

25TH ANNIVERSARY

GECA



CASE STUDY

Homes NSW Recycled Content Verification Study

Building a stronger evidence base for circular modular housing

Independent assessment of recycled content, supply chain opportunities and embodied carbon in a MOOV modular dwelling

CARBON ANALYSIS
SERVICES
PROVIDED BY:



This *Case Study: Homes NSW Recycled Content Verification Study* was prepared by GECA. The views expressed within are not necessarily the views of Homes NSW and may not represent department policy.

THE CHALLENGE

How do you turn recycled-content claims into procurement-ready evidence?

As Homes NSW expands the use of modular housing, there is an opportunity to embed circular economy principles into how materials and products are specified and procured. But setting meaningful recycled-content requirements depends on having reliable evidence. While suppliers are increasingly able to report recycled-content figures, the systems needed to verify those claims at product level and trace materials through the supply chain are still developing.



CLAIMS

What does the supplier report?

Recycled-content figures may be available, but can represent anything from a specific product to an average across an entire manufacturing site.



EVIDENCE

Can the claim be substantiated?

Supporting documentation, production records, chain of custody and independent verification vary significantly between materials and suppliers.



PROCUREMENT

Can Homes NSW confidently use it?

Reliable, comparable evidence is needed to establish baselines, set future requirements and track progress.



THE OPPORTUNITY

Establish a credible baseline and a consistent approach to verification that Homes NSW can use to strengthen recycled-content requirements across future modular housing procurement, supported by material-specific benchmark trajectories.

PROJECT AT A GLANCE

A real-world pilot for circular modular housing

Homes NSW commissioned GECA to independently assess recycled-content opportunities within a completed MOOV modular dwelling delivered under the Modern Methods of Construction Program. The pilot created a practical evidence base for understanding current performance and identifying where procurement can drive improvement.

1

**completed
modular dwelling**

Single-storey, steel-framed
volumetric home

77m²

total area

Approximately 58m²
internal floor area plus
external porch

~14

tonnes

Confirmed material mass
captured in the Bill of
Quantities

20+

**material
categories**

Mapped across the
dwelling supply chain

6

material streams

Assessed in detail for
recycled content and
benchmarking

100+

sources reviewed

Australian and global
literature, policy, standards,
industry reports and case
studies

OUR APPROACH

From global best practice to project-level evidence

GECA combined international research with project-specific supply chain analysis to build a defensible recycled-content baseline and practical pathway for improvement. The study moved from understanding what leading markets are doing to testing what could be verified within the actual MOOV dwelling supply chain.

01

BENCHMARK

Reviewed global and Australian circular modular housing practice and policy.

02

MAP

Mapped the MOOV dwelling materials, products, manufacturers and suppliers.

03

PRIORITISE

Identified high-impact material hotspots and recycled-content opportunities.

VERIFY

Reviewed supplier declarations, EPDs, calculations, certifications and traceability evidence. Established a recycled-content baseline and benchmarked six priority material streams.

04

MODEL

With Rebuilt, modelled the dwelling's upfront embodied carbon at the current baseline and under two recycled-content uptake scenarios to understand how increased recycled content could influence whole-of-dwelling embodied carbon.

05

RECOMMEND

Developed actions for design, procurement, verification, supplier engagement and future reporting.

06

WHAT WE FOUND

A baseline for better decisions

20.1%

Verified dwelling-level recycled-content baseline by weight across 94.15% of mapped dwelling weight

**382.3
kgCO₂e/m²**

Upfront embodied carbon (A1–A3)

Up to 10%

Modelled reduction in upfront embodied carbon by increasing recycled content across current providers of the six priority materials

6 material streams

Assessed in detail across baseline, intermediate and higher-uptake scenarios

KEY INSIGHTS

Recycled content and embodied carbon are related, but they are not interchangeable. The materials with the greatest opportunity to increase recycled content are not always the materials offering the greatest carbon reduction.

Material production dominates the dwelling's upfront carbon footprint. This reinforces the importance of material specification and procurement as key levers for improvement.

Government procurement is the best lever to drive immediate improvements with current material suppliers.

WHERE THE OPPORTUNITIES ARE

Different materials need different strategies

The study found that there is no single pathway to higher recycled content. Each material is constrained by different technologies, supply chains and levels of verification maturity — so future targets should be set material by material. The six materials showed very different levels of opportunity. Aluminium and plasterboard had the largest gap to global best practice, while insulation and composite decking were already close to leading performance.

○ current (reported) ○ ISO 14021-aligned calculation — benchmark / opportunity range

STRUCTURAL STEEL

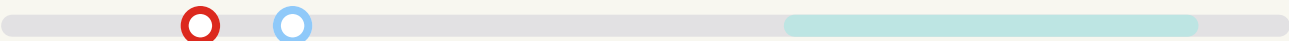
24% current, reported

ISO 14021-aligned calculation: **17%**

Conventional (BF-BOF) benchmark 20-30%



Electric arc furnace (EAF) benchmark 60-90%



● High Priority

Key Opportunity: Future gains depend on both recycled content availability and a shift toward electric arc furnace production. The steel production route matters as much as the recycled-content percentage.

