THE PERCEPTION OF PLYWOOD PLANES

TO WHAT EXTENT CAN CROSS LAMINATED TIMBER (CLT) CONTRIBUTE TO THE 'ENVIROMENTAL WAR' AND HOW SHOULD ITS ADOPTION BE OPTIMISED / NAVIGATED TO AVOID SOCIAL, CULTURAL, POLITICAL, AND REGULATORY MISCONCEPTIONS / PERCEPTIONS TO BECOME A SUSTAINABLE SUCCESS?

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WHAT IS CLT

CLT:
Cross laminated timber (CLT) is a engineered timber construction product that uses layers of mass wood glued together to create structural or aesthetic elements

The material of the future is here, open both arms and embrace it. The solution has presented itself, hidden and embodied within history and culture. Cross-Laminated Timber. The very material that began our architectural dream thousands of years ago in the primitive shape of mere shelter has evolved from just offering protection, to modern day luxury. Architecture has advanced and so has its materials. Timber turned into stone, brick, concrete and steel... Now, back into timber? Surely we should not trust such a material that is so ancient and so organic? The misconceptions of mankind have on many occasions hindered progress and served reasonable doubt. Innovations and interventions have created chaos and solutions. We are in that very moment, where we need clarity to defuse this ongoing disruption before it creates regional or global chaos that threatens true visionary progress. This 'chaos' is the war with climate change.

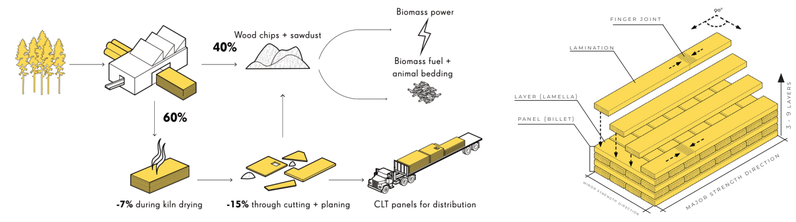


Figure I - Process of CLT (Thistleton Architects, 2018)

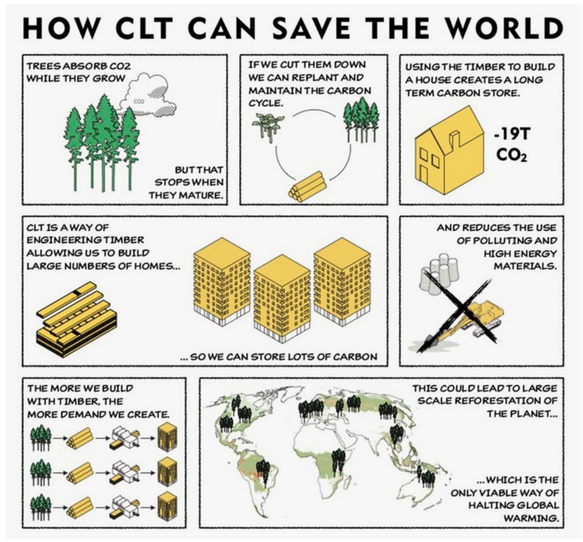


Figure II - HOW CLT CAN SAVE THE WORLD (Thistleton Architects, 2018)

ABSTRACT

Pushed into the spotlight, as an apparent architectural and engineering 'prodigy', CLT was birthed from architecture and engineering, as a response to a unique moment in the construction industry. This seemingly innocent material could start to shape our architectural world for many years ahead. Perhaps more than any material has ever done. It questions some of the raw fundamentals that have been standard for the last few centuries of architecture.

