

A Low-Carbon and Bio-Based Temporary Housing System for Northern New South Wales



Mahmoud Abu-Saleem¹, Kim Baber², Joe Gattas¹, Andrew Rose³, Fabiano Ximenes⁴

foldedstructureslab.com

j.gattas@uq.edu.au

fabiano.ximenes@dpi.nsw.gov.au

¹ School of Civil Engineering, The University of Queensland, St Lucia, QLD, Australia

² School of Architecture, Design and Planning, The University of Queensland, St Lucia, QLD, Australia

³ Faculty of Science and Engineering, Southern Cross University, East Lismore, NSW, Australia

⁴ Department of Primary Industries and Regional Development, NSW Government, Parramatta, NSW, Australia

Overview

This project aims to develop a pioneering, sustainable, and low-cost prefabricated temporary housing system, made primarily of recovered waste cardboard and under-utilised timber materials available in the Northern NSW. It will significantly increase the capacity to use renewable and recycled materials in temporary housing construction, supporting new and expanded regional manufacturing capabilities in bio-based modular housing systems. This seed project is funded by the NSW Decarbonisation Innovation Hub, Land and Primary Industries Network.

Figure 1: Bio-based temporary housing prototype, with hybrid timber-cardboard sandwich panels for internal structure, hardwood thinning and pulplog external structure, and transportable base. Prototype is 3x3.6 m and represents the front segment of a larger house.

Project Partners

This project brings together the complementary expertise of government, research, and industry partners, representing each stage of the value chain—from forest resources to wood products and final building applications. This collaboration enables radically new approaches to resource-efficient building design, suited to low-carbon, sustainable, and scalable delivery models for post-disaster temporary housing.







FOR A BETTER WORLD



Figure 2: NSW State Forest Estate (source: Forestry Corporation NSW Defined Forest Area map).



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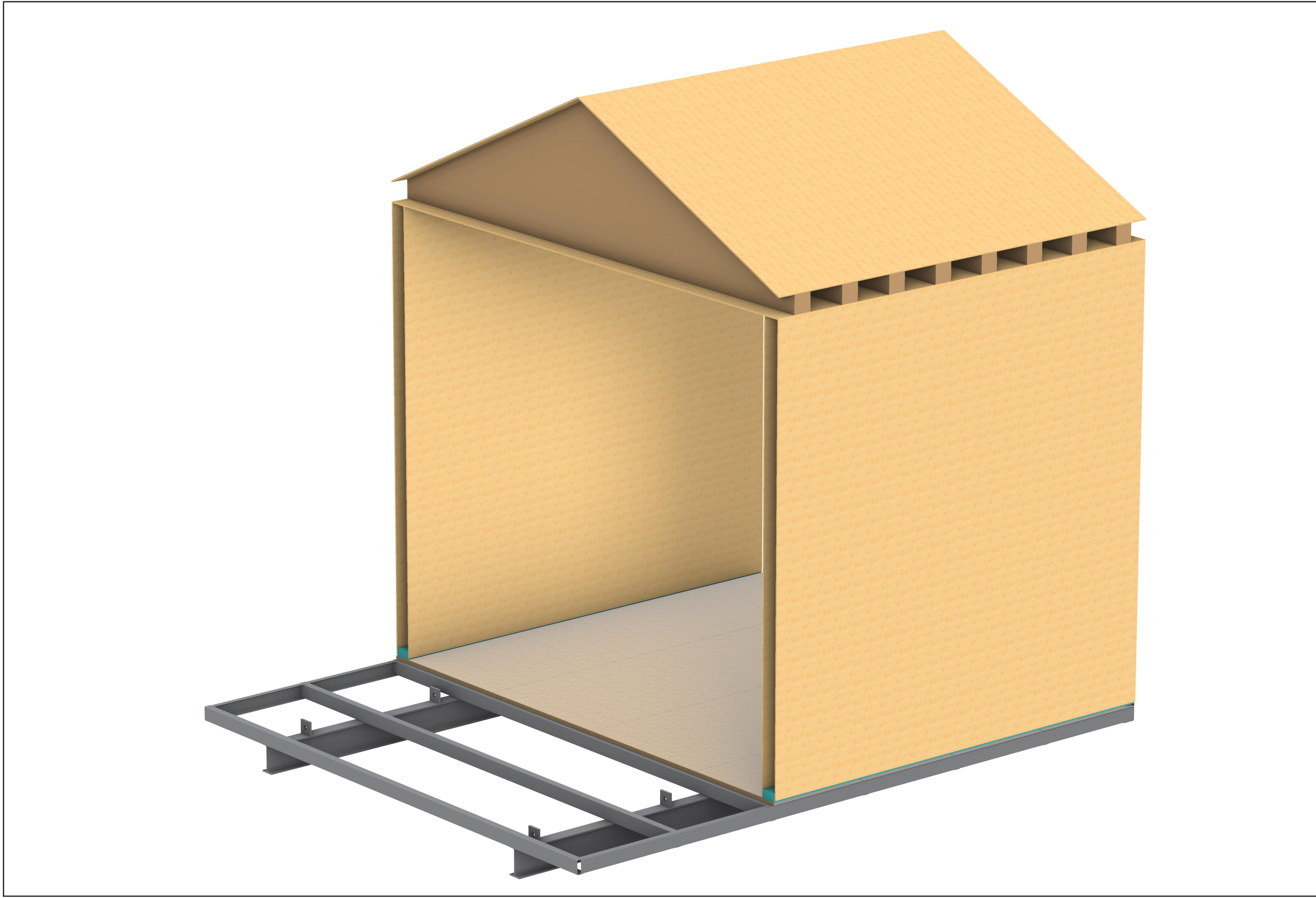


