

Environmental impact evaluation on interlocking compressed earth brick using life cycle assessment

ABSTRACT

Interlocking Compressed Earth Bricks (ICEB) is one of the alternative low carbon building materials replacing conventional brick. This study evaluates the embodied environmental impact of ICEB production in terms of embodied environmental implications for global warming potential (GWP). The life cycle assessment (LCA) analysis methodology was performed to identify and quantify the environmental performance of brick production from cradle-to-gate. Additionally, the emission in terms of GWP is analyzed using GaBi software. The system investigated includes raw materials and machinery used for brick production and transportation. Energy use and emissions are quantified, and the potential environmental effects are assessed. Sensitivity analyses were calculated on the percentage of cement content of 15% and 10% of the soil weight. The results show that the embodied carbon for 1 kg clay bricks in Sabah is 0.202 kgCO₂-eq. Cement usage in brick production contributes the most significant environmental impact with carbon emissions of 0.172 kgCO₂. The carbon emission of ICEB found a slight improvement compared to the conventional fired clay bricks (FCB). The result on sensitivity analyses found that the GWP reduced to 27-51% as the percentage of cement content was reduced at 10 and 15%. The findings proved that carbon emissions could be reduced with a lower cement usage in the mix design of ICEB.