Towards a circular value chain of wood from existing buildings in the UK

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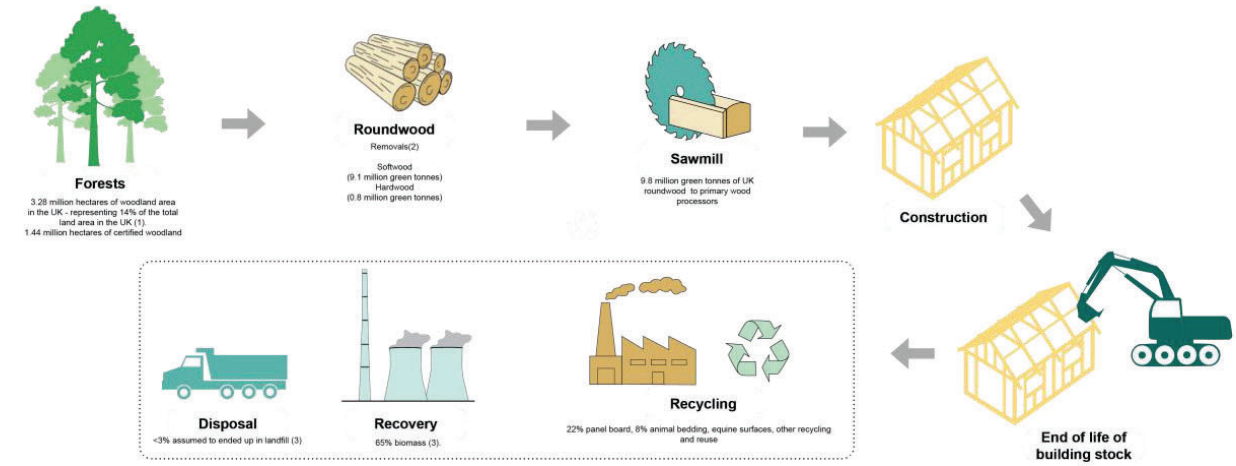
Department of Architecture | Centre for Natural Material Innovation

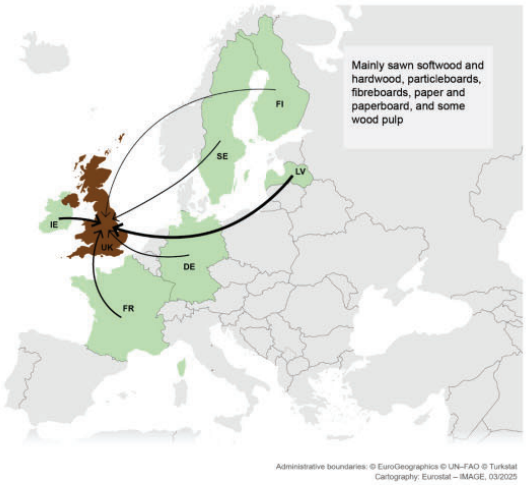
UK timber supply chain and waste wood

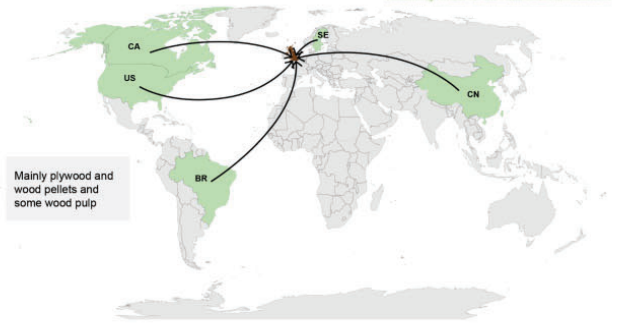


1. Braby D. Forestry Statistics 2024 - Chapter 1: Woodland Area & Planting. Forest Research; 2024.
2. Piller, K. Forestry Statistics 2024 - Chapter 2: UK-Grown Timber. Forest Research; 2024.
3. WRA (Wood Recyclers' Association). 2024. Over 97% of UK waste wood processedin 2023.https://woodrecyclers.org/over-97-of-uk-waste-wood-processed-in-2023/