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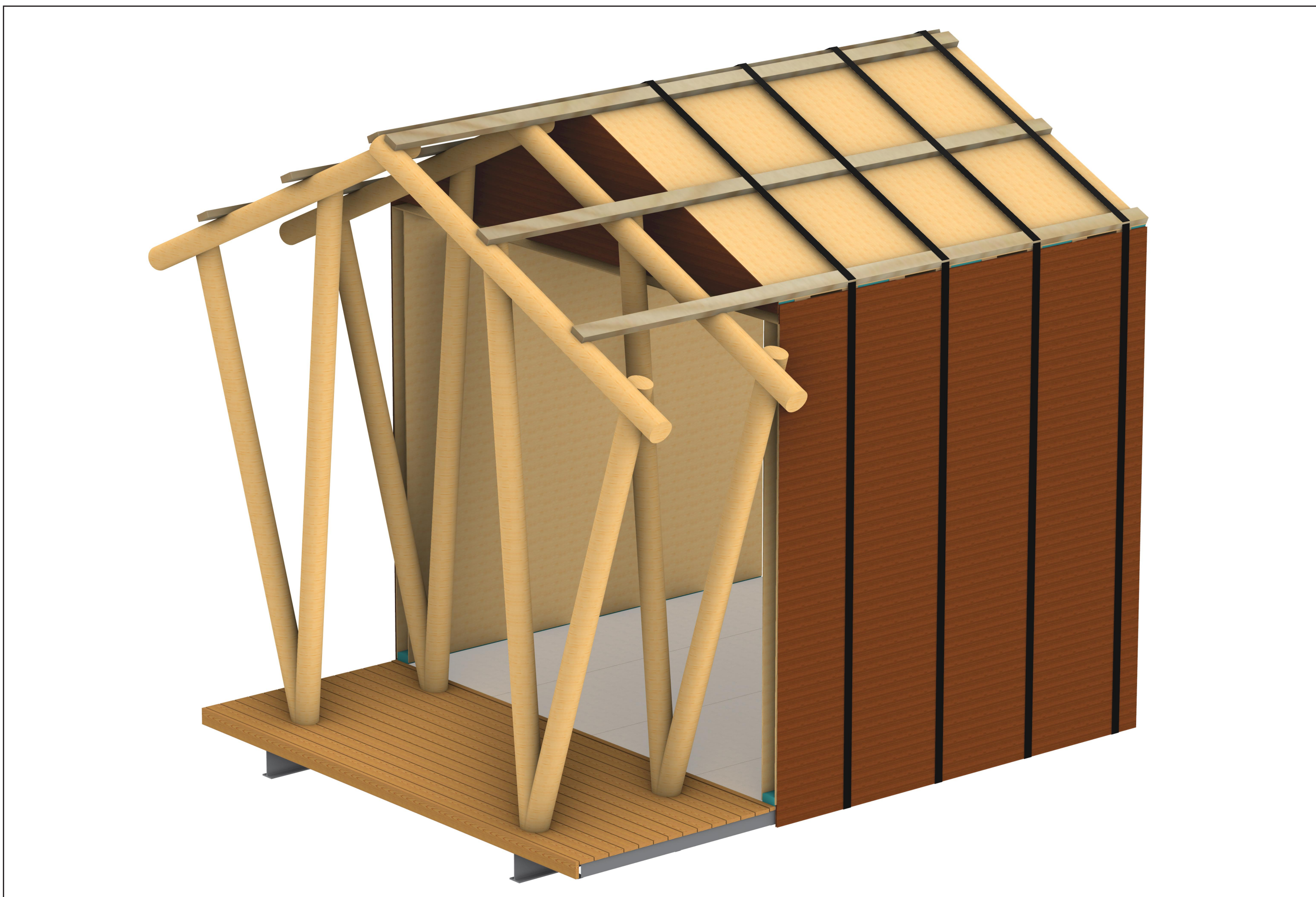


