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Does prefab stack up?

How do prefabricated building systems stack up environmentally and economically compared with traditional construction? BRANZ has been taking a look.

PREFABRICATION REFERS to a variety of building approaches ranging from transportable homes, modular units, and roof, wall or floor panels, to component systems such as built-up windows.

Opportunities exist

A recently completed Building Research Levy-funded BRANZ project looked at the economic and environmental impact of prefabricated building systems in the New Zealand construction sector.

It found prefabricated construction offers opportunities for improvement in environmental sustainability due to factors such as readily reduced greenhouse gas (GHG) emissions through better material control, waste reduction and reduced transport needs.

Better economic outcomes are also possible, but the research found these are dependent upon economies of scale and site access.

Three systems studied

The BRANZ project studied the construction of a 120 m² transportable home using four different construction approaches (see Figure 1):

- On-site traditional construction.
- A complete transportable prefabricated home.
- A home constructed with panellised prefabrication.
- A hybrid home constructed from modules and panels.

Reduced emissions

All three prefabricated home options had significantly reduced GHG emissions than the home constructed in the traditional manner. The variation in construction waste was the largest single attributing

factor, because better process controls:

- reduced the need to over-order
- provided greater ability for material reuse, as multiple units are being constructed.

These results were corroborated with manufacturers' experiences. A number of significant outcomes were identified (see Table 1).

Some systems unproven in New Zealand

The research project team recognises that some prefab systems are unproven in the New Zealand environment. However, they have a

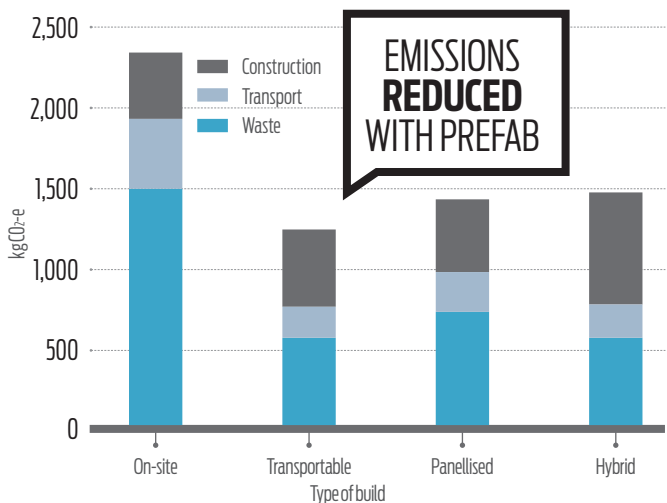


Figure 1: GHG emissions using four different construction approaches. Embodied GHG emissions have been omitted as they are the same in all cases.

Table 1

KEY FINDINGS

- 1 The most common prefabricated elements in non-residential construction are concrete wall panels (50% of all prefab walls) and floor beams (100% of all prefab floors).
- 2 By value, 17% of all building work in New Zealand is prefabricated to some degree – including windows and prehung doors.
- 3 Prefabrication reduces the waste generated at construction sites by allowing reuse.
- 4 Building prefabricated systems is safer, with 75% fewer fatalities in factory-based construction than using site-based processes.
- 5 Prefabrication reduces the rate of human error due to better process controls which reduces the defects in construction, enhancing productivity and efficiency.
- 6 One of the key barriers to the uptake of prefabrication in New Zealand is the low level of innovation in the industry.
- 7 The greatest benefits of prefabrication can be gained from repetition when there are multiple identical (or nearly identical) units/panels/modules to construct.
- 8 Prefabrication provides a reduced likelihood of timber treatment chemicals leaching into the environment through more controlled waste management processes, making treated timber sawdust and off-cuts easier to capture and reuse. This has a direct environmental benefit and also raises questions about the current management of treated timber wastes on traditional construction sites.

record of performance in other countries, such as Europe and the United States. This highlights a significant opportunity for their use in New Zealand.

Tools developed

A decision tool - the PrefabNZ toolkit - was developed in this project for industry use. This Microsoft Excel utility introduces clients to the benefits of prefabrication and helps make decisions about the most appropriate prefabricated construction types for a specific location, based upon site-specific parameters, material and construction choices.

The PrefabNZ toolkit is available as a download from the BRANZ website (www.branz.co.nz under Toolbox) or the PrefabNZ website (www.prefabnz.com).

To track the uptake of prefabrication by the construction industry, a monitoring tool was also developed as part of the research. ◀

For more ▶ Full results from this research are available on www.branz.co.nz, see Study Report SR279 *Prefabrication impacts in the New Zealand construction industry*.