Influence of allocation methods in life cycle assessment of buildings

LIRIDE

Research team

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Context

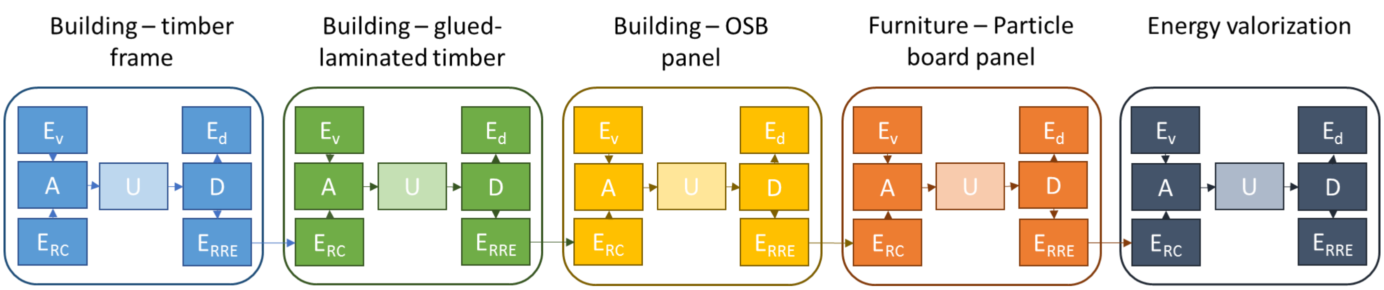
The use of material resources forms a great challenge for societies of today and tomorrow. The building sector is amongst the biggest consumer of these resources. It also generates a high quantity of residues once it reaches the end of life. These residues may be discarded to waste, or recycled, which launches a new life cycle. Doing so extends the total life span of a material with a single extraction phase. Several methods exist to account for the life cycle impacts of materials going through multiple life cycles. This gives rise to inconsistancies with each other by not always aknowledging the same parameters. Such parameters include the link that unites a first use to its second, or the variation of inherent properties at the end of a cycle.

Goal

The project aims to propose a consistent procedure for modeling materials with multiple life cycles. To do so, allocation methods from attributional life cycle assessment (A-LCA) are compared and adapted to make them more inclusive of the issues of circular use of materials, i.e., the number of cycles and the variation in intrinsic properties. The conclusions of these models are compared with those of a consequential LCA model (C-LCA) to illustrate the influence of the field of study. An application case is developed with wood products from the building sector.

Methods

The project's case study is a five-cycle cascade recycling of wood products from the building sector. The environmental assessment is carried out using three methods. The first (A) is a polluter-pays approach that considers only the emissions associated with the handling in the present cycle. The second (B) is a proposed method that allows the consideration of subsequent and previous cycles in the assessment, in addition to the quality of the recirculated products. The third (C) is the broader consequential method. The results indicate that the inclusion of life cycle number and quality can significantly affect the sharing of impacts between cycles, but that the conclusion on the efficiency of material recirculation depends rather on the broader system.



Applications

With the growing popularity of circular economy, the study illustrates the importance of using appropriate calculation methods to determine the environmental balance of materials from the building sector, as well as from the domestic sector. The proposed method (B) can be used consistently across all environmental balance applications involving reuse, recycling, recovery and landfill.

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