

# 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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This basic concept of Circular Economy (CE) is the eco efficiency circular flow of materials and energy to reach sustainability. The transition from the current economic model to one based on premises such as the transformation of waste into resources to obtain primary and secondary raw material and energy is an ongoing process in different parts of the world. The CE is more applied in stages of reduction, reuse and recycling of waste seeking to achieve economic prosperity (Kirchherr et al., 2017).

Many studies are about experiences or practices EC in China or have relationship with environment, industry, symbiosis, technology, and ecology (Araujo Galvão et al., 2018). The municipal solid waste sector is not mentioned as one of the mainly topics of investigation. However, it is a fundamental link in the production chains to practice the CE premises.

The search for CE strategies and alternatives and their implementation presents numerous challenges related to local peculiarities and vulnerabilities, and, also with its global interactions and effects, such as the climate crisis and urban resilience. To assess the social and environmental benefits of the circular economic strategies adopted is necessary the case-by-case study at the local, regional, and global levels, and in temporal terms (Korhonen et al., 2018).

Salvador city, capital of the state of Bahia, Brazil and Barcelona city, located in 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 the transition from linear model of municipal solid waste management and try to incorporate the concept of circular economy. These cities are also part of 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 a chronic high unemployment rates and informal jobs, aggravated by the Covid-19 pandemic (Salvador Municipality, 2019).

The strategies of transition for a municipal solid waste management aligned with the Circular Economy that would lead to economic progress, environmental benefits with an emphasis on reducing social vulnerability, need to be more investigated. This work explores this issue through a comparative analysis about the circular economy concept application in solid waste management in Salvador and Barcelona cities. The analysis aims to answer some important questions as which mechanisms are essentials for the transition to circularity fluxes in municipal solid waste management; which the mainly adequate technological routes must be adopted; and what strategies that must be prioritized for the transition to a circular economy model that could increasing urban resilience.

The methodology was a systematic and critical review about scientific literature and municipal solid waste management plans and official documents between the year of 2012 until 2020. The keywords for database search were “municipal solid waste management” and “circular economy” and, “plans” or “programs”. Only peer-reviewed papers were revised. The papers that did not directly have relation with solid waste management and circular economy in urban context were excluded. The solid waste management goals, technological routes and mechanisms were analyzed according to EC concept, i. e. the preparation for the prevention phase must emphasized.

The municipal solid waste management hierarchy is adopted as a planning guideline in both cities. A portion of the waste in the Barcelona city (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 a mechanical biological units and energetic valorization. The rejects from these fluxes are sent to sanitary landfill. On the other hand, in Salvador city, the majority of the waste (99,4%) are not segregated and is being sent to the sanitary landfill, since 1999.

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

From the year to 2010 to 2020, the municipality of Barcelona adopted a strategy that aims to reduce the amount of waste sent to landfills, using treatment units, 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 2020. The solid waste management in Salvador, Bahia, in turn, is very far away of the CE concepts.

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, and new jobs. 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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