New growth in timber markets

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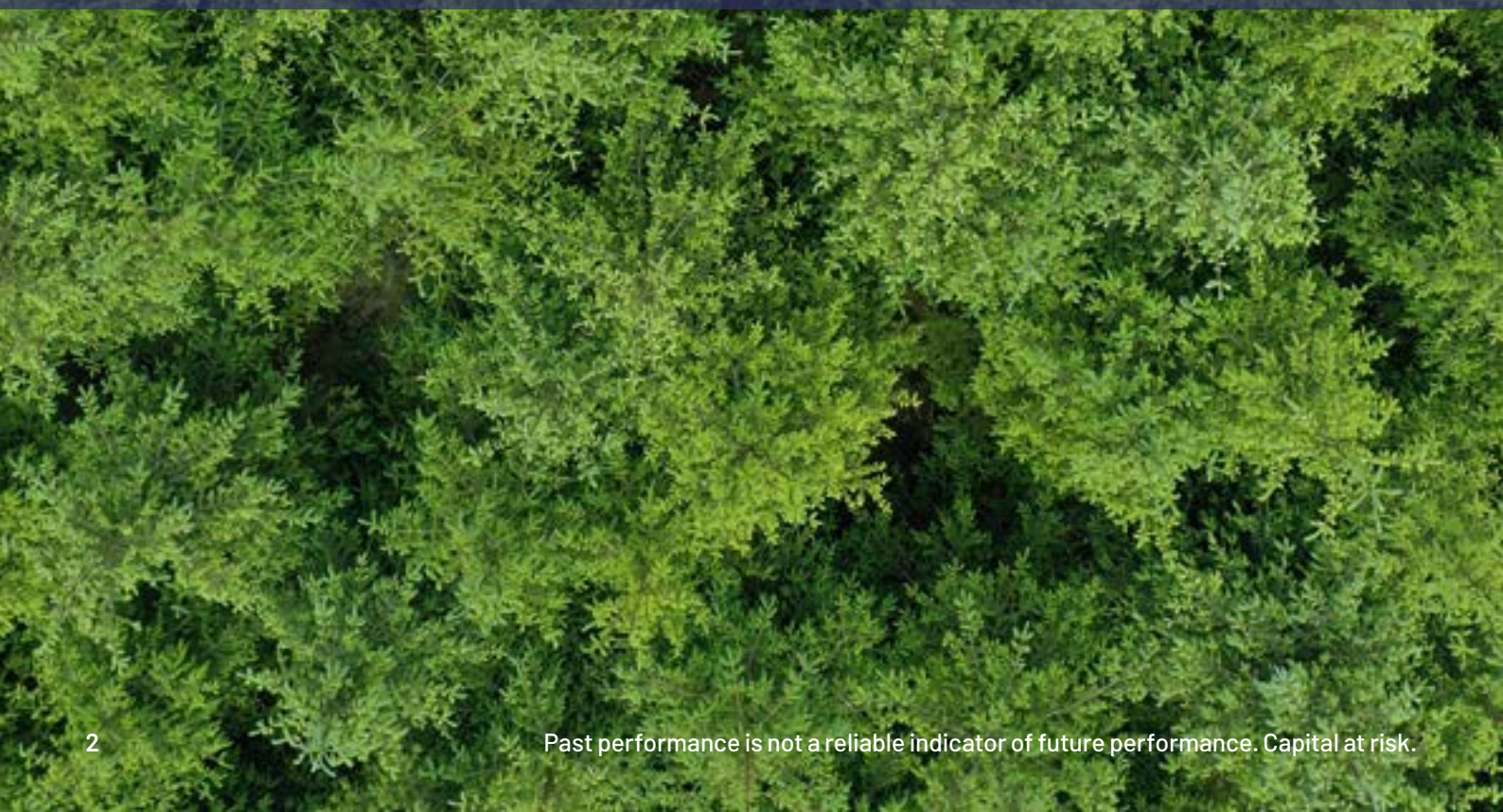
Gresham House believes that global industrial roundwood consumption will almost triple by 2050 from a historic annual increase of 1.3% to 3.1%.

This is a remarkable growth story for a global commodity market, underpinned by three core drivers:

- population growth and urbanisation
- a global housing shortage
- the transition to a lower carbon economy

Complementing these demand drivers are new developments in timber construction, allowing for a wider application of the commodity. One of those developments is mass timber which looks set to revolutionise the construction industry.

In this paper we will look at what mass timber is, how it is used, what the barriers are to widespread adoption as well as the implications for Forestry.



