

# Home-grown Timber Markets and Opportunities

## Building from England's Woodlands

Forestry Commission's Timber in Construction Innovation Fund



Finbar Charleson,  
Architect & Research Lead  
dRMM Architects

# www.menti.com

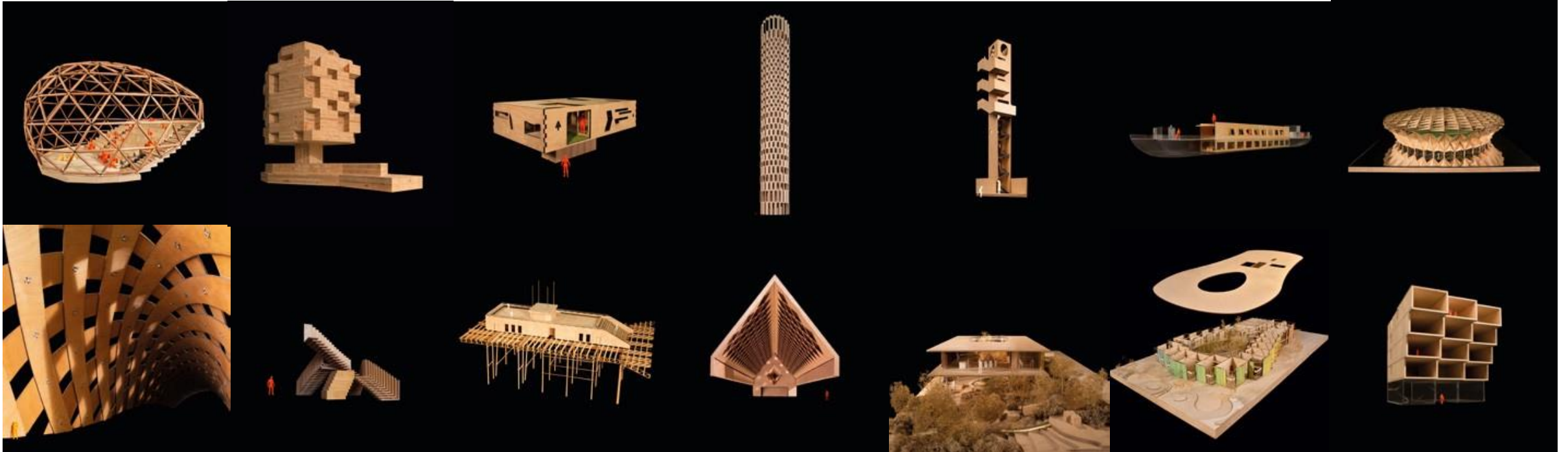
Enter the code to join

It's on the screen in front of you

**1726 0561**

Join

# 1 | 2 | 3 | 4 | 5



# 1 | 2 | 3 | 4 | 5



Kingsdale School



Rundeskogen



Naked House



MK40 Tower



Four Dwellings School



Endless Stair



Hastings Pier



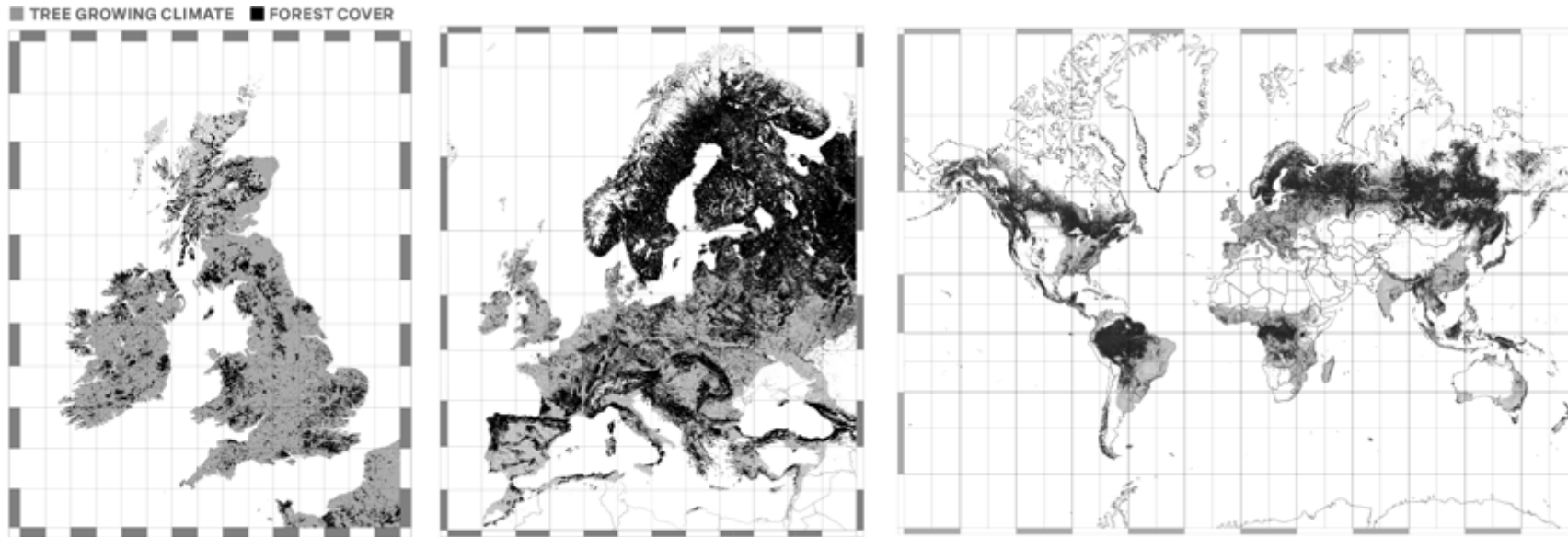
Maggie's Oldham



Wintringham Academy



Workstack



ACAN Tree Campaign (2020)



The Centre for Advanced Timber Technology (CATT), together with dRMM, ECOSystems Technologies and Edinburgh Napier University (ENU), are pleased to announce they have been awarded a £XXX grant from the Forestry Commission's Woods into Management Forestry Innovation Funds for research into potential new timber building products manufactured from homegrown timber.

The team will work together with project manager Built Environment - Smarter Transformation (BE-ST) to demonstrate the viability of a suite of construction products to create large-scale demand for building products manufactured from English timber. Building on dRMM's track record for pioneering CLT design, and their project partners' successful Transforming Timber project, the studio will explore the potential of dimensioned and engineered timber products over the three-year project.

The research will identify suitable species for use in construction and their relative strength grading, being conducted at the Centre for Wood Science and Technology (Edinburgh Napier University). It will enhance the limited existing data on the mechanical properties of wood from trees grown in England, thanks also to material provided by Pontrilas Merchants, local to CATT's new Hereford campus.

The research takes a particular in solutions compatible with MMC requirements, looking to generate a standardised kit of parts (wall, floor and roof solutions) that can be scaled and adopted to meet the needs of low-rise construction across England.

'This research represents a strategic convergence of England's forestry, manufacturing and construction industries to drive the increased adoption of English homegrown timber in construction.'

