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The challenges for solid waste management in accordance with Agenda 21: A Brazilian case review

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Abstract

This paper aims to evaluate the suitability of the Brazilian solid waste policy (BSWP) with global Agenda 21 and the challenges of implementing the BSWP in municipalities. For this, a review of the principles that guided the creation of this policy was performed to demonstrate that international pressures were important in determining its effectiveness. The contradictory relationship between the satisfactory legal framework that established the Brazilian waste management policy and its weakened implementation in the municipalities is also examined . To illustrate the difficulties faced at the local level, a case study involving municipalities that compose the state of Espírito Santowe was undertaken. In this state, the municipalities signed terms of environmental commitment with supervisory agencies who undertook, within a pre-established schedule, to implement a set of actions to shape the proper management of solid waste, adapted to the requirements of national policy and the guidelines of Agenda 21. Finally, the various difficulties in meeting the requirements are discussed. It is necessary and urgent that Brazil finds a way to coordinate the mechanisms of an innovative and well formulated legal instrument to ensure the successful implementation of solid waste management at the local level to achieve the environmental, economic and social objectives

Keywords

Solid waste management, Brazilian solid waste policy, Agenda 21, public policy implementation, local authorities, challenges

Introduction

The acceleration of industrialization on a global scale during the last century, the population boom and the resulting intensification of urbanization, especially in developing countries, have transformed the relationships between the environment and society. Despite remarkable production increases in food and manufactured goods, greater social differences have developed within countries and between rich and poor countries. In addition, increasing supply (industrialization) and demand (population growth) for goods and services has promoted significant environmental pressure.

In accordance with worldwide transformations, changes in Brazil were significant, especially for economic growth indicators and based on the greater access of the population to a consumption pattern (hitherto) that only exists in the most developed countries. Brazil has the seventh largest economy in the world with a GDP of BRL 4,84 trillion equivalent to USD 2.4 trillion in 2013 (IBGE, 2014, IMF, 2014) and according to estimates from the CEBR (2013), Brazil will occupy the fifth position until 2015.

When access to goods and services are increased, other changes in consumption habits increase the demand for natural resources. The population increasingly relies on nature to satisfy its desires. Consequently, increasing pressure is applied to the environment. To understand the causal relationships of this process, the United Nations held a series of events that were aimed at promoting an alternative to the development model that is usually utilized worldwide.

Thus, since the 1960s, discussion of environmental issues has intensified, including discussions about solid waste management. Agenda 21 is the major document produced and endorsed by the United Nations Conference on Environment and Development (known as the 'Earth Summit'). Global Agenda 21 is a reference document that guides governments in several spheres to plan and execute actions that promote a balanced use of environmental assets in contemporary societies. This constitutes an unprecedented commitment by the international community to an integrated

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framework of shared values, objectives, priorities and actions (Jalas, 2012; Ngah et al., 2011).

Agenda 21 contains conceptual innovations and proposed programmes and actions that place requirements on public managers. To meet the challenges of its implementation, the United Nations recommended that signatory countries should create development councils and national action plans. The Brazilian Agenda 21 – BRA21 (published in 2002) established a programme to promote Local Agenda 21 (LA21) (MMA, 2002). Moreover, the guidelines for the modernization of social and environmental agenda were identified in the Brazilian document to create a systemic view of the various development dimensions (Kohler, 2003; Malheiros et al., 2008).

This environmental vision occurs in a country in which unplanned city and economic growth increases the generation of waste based on the premise of Leal et al. (2002). This premise interweaves the increased production and consumption stimulus with the generation of municipal solid waste (MSW). During periods of economic progress, the urban services infrastructure in municipalities, such as the municipal solid waste management system (MSWM), has not been accompanied by increasing waste generation (as observed in other countries) (UNEP, 2005). Thus, to minimize problems due to inefficient solid waste management, the Multiannual Investment Plan of the Brazilian government provides a set of actions for applying the national Agenda 21 guidelines, which are aimed at solid waste management throughout Brazilian territory. Thus, the requirements of the BSWP which was sanctioned in 2010 must be met. The challenge for public and private organizations imposed by the BSWP is to eradicate dumps by 2014 and to deploy selective collection, reverse logistics and organic waste composting to make sanitary landfill maintenance feasible. To ensure the implementation of the BSWP, the Brazilian government may only sign agreements and contracts that transfer federal funds to states and municipalities if they have formulated MSWM plans (Brazil, 2012).

To achieve the purposes of the plan, local action strategies must be well defined and managed by the municipalities. This process is necessary because each region has specific characteristics and difficulties that are specific to the cities growth pattern, local potential, needs and volume of generated waste. However, although Brazilian environmental legislation is among the most comprehensive in the world (UNEP, 2013), the guidelines of Agenda 21 effected in relation to solid waste are far from desirable, even when considering the year of 2014 as a milestone towards dump eradication. For municipalities, the challenges for changing reality are different. However, these areas stand out as having the most efficient capacity planning and public service management (Guarnieri, 2011).

This paper aims to evaluate the suitability of the BSWP with global Agenda 21 and the challenges of implementing the BSWP in municipalities. It has been divided into five sections in addition to the introduction. The second section contains a brief review of environmental policy evolution worldwide, which identifies Brazil as a state for consideration in the drafting of Agenda 21. In the third section, the evolution of the regulatory framework of solid waste in Brazil is presented by considering this legal instrument as an offshoot of Agenda 21. The fourth section is dedicated to the Brazilian solid waste policy and discusses the suitability of the BSWP principles relative to Agenda 21. The fifth section considers the state of Brazil for case analysis and highlights the main difficulties for effectively implementing policy in municipal regions. From the case analysed, the final section provides a discussion about the main challenges observed, as well as a proposed interpretation.

Environmental policy evolution and the Brazilian context

Popular concern about environmental degradation due to the negligence of responsible authorities began an environmental movement in the 1960s that resulted in the growth of the environmental movement and in the realization of the First World Conference on the Human Environment in Stockholm (1972). This UN conference was a milestone that resulted in the discussion of sustainable development actions (i.e. a new form of development that ensures the availability of resources for the next generations) (Baylis and Smith, 1997; Nowosielski et al., 2007; UN, 1972; World Commission on Environment and Development, 1987).

