CARBON BENEFITS OF ADAPTIVE REUSE VS NEW BUILD: A LIFE-CYCLE ASSESSMENT



Jamestown ESG Information Series: With ESG shaping real estate's future, this series aims to equip our key stakeholders with critical knowledge for informed decision making.

Jamestown Green

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RETHINKING CARBON IMPACT: THE CASE FOR ADAPTIVE REUSE

Jamestown's life-cycle assessments (LCAs) on two adaptive reuse assets demonstrate 20-40% lower whole life-cycle carbon emissions over 50 years compared to new construction.

Current certifications and regulations prioritize operational carbon due to its greater contribution to global emissions, ease of measurement, and long-term cost savings. This tends to favor new builds as improving operational efficiency of adaptive reuse projects is often more complex.

While policies have started addressing embodied carbon in new construction, they often overlook the more fundamental question; should existing buildings be demolished and replaced with new ones in the first place?

Our study reveals that the preservation of the existing buildings is the decisive factor behind adaptive reuse outperforming new construction in total carbon emissions, largely due to the significantly higher upfront embodied carbon of new builds.

We urge the industry to embrace a more holistic perspective that considers both embodied and operational carbon to better capture the true environmental impact of building projects.

For this study, the following are defined as:

Adaptive reuse: Transforming an existing building for a new purpose whilst retaining its core architectural elements.

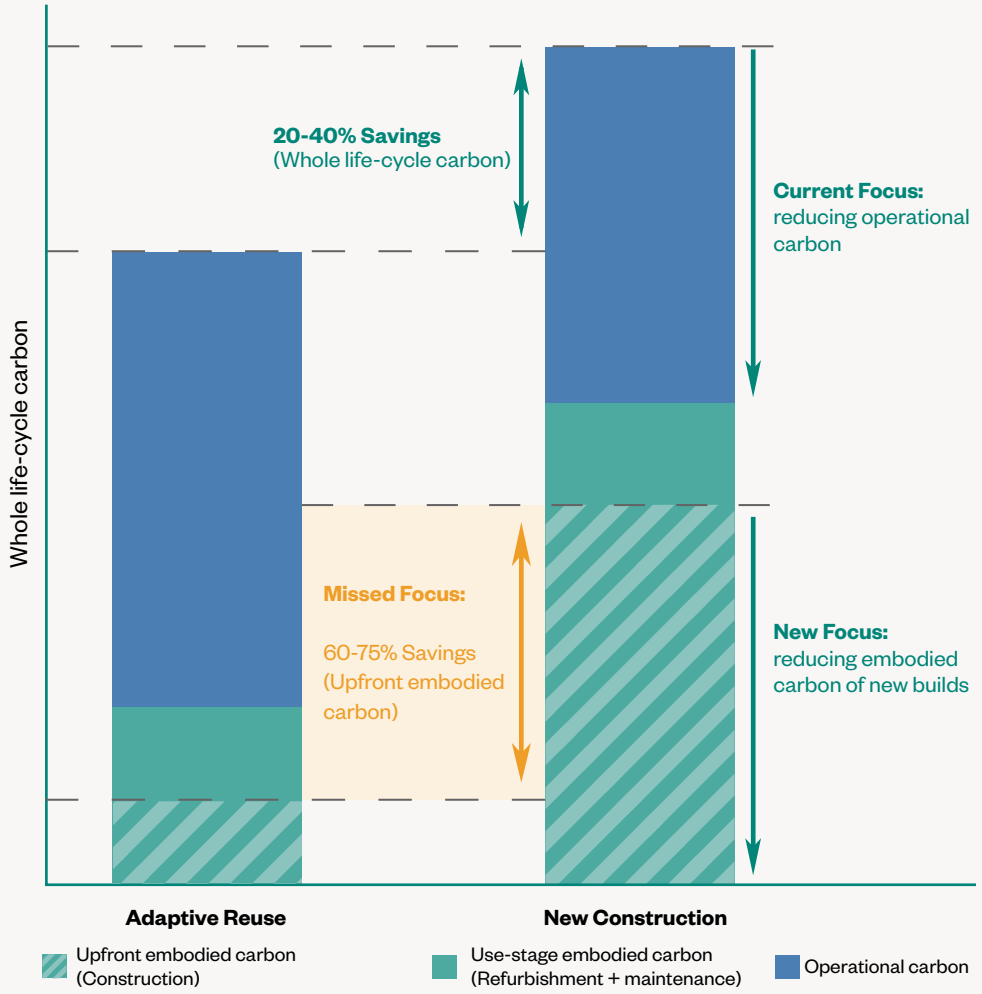
Operational carbon: Emissions from energy consumption during the building's use (ie heating, cooling, lighting).

Embodied carbon: Emissions from materials required for construction (upfront) and refurbishment and maintenance (use-stage).