Robert Hairstans - NMITE / CATT

'By manufacturing a viable and scalable homegrown timber alternative to carbon-intensive concrete and steel, we seek to reduce the UK's reliance on imported products. As homegrown resources are integrated into localised manufacturing facilities and supply chains, they travel fewer carbon miles and further reduce the carbon footprint of construction.'

Kat Scott - dRMM Architects

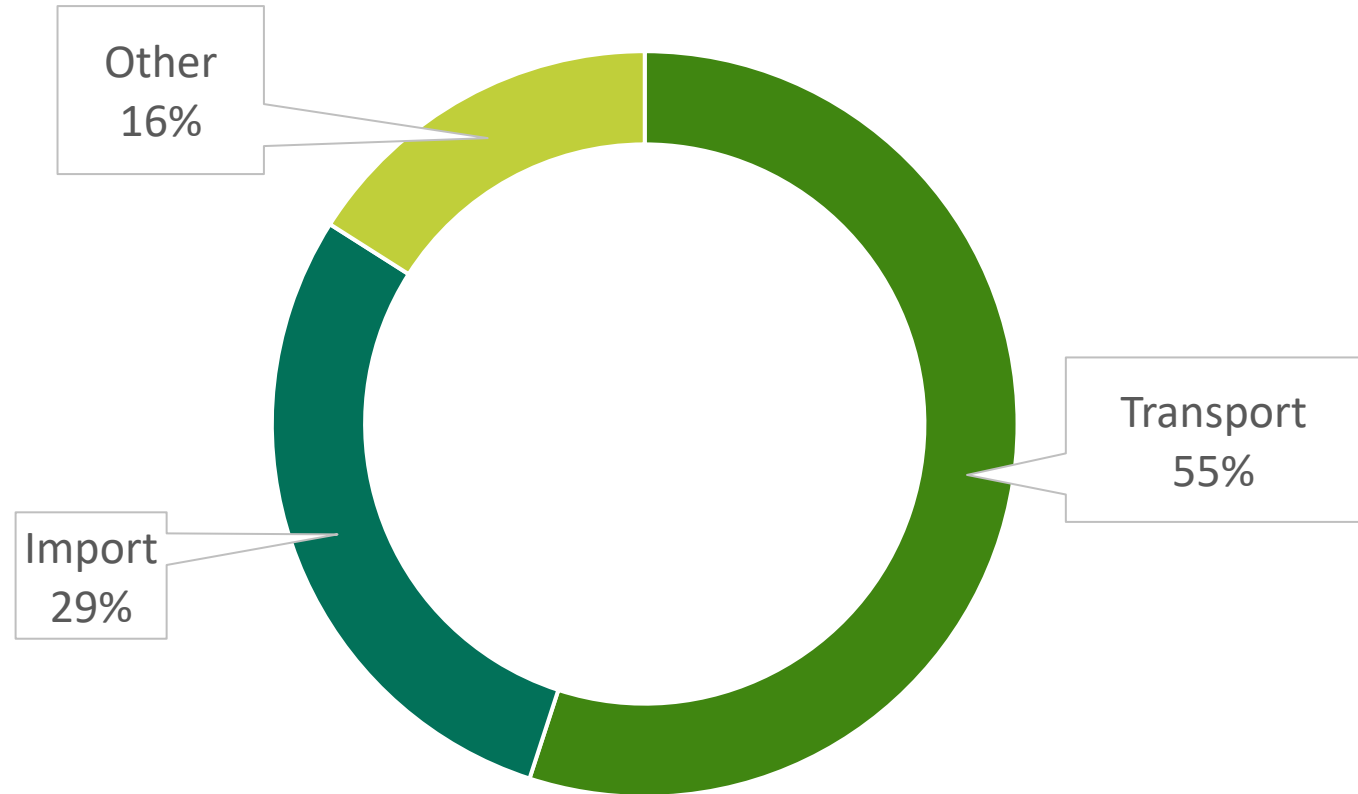
'The project directly aligns with current approaches to platform design whilst demonstrating the circular whole life value proposition, from forest floor to built environment via manufacture, assembly, disassembly, and reassembly (DfMA+D and R) - the 'Biogenic Off-Site Manufacture regenerative loop'.

Matt Stevenson - Ecosystems Technology



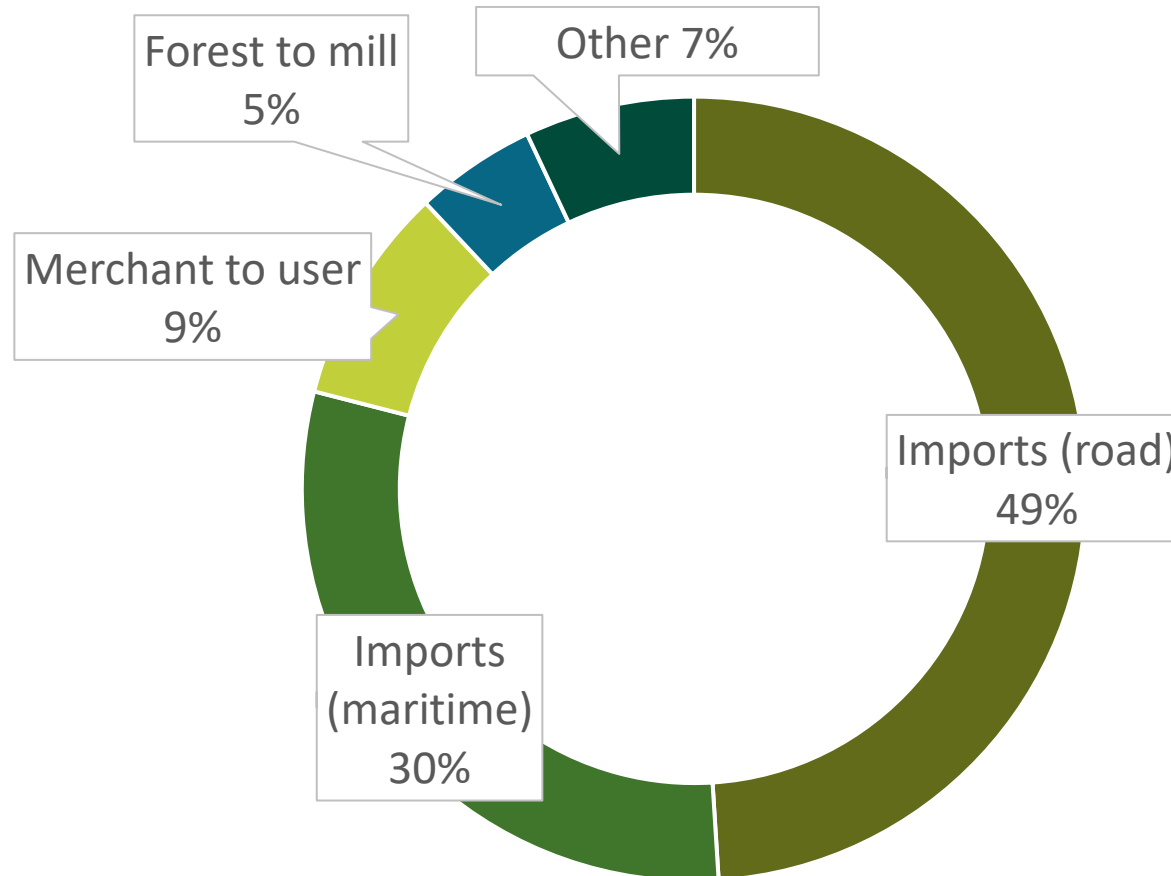
# Why do we need to use homegrown timber?

