

Emerging risks have unique characteristics that require specialist technical, management and organizational skills. Our Risk Consulting expertise across different industries and lines of insurance business around the world is key to helping companies understand and mitigate these exposures. In our Emerging Risk Trend Talk series, we address such topics, highlight loss events, and look at targeted loss prevention measures.

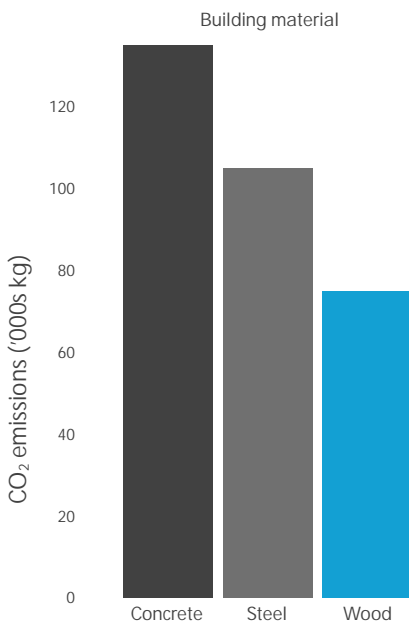
## The trend

Offering significant economic opportunities in terms of cost and reduction in construction time, mass timber has the potential to be a critical building component for cities of the near future.

The global mass timber construction market is driven by factors such as the growth in awareness of the carbon footprint of steel and concrete construction. The building and construction sector is among the largest contributors to Co2 emissions, accounting for over 34% of energy demand and around 37% of energy and process-related Co2 emissions in 2021<sup>1</sup>. The reduction of such emissions is essential to meet climate change commitments around the world.

As such, the emergence of mass timber as an alternative to concrete and steel represents a significant short and medium-term opportunity for the sector to reduce its carbon footprint (*see graphic*) while also satisfying a demand for construction that is more cost-efficient and as durable as steel and concrete construction.

### Wood can reduce construction CO<sub>2</sub> emissions



Source: Forest Business Network, International Mass Timber Report 2022

From mixed use developments to hotels to schools, an emerging market is already being realized in mass timber buildings. According to a report by Allied Market Research, the global mass timber construction market generated US\$857mn in 2021, and is anticipated to generate \$1.5bn by 2031, with a CAGR of 6.0% from 2022 to 2031<sup>2</sup>. However, as mass timber buildings evolve with greater height and intricate designs, they will pose new challenges in terms of risk mitigations.



Photo: Envato

## Advantages of using mass timber

### Material characteristics

- Lighter weight material that meets the same load capacities as concrete structures
- Predictable performance under fire exposure
- Better thermal resistance, resulting in lower heat loss.
- Wood is a renewable resource
- Aesthetic appeal.

### Design characteristics

- Enhanced quality control / quality assurance (QC/QA) through prefabrication and integration of services in a controlled factory setting.
- Structural wood products that could double as interior finishes.

### Cost competitiveness

- Construction costs may be lower than with traditional concrete and steel materials and methods due to less construction traffic and fewer workers.

Expanding mass timber manufacturing/fabrication capacity will generate more cost-competitive bids.

### Construction process

- Faster construction of superstructure (up to 25% faster)
- Quiet and safer construction sites.

## Three timber takeaways

- There were 139 mass timber buildings around the world of eight stories or higher, with 70% of these in Europe, as of February 2022.<sup>3</sup>
- The height of the world's tallest timber building has tripled in just 10 years. The 85-meter Mjøstårnet in Brumunddal, Norway, was the tallest all-timber building in the world, of February 2022.<sup>4</sup>
- More than 2,000 multi-family, commercial, or institutional mass timber projects were in progress or built in the US, as of December 2023.<sup>5</sup>



