

Solid Waste Management in Brazil: an Analysis of Public Policies Under European and USA Laws

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ABSTRACT

The management of solid waste, although heavily dependent on the legal structure of each country, may present similarities between them. Within this perspective, the present study was motivated by the need to understand how countries behave towards their MSW management systems in an attempt to identify similarities with the present model in Brazil. The objective was to analyze the international experiences in MSW management, including public policy, the legal structure and the existing institutional arrangements abroad (Europe, United States and Japan) as well as in Brazil. We verified the influence of public policies on the adoption of practices, technologies and technological routes of

treatment and final disposal of MSW in the country by drawing a parallel between the international models of MSW management. The management of MSW in the analyzed countries has been based on regulated models, given the complexity of a system that requires a technical expertise that, in a general way, is not shown by municipalities. In Brazil, although the national legislation has been consolidated over the past decades, there is still a need for the development of specific legal instruments and a management system more efficient than the current one, since that, like in the analyzed countries, the municipalities have not such requirements as technical staff and financial capacity suitable for a proper management.

KEYWORDS: Urban solid waste; waste management; waste policies; legal instruments; institutional framework; regulation

INTRODUCTION

The environmental discussions that have permeated the construction of a legal structure that would allow the State to exercise its role as manager and regulator of the environment date back to the middle of the last century. When it comes specifically to issues focused at the proper handling of solid waste, however, the legislation is a more recent.

In Brazil, there were more than 20 years of discussion thus far until the establishment of a nationwide policy related to waste, 29 years after the launch of the National Policy on the Environment – PNMA (Law no. 6938/1981) and the creation of the National System on the Environment – SISNAMA and of the National Council on the Environment – CONAMA. Thus, the Federal Government has approved in 2010 the National Policy on Solid Waste - PNRS (Law no. 12305/2010), in conjunction with the National Policy on the Environment-PNMA and the National Policy on Environmental Education (Law no. 11445/ 2006), in order to establish guidelines for the integrated management and solid waste management (including hazardous). This Law came to comprise the legal apparatus and mark out the States and municipalities in the implementation of public policies, encouraging the establishment of landfills and other technologies, associated or not, seeking the closure of dumps and the implementation of an effective management of municipal solid waste (MSW) in the States and municipalities of Brazil.

With the purpose of analyzing such issues, this article presents the institutional legal framework and the evolution of public policies related to MSW, by making an analysis of the current situation of MSW Management in the Country - based on a bibliographic review, survey information with consultations to databases and technical visits (national and international), apart from the professional experience of the researchers involved – with reference to the international experience (countries in the European Union, USA and Japan), through the effective applicability of their public policies, their institutional arrangements, their implications and consequences in Brazil.

MATERIAL AND METHODS

To achieve the proposed objectives, a team of 62 researchers was composed and distributed among the regions of Brazil and in the following countries: Portugal, Spain, Switzerland, Greece, United States and Japan. The team was divided into different work centers (regional and international), connected to the coordinators in order to optimize the process of executing the research, as shown in the organizational chart of Figure 1.

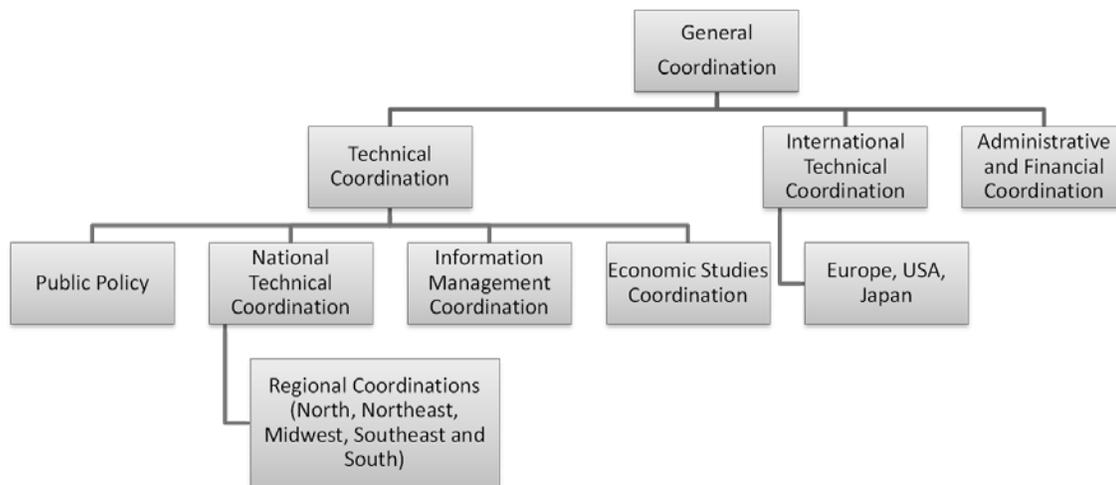


Figure 1: Organizational chart of the research network

Source: FADE/UFPE/BNDES (2013)

