A Life Cycle Analysis approach focusing on source separation systems: Case Study of Pyrgos in Tinos Island

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Abstract

Waste recycling and reuse is the main goal imposed by the latest EU Waste Framework Directive (2008/98/EC) in waste management. Starting in 2020 at least 50% of plastics, paper and cardboard, glass and metals must be prepared for reuse or be recycled. In addition, dedicated collection systems, including organic waste have to be implemented for these categories, in order to reach the targets set by EU. For this reason, a number of waste management methodologies is proposed, in order to find the most sustainable system in environmental, economic and technical terms.The municipal solid waste (MSW) management includes three main processes: the collection, the treatment and the disposal. Hence the most of the waste management systems found in the literature is a combination of the aforementioned activities.

In the present study a holistic LCA approach of the waste management system applied in PyrgosTown of Tinos is presented. The applied SS system is based on the source separation in four different bins. In specific the brown bin corresponds to the collection of the organic fraction, the yellow corresponds to the collection of the paper/cardboard, the orange corresponds to the collection of the glass and the red one corresponds to the collection of the metals and plastic. In parallel, a grey bin still remains for the not easily separated waste by the consumer. The organic fraction is led to a pilot composting unit for the compost production.The most crucial parameters that have been investigated are the SS intensity, the fuel consumption for the transportation sector, as well as, the considerations related to the carbon storage for the calculation of the total environmental footprint. Hence, comparing to the landfill process, the SS system is considered more environmentally friendly, since avoidance in disposal of the organic fraction at the landfill site is performed.

Two methodologies are applied for the estimation of the environmental footprint. IMPACT 2002+ and IPCC 2007 are the method taken into account in this study. The IMPACT 2002+ methodology was selected, since it links the LCI results of the examined case studies through 14 midpoint categories to 4 damage categories: Human Health, Ecosystem Quality, Climate Change and Resources.In addition, the results are presented through the IPCC 2007 methodology, which is a single issue method focusing on the estimation of the global warming impact. The last method is taken into consideration, because the global warming impact is considered one of the most significant impact categories, since a number of considerations about the carbon degradation have been taken into account in the examined

concepts.Results showed that the savings emissions from the recovering of materials at source are extremely higher than the avoidance of the emissions related to the compost process.

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