Mass timber, construction and why it is relevant

Innovation in the development of forest products has led to the creation of mass timber, which looks set to revolutionise the construction industry.

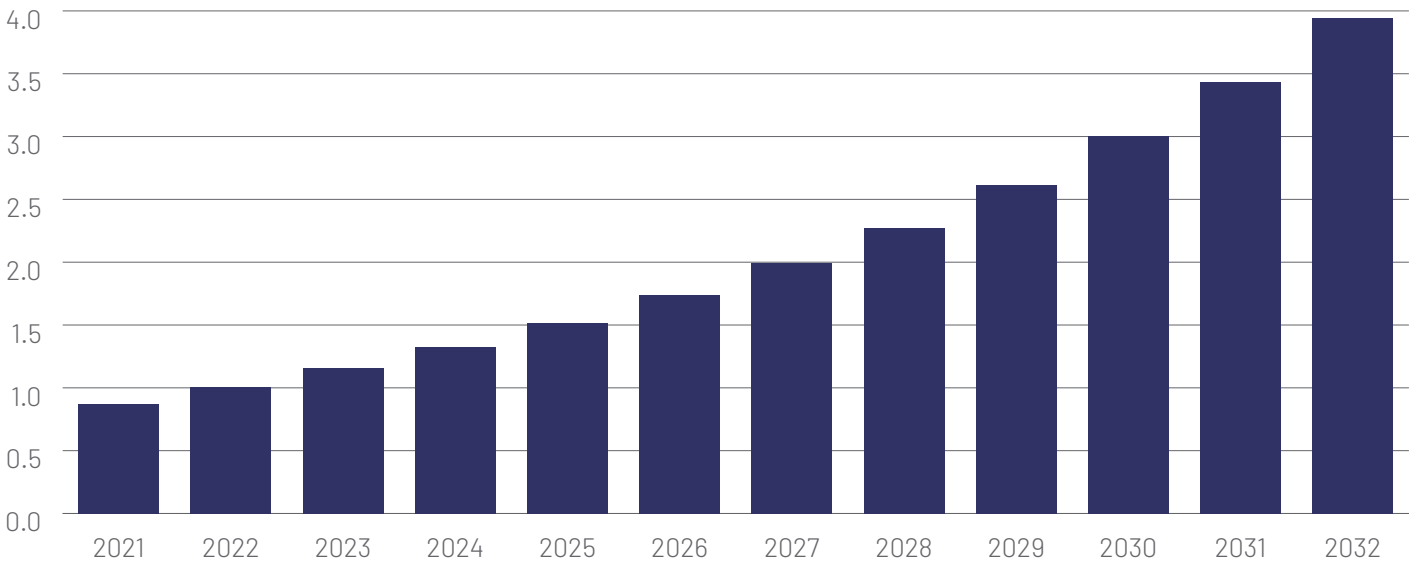
Mass timber is made by laminating thin layers of wood to create large structural building materials; the most prevalent is cross laminated timber (CLT). Mass timber is a unique building material with:

- a negative carbon footprint, contributing to decarbonisation
- a fast construction time, allowing houses to be built quickly and cheaply
- structural integrity and fire resistance, offering beneficial properties in relation to safety

These properties make mass timber a powerful tool to mitigate climate change and the global housing crisis. Mass timber is most widely used in Europe, where the supply of timber is strong, and the architectural style allows for the easy application of the product. The CLT industry has grown massively since its inception and is expected to increase 3.5-fold by 2030.[1]

1. Mass Timber Construction Market Research, 2031, Apr 2023

CLT market size (2021-2032) (£bn)



Source: Spherical Insights and Consulting

Mass timber is most notably known for being a green building material that has a negative carbon footprint.[2] This is because trees absorb atmospheric CO_2 during photosynthesis, and the sequestered carbon remains stored in the wood until its disposal.

