Bontnewydd: Sustainable School Project

The Bontnewydd Project is lead by: Cyngor Gwynedd

Presented today by project collaborator:
Dr Diana Waldron, Woodknowledge Wales

15/07/2025 – ASBP Webinar: Reusing Timber in Construction

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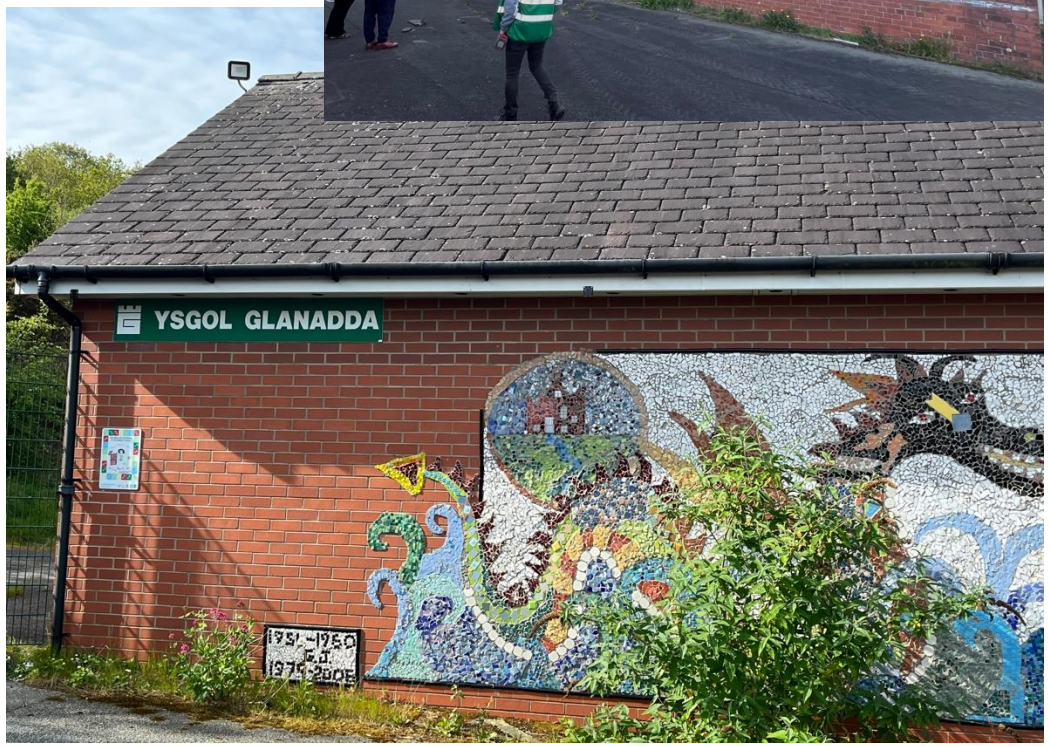
ASBP The Alliance for Sustainable Building Products

Bontnewydd: Sustainable School Project

Save the life of our buildings and materials = save the planet!

Ysgol Bontnewydd

Ysgol Glanadda



Bontnewydd Project
“Bring our buildings and materials back to life”

- Through this project, Gwynedd Council, set out to create and develop a network of willing partners to bring this Circular Economy project to life.
- Part of the **Sustainable Schools’ Challenge**.

Llywodraeth Cymru
Welsh Government

Her Ysgolion Cynaliadwy
Rhan o Raglen Cymunedau Dysgu Cynaliadwy
Sustainable Schools **Challenge**
Part of the Sustainable Communities for Learning Programme

CYNGOR GWYNEDD

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- **Two schools** as “**material banks**” or “**donor buildings**”:

  1) Ysgol Bontnewydd (1970s School) & **2) Ysgol Glanadda** (Victorian ilding, Late 1800s)

Bontnewydd Project
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- **Two schools** as “**material banks**” or “**donor buildings**”:

  1) Ysgol Bontnewydd (1970s School) & **2) Ysgol Glanadda** (Victorian
- One local former school site to resolve the issue of **material storage.**
- **One community pushing together towards the same goal:**

To preserve the life of our building materials, build high-quality schools and contribute to the circular economy of North Wales

Bontnewydd Project
“Bring our buildings and materials back to life”

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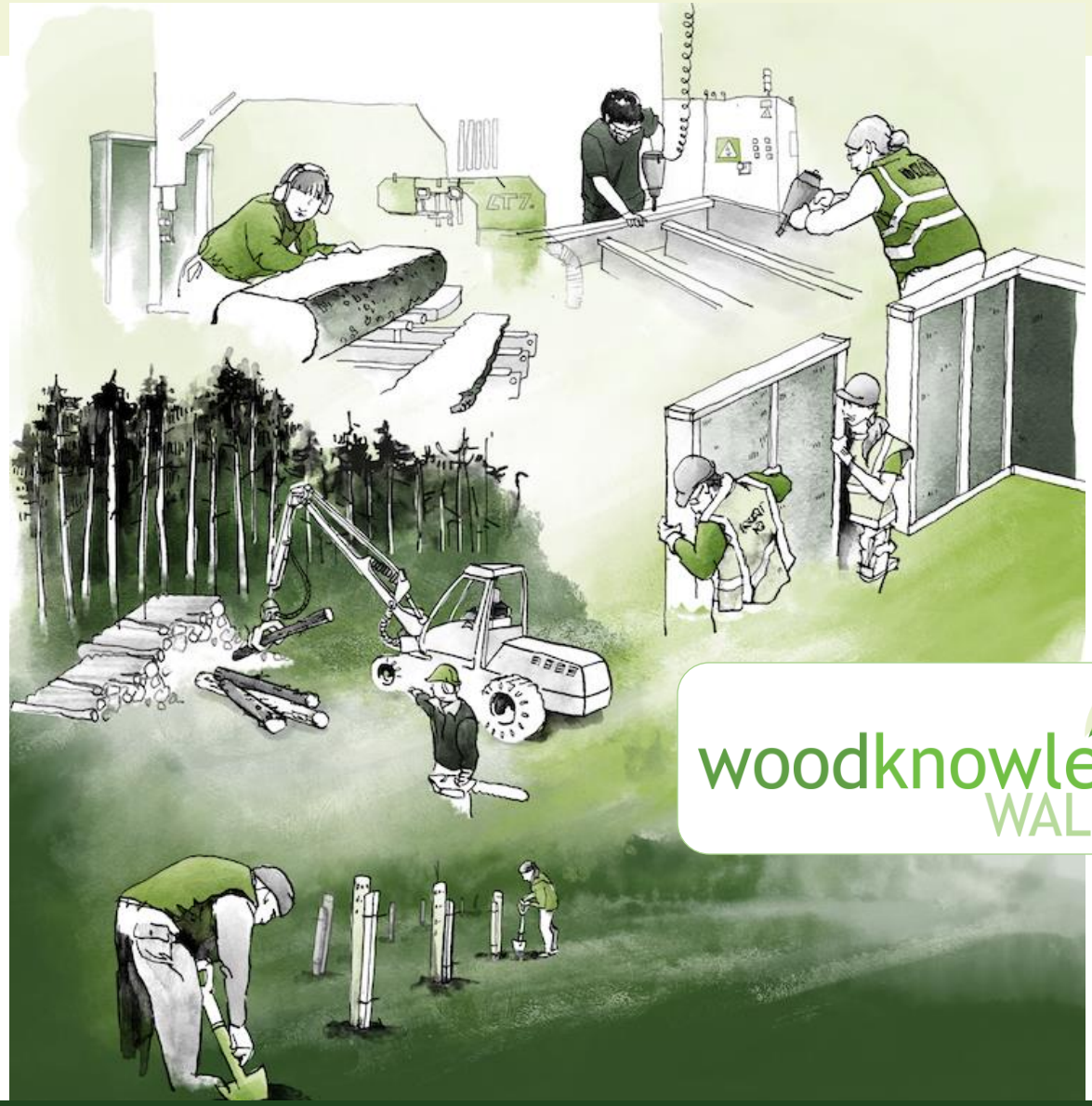
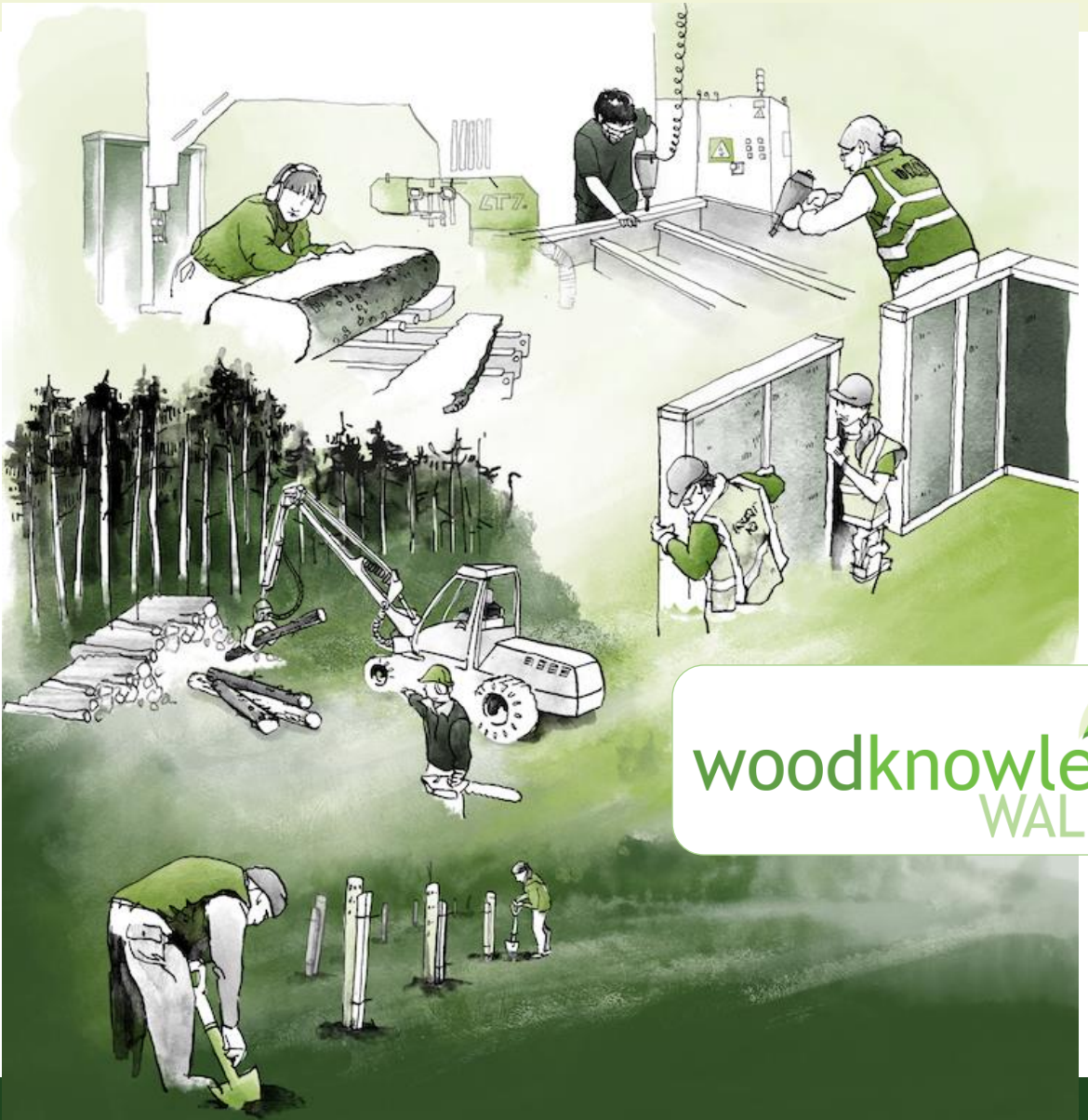
Bontnewydd Project