Whole life-cycle carbon: Total emissions from embodied and operational carbon over a building's entire lifespan (assumed 50 years).

MISSED OPPORTUNITY: AVOIDING NEW BUILD WHERE POSSIBLE HAS GREATEST CARBON IMPACT

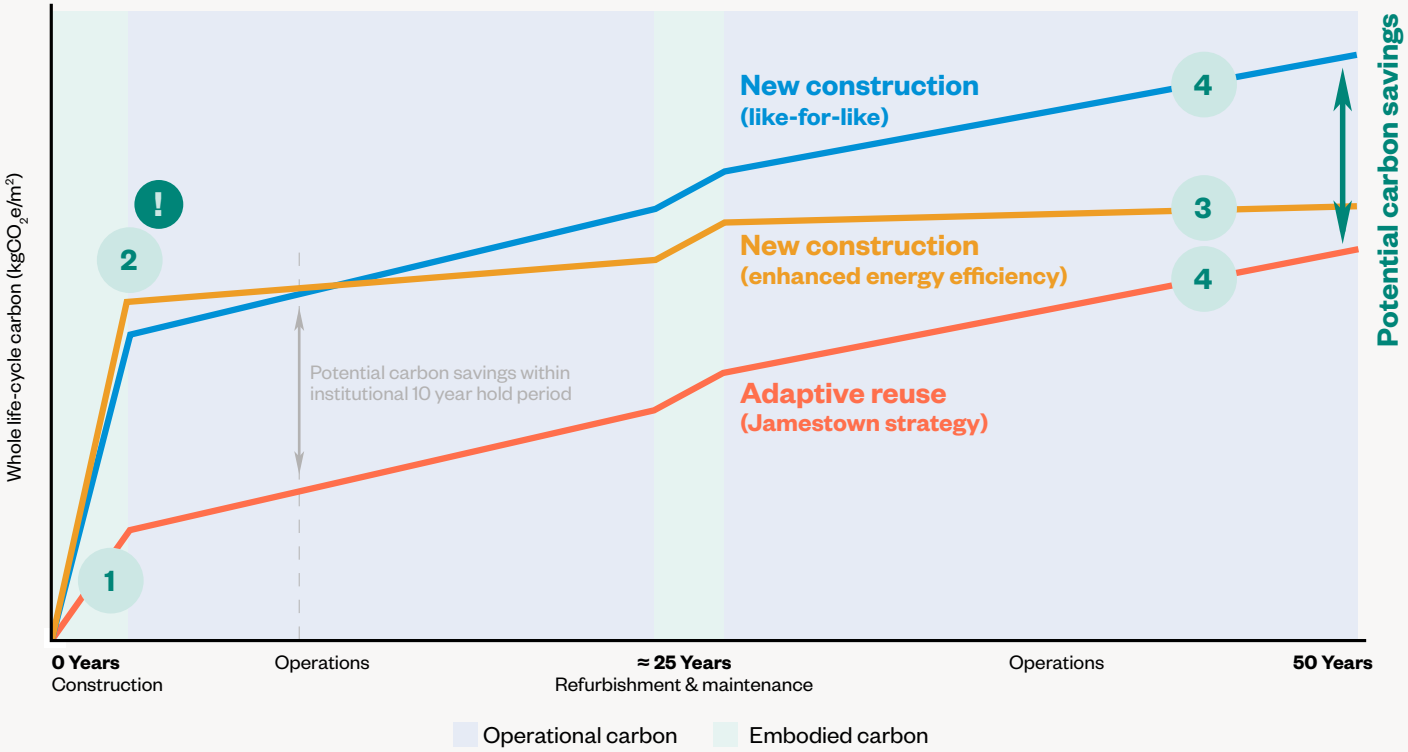
Key Insights from Case Studies



The graph is illustrative and not entirely proportional, intended for conceptual purposes to represent approximate carbon savings from the case studies.

WHOLE LIFE-CYCLE CARBON CASE STUDY: KEY INSIGHTS

Jamestown presents the key insights from two LCAs conducted by Drees & Sommer and Agradblue. These assessments compare the whole life-cycle carbon impact of adaptive reuse versus hypothetical new construction scenarios over 50 years. Common insights are summarized below, with detailed studies provided on the following pages.



'Adaptive reuse' scenario reflects Jamestown's asset strategies. The hypothetical new construction scenarios include 'like-for-like' new build (comparable use, size and standard) and an 'enhanced energy efficiency' new build, designed to be 30% more operationally efficient than 'like-for-like'.

