



## Full length article

## Barriers to waste recycling development: Evidence from Brazil

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## ABSTRACT

Part of urban sustainability strategies, waste recycling is an activity that can provide environmental, sanitary, social and economic benefits. However, despite its relevance, it has not been entirely developed. Therefore, the purpose of this paper was to identify the restraining forces that have limited the expansion of waste recycling. The research was carried out through a collective case study in Brazil, where besides preserve natural resources, waste recycling creates employment and wealth. Two contrasting cases were studied: a newly-implemented program and a well-established one. Data collection included documental research, in loco observation, 800 closed quantitative interviews with householders and 33 guided qualitative interviews within waste pickers, scrap dealers, recycling industries' managers and local administrators. The main barriers identified were the lack of knowledge about practical and operational aspects of programs, an unequal sharing of the costs and benefits of recycling, a deficient infrastructure and a shortfall of professional management. The better understanding of these barriers can improve waste recycling in distinct urban contexts, as some of the barriers have been found in other developed and developing countries. They can also aid local administrations to perceive and overcome problems in different urban activities.

## 1. Introduction

Among the issues concerning sustainable development, one that deserves special attention is urban sustainability. The difficulty in balancing quality of life and preservation of natural resources is more evident in urban areas, where expectations about job availability, housing and access to culture exist together with hopes for pure air, mental and physical health and contact with nature.

The contribution that a city can offer to a sustainable development involves individual and collective activities, such as land occupation, energy and water saving, public transportation, basic sanitation etc. Another activity is waste management, which includes the entire cycle of waste generation, storage, collection, sorting, transport, treatment and disposal. When an urban area experiences any kind of growth (demographic, economic etc.), it is expected to face the challenges of increased flow of resources, making waste management even more relevant.

One of the waste management strategies is waste recycling, an alternative for the reutilization of recoverable portions of resources, especially in times of higher consumption of goods and services. Successful waste recycling programs produce many benefits, including environmental, sanitary, social, economic and educational. They reduce the use of raw materials and the amount of waste carried to landfills or incinerators and, in developing countries, they are able to create job opportunities and income (Grimberg and Blauth, 1998). However,

despite all these benefits, waste recycling has not been fully spread yet. In Brazil, although previous researches have showed that 47% of the population considered waste the main urban environmental problem, only 32% of the cities do have active recycling programs (Brasil, 2012; IBGE, 2012). Second, less than 12% of the potentially recyclable materials are collected, rate similar to other developing countries such as Russia (11%), China (20%) and South Africa (10%) but lower than those with similar economies, such as Italy (43%), France (40%) or Canada (32%) (SNIS, 2015; Snytkova and Salnik, 2013; Tai et al., 2011; Green Cape, 2015; Eurostat, 2015; Giroux, 2014). Third, the average amount of recycled waste sorted in Brazil had little change from 2008 (12.3 kg/cap/yr) to 2013 (12.8 kg/cap/yr) (SNIS, 2015). These numbers suggest that there exist active restraining forces to the improvement of waste recycling in Brazil. Therefore, the purpose of this paper was to identify the barriers that limit the development of waste recycling programs.

## 2. Barriers or restraining forces

The idea of barriers can be traced to the work of Lewin (1952, 1958) on individual change. He argued that every process of change has three stages, called unfreezing, movement and refreezing. Unfreezing regards the motivation and willingness to change, when an individual/group realizes the need to modify or to adjust some behavior. The movement is when new behaviors are learned or when the individual/group turns

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from less accepted to more accepted behaviors. Lewin (1952, 1958) explained that this stage depends on the (un)balance between driving forces – that support or encourage change – and restraining forces – that create physical or social obstacles that do not lead to locomotion, but influence the effect of the driving forces. Hence, any type of movement will depend on the interaction between these forces: if driving forces are stronger, the outcomes will be closer to desired; if restraining forces are stronger, then more effort will be needed to achieve intended goals. Finally, refreezing involves the consolidation of change, the continuance in the new status or the maintenance of learned behaviors.

Lewin's (1952) ideas on the process of change seem adequate to analyze waste recycling programs. His model was developed to explain individual or group behavior; nevertheless, macro processes such as those related to urban management (public transportation, energy and water saving, waste recycling etc.), are formed by a series of individual and group behaviors. More specifically, the waste recycling process can be understood as a sequential collection of various individual and group behaviors performed by the participants of the stream, such as householders, waste pickers, industry managers, local administrators etc. These behaviors are connected, and actions in one part of the stream influence the next levels. For instance, policies on waste recycling implemented by local government may not be effective if households do not accept and change their own behavior; the policy itself depend on the individual behavior of local representatives, who must be willing to modify current practices.

A further benefit of Lewin's model is the acknowledgement of the driving and restraining forces. He explains that before change, the individual/group is in a state of quasi-stationary equilibrium, which he compares to a river that flows with a given velocity in a given direction during a certain time interval. In order to alter the equilibrium and promote movement (change the velocity or the direction of that river), he proposes two methods: add forces in the desired direction or diminish opposing forces (Lewin, 1958). Concerning waste recycling, the numbers presented before imply that the changes that have happened over the years were not fulfilling, or using Lewin's analogy, have not changed the velocity or the direction of the river at a sufficient rate. Thus, to improve waste recycling, we believe that the restraining forces should be identified and reduced.