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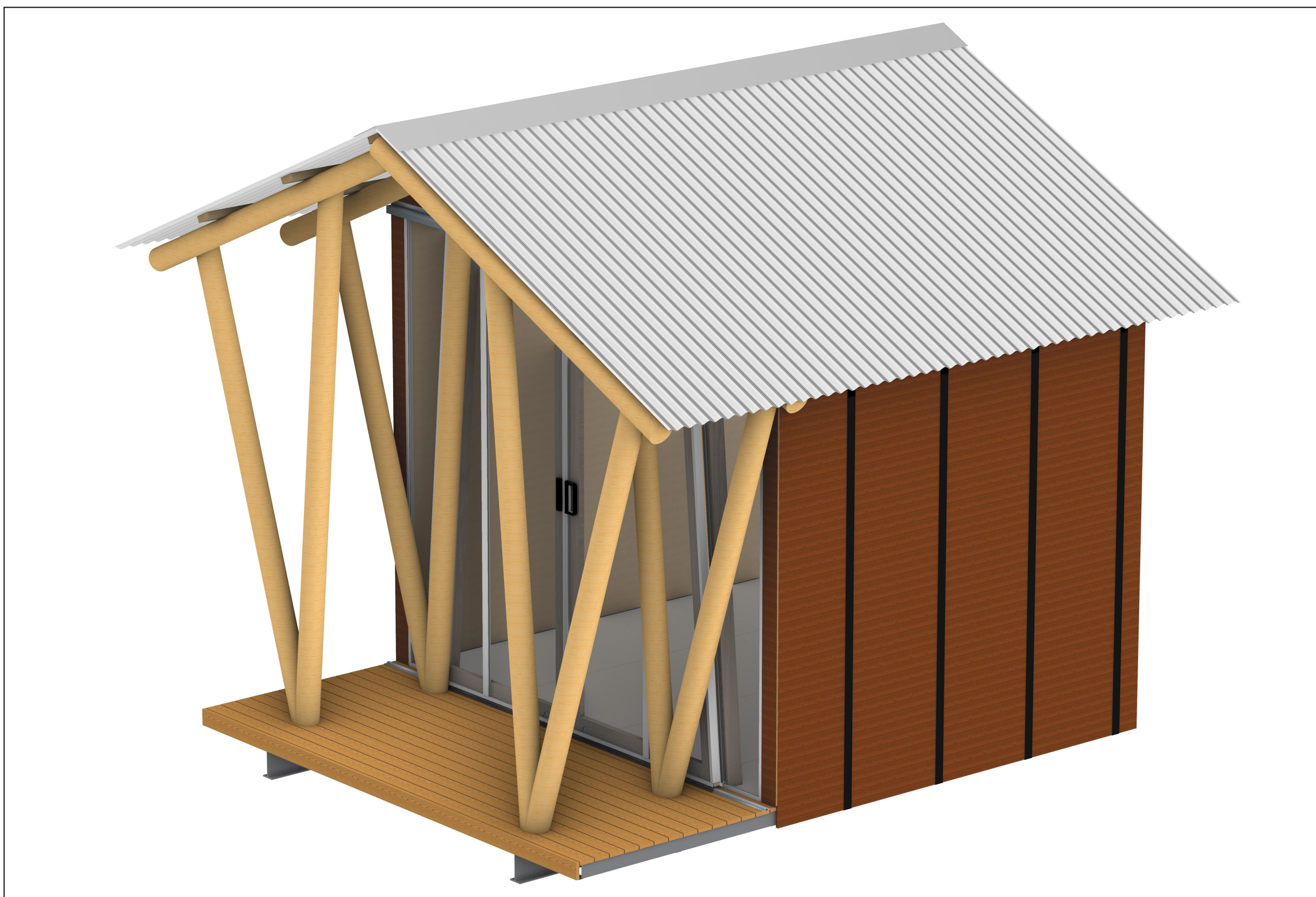
Hybrid Timber-Cardboard Sandwich Panels

This project presents a new class of bio-based structural composite product, termed timber-cardboard sandwich panels. These panels bond cardboard ‘studs’, made from recycled or waste material, to panellised wood product faces to create a high-performing building product. Face materials can be selected to suit local availability and finish preferences; the current prototype features Radiata Pine plywood, Hoop Pine plywood, particleboard, and medium-density fibreboard (MDF) VJ panel products. Panels are fabricated with standard workshop tools and are stronger than typical foam-core sandwich panels.



Thinning and Pulplog Structural Elements

In natural forest ecosystems, trees vary in size and form. To manage this, plantation and managed native forests are periodically thinned to promote forest health allow remaining trees to reach full size. This process generates a significant volume of small-diameter logs, which currently have limited use beyond mulch, chip, or pulp products. This project explores an innovative structural use for small-diameter roundwood logs as external framing components to construct durable, economical and much needed covered outdoor space. It also incorporates cladding made from pulplog and hardwood forestry residues, providing a durable, natural finish for the building exterior.



Value and Carbon Value Engineering

The housing system is designed to maximise both value creation and carbon sequestration across the entire building lifecycle. By using locally sourced forestry by-products, residues, and waste materials, it reduces manufacturing costs and significantly reduces embodied carbon emissions. These materials remain in use for longer, avoiding emissions from end of life forest, landscape, or landfill decay. The building layout is optimised to simplify fabrication and assembly, minimise production waste, and allow for straightforward disassembly for reuse or recycling at the end of its lifespan.