An Assessment of Greenhouse Gas Emissions from CLT and Glulam in Two Residential Nearly Zero Energy Buildings

Author:	Lolli, Nicola
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Publisher:	Taylor&Francis Online
Year of Publication:	2019
Country of Publication:	United Kingdom
Format:	Journal Article
Material:	CLT (Cross-Laminated Timber)
	Glulam (Glue-Laminated Timber)
Application:	Wood Building Systems
Topic:	Environmental Impact
Keywords:	GHG
	Greenhouse gas emissions
	Tall Wood
	Concrete
Language:	English
Research Status:	Complete
Series:	Wood Material Science & Engineering
Online Access:	Free

Resource Link

https://www.tandfonline.com/doi/full/10.1080/17480272.2019.1655792

Circular Economy & the Built Environment Sector in Canada

https://research.thinkwood.com/en/permalink/catalogue2805

Organization:	Delphi Group
	SCIUS Advisory
Year of Publication:	2021
Country of Publication:	Canada
Format:	Report
Material:	CLT (Cross-Laminated Timber)
	Glulam (Glue-Laminated Timber)
	NLT (Nail-Laminated Timber)
	Other Materials
Application:	Wood Building Systems
	Hybrid Building Systems
Topic:	Environmental Impact
	Design and Systems
Keywords:	Circular Economy
	Greenhouse gas emissions
	Waste
	Demolition
	Design for Disassembly and Adaptibility
	Design for Durability
	Deconstruction
	Material Recovery
	Reverse Logistics
Language:	English
Research Status:	Complete

Summary:

This study on Circular Economy & the Built Environment Sector in Canada was carried out by The Delphi Group in collaboration with Scius Advisory and completed in March 2021 on behalf of Forestry Innovation Investment Ltd. (FII) in British Columbia and Natural Resources Canada (NRCan) as the co-sponsors for the research. The work identifies a broad range of current efforts across Canada and undertakes a deeper dive on design for disassembly and adaptability (DfD/A) best practices, including an analysis of the ISO Standard 20887:2020 (i.e., design for disassembly and adaptability) in line with current Canadian industry practice and market readiness.

Online Access: Free

Resource Link

https://delphi.ca/wp-content/uploads/2021/04/Circularity-in-Canadas-Built-Environment-Final-Report-April-14-2021.pdf

Cradle-to-Gate Life-Cycle Assessment of a Glued-Laminated Wood Product from Quebec's Boreal Forest

https://research.thinkwood.com/en/permalink/catalogue2555

Author:	Laurent, Achille
	Gaboury, Simon
	Wells, Jean-Robert
	Bonfils, Sibi
	Boucher, Jean-François
	Sylvie, Bouchard
	D'Amours, Sophie
	Villeneuve, Claude
Publisher:	Forest Products Society
Year of Publication:	2013
Country of Publication:	Canada
Format:	Journal Article
Material:	Glulam (Glue-Laminated Timber)
Topic:	Environmental Impact
Keywords:	LCA
	Cradle-to-Gate
	Sustainability
	Greenhouse gas emissions
	Carbon Footprint
Language:	English
Research Status:	Complete
Series:	Forest Products Journal

Summary:

The building sector is increasingly identified as being energy and carbon intensive. Although the majority of emissions are linked to energy usage during the operation part of a building's life cycle, choice of construction materials could play a significant role in reducing greenhouse gas emissions and other environmental end-point damages. Increasing the use of wood products in buildings may contribute to the solution, but their environmental impacts are difficult to assess and quantify because they depend on a variety of uncertain parameters. The present cradle-to-gate life-cycle analysis (LCA) focuses exclusively on a glued-laminated wood product (glulam) produced from North American boreal forests located in the province of Quebec, Canada. This study uses primary data to quantify the environmental impacts of all necessary stages of products' life cycle, from harvesting the primary resources, to manufacturing the transformed product into glulam. The functional unit is 1 m3 of glulam. This is the first study based on primary data pertaining to Quebec's boreal forest. Quebec's boreal glulam manufacturing was compared with two other LCAs on glulam in Europe and the United States. Our results show that Quebec's glulam has a significantly smaller environmental footprint than what is reported in the literature. From an LCA perspective, there is a significant advantage to producing glulam in Quebec, compared with the European and American contexts. The same holds true in regard to the four end-point damage categories.

