

Gordon Wilson Flats

Residential

Executive Summary
Life Cycle Assessment - Case Study



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6,830m²
gross floor area

11
no. of storeys

Wellington
New Zealand

Per GFA

Absolute

Case 1 (Retain + Timber) Upfront Carbon (Incl. biogenic)	Case 1 (Retain + Timber) Whole-of-life Carbon (Incl. biogenic)	Case 2 (Re-build - Concrete) Upfront Carbon (Incl. biogenic)	Case 2 (Re-build - Concrete) Whole-of-life Carbon (Incl. biogenic)	Existing Building Upfront Carbon (Incl. biogenic)	Existing Building Whole-of-life Carbon (Incl. biogenic)
64 kgCO ₂ eq/m ² A1-A5 (GWP)	87 kgCO ₂ eq/m ² A-D (GWP)	812 kgCO ₂ eq/m ² A1-A5 (GWP)	729 kgCO ₂ eq/m ² A-D (GWP)	548 kgCO ₂ eq/m ² A1-A5 (GWP)	581 kgCO ₂ eq/m ² A-D (GWP)
434 tCO ₂ eq A1-A5 (GWP)	595 tCO ₂ eq A-D (GWP)	5,544 tCO ₂ eq A1-A5 (GWP)	4,980 tCO ₂ eq A-D (GWP)	3,743 tCO ₂ eq A1-A5 (GWP)	3,966 tCO ₂ eq A-D (GWP)



Upfront Carbon (A1-A5) - Case 1 vs Case 2 (Incl. biogenic)

92% ↓

Case 1 (Retain + Timber) achieves an 92% reduction overall Upfront Carbon emissions compared to Case 2 (Re-build - Concrete).



Whole-of-life Carbon (A-D) - Case 1 vs Case 2 (Incl. biogenic)

88% ↓

Case 1 (Retain + Timber) achieves an 88% reduction overall Whole-of-life Carbon emissions compared to Case 2 (Re-build - Concrete).

The Existing Structure
should be retained.

Key Findings

The LCA results show that **Case 1 (Retain + Timber: Partially Refurbished with Mass Timber Frame)** has a total **climate change impact (GWP) (A-D)** of **594,953.13 kgCO₂eq** or **595 tCO₂eq**. **Product stage (A1-A3)** is the most dominant life cycle module in the design, followed by the **Maintenance & Replacement stage (B2, B4)** and the **End-of-life stage (C1-C4)**.

When compared to **Case 2 (Re-build - Concrete: Demolition and Rebuild with Concrete)**, **Case 1** achieves a **92% reduction** in **Upfront Carbon** and a **88% reduction** in **Whole-of-life emissions**.

Compared to the carbon released when the **Existing Building** was built in **1959**, **Case 1** requires only **12%** to make building warm and habitable.

Carbon removals (**sequestered biogenic carbon** and **Module D benefits**) are included in the total **climate change impact (A-D)** and **upfront emissions (A1-A5)**. Specific to the potential benefits beyond the system boundary (**Module D**), it depends heavily on **end-of-life (C1-C4)** assumptions, introducing uncertainty about actual post-service carbon outcomes.

Assessment Information

Category	Building Life Cycle Assessment
Service Life	50 year building life
Material Quantity Data Source	BIM models of the building
Emission Factor Data Source	The LCA Data (primary and background data sets) used in this assessment are: - BRANZ CO2NSTRUCT for modules A1-A3 and BRANZ dataset for the remaining modules - Environmental Product Declarations (EPDs) for specific products
Tool Used	LCAQuick V3.6 (BRANZ)
Assessment Scope	- Substructure - Superstructure - Internal Finishes