For the purpose of this study, primary and secondary data were collected. The first ones were based on technical visits and interviews with local managements, seeking to identify the conditions for treatment and disposal of waste from each municipality researched. To this end, we used structured questionnaires, aimed at subsidizing the team with general information on the waste management of Brazilian municipalities, main players, treatment technologies, institutional arrangements and existing public policies.

The secondary data were obtained from government databases on national bases (IBGE, ABRELPE, SNIS and environmental agencies) and international ones (EPA, EEC and Anred). In Brazil, this survey was conducted among institutions using diagnostics, projects and social activities previously performed (Environmental Agency, Secretaries of Health, social action, education, environment, farm, infrastructure or similar). In Europe, USA and Japan, this survey was initiated through consultation in existing databases at the federal, state and local level, through homepages, files, projects, programs, among others.

From the information gathered at domestic and international levels, the key considerations regarding the implementation of public policies and MSW management in Brazil and countries of Europe, USA and Japan are then presented. This analysis was based on three dimensions: (i) institutional arrangements; (ii) management models, and (iii) incentive systems. Thus, the interrelationships among the players of the process, notably, the federative entities, companies and civil society, the prospects for waste management, and its indications in legislation and incentive systems provided for by law and regulated by means of decrees or other legal instrument were identified.

RESULTS AND DISCUSSION

Public Policies and Urban Solid Waste in Brazil

The establishment of the Brazilian environmental policy is recent and was based on the action of local social movements and external pressures. The first Secretariat dedicated to environmental issues

on a national level, the Secretariat of the Environment-Sema was established in 1973, when environmental protection mechanisms were based solely on command and control instruments, usually in response to reports of industrial and rural pollution.

The 1980s has brought the improvement of methods for the diagnosis of environmental problems and the boost noted by ecological movement, based on technological breakthrough experienced in said period. The spread of the concept of sustainability brought by the Brundtland Report at the end of the decade has brought to light, although in a timid manner, the need for a more efficient management of the increasing volume of solid waste generated by the population arising from the increase in consumption and economic growth of the regions.

The enactment of Law no. 12.305/2010, 20 years after the start of initial discussions aimed to its preparation, provided the Brazilian society with its main instrument of regulation: the National Policy on Solid Waste - PNRS (Brazil, 2010). In accordance with the head provision of Article 5° of said Law, the PNRS was conceived in conjunction with the National Policy on Basic Sanitation - PNSB and the Law on Public Consortia - LCP. The legislation also provides for compliance with the National Law on Environmental Education (Law no. 9795/99). These laws are designed to work seamlessly and complement to MSW management. It is possible also realize that in this interrelationship, the PNSB is one of the components of the National Policy on the Environment – PNMA, which represents a related policy, which deals with subjects that have interpenetration with the PNRS.

The new Law no. 12305/2010 (PNRS) sets forth the principles, objectives and instruments, guidelines, goals and actions adopted by the Federal Government, either alone or in cooperation with States, Federal District, municipalities or individuals, with a view at the integrated management and solid waste management (including hazardous), the responsibilities of generators and public authorities, and the relevant economic instruments. Additionally, demonstrates the concern about the disposal of waste, providing guidelines for the collection, treatment and final disposal, as well as ways to reduce the production of such waste. However, despite the need for its consolidation, its existence has not yet proves enough to be able to effectively influence, in the short term, a change in the reality of Brazilian municipalities.

The PNRS and PNSB establish selective constraints, determining those responsible for actions in specific situations and mentioned in both. Figure 2 shows the organizational chart of the Brazilian legislative framework, at the federal level, focused on the regulation of MSW management. The Table 1 presents the institutional arrangements, management models and incentive systems of the environmental legal system established by the legal system in Brazil in the field of MSW management.

