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Introduction of a dynamic interpretation of building LCA results: the case of the smart living (lab) building in Fribourg, Switzerland

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Abstract

The building sector is one of the largest contributors to climate change. The life cycle assessment (LCA) is a method developed for the calculation of greenhouse gas (GHG) emissions. Although a building lifetime is not predictable, it is an essential data in the yearly impact calculation. Yet, the LCA is currently used as a static method, because it only considers one or a few buildings' lifetime.

The purpose of this study is to introduce a new dynamic interpretation of LCA results, which aims at improving the building assessment robustness.

To that end, two different methods of calculation are compared:

- a static approach that assesses the impacts on the 50th, then 70th and then 100th year of the buildings;
- a dynamic approach that assesses the impact anytime during the first 100 years of building lifetime.

Since the building impacts depends also on the chosen components and their quantity, in this study two scenarios have been applied: one compares two building projects that differ from each other only on the shape; the other compares two projects that differ only on the chosen components. The smart living lab building has been chosen as a case study. This building aims at reaching the goals of the 2000-watt society vision and will be achieved in 2020 in Fribourg, Switzerland. As the lifetime is a key parameter of the performance, it is particularly interesting to conduct such a study in the frame of a very efficient building. KBOB database and lifetime of components proposed by PI-BAT were used for assessing the GHG emissions.

The dynamic interpretation shows that the results of the static method could vary up to 100% according to the chosen building lifespan and thus, completely change the conclusion of the impact comparison. This becomes more significant when the projects differ on their shape and even more obvious when they are compared on their chosen components. To conclude, a dynamic approach leads to more robust results and should therefore be chosen.