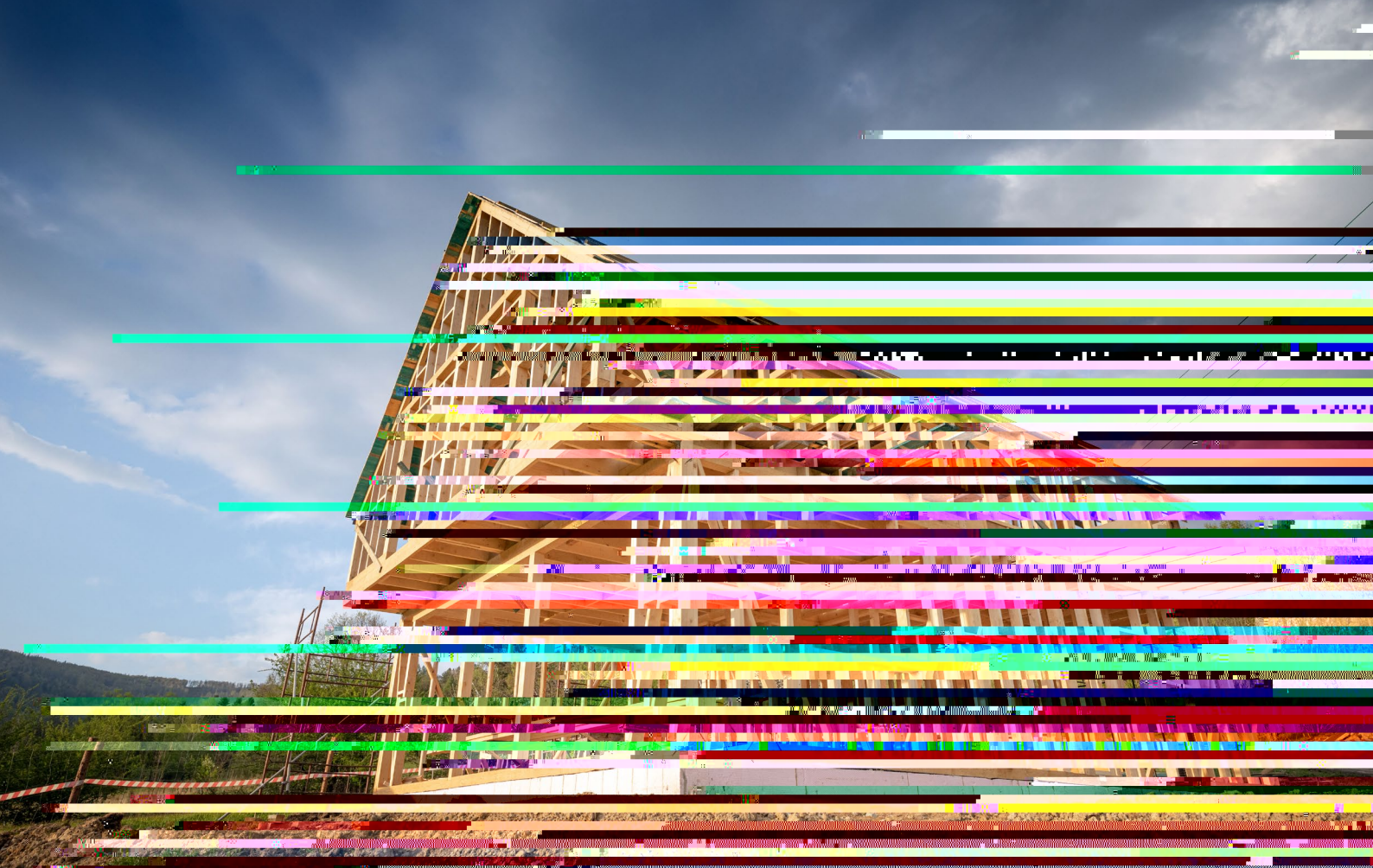
## Allianz Risk Consulting Risk Mitigation and Loss Prevention Measures

### Design phase

- Understanding the design concept is important for assessing technical exposure and conformity with building codes and regulations. Selection of contractors is key as they can reduce fire risk through value engineering and adherence to local public-law requirements. Select reputable and qualified contractors, early in the design process, with relevant experience and capacity. Ensure they utilize Building Information Modeling (BIM) and have effective fire safety policies and a realistic time schedule that includes buffer time for unexpected events.
- Hybridization of conventional and newer buildings can mitigate fire risks by considering the location of wet rooms and electrical intakes, alternating cross-laminated timber floors, and building the first floor in concrete.
- A minimum two-hour fire resistance rating is expected for bearing walls, structural frames, floor protection and at least one-hour fire resistance for roof protection, or even higher depending on

## Mass timber





## Water damage

Mass timber is highly vulnerable to water damage, including flood, water ingress and plumbing leaks.