In June 1992, Rio de Janeiro hosted the United Nations Conference on Environment and Development (UNCED), known as the Earth Summit or Rio 92. During this conference, Global Agenda 21 were created and demonstrates the global consensus over two decades on the concept of sustainability introduced by the 1972 Stockholm Conference, connecting environment and development (Barbieri 2004; Llamas-Sanchez et al., 2013; Mebratu, 1998; Ngah et al., 2011; UN, 1993).

This agenda reconciled environmental protection, social justice and economic efficiency methods and placed a requirement for a deep restructuring of waste policy on the governments (Bárcena, 1994). This document is divided into 40 chapters that include chapters on energy, transport, waste, economic instruments and technology and social inequality among others (UN, 1993). In chapter 21, problems related to solid waste are discussed to provide strategies for promoting sustainable development. To ensure that the proposed national public policy goals were achieved, four main action areas were focused on, including minimizing waste, increasing maximum waste reuse and recycling, proper waste disposal (treatment and deposit) and expanding the scope of waste services. Although these four areas are interrelated and complementary, they should be integrated to ensure the environmentally sound management of municipal solid waste (MMA, 2002).

The global benefits that will derive from implementing Agenda 21 should provide developing countries with financial and technological frameworks that enable them to fulfill their commitments. The cost of inactivity could outweigh the financial costs of implementing Agenda 21 and could limit the options of future generations. To ensure the success of Agenda 21, it is

necessary to translate Agenda 21 into national policies and its programmes into processes that integrate environmental considerations and development with national and local priorities. It must be realized that the appropriateness of these policies at the different levels of coverage (global, national, regional and local) is a challenge due to the considerable variation in local authority domains across the member states, as well as the wide diversity in specific types of local and regional authority within the member states (Lafferty and Eckerberg, 2013).

By seeking to promote integrated waste management in municipalities and prevent discontinuities due to management changes, the federal government imposed the responsibility for designing public policies on states and municipalities. These policies have gradually organized the sector and improved the institutional and operational capacities. Thus, this policy has been applied to the states and municipalities throughout the implementation period of the BSWP.

It is however necessary to realize that this implementation is a great challenge due to the deeper structural transformations in Brazil that occurred throughout the twentieth century but mainly during the second half. The population has increased by 1820.9% since the first Brazilian Census of 1872 (IBGE, 2012). From a demographic point of view, a sudden change occurred in the distribution of people between urban and rural areas (Camarano and Beltrão, 2000). Between 1960 and 2010, the number of municipalities in Brazil increased from 2766 to 5565, with an average growth rate of 16% per decade. The population census of 2010 indicated an urbanization rate of approximately 84.4% (i.e. more than 160 million Brazilian citizens living in urban areas) (IBGE, 2012). During this time, Brazil became an industrialized economy. Naturally, this movement has reconfigured the Brazilian territorial space regarding the migration of workers seeking opportunities (Malheiros et al., 2008).

It is also interesting to note that even in the early twentieth century sanitary conditions in Brazil were quite poor. Given this diagnosis, many urban policies were implemented in major urban centres, with sanitation works, expansion of streets and construction of large-sized public buildings. To accomplish these operations, entire populations were displaced to distant parts of the central areas (Hogan et al., 2001), contributing to the disorganized expansion of urban boundaries, as the vegetative and economic growth observed subsequently resulted in the conurbation of the two areas (central and peripheral). An emblematic example is the region of the Cidade de Deus, in the city of Rio de Janeiro.

All spatial transformations resulted in the consolidation of urban slums in Brazil. Cities that grew without planning were not accompanied by concomitant growth of managerial capabilities to provide basic public services, such as education, health and environmental sanitation (Santos Jr, 2013; Wood and Carvalho, 1983).

The proliferation of urban areas has contributed to the exponential growth of generated solid waste (by volume). Without the necessary planning and with a lack of established institutions (especially laws and environmental standards duly complied), the proliferation of inadequate waste disposal occurs (residential, industrial, hospital, etc.). The generation of MSW increased by 1.8% between 2010 and 2011, an increase rate that was greater than the rate of urban population increase which was 0.9% (ABRELPE, 2012). In addition, the survey showed that approximately 10% of these waste materials were not collected in 2011, which was equivalent to 6.4 million tonnes of waste.

Despite high levels of waste collection (approximately 90%), the disposal of collected MSW in Brazil is precarious. Of all the waste collected in 2011, 42% was inadequately accounted for or routed (ABRELPE, 2012) to controlled landfills or garbage dumps that lacked the necessary components for protecting the environment and human health. With this scenario, a major challenge of this law is to eradicate the 2906 existing garbage dumps in 2810 municipalities by 2 August 2014 (the date of the BSWP enactment) (IPEA, 2012).

Among the requirements of the BSWP (besides the eradication of garbage dumps), the municipalities must commit to optimizing the life of their sanitary landfills through selective collection, implementation of reverse logistics and engaging collectors in the selective collection and recycling of materials (Brazil, 2010a). The states found a way to achieve these goals in the 12.305/2010 law, especially regarding the eradication of garbage dumps. The states created public consortia for solid waste management that were aimed at minimizing the problems faced by small municipalities (whether due to a need for skilled labour or lack of financial resources).

In the next section, the main regulatory frameworks that preceded the enactment of BSWP are presented, demonstrating the relevance of Agenda 21 for the development of this policy.

The heritage of Agenda 21: The evolution of the regulatory framework of solid waste in Brazil

The Agenda 21 is a blueprint for meeting the challenges of environment and development into the next century (Bárcena, 1994; Llamas-Sanchez et al., 2013; Ngah et al., 2011). To accomplish this goal, national, regional and local efforts are necessary to achieve a more sustainable future (Lafferty and Eckerberg, 2013). Agenda 21 recommended that by 1996 local authorities should develop a consensus on a local version of Agenda 21 for their communities (DECLG, 1995). Locally Agenda 21 has been one of the most extensive follow-up programmes to UNCED and is widely cited as a success in linking global goals to local action. Thus, local community participation is the cornerstone in the so-called LA21 (Brandt and Svendsen, 2013; UN-DESA, 2012). In this way, the Brazilian government was committed to prepare a national Agenda 21 which contained a sustainable development strategy involving concerted efforts at every level of government and society to change behaviour and consumption patterns, as shown in Figure 1.