Where to find the “woody” experts in Wales?

Collaboration with Woodknowledge Wales



Collaboration with Woodknowledge Wales



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New Welsh Storybook Launched at WoodBUILD25: 'Sbriwsen Sitka – y Goeden Bren Ryfeddol'

With thanks to our generous sponsors for supporting this project

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Timber and Decarbonising Wales

Unlocking climate, economic and social value through afforestation, sustainable forest management and circular wood use

Read More

Using Wood in Construction as a significant Greenhouse Gas Removal Mechanism

A report summarising Home-Grown Homes research undertaken by Woodknowledge Wales, the BioComposites Centre and the ASBP that seeks to redefine the role of timber and other biogenic materials in construction

Read More

Welsh timber in action: Eight case studies showcasing a better way to build

Eight case studies showcase how Welsh timber and innovation are delivering sustainable, scalable solutions for housing, manufacturing and forestry in support of national strategy A [...]

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New Tool Empowers Early Design Decisions to Cut Embodied Carbon in Welsh Housing

Discover a free new tool to help housing professionals assess and reduce upfront embodied carbon during the earliest stages of low-rise housing design

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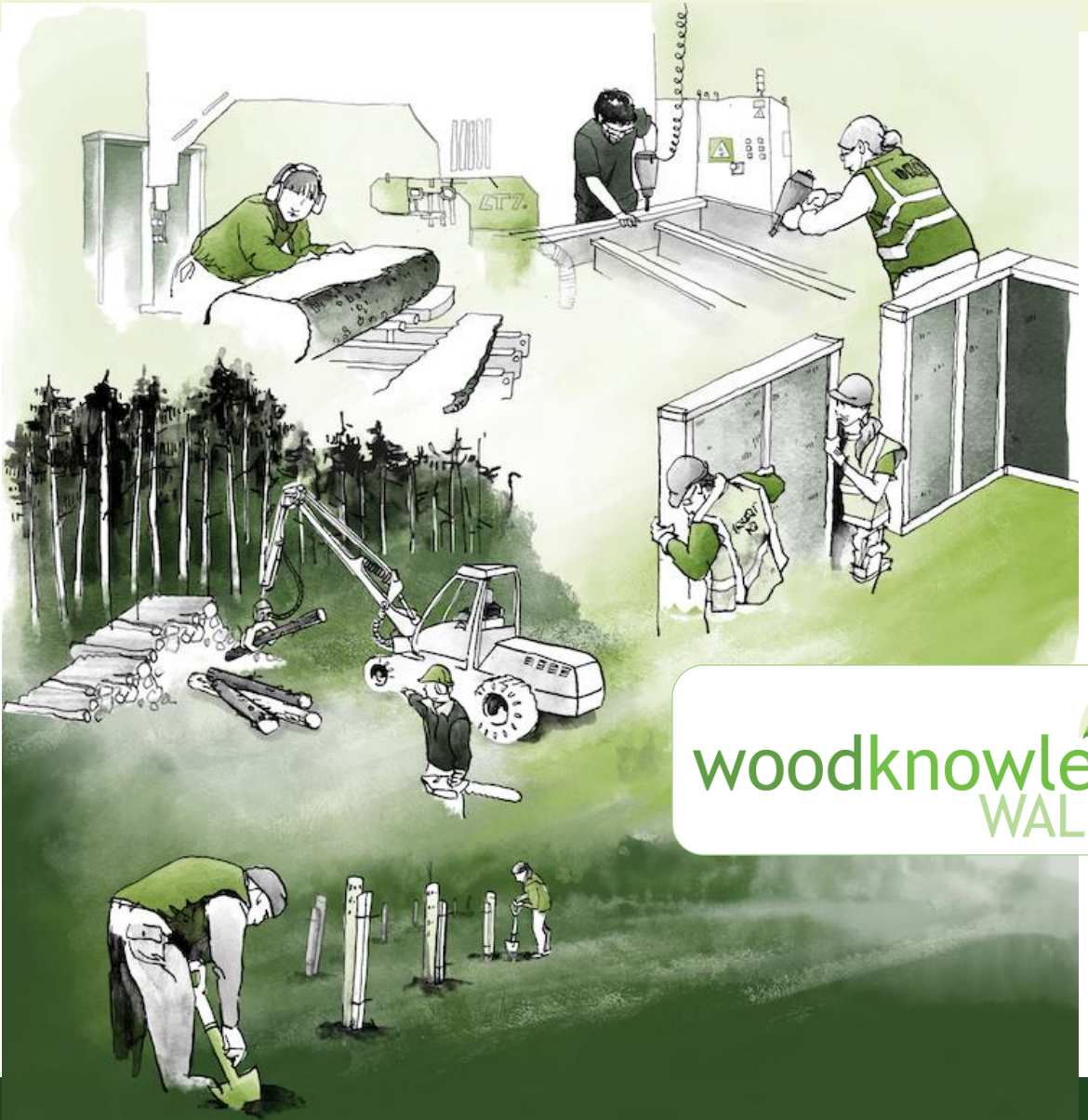

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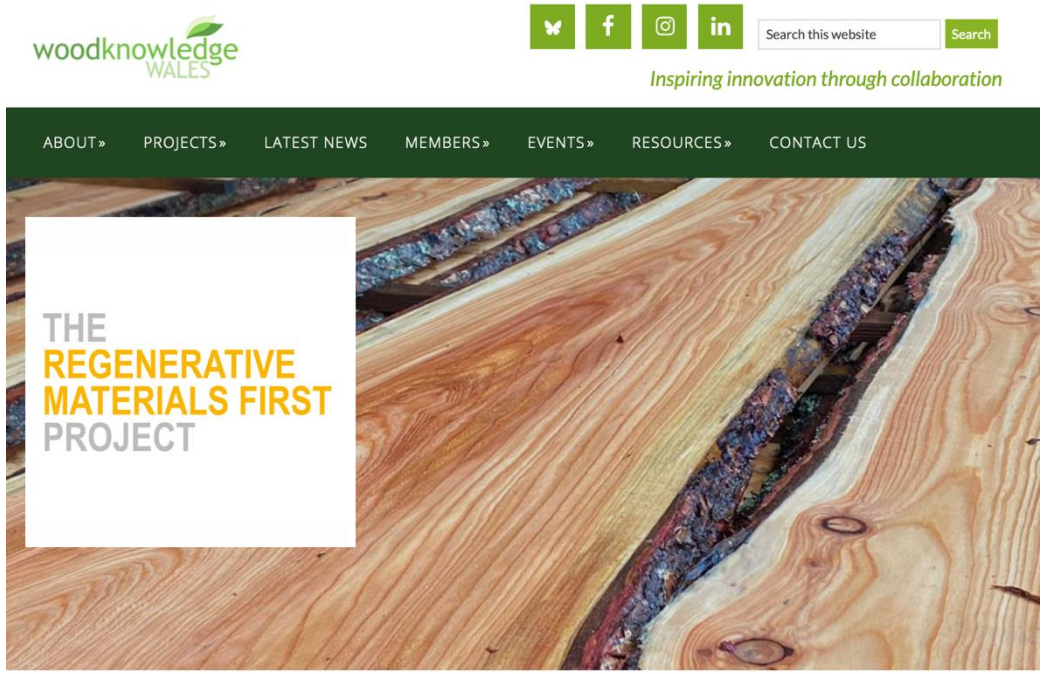
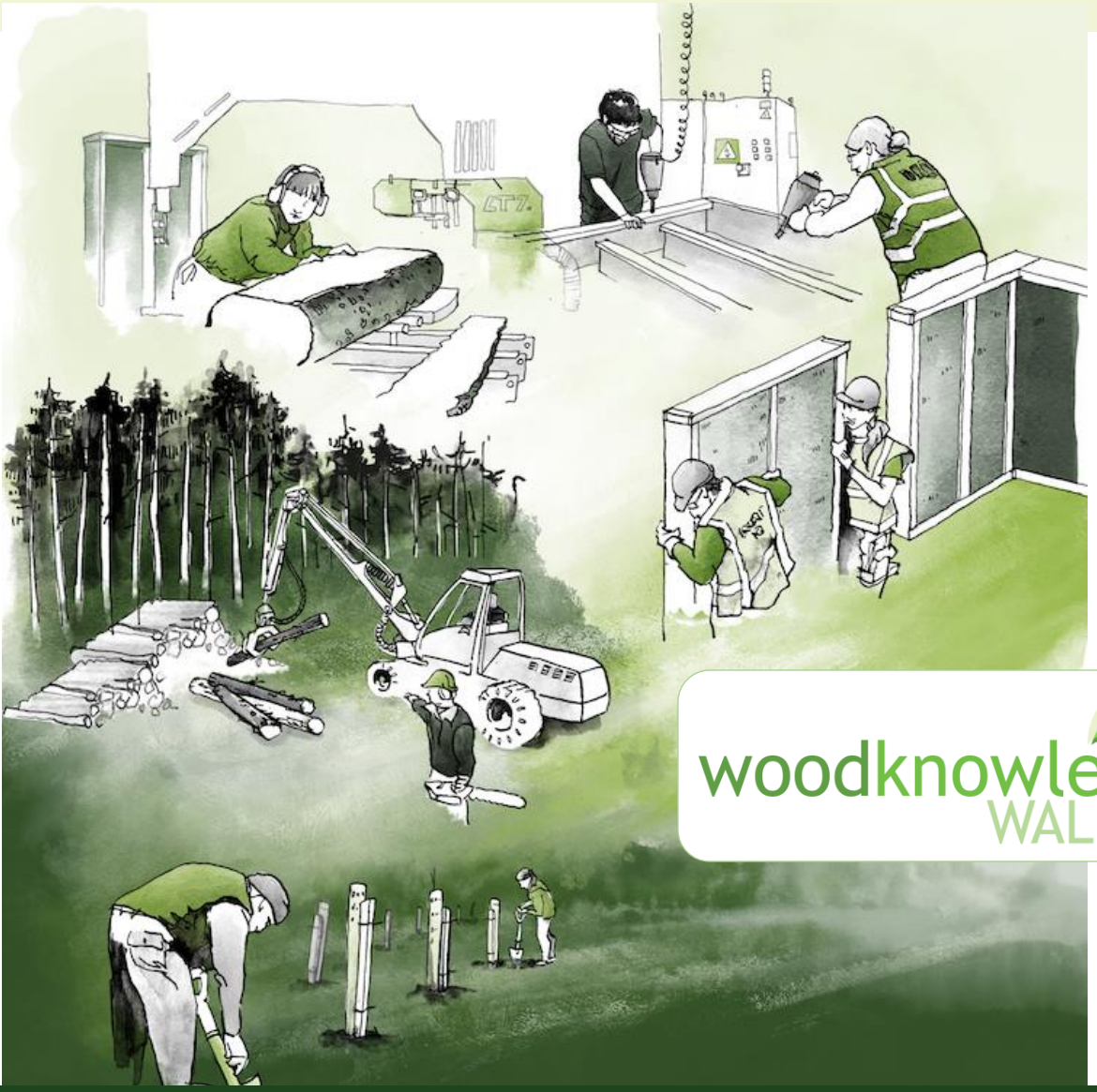


