GLOBAL WARMING POTENTIAL OF A RESIDENTIAL BUILDING CONSTRUCTION IN MALAYSIA USING THE LIFE CYCLE ASSESSMENT (LCA) APPROACH

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Abstract
Building industry consumes substantial natural resources and produces considerable greenhouse gas emission. This paper presents a life cycle assessment approach to assess Global Warming Potential (GWP) of a residential building in Malaysia. The results show that building element that uses a cement-based material such as concrete contributed the highest GWP in comparison to other materials. In the construction phase, temporary timber formwork has the highest GWP. The results also show that the semi-detached house has higher GWP per m^2 compared to flats. The findings from this research can serve as the benchmark for LCA for buildings in Malaysia.

INTRODUCTION

Climate change and sustainable development are among major issues being discussed these days all over the world thoroughly. These issues demand improvement in government policies and industry standard. Building industry contributed considerably to the economy and social development but also responsible for excessive natural resource consumption and emission released (Arena and de Rosa, 2003). Recent research estimated that buildings responsible for 50% of Greenhouse Gas (GHG) emission and consume 40% of all primary energy globally (Asif et al., 2007).

Due to the increasing awareness of environmental issues, numerous studies have been conducted to reduce buildings' environmental impact including the implementation of Life Cycle Assessment (LCA) (Singh et al., 2011). Currently, LCA method is one of the assessment tools that being applied to assess the environmental impact thoroughly. LCA is globally accepted as a tool to improve the environmental impact of manufacturing processes and services in various industries and recently has been introduced to the building industry (Fava et al., 2009; Ortiz et al., 2009). LCA is a systematic analysis for quantifying industrial process and products by itemizing flows of energy and material use, wastes released to the environment and evaluating alternatives for environmental improvements (Fay et al., 2000; Guinée, 2012).

In Malaysia, the palm oil industry is the first sector to apply LCA as it was part of the requirement to export biodiesel to European countries (Ismail and Chen, 2010). Research on LCA has evolved to various industries in Malaysia since, ranging from electronics (Syafa et al., 2008), potable water production (Sharaai et al., 2009a, 2009b), electricity generation (Shafie et al., 2012), waste management (Onn and Yusoff, 2012) and buildings (Bin Marsono and Balasbaneh, 2015; Omar et al., 2014; Wan Omar et al., 2014; Wen et al., 2014).