Among the many issues addressed by Agenda 21, the Brazilian basic sanitation policy (BBSP) was regulated by the law Nº

Figure 1. Policy hierarchie framework.

11,445/2007 (Brazil, 2007). In Brazil, the guidelines adopted by the public sanitation services are divided into four components, including drinking water supply, sanitation, urban sanitation and solid waste management, and drainage and storm-water management. The BBSP defines the service management of municipal solid waste as composed of a set of activities, infrastructure and collection facilities, trans-shipment and waste transportation, screening for reuse or recycling, treatment (including composting), and disposal from sweeping and cleaning streets. This is an attempt the achieve target 10 of the Millennium Development Goals which aims to halve the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015 (Lenton et al., 2006).

The BSWP is subordinated to the Brazilian sanitation policy (Brazil, 2007). The first legal efforts for MSW management in Brazil emerged in 1980. The support given by the 1988 Constitution of environmental issues is noteworthy. However, actions for creating the BSWP were initiated to achieve the goals of Agenda 21 on early 1990s. After 20 years of debates between the Ministries of Environment, Cities, Health, Development, Industry and Foreign Trade, Planning, Budget and Management, Social Development and Fight Against Hunger, Finance and Civil House and legal proceedings, the final release of this bill was passed in 2010, when the country finally sanctioned Law No. 12.305/2010, the National Solid Waste Policy (Brazil, 2010a, b; Grimberg, 2007; Lopes, 2006; Nascimento Neto, 2013).

This law established a new vision of environmental responsibility that focused on solid waste management and resulted in progress towards sustainable practices (Marchese et al., 2011). An important innovation of this law for the country was the definition of the polluter responsibility regardless of the existence of fault (Pearce and Atkinson, 1993). In addition, this policy provides principles, objectives, instruments, guidelines, goals and actions for integrated and solid waste management practices that are environmentally friendly (Nascimento Neto, 2013).

According to Machado (2012), the principles that guide the BSWP, are principles of prevention, precaution, polluter pays, shared responsibility, cooperation and protector receives. The author indicates that the BSWP establishes an order of priority for solid waste management in which preventing the generation of solid waste is a priority with legal force. Specifically, the sequence identified in the law is as follows: waste reduction, waste reuse, recycling, waste treatment and environmentally appropriate disposal of waste (Machado, 2012). This orientation is important because it targets the 3Rs (reduce, reuse, recycle), which is primarily aimed at reducing the waste generation for later reuse or recycling. This order of priority is also mentioned in the literature (De Brito, 2003; Rogers and Tibben-Lembke, 1999; Wilson et al., 2012).

For Brazil, the requirement of sharing responsibilities is an innovation aimed at meeting the requirements of Agenda 21. Wilson et al. (2012) notes that shared responsibility is a legal recourse that comprises the entire supply chain (including the consumer) to provide effective collaboration between those responsible for waste generation and reuse or disposal. For sharing, cooperation is necessary to obtain integrated solid waste management. Therefore, in the BSWP, cooperation aims to prevent the various responsibilities of those involved in solid waste management that is not disarticulated. However, a coordination chain involves the creation of motivation mechanisms (Chopra and Meindl, 2011), as provided by the BSWP in the protector receives principle. The applicability of this principle is complex, however BSWP overcome this obstacle and has provided the articulation of this mechanism involving all participants (Machado, 2012).

The UN considers the BSWP as a successful national action on waste management due to the ability to hierarchically apply all the principles in a practice and integrated manner, creating incentive mechanisms, including economic ones (May, 2003), to involve all participants. Furthermore, UNEP (2013) highlights that the BSWP gives special attention to the integration of the informal sector into the waste management system. Municipal authorities in developing countries have invested in selective collection systems in partnership with collectors organizations, according to models developed from their different local dynamics and this method of waste management has become a benchmark for other countries, mainly due to the increase in economic investments and legislation approved by the federal government (Ribeiro et al., 2009; Samson, 2007; Scheinberg, 2012).

In addition, the BSWP establishes a link between different public administration levels and the business sector. This link considers technical and financial cooperation for integrated solid waste management. However, municipalities still bear considerable responsibility because they represent the closest administrative public sphere of everyday problems (i.e. they act directly on the problem). Local authorities have a key role to play in this regard because they are an essential factor to support and contribute to efficient waste management implementation.

The next section presents the legal–institutional framework that was created by Brazil to address the municipal solid waste problem. Brazilian environmental legislation is among the most appropriate in the world (UNEP, 2013). However, Brazil faces many challenges in implementing all policies. These challenges compromise the goals established in Brazilian Agenda 21, as discussed in the next but one section.

The Brazilian solid waste policy: An integrated sustainable waste management policy

The BSWP has federal coverage, but it gives autonomy to the states and municipalities to formulate their own policies. Thus, the BSWP aims to promote LA21 and integrated and sustainable development. Furthermore, chapter 28 of Agenda 21 urges councils to strive for sustainability on a local level, encouraging municipalities to implement LA21 programmes. However, this chapter differs from others, because it is specifically procedural. They stipulate specific dates for activities such as the establishment of cooperation and coordination between local authorities (Lafferty and Eckerberg, 2013). Regarding this deadlines, Brazil fulfilled the requirements after the limit, namely with a delay.

The Act that established the BSWP determines the development of a solid waste management plan for waste from public sanitation, industrial, health and mining sources. Radioactive waste is regulated by specific laws. All pesticide containers, batteries, tyres, lubricants (and their packaging), lamps and electronic equipment that are discarded by consumers must go through a reverse logistics process (involving retailers, distributors and manufacturers) for disposal at appropriate locations. Construction waste and demolition materials cannot be sent to dumps and must be correctly disposed of environmentally. Reverse logistics for these products is being made possible through sectoral agreements (SINIR, 2014). Reverse logistics is the process of moving goods from their typical final destination for the purpose of capturing value, or proper disposal (Chaves and Batalha, 2006; Dowlatshahi, 2000; Hawks, 2006; Lambert et al., 2011; Rogers and Tibben-Lembke, 1999). The purpose of the sectoral agreements is to ensure that solid waste is reused, recycled or assembled by a responsible industry. Sectoral agreements with various production chains will be signed. Thus, manufacturers, distributors, retailers and consumers should share the responsibility for waste (Jacobi and Besen, 2011).