1. **Low upfront embodied carbon:** Repurposing existing buildings significantly reduces carbon emissions in construction
2. **High upfront embodied carbon:** High embodied carbon impact due to construction of new building
3. **Low operational energy:** 'New construction (enhanced energy efficiency)' can perform best however upfront embodied carbon impacts final LCA result
4. **Comparable operational energy:** 'Adaptive reuse' can compete with 'new construction' with HVAC and façade upgrades

! The LCAs cover modules A to B (upfront and use-stage). LCAs typically exlude demolition of existing buildings, treating it as a sunk cost. One case study showed an additional 20% carbon saving with demolition included.

Our adaptive reuse strategy has demonstrated **whole life-cycle carbon savings ranging from 21% to 43%** over 50 years. Key insights from the case study:

- Adaptive reuse exhibits lowest whole life-cycle carbon impact due to preservation of the original buildings and avoidance of high embodied carbon of a new construction
- Despite better operational efficiency, 'new construction' exhibits higher overall life-cycle emissions due to high upfront embodied carbon (up to 60% of total emissions occur during construction)
- Carbon-intensive buildings (ie reinforced concrete) can offer greater carbon savings when preserved compared to less intensive structures (ie warehouse)

CASE STUDY: REFURBISHMENT OF EXISTING OFFICE BUILDING

Schanzenstrasse 24 Cologne, Germany

Agradblue have been engaged to compare the whole life-cycle carbon impact of a major office refurbishment versus hypothetical new construction scenario. The adaptive reuse calculations are based on design documentation for the current refurbishment, while the hypothetical new construction scenarios are based on comparable benchmarks. The assessment includes Modules A to B, covering upfront, and use-stage carbon. **The adaptive reuse strategy has led to 43% reduction in whole life-cycle carbon emissions over 50 years when compared to new construction. The savings are higher as the hypothetical new construction scenario replaces a higher carbon intensive building consisting of a multistorey reinforced concrete building.**

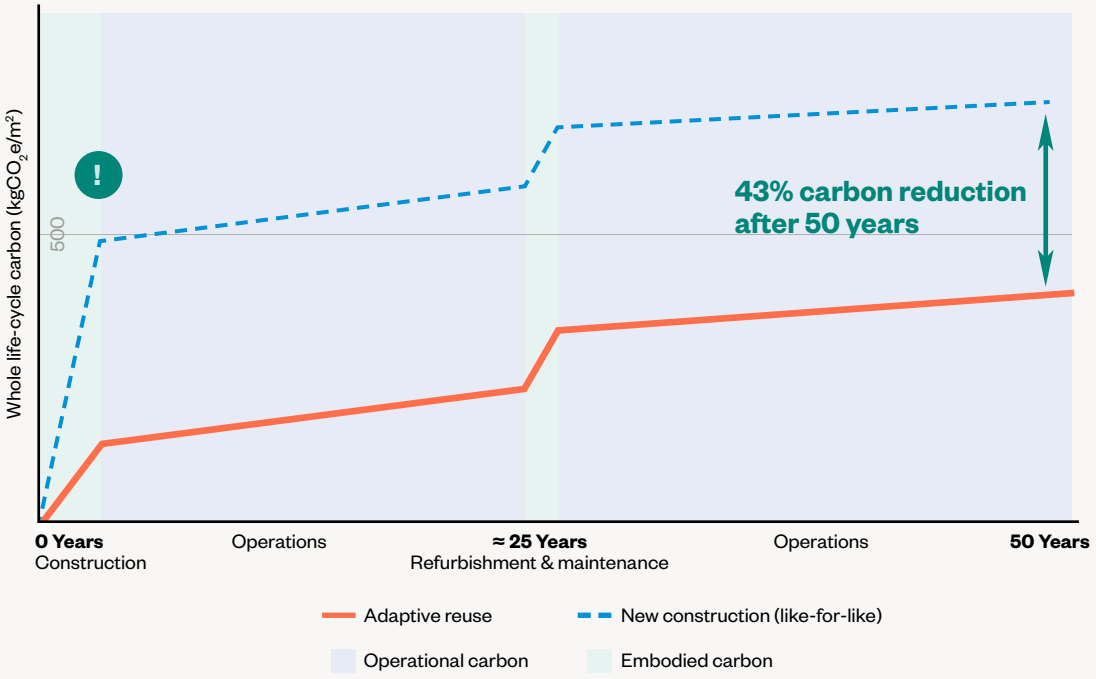
Office
Constructed in 1900



Refurbished Office
Refurbishment in 2026



1. Adaptive Reuse Refurbished office | 2,086sqm	**2. New Construction (like-for-like)** New office | 2,086sqm
Asset Strategy Refurbishment of existing office including new façade, roof structure, air heat pumps, insulation and interiors. Energy Label (target): Below average-energy consumption	**Hypothetical** New construction based on comparable use, size and construction standard as Scenario 1. Energy Label (hypothetical): Below average-energy consumption



! High proportion of carbon emissions occur during construction highlighting the importance of addressing upfront embodied carbon; ≈25% for adaptive reuse and ≈60% for new construction.