A transformational hub for innovators in construction

Regenerative materials are bio-based materials such as timber, straw or hemp, and/or reclaimed or recycled building materials that are produced and used in ways that have a positive impact on the natural environment and society.Their responsible choice and application can help restore natural resources, enhance biodiversity and wellbeing, and contribute positively to the local economy.

Collaboration with Woodknowledge Wales



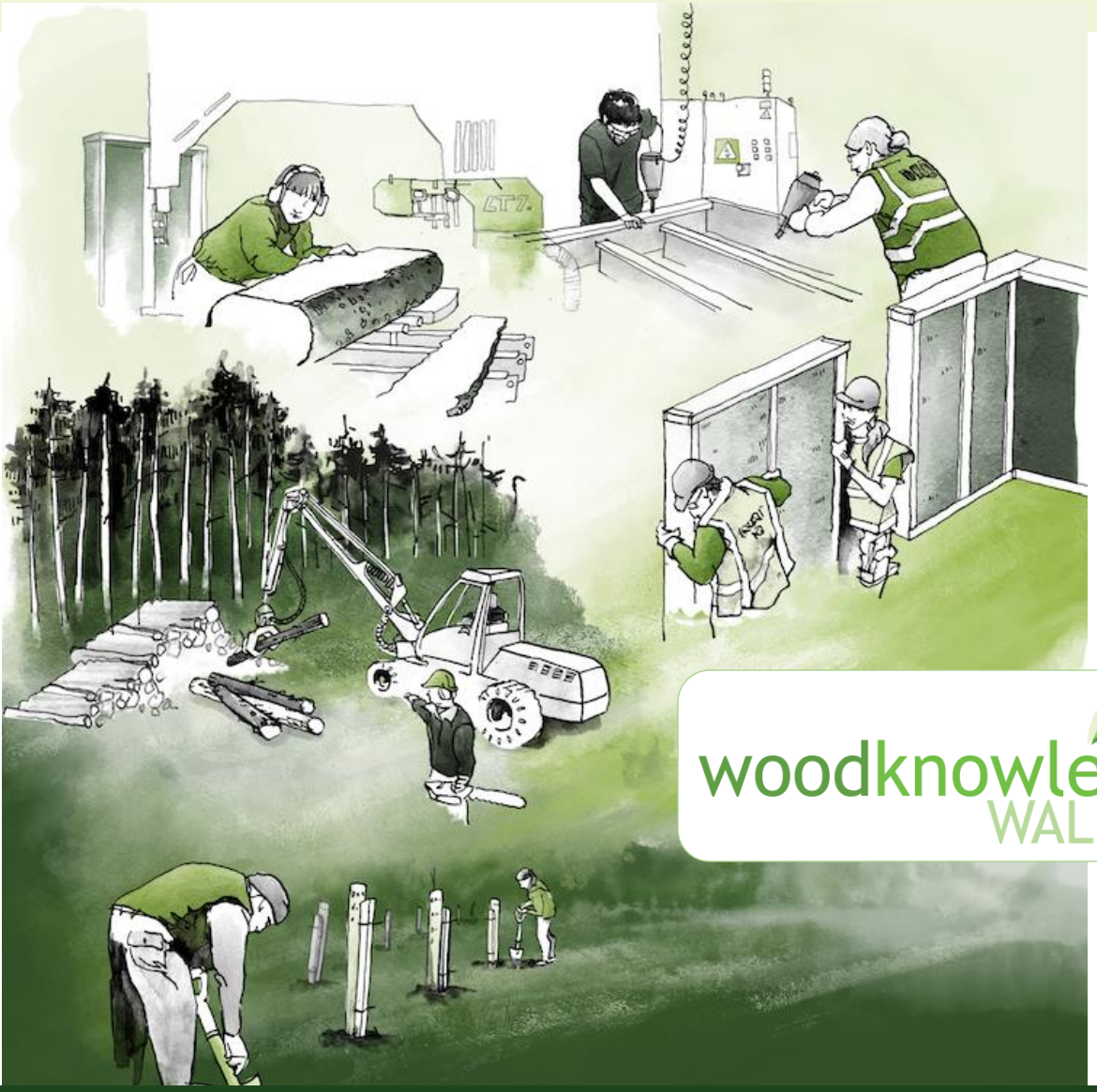
At Woodknowledge Wales we consistently work on bringing together the timber sectors (and beyond) to support a thriving sustainable future for people and planet

FORESTRY

MANUFACTURING

CONSTRUCTION

Introducing Woodknowledge Wales



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FORESTRY

MANUFACTURING

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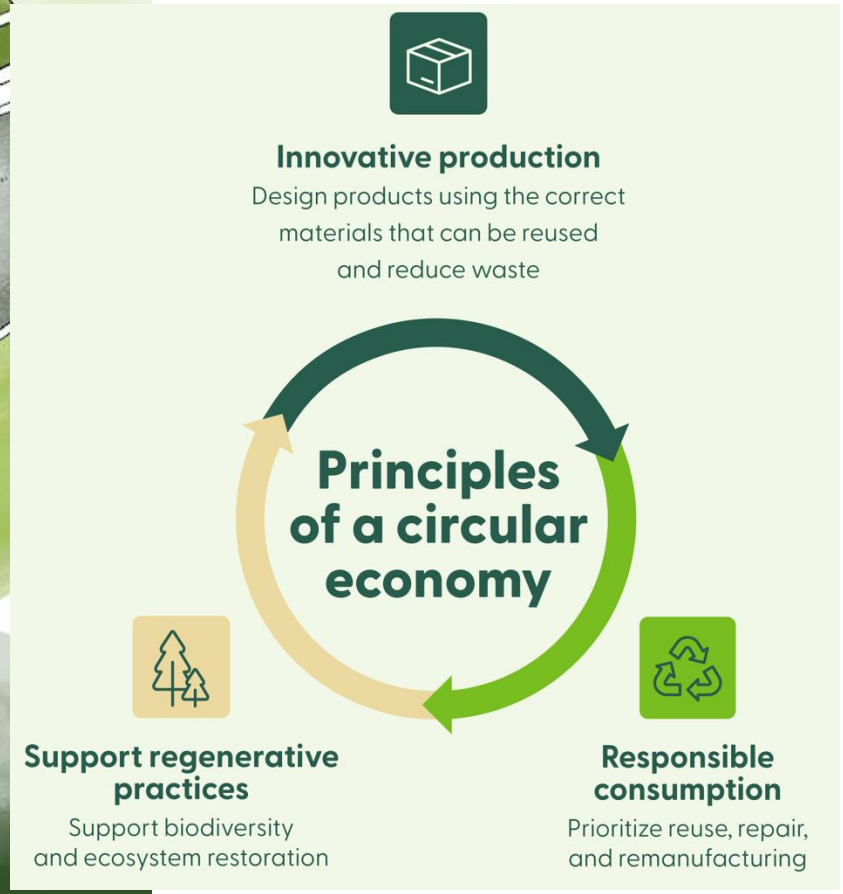
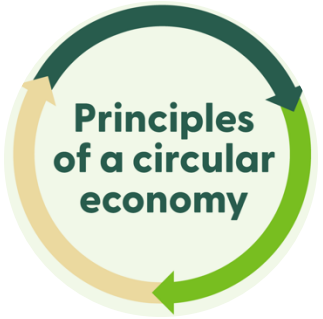
Principles of a circular economy