If hazardous products are to be managed by the private sector, a major challenge for municipalities is requiring that all public authorities be prohibited from using open sewers (dumps) and controlled landfills, regardless of their size. The waste can only be sent to sanitary landfills until 2 August 2014. In addition, residues may only be disposed of if there is no possibility of recycling and reuse. Composting is required for organic waste materials. Currently, only 10% of municipalities have a municipal solid waste plan. In addition, many of the remaining cities of the country will not comply with the deadline (according to the National Confederation of Municipalities Research, 2013).

The Act also stipulates that municipalities must implement selective collection with the participation of cooperatives and other collector associations of reusable and recyclable materials by individuals with low incomes. This guidance is supported by Decree No. 7405/2010 (Brazil, 2010c), which establishes the pro-collector programme to integrate and coordinate the actions of the federal government that are directed at assisting and fomenting the productive organization of reusable and recyclable material collectors. In Brazil, collectors of reusable and recyclable materials are low-income people who are dedicated to collecting, sorting, repairing, refurbishing, processing and selling of reusable and recyclable materials (de Medeiros and Macêdo, 2006; Miura and Sawaia, 2013).

The objective of this programme is to improve working conditions and increase opportunities for social and economic inclusion of collectors with the resulting expansion of selective solid waste collection, reuse and recycling. Thus, this programme caters to the eighth goal of BRA21, which seeks social inclusion and income distribution. This link is essential for making solid waste management possible and efficient along the reverse chain (i.e. the collectors are the agents that enable the reverse logistics of various materials) (Bortoli, 2013; Pereira Neto, 2011; Streit, 2013).

Xavier and Correa (2013) indicate that the activity of collecting is an attractive option for professional companies that emerge as an interesting alternative for the government in both practical and financial terms as they reduce the high costs of waste collection in the country. Large Brazilian companies, such as Suzano, Klabin and Tetrapak, have already worked with collector cooperatives for several years. These companies negotiate to buy recyclable materials for replenishment in the same or in a different production chain. According to Guarnieri (2011), the integration of associations and cooperatives of solid waste management collectors differentiates Brazilian legislation relative to the legislation of other countries.

The BSWP also defines the so-called economic instruments (SIs) to enable its implementation. The evaluation of a solid waste management system's financial viability is complex (Wilson et al., 2012) but the SIs proposed by BSWP are used with the purpose of internalizing the costs of producing the negative environmental externalities caused by the production process or the use of environmental resources (Teixeira, 2013). The BSWP proposes, in this sense, that it is the responsibility of government to institute inducing measures and credit lines to meet the initiatives to prevent and reduce the generation of solid waste in the production process, development of products with minor impacts to human health and the quality environment in its life cycle; deployment of physical infrastructure and equipment acquisition to cooperatives or other forms of association of reusable and recyclable materials collectors formed by low-income individuals; development of solid waste management intercity projects; structuring of a selective collection system and reverse logistics, decontamination of contaminated areas, development of research for clean technologies applicable to solid waste.

The companies are financially responsible for managing all reverse logistics systems, which comprise the process of planning, implementing and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal. In

the particular case of Brazil, the BSWP requires that this system involves the collectors of reusable and recyclable materials.

All of these aspects are related to social inclusion and to seeking financial sustainability, which is required for achieving harmony between integrated solid waste management and the sustainable development that is proposed in Global Agenda 21. This complies with the triple bottom line that focuses not just on the economic growth, but also on the environmental and social development aspects (Elkington, 2004). Moreover, these principles and aspects apply to objective 18 of BRA21, which aims to modernize the country in order to unite environmental management and the economic tools that are necessary for their development. Some innovative actions have demonstrated that environmental management begins to leave the mitigation or preventive phase in favour of a restorative phase, which induces uses compatible with conservation. Thus, Brazil is finally working towards policy reformulation based on legal command and control restrictions (which have revealed inefficiencies) for a policy that tends to promote the internalization of environmental production process costs without losing strength in the correction process. Promotion planning that integrates different dimensions of development is needed to mitigate the impacts of economic policies beyond environmental and social concern (MMA, 2002).

The BSWP defines strategies that enable the addition of value to waste, which increases the competitiveness of the productive sector and provides social inclusion by creating mechanisms through solid waste recycling that create business, employment and income. These strategies were sanctioned in Law 12,375 (Brazil, 2010c), which changes the national tax legislation. The tax on industrialized products (IPI) for the acquisition of solid waste as raw materials or intermediates for product manufacturing is reduced for some time. However, this reduction can only be enjoyed if the solid waste is directly acquired from a cooperative of recyclable material collectors with a minimum number of members. In April 2014, the stock exchange of Rio de Janeiro began operating the reverse logistic credits-CDA (BVRIO, 2014), as well as carbon credits, as mechanisms that enable the implementation of the 'polluter pays' principle in practice..

In addition to these initiatives, financial institutions are encouraged to create lending instruments that are designed to comply with the guidelines of this law. For municipalities, financial incentives come in the form of 'coercion'. In this case, funds will be released only if the implementation of municipal solid waste management plans is effective and if the projects presented to plead for these resources are related to the plan requirements (Jacobi and Besen, 2011). For users or individual SW generators, the BSWP predicts that public urban sanitation and solid waste management is attributed based on a system that observes the sanitation plan to calculate these costs. Before this requirement, no efforts were made by the municipal government to structure this system for defining urban sanitation services and the costs of solid waste management.

The BSWP goals are ambitious and should be pursued with the policy of environmental education. They should be created in accordance with the Brazilian Environmental Education Policy (Brazil, 1999). Thus, there appears to be a connection with purpose 21 of Brazilian Agenda 21, whose goal is to establish the pedagogy of sustainability ethics and solidarity. The aim of this policy is to disseminate a code of ethical values that is shared by the entire society to protect all of its members against the interests of a minority. Furthermore, to meet the fifth goal of BRA21, whose purpose is to provide information and knowledge for sustainable development, the BSWP proposes the creation of the National System of Information on the Environment (SINIMA) to guarantee the rights of citizens to access information.

