83. Life Cycle assessment of construction materials based on carbon footprint

Mwangi D. M[1]*, Chege J. N. [1], Matheka R. M.[1] And Mirara S. W[1]

Civil and Environmental Engineering Department, Meru University of Science and Technology

*Corresponding author: dmumbi2020@gmail.com, 0716264938

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Abstract

Construction is among the leading industries contributing the largest carbon footprint. Construction and demolition (C&D) waste emit greenhouse gases which pollute the air and exacerbates greenhouse effect, yet its disposal is still wanting. The effect of global warming is becoming more extreme, and the average temperature levels are being surpassed every year and in turn contributing to climate change. This study focused on identification and quantification of greenhouse gases associated with different construction materials. The study employed Life Cycle Assessment (LCA) methodology, considering the entire life cycle of key construction materials from extraction and production to disposal. Emission factors specific to each waste category, including concrete, wood, metal, and plastic were utilized to calculate the greenhouse gas (GHG) emissions. Through a detailed examination of secondary data sources, encompassing materials extraction, production, transportation, use, and disposal, the key contributors of GHGs in the construction industry were identified to be concrete, steel and PVC plastics. Further the research examined the life cycles of the three key contributors of construction materials waste from cradle to gate to grave, quantifying the carbon emissions at every stage of the life cycle whereby eminent greenhouse gases included: carbon dioxide (CO2), methane (CH4) gas, nitrous oxide(N2O), hydrofluorocarbons (HFCs) etc. The key GHG emitters were Steel, PVC and concrete and by modelling through the openLCA, found out that for one tonne of concrete waste there is an impact of 733.9742kg CO2eq. on global warming, steel 4.147E5kgCO2eq. while PVC results to 1.014E4 kgCO2eq.Therefore, there is need for a sustainable management of the C&D waste which alligns with global efforts to mitigate climate change and promote environmental sustainability.

Keywords: *Carbon footprint, construction sustainability, Green house gases*