LCA FOR A RESIDENTIAL ITALIAN MULTIFAMILY BUILDING: A CASE STUDY

Pierluca Vitale, Department of Environmental, Biological, Pharmaceutical Sciences and Technologies – Second University of Naples, Via Vivaldi, 43, 81100 Caserta, ITALY
pierluca.vitale@unina2.it
Fabrizio Di Gregorio, AMRA s.c.ar.l. – Analysis and Monitoring of Environmental Risk, Via Nuova Agnano, 11, 80125 Napoli, ITALY
Umberto Arena, Department of Environmental, Biological, Pharmaceutical Sciences and Technologies – Second University of Naples, Via Vivaldi, 43, 81100 Caserta, ITALY

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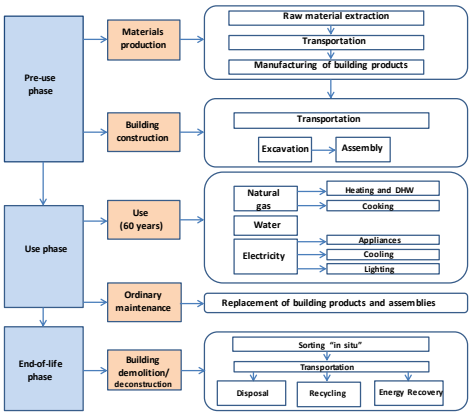
The importance of the construction sector involves environmental, economic and social aspects. From an environmental point of view, the sector consumes about 60% of the mineral extraction from the lithosphere [1], and requires up to 40% of the total energy demand of an industrialized country [2]. Moreover, a huge amount of construction and demolition wastes are generated: 821 Mt/y only in Europe in 2012, i.e. 32.7% of the total amount of European waste [3-5]. An environmental friendly policy appears then necessary to improve the environmental performances of the sector.



This study develops an attributional Life Cycle Assessment (LCA), with reference to a typical Italian multifamily building (24 flats on three floors), with the aim of comparing the potential environmental impacts related to its main life cycle stages: material production and construction (pre-use), utilization and maintenance (use), building demolition and waste management (end-of-life). The pre-use phase takes into account the production of 24 construction materials or components, their transportation, and the final on-site assembling. The use-phase assumes a building life of 60 years, and estimates the energy and material consumptions for the ordinary maintenance and those related to lighting, cooking, heating, cooling, and appliances. The end-of-life phase considers the stages of building demolition and management of the related wastes. The latter was defined based on the Italian best practices, assuming recycling rates ranging between 60% and 95% for recoverable (mainly metals and inert) materials, and a safe landfilling of the rest waste [6].

The results compare the contributions of the different life cycle stages, and quantify the influence of design criteria on the environmental performances of the building under analysis, along its life cycle.

The role of pre-use phase appears remarkable, since the production of concrete and steel implies huge impacts, in particular for the category of Global Warming. The use stage gives the most important contribution to the total impact, which in the case of Global Warming category is as high as 75% of the total. Its crucial role relates to the assumed life span of 60 years, in particular for the energy consumptions necessary for air conditioning. This in turn emphasizes the importance of design criteria for building insulation: a sensitivity analysis was therefore developed for alternative scenarios, utilizing different insulation solutions.

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