According to the Brazilian Constitution, it is up to the municipalities to legislate on the matters of local interest, which covers the management of public services for urban cleaning and MSW management. In a country characterized by a predominance of small municipalities a country characterized by a predominance of small municipalities, despite observing the presence of entities of the direct administration in MSW management and with little technical training, with 61.2% of the municipalities reporting deficit economic conditions, uncontrolled production of solid waste and disposal without criteria, contributing to the waste of materials and energy, according to the National Survey on Basic Sanitation - PNSB (IBGE, 2010). The same survey also records that the existence of dumps is still a predominant reality in Brazilian cities, where solid wastes are disposed without any care, representing a serious threat to public health and the environment.

Public policies (management) of solid waste to be implemented must be coordinated among all levels of the federative entities, within the limits of powers established by the Federal Constitution in force and with the participation of society at all stages of the process, thus ensuring the exercise of social control (COSTA, 2011).

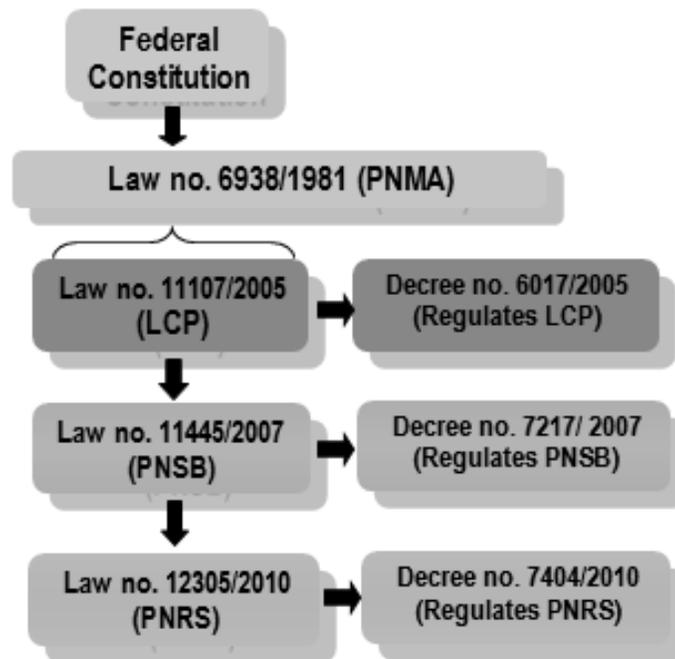


Figure 2: Legislative framework of MSW in Brazil.

Thus, despite the national picture does not provide further significant changes yet, one senses a major shift in attention that waste management has demanded of public institutions, at all levels of government. Governments, both Federal and State, have been under pressure to apply more resources and create programs and lines of credit where the beneficiaries are municipalities. These, in turn, have been charged to fulfill their role to solve the problems of urban cleaning and create conditions for the universality of services and maintenance of its quality over time, which happened to be followed more strictly by the population, by environmental agencies, by the Public Prosecutor and by non-governmental organizations focused on environmental protection.

Only the pressures of society, along with a public manager definitely engaged and aware of the importance of urban cleaning for the health of population and environment, can change the picture of inefficiency of the sector. It takes political decisions that, although in the short term will result in a temporary burden represented by the need of tax increase or transfer of funds from another sector of the municipality, in the medium and long term will reflect on improvement in the quality of the services provided, which could be capitalized politically by the local administration.

The Influence of International Policies in MSW Management

The Member States of the European Union have been highlighted by a significant change in the management model, since the amount of waste generated and the demand for treatment technologies, such as recycling with energy recovery, reducing significantly the amount deposited in landfills is increasing every day. This change was driven first by community (EEC) and national law of each Member State, establishing goals and instruments for source reduction, screening, recycling, and recovery of waste, disposal of dumps and uncontrolled landfills, as well as restrictions on the disposal of some kinds of waste in landfills. And secondly, because of the rising prices of raw material, recycled materials and fuels resulting from incentives generated from the implementation of the legislation. However, the recovery of solid waste was the dominant aspect, because in 2008 was

recovered 46% of the waste discarded by society in the form of recycling and 5% were incinerated with power generation.

