the quantity of waste produced* would imply a longitudinal analysis, using previous Snis data.

However, for the other six objectives, by combining the Snis's quantitative and qualitative data, it is possible visualize the management situation, which is still incipient when it is not unsatisfactory in relation to the PNRS targets.

In relation to the *Protection of public health*, on one hand, the *Percentage of the population served* indicator appears to achieve an advanced level, according to the reference scale adopted by this study (table 5). On the other hand, the other indicators related to this objective, such as *Percentage of waste destined for screening* and *Existence of waste dumps*, like *Percentage of selective collection*, takes the achievement of this target to the lowest level.

Graph 1 indicates this, showing that the PNRS objective of reutilization and recycling is far from being accomplished in the municipalities of the RJMA. This data has been confirmed by investigative journalists (Thuswohl, 2014) who, based on interviews with consultants working with the Legislative Assembly of the State of Rio de Janeiro (Alerj), report that selective collection programs on a large scale are lacking in the entire state of Rio de Janeiro. This same source points out that the city of Rio de Janeiro itself, the second largest generator of solid waste in all of Brazil (Abrelpe, 2012), has a value of 0.5% for selective collection, which is below the national average.

In relation to *Integrated management and sustainability*, in addition to the low level of investment expressed by the *Municipal spending* indicator, the Snis data suggests that there is minimum integration with intermunicipal consortiums. On the other hand, this information contrasts with news found on the websites of local governments (Agernersa, 2014; Inea, 2015) which indicate seven solid waste consortiums in all of the municipalities of the state of Rio de Janeiro (Agernersa, 2014), of which six are active (Inea, 2015). Among these, Inea cites the Baixada Fluminense Consortium which would include the municipalities of Belford Roxo, Duque de Caxias and Nilópolis in addition to the municipalities of Mesquita, Nova Iguaçu and São João de Meriti, even though there is no consortium indicated in the 2013 Snis data. Recent data (Dec. 2016) from Inea reveals that this consortium is not in fact operating. In principle, it would operate in the management of civil construction waste, but not even this initial activity is taking place.

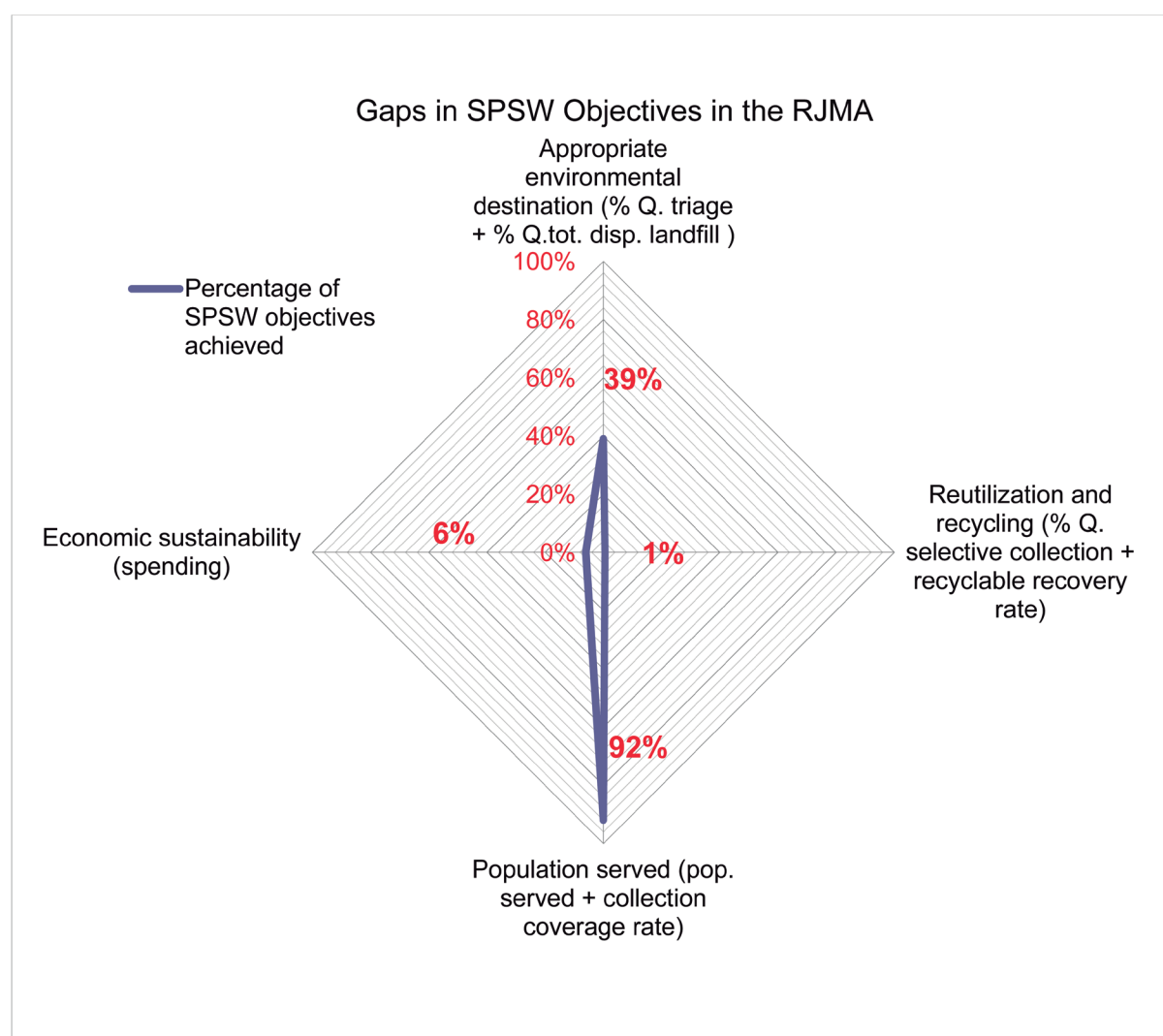
The average for environmentally appropriate disposal derived from the Snis data (an average of 39%) may be considered optimistic when compared to updated information from the press (Thuswohl, 2014), because it does not take into account the existence of clandestine waste dumps operating by drug lords (O Eco, 2014) and the effective conditions of the units defined as sanitary and controlled landfills. The Seropédica landfill, which after the closing of the Jardim Gramacho waste dump has turned into the main final destination of USW in the RJMA, accepting 8 thousand tons of garbage daily (household and other types), according to the Municipal Company Comlurb (Thuswohl, 2014), is located near the main water source in the region, the Guandu River, and above the Piranema Aquifer.