https://doi.org/10.52202/080513-0468

Main imports of forest products from Europe to the UK





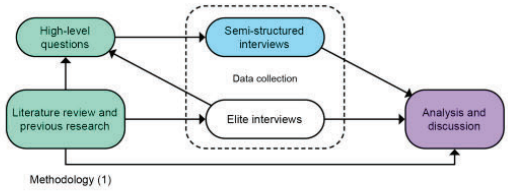
Imports to the UK in 2023

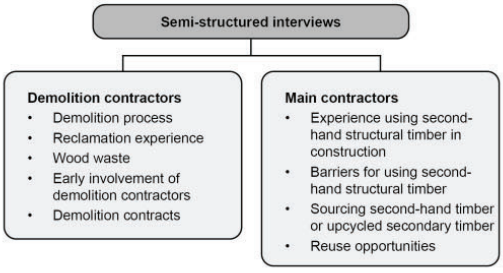
- 6.2 million cubic metres of sawnwood (1)
- 3.1 million cubic metres of wood-based panels (1)
- 6.4 million tonnes of wood pellets (1)
- 4.8 million tonnes of paper (1)
- 172,170 cubic metres of engineered wood products (2)

1. Piller K. Forestry Statistics 2024 - Chapter 3: Trade. Forest Research; 2024.
2. TDUK. Supply - Engineered Wood Products. https://timberdevelopment.uk/supply/market-data/premium-dashboards/

Research aims and methodology

This research investigated the strategies for salvaging and repurposing timber from existing buildings by conducting systematic interviews of key stakeholders in the timber construction sector in the UK





1. Godina M, Gowler P, Rose CM, Wiegand E, Mills HF, Koronaki A, Ramage MH, Shah DU. Strategies for salvaging and repurposing timber elements from existing buildings in the UK. Journal of Cleaner Production. 2025;144629.

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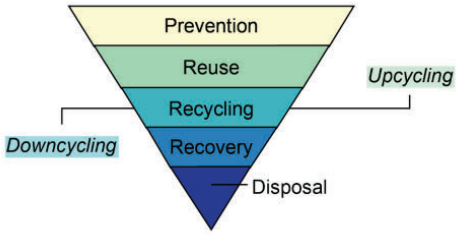
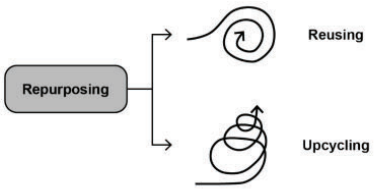
Repurposing timber elements for a circular value chain



Waste hierarchy pyramid (1), highlighting the increase or decrease of value by upcycling or downcycling respectively



1. Waste Framework Directive. https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive_en

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Barriers and opportunities explored

Reclamation

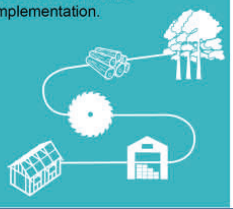
Reclamation barriers and opportunities were explored with a focus on all the on-site demolition activities. The research was limited to investigate the reclamation of sawn timber (softwoods and hardwoods) from existing buildings not designed for deconstruction in the UK.

Repurposing

Two repurposing alternatives were considered for the reuse of reclaimed timber as a structural material in construction, reuse and upcycling. Reuse refers to the use of timber components by largely retaining their shape, size and function. Upcycling refers to the use of reclaimed timber as a feedstock for the manufacturing of new engineered wood products for structural use - referred in this study to as Mass Secondary Timber (MST).

Supply chain

The challenges and opportunities of salvaging and repurposing timber elements were discussed in relation to the processes involved in the reclamation and reconditioning, production, certification, supply, and distribution of reclaimed timber materials or MST products, to understand these for their future implementation.