### Design phase

The moisture content of timber can vary with temperature and humidity, leading to swelling when exposed to excessive wetting. Water can cause significant damage to the structure, especially when the end grain is near the ground. Cross-laminated timber, which is at least three layers of lumber that are cross-oriented and bonded with adhesives to form a wood panel, is less prone to swelling due to adhesives and alternating wood layers. However, water exposure can lead to potential delamination.

To mitigate water damage, mass timber elements can be manufactured with reduced moisture content and stored in controlled atmospheres.

Water management and high-quality analysis are crucial for ensuring the durability of wooden structures.

### Construction phase

During construction, surface wetting is acceptable as long as internal surfaces remain dry. Moisture content below 20% is considered low risk, while exceeding 20% increases the risk of fungal decay. Protective measures like cladding, screening, proper drainage, and regular checks should be implemented to prevent moisture intrusion and termite infestation.





## **Construction phase**

A comprehensive water/moisture management plan should be developed in collaboration with the contractor and subcontractor to keep the building as dry as possible. This plan should be updated throughout construction and

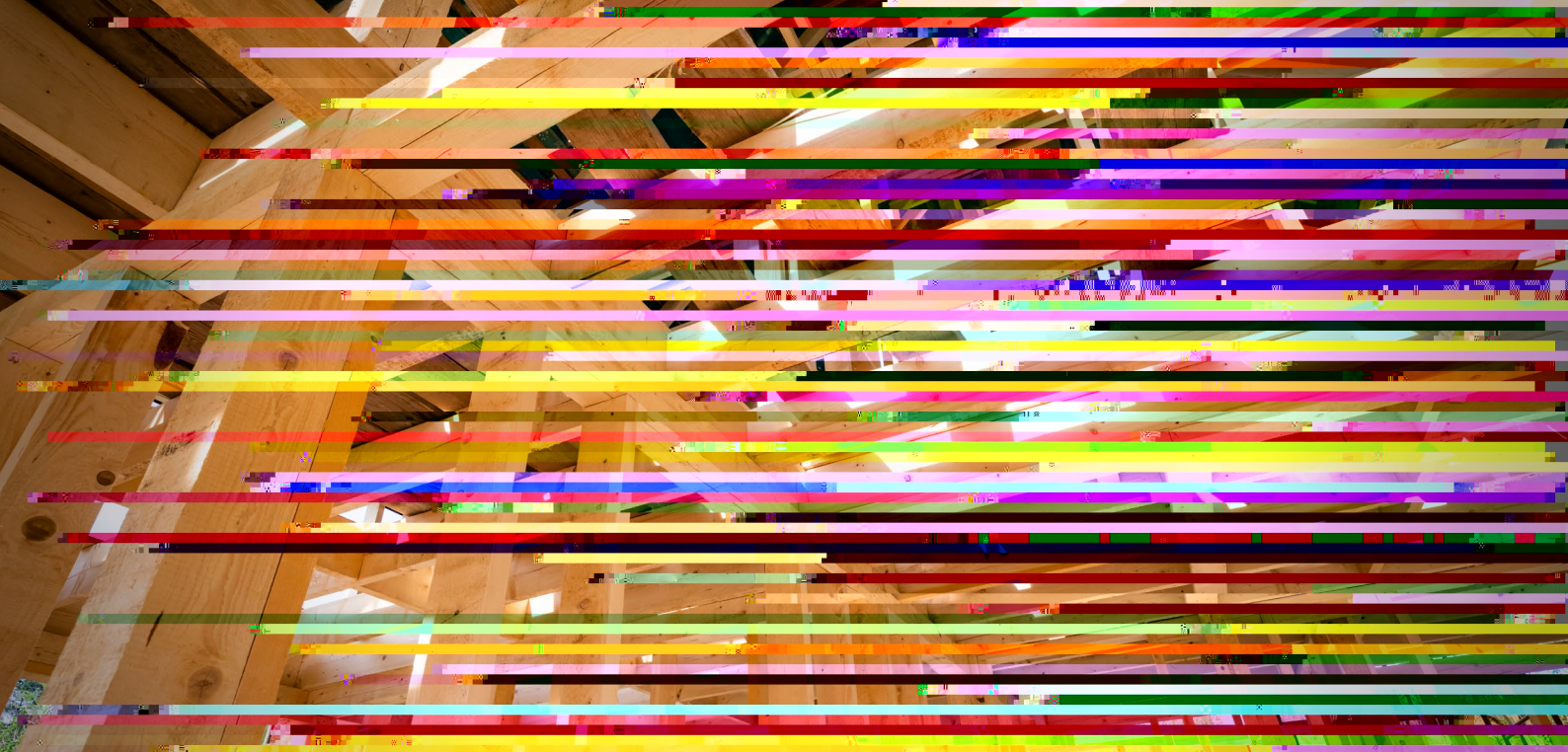
## Termites and insects

While not common in all areas of the world, termites and

Natural hazards

Earthquake





## **Storms, tornadoes, cyclones and hurricanes**

During the design phase, it is important to consider storm exposure and prepare for potential extreme weather events. Contractors should monitor the weather forecast daily and have clear organizational structures in place for efficient preparation and loss prevention. Measures such as strengthening temporary bracing, closing external openings, inspecting and repairing waterways and drains, and securing equipment are recommended.

During the construction phase, there are several key recommendations to minimize the impact of storms. These include securing loose construction site materials, stabilizing formwork, elevating materials above the ground, regularly cleaning the site, and prioritizing critical work. It is also important to secure non-removable materials, anchor containers and storage boxes, address roof defects, and prepare cranes for strong winds.

During the operational phase, implementing a windstorm emergency response plan is crucial. This should include a