The correct application of the law would result in the following midterm outcomes: the readjustment of industrial activities for solid waste disposal, the growth of industrial recycling activities, and the socioeconomic inclusion of waste collectors organized in cooperatives. All these appointments concerning physical aspects (as a waste management hierarchy that looks for attempts to implement the 3R's, the reverse logistic to realize proper solid waste disposal and selective collection) and governance-related aspects (as principals, actors involved and economic instruments) demonstrate that BSWP is a policy that proposes an integrated sustainable waste management as proposed by Wilson et al (2012) and UNEP (2013)

Despite the innovations and adequacies of BSWP that are highlighted in this section, the following question arises: if the BSWP is an progressive legal instrument that proposes the triple bottom line as proposed by Agenda 21, why does Brazil still precariously implement solid waste policies? The Brazilian local waste management policy implementation is shown to meet several obstacles presented in the next section by a case study in the state of Espírito Santo.

Local waste management policy challenges: The case study of the Espírito Santo state

Among the 26 Brazilian states, Espírito Santo is ranked as fifteenth in terms of population (Lira and Vieira, 2011) and eleventh in terms of national gross domestic product (IBGE, 2013), despite its small geographical area. The presented features justify the use of this state as a case since it is among the most and least populous and has an average economy relative to others. Moreover, this state adequately represents the demographic transformations in Brazil, as presented in the section entitled 'Environmental policy evolution and Brazilian context' above. Their industrialization process, not only fostered rapid economic development, but also population growth (Santos Jr, 2013). Between 1970 and 2010, their population more than doubled from 1.6 to 3.5 million.

The state is composed of 78 municipalities and although most municipalities are small (less than 50 000 inhabitants), the average urbanization rate is over 80%. If the small size of a municipality can facilitate solid waste management, on the other side, high urban concentrations and deficient administrative support

potentially contributed to the critical situation in the year of BSWP enactment when only 26 cities correctly placed their waste in three private and licensed sanitary landfills. These landfills were located in the municipalities of Aracruz, Cariacica and Vila Velha. The other 52 municipalities used 102 garbage dumps that were located around the state (SEDURB, 2008).

To meet the requirement for eradicating the 102 garbage dumps in the Espírito Santo, Department of Sanitation and Urban Development divided the state in six regions. Whereas two regions contain licensed sanitary landfills, the state challenge is to provide the other four regions with regional sanitary landfills. Both the management and regulation of the four systems are being made through the Regional Public Consortia, which is formed by the state and municipalities and operated under the concessions of specialized companies (SEDURB, 2008).

Each member of the municipality consortium has a role within the system. The state government conducted a study that defines regionalization for sanitary landfill distribution and transhipment areas in the four regions. With these investments, the state minimized the operational costs for the municipalities. However, in return, the municipalities must improve the management of the local public sanitation structure for sustainability. In addition, municipalities must discontinue the use of garbage dumps, recover degraded areas, fairly split operation expenses with the consortium; implement and manage economic recovery and deployment of selective collection and recycling.

BSWP was enacted in mid-2010. However, the state government realized the difficulties for municipalities in implementing a complex policy. In order to encourage and monitor the implementation of national and state requirements for solid waste management, the Espírito Santo state prosecutor and the Ministry of Labour collaborated with each municipality that participated in the development of the terms of environmental commitment (TEC) consortia and to adjust the municipal solid waste management plan to the BSWP. These terms are related to a commitment to actions and procedures that are necessary for implementing the principles, objectives and instruments of the BSWP. In this sense, the TECs that are signed between the ministries and the municipalities are governed by three national laws (12,305/2010; 9,264/2009 and 7,347/1985). When these laws are not complied with, penalties and other punitive sanctions result.

The third section of the TEC contains specific obligations for municipalities and provides a supply of reference terms for the preparation of the integrated municipal plan for solid waste management when the municipalities participate in a consortium solution. This TEC clause is subdivided into sub-items to accomplish the minimum standards provided by the BSWP. The selective collection implementation, which includes the separation of dry and wet wastes, the implementation of reverse logistics for hazardous waste, and the determination of punishment mechanisms for waste generators that do not abide by the law (among others). Table 1 describes all of the documents and deadlines that the municipal governments must satisfy. The deadlines are counted from the signing of the TEC by the municipalities legal representative (in this case the mayors).

The TEC is a tool that enables LA21 with respect to solid waste and determines actions that are oriented to the municipal level and contribute to the achieving of the proposed objectives. The implementation supervision of these requirements is done through follow-up meetings to verify the executed actions and adjust those that were made inappropriately or that have not yet been performed (AMUNES, 2014b). Eventually, when the deadline has expired the municipality can be punished with financial penalties.

Information was obtained from the implementation of these requirements through the information monitoring system of the TECs of the Association of Municipalities in Espírito Santo (AMUNES, 2014a). This system provides information from 72 of the 78 counties in the state and lists (per TEC item) the implementation progress of actions according to the time established for each requirement (according to Table 1 with information obtained in 1 February 2014). The six municipalities outside the analysis already comply with the legal requirements.

Figure 2 shows that most of the requirements (64%) have not yet been implemented. As the deadlines for implementing all of the required elements in the TEC are short, these data indicate problems or resistance by the municipalities when implementing some of the requirements. Another large portion (29%) of the requirements or demands has been made. However, these requirements have not been validated by competent institutions. Thus, it is not possible to state that these requirements were accomplished. In some cases, the municipalities are instructed to rectify the monitoring system because the requirements have not been adequately or completely fulfilled (AMUNES, 2014b). The remaining items (7%) are in progress and their deadlines have not expired. Overall, the requirements have been implemented or are under implementation. However, many of the TEC items that are required for deployment of the BSWP at the municipal level have not been started.

To analyse the performance of the TEC. Figure 3 shows the requirements within the stipulated deadlines.

In addition, to corroborating information about overdue deadlines for most of the requirements (Figure 3), it was possible to ascertain which requirements are more complex for implementation. Some items, such as items 5, 6.2 and 6.4, were fully implemented (100%) by more than 64% of the analysed municipalities and are awaiting validation by the competent bodies. Item 5 involves the constitution of a TEC monitoring committee for each municipality. Overall, 68% of the municipalities have fulfilled this requirement.

