# RESEARCH in Progress

Forest Products Laboratory

Assessing Life-Cycle Environmental Impacts of CLT Mass Timber Buildings in the U.S. Northeast Region

Supported by a grant awarded to The Nature Conservancy (TNC) from the Doris Duke Charitable Foundation, this project explores opportunities for increased demand for sustainable wood products to become a catalyst for reforestation, improved management of forests, and increased mitigation of climate change through the global forest sectors. Specifically, the project will develop detailed whole-building life-cycle assessments (LCAs) of six case studies of wood product use in the mass timber construction sector, focusing on the climate change impact and covering a representative range of geographies and forestry systems. These case studies would help answer the following questions:

- What is the possible range of climate outcomes associated with an increase in the use of wood in world construction sector?

- How much do those outcomes vary depending on the specifics of the wood product use, production, and origin?

- What scale of impact might a given increase in wood product demand have on wood harvest and forest carbon stocks?
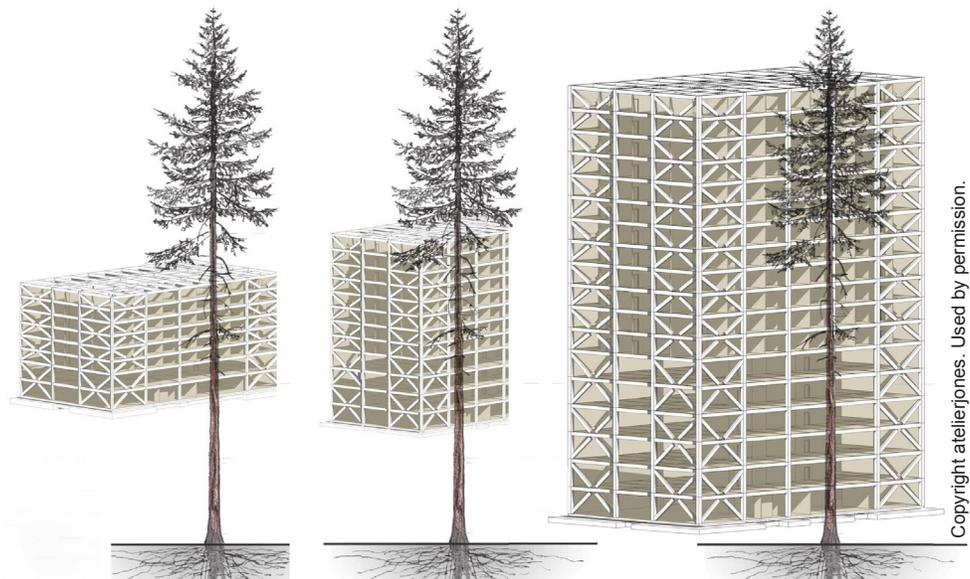
UL: MEETING THE SAFETY CHALLENGES OF THE FUTURE BUILT ENVIRONMENT
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Background

In the context of its ongoing initiative on Natural Climate Solutions, TNC is seeking to understand the potential opportunity to mitigate climate change through the use of mass timber materials in construction globally. Central to this opportunity is a better understanding of whether, and under what circumstances, managing forests to produce timber and other wood products delivers sustained benefits to climate change mitigation. TNC has initiated a multi-phase collaborative research project to understand the ways that mass timber use could impact net greenhouse gas (GHG) emissions across the

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economy, from management and harvest of forests to construction, use, and demolition of buildings.

The first phase of this work will involve LCA case studies comparing mass timber and conventional buildings in six geographies, three within and three outside the United States.

Objective

The FPL team is in charge of developing a full comparative LCA study for three multiple-story mass timber buildings and their concrete alternatives in the U.S. Northeast region, with Boston as the point location.

Approach

This comparative LCA study will proceed specifically as follows:

- The cradle-to-gate (including module A1 to A5) LCA analysis will be completed for 8-, 12-, and 18-story cross-laminated timber (CLT) mass timber buildings and their functional equivalent concrete buildings.

- Using the bill of materials provided by the building architects, SimaPro LCA software will be used to model the life-cycle impacts to the environment from the six building designs and compare the LCA results.

- It is assumed that building materials will be supplied primarily from the regional Northeast area, and the FPL team will modify the U.S.-based building material life-cycle inventories (LCIs) for Northeast region and make assumptions for building material transportation distance and other necessary modifications.

Expected Outcomes

Using these three comparative LCAs, this research will determine the GHG emissions reduction potential from mass timber use in the building sector for the U.S. region. This may increase potential for growth in wood utilization, timber harvest, and forest management practices through the market demands.

Timeline

Buildings design and material take-offs were completed in October 2019, and comparative LCAs were completed in December 2019. The final report will be written by spring 2020.

Cooperators

USDA Forest Service, Forest Products Laboratory

The Nature Conservancy

University of Washington

Consortium for Research on Renewable Industrial Materials (CORRIM)

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