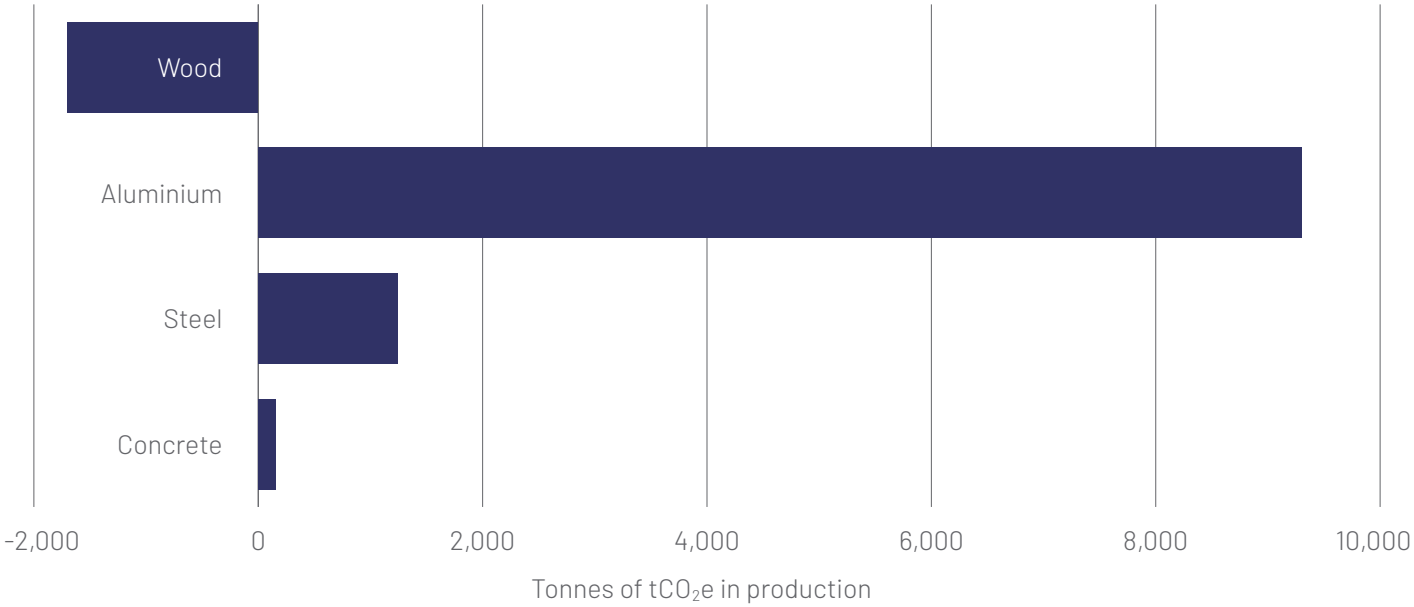
This property is unique to timber, as all other building materials emit CO_2 in their production rather than absorbing it. Commonly used materials like concrete and steel are particularly damaging to the environment. Over 4.2 billion tonnes of concrete are produced each year, representing 8% of global CO_2 emissions.[3] Contrastingly, timber absorbs a net 1,700 CO_2e of emissions[4] in the production of one ton, essentially having a mitigating effect on climate change.

2. Could wooden buildings be a solution to climate change?, July 2019

3. Ellis et al. 2020

4. Estimated from graph

Emissions in the production of one tonne (CO_2)



Source: Gresham House Global Timber Outlook

The positive environmental effect of mass timber provides an opportunity to decarbonise the construction industry which accounts for 37% of total emissions[5] globally. To meet the climate targets set out in the Paris Agreement, global emissions need to be reduced by 45% by 2030.[6]

This requires a huge shift in the way all practices are carried out, especially within the construction industry. Emissions fall into two main categories:

- Embodied emissions - stemming from the type of materials used in construction
- Operating emissions - which relate to the energy needed to power buildings

Mass timber's inherently negative carbon footprint and structural properties help reduce both kinds of emissions. Studies show that buildings constructed from mass timber can reduce energy consumption by over 30%, and CO_2 emissions by over 40% compared to concrete and steel buildings.[7]

Mass timber also benefits from its fast construction time, as modular housing uses panels which can be manufactured offsite. This results in a 25% shorter construction time[8] compared to traditional buildings, because the parts involved are assembled once onsite. Typically, mass timber buildings can be completed 4-6 weeks earlier than concrete or steel buildings, and with between 20-50% less workers.[9] Having a fast and easy building method reduces labour costs, thus reducing overall construction costs.

Fast construction places mass timber in an ideal position to respond to the global housing crisis. For example, in the UK, the supply of new housing is consistently lower than the government's target of 300,000 new homes a year.[10] This housing shortage is a global trend - 1.8 billion people around the world lack adequate housing.[11] With further population growth and urbanisation expected over the coming years, the demand for housing will continue to rise. We are therefore faced with the challenge to increase delivery, and mass timber can be used to address this issue. Governments have recognised these benefits and are promoting its use in their new housing plans. This shift in attitude is also reflected through the expansion of the International Building Code to include mass timber in more construction types (2021).[12]

5. New Zealand Forestry Owners Association - Forestry Facts and Figures 2018

6. For a livable climate: Net-zero commitments must be backed by credible action, 2022

7. Comparative life cycle assessment of a reinforced concrete residential building with equivalent cross laminated timber alternatives in China, 2022