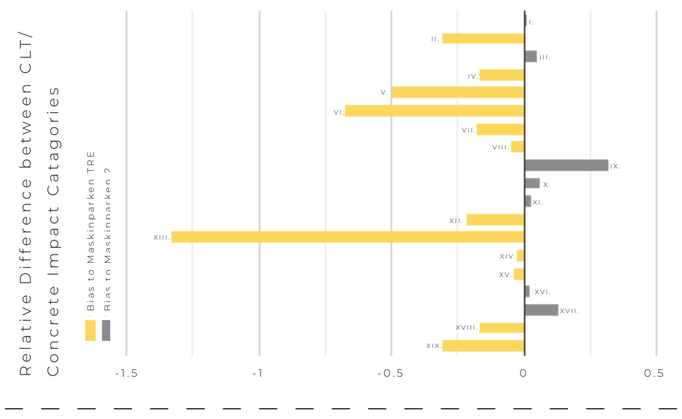
With 'green solutions' being critical to every industry, sustainable responses have been a key development. CLT's characteristics as previously explored carry significant potential in our response to the current climate. However, this branding of CLT as being 'sustainable' is not the only one that it wears. It carries the challenges of the "shock of the new" (Hughes, 1981) and the "shock of the old" (Edgerton, 2006). This mix of renaissance, revolution and innovation to a seemingly understood material, leads the way to both perception and misconception. These cultural marks that CLT already carries, both helps and hinders its future in becoming 'the material' for the climate crisis. Whilst this idea of the 'shock of the new' potentially makes it subject to this critical dialog from experts, but allows for testing and full understanding before becoming commonplace.

LITERATURE

The literature reviewed covers a varied set of topics. The first being a synthesis of (Andersen et al., 2021) and (Eliassen, 2019) work looking into the sustainability of a comparative case study into a CLT against standard construction strategies, such as reinforced concrete and steel structures. This sustainability factor is a well reviewed section of literature covered by multiple sources throughout the paper. The topics include 'The architecture of error' (Hughes, 2014) and 'A quick history of plywood' (Mitchell, 2021) that help to define the challenges plywood once went through and the social / cultural misconceptions and perceptions. The dissertation becomes a synthesis between these two sets of literature, using further sources into both historic and contemporary texts reviewing the cultural, social, political, economic, governmental and regulatory barriers that CLT faces. It also considers the blueprints set out by history with organic materials and frameworks from other countries that already have adopted CLT such as Scandinavia.

A TECHNICAL ANALYSIS

With the demand for construction ever growing, CLT deserves to be a key part of the solution. This is reinforced by the research into CLT's true sustainability. The case study of Maskinparken TRE and Maskinparken 2 showed that through all three stages; construction, utilisation and end of life, the CLT building's performance was significantly ahead both environmentally and economically. This is shown through the assessment of the comparative case study, the examined GHG emissions, LCA and the biogenic carbon footprint, we can conclude that the CLT building outperforms the traditional RC and steel approach of today. It is noted that noting results vary but should dispel concerns that CLT assessment is only 'truly sustainable' through a certain lens. Maskinparken TRE (CLT) , located in Norway, is a testimony to the use of CLT systems. Being built in a Scandinavian country, its results will naturally vary to a UK based construction but there is no question that the results will remain overall positive. However, it gives a strong reference towards why the UK should consider industrialising CLT construction.



I. Fine particulate matter formation
II. Fossil resource scarcity
III. Freshwater ecotoxicity
IV. Freshwater eutrophication
V. Global warming, Base scenario
VI. Global warming, Biogenic carbon scenario
VII. Human carcinogenic toxicity
VIII. Human non-carcinogenic toxicity
IX. Ionizing radiation
X Land use
XI. Marine ecotoxicity
XII. Marine eutrophication
XIII. Mineral resource scarcity
XIV. Ozone formation, Human health
XV. Ozone formation, Terrestrial ecosystems
XVI. Stratospheric ozone depletion
XVII. Terrestrial acidification
XVIII. Terrestrial ecotoxicity
XIX. Water consumption

Figure III - Thermal efficiency of materials (Thistleton Architects, 2018)

Figure IV - Comparison of strength (Thistleton Architects, 2018)

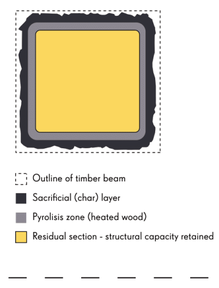


Figure V - Fire properties of wood (Thistleton Architects, 2018)