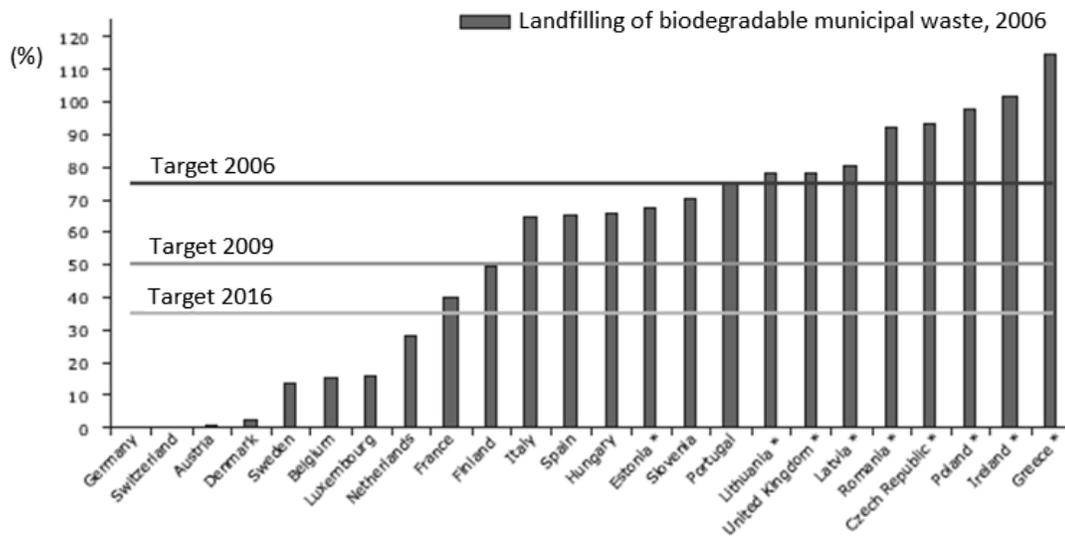
Table 1: Comparison of decrees governing the Brazilian legislation.

	INSTITUTIONAL ARRANGEMENTS	MANAGEMENT MODELS	INCENTIVE SYSTEMS
Decree no. 7404/2010 – Regulates Law no. 12305 (PNRS)	<ul style="list-style-type: none"> - Selective waste collection systems will be deployed by the holder of the public service for urban cleaning and solid waste management (Art. 9th) - For the operation of reverse logistics: sectoral agreements (contractual) between public authorities, manufacturers, importers, distributors, dealers (Art. 19th) - Regulations provided by Decree published by the Executive Branch (Art. 30th) 	<ul style="list-style-type: none"> - Inter-ministerial Committee of PNRS, coordinated by the MMA. (Art. 3rd) - Steering Committee for the Implementation of Reverse Logistics Systems (Art. 33rd) - observe the following order of priority: no generation, reduction, reuse, recycling, treatment of solid waste and environmentally appropriate final disposal of waste (Art. 35th) 	<ul style="list-style-type: none"> Procedures for the purchase of used products or packaging may be adopted, and delivery stations of reusable and recyclable waste can be conceived, and should be prioritized, especially in the case of post-consumer packaging, the participation of cooperatives or other forms of associations of recyclable or reusable material. - Possibility of contracting entities, cooperatives or other forms of association of recyclable or reusable material collectors.
Decree no. 6017/2007 – Regulates Law no. 11107 (LCP)	<ul style="list-style-type: none"> - Public consortia may have one or more goals and consortium members may be associated with respect to all or only a portion of them (Art. 3rd paragraph 1st) 	<ul style="list-style-type: none"> - The legal personality of the consortium may be either public or private. (Art. 7th) - Establishes the agreement of division for the allocation of funds of the consortium (Article 13rd) - Establishes the hiring of the Consortium and consortium member in the modality of exemption from bidding - Establishes the program contract as one of its modalities 	<ul style="list-style-type: none"> - Establishes as an administrative misconduct the entry into the agreement of division for the allocation of funds without budgetary resources provided (Art. 13rd) - Establishes the preference in the transfer of funds from the Union to the public consortia (Art 37th) Provides that the Union shall conclude agreements, from 2008 on, through public associations (Art. 39th)
Decree 7217/2010 - Regulates Law no. 11445 (National Policy in Basic Sanitation)	<ul style="list-style-type: none"> - The planning process of basic sanitation involves: the basic sanitation plan, drawn up by the holder; the <i>Política Nacional de Saneamento Básico</i> (National Policy on Basic Sanitation) (PNSB), prepared by the Union; and the regional sanitation plans drawn up by the Union, under the coordination of the Ministry of the Cities (Art. 24th) - The <i>Política Nacional de Saneamento Básico</i> (National Policy on Basic Sanitation) will be promoted by federal agencies and entities, either alone or in cooperation with other entities of the Federation (Art. 53rd) 	<ul style="list-style-type: none"> - The provision of basic sanitation public services should be conducted based on the sustainable use of water resources (Art. 18th) - Consolidating and matching specific plans should be undertaken by the holder, including through a public consortium of which participates (Art. 25th) - Establishes the stages of PNSB (Art. 58th) 	<ul style="list-style-type: none"> - admits a regulation (Art. 27th) - admits social control (Art. 34rd) - determines that the holder of the service can, by indication of the regulatory authority, step in and resume the provision of delegated services in the cases provided for in the legal, regulatory or contractual provisions (Art. 23rd)