Timber industry total territorial and overseas carbon footprint (TDUK, 2022)



# Why do we need to use homegrown timber?

Transport carbon footprint  
(TDUK, 2022)





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# Project aim

To enhance the utilisation of the current English Forest resource for built environment delivery and influence future forest strategies



WP1



WP2

Wood  
Properties  
Categorisation



WP3

Optimised  
Engineered  
Timber  
Products



WP4

System  
Design



WP5

Pilot  
Manufacture  
and Prototype  
Testing



WP6

Outreach  
Education

# What we are going to cover



Introduction

Research  
Questions

Methodology

Results

Conclusions  
Q&A

1 | 2 | 3 | 4 | 5

# Wood-based products used in construction

## Engineered Wood Products (EWP)



## Other wood products

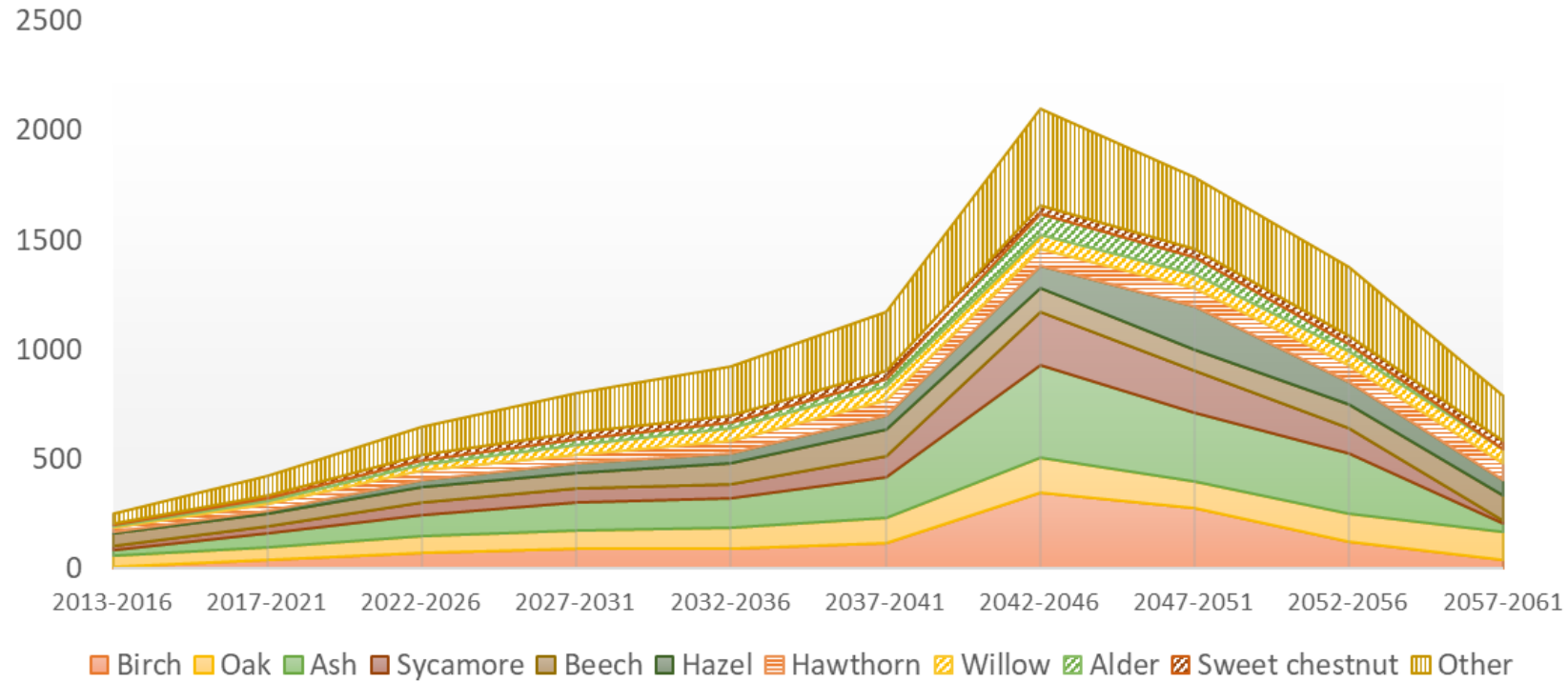


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## Species



### Forest Research (2014)



- Alder
- Ash
- Beech
- Birch
- Oak
- Poplar
- Sweet chestnut
- Sycamore
- Willow

1 | 2 | 3 | 4 | 5



Introduction

**Research  
Questions**

Methodology

Results

Conclusions  
Q&A

1 | 2 | 3 | 4 | 5

## Research question

What are the market opportunities of manufacturing a variety of wood-based products made with UK hardwoods ?

1 | 2 | 3 | 4 | 5

## Research question

How do the opportunities map to three key themes?:

Challenges

Drivers

Knowledge

1 | 2 | 3 | 4 | 5



Introduction

Research  
Questions

**Methodology**

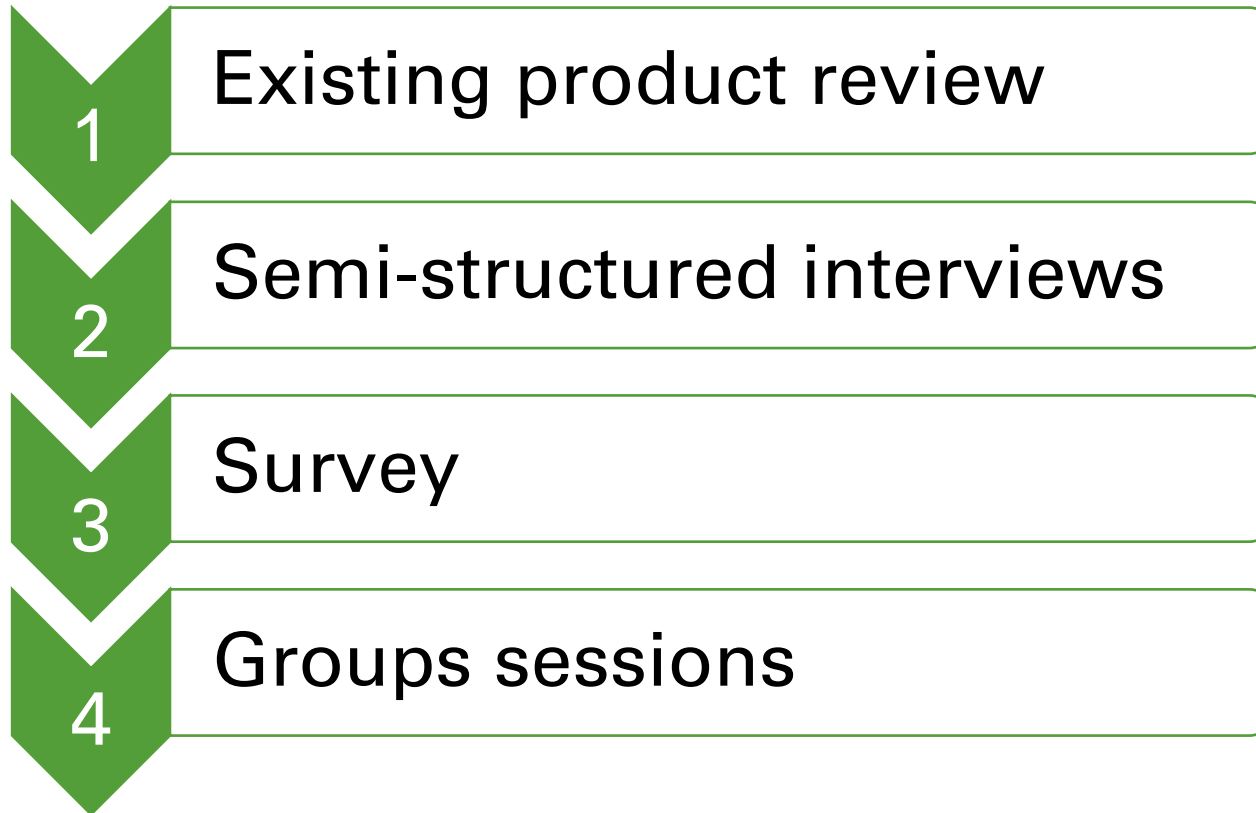
Results

Conclusions  
Q&A



1 | 2 | 3 | 4 | 5

# Methodology



1 | 2 | 3 | 4 | 5

# Interviews

5

Forestry  
(FRS)



7

Wood products  
manufacturers  
(MNF)

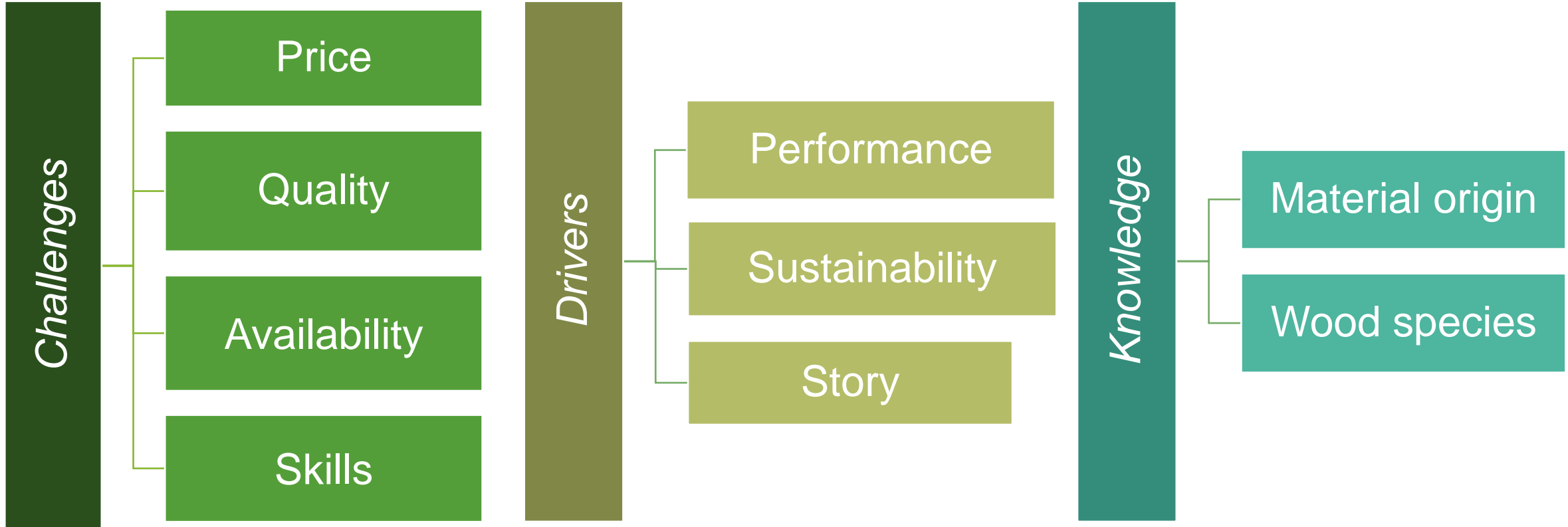


2

Experts in wood  
products  
(OTH)



