Determination of Houses LCA within warm climate changes using GaBi software

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Abstract

The construction sector, (buildings development mainly) are liable for the 40% of EU energy consumption. For this the European directives 2002/92/EC and 2010/31/EC (recast) focuses on the energy performance of buildings and aim to improve energy efficiency. Despite the fact that EU north countries have slowly-slowly started to adopt guidelines for green building materials, Cyprus does not have any guidelines and laws in order to reduce the environmental impact of buildings and generally from the construction sector.

This paper aim to determine the environmental footprint (EFP) of typical houses in Cyprus, using life cycle assessment method (LCA). The purpose of LCA for this work is to evaluate the containment of environmental impacts combined with the use of raw materials and energy. The software of GaBi 6.0 was used to calculate EFP and specifically the method "International Reference Life Cycle Data System (ILCD)" which is introduced within the recommendations of the European framework for assessing the impact of the life cycle. Through a questionnaire the features of a typical residence house in Cyprus were determined. The main feature of such a house is that it is made of reinforced concrete and the size varies from 170 to 200 m². Then six houses were used with those characteristics, and we gathered information on the quantities of construction materials, the method of construction, their use and demolition. Through the ILCD method thirteen indicators were determined. 9 of them were dealing with the environmental pillar (like global worming potential, ozone depleting potential, acidification potential, eutrophication potential, eutrophication aquatic, photochemical oxygen creation potential, abiotic recourse depletion, Resource depletion – water and terrestrial ecotoxicity freshwater. 4 indicators (human toxicity potential, non cancer and cancer effects; human toxicity potential, cancer effects; Particulate matter and ionising radiation / human health) were used the social pillar (including public health).

The results indicated that electricity consumption (during the construction but mostly during the operational phase of the house) plays significant role in the environmental impact of the houses while construction materials like cement, concrete, steel are the main cause in the entire life cycle of a house for the huge environmental damage caused by the construction industry.

Keywords: LCA, Gabi model, environmental foot print, contraction materials, subtropical climate change