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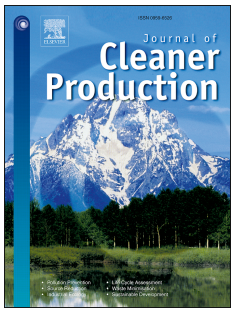

Comparative Life Cycle Assessment of Beverages Packages in Palestine

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Comparative Life Cycle Assessment of Beverages Packages in Palestine

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Abstract

Palestine has been encountering a serious problem represented in continuing and unfair depletion of its natural resources especially water and energy. The causes of such a problem are attributed to many sources including some Palestinian industries which adversely contribute to the shortages of these resources and consequently result in some negative environmental impacts. Among these industries are the beverages bottling and their packaging materials industries working in Palestine. This study aims at evaluating and comparing the potential environmental impacts of glass, aluminum (Al), and polyethylene terphthalate (PET) packaging materials of certain sizes of beverages using life cycle assessment (LCA) methodology based on the International Standardization Organization (ISO) standards. More specifically, the LCA study is conducted on the 300 ml glass bottles, the 330 ml Al- cans, and the 2000 ml PET bottles produced, consumed and disposed in West Bank in Palestine. Based on life cycle inventory analysis of data obtained from local sources, seven significant weighted environmental impact categories, in accordance with Impact 2002+ method, are considered in conducting the life cycle impact assessment. Such categories include water consumption, non-renewable energy, solid waste, human toxicity, terrestrial acidification, global warming potential and respiratory effects. The comparative LCA study reveals that, in the Palestinian context, the 2000 ml PET beverages bottles have the least environmental impact, while the 330 ml Al beverages cans come second after the PET bottles, whereas the 300 ml glass bottles are found to have the highest environmental impact. In addition, as revealed by the results of sensitivity analysis, the resulted environmental impacts could be significantly reduced via increasing the respective recycling rates of the three investigated packaging materials.

Keywords: life cycle assessment (LCA), packaging materials of beverages, water consumption, non-renewable energy, human toxicity, solid waste.

1. Introduction

During the last few decades, environmental awareness has increased due to growing evidence of adverse effects of industrial (Fernandez-Garcia *et al.,* 2015), agricultural (Casanova-Pelaez *et al.,* 2015) and domestic pollution (Pan and Wang, 2012) and depletion of scarce resources (Banos *et al.* 2011). This awareness has fueled the movement in governments and "green movement" among civil organizations towards environmental protection of air and climate, water (Montoya *et al.,* 2015), land, energy resources (Montoya *et al.,* 2014; Hernandez-Escobedo *et al.,* 2015), humans (Gazquez *et al.,* 20105), animals (Sanchez-Muros *et al.,* 2014) and plants (Manzano-Agugliaro and Canero-Leon, 2010). To solve global environmental problems, one needs