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Timber building: carbon and cost comparison

Benefits of wood in construction (MBIE)

- Wood is **sustainable, renewable, and generally less energy-intensive to process** compared to other construction materials.
- Through its ability to store carbon, **wood is essential in transitioning New Zealand to a carbon-neutral economy**. The long-term locking away of carbon dioxide in the form of buildings is recognised in international climate agreements for carbon accounting.

Benefits of wood in construction (MBIE)

- Wood technologies provide opportunities for off-site pre-fabrication, which **reduces waste and construction times**. Off-site manufacturing is also **safer** for the construction industry's labour force.

Benefits of wood in construction (MBIE)

- Wood can perform as well as other building materials in **fire** and **acoustics**. Research done internationally, most recently in Australia, has demonstrated the health and **wellbeing benefits** of using natural materials such as wood in workplaces, schools, hospitals and homes.
- Wooden buildings have high **seismic resistance**, and are not only survivable, but can be brought back into use, rather than having to be demolished.

But how do the numbers stack up?
Does an engineered timber building really have a smaller carbon footprint? And does a smaller carbon footprint come at a hefty premium?

We modelled a typical six-storey commercial building, built two ways:

Timber:

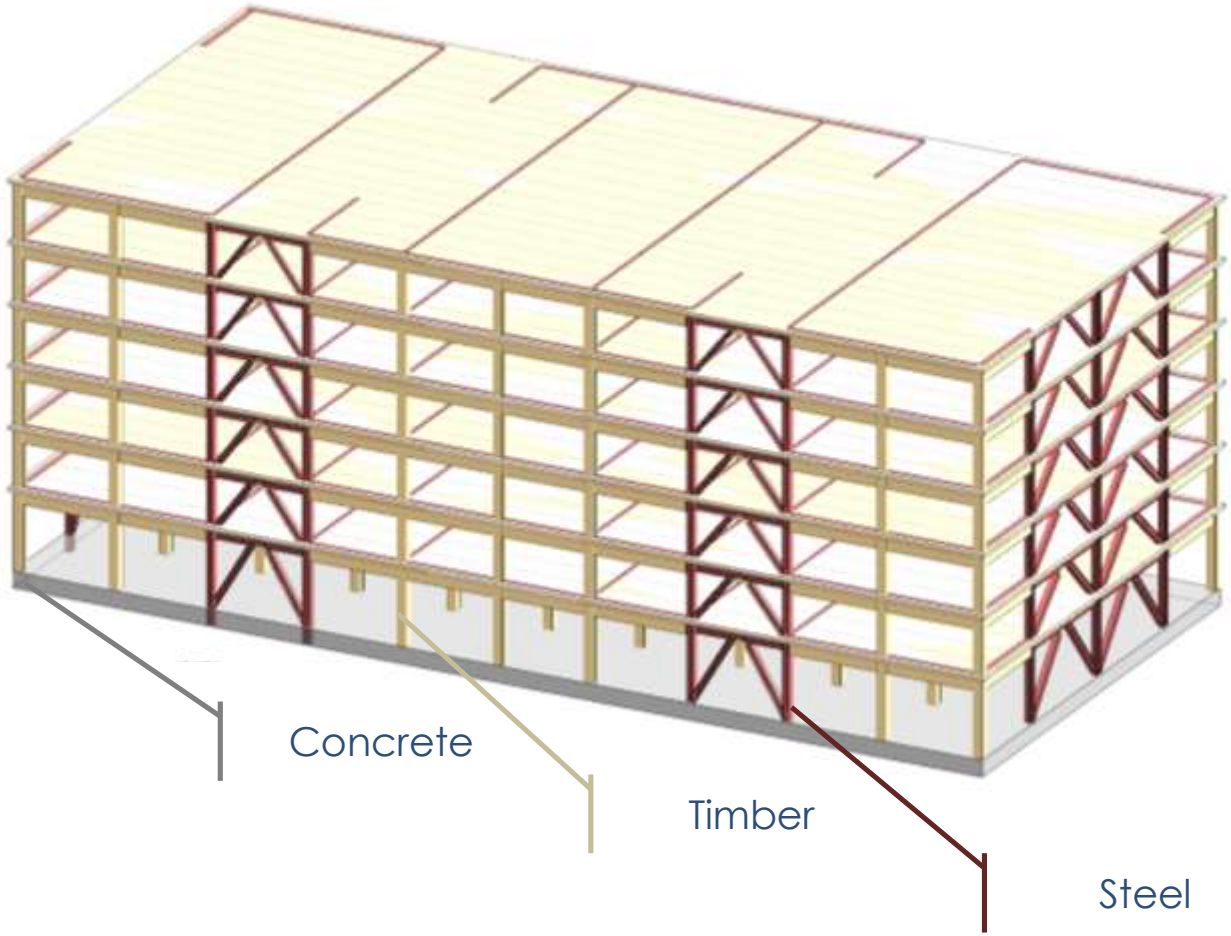
Engineered timber beams, columns, panels and floors, structural steel bracing and reinforced concrete foundation

