

Municipal Solid Waste Management Strategies to Transition to Circular Economy and Urban Resilience: A Comparative Analysis of Plans from Two Big Cities, Salvador, Brazil and Barcelona, Spain



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Introduction

Circular Economy (CE) is more applied to stages of reduction, reuse and recycling of waste seeking to achieve economic prosperity (Kirchherr et al., 2017). The municipal solid waste sector is a fundamental link in the production chains to an effective transition to the CE model. This transition presents numerous challenges related to local peculiarities and to vulnerabilities, and, also with its global interactions and effects, such as the climate crisis and urban resilience.

Salvador (SALV), capital of the state of Bahia, Brazil, and Barcelona (BCN), capital of the Autonomous Province of Catalunya, Spain have similarities. Both are big and large coastal cities with an economic sector heavily based on tourism and services. The municipalities of these cities are seeking to transition from the linear model of Municipal Solid Waste Management (MSWM) and trying to incorporate the concept of circular economy. These cities are also part of the 100 RC Resilient Cities Network. As common issues there are high population density, stress of urban systems and risks due to natural disasters and climatic events (Barcelona Municipality, 2021). In addition, Salvador city faces chronic high unemployment rates and informal jobs, aggravated by the Covid-19 pandemic.

Objective

The objective of research was to analyze strategies, alternatives, and their implementation to facilitate the transition to the circular economy of solid waste management.

Methodology

The methodology was a systematic and critical review on scientific literature and municipal solid waste management plans, and official documents. A comparative analysis of data and information was carried out for Salvador and Barcelona between the years of 2012 and 2022. The search terms in the web of science were “municipal solid waste management” and “circular economy”, and “plans” or “programs”.

The research questions to be answered were: (1) Which mechanisms are essentials for the transition to circularity fluxes in municipal solid waste management (MSWM)? (2) Which are the mainly adequate technological routes must be adopted? (3) What strategies must be prioritized for the transition to a CE model that could increase urban resilience?

Results & Discussion

In Spain and Brazil there are national solid waste management plans. The ultimate objective of the Spanish plan is to make society more efficient in the use of resources moving towards a circular economy, while the Brazilian Plan is the implementation of a SWM hierarchy, with priority to the elimination of dumps. The most important plans in municipal management are the “Basic Urban Cleaning Plan”, that is implemented between 2012 and 2030 (Salvador, 2012) on Salvador (SALV) and the “Waste Plan” on Barcelona (BCN), that was implemented between 2012 and 2020 (Barcelona, 2013).

The MSWM hierarchy is adopted as a planning guideline in both cities. A portion of the waste in BCN (39,5%) is segregated and collected selectively (organic, paper, glass, light packaging, and other fractions). These fractions are valorized by composting initiatives and recycling units. The remaining portion, that is not segregated, denominated “resta” is sent to mechanical biological and energetic valorization units. The rejects from these fluxes are sent to sanitary landfills. On the other hand, in SALV, the majority of the waste (99,4%) is not segregated and is being sent to sanitary landfill since 1999.

The MSWM system in the city of SALV is financed by a fee that is charged and calculated by taking into account the constructed pattern of the building and other variables such as constructed area, current market value and property use (commercial or residential). In BCN, the fee is calculated by considering water consumption and the building’s pattern. The citizens that have washing machine, dish washing machine, swimming pools, etc., have to pay a higher rate than citizens who only have basic sanitary hydraulic devices such as showers, sinks, etc.

From the year 2012 to 2020, the municipality of Barcelona adopted a strategy that aimed to reduce the amount of waste sent to landfills, by using treatment and recycling units, promoting agreements and initiatives to improve the selective collection of the different waste fractions. However, this strategy is not enough to allow reaching all the goals for reuse, recycling and destination that were stipulated by Spain and the European Community for the year of 2020. The MSWM in Salvador, Bahia, in turn, is very distant from the CE concepts. The priority is the improvement of the different waste collection services. Only 0.6% of that is collected and segregated by cooperatives of recyclable material collectors with no contractual relationship. Based on the comparison of the strategic plans, and indicators of achieved goals in the analyzed period, it is observed that the incorporation process of the concept of Circular Economy in Barcelona is more advanced than in the city of Salvador. Thus, this can provide subsidies on some of the strategies to be adopted (Figures 1 and 2) to incorporate the concept of CE and contribute to reduce vulnerabilities

	Vulnerabilities	Benefits	
↓	Poverty and social inequality	Generation of qualified jobs; new businesses	↑
	Intensive use of municipal services of MSWM	Robustness of the SW system, eco-efficient and diversified routes, increase in the useful life of products, sustainable consumption	
	Lack of the belonging perception, of the right to have access to the city’s infrastructure and of the social cohesion	Better quality of service provision, healthy environment, greater environmental awareness	