The universality of service indicator is the only one that presents a satisfactory level. However, the law's objective is also "regularity, continuity and functionality," but these properties are not contemplated in the Snis survey. It is also important to consider that the data about the service's dimensions is provided by the municipalities involved in the study themselves and not by external oversight en-

tities. Thus, it makes sense to discount from this high percentage of attainment for this goal a certain percentage due to the degree of partiality present in the answers provided to the Snis.

In relation to the objective of integrating the waste collectors, both the qualitative Snis data as well as press information confirm that there is still a minimal commitment on the part of the municipalities of the RJMA. The qualitative data shows that most of the waste collectors are isolated and not organized. In fact, the press points out that the projects involving waste collectors today in the RJMA are being promoted by the use of external resources (by, for example, Petrobras) and implemented by NGOs, and are not initiatives by these municipalities.

GRAPH 1 GAPS MEASURED BY 2013 SNIS SOLID WASTE INDICATORS



Source: Elaborated by the authors based on 2013 Snis data.

TABLE 7 SUMMARY TABLE OF THE GAPS IN THE IMPLEMENTATION OF THE LAW'S OBJECTIVES

PNRS objective (Law no. 12,305/2010)	Situation in the RJMA based on the Snis
Not generating waste/Reducing the quantity of waste produced	No information /Future research
Protection of public health	<i>Minimal</i>
Reducing hazardous waste	No information
Environmentally appropriate final disposal	<i>Minimal</i>
Reutilization and recycling	<i>Insignificant</i>
Integrated management and sustainability	<i>Minimal</i>
Technical capacity	No information
Reverse logistics	No information
Integration of waste collectors	<i>Minimal</i>
Sustainable public purchases	No information
Clean technologies	No information
Producing energy from waste	<i>Insignificant</i>
Environmental labeling	No information
Sustainable consumption	No information
Regularity, continuity, functionality and the universality of services provided	No information/ <i>Satisfactory</i>

Source: Elaborated by the authors based on 2013 Snis data.

6. CONCLUSIONS

This study makes two main contributions: a) theoretical-methodological, b) empirical and practical. On the theoretical level, this work expands the administrative literature devoted to the PNRS, which is still limited (Heber and Silva, 2014) and offers several reflections in the form of hypotheses about this policy's weak processes of implementation and institutionalization on the local level based on the work of institutionalist authors. At the same time, this study proposes an innovative methodological tool for the monitoring of a fundamental public policy and the possible improvements to be made to the Snis. From the empirical point of view, this study contributes to the construction of a picture of the solid waste management situation within the specific context of the Rio de Janeiro Metropolitan Area, the second largest metropolitan region in the country in demographic and economic terms and therefore also in terms of the quantity of waste produced (Abrelpe, 2012), indicating the relative situation of the sample municipalities in terms of the main guiding elements of the PNRS. The empirical section of this study also presents important data that can help the practice of policy and the administration of urban solid waste management. In observing these local governments through the main source of public sanitation statistics in Brazil, this study shows that the institutionalization process of solid waste management in the Rio de Janeiro Metropolitan Area, in terms of the PNRS

framework, is still in an incipient phase. However, in the light of institutional studies, this finding does not appear to be an exceptional nor inexplicable result for the state or for Brazil as a whole.