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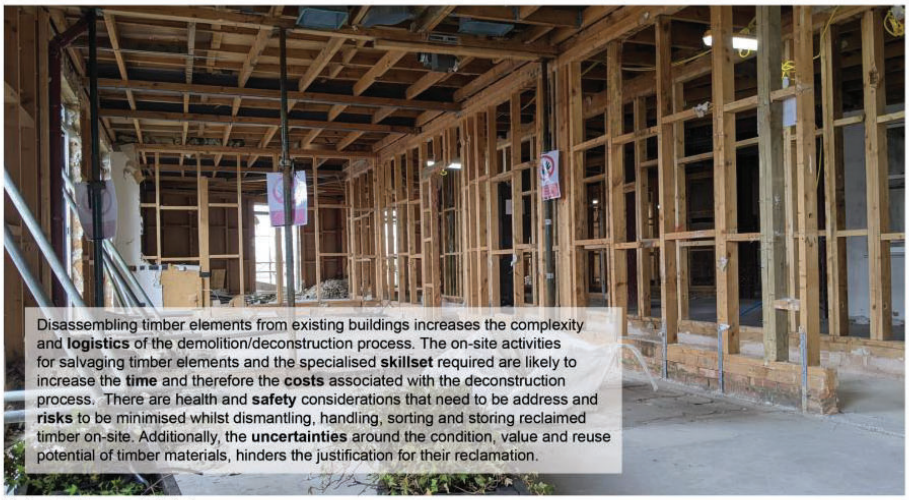
Reclamation barriers



Disassembling timber elements from existing buildings increases the complexity and **logistics** of the demolition/deconstruction process. The on-site activities for salvaging timber elements and the specialised **skillset** required are likely to increase the **time** and therefore the **costs** associated with the deconstruction process. There are health and **safety** considerations that need to be address and **risks** to be minimised whilst dismantling, handling, sorting and storing reclaimed timber on-site. Additionally, the **uncertainties** around the condition, value and reuse potential of timber materials, hinders the justification for their reclamation.

Westbury Hotel. Image credits Colin Rose

- Time
- Cost
- Logistics
- Demolition methods / skillset
- Safety
- Uncertainties

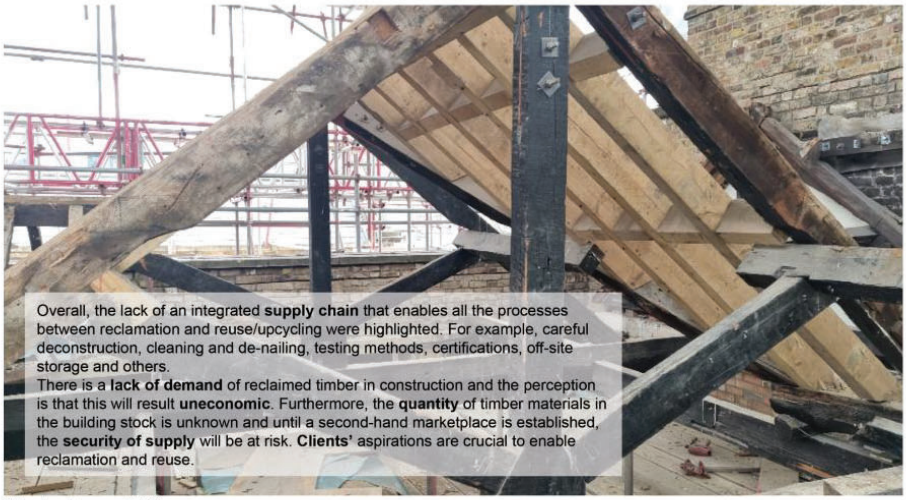
Repurposing barriers

Without proper **certification** and **specifications** (e.g. grading methods), the adoption of reclaimed timber in construction is limited to temporary structures and non-structural elements. The perception was that buildings with reclaimed timber may find it difficult to obtain **insurance**, and that the use of reclaimed timber was likely to be restricted to the private residential sector.
The principal barriers associated with the upcycling of reclaimed timber were the difficulty of identifying and removing **nails and other metals** buried into the timber elements before manufacturing, and the **lack of manufacturing companies** in the UK capable of fabricating MST products at scale.

Reclaimed timber with metal impurities. Image credits UCL

- Certifications
- Specifications
- Insurance
- Lack of supply chain

Supply chain barriers



Overall, the lack of an integrated **supply chain** that enables all the processes between reclamation and reuse/upcycling were highlighted. For example, careful deconstruction, cleaning and de-nailing, testing methods, certifications, off-site storage and others.
There is a **lack of demand** of reclaimed timber in construction and the perception is that this will result **uneconomic**. Furthermore, the **quantity** of timber materials in the building stock is unknown and until a second-hand marketplace is established, the **security of supply** will be at risk. **Clients'** aspirations are crucial to enable reclamation and reuse.