Online Access:	Free

Resource Link

https://meridian.allenpress.com/fpj/article/63/5-6/190/136808/Cradle-to-Gate-Life-Cycle-Assessment-of-a-Glued

Dynamic Life Cycle Carbon and Energy Analysis for Cross-Laminated Timber in the Southeastern United States

https://research.thinkwood.com/en/permalink/catalogue2688

Author:	Lan, Kai
	Kelley, Stephen
	Nepal, Prakash
	Yao, Yuan
Publisher:	IOP Publishing Ltd
Year of Publication:	2020
Format:	Journal Article
Material:	CLT (Cross-Laminated Timber)
Topic:	Energy Performance
Keywords:	Life-Cycle Assessment
	LCA
	Dynamic
	Carbon Analysis
	Greenhouse gas emissions
	Energy Consumption
	Cradle-to-Grave
Language:	English
Research Status:	Complete
Series:	Environmental Research Letters

Summary:

Life Cycle Assessment (LCA) has been used to understand the carbon and energy implications of manufacturing and using cross-laminated timber (CLT), an emerging and sustainable alternative to concrete and steel. However, previous LCAs of CLT are static analyses without considering the complex interactions between the CLT manufacturing and forest systems, which are dynamic and largely affected by the variations in forest management, CLT manufacturing, and end-of-life options. This study fills this gap by developing a dynamic life-cycle modeling framework for a cradle-to-grave CLT manufacturing system across 100 years in the Southeastern United States. The framework integrates process-based simulations of CLT manufacturing and forest growth as well as Monte Carlo simulation to address uncertainty. On 1-ha forest land basis, the net greenhouse gas (GHG) emissions ranges from -954 to -1445 metric tonne CO2 eq. for a high forest productivity scenario compared to -609 to -919 for a low forest productivity scenario. All scenarios showed significant GHG emissions from forest residues decay, demonstrating the strong need to consider forest management and their dynamic impacts in LCAs of CLT or other durable wood products (DWP). The results show that using mill residues for energy recovery has lower fossil-based GHG (59%–61% reduction) than selling residues for producing DWP, but increases the net GHG emissions due to the instantaneous release of biogenic carbon in residues. In addition, the results were converted to 1 m3 basis with a cradle-to-gate system boundary to be compared with literature. The results, 113–375 kg CO2 eq./m3 across all scenarios, were consistent with previous studies. Those findings highlight the needs of system-level management to maximize the potential benefits of CLT. This work is an attributional LCA, but the presented results lay a foundation for future consequential LCAs for specific CLT buildings or commercial forest management systems.

Online Access: Free

Resource Link

https://iopscience.iop.org/article/10.1088/1748-9326/abc5e6/meta

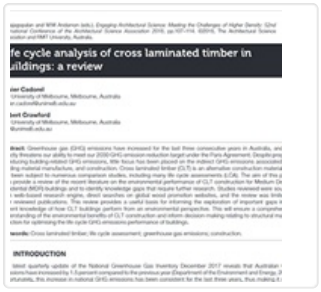
Environmental and Economic Evaluation of Small-Scale Bridge Repair Using Cross-Laminated Timber Floor Slabs

https://research.thinkwood.com/en/permalink/catalogue2397

Author:	Iwase, Tetsuya
	Sasaki, Takanobu
	Araki, Shogo
	Tomohumi, Huzita
	Kayo, Chihiro
Publisher:	MDPI
Year of Publication:	2020
Format:	Journal Article
Material:	CLT (Cross-Laminated Timber)
Application:	Bridges and Spans
Topic:	Design and Systems
	Environmental Impact
Keywords:	Floor Slabs
	Life-Cycle Assessment
	Greenhouse gas emissions
	Waterproofing Treatment
	Reinforced Concrete
Language:	English
Research Status:	Complete
Series:	Sustainability
Online Access:	Free

Resource Link

https://www.mdpi.com/2071-1050/12/8/3424



Life Cycle Analysis of Cross Laminated Timber in Buildings: A Review

https://research.thinkwood.com/en/permalink/catalogue2141

Author:	Cadorel, Xavier
	Crawford, Robert
Year of Publication:	2019
Country of Publication:	Australia
Format:	Conference Paper
Material:	CLT (Cross-Laminated Timber)
Application:	Wood Building Systems
Topic:	Environmental Impact
Keywords:	Greenhouse gas emissions
	Life-Cycle Assessment European Standard EN15978
	Multi-Family
	Multi-Storey
	Mixed-Use Building
	Buildings
Language:	English
Conference:	International Conference of the Architectural Science Association
Research Status:	Complete
Online Access:	Free