Tolbert and Zucker (1983) conclude in their study of municipalities in the United States that the role of state government, as an intermediate level of government, was crucial in a faster and effective adoption of national reform on the municipal level. In the case of the RJMA, in which the Pers and the PNRS constitute two parallel and disjointed frameworks, municipalities, in many cases with few financial resources as emphasized by the Brazilian authors cited here, are submitted to two different jurisdictions, the national and the state, with no coordination between them or much support from the other levels of the government in the local implementation of policy.

Secondly, we can interpret the findings of this study from the point of view of the institutional discussions of Selznick's (1996) basic considerations. In studying large industrial ventures, Selznick on one hand argues that the bureaucratization process of these organizations has ensured greater protection of workers' rights and has placed limits on the power of the managers. On the other hand, he observes that the introduction of laws in these peculiar forms of "private government" that constitute large industrial firms has not guaranteed the legalization of these activities. Selznick emphasizes in this sense the role to be played by the political dimension. To this sociologist, the effective adoption of rules, which he calls the process of "legalizing industrial life," would have occurred only through gains made through participating in collective bargaining and its dynamics, or in other words, institution building collective processes which are able to regulate life in general within the organization.

This reflection, even though it comes from a different research context, also applies to the implementation of the PNRS. In fact, among the other Brazilian studies cited, only that of Silva Filho and partners (2009), based on a case study in Rio Grande do Sul, reports an effective application of public laws, but it is associated with the active participation of members of organized civil society. If this type of articulation has or has not occurred in the RJMA as well is not the object of this study, but the present discussion leads to the question that identifies the first area that requires further examination in future research. Ten years after Selznick, institutional economists such as Searle and Hodgson went further in deepening Selznick's intuitions, insisting on there being a difference between rules, norms and institutions. Working with the concepts of habits, beliefs and sometimes entering controversial behaviorist territory, these authors emphasize the reciprocal relationship between habits and institutions (Hodgson, 2006). From this point of view, one cannot institutionalize a law and make it legitimate and recognized by the community without its principles belonging to or being in consonance with the habits of the community. For an institutionalization process to occur, habits and norms have to flow together, becoming a single whole and making the opposition between the formal and informal institution pointless and useless. This cultural dimension of institutionalism, frequently rejected by institutionalists with a more political focus (Amenta and Ramsey, 2010), has also not been included in this study, but once again it identifies a possible path to be investigated in order to understand the real challenges of implementing the PNRS in these municipalities. This study has emphasized the tendency of laws, plans and programs to superimpose targets and objectives, without any communication between them while at the same time excluding the cultural and relationship (or habitual) dimensions. In this sense, future research on this subject could take into account the political cultural of regional/local administration (for the Rio de Janeiro

Metropolitan Area and the Lowlands of the State of Rio de Janeiro). In a certain form, the studies of Greenwood and Hinings (1996) of inertia and organizational change can help us understand, even to a lesser extent, the incipient level of the adoption of the PNRS guidelines that we have witnessed. The argument used by these authors, which is in line with other sociological institutionalists and is also utilized by Almeida et al in their case study of Pernambuco (Almeida et al., 2015), is that the roots of these norms constitute an obstacle to change. In the present case, in which the norm itself is the element of change, perhaps it is the roots of non-written norms and habits in Hodgson's sense which are in conflict with the law, or simply culturally distant from them, which may have been an obstacle to the institutionalization process up until now. We return then to the need for deeper studies of the regional/local political-administrative culture. In addition to these theoretical reflections, this work contains relevant considerations on the empirical level which offer important warnings in terms of the quality of government practices in this area, both within the local and national spheres. The gaps found above are also all related to the information databases themselves, because the Snis does not provide information for 60% of the indicators defined by the PNRS objectives and identified by this study. This study also demonstrates that there is a weak commitment on the part of the municipal governments in terms of USW management, given that the average investment in this area represents just 6% of total spending. As a result, the other largest gaps are related to the objectives of *reutilization and recycling, selective collection, the integration of waste collectors and the production of energy*, which are all aspects that require the development of targeted programs and capital investment. This study is limited in terms of the exploratory nature of its methodology and use of secondary data sources. Even so, it represents a pilot study for future research following the theoretical paths traced above, the empirical gaps identified here, and the reproduction of our proposed methodology.

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