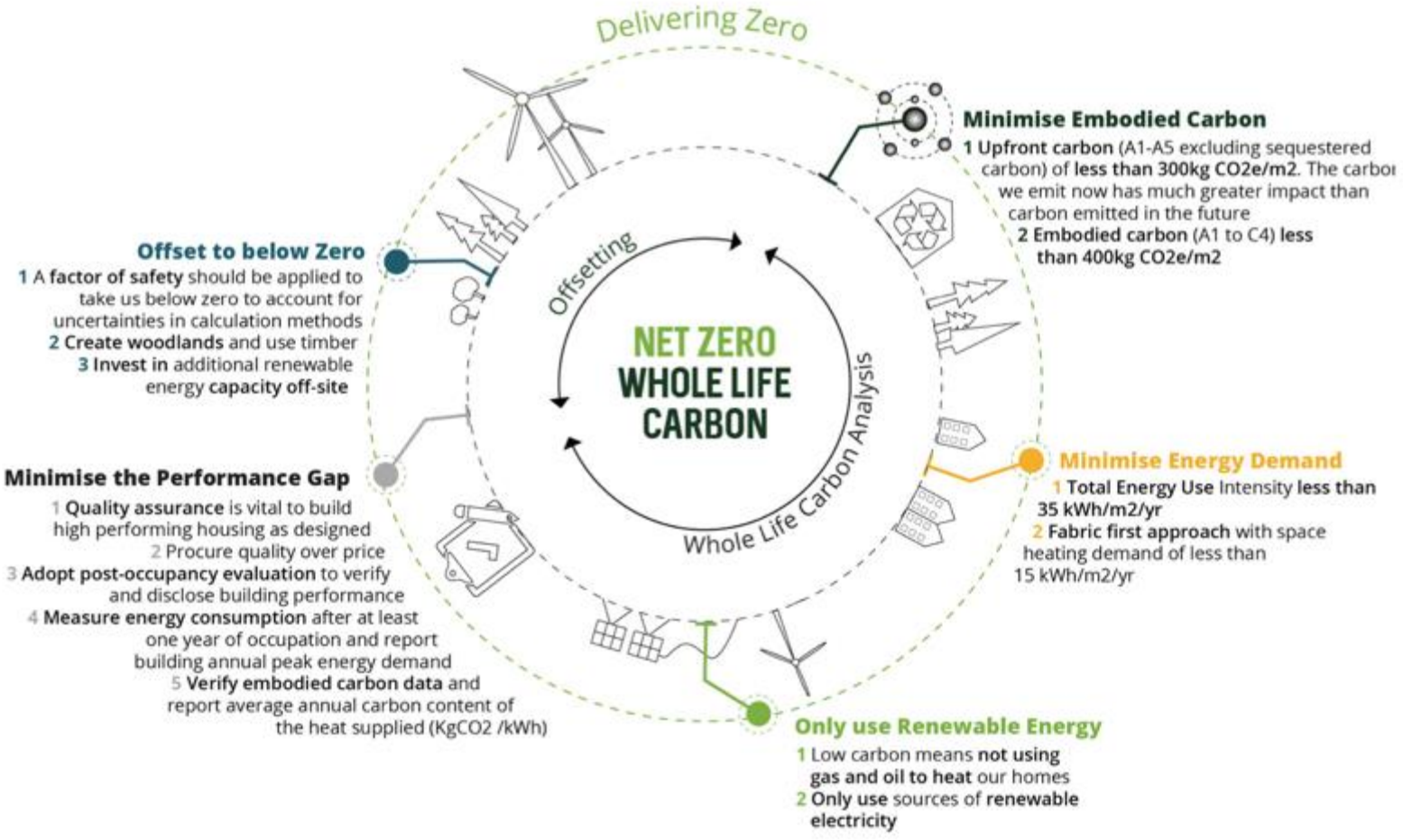
Introducing Woodknowledge Wales

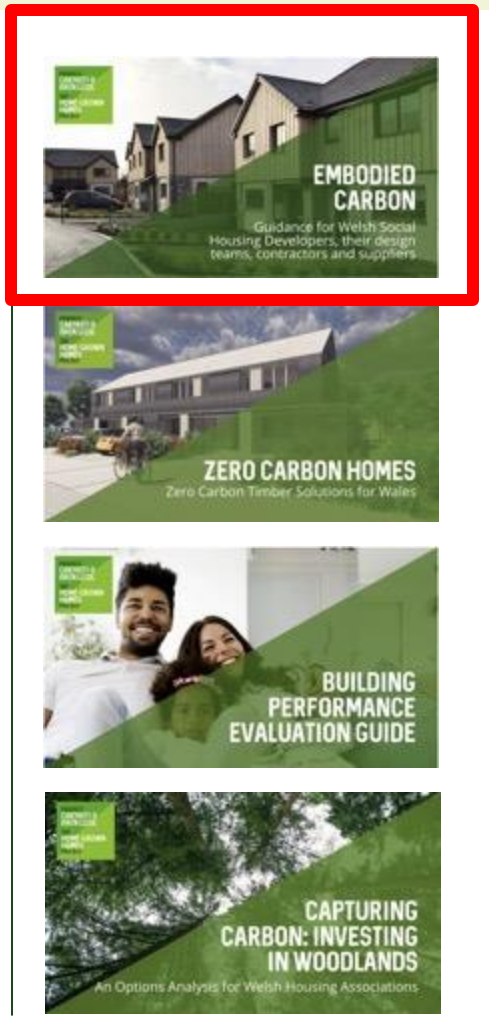


Source: Forest Stewardship Council® (FSC®)



Home-Grown Homes Project
Delivering Net Zero Carbon Homes





Embodied Carbon Guidance

The importance of considering Embodied Carbon as early as possible

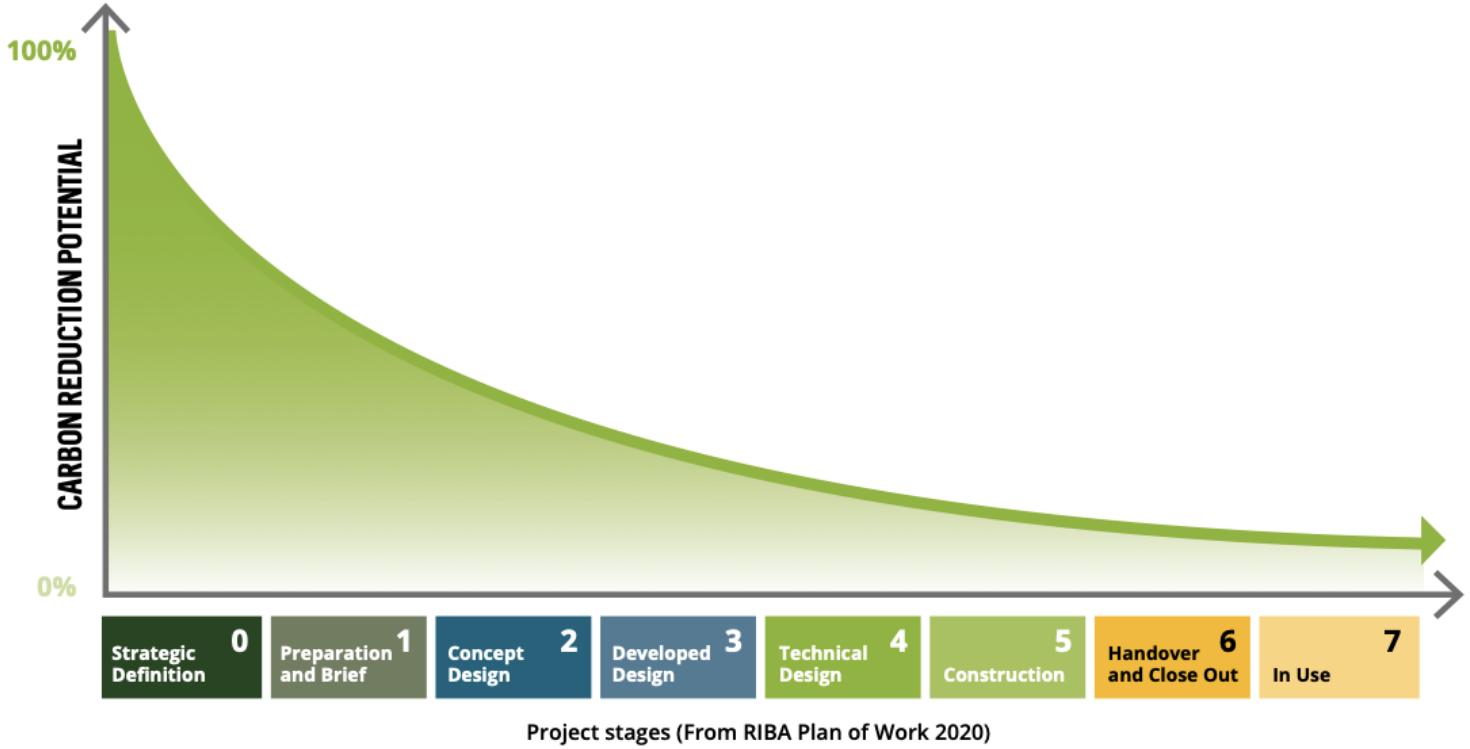


Figure 8
How the ability to influence Embodied Carbon decreases as the project progresses

Embodied Carbon Guidance

WkW developed targets and guidance on how to achieve these targes for: Upfront Carbon and Energy Use Intensity (EUI)