Resource Link

https://www.researchgate.net/publication/330620007_Life_cycle_analysis_of_cross_laminated_timber_in_buildings_a_review

Oregon Cross-Laminated Timber; An Economic Solution to Incorporating Timber into Cap and Trade

https://research.thinkwood.com/en/permalink/catalogue2706

Author:	Lutje, Dakoata
Publisher:	University of Oregon
Year of Publication:	2020
Country of Publication:	United States
Format:	Thesis
Material:	CLT (Cross-Laminated Timber)
Topic:	Environmental Impact
	Market and Adoption
Keywords:	Cap and Trade
	Greenhouse gas emissions
	Environmental Impact
Language:	English
Research Status:	Complete

Summary:

As the state of Oregon begins to introduce a new cap and trade program to reduce the effects of its greenhouse gas emissions, the state has opted not to incorporate its largest greenhouse gas emitter; the timber industry. The decline of the timber industry after the 1980's had lasting effects on disadvantaged communities, and state politicians have battled the cap and trade bill in fear of further deterioration of the timber industry. In this paper I aim to take an in depth look at the potential that CLT has in Oregon, how it can be promoted by the government, and what the environmental effects of it are. I found that, with the rise of mass timber construction and promotion of green building, the state has the opportunity to use revenues from its cap and trade program to economically incentivize CLT construction that can provide relief to economically stressed rural logging communities, all whole bolstering its efforts to better the environmental impact of an ever expanding construction industry.

Online Access: Free

Resource Link

https://scholarsbank.uoregon.edu/xmlui/handle/1794/25778

Seeing the Forest and the Trees: Environmental Impacts of Cross-Laminated Timber

https://research.thinkwood.com/en/permalink/catalogue2702

Author:	Kwok, Alison
	Zalusky, Hannah
	Rivera, Maria Isabel
	Rasmussen, Linsday
	McKay, Hannah
Publisher:	Taylor&Francis Online
Year of Publication:	2020
Format:	Journal Article
Material:	CLT (Cross-Laminated Timber)
Topic:	Environmental Impact
Keywords:	Greenhouse gas emissions
	Embodied Carbon
	Embodied Energy
	Life Cycle
Language:	English
Research Status:	Complete
Series:	Technology
	Architecture + Design

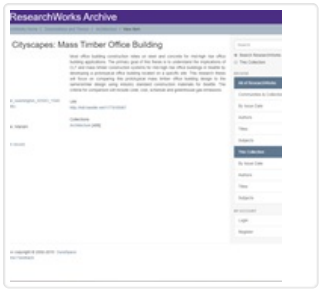
Summary:

With advances in wood product development and building code acceptance, mass timber structural systems have become viable alternatives to steel and concrete structural systems (Post 2015). These mass timber systems have environmental benefits, such as carbon sequestration ability and lower greenhouse gas emissions than steel and concrete systems. How can mass timber materials such as cross-laminated timber (CLT) reduce the environmental impacts of buildings, and how certain is this reduction? In order to truly answer this question, environmental impact assessments of CLT and other wood materials must first address variation and uncertainty in forest management and biogenic carbon accounting.

Online Access: Free

Resource Link

https://www.tandfonline.com/doi/full/10.1080/24751448.2020.1804754



Wood Cityscapes: Mass Timber Office Building

https://research.thinkwood.com/en/permalink/catalogue2300

Author:	Hovhannisyan, Mariam
Publisher:	University of Washington
Year of Publication:	2016
Country of Publication:	United States
Format:	Thesis
Material:	CLT (Cross-Laminated Timber)
Application:	Wood Building Systems
Topic:	Design and Systems
	Cost
	Environmental Impact
Keywords:	Office Buildings
	Mid-Rise
	Cost
	Schedule
	Greenhouse gas emissions
	Prototype
Language:	English
Research Status:	Complete

Summary:

Most office building construction relies on steel and concrete for mid-high rise office building applications. The primary goal of this thesis is to understand the implications of CLT and mass timber construction systems for mid-high rise office buildings in Seattle by developing a prototypical office building located on a specific site. This research thesis will focus on comparing this prototypical mass timber office building design to the same/similar design using industry standard construction materials for Seattle. The criteria for comparison will include code, cost, schedule and greenhouse gas emissions.

Online Access: Free

Resource Link

http://hdl.handle.net/1773/35087