Timber truss. Image credits UCL

- Lack of demand
- £££ Uneconomic
- Security of supply
- Limited market
- Amount of timber in building structures
- Clients

Salvaging opportunities

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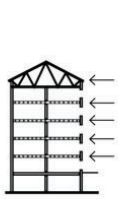
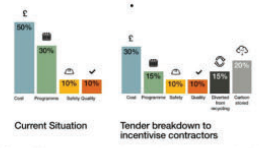
- Pre-demolition audits
- Surveys - reclamation specialists
- Waste Wood Assessment guidance
- Demolition method and logistics
- New job opportunities
- Early involvement of demolition contractors
- Demolition contracts



Top-down approach

Salvaging assemblies (full components)

Hybrid deconstruction using machines and hand tools



Demolition contracts to incentivise deconstruction (1)

1. Elliott Wood Partnership. Full Circle to Reuse - A guide by Elliott Wood and Grosvenor Britain & Ireland. https://online.flippingbook.com/view/915371497/

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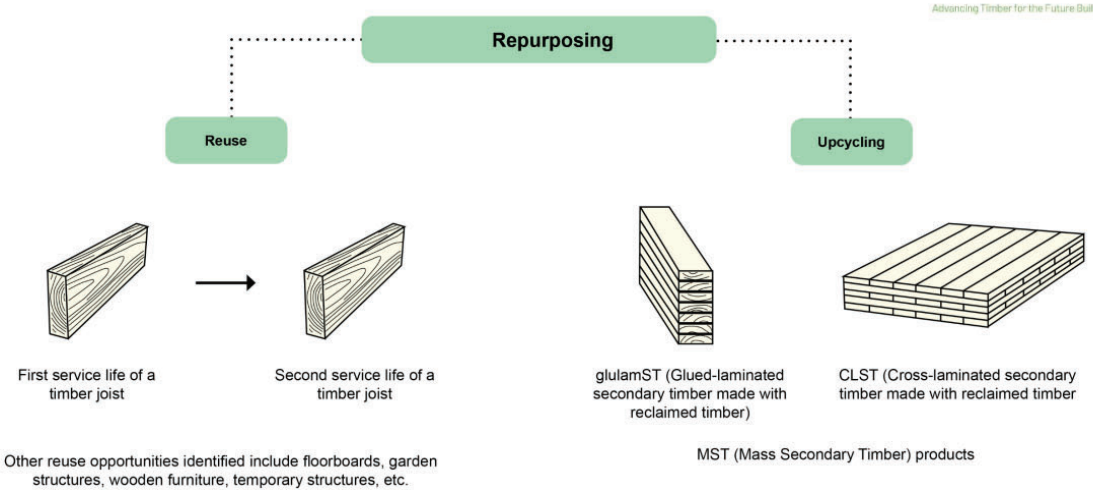
Repurposing opportunities



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Repurposing and value chain opportunities

Repurposing opportunities

- Properties of reclaimed timber
- Client aspirations
- Efficient design
- Modular design and off-site manufacturing
- Mass secondary timber, MST
- Underutilised domestic timber market
- Business opportunities
- Local supply chains for MST

Value chain opportunities

- Sourcing second-hand timber from reclamation yards and established markets incentivised by the government
- Free collection of wood waste from demolition sites to process for reuse
- Tax incentives and subsidies across the supply chain

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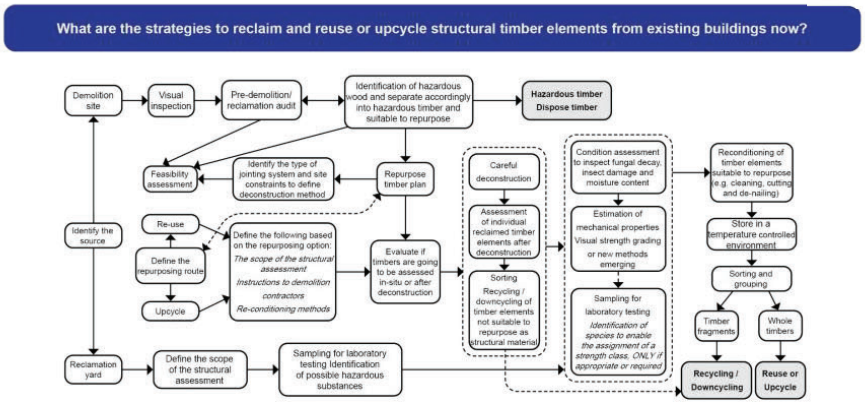
Strategies for salvaging and repurposing timber



Strategies for enabling reclamation and reuse/upcycling of timber from existing buildings. Source: Adapted from Elliott Wood Partnership (1).