Figure 1: Results of the incorporation of the Circular Economy Concept for Urban Resilience

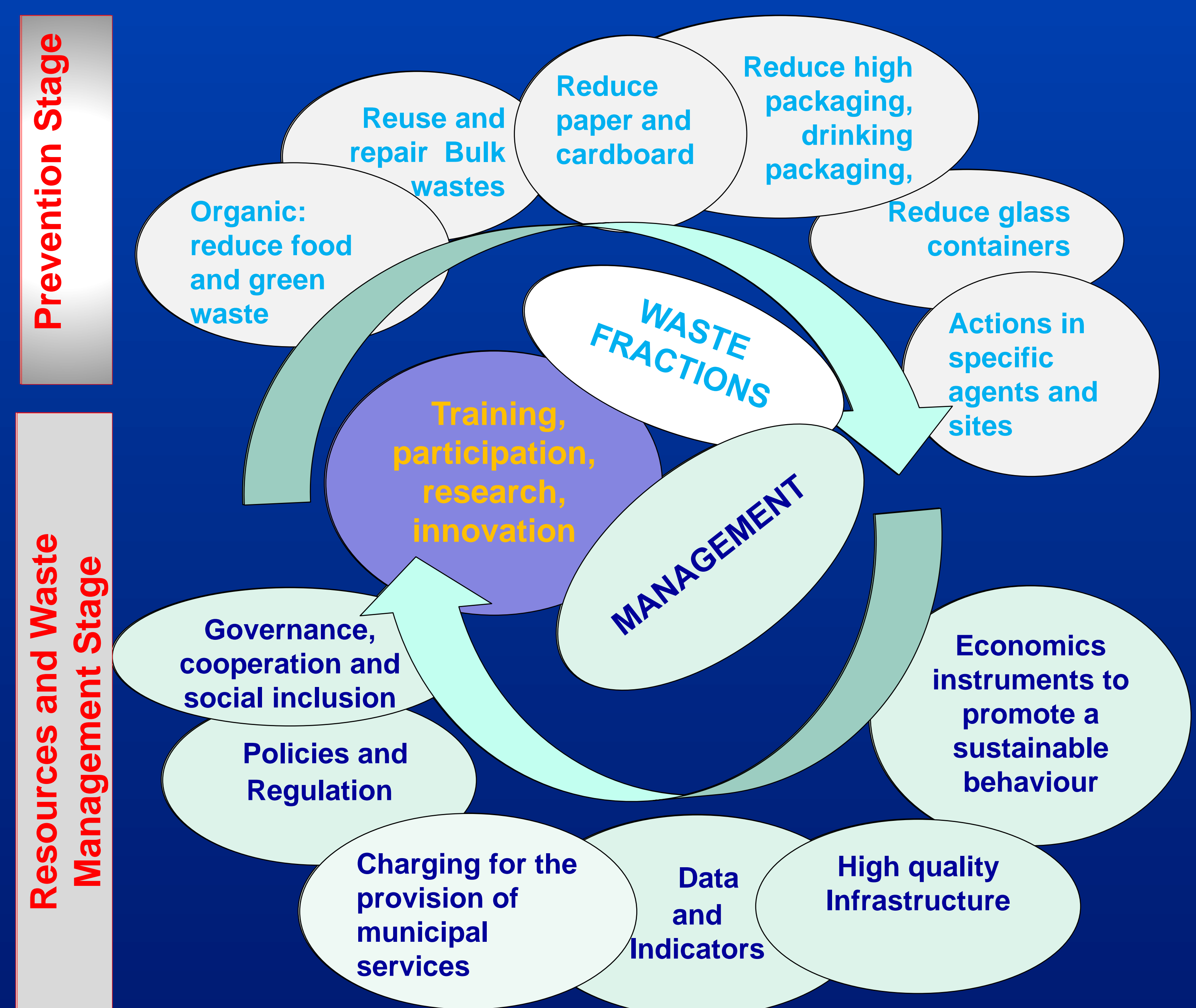


Figure 2 MSWM for Strategies to transition to EC and improvement Resilience

Conclusions

It is concluded that the strategy adopted by the municipality of Barcelona led to a solid waste system more circular than in the city of Salvador. For improve resilience and circularity of the municipal solid waste management system, it is necessary to go further seeking a better efficiency in the re-insertion of recycled materials through initiatives that can create markets for secondary raw materials. Complementary, it is necessary innovate instruments of planning that encourage a new behaviour of citizens in the search for new processes and products based on the concept of Circular Economy

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