8. 4 Things To Know About Mass Timber, 2023

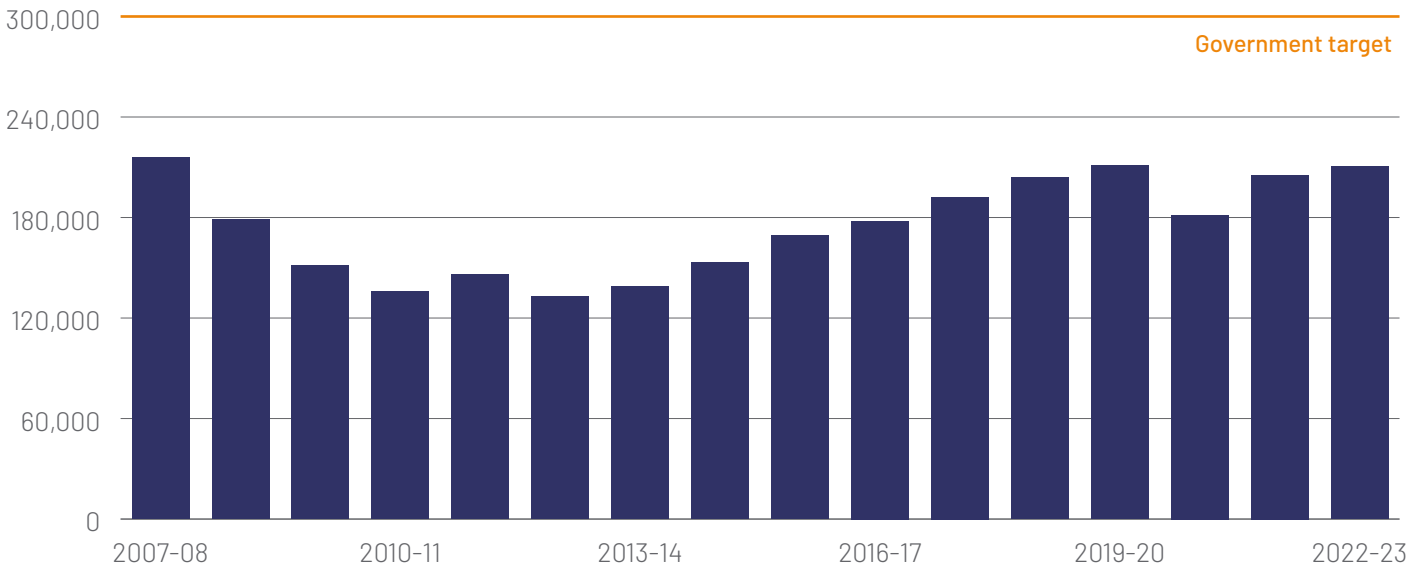
9. Building Sustainable Futures with Mass Timber Construction, July 2022

10. Tackling the under-supply of housing in England, May 2023

11. The Global Housing Crisis: A Crisis Unlike Any Other, October 2022

12. Mass Timber, 2023

UK permanent dwellings started



Source: Office for National Statistics

Mass timber as a mainstream building material

The current cost of mass timber is preventing the material's widespread adoption in construction. It can be more expensive than other materials because of the limited timber supply and as such, construction companies may opt for cheaper alternatives. To increase the accessibility of the material, more sustainably managed forests are needed.

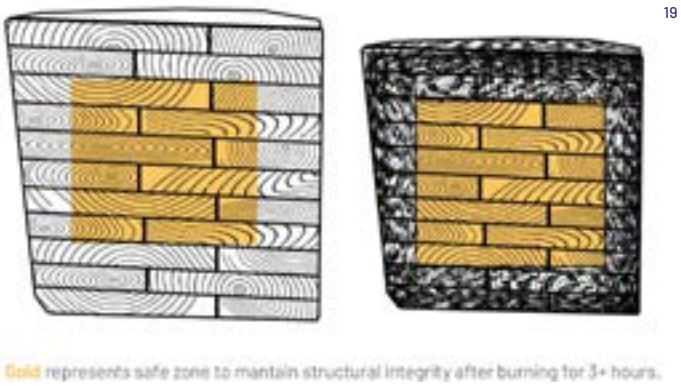
For mass timber to have a positive environmental impact, forests must be harvested sustainably. The timber market is characterised by limited supply,[13] due to the natural length of tree rotations and therefore, as the demand for timber rises, the supply cannot increase at the same rate. However, if forests are not managed sustainably, the threat of deforestation becomes significant, as the increased demand may be met by a rise in illegal logging activities. Felling trees at a faster rate than they are planted would result in a negative environmental impact and resource depletion.