1. Godina M, Gowler P, Rose CM, Wiegand E, Mills HF, Koronaki A, Ramage MH, Shah DU. Strategies for salvaging and repurposing timber elements from existing buildings in the UK. Journal of Cleaner Production. 2025;144629.

Towards a circular value chain of timber construction in the UK

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Reclaimed timber on truck. Image credits UCL

Recommendations for practitioners

- Conduct pre-demo / pre-reclamation audits, feasibility assessments and repurposing plans
- Identify possible material sourcing locations - reclamation yards, material hubs or demolition projects
- Follow the Waste Wood Assessment Guidance
- Incorporate reuse or upcycled timber products into your projects - start with small percentages and/or small-scale projects
- Collaborate with other stakeholders - contractors, designers, researchers
- Push for incentives to increase policy and legislation for salvaging and repurposing
- Have early conversations with stakeholders, in particular with demolition contractors

* Timber in construction roadmap 2025
The UK government committed to a Circular Economy Taskforce

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What's next?

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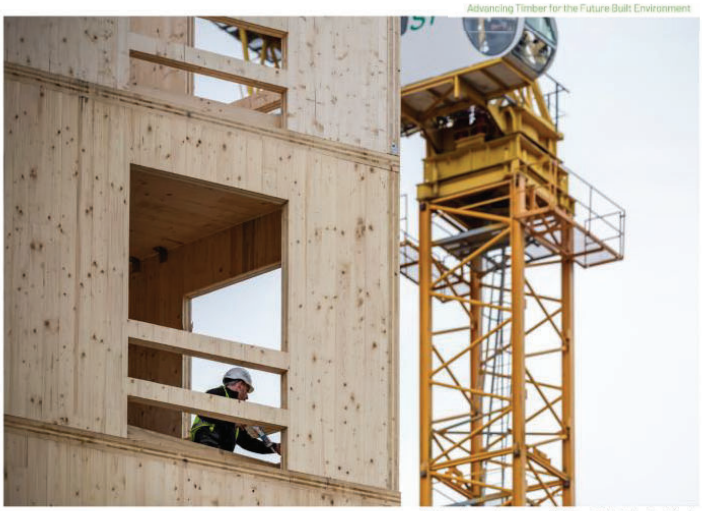
Future work

- Interviews with reclamation yards, timber merchants and contractors working in the residential sector
- Pilot study to undertake reclamation and reuse or upcycling of structural timber
- Investigate grading methods and certifications for reclaimed timber to enable reuse
- Develop robust guidelines for the reuse of reclaimed timber
- Life-cycle assessments to better understand the carbon impact of reusing and upcycling timber throughout the material lifetime



Dalston Lane. Image credit Waugh Thistleton Architects

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WOODCIRCLES

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woodcircles

Integrated, circular, and digitally supported sustainable solutions for waste minimization and carbon capture in buildings and the construction sector - funded by EU Horizon

WOODCIRCLES concept. Image credit Waugh Thistleton Architects

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WOODCIRCLES solutions (1)

- Upcycling of wood construction waste destined for incineration to new construction products
- Developing digital tools to map the materials available in the Urban Forest, meaning wood from existing buildings, constructions, and furniture
- Developing two new value chains for recycled wood: engineered wood products and insulation
- Prototyping and demonstrating an 'Urban Sawmill' facility to convert low-value, inhomogeneous wood construction waste into standardised, value-added products
- Designing a wood-based building system optimised for disassembly to enabling effecient re-use and recycling of wood construction materials in the future
- Producing a pilot demonstration building that will tour three European cities (Rotterdam, Tartu, and Turin)

woodcircles

The University of Cambridge is primarily contributing to the Material Stock and Flow Analysis of wood materials at European and local levels with the partner cities of Tartu, Turin and Rotterdam, and on the Sustainability Assessment of the proposed solutions - e.g. engineered wood products and insulation products manufactured using reclaimed wood.

1. WOODCIRCLES. https://woodcircles.eu/project/

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