Concrete & Steel:

Steel beams and columns, concrete + steel floors, and reinforced concrete foundation

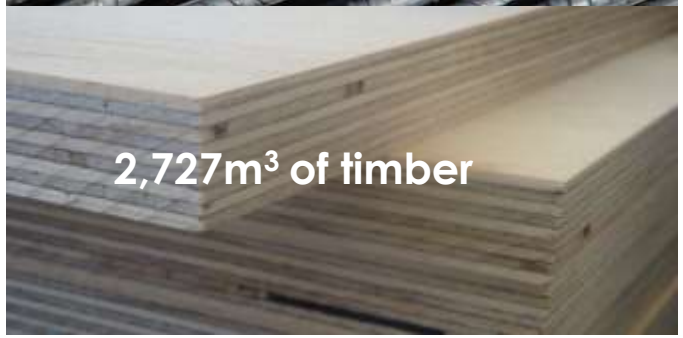
The small print

- We've only included the structural components in the modelling – beams, columns and structural wall and floor components.
- The structure typically makes up one third of the cost of a commercial building.
- We've assumed a level site with a similar roof structure.
- We've used the best available data and have followed international best practice to determine these results.



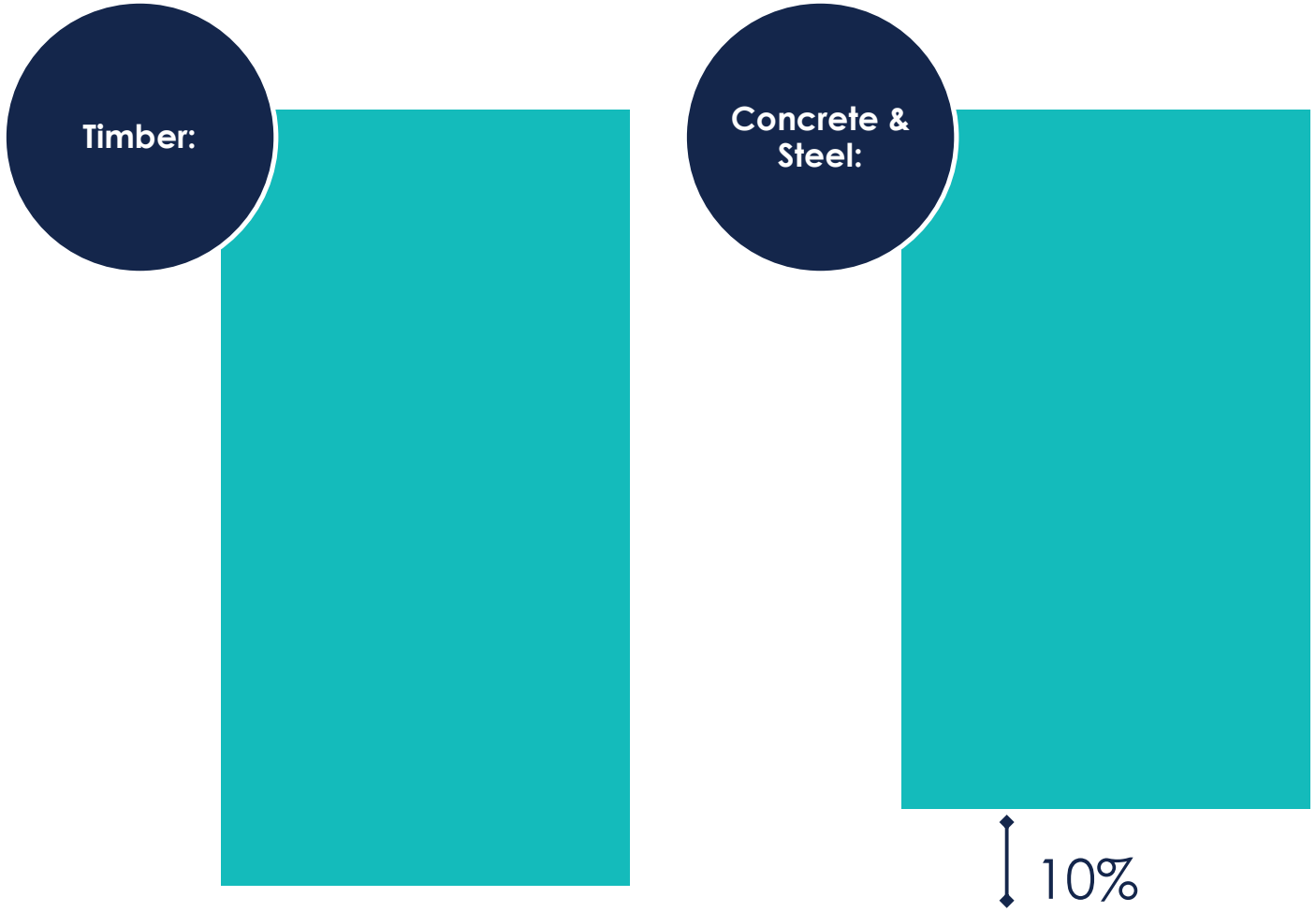
Materials

Timber:

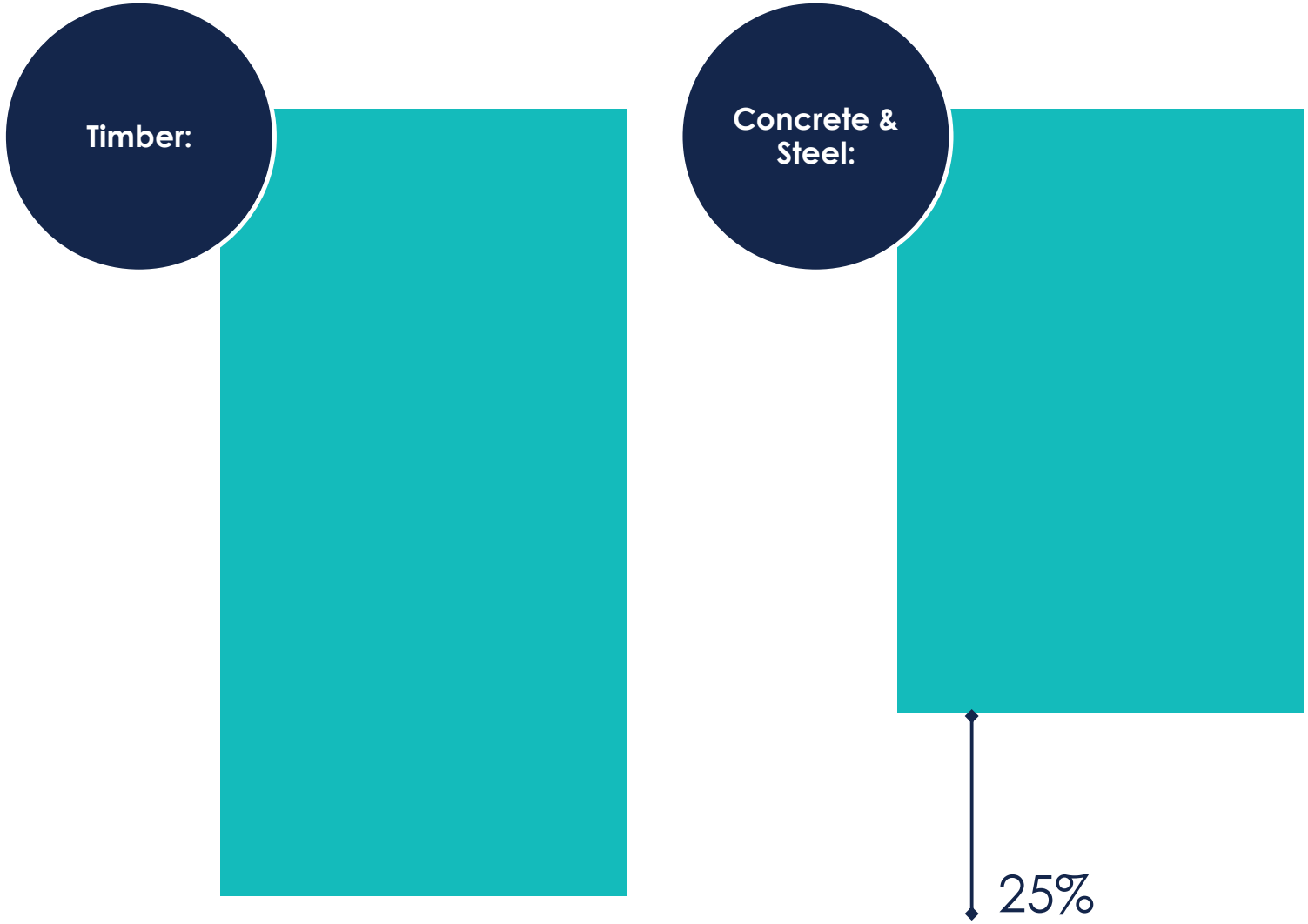


Concrete & Steel:

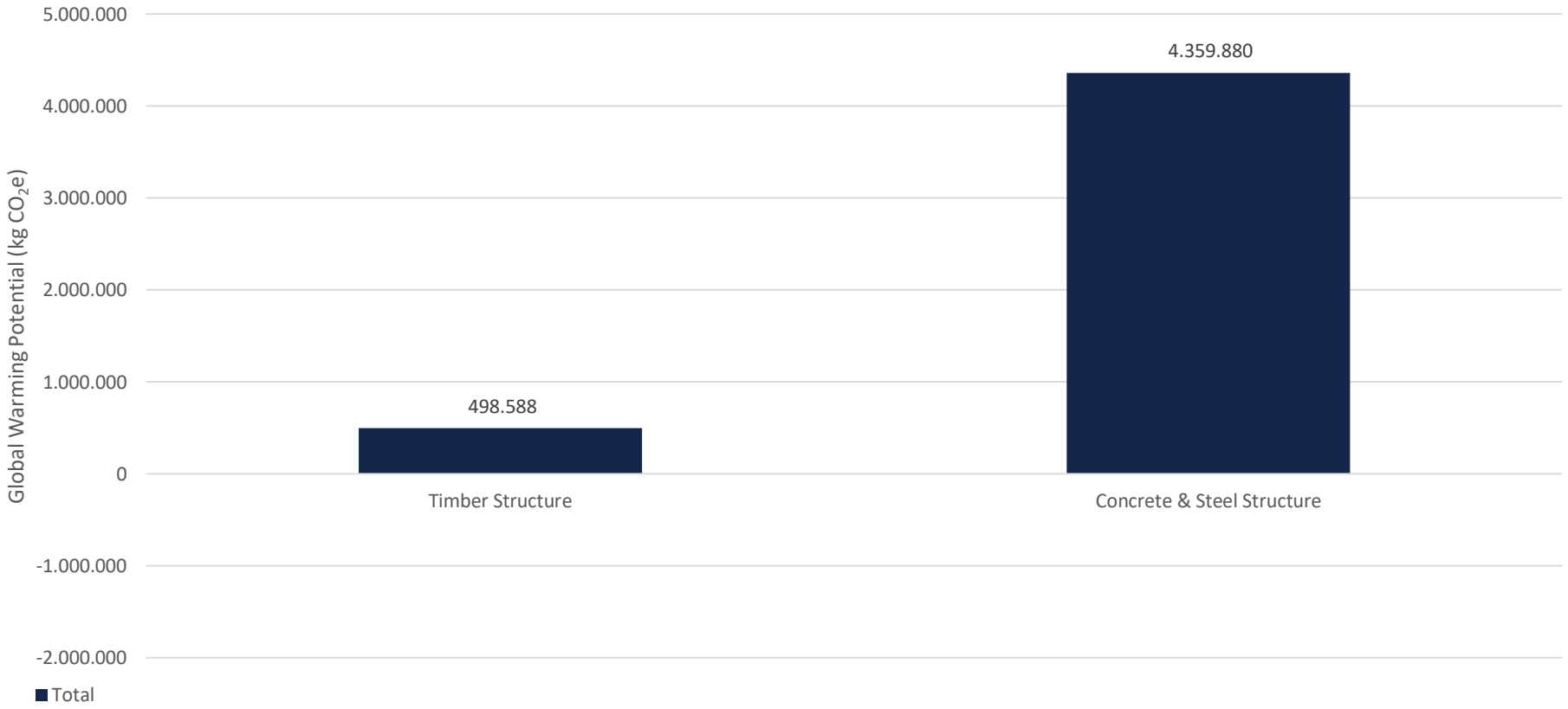
Cost of structure (EU engineered timber)



Cost of structure (NZ/AU) engineered timber)



Upfront carbon comparison (raw materials, manufacturing & transport)



Imported timber or NZ ?

- Spruce is close-grained, making it naturally durable – typically it is not treated.
- Due to transportation, it has a slightly higher GWP than local timber.
- It's about 30 – 40 % cheaper than local engineered timber.
- Currently NZ timber requires treatment to comply
- Untreated options in the right location will reduce costs
- Increased sawmill efficiency will reduce costs

The net total cost difference for an engineered timber structure is likely to be around 3% of the total cost of the finished building.
For this you get about a 90% reduction in carbon emissions for your entire structure
Any questions?

Measuring emissions

- Each material has an emissions **life cycle** - the emissions associated with production, transport, use and disposal.
- We've concentrated on the measurable parts of the product life cycle **– raw materials, manufacturing & transport.**
- Different greenhouse gases have different impacts on climate change over different time spans. To keep it equal, the life cycle impact of each material is calculated in **Global Warming Potential (GWP)** over 100 years in kg of CO_2 equivalent.

Production	Raw material supply	A1
	Transport of raw materials	A2
	Manufacturing	A3
Installation	Transport to customer	A4
	Construction/Installation	A5
Use Phase	Use	B1
	Maintenance	B2
	Repair	B3
	Replacement	B4
	Refurbishment	B5
	Operational energy use	B6
	Operational water use	B7
End-of-Life	Deconstruction/ Demolition	C1
	Transport to waste processing	C2
	Waste processing	C3
	Disposal	C4
Next Product System	Reuse-Recovery-Recycling-potential	D