## Manufacturing, transportation and supply chain

Off-site manufacturing is commonly used for mass timber projects, with timber elements such as columns, beams and panels being manufactured in factory environments and then erected on-site. This approach offers advantages such as high levels of accuracy, regulated QA and QC systems, and improved efficiency compared to conventional on-site construction.

Mass timber construction has a unique supply chain and manufacturing process that differs from traditional concrete and steel framing.

However, there are some challenges. Mass timber is typically made to order and cut to specific dimensions, with additional processing required to fit adjacent panels or beams and accommodate hardware. As a result, there is no off-the-shelf option for purchasing mass timber, and developers, architects, and contractors often need to engage a mass timber supplier early in the project planning phase.

The experience and coordination of project participants are crucial, as well as careful planning of time schedules and construction processes. Due to just-in-time delivery, thorough logistic planning and management of building materials are essential.

One significant disadvantage of the assembly line manufacturing process is the potential for a serial loss scenario. If a particular batch of mass timber elements contains poor quality lumber or defective adhesives, multiple elements positioned throughout a structure or across multiple project sites may be affected. Countries without a culture of off-site construction may face design errors, requiring adaptations to ensure

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## Workmanship issues

Construction firms may face challenges in finding experienced work crews for mass timber construction as it is relatively new. This can lead to productivity issues and safety-related concerns as crews navigate the learning curve of working with mass timber.

Improper installation can result in damage to the finished product, which can have significant financial implications for repairs or replacements.

It is crucial for building contractors to hire experienced subcontractors and properly trained work crews to avoid re-work, accidents, construction defects, and delays that could impact the overall success of the project.

## Cost of repairs and rebuilding

There is limited knowledge regarding the repairability of mass timber construction but it is highly likely that the cost of repairing or rebuilding structures could be significantly higher than conventional construction materials.

One unique property of timber is

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## Further information and contacts

For more detailed information on mass timber please contact your regional Allianz Commercial risk consultant(s).

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