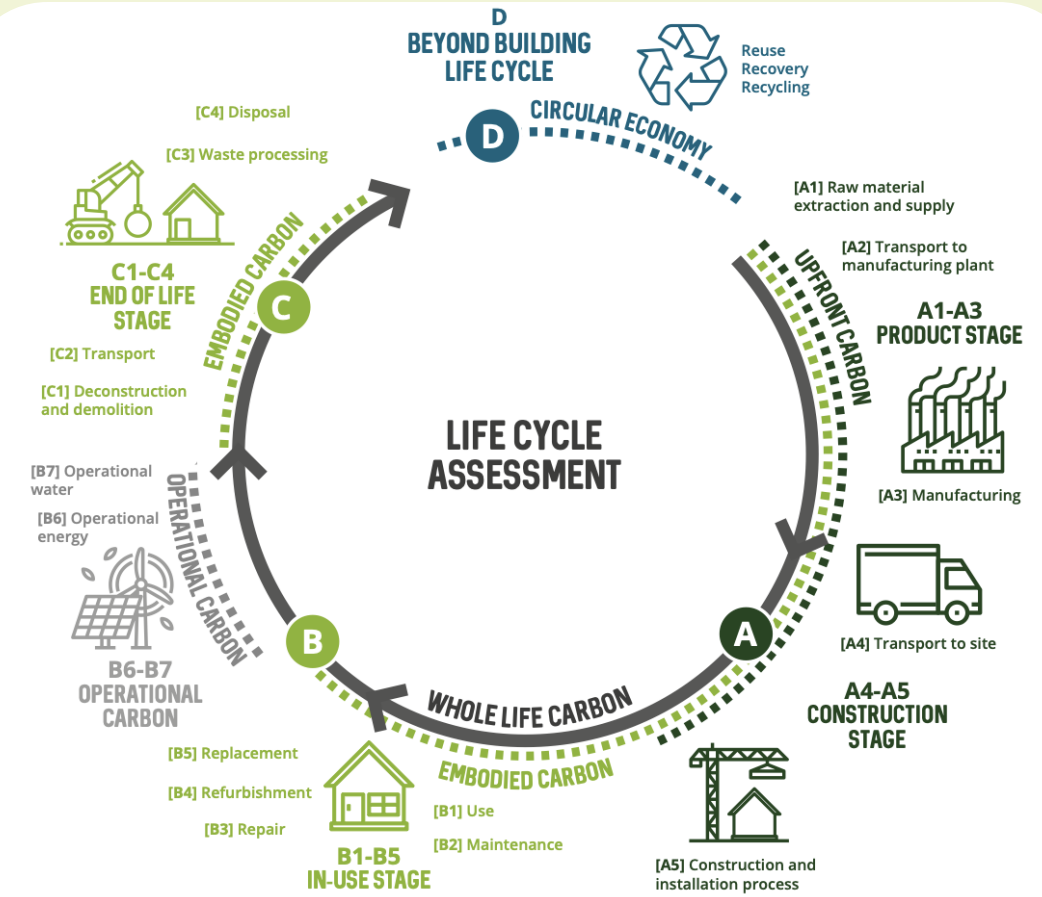


Figure 1
Embodied Carbon Relationships

Woodknowledge WalesTargets	Low-Rise Housing	Medium and High-Rise Housing
Upfront Carbon	300 kg CO_2e/m²	450 kg CO_2e/m²
Embodied Carbon	400 kg CO_2e/m²	750 kg CO_2e/m²
Energy Use Intensity for Space Heating	15 kWh/m² per year	
Total Energy Use Intensity	35 kWh/m² per year	

Bontnewydd Project
Circular Design Principles

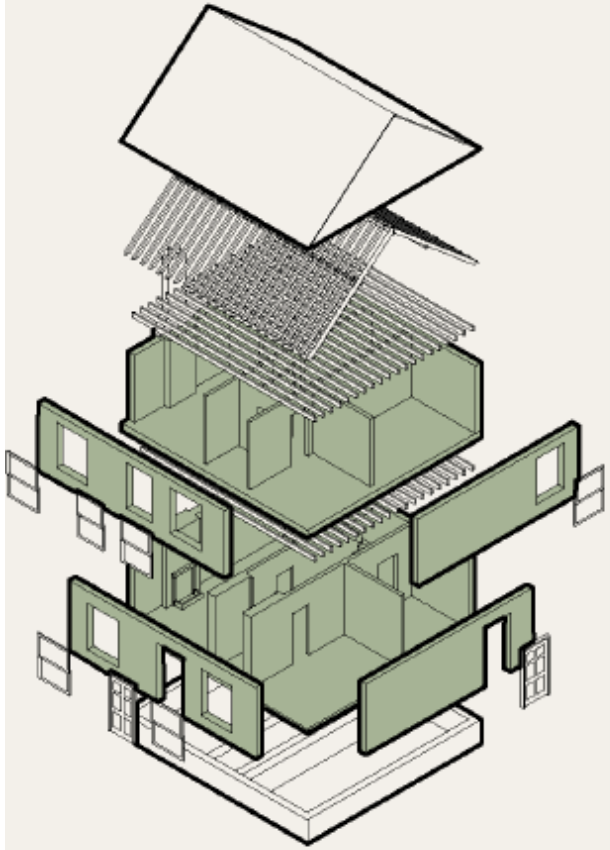
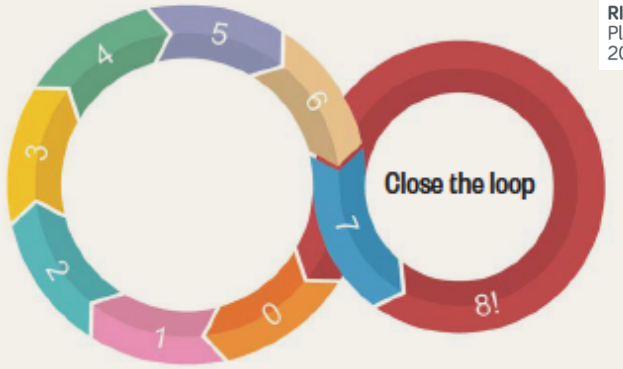
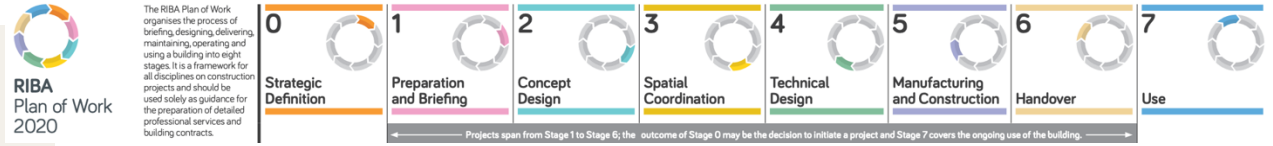


Diagram of a notional building as a Material Bank for future buildings.



Adjustment of RIBA Stages to 'Close the Loop' with Stage 8



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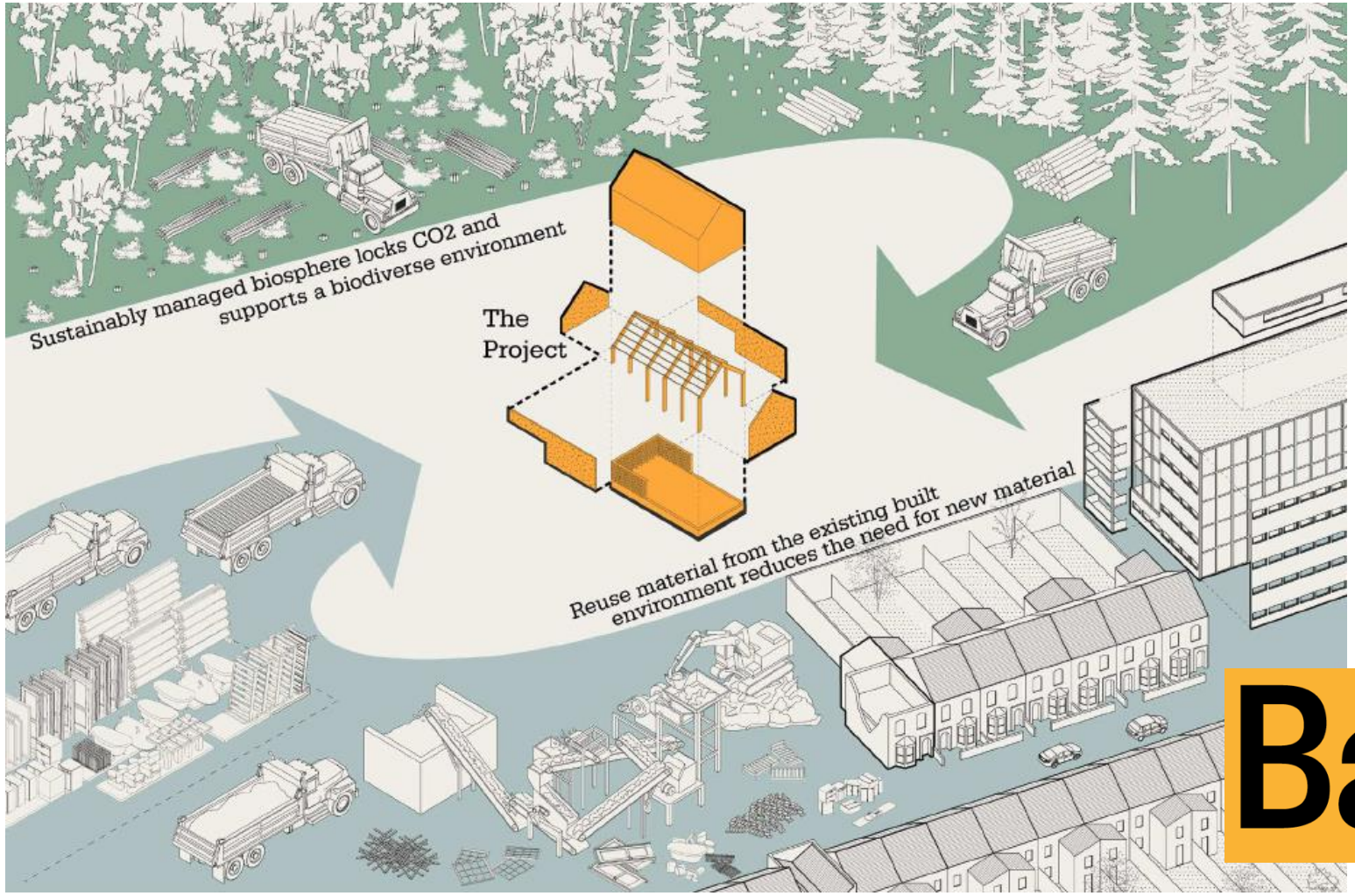
Bontnewydd Project

