



Full length article

Recycling in Brazil: Challenges and prospects



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ABSTRACT

This article presents a comparative analysis of the performance in formal and informal areas that deal with solid waste in Brazil. The article demonstrates that there has been significant progress in areas related to recycling and that this progress has been based mainly on informality and on the precarious labour conditions for the pickers of recyclable materials. The article also focuses on the problems found in the model for waste recovery that is being implemented in Brazil and that is based on allocation of precarious waste recovery facilities; this model has mostly small operational capabilities even in large municipalities. These problems are discussed in contrast to the great challenges imposed by the new legal framework of the country. Finally, the article proposes a categorisation of the technological models of material recovery facilities (MRFs) based on their degree of automation and nominal capacities in a manner similar to that used worldwide for incineration plants.

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1. Introduction

People around the world are generating waste in raising quantities, and the composition of this waste is becoming increasingly complex. “These two trends pose a challenge to cities, which are charged with protecting their citizens from their waste” (Sintana, 2012). Industrialized countries usually generate far more waste than the others, but their waste tends to be best managed. As in many less industrialized countries, the wastes in Brazil are usually managed mixing formal actors in the regular collection and informal actors in selective collection and in the waste recovery. In this context, the big challenge is integrating the informal waste sector, by assuring adequate work conditions, increasing collection efficiency and improving waste treatment methods.

Municipalities around the world employ a variety of waste treatment options. Factors as local waste characteristics, qualification, cost and availability of local labour, and technological appropriateness should be considered to choose an option. Higher-income cities usually employ capital intensive technology for waste management activities and tasks, whereas lower-income cities tend to rely on labour-based technology options. “Regardless of the context, waste, directly and indirectly, is one of biggest challenges of the urban world” (UNHABITAT–2010, p.1). Recycling is the preferred option for the management of municipal solid waste, after

reducing the generation of solid waste at its source all over the word. Recycling has gained more attention in Brazil with the approval of the National Policy for Solid Wastes (PNRS). Law 12,305 passed in 2010. With this Law, the EPR (extended producer responsibility) was established as an instrument of economic and social development to facilitate the collection and return of solid waste to the corporate sector. Irrespective of support from governments at any level, manufacturers, importers, distributors and dealers of pesticides, including their waste and packaging; batteries; fluorescent, sodium vapour, mercury and mixed-light lamps; lubricating oils and their packaging and residues; tires; electric and electronic products and the components of the electric and electronic products are required to assume responsibility for the entire life cycle of their products.

Another relevant aspect of PNRS is the obligation of the Brazilian cities to deposit only the solid waste treatment tailings in sanitary landfills after August 2014. This policy implies the need to create material recovery facilities more adequate to the needs of waste recovery with a view to obtaining the least amount of residual material not amenable to solid waste treatment.

With these challenges posed by the new legal framework, this article has as its objective to record the current status of the recovery of recyclable solid wastes in Brazil, to review the background of this waste, to present the policies and plans currently being implemented and to identify elements for reform necessary to achieve the goals described in the National Plan of Solid Wastes (PNRS).

An approach to the recycling sector of Brazil has been established, encompassing the gravimetric composition of the solid

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Table 1
Forms of final disposal of domestic solid waste.

Final destination	Quantity in 2000 (t/day)	%	Quantity in 2008 (t/day)	(%)
Sanitary landfill	49.615	35.4	110.044	58.3
Controlled landfill	33.854	24.2	36.673	19.4
Dumping site	45.485	32.5	37.361	19.8
Composting plant	6.365	4.5	1.520	0.8
Material recovery facility	2.158	1.5	2.592	1.4
Incineration	483	0.3	65	<0.1
Wetland areas	228	0.2	35	<0.1
Unspecified sites	877	0.6	SI	–
Other units	1.015	0.7	525.20	0.3
Total	140.081	100	188.815	100

Source: [Brasil \(2012a\)](#).

waste and its recovery, the selective collection, and the characterisation of the material recovery facilities (MRFs). The conditions under which the waste pickers are permitted to pursue their activities and the results achieved by the waste pickers are examined and discussed.