This committee shall be composed of the following eight members: a representative from the public prosecutor of Espírito Santo state, a representative of the municipal environment, a representative of civil society (preferably an association or cooperative of waste collectors), a representative of the municipal infrastructure, a representative of the city health department, a representative of the municipal social welfare, a representative of

Table 1. Requirements on TEC solid waste.

Item	Documents to be submitted	Time (day)
3.1	Deliver the terms of reference for the development of the Municipal Integrated Plan for Solid Waste Management in accordance with Article 19 of Law Nº 12.305/2010.	210
3.1.1	The selective collection system must insert at least the separation of wet and dry waste and gradually be extended to the separation of types of dry waste.	
3.1.2	Municipality licensors shall submit plans for collection, selective collection, sorting and packaging for licensed activities or potentially pollutant to reduce the generation of waste, especially hazardous waste.	
3.1.3	Provision of penalties, regulation of waste generators that do not segregate, package or provide for the collection of reusable or recyclable solid wastes and proper disposal.	
3.1.4	Establish criteria for identifying industrial and commercial wastes, which by their nature, composition and volume, are not considered as household waste.	
3.1.5	Specify the terms and steps that will occur due to the participation of cooperatives or associations of recyclable or reusable material collectors in solid waste management.	
3.1.6	Implementation mechanisms for composting organic solid wastes.	
3.1.7	Structuring of the collection network points of vegetable oil and used furniture.	
3.1.8	Promote studies and propose measures for tax exemption of recyclable and reusable products.	
3.1.9	Establish systems for calculating the costs of providing public services for urban sanitation and solid waste management and for how to proceed with this collection.	
3.1.10	Establish municipal information systems for solid waste management.	
3.1.11	Designate a qualified technician for the development, implementation and operation of all stages of municipal/Inter-municipal management	
3.2	Hand out the plan for integrated management of solid waste, individually or mixed.	360
3.3	Present drafts of laws and the provision of contracts for the collection and disposal of solid waste and the undifferentiated selective collection services.	180
3.4	Prepare the environmental education program (EAP)	180
3.5	Implement selective collection programs 'door to door' with voluntary waste collection points (PEVs) in city neighbourhoods.	360
3.5.1	To forecast the expansion of selective collection or voluntary waste collection points to the entire city until 2016.	
3.6	Promote formalisation of waste collector organisations into cooperatives and associations.	180
3.6.1	Present an updated register of all waste collectors and their families with proof of proper inclusion in the Registry for Federal Government Social Programs.	120
3.6.2	Provide equipment and structure for waste collection organisations.	240
3.6.3	To gradually designate solid waste collected in the selective collection programme to the collector organisation or organizations by action region.	180
3.6.4	Present in regular meetings, a report containing the selective collection volume of waste delivered to the Association of Collectors.	
5	Establishment of a TEC monitoring committee for each municipality.	
6.2	Formalization of an administrative process in each municipality regarding compliance with TEC and supporting documentation for inspection purposes.	
6.3	Inclusion in the municipality link or portal site that directs the browser to an area intended to inform citizens about the actions taken because of this environmental commitment term that concludes with the prosecution.	

Source: Prepared by the authors based on AMUNES (2014a).

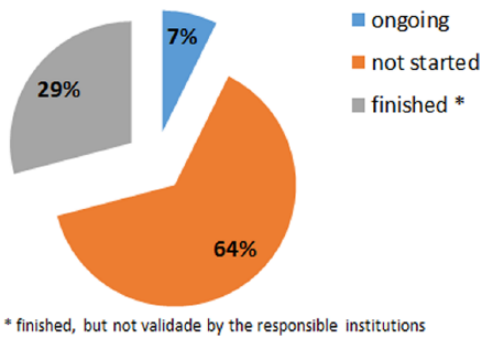

Figure 2. Level of implementation of the TEC items.

the municipal education department and a representative of the municipal department of urban services. It is emphasized that it is not difficult to accomplish this requirement. However, 32% of the state municipalities did not execute this item within 30 days of signing the TEC.

In contrast, 82, 79 and 72% of municipalities did not implement items 3.6.3, 3.6 and 3.3, respectively. The deadline for implementation of these items has expired. Item 3.6.3 requires that the municipalities designate that the collection of urban solid waste occurs by the organization or the organizations of collectors. This item is accomplished with regional acting and requires 180 days to run after the signing the TECs. It is understandable

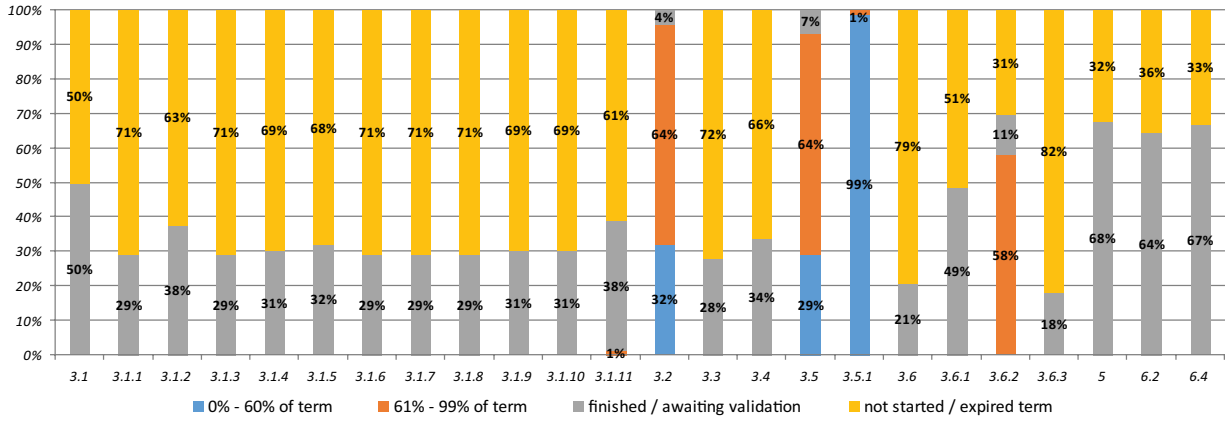

Figure 3. Implementation progress of each TEC item.

that this item was not well implemented by municipalities because it involves the implementation of other TEC items, such as item 3.5. Item 3.5 requires selective 'door to door' waste collection and must be combined with other voluntary waste collection programs in city neighbourhoods. From Figure 3, it is observed that only 7% of the municipalities have already completed this step. In addition, others municipalities are implementing this step because the deadline for implementation has not expired.