According to the analysis of policy developments and the current situation of management in the EU, two socioeconomic factors are crucial in driving towards reducing the use of landfills: sharp rate of urbanization and population density; and consolidation of policies (EU and national) aimed at

reducing the disposal of biodegradable waste in landfills (EEA, 2009b). The majority of the EU Member States increased their MSW recycling rates, including composting, in the last five to ten years. Some EU Member States with lowest rates of recycling, such as the cases of Ireland, Italy, Portugal and United Kingdom, have shown a reasonable growth rate since 2000 of about 1% per year. Recycling of materials such as paper, cardboard, bio-waste, glass, plastic and metals form the backbone of recycling of municipal waste in the EC (ETC/SCP, 2009a).

As mentioned previously, the EU Policy on the disposal of waste (1999/31/EC) contributes directly to this effect, by requiring Member States to reduce in 2006 the deposition of biodegradable MSW to 75% of the quantities generated in 1995, to 50% by 2009 and to 35% by 2016. These measures aim to reduce environmental pressures of landfill, in particular methane emissions and subsurface contamination by leachate. With this, in 2006, seven Member States, including Switzerland, had already fulfilled the goal of 2016, while eight countries, all with extended periods, still need to reduce the deposition of biodegradable MSW substantially in order to meet the goal of



Notes:

* Countries with derogation periods of up to 4 years to achieve the targets.

1) The rates of landfilling over 100% may result from an increase in the production of biodegradable waste since the goals are related to the absolute values generated in 1995.

2) Percentages for Greece, Italy, Luxembourg and Portugal are based on total of biodegradable waste deposited in the landfills.

2006. There are no data available for Bulgaria, Cyprus and Malta (Figure 3).

Figure 3: Deposition of biodegradable waste on landfills in 2006, compared with the goals of EU Policy.

Source: ETC/SCP based on data from the European Commission (2009).

Several countries are very advanced as to reduce the disposal of biodegradable waste in landfills, for example, Switzerland, Germany, Netherlands, Sweden, Belgium, Austria and Denmark have reported rates of this waste-ground below 5%.

The solid waste reduction can partly be attributed to the implementation of European legislation, for example, the Policy no. 94/62/EC on packaging and its waste. By the year 2001, Member States had to recover a minimum of 50% of all packaging placed in the market while the recovery target expected to be achieved until the 31st of December 2008 went on to 60%. Moreover, the application of the Policy no. 1999/31/EC has led to different strategies to prevent that the organic fraction of MSW be deposited in landfills and be valued as material for composting (including fermentation) and pre-treatment, for example, mechanical-biological treatment (including physical stabilization). As a result, the amount of recycled waste has increased from 21.8 million tons (46 Kg per capita) in 1995 to 59.2 million tons (121 Kg per capita) in 2010, which corresponds to a global growth by a factor of 2.7 at an annual rate of 7.4%. All these policies have led to a reduction of waste going to landfills, as can be observed in Figure 4