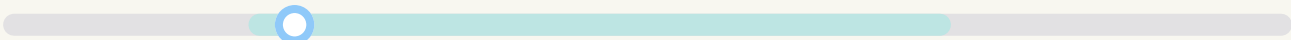
ALUMINIUM

0% current, reported

Near-term opportunity 20-30%



Global best practice 30-75%



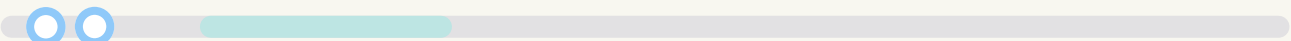
● **Very High Priority**

Key Opportunity: Introduce recycled billet requirements and strengthen chain-of-custody evidence from billet through to extrusion. Aluminium has one of the largest gaps between the assessed baseline and global best practice.

PLASTERBOARD

4-7% current, reported

Global best practice 20-30%



● **Very High Priority**

Key Opportunity: Increase recycled gypsum as cleaner recovery and take-back pathways mature, while requiring clearer disclosure of recycled content in the liner and gypsum core.

ENGINEERED WOOD

~40% current, reported

Global best practice

70-90%



● **High Priority**

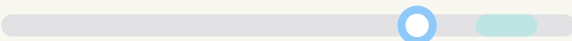
Key Opportunity: Increase recycled fibre requirements across flooring and joinery while strengthening product-specific verification and maintaining performance requirements.

INSULATION

82% current, reported

Global best practice

85-90%



● **Low Priority**

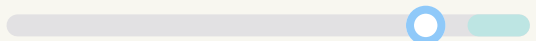
Key Opportunity: Performance is already close to global best practice. The priority is to maintain high recycled content and improve the quality of supporting verification evidence.

COMPOSITE DECKING

85% current, reported

Global best practice

95-99%



● **Low Priority**

Key Opportunity: Maintain the strong current position and favour independently verified products above 90% where available.

FROM EVIDENCE TO PROCUREMENT

Turning the study into procurement action

The study's recommendations focus on minimising overall environmental impact, embedding evidence requirements earlier, strengthening verification over time and using procurement scale to drive change in suppliers and manufacturers. The aim is not to rely on a single blanket recycled-content target, but to create a staged approach where recycled-content levels and data quality improve for each material and its supply chain. The key themes of the six recommendations include:



Design circularity in early

Design for disassembly, adaptable layouts and standardised components.



Specify evidence from the start

Include recycled-content and carbon evidence requirements in tenders and procurement documentation.



Measure confidence as well as content

Track recycled-content performance alongside evidence quality and traceability.



Set targets material by material

Use realistic, benchmarked ceilings rather than one target for every material.



Use procurement to shift the market

Focus on high-volume strategic suppliers; schedule progressive increases in minimums.



Collaborate and scale

Extend across the supplier panel; align requirements with other agencies.

WHAT THIS PILOT SHOWS

From one pilot to a scalable evidence base

This pilot shows how stronger sustainability and procurement practices can support Homes NSW to improve the environmental performance of future modular housing projects.

There's room to use more recycled content

Recycled content is already present across the assessed modular dwelling, with a verified baseline of **20.1% by weight**. The study identified further opportunities to increase recycled content, particularly in aluminium, plasterboard, engineered wood and steel.

Government buying power can drive change

Suppliers told us that **government procurement requirements and customer demand are key drivers** for increasing recycled content. This shows the influence major government buyers can have in encouraging suppliers to use more recycled materials and provide stronger evidence to support their claims.

86%

of suppliers surveyed identified government procurement requirements as the strongest driver for increasing recycled-content uptake

More recycled content can help reduce carbon – but it's not the whole story

Increasing recycled content across the six priority materials could reduce upfront embodied carbon by **up to around 10%**. Achieving greater reductions will require additional changes, such as the materials selected, how they are manufactured and how homes are built.

This approach could be used more widely

The pilot provides a practical approach for understanding what materials are being used, how much recycled content they contain, what evidence supports those claims and where further improvements can be made.

The same approach could be applied across more suppliers, projects and housing types, helping Homes NSW build a stronger evidence base and identify new opportunities to improve recycled content, circularity and embodied carbon over time.

Ultimately, the pilot provides a practical foundation for using evidence, verification and government procurement to support more consistent, transparent and circular housing outcomes.



The study identifies material-specific opportunities to enhance sustainability outcomes through future modular housing procurement, with findings and insights relevant to the broader social and affordable housing sector. The independent verification of environmental claims has sent a clear market signal of the increased demand for recycled content and greater transparency in material disclosures.

Megan Chatterton
Senior Project Officer, Choose Circular
Homes NSW



Delivering more housing is critical in Australia but we need to do this in a sustainable way. Working with GECA on the Homes NSW research creates a baseline for not just us but also for the industry on modular construction in Australia. It was eye-opening to see that when measured you can make a material difference. The team from GECA were so helpful and facilitated the project exceptionally well and are a partner we will keep working with as we expand our business.

Nick O'Neill
Managing Director at MOOV Modular