Life Cycle Checklist
Inclusions and Exclusions



Study Background

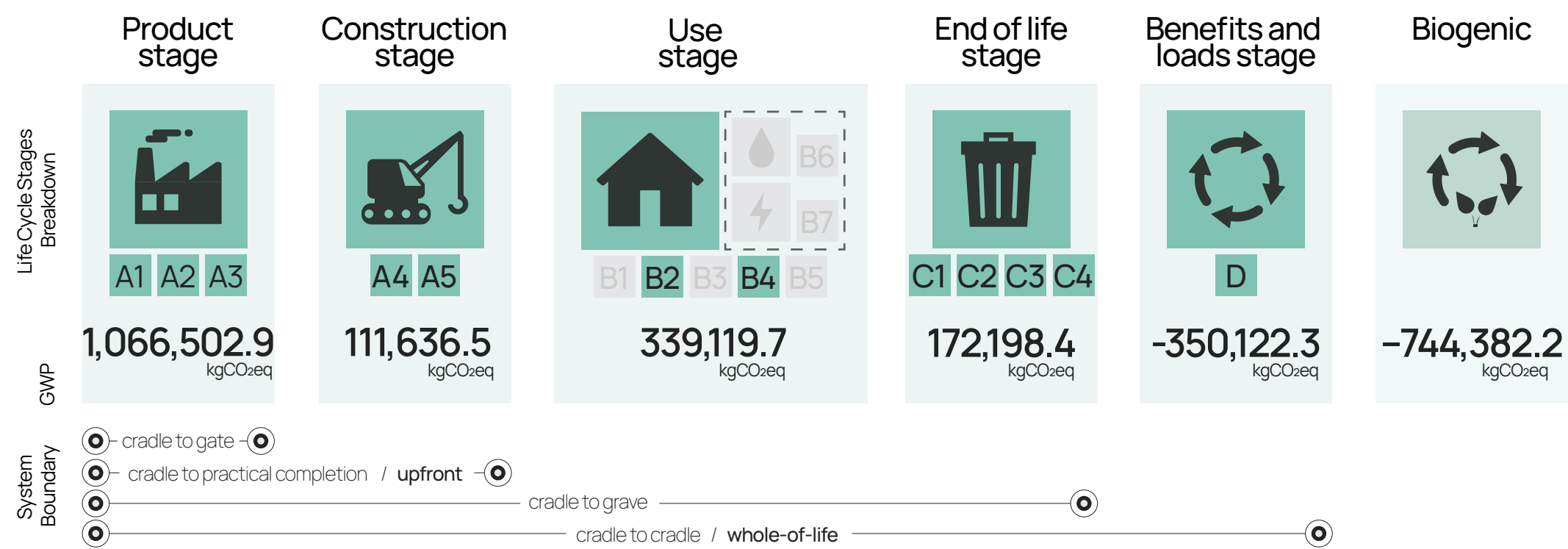
The Architectural Centre is seeking to comprehend the anticipated environmental impact of the building, 'Gordon Wilson Flats', located at 320 The Terrace, Wellington. To achieve this, Capana Group has been enlisted to conduct an environmental impact development using a whole-of-life cycle approach. The objective is to assess the environmental footprint of **Case 1**, which involves partial retention and refurbishment using a **mass timber frame**, and to compare it against **Case 2 (Re-build - Concrete: Demolition and Rebuild with Concrete)** and the **Existing Building**.

Limitations

This assessment is subject to limitations, as outlined below.

01	02
Data	Software
Limited to design documentation collected from the building. Data sourced from BIM models and drawings. Manual calculations were done where data gaps occurred.	Limitations in the LCAQuick V3.6 software. Assumptions were made to assign the most similar materials used in the software.

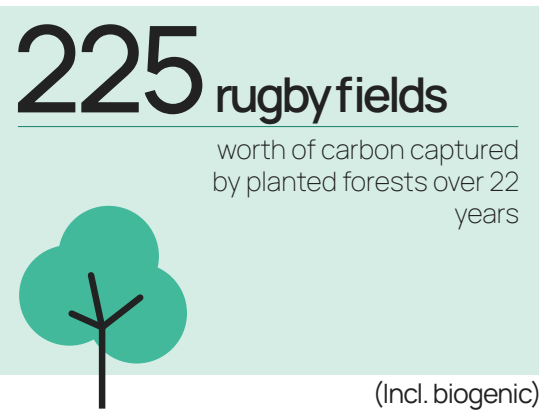
Results Over Life Cycle Stages - Case 1 (Retain + Timber)



