

Comparative Life Cycle Analysis of Selected Modular Timber Construction and Assembly Typologies

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Abstract : The building industry must reduce its emissions in order to meet 2030 neutrality targets, and modular and/or offsite construction is seen as an alternative to conventional construction methods which could help achieve this goal. Modular construction has previously been shown to be less wasteful and has a lower global warming potential (GWP). While many studies have been conducted investigating the life cycle impacts of modular and conventional construction, few studies have compared different types of modular assembly and construction in order to determine which offer the greatest environmental benefits over their whole life cycle. This study seeks to investigate three different modular construction types -infill frame, core, and podium- in order to determine environmental impacts such as GWP as well as circularity indicators. The study will focus on the emissions of the production, construction, and end-of-life phases. The circularity of the various approaches will be taken into consideration in order to acknowledge the potential benefits of the ability to reuse and/or reclaim materials, products, and assemblies. The study will conduct hypothetical case studies for the three different modular construction types, and in doing so, control the parameters of location, climate, program, and client. By looking in-depth at the GWP of the beginning and end phases of various simulated modular buildings, it will be possible to make suggestions on which type of construction has the lowest global warming potential.

Keywords : modular construction, offsite construction, life cycle analysis, global warming potential, environmental impact, circular economy

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