# Questions



1 | 2 | 3 | 4 | 5



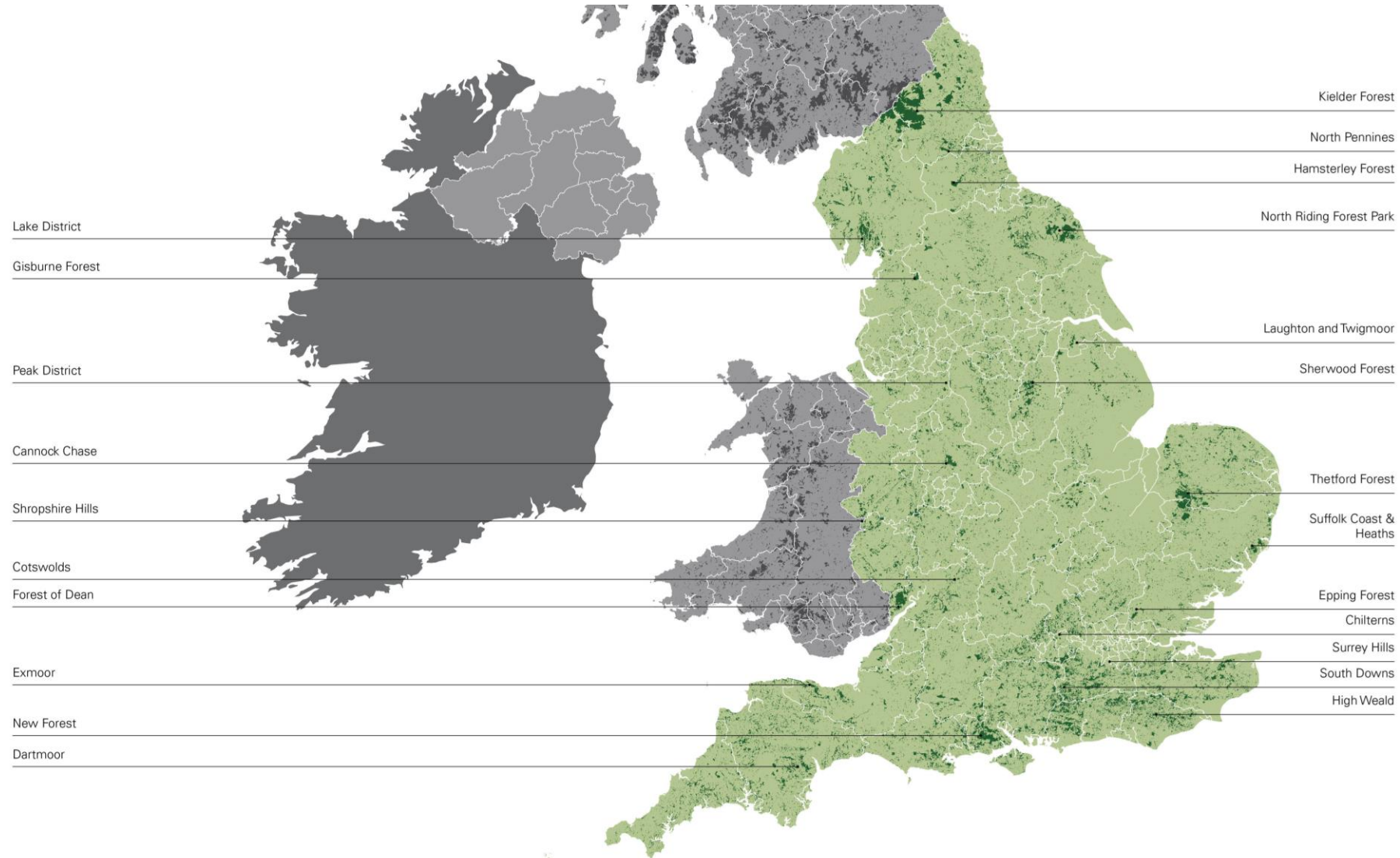
Introduction

Research  
Questions

Methodology

**Results**

Conclusions  
Q&A



**EWP Manufacturing Sites**

- Mass Timber (Glulam)
- Mass Timber (CLT)
- Mass Timber (LVL)
- Modified WPs (Thermally)
- Modified WPs (Acetylated)
- Modified WPs (Denatured)
- Engineered Joists

Stora Enso, Sweden (CLT)

Steico, Poland (I-Joists)

Polimeier, Germany (LVL)

Binderholz, Austria (CLT)

Pivetaubois, France (Glulam)

Xilonor, Spain (CLT)



**Timber Processing Sites**

- Primary Saw
- Sawmill
- Fencing
- Pellets
- Bark
- Board
- Modified WPs
- Mass Timber

Irving & Sons Sawmill

Kronospan (Panels)

Charles Ransford & Sons Sawmill

Pontrilas Sawmill

Woodgate Sawmills

Vastern (Brimstone Timber Cladding)

AJ Charlton & Sons Sawmill

Norbord

Buckland Timber (Glulam)

Egger

TaylorMade Timber Products (James Jones and Sons)