However, the success of selective collection depends on factors that are discussed in other sections of the TEC (such as item 3.4) that involve the preparation of the environmental education program. This item was only fully implemented by 34% of the municipalities and the deadline has already expired. Another item that interferes in the expansion of selective collection is the performance of this step by the company (as provided in item 3.3). In this case, 72% of the municipalities have not submitted this programme although the deadline has already expired.

As discussed in other sections, the BSWP text is adequate and has all the elements necessary for the waste management. If public policy is separated into its three stages, namely: formulation, implementation and evaluation, it seems clear that the challenges of BSWP and meeting requirements of Agenda 21 is present at the time of its implementation, since this challenge has already been surpassed in its formulation stage (which required 20 years of discussions). Based on the observations of the case analysed here, the next section provides an interpretation of the difficulties of implementing BSWP locally.

Discussion and final remarks

The Brazilian Constitution of 1988 promoted a collaborative federal pact by using a slogan of power and duty 'decentralization' (Brazil, 1988). Modernization sought to answer the slogan with 'think the federal, state and joint action in the city'. This slogan largely explains the first programme of Brazilian Agenda 21, which the Brazilian society should broadly participate in while encouraging the LA21. These participants wanted a 'bottom-up' agenda that was strongly anchored in place to address problems.

In fact, there was some sort of social engagement in the formulation of local agendas. However, taking as an example the scenario of the waste management seen in the state of Espírito Santo, one realizes that Brazil is a country that is particularly heterogeneous physically and administratively, which aggravates the operational implementation of policies at the local level. The decentralization policy in itself is completely effective in the presence of a strong state, with regulatory and supervisory power, since in general, as reported by Brandão (2013; p. 163): the subnational scales encountered situations of low technical, management, institutional and financial capacity to deal with the complex competence decentralization in a vast territory, with the redistribution of revenue in very asymmetric urban-regional spaces, thus making it very defiant, sophisticated and hard to structure medium and long-term strategies.

So even if constructed from local stakeholders, public participation in elaborating and operating local policy often occurs precariously. An important issue to be considered is that BSWP went through a long process of discussion that has lasted more than 20 years to compose a suitable final document. However, the implementation phase in the federal, regional and local spheres has been inappropriately carried out when analysing the order of activities to be performed. The Brazilian waste management plan (which regulates and organizes the BSWP implementation) has not yet been approved, but the BSWP is already being deployed in local spheres. It is possible that international pressure to achieve Agenda 21 goals, added to the difficulty of coordinating all actions which should be carried out in conjunction to ensure the successful implementation of this policy offer some explanations for this scenario.

One of the key issues for a successful implantation is the empowerment of local authorities to deal with such a complex and comprehensive legal instrument for environmental, economic and social interests. It is important to consider that, in Brazil, the municipal secretaries, as well as their assistants, are appointed to positions by the mayors. Often these appointments are political or motivated by self-interest and do not imply a technical capacity to perform a specific function. Therefore, a major

bottleneck in the BSWP implementation at the local level is the lack of ability and capacity of the teams to assist local governments, added to the absence of a comprehensive and continuous capacity building programme of strengthen these teams in order to implement this policy (Chaves and Santos Jr, 2014).

Combined with low administrative capacity, the solution to the implementation of the Brazilian solid waste management policy has been the hiring of consulting firms that often do not know the specific local conditions, and produce standard actions plans that are too far from the real needs, as happened with the city of São Mateus and Vitória, in the Espírito Santo state (AMUNES, 2014b).

Local authorities have an essential role in the implementation of efficient waste management. On the other hand, their administration comprises a wide-ranging responsibilities and functions in relation to the environment, planning, development, housing and the provision of other physical and personal services, as occurs for all demands of LA21, in which initiatives require participatory assessment and decision-making at the local, national and international level (ICLEI, 2002; Paavola and Adger, 2006).

In the case analysed in the previous section, it became clear that difficulties in meeting these requirements are not merely the result of the managerial shortcomings of the municipalities, but are closely linked to how the environmental commitment term (ECT) was built. This has hindered practical implementation and demonstrates that even instances of territorialized coordination cannot be handled adequately within the local specificities. The control instrument of BSWP implementation used in the Espírito Santo state, the ECTs, and the hierarchy of the requirements are not consistent with the diversity of problems faced by the 72 municipalities.

Due to the specific conditions of each municipality, is impossible to establish standardized steps for the 72 cities that were studied. For example, the municipality of Aracruz, which now has a sanitary landfill in operation and properly disposes of municipal solid wastes, did not sign a TEC with the Espírito Santo Public Prosecution. Moreover, the municipality of Boa Esperança has three areas that were used as garbage dumps and need to be recovered. Beyond their quantitative differences, the municipalities have different environmental liabilities (for example, due to the proximity of the surface groundwater). These liabilities are evident in that many municipalities do not have adequate geomorphology or other prerequisites that are required by the standards for sanitary landfill location and construction.

Regarding the National Solid Waste Policy, the present analysis showed that municipalities are facing implementation difficulties. One such difficulty results from the high initial cost of deploying some phases of the National Solid Waste Policy, such as the recuperation of degraded areas and the costs of creating and maintaining sanitary landfills (among others). Therefore, as reported by Ren and Hu (2014) financial performance, the key for waste management efficiency and sustainability, is being neglected. Another weakness observed in the implementation of the BSWP at a municipal level is the precarious attention given to environmental education mechanisms. It is necessary to invest in solutions that reduce the production of waste, including clean technologies and sustainable consumption in addition to the proper collection, treatment, and disposal of waste.

Moreover, the BSWP often does not appear as a priority for municipal agendas because their governments change every 4 years. This policy will bring long-term results that are characterized by short-term disbursements. Because it is impossible to isolate the politics of policy, this temporal and political contingency shows up as an obstacle for policy implementation. Thus, environmental education appears as an activity of permanent character, which exceeds the limits of temporal governments.