The reuse potential: Deconstruction vs Demolition



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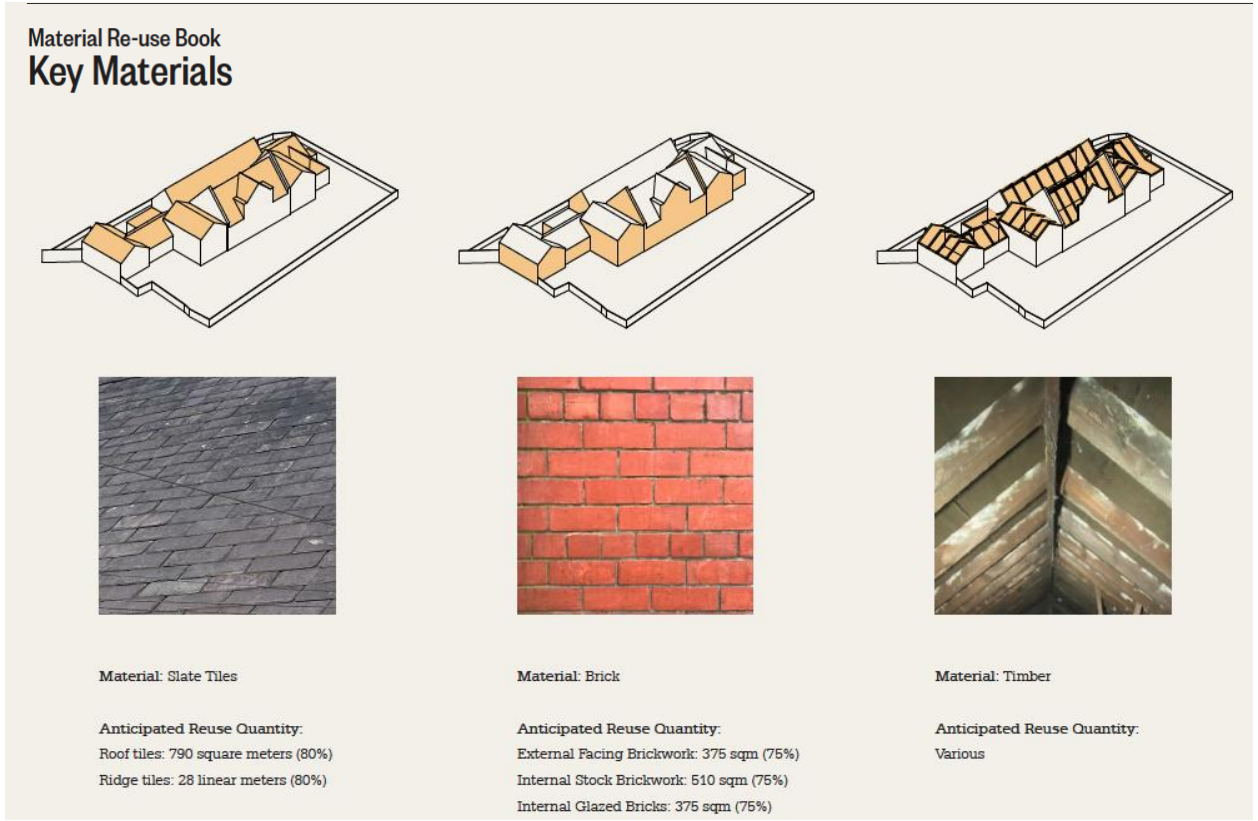
Bontnewydd Project
Bringing together a broad team of experts

- Material Audit before and after deconstruction (**Frame Four**)
- Circular Economy consultants (**Baker Brown**), development of a “Material re-use book


Material Re-use Book
Key Materials

Material: Slate Tiles

Anticipated Reuse Quantity:
Roof tiles: 790 square meters (80%)
Ridge tiles: 28 linear meters (80%)

Material: Brick

Anticipated Reuse Quantity:
External Facing Brickwork: 375 sqm (75%)
Internal Stock Brickwork: 510 sqm (75%)
Internal Glazed Bricks: 375 sqm (75%)

Material: Timber

Anticipated Reuse Quantity:
Various


BakerBrown

Bontnewydd School
Material Re-use Book
Glanadda & Bontnewydd

Site Location
Bontnewydd School

Date: July 2024

Revision C

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Reclaimed materials: Bank of materials

Her Ysgolion Cynaliadwy
Rhan o Raglen Cymunedau Dysgu Cynaliadwy
Sustainable Schools Challenge
Part of the Sustainable Communities for Learning Programme

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Reclaimed materials: Bank of materials

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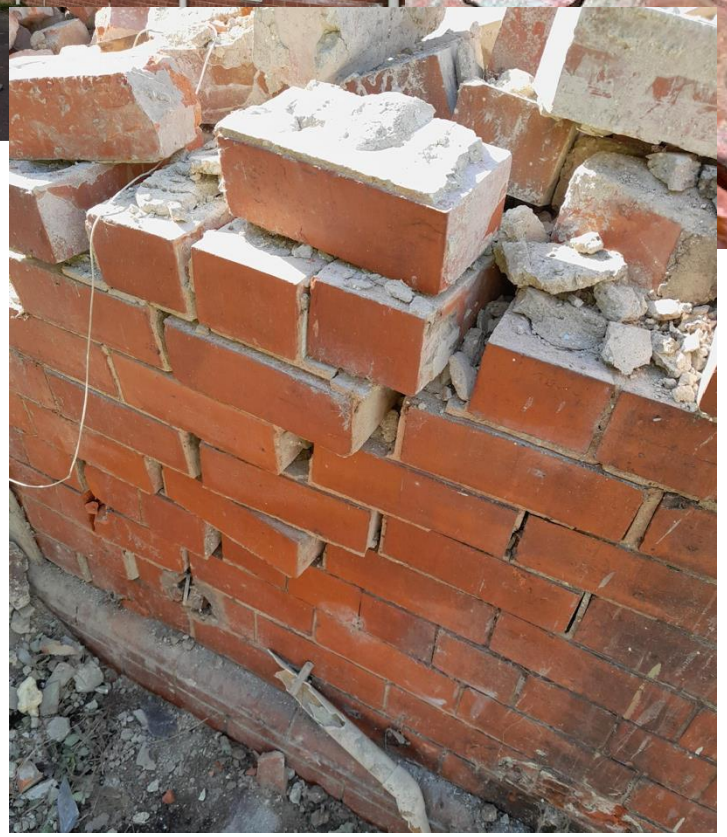
“Donor Buildings” and site location

Presenting a wide range of challenges:

Deconstruction:

Different types of bricks and mortar (Victorian time: lime-based mortar, 1970s: cement-based mortar)



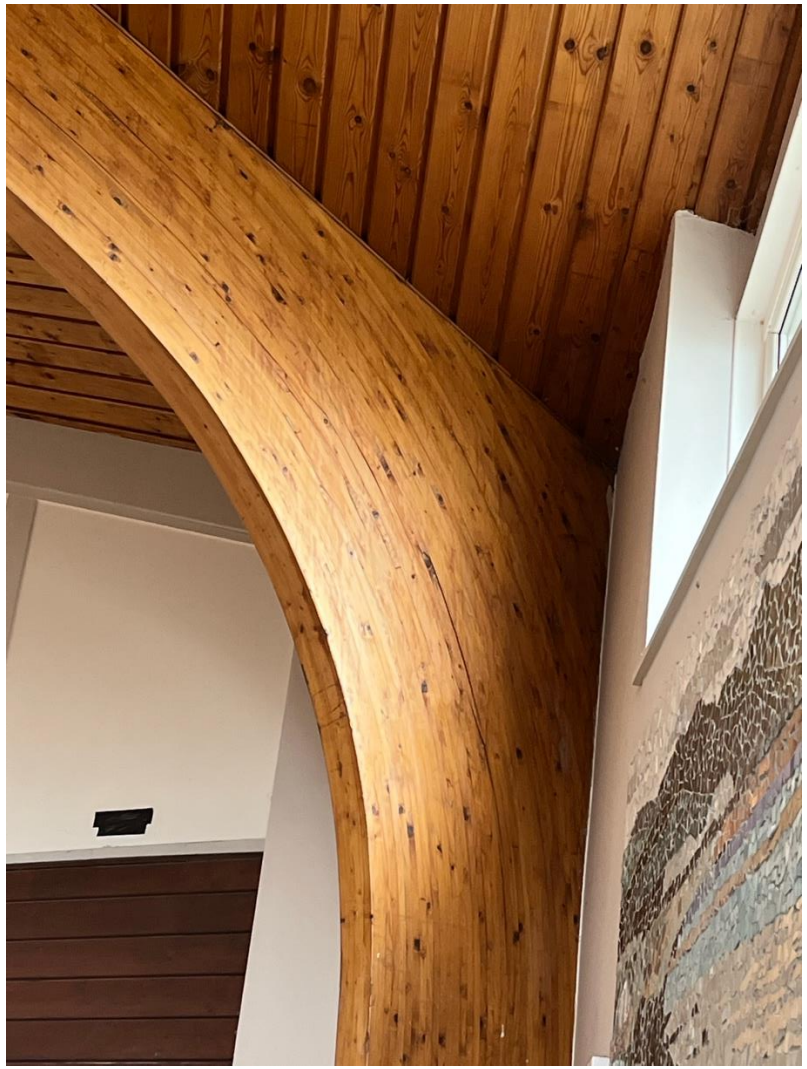
Bontnewydd Project
Challenges

Transport of large pieces

Previous treatment or painting of timber elements

Metal fixings/Nails

Bontnewydd Project
Challenges



Challenges around regrading glulam, and other engineered timber.

Reclaiming parquet flooring

Etc

Bontnewydd Project
Challenges

Storage

Protecting vulnerable material from the element

Re-grading

Warrantees

Insurance

Etc...

Trip to deconstruction site: Bontnewydd Project.