Benchmarking - Case 1

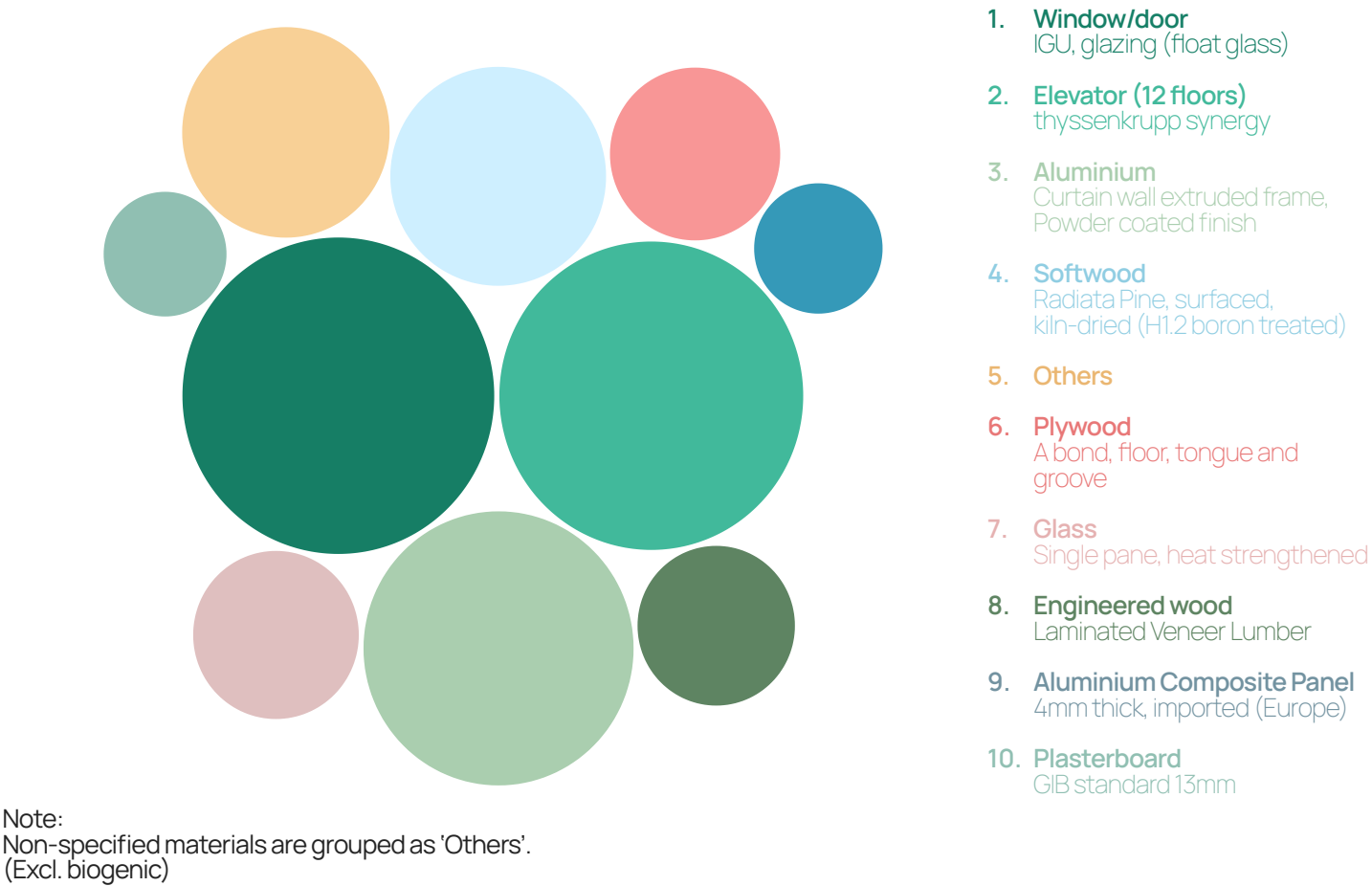
From stages A1-A5

Carbon avoided when compared to Case 2 is equivalent to...



Upfront Carbon Material Breakdown - Case 1

Top 10 Building Materials From Stages A1-A5



Carbon Analysis - Case 1 (Retain + Timber) vs Case 2 (Re-build - Concrete)

Summary of comparison between Proposed and Reference

Modules		Case 1 (Retain + Timber)		Case 2 (Re-build - Concrete)		Achieved % Reduction
A1-A5	Upfront Carbon	63.50	kgCO ₂ eq/m ²	811.73	kgCO ₂ eq/m ²	92%
A-C	Whole-of-life Embodied Carbon	138.37	kgCO ₂ eq/m ²	911.16	kgCO ₂ eq/m ²	85%
A-D	Whole-of-life Carbon excl. B6, B7	87.11	kgCO ₂ eq/m ²	729.10	kgCO ₂ eq/m ²	88%