PLYWOOD PLANES

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The assessment of the plywood planes case study acts as a forewarning to potential challenges when introducing CLT into modern construction. Development of CLT originated in Scandinavia and was subject to minimal negative branding than perhaps the UK may experience, which could involve the 'shock of the old'(Edgerton, 2006) and 'shock of the new' (Hughes, 1981). An appreciation of the political appetite and cultural implications that can be created through the proposed use of an organic based material against a known artificial antagonist can be devastating towards its success if not handled correctly. The most appropriate method for successful integration is through governmental policies, potentially adopting Scandinavian strategies, to allow the CLT to become 'pop culture' within the UK.

Figure VI - de Havilland Mosquito (Badrocke, 2013)

PARADIGMS OF INTERGRATION

Whatever the process that is put into place, the UK is still "lagging behind" (Smyth, 2018). But the environmental credentials of CLT demands a sudden shift in adoption. The UK government is slowly trying to rectify this lack of support by addressing the underinvestment in skills and innovation (Prior et al., 2017) yet the evidence for that is less so, as mentioned previously it is "public perception along with those in industry is often what drives government policy" (Smyth, 2018). With this slow governmental climate that drives the UK means that even in 25 years from now, this authority and redirection of material use within any business of policy could change (Smyth, 2018). These design and logistical decisions still "advocate for traditional forms of construction" and therefore will not be a driving force or integrated or "enhance people's careers" (Roos et al., 2010).

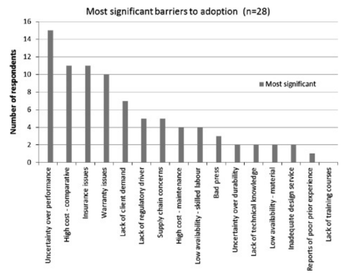

Figure XXVII - Most significant barriers to adoption of novel, more sustainable, approaches, products and materials. (Jones et al., 2016)

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Figure I: Thistleton Architects, W. (2018) Process of CLT [Online] Available at: https://www.thinkwood.com/wp-content/uploads/2019/08/Think-Wood-Publication-100-Projects-UK-CLT.pdf

Figure II: Thistleton Architects, W. (2019) How CLT can save the world [Online] Available at: https://waughthistleton.com/news/19/01/03/how-clt-can-save-world/

Figure III: Thistleton Architects, W. (2018) Thermal efficiency of materials. [Online] Available at: https://www.thinkwood.com/wp-content/uploads/2019/08/Think-Wood-Publication-100-Projects-UK-CLT.pdf

Figure IV: Thistleton Architects, W. (2018) Comparison of strength [Online] Available at: https://www.thinkwood.com/wp-content/uploads/2019/08/Think-Wood-Publication-100-Projects-UK-CLT.pdf

Figure V: Thistleton Architects, W. (2018) Fire properties of wood [Online] Available at: https://www.thinkwood.com/wp-content/uploads/2019/08/Think-Wood-Publication-100-Projects-UK-CLT.pdf

Figure VI: Mursystem (n.d.) Maskinparken 2&3, Trondheim [Online] Available at: https://mursystem.no/referanse-prosjekt-murer-trondheim/maskinparken-2-3-trondheim

Figure VII: Jones, K. et al. (2016) Most significant barriers to adoption of novel, more sustainable, approaches, products and materials. [Online] Available at: https://www.sciencedirect.com/science/article/pii/S0950061816313514

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"WE OFTEN REFER TO HUMAN CIVILISATIONS BY THE PRINCIPAL MATERIALS THEY EMPLOY, SUCH AS THE BRONZE AGE, IRON AGE ETC. IN THIS VEIN, THE 20TH CENTURY CAN BE VERY MUCH CALLED THE CONCRETE AGE AND IT SEEMS VERY LIKELY THAT THE 21ST CENTURY WILL BE THE TIMBER AGE."

WAUGH THISTLETON ARCHITECTS
(THISTLETON, 2018)

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