Consequently,it is imperative that when increasing our reliance on timber, we also increase the stock of sustainable forests. Only 3% of the world's forests are productive, yet they supply a third of the world's timber needs.[14] Investment is therefore needed to provide sustainable, productive forests as well as legislation to prevent deforestation. This includes the European regulation on deforestation-free products,[15] which prevents the use of materials that have contributed to deforestation, helping reduce the activity and promote the sustainable management of forests.

13. Gresham House Global Timber Outlook, 2020
14. Productive forests are the way forward, November 2021
15. Deforestation-free products, 2023

There also needs to be more incentive for the construction industry to switch to mass timber, to maximise the material's impact. Currently, concrete is the most destructive material in the world[16] but also the most employed, however improved legislation encouraging sustainable building can promote the use of mass timber over other materials.

Already, initiatives to boost timber construction are happening globally; in the UK, consultancy companies are creating publicly available documents on mass timber[17] construction practices. At a legislative level, British Columbia implemented their Mass Timber Action Plan,[18] which indicates their strategy to increase mass timber's use and highlights the benefits it brings to the people, economy, and environment. More legislation like this is needed to promote the widespread adoption of the material in the construction industry, to fully reap the benefits it offers.



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16. Concrete: the most destructive material on Earth, 2019
17. Overcoming Challenges in Mass Timber Construction Adoption, June 2023
18. Mass Timber Action Plan, April 2022
19. Mass Timber Construction, 2023

Finally, removing misconceptions about mass timber would help increase its use in the construction industry. The 2017 Grenfell Tower disaster highlights the importance of fire safety in our built environment. As a result, mass timber use in the UK faced a setback,[20] due to the flammability of wood. However in practice, it has proven to be more fire resistant than many common construction materials. Once ignited, the outer layer chars, which protects the inner core, and slows down combustion.[21]

This allows mass timber to retain its form and hold its load bearing capacity better than other materials. CLT for example, is designed to withstand heats of up to 300 degrees celsius[22] before it even begins to char. Reversing misconceptions and spreading knowledge on the properties of mass timber is needed to boost its adoption in the construction industry.

Mass timber case study

Mass timber buildings are becoming more and more common. The 'Tower of Lake Mjøsa' in Norway is an example of mass timber's structural integrity. Built in 2019, the 86-metre building was once the tallest timber structure in the world.[23] Since then, more mass timber buildings have been built, overtaking Mjøsa Tower in terms of height,[24] reflecting the beginning of a mass timber revolution for the construction industry.

Photo credit: Mjøstårnet by NinaRundsveen/CC BY

Outlook and opinion: mass timber and forestry

The mass timber industry is expected to grow in the coming years, at a compound annual growth rate of 14.5%,[25] driven by:

- the need for climate action and decarbonisation
- population growth and increased urbanisation rates, boosting housing demand

The recognition of mass timber as an effective way to tackle our current crises is growing. The UN aims to increase worldwide forest area by 3% by 2030 through more sustainably managed forests.[26] Not only will this boost the amount of timber available for mass timber creation, but it will also provide further benefits, such as increased rural employment and improved flood prevention.

Despite recognition that mass timber can tackle some of the major challenges across society, progress is impossible without change. Collaboration between the construction industry, legislators, and researchers is critical to catalysing the widespread adoption of mass timber.

Finance remains the most effective tool to allocate capital, and significant investment into sustainably managed forests is needed to provide this long-term timber resource. As the climate crisis and the housing shortage deepen, mass timber can provide an effective solution. However, readers should make no mistake; the revolution is already underway.

20. How is the CLT industry responding to the combustibles ban?

21. Fire performance, protection and safety in light-frame wood and mass timber buildings. March 2019

22. Behavior of cross-laminated timber panels during and after an ISO-fire: An experimental analysis, 2023

23. Mjøstårnet The Tower of Lake Mjøsa / Voll Arkitekt, February 2020

24. How to Use Alternative Products and Materials to Reduce a Project's Carbon Footprint, October 2023

25. Mass Timber Construction Market Research, 2031

26. United Nations Global Forest Goals And Targets Of The UN Strategic Plan For Forests 2030, April 2019

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With special thanks to Emma Jowett

Gresham House Forestry is a specialist global asset manager with £3.4 billion of forestry assets under management. These forests are managed sustainably and are focused on producing timber for the growing needs of the construction industry.

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