CASE STUDY: INDUSTRIAL WAREHOUSE CONVERSION INTO OFFICE

Pilotenstraat 1-15 Schinkel Amsterdam, Netherlands

Drees & Sommer have been engaged to compare the whole life-cycle carbon impact of converting the vacant warehouse into creative office, versus two hypothetical new construction scenarios. The adaptive reuse calculations are based on design documentation for the current conversion, while the hypothetical new construction scenarios are based on comparable benchmarks and modelling. The assessment includes Modules A to B, covering upfront, and use-stage carbon. **The Schinkel adaptive reuse strategy has led to 21% reduction in whole life-cycle carbon emissions over 50 years when compared to demolish and new construction. The savings are more moderate as the hypothetical new construction scenarios replace a lower carbon intensive building consisting of a low rise lightweight steel frame warehouse.**

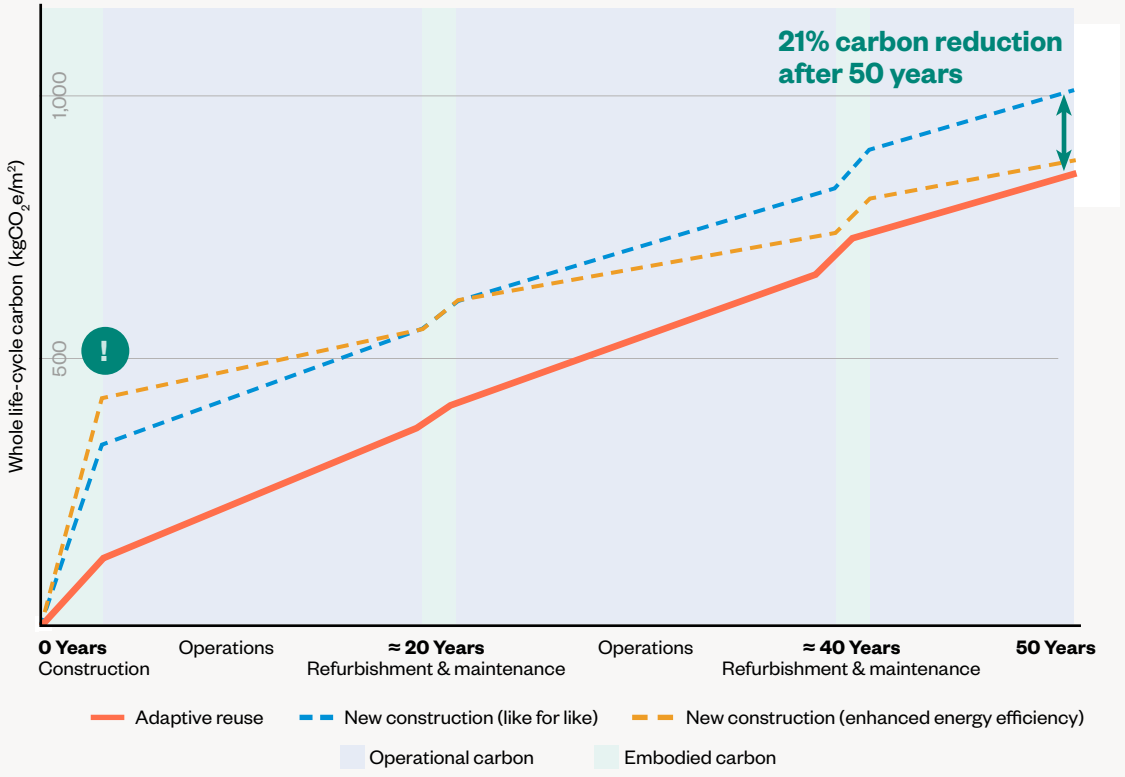
Vacant Industrial Warehouse
Constructed in 1950



Creative Office + F&B
Refurbishment in 2025



1. Adaptive Reuse Refurbished office | 5,400sqm	2. New Construction (like-for-like) New office | 5,400sqm	3. New Construction (enhanced energy efficiency) New office | 5,400sqm
Asset Strategy Warehouse to office conversion. Majority of structural elements retained. New windows, walls, installations (air-to-water heat pump). Energy Label (target): A	**Hypothetical** Same layout + materials as Scenario 1. All new materials instead of partially maintained. Energy Label (hypothetical): A	**Hypothetical** Same as Scenario 2 but designed to be 30% more operationally efficient (using ground source heat pumps). Energy Label (hypothetical): A or higher



! High proportion of carbon emissions occur during construction highlighting the importance of adressing upfront embodied carbon; ≈15% for adaptive reuse and ≈30-50% for new construction.

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