BENEFITS OF WOOD

FACT SHEET 1

TIMBER QUEENSLAND
We build Queensland

Environmental Benefits – Embodied Energy, Carbon Storage and Life Cycle Impacts

Timber is one of the most environmentally-friendly building materials available. Timber is a renewable resource that has low embodied energy and stores carbon. It can be recycled and put to new use through dismantling and deconstruction.

Life Cycle Analysis

Using Life Cycle Analysis (LCA), we can assess the lifetime environmental impacts of individual building products or entire buildings. This includes a building product's or building's production, transport, operational impacts, maintenance, deconstruction and disposal at the end of its operational life (see Figure 1).

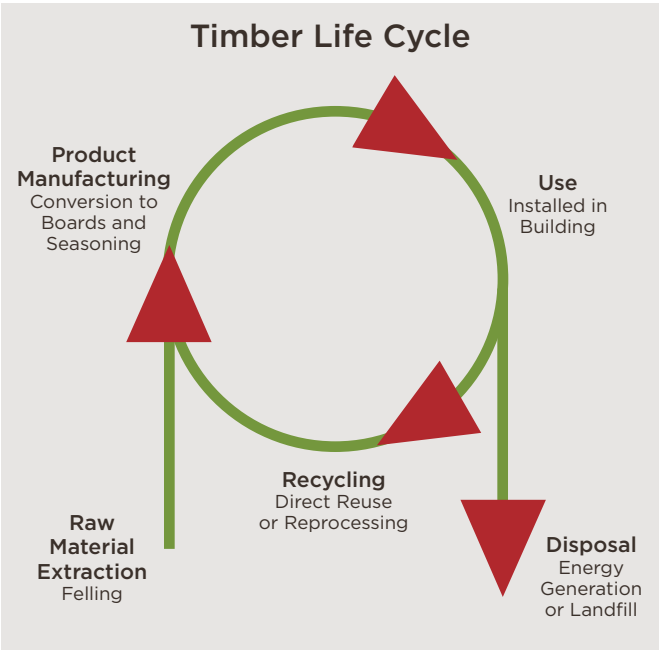

Figure 1 The timber life cycle. Image courtesy of Edge Environment.

Quick Facts

1. Timber production requires minimal manufacturing and therefore has a low embodied energy. For example, an elevated timber floor has less than half the embodied energy of a concrete slab (Milne, 2013).
2. Typically, substituting one cubic metre of timber for one cubic metre of solid material like concrete will divert approximately one tonne of carbon dioxide from the atmosphere (Reid, 2004).
3. From an environmental perspective, the 'whole-of-life' impact of timber is low. Timber has low embodied energy in production and improved thermal performance in building use for occupants through reduced energy costs. Furthermore, industry can reuse and/or recycle timber products into other timber products (see Figure 1).
4. Approximately half of the dry weight of a tree's wood is carbon which is stored in its wood until the tree decomposes. Australian forests sequester (absorb) approximately 10 percent of Australia's greenhouse gases per year (Forest and Wood Products Research and Development Corporation, 2006).

The life cycle global warming impacts of timber are low because **timber is a naturally-grown material, stores carbon while in use and requires minimal energy in its production.** As a building material, timber is a natural insulator which adds resistance to heat flow (as measured by R-value) and helps reduce a building's energy requirements for heating and cooling (WoodSolutions, 2017b). Builders can also design timber structures for easy disassembly at the end of a building's life, allowing for the reuse and/or recycling of materials.

Carbon Storage

Building with timber can help to capture and store carbon. (see Figure 2) As a tree grows, it absorbs carbon dioxide from the atmosphere, releases oxygen and stores carbon. After the tree is harvested, the carbon will remain in the wood over its usable life, until the wood eventually decomposes. A tree can store fifteen times the carbon that is expended as energy during its transformation to timber construction components. Therefore, by harvesting trees and producing timber for construction, there is a net carbon benefit.

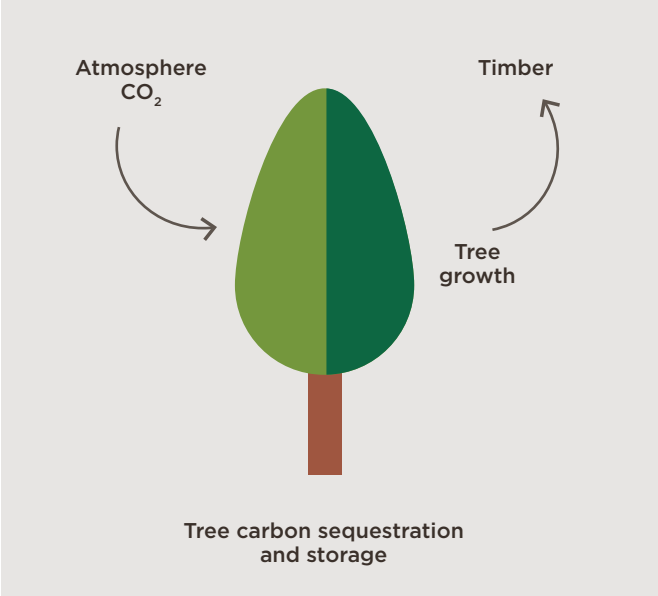

Figure 2 The Carbon Sequestration

New trees are generally replanted or regrown to replace harvested trees allowing the sustainable, renewable forestry process to continue. In 2005, Australian forests, both natural and plantation, removed 56.5 million tonnes of carbon dioxide from the atmosphere—amounting to approximately ten percent of the nation's emissions (Forest and Wood Products Research and Development Corporation, 2006).

Embodied Energy Benefits

Embodied energy is the amount of energy used in the creation of a product. Typically, the more highly processed a material is, the higher is its embodied energy. Lower embodied energy is beneficial to the environment as it contributes to a lower impact over the life of a product or material.

Timber has a low embodied energy as it requires minimal processing in its conversion from the standing tree to usable timber product. **A steel beam can require up to ten times more energy to produce than a timber beam** (Tas Timber, n.d.). Figure 3 provides a comparison of the embodied energy of construction materials. Engineered wood products like cross laminated timber and timber I-beams require more processing than traditional timber, but still have a much lower embodied energy than non-wood alternatives.

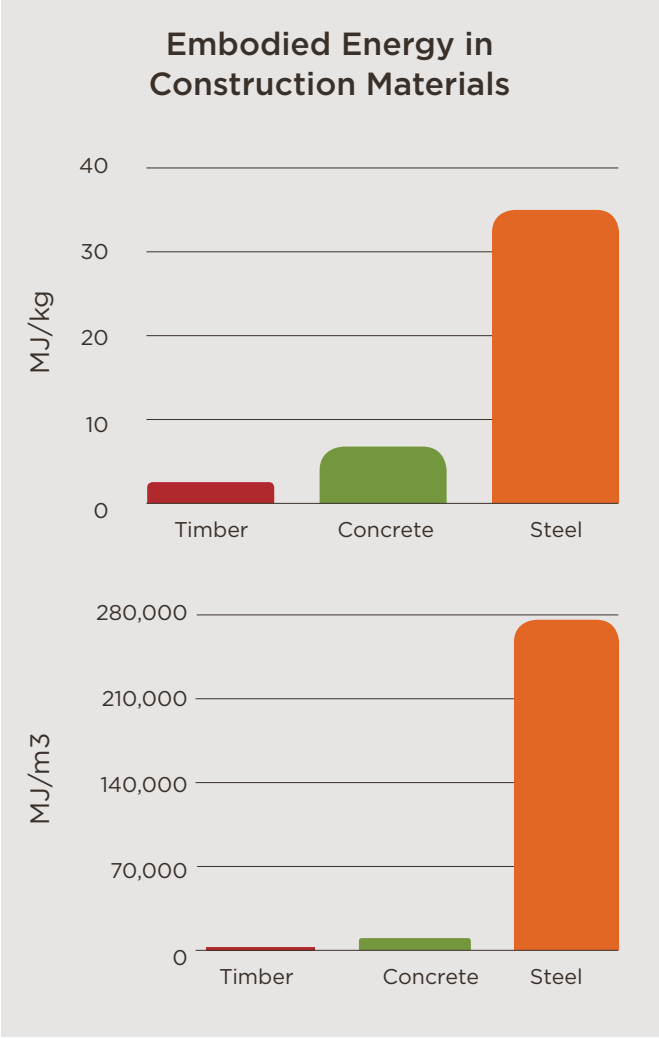

Figure 3 Embodied energy of construction materials (Image courtesy of Edge Environment, with data from Azpilicueta, n.d.)

Construction materials, like steel and concrete, use significant heat energy during creation, and as such, have high embodied energy and carbon

emission impacts. Concrete also releases carbon chemically when calcium carbonate is heated during the cement creation process, raising its embodied carbon significantly. A timber floor has around 16 percent of the embodied carbon of a concrete slab (see Figure 3). Figure 4 provides a comparison of the embodied carbon in construction materials.

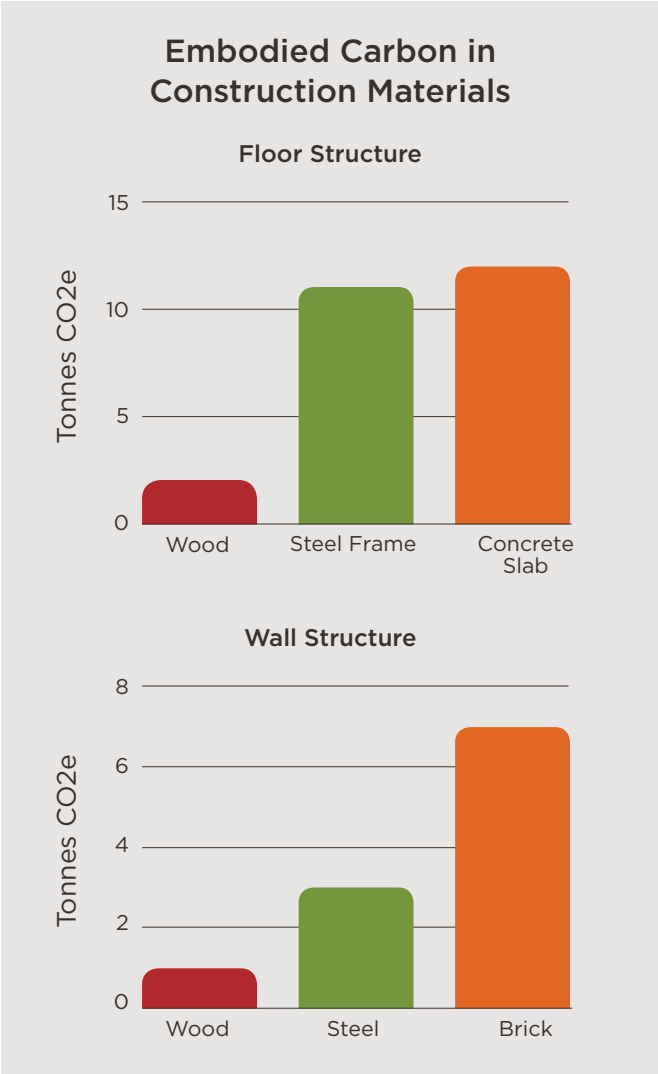

Figure 4 Embodied Carbon of Construction Materials (Image courtesy of Edge Environment, with data from Forest and Wood Products Research and Development Corporation (2006))

The combined benefits of carbon sequestered in Australia's native forests and plantations, the ongoing storage of carbon in wood products, the low embodied energy in timber production, the improved thermal performance with timber products, and the significant opportunities for reuse and recycling at end of life, means that choosing timber in design and construction has multiple environmental benefits.

Further Reading

Azpilicueta, E. (n.d.). *Table of embodied energy or primary energy of materials*. Retrieved from www.tectonica-online.com/topics/energy/embodied-energy-materials-enrique-azpilicueta/table/31/

Forest and Wood Products Research and Development Corporation. (2006). *Forests, Wood and Australia's Carbon Balance*. Retrieved from www.woodsolutions.com.au/articles/carbon-storage

McGee, C. (2013). *Your Home Materials*. Retrieved from www.yourhome.gov.au/materials

Milne, G. (2013). *Your Home Embodied Energy*. Retrieved from www.yourhome.gov.au/materials/embodied-energy

Reid, H. et al., (2004). *Using Wood Products To Mitigate Climate Change*. Retrieved from www.fao.org/fileadmin/user_upload/rome2007/docs/Using_wood_products_to_mitigate_climate_change.pdf

Tas Timber. (n.d.). *Timber products use less energy*. Retrieved from www.tasmaniantimber.com.au/brochures

Wood Solutions. (2013). *Environmental Credentials*. Retrieved from www.woodsolutions.com.au/page/environmental-credentials/

Wood Solutions. (2017a). *Carbon Storage*. Retrieved from www.woodsolutions.com.au/articles/carbon-storage

Wood Solutions. (2017b). *Thermal Performance*. Retrieved from www.woodsolutions.com.au/articles/thermal-performance

WoodSolutions. (2017c). *Environmental Product declarations*. Retrieved from www.woodsolutions.com.au/articles/environmental-product-declarations