But of course we like challenges and searching for solutions

Bontnewydd Project
Site visits

Post- deconstruction

Pre- deconstruction

Bontnewydd Project
Challenges

Post- deconstruction

Pre- deconstruction

Foundations and Suspended Timber Floors
opportunities to explore:

We put together a group of experts to discuss potential viable options with Bontnewydd's design team:

- Potential reuse of existing concrete slab and/or foundation
- Alternatively, concrete-free foundation scenarios
- Suspended timber floor options.
- Structural implication and Embodied Carbon impact of reusing reclaimed timber

JAE COTTERELL
Director Passivhaus Homes and PH15 Systems
Specialist Advisor

BETH WILLIAMS
Structural Engineer
Specialist Advisor
Momentum Engineering

KATHERINE ADAMS
Director Reusefully
Circular Economy
Specialist Advisor
ASBP

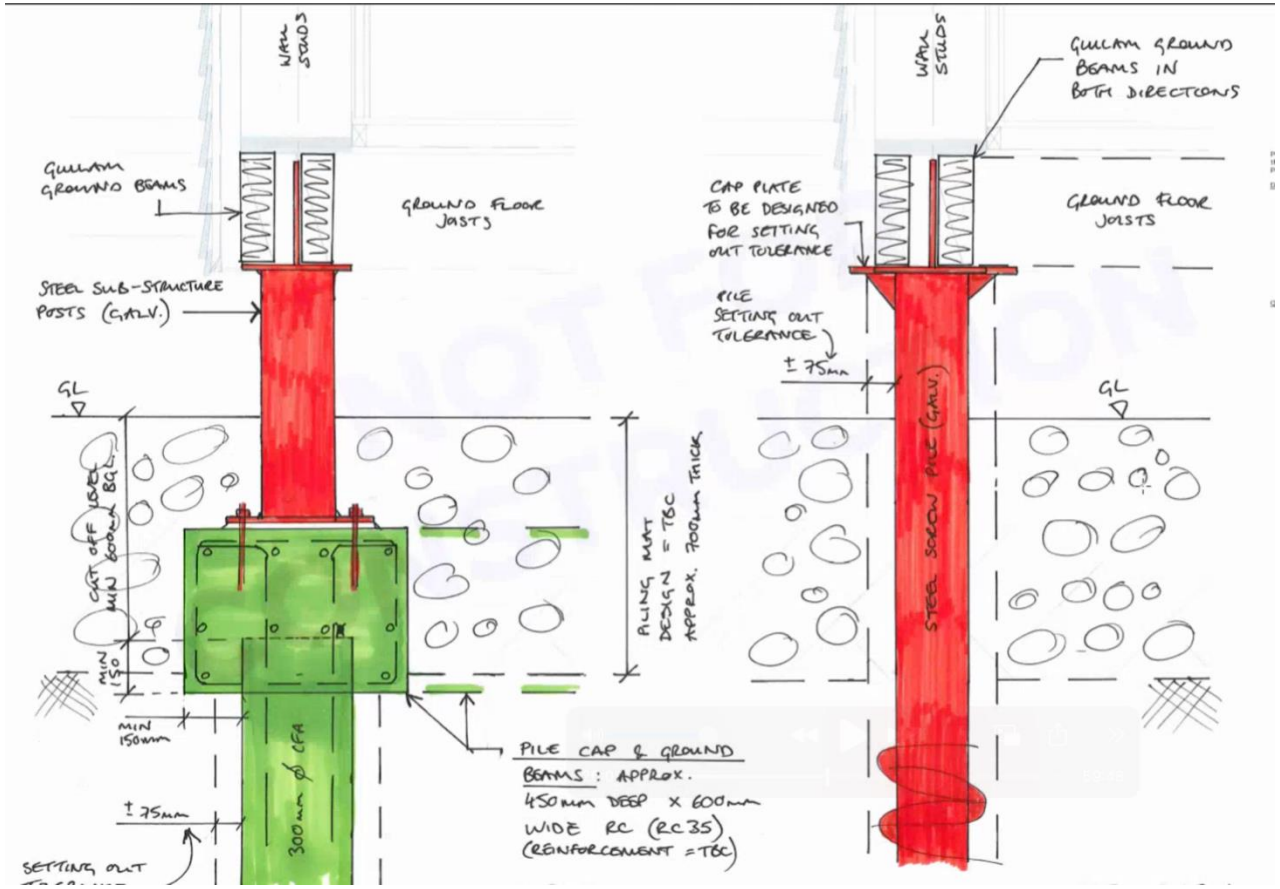
TOBY MACLEAN
Independent Specialist Advisor
Embodied Carbon Expert
Structural Engineer
Woodknowledge Wales

Bontnewydd Project
Discussing options of suspended timber floors

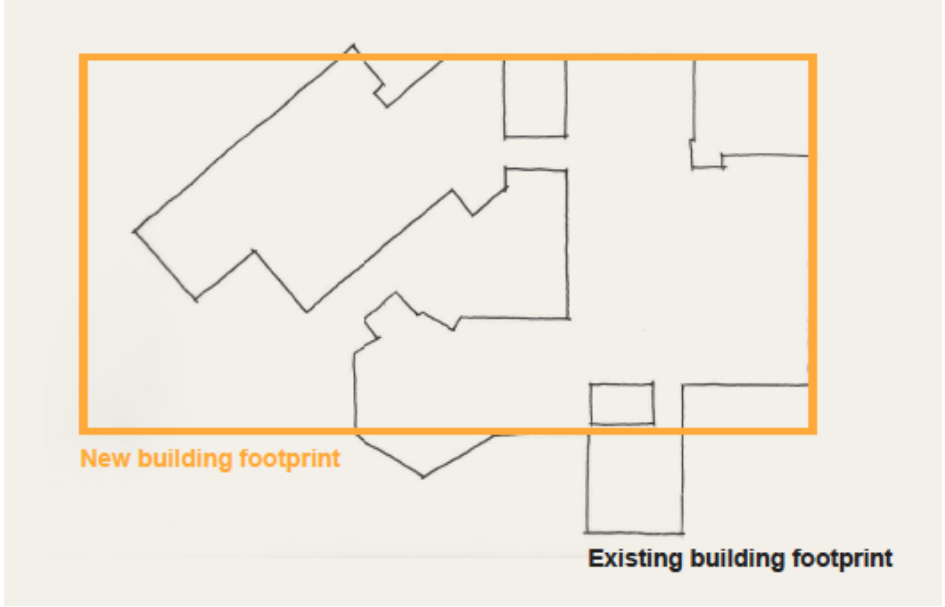
Example images. Credit: Jae Cotterell. PH15 Systems

Bontnewydd Project

Discussing options of concrete-free foundations/reuse foundation/slab



Example images. Credit: Beth Williams. Momentum Engineering.



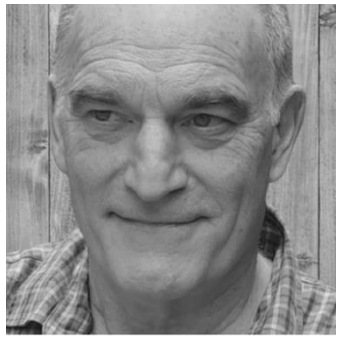
Images credit: Baker Brown. Material Re-use Book, Bontnewydd

Bontnewydd – Pushing the boundaries

WkW further support: Re-grading of timber and re-processing

Further areas of WkW's support in collaboration with Bontnewydd:

- Advice on the process of storage and regrading of reclaimed structural timber (samples for microscopic analysis, visual investigation pre- and post-deconstruction)
- Exploration of viable local routes to reprocess/refurbish the reclaimed timber elements
- Potential concrete-free foundations



PHIL O'LEARY
Director of Filros Timber Consultancy
Specialist Advisor
Forestry and Wood Wcience

DAINIS DAUKSTA
Specialist Advisor
Forestry and Wood Science
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Dr DIANA WALDRON
Built Environment Lead
Architectural Engineer
Sustainable Buildings Research
Woodknowledge Wales

JOHN SWEENY
Small Scale Sawmilling Advisor
Timber Processing Expert
Woodknowledge Wales

Reclaimed timber analysis:
Victorian timber (Detective work?)