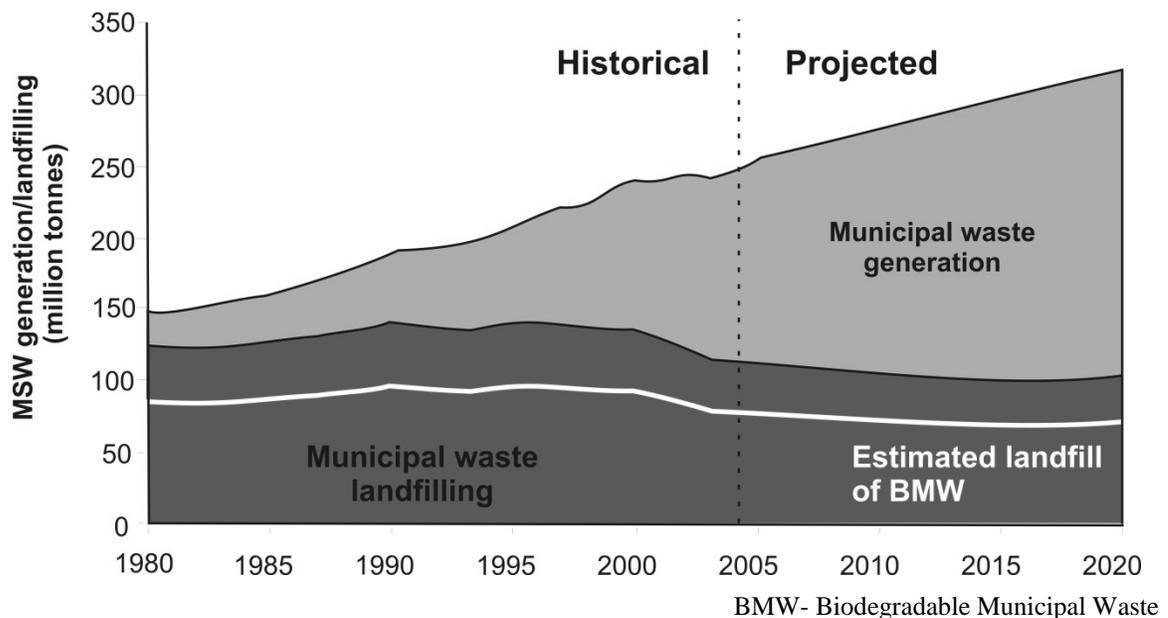


Figure 4: Evolution of waste generation and landfilling in Europe.

Source: ETC/RWM, 2007 (from 1980 to 2004 the data are from Eurostat, from 2005 to 2020 constitute forecasts).

The significant investments made in the countries which joined the EC allowed to achieve the goals of its strategic plans of MSW management, generating a significant transformation of the scenario, so far insufficient. Countries like Portugal and Spain, which joined the EC in 1997, also have benefited by the cohesion funds for the improvement of the management of treatment of waste generated in their territories. On the other hand, smaller and not-so-privileged countries such as Latvia, Lithuania, Bulgaria, Estonia, Malta, Greece and Turkey continue to have greater difficulty in adequately organize the hierarchy in managing of treatment of waste and to meet the goals imposed by the EC, because practically deposit all generated waste in landfills. This practice remains the most common form of disposal of MSW in 19 countries of the EC.

Another quite interesting data is that the 7 countries that most incinerate waste with energy recovery in the EC, are also those who recycle more. This occurs when the policies of utilization of

materials are observed according to a proper hierarchy of management, demystifying the idea that the choice by the use of incineration sacrifices the option for recycling.

In the United States of America (USA), the economic situation should be considered as one of the strongest factors of impact on the consumption and waste generation, as usually, the significant increase in MSW generation is directly linked to the sharp economic growth and, on the other hand, decrease during the time of economic decline. An example of this occurred until the year 2007, in which it was found a growing generation of MSW by the population, including the growth of waste generation per capita. However, due to the consolidation of a waste policy there was a decrease in the total waste generation, equivalent to 4% from 2008 to 2009.

The evolution of American policies on MSW management, over time, is notable for having been strongly influenced by two factors: the will to improve public health and to protect the environment, the latter although newer, is directly related to the first (HICKMAN and ELDREDGE, 2007). The analysis of this process of evolution during U.S. history can be presented in clearly defined periods since the management was changing in response to technological developments in the country and the need to keep under control the increase of MSW (ROBERTS, 2011). With regard to management models, the U.S. focuses on MSW disposal alternatives to landfills, recycling and a small part of incineration for energy recovery. With regard to recycling, one can highlight the philosophy of "Zero Waste" for MSW management, and a bet on change of attitude not only of the population as well as government agencies and industry. Implying even in changes in the manufacture of products and materials, their packaging, their uses and useable life, as well as everything else that contributes to reduce or eliminate waste.