The disposal of requirements in terms of the signed commitments of municipalities was inadequate in the analysed case. The presented schedule of documents and the hierarchy of proposed steps does not facilitate their management. Therefore, to satisfy Agenda 21 with regard to solid waste (more than the required municipalities compliance with the schedule established by law), the Brazilian federal government needs to advance its intellectual and financial strategies for fostering.

To achieve a waste management system elaborated based on the principles of sustainability as required by Agenda 21, the local initiatives require participatory assessment and decision-making. This emphasis on participation by multiple stakeholders is a manifestation of the diversity of policy goals that sustainable development entails and of the interest in procedural justice as a criterion in decision-making at the local, national, and international level (Paavola and Adger, 2006). However, local authorities in Brazil fear an extensive popular participation, as these can press for measures that are conflicting with political interests. Therefore, public administration, which should encourage popular participation, does not perform its role effectively

Thus, theory may challenge the LA21 view by arguing that the costs of self-organization are often ignored and no alternative costs considered (Brandt and Svendsen, 2013). This is a missing link in the literature as previous authors have mainly focused on the benefits from local participation. There are some advantages from citizen participation in government decision-making, as a stronger democracy in which there are formulated policies, higher legitimacy and fewer conflicts because society more readily accepts the government decisions and the public provide more information for decision-makers which increases the quality of political decisions (Brandt and Svendsen, 2013; McKenzie-Mohr, 2011).

So today, the main challenge is in the BSWP recognition by the federal government that the decentralization strategy is not sufficient to fulfill the agenda. Greater social involvement and extensive politicization of society could contribute to the success of this policy implementation. In addition, some policies have only succeeded when certain priorities are satisfied. For example, an environmental policy that seeks sustainability will only be 'embraced' socially when the country provides the minimal conditions for the well-being of citizens. Thus, in a developing country (as is the case of Brazil), the solid waste policy can only be

advanced when economic progress can reduce the number of negligible diseases and illiterates, and advance urban policies.

Despite the delays in implementing various guidelines of Agenda 21 (not only in Brazil but also in many other countries), the Brazilian effort to develop an effective legal mechanism stands out. This effort is essential for sustaining growth and expanding the competitive position of Brazil in a world that is experiencing a significant economic crisis. Within this effort, Brazil has developed a modern policy for dealing with MSW relative to several existing experiences throughout the world. However, public policies require more than good formatting. They also require effective implementation and movement towards goals. Although the quest to achieve sustainable development is not new, the urgency to improve the capacity to assess progress towards it is mounting (Ngah et al., 2011).

The size of a country such as Brazil requires decentralized public policies that give municipalities and states responsibility for their implementation. Some Brazilian public policies have been successful due to decentralization, including educational and health policies. However, national guidelines and monitoring by the federal government are essentials for achieving the goals and targets of the country.

An important step toward better management of public policies in Brazil was the fact that, in recent years, Brazil has greatly expanded its network of colleges and universities, that if they are directly involved in the process, can provide adequate human resources to break the technical barriers faced by many municipalities, but also effectively participate in social politicization process. Without this synergy, it is not feasible to think about success of the policy in the present, nor in the future.

The theme 'solid waste' requires robust knowledge in multiple fields of knowledge (environmental engineering, biology, logistics, among others). Thus, interdisciplinary technical staff members are required. This requirement is completely different from the reality that is observed in most municipalities, especially small municipalities (Chaves and Santos Jr, 2014). Again, it is necessary to recognize this feebleness of the federal government and adopt strategies that mitigate these weaknesses. If the weakness is local, only the federal can coordinate the solution. Again, there is a problem of policy scope and actions' scale in Brazil. It is necessary and urgent that Brazil find a way to coordinate the mechanisms of an innovative and well formulated legal instrument to ensure the successful implementation of solid waste management at the local level achieving environmental, economic and social objectives.

Moreover, at the federal level it is necessary to intensify efforts to conclude the plan that guides the implantation of BSWP. This plan has been discussed since 2011 and highlights the difficulties in moving into the practical deployment of BSWP. However, this plan seeks to solve problems such as the qualification of the teams that manage the LA21, propose long-term goals in order to prevent the mandates and parties cause interference in efforts to plan basic sanitation policies.

Owen and Videras (2008) provide empirical evidence that trust in the implementation of LA21 is related to the implementation of programmes that require the coordination of local stakeholders. In other words, lower trust implies that the benefits of the programme have to be larger in order for the programme to be implemented (Llamas-Sanchez et al., 2013). When local governments are weaker, LA21 coordination is more likely to be implemented, perhaps as a substitute for actions taken by local governments.

Agenda 21 focuses on local sustainable development projects and requires the coordination of diverse decision-makers in a community. Other countries have also had difficulties in the implementation of LA21 policies (Agamuthu et al., 2009; Bhat et al., 2014; Brandt and Svendsen, 2013; Gilbert et al., 2013; Roberts and Diederichs, 2002; Smardon, 2008; Sofroniciu, 2005; Wilson et al., 2012) and the example of overcoming challenges can assist Brazil at the present time. However, the formulation of a legal instrument that determines the mechanisms for the proper functioning of this system is distinct, as well as factors that interfere with the implantation of Brazilian waste management policy. In addition, for a country with continental dimensions such as Brazil's, the local challenges are different and decentralization must be part of the agenda for policy success. Although discussions have been based on the case presented in one of the Brazilian states, the difficulties are present in all regions of the country, as demonstrated in Carvalho et al., 2013; Castro and Araújo, 2004; Godoy, 2013; Gomes, 2012; Jacobi and Besen, 2011; Kneipp et al., 2012; Lisboa et al., 2013; Pereira et al., 2012; Ribeiro and Besen, 2011).

The case aimed to present the problem of implementing a policy, which despite having a well-meant policy, their enforcement are considerably complex. Thus, in practice, state and local policies should be more feasible. Finally, this gap between BSWP formulation and implementation must be minimized through coordination at the federal level. Only then Brazil will cease to be a reference not only for its policy formulation, but also for their ability to overcome many obstacles in its implementation.

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