This article presents the results of investigation of technical, environmental, social, and operating conditions of the “materials recovery facilities (MRFs)” deployed in Brazil and describes the challenges related to the management of waste in accordance with the new legal framework and the challenges associated with the National Plan for solid waste. The article proposes a definition and categorisation of MRFs according to their degree of automation and nominal capacity, similar to what is already known worldwide for incineration plants.

After this brief introduction, advantages and disadvantages of distinct models are discussed, and finally, conclusions and recommendations for the sector required reform are suggested.

2. The sector of recycling in Brazil

According to Hoornweg, world cities generate approximately 1.3 billion tonnes of solid waste per year. “Waste generation rates will more than double over the next twenty years in lower income countries. Globally, solid waste management costs will increase from today’s annual \$205.4 billion to about \$375.5 billion in 2025. Cost increases will be most severe in low income countries (more than 5-fold increases) and lower-middle income countries (more than 4-fold increases)” ([Hoornweg, 2012](#)).

With the approval of a new legal framework for the management of solid waste in the country and the consequent increase in the costs involved in waste management, it is necessary to understand the problems associated with further analysis of the recycling sector.

Brazil has 5565 municipalities and a population in 2012 of approximately 1969 million inhabitants ([IBGE, 2012a,b](#)). About 70% of the municipalities have fewer than 20 thousand inhabitants, in contrast to the 15 largest metropolitan regions that contain 37% of the population, corresponding to 72 million inhabitants ([IBGE, 2012a,b](#)). These population differences dictate different regional, economic and cultural realities as well as distinct standards of living.

In 2008, approximately 1835 million t/day¹ of municipal solid waste were collected throughout the country ([IBGE, 2010](#)). The average collected municipal solid waste was 0,97 kg per capita per day (referred to 2008).

The collection of solid waste from homes has encompassed 98% of the urban population and 80% of the population of the whole country (PNAD, 2007). Of the waste collected, 58.3% was sent to

Table 2
Estimate of gravimetric composition of municipal solid waste.

Waste	Quantity (t/day)	Share (%)
Recyclable material	58.527	32
Organic matter	94.335	51
Other	30.619	17
Total	183.482	100

Source: [Brasil \(2012a\)](#) - data of 2008.

sanitary landfills, 19.4% was sent to controlled landfills, and 19.8% was sent to dumping sites, as shown in [Table 1](#).

2.1. Waste generation and recycling rates

Brazil, in accordance with the provisions for developing countries, presents a steady growth in per capita generation of waste that should continue for years to come ([Campos, 2013](#)).

This information is fundamentally important for understanding the evolution of the generation of the quantity and quality of waste and to study the strategies used for the management of this waste.

Studies conducted by the Institute of Applied Economic Research (IPEA) show that in 2008, 32% of the collected wastes were recyclable materials, corresponding to 58,527 t/day, as shown in [Table 2](#).

According to a 2008 survey of the National Information on Sanitation System (SNIS), covering a limited sample of municipalities, the per capita annual recovery of recyclable materials from waste was 3.4 kg of paper, 2.0 kg of plastic, 0.8 kg of metals and 0.6 kg of glass ([Brasil, 2009c](#)). The programs for the recovery of waste under the coordination of the local governments are just beginning, operate precariously and represent less than 4% of the recycled waste in the country ([Brasil, 2012a](#))

In recent years, there has been a relative increase in the recycling of solid waste in Brazil. Recycling of solid waste reached 13% in 2008, as shown in [Graph 1](#) ([Figueiredo, 2012](#)). In the case of aluminium beverage cans, the recycling rate reached 98% in 2010 ([CEMPRE, 2012](#)). The high recycling rates are achieved by the strong exploitation of the labour of hundreds of thousands of collectors of recyclable material.

The situation is favourable when compared to other countries of Latin America but far from the rates achieved in Organization for Economic co-operation and Development - OECD countries.

Waste exchange initiatives supported by industrial federations are being consolidated and are already operating in several Brazilian states, easing changes between companies and industries with offers of purchase and sale of recycled industrial waste ([Wolffebuttel, n.d.](#)).

[Figueiredo \(2012\)](#) considers that the recycling of the waste by industry exclusively meets the demands of economic production chains of the sector and is not of importance to environmental

¹ t – tonne or metric ton (1000 kg).

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