DAF Timber Sawmill

Towne Timber Sawmill

BSW Melton

M R Ellis

R & D Waller

B Thomson

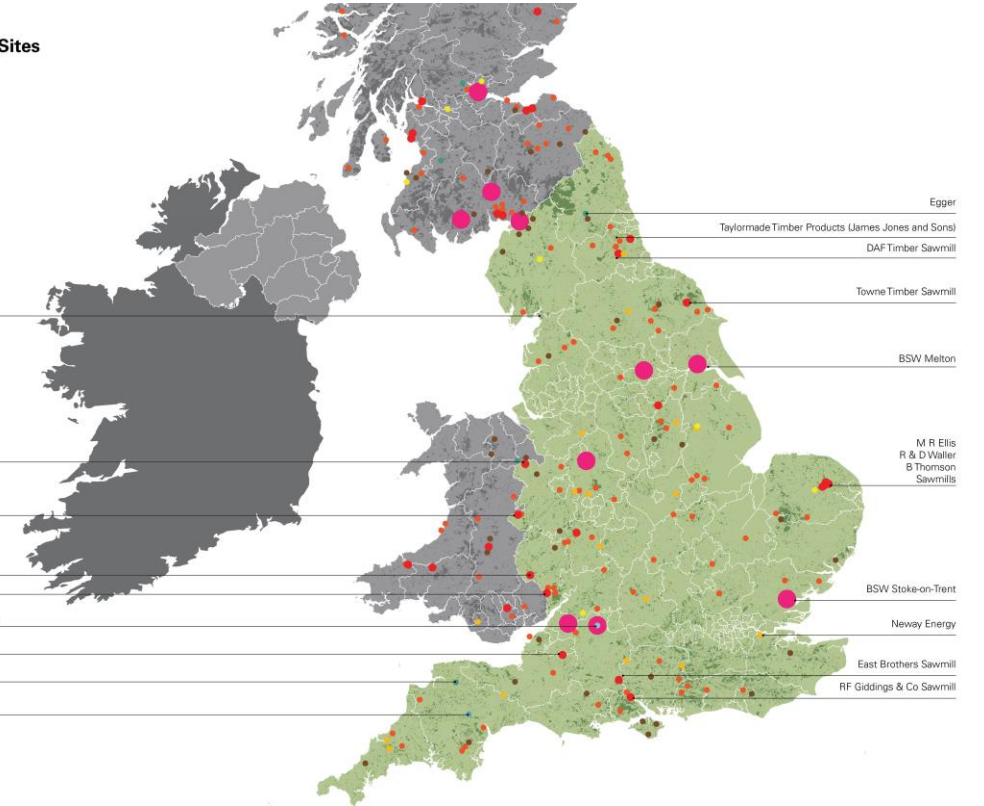
Sawmills

BSW Stoke-on-Trent

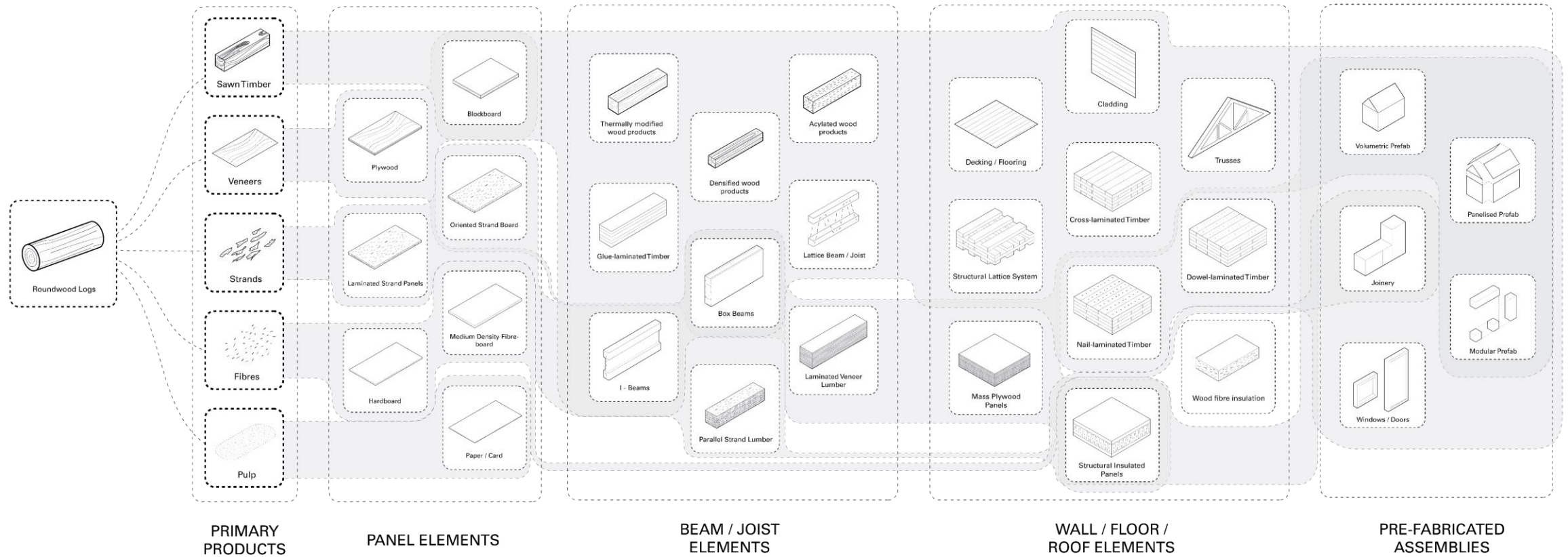
Neway Energy

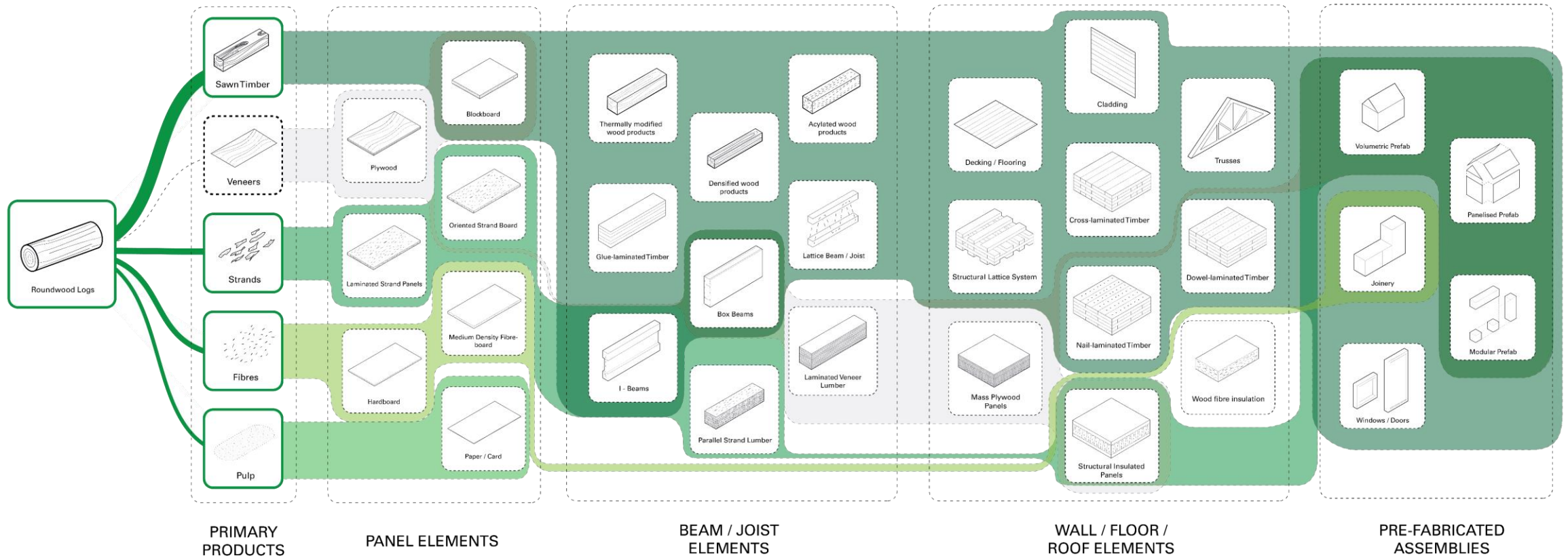
East Brothers Sawmill

RF Giddings & Co Sawmill



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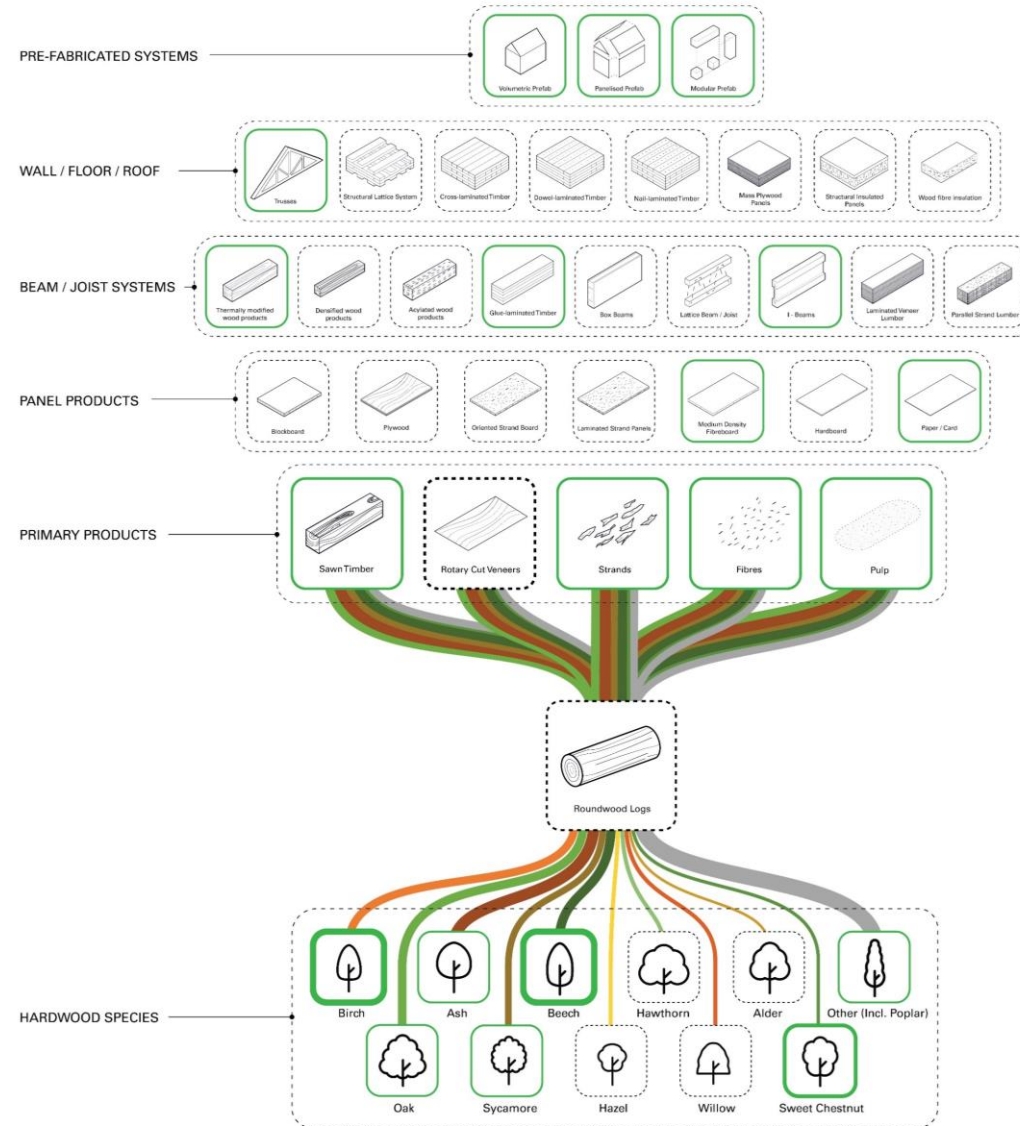






