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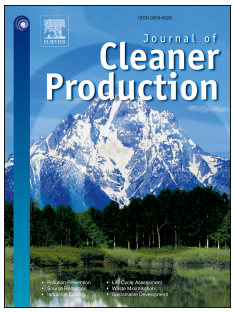

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Methodology to evaluate the environmental impact of urban solid waste containerization system: a case study

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ABSTRACT

Integrated systems for municipal solid waste (MSW) management have to be planned and designed to satisfy the needs of citizens and minimise the environmental impact of any of its stages: collection, transport and treatment. The collection step is usually performed through containerization systems which are not analysed from the environmental impact perspective. Accordingly, this paper describes a methodology to evaluate the environmental impact of the urban containerization systems by using the life cycle assessment (LCA) methodology.

The methodology designed determines the environmental impact associated with the total containerization of a city, as well as for each district. This methodology consists of three phases: i) detailed data collection for the city; ii) LCA for each containerization system applied in the city; and iii) LCA aggregation for each district and for the city as a whole, including result discussion and conclusion extraction. Therefore, the methodology allows an assessment of the differences among districts and establishes a correlation among environmental impact, number of containers and collection effectiveness, as well as their relationship with depending demographic and socioeconomic variables. To verify the methodology, it has successfully been applied to the city of Madrid (Spain).

Results show that: i) the environmental impact of the containerization systems is mainly driven by the type of container employed and capacity allocation; ii) the container's environmental impact depends on the weight/volume ratio, the type and weight of each component materials and the container's lifetime; iii) the containerization overcapacity in certain districts leads to a higher impact per capita; and iv) those districts with lower waste collection effectiveness (kg of waste collected per litre of container) or with higher containerization capacity for the collection of MSW fractions whose collection is less effective (paper and cardboard), have a greater impact per mass of waste collected.