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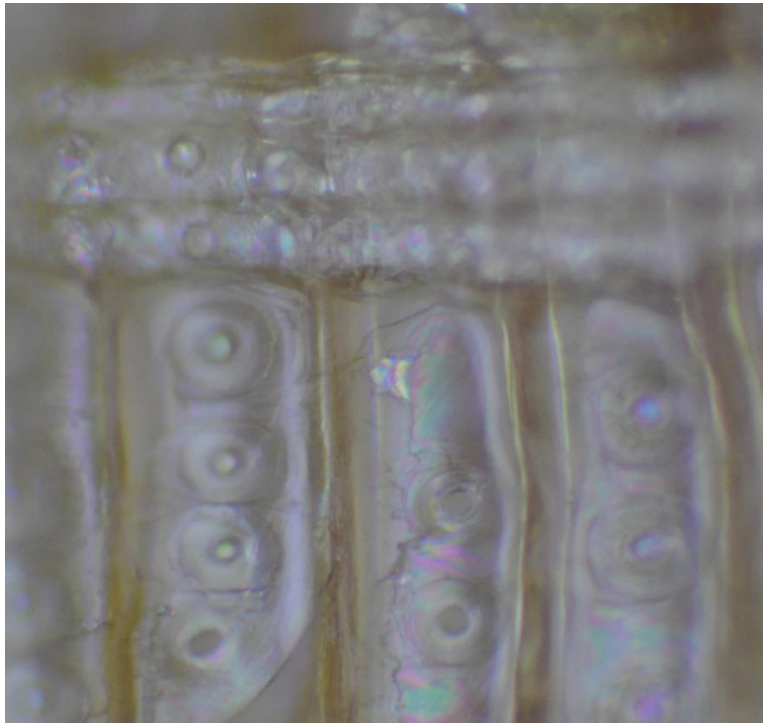
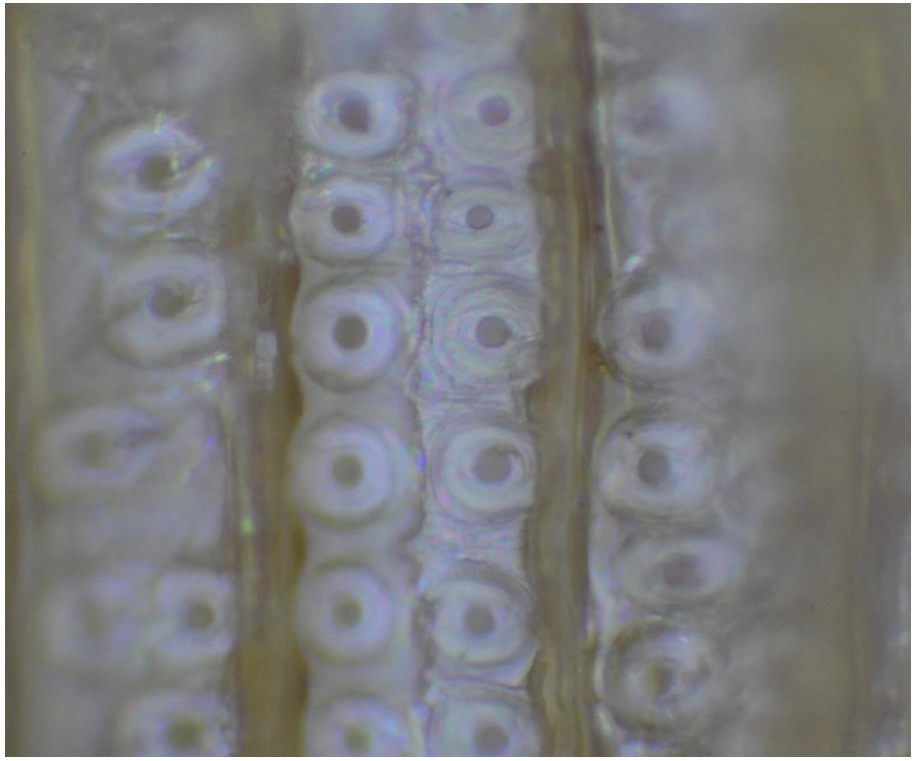
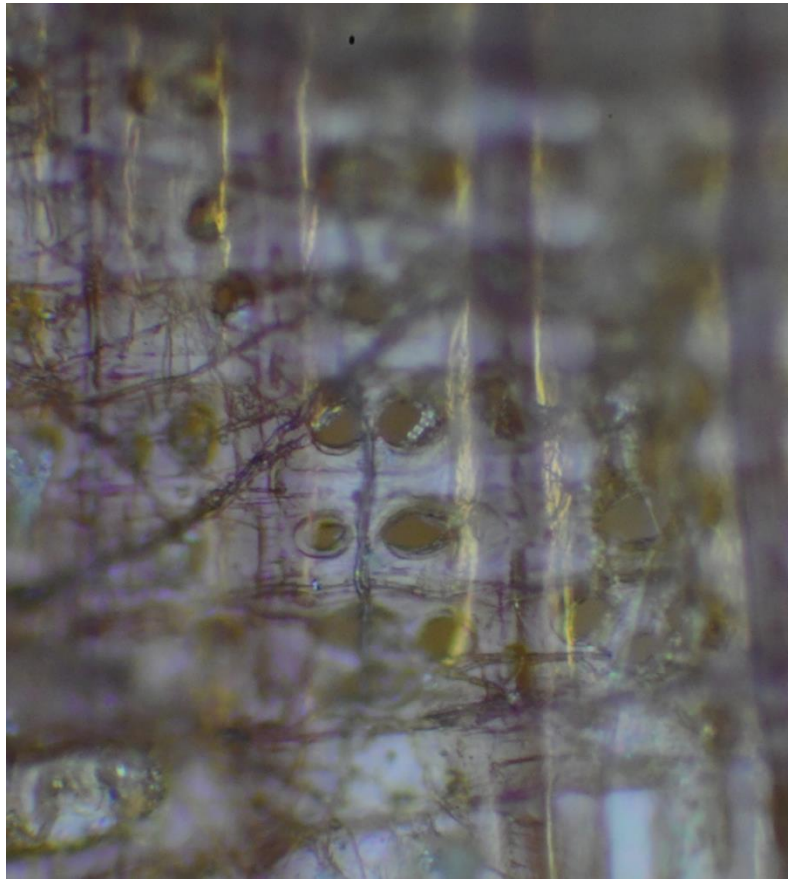
Re-grading: Microscopic analysis of samples taken from reclaimed material





These images (above and left) are most likely to be very slow grown Scots pine, Baltic/Russian origins from one of the Baltic ports.



Different type of timber.
Needs further investigation

Limitations & Constrains:

Source: Bontnewydd's Architectural Drawings.

- Time pressure is the "enemy" of efficient design and cost savings.
- Building design before material audit

Key learnings

- Energy inputs can negate the apparently benign process of recycling timber. Planning is KEY!
- If possible: Material Audit first! Design second (i.e. design with your available materials)
- Saving a slab will be a considerable cost saving (and embodied carbon!), but “time-pressure is usually the enemy of good and efficient design”
- Planning the reuse of existing foundation, need to take place at the early stages of the design of the building.
- It is worth exploring suspended timber floors options, but water table is critical.
- One great advantage with large section of recycled timber (if it has been stored correctly) is its low moisture content. Perhaps a USP because you can be reasonably sure that it won't move much again. It is a luxury to have large section timber that has been air dried over decades.
- Begs the question then why cut it into small pieces?

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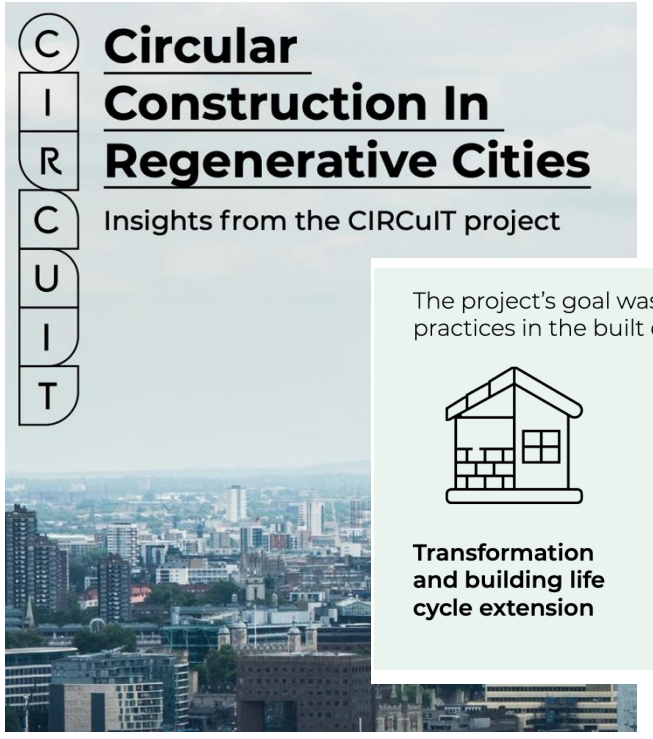
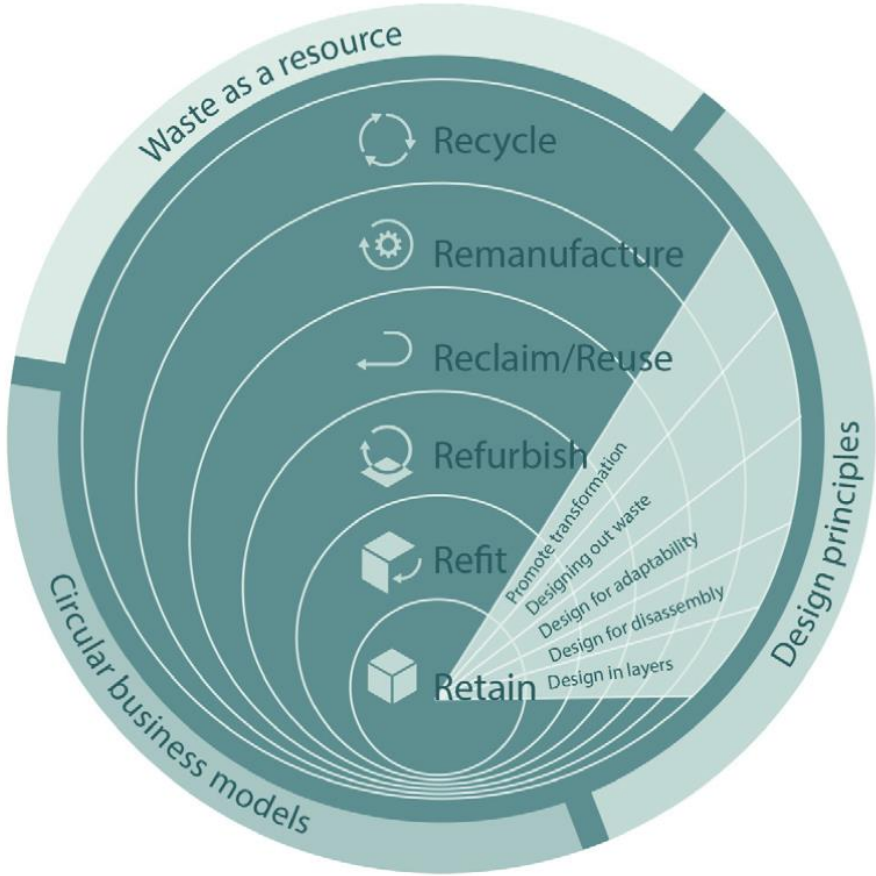
Collaborative projects:
Bontnewydd – Pushing the boundaries

- Other options to reuse timber
- Buckland Timber – e.g. Producing Glulam from reclaimed timber
- Upcycling waste timber project. Simple Works et al.



Buckland Timber
Glulam Design | Manufacture | Installation



Principles of circular construction
The Handbook to Building a Circular Economy, David Cheshire, AECOM, 2021

Source: Circuit Research and Simple Works Engineering

Thank You! Diolch yn fawr!

Any questions? Please get in touch

Dr Diana Waldron
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Woodknowledge Wales Team

"Going beyond wood, knowledge and Wales"