

DESIGN BUILDINGS FOR LATER REUSE AND RECYCLING: A WAY TO FURTHER REDUCE THE CARBON FOOTPRINT OF CONSTRUCTION?

CONTEXT

More than 50% of waste from the construction sector is wood in all its forms. This is why it is relevant to reduce its end-of-life disposal and to encourage its reuse and recycling according to the 5R's.¹ FPInnovations researchers and their partners have designed a 6-storey, light wood-frame residential building that allows both source reduction, and reuse and recycling at the end of its useful life. In Scenario 1, the building was designed to be easily convertible to an office building. In the other two scenarios, the building was redesigned, so that its elements could be reused (Scenario 2) or so that a greater portion of materials could be recycled at the end of their service life (Scenario 3). Construction costs and environmental impacts for the three scenarios were compared to those of a light wood-frame construction.

¹ 5R's is an acronym to describe the hierarchy in the processing of residual materials. It designates the priority given to reduction, reuse, recycling, recovery for use as an energy source, and residual management, in that order.



Find out more:

Batsy, Dieudonné Romaric and Lavoie, Patrick. *Conception des bâtiments pour la démontabilité (CpD/A) et l'adaptabilité*. FPInnovations, 2020.

KEY MESSAGES

- The principles of design for disassembly and adaptability (DfD/A) are applicable to light wood-frame mid-rise buildings and would not lead to significant increases in construction costs.
- For all buildings studied, the end-of-life period contributes about 17% of the life-cycle carbon footprint.
- The largest potential reduction of GHG emissions (~50%) is attributable to extending the usable life of the building from application of adaptability principles, i.e. versatility, convertibility and capacity for increasing the building size.
- Application of disassembly principles leads to lesser GHG reductions, reaching at most 9%. Taking into account avoided production, resulting from the reuse of certain elements and materials, brings this reduction to 16%.

GHG REDUCTION RELATED TO APPLICATION OF DESIGN FOR DISASSEMBLY AND ADAPTABILITY (DfD/A) PRINCIPLES



RECOMMENDATIONS

- (Educate construction professionals and product manufacturers on the importance of integrating end-of-life considerations at the start of the product and building design processes.
- Continue development of the proposed DfD/A checklist by consulting industry professionals and other stakeholders.
- Develop life-cycle inventories specific to Quebec for the management of residual materials and innovative construction products.