Timber

After 150 years of the unsustainable use of New Zealand's native timbers, little is now available for general construction purposes. In the 1930s plantations of various timbers were trialled, with radiata pine considered to be the most suitable for forest production.

While radiata pine is the most common timber used, it is not a durable timber unless treated against insect attack and, more importantly, fungal attack, in order to be suitable for construction in areas where dampness is likely. Radiata pine accepts treatment readily and can be treated with a variety of chemicals to give a range of durability targeted for particular end uses.

Treatment increases cost and risk of pollution from toxic chemicals and makes disposal more difficult. Specifiers should specify treatments that closely match the use and durability required.

Imported timbers are often specified for specialist uses, and care should be taken to ensure they are from properly certified sustainable sources. Look for certification provided by FSC (Forest Stewardship Council) or PEFC (Programme for the Endorsement of Forest Certification).

The embodied energy figures quoted for timber do not include the production of treatment chemicals. External use of timber in New Zealand buildings is primarily as:

- landscaping timbers (steps, retaining walls, board walks)
- foundations systems
- deck structures
- decking
- wall cladding and exterior trims
- roof cladding – shingles and shakes.

Extraction and manufacture	
Impact of extraction	The environmental impacts from extraction depend on whether the timber is from a sustainably managed forest that has a recognised certification (for example, for imported hardwoods, from the Forest Stewardship Council (FSC)). Carbon absorption benefits will be lost where felled forest is not replanted – where converted to pasture, the land may become a net producer of carbon. There is also the visual impact of areas of felled forest until regrowth occurs.
Energy and resource use	Embodied energy of timber is quoted[1] as: • Air dried roughsawn treated: 2.7 MJ/kg • Kiln dried (gas fired) dressed treated: 8.9 MJ/kg • Timber, glulam: 7.8 MJ/kg Timber processing (drying) may derive a significant portion of energy demand by generation on-site from waste. Significant water is used in the pressure treatment process – determine if the supplier/ treatment plant has its own water collection and wastewater recycling system. For light organic solvent preservation (LOSP) treatment, determine if the plant has a solvent recovery programme.

By-products/emissions	Timber during the growing process is a carbon sink. Chromated copper arsenate (CCA) timber treatment chemicals contain chromium and arsenic. Other chemicals than are permitted in treatment (following the standards) include methyl bromide, naphthenate, tri-butyl tin oxide (TBTO) and tri-butyl tin naphthenate (TBTN) but note that in practice TBTO and TBTN are no longer commonly used in New Zealand White spirit solvent is used for LOSP-treated timber. Environmental impact is reduced where the timber treatment plant has in place an effective chemical recovery and disposal process. New Zealand timber processing plants are generally required to comply with specific controls on plant emissions, water use and water discharge under their resource consent. Formaldehyde emissions may occur as a result of the glues used in the manufacturing process. Pollens are a potential health issue for a number of people living close to forest plantations. Decomposition of trimmings and felling debris may contribute to CO2 and other greenhouse gas emissions.
Sourcing	
Material sources	The majority of timber used externally is treated New Zealand grown radiata pine. A small but significant proportion of decking timber available is imported hardwood usually sourced from the Pacific or South East Asia. Western red cedar weatherboards and shingles and shakes are imported from Canada. Treatment chemicals are imported.
Availability	Most common framing sizes and profiles readily available.
Transport to site	Transport distances vary, depending on where the timber is grown and milled. Timber has medium weight and bulk.
Construction/installation	
Health and safety during construction/installation	Untreated timber is non-toxic. There are health issues associated with timber treatment chemicals such as methyl bromide, chromium, arsenic, naphthenate, tri-butyl tin oxide and LOSP solvents. Breathing, ear and eye protection are required when power cutting or machining. Gloves are required to avoid skin contact when handling newly-treated LOSP and H3.2 and above treated timber. LOSP treatment solvents and dust from cutting can cause skin, eye or respiratory tract irritations. Material that has a strong solvent smell should be handled with gloves and work areas must be well ventilated. CCA-treated timber should not be burnt. Untreated timber does not off-gas but a number of paint and stain finishes may do.
Ease of construction/ installation	Timber is relatively light to handle (large beams may require light lifting equipment)
Adaptability	Timber structures are able to be modified relatively easily. Timber claddings are relatively easy to replace. Timber can be engineered (for example, selective removal of defective timber and rejoining or laminating) to maximise usage