Current available literature also offers an opportunity to study restraining forces. In a systematic review about barriers to waste recycling, Jesson et al. (2014) analyzed a total of 109 documents, from which only 30 were academic researches. On the review carried out for this paper, even though 32 scientific papers were found, a closer view indicated that only nine were about restraining forces,<sup>1</sup> while the remaining 23 actually focused on driving forces, and superficially mentioned the barriers.<sup>2</sup> We believe that most studies concern the driving forces either because they are usually recognized as stronger than the restraining forces, or because their presence is accepted as enough to support change, neglecting the existence of any other limitation. Moreover, the word “restraining” and its correlates (barriers, limits, obstacles, resistances, restrictions etc.) are misinterpreted as something negative or abnormal; in fact, restraining forces should be considered natural and even benefic, as they might promote resistance to prejudicial or questionable changes (Robbins and Judge, 2013).

Another feature in current literature is the primary interest on household behavior. Among the nine studies about restraining forces,

<sup>1</sup> Bacot et al. (2002); Blake (1999); Jesson et al. (2014); McDonald and Oates (2003); Oliveira (2012); Read (1999); Simmons and Widmar (1990); Troschinetz and Mihelcic (2009) and von Borgstede and Biel (2002).

<sup>2</sup> Barr (2007); Best and Kneip (2011); Burcham (2015); Derksen and Gartrell (1993); DeYoung (1989); El-Amrouni et al. (2010); Fullerton and Kinnaman (1996); Hornik et al. (1995); Jeyaraj (2011); Martin et al. (2006); McCarty and Shrum (1994); Mee and Clewes (2004); Ribeiro and Besen (2011); Schultz et al. (1995); Schultz and Oskamp (1996); Shaw and Maynard (2008); Simmons and Widmar (1990); Tonglet et al. (2004); Troschinetz and Mihelcic (2009); Vicente and Reis (2008); Vining and Ebroe (1990); Vining et al. (1992) and Woodard et al. (2006).

six were about obstacles in household behavior (Blake, 1999; von Borgstede and Biel, 2002; Read, 1999; Simmons and Widmar, 1990; McDonald and Oates, 2003; Troschinetz and Mihelcic, 2009) and only three regarded the entire recycling stream (Jesson et al., 2014; Oliveira, 2012; Bacot et al., 2002). The premise is that recycling depends mostly on source-separation and, consequently, if household behavior is changed, than recycling will be effective. Although successfully recycling programs do depend on source-separation, they also depend on sorting, collection, treatment, final disposal and adequate management, actions involving other individuals and groups who are likewise susceptible to the influence of driving and restraining forces. For that reason, this research deliberately included several stakeholders of the recycling process.

Within the few studies exclusively addressed to restraining forces, two are noteworthy. Jesson et al. (2014) classified the main barriers to recycling into four groups, being: situational barriers (inadequate containers, lack of space at home, unreliable collections etc.); behavioral barriers (household disorganization, lack of time or of a household routine etc.); knowledge barriers (not knowing what to recycle or the basic aspects of the scheme); and attitude barriers (not believing in the environmental benefit and lack of reward or recognition for efforts). Broader, Trudgill (1990) proposed six categories of barriers to general pro-environmental behavior: agreement (acceptance that the problem exists and it is relevant); knowledge (of causes, consequences and possible solutions); social (moral and ethical implications of actions); technological (availability e appropriateness of solutions); economic (cost sharing); and political (power division and willingness to solve the problem).

### 3. Methods and cases studied

The approach chosen for this research was the collective case study, suggested when two or more cases are analyzed to reveal new findings, facts or insights about the phenomenon of interest (Stake, 1994). The study was engaged in Brazil, a developing country where, besides resource conservation, waste recycling is used to generate employment and income. In Fig. 1, we present a generic overview of waste recycling systems in Brazil, where programs are slightly different from those in developed countries. The most apparent distinction is the presence of informal groups such as waste pickers, scavengers, itinerant traders, scrap dealers, middlemen etc. In some cities, local administration admits that about 70% of the recyclable waste collected is done “unofficially”, i.e., by informal participants rather than outsourced collecting companies (PMC, 2013). Another variation is in final disposal options, as Brazil, with more available land, is usually more prone to invest in sanitary landfills instead of incinerators, more suitable for countries with restricted available land.

The study was conducted in Brasília and Curitiba, respectively third and fifth wealthiest Brazilian cities, which vary considerably in the level of development of their waste recycling systems (see Table 1). While Curitiba's waste program is almost thirty years old, well established and considered one of the best in the country, Brasília started in 2014 its third formal attempt to implement a recycling program; additionally, Curitiba accomplishes better results in coverage and volume collected and it has higher per capita investment in sorted collection (more than national average). The study of two cities in different stages of development intends theoretical replication, when the cases will produce contrasting results for predictable reasons (Yin, 2015). It is also related to the possibility of generalizing the barriers to other waste recycling programs in Brazil, as case studies permit to expand theories and suggest modified explanations to a complex phenomenon through the deep investigation of one or more cases that represent it, i.e., they permit an analytical generalization (Becker, 1994; Stake, 1994).

In order to guarantee that conclusions are not based in casual events and to confirm acquired information, it is part of qualitative case studies the gathering of data from different sources and by different

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