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# Existing products



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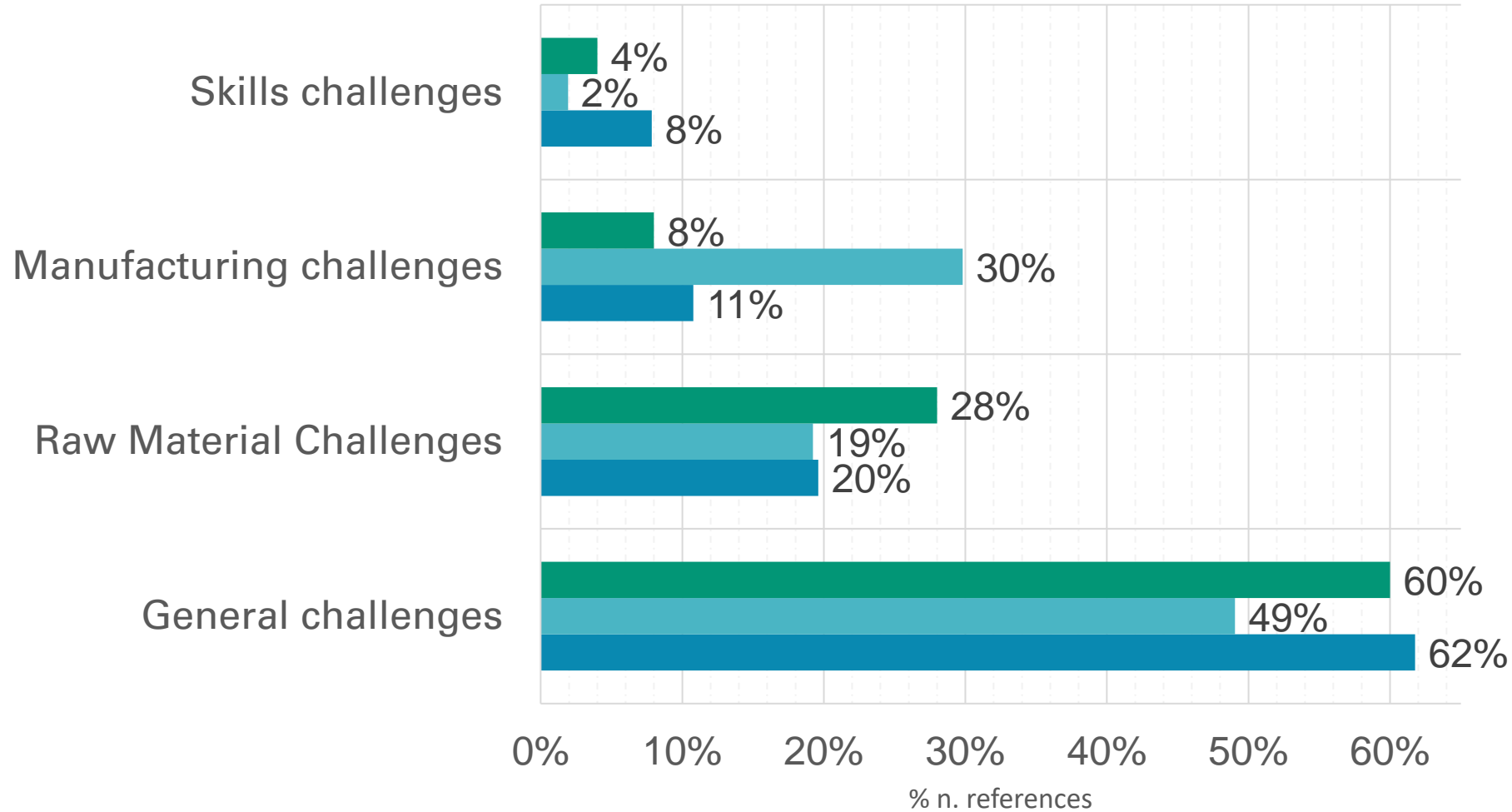
# Existing products



GLT made in the UK with  
hardwood (Oak imported and  
ash homegrown)

Modified wood made in the UK  
(Ash, poplar, sycamore)

# Interviews: Challenges



■ OTH ■ MNF ■ FRS

1 | 2 | 3 | 4 | 5

# Interviews (Is) General challenges

**Price** and a **disconnected supply chain** were among the general challenges mentioned by **all three groups**

As well the **state of woodlands** and their **marginal access**

*“ The UK forestry industry and capacity is not suitable for upscaling, there is not enough forestry and there is not enough good quality forestry” .*

*“Woodlands are always on marginal land with really poor access and therefore they still get managed, maybe, but the raw material is not necessarily commercialised”.*

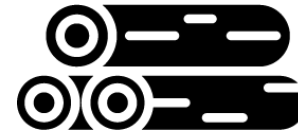
# Survey (S) challenges



- Lack of **skills** and **knowledge**



- **Certification** and **guidance**



- Raw material **availability**



- **Cost** of production

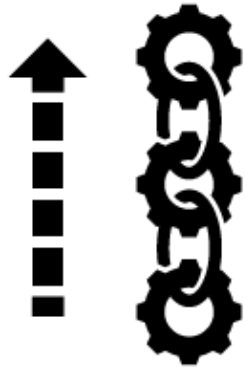
# Groups sessions (GS) challenges

**Price, volume and a disconnected supply chain**

Lack of **grading knowledge**, and “**tacit knowledge**” being lost by the industry with fewer experienced millers and wood experts.

# Summary: challenges

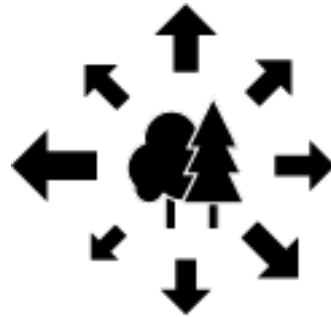
	Identified by	Type of risk	Actions
Disconnected supply chain	Is, GS	High	Supporting and advocating vertically integrated businesses
Manufacturing costs	Is, S, GS	High	Ongoing research and collaboration between academia and industry
Raw material volume	Is, S, GS	Medium	Product diversification
Skills and knowledge gap	Is, S, GS	Medium	Supporting industry-oriented education
Quality of and access to woodlands	Is, GS	Medium	Long-term plan for the use of the woodlands



**Supporting and advocating vertically integrated businesses**



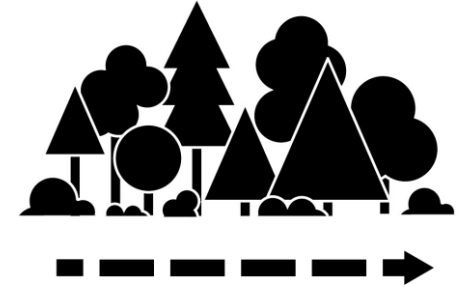
**Ongoing research and collaboration between academia and industry**



**Product diversification**



**Supporting industry-oriented education**



**Long-term plan for the use of the woodlands**



# Interviews (Is): Drivers

The use of **low value and cascading materials** was mentioned by all three groups alongside an increased demand for **locally sourced materials and products**

## **FRS**

Hybrid solutions  
Furniture

## **MNF**

Higher strength  
(Saving on thickness)

## **OTH**

Durability

# Survey: Drivers

- **Structural capability**
- **Embodied carbon**
- **Moisture behaviour**
- **Fire performance**

*“The price of homegrown products should be between 6-9% higher”*

1 | 2 | 3 | 4 | 5

# Groups sessions (GS) drivers

Potential drivers:

**Increase in structural capability**

**Cost**

**Embodied carbon guidance & legislation**

**Durability**

# Drivers: Summary

## Key selling points

Structural capability

Durability

*Investigate*

## Opportunities

Use of wood 'waste'

Embodied energy

*Research and support from legislation*

# Interviews (Is): Knowledge

## FRS Group

Focus on species less available

*Poplar, willow & alder*

*Sycamore (Shorter time to get dry)*

## OTH Group

*Poplar*

*Oak & sweet chestnut for their structural capability*

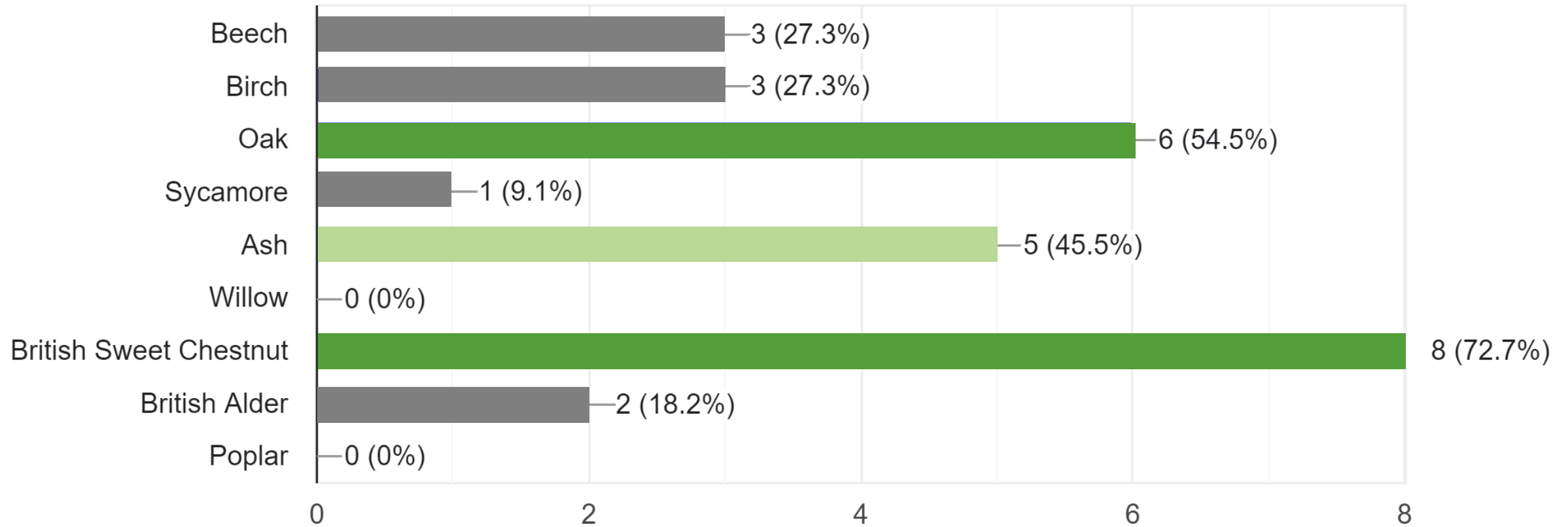
## MNF Group

*Oak*

*Alder and Poplar for OSB*

Species with **low availability are not suitable for manufacturing production**

# Survey: Knowledge (Species)



# Groups sessions (GS): Knowledge (key species)



**Oak**



**Ash**



**Sycamore**



**Sweet  
chestnut**

# Summary: Knowledge (species)

Look for **under-used** species

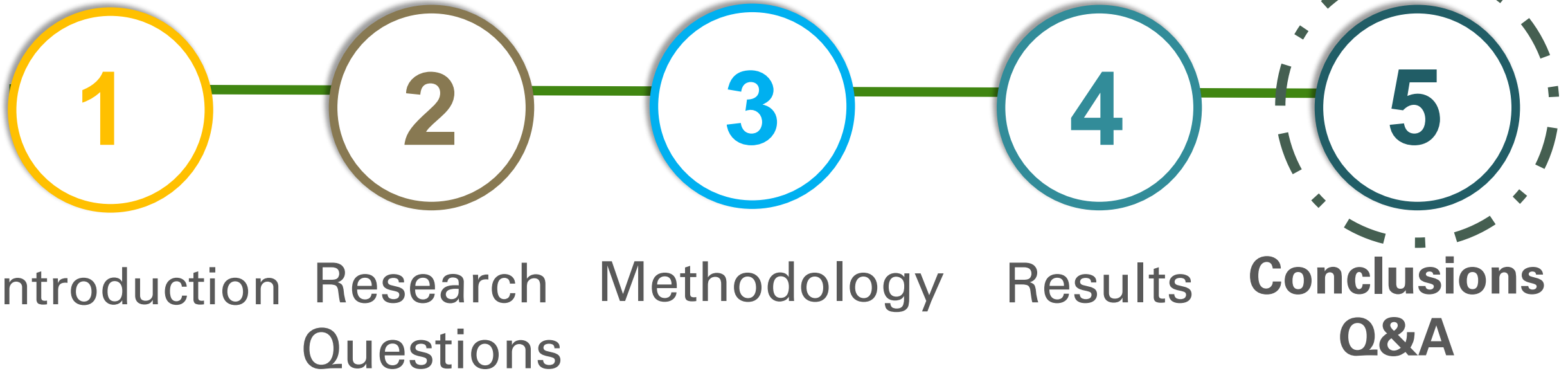
Use of 'low value' timber

Materials for **structural** purposes

Structural capability



1 | 2 | 3 | 4 | 5



# Recommendations

## Policy

- Support to SMEs to encourage vertical integration allowing woodlands owners/managers to add value on-site to woodland products
- Provide fiscal incentives to capture benefits of locally grown material in EPDs
- Incentivise the purchase of timber by manufacturers most local to supply

# Recommendations

## Industry