About Japan, it is possible to consider the low degree of freedom granted to local administrative subdivisions - regions and their municipalities - to set their own guidelines and management models, given by the degree of difficulty of the Japanese system to support the accumulation of waste generated in the country. However, law enforcement is strongly local, the adoption of technological solutions such as recycling and incineration is directly linked to the territorial issue and the consequent need to decrease the volume of waste. This is an aspect that can be related to Brazil where is also found a low degree of institutionalization of municipal administrations.

Comparative Analysis

There is a large asymmetry between the treatment and final destination in regions of Brazil, some still with a predominance of final disposal of waste at dumps and others where was noted the existence of a significant diversification of treatments, including the use of materials and energy from more evolved and adequate models of management. This is due mainly to economic disparities, social, environmental and cultural features of each region, reinforcing the need to analyze cautiously the technological alternatives available in the market in order to be able to meet the reality of each region of the country.

As for the result in relation to the international experiences one can highlight the fact that the same feature a common aspect, which deals with the establishment of specialized agencies to coordinate and discuss the implementation of policies with a more focused role in the regulation and penalties foreseen. Now, in the spheres of both the United States of America (USA), as in the Member States of the European Union (EU), international legislation demonstrates tendency towards the execution of the policies in a more direct manner by the own Member States in relation to the choices of alternative technologies to be adopted, and the determination of deadlines for their implementation.

When these international models are analyzed, one can identify features that allow obtaining a reference and establishing a relationship with the Brazilian case, being possible to point out:

- **European Union** – basically are adopted common public policy, defined in policies, and that should be implemented by all Member States, but each Member State defines the form, the means and the deadline for its implementation.
- **USA** – works by means of a Regulatory Agency (EPA), being a management experience in a continental country, with strong federalism and implementation through State legislation;
- **Japan** – the municipalities perform the management, however, have little autonomy, including in the choice of technologies.

In Brazil, after the volume of public investment made and the various experiences registered in States and municipalities, one can see the need for a change in the management model implemented. At first, investments were concentrated in individual municipalities and in the deployment of landfills. However, during the construction of the legislation, some aspects relevant to a change in the management model were highlighted, such as: the understanding that only a legal framework itself is not enough, nor the investment in technology, the existence of an enormous shortage as to the technical and management capacity and the strong tendency for the associated management of municipalities.

Even when compared to international models analyzed, one identifies the most effective possibility of establishing a regulatory body in this regard since the issues involving waste management are complex by the various aspects involved and because it is a subject that requires a reasonable level of technical knowledge, not displayed by the municipalities generally. Since, for the most part, have a low degree of institutionalization of their administrations with few technical staff so that to seize this knowledge, facilitating economic interests to put some pressure for the choice of the technologies to be deployed, not always the most efficient or appropriate to that case.

Therefore, the dissemination of available technologies, their advantages and disadvantages for different economic, environmental and social situations are critical for decision support. Furthermore, it is imperative that the presence of the State as the protagonist of the process of regulating, licensing, implementation, monitoring and control of the management systems and solid waste treatment to be deployed, providing the responsible agencies with tools and resources for their activities.

CONCLUSIONS

Although the national environmental legislation is more consolidated and is relatively broad, with respect to technical and operational suitability of solid waste there is a urgent need to develop specific legal instruments to this issue, in particular the National Policy on Solid Waste - PNRS, mainly due to the huge existing environmental debt and the continuous and increasing generation of waste by the population.

However, only the imposition of statutory instruments does not guarantee the efficiency of the system, and needs to be understood by the public administration that its role is determining in surveillance and control action, and must be present in all stages of MSW management in order to ensure the efficiency and quality of urban cleaning systems, so as to avoid the various social problems, environmental, economic and health.

Similarly, as the environmental issue and the urban cleaning service are still dependent on the political will and pressure from society, the result for an integrated management of MSW depends on a greater involvement of the players involved, especially civil society participation and a definition of

a management model, including the institutional arrangements and in anticipation of the choice and the use of technologies by the State and municipal levels. Specific rules should be drawn up taking into consideration the diversity of each reality and the specificities of solid waste management, involving the participation of society and agencies of various sectors, in an articulated and integrated manner.

Beyond the more efficient performance of public administrations and of the role of standards and legal instruments, it is necessary actions by the society, being represented by the Public Prosecutor, and defense and environmental protection organizations through the monitoring and compliance requirement, since it is in the process of re-education, awareness and changing attitudes, that happen slowly, but that will be key to the achievement of effective results.

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