Performance during the life of the building	
Health and safety during life of building	Untreated timber is non-toxic (radiata pine is not durable when used externally if untreated). Some leaching of the chrome and arsenic into soil may occur where the treatment chemicals have not become 'fixed' in the timber – typically when delivery is immediately after treatment. Uncoated CCA-treated timber is not recommended for use in areas where young children will play. Demolition treated timber requires specific disposal techniques because of residual chemicals. Untreated timber (imported western red cedar) is suitable for roof water catchment.
Structural capability	Common usage is as a structural member – studs, joists, beams, rafters etc. Engineered timber products such as glulam or laminated veneer lumber (LVL) can be used as beams or columns in larger structures such as halls or gymnasiums. LVL bracing walls can be used to provide earthquake resistance. Multi-Storey Light Timber-Framed Buildings in New Zealand – Engineering Design is available in PDF and ePUB formats at no cost. It can be downloaded from the BRANZ website at: www.branz.co.nz/LTFBuildings Weatherboard cladding is considered non-structural.
Expected durability/ serviceability (assuming correct installation and maintenance)	Durability of both natural and treated timbers depends on the species, the level of treatment, the treatment type and the conditions the timber is exposed to. Copper-based timber treatments, particularly those with higher levels of copper replacing the chromium and arsenic (ACQ and CuAz), are corrosive to galvanised components where moisture is present.
Maintenance rating	Very high for stained or clear finished exterior timber that is recoated every 1–3 years. Medium to high for painted cladding that is recoated every 7–10 years. Low for unpainted cladding. Low to medium for interior painted timber – repainting normally occurs as a result of a change in décor. Not applicable to wall and roof framing (maintenance of weatherskin protecting the framing is critical) however framing exposed to moisture (such as deck framing) will require annual checking for signs of damage.
Moisture resistance	Timber readily absorbs moisture. Wet timber will rot unless it is a naturally durable species or is treated to H3.2 minimum (H3.2 timber will also rot if continually damp). H3.1 treated timber requires painting when used in exterior situations. Untreated and H1.1 treated timber must not be used where the in-situ moisture content will exceed 20 percent.
Rot, mould and corrosion	Moulds such as the toxic stachybotrys may form on wet enclosed spaces (over 20 percent mc) that have less than H1.2 treatment. Lichen and mosses will grow on damp, weathered surfaces unless surfaces are treated
Thermal performance	Timber provides low levels of thermal insulation and does not provide thermal mass. The cellular structure of imported cedar does impart a slightly greater resistance to heat loss than a radiata pine board of the same profile.
Sound insulation	Solid timber (100 mm thick) will reduce sound transmission. Timber claddings will not provide effective sound insulation.
Fire performance	Small sections will burn readily and contribute to spread of flame. Large sections, such as glue laminated timber, typically tend to char.

Waste disposal/recycling/re-use	
Re-use	Some salvaged material can be reused.
Recycling	Some salvaged material can be recycled.
Waste disposal	Untreated timber (and low level treated timber) is biodegradable – CO2 and other greenhouse gas emissions result from degrading timber. CCA-treated timber must be disposed of in designated hazardous material areas to isolate the waste and contain leachates.

1. Embodied energy figures taken from work © J. Andrew Alcorn, 2010. (Alcorn, J. Andrew, Global Sustainability and the New Zealand House, a thesis submitted to Victoria University of Wellington in fulfilment of the requirements for the degree of Doctor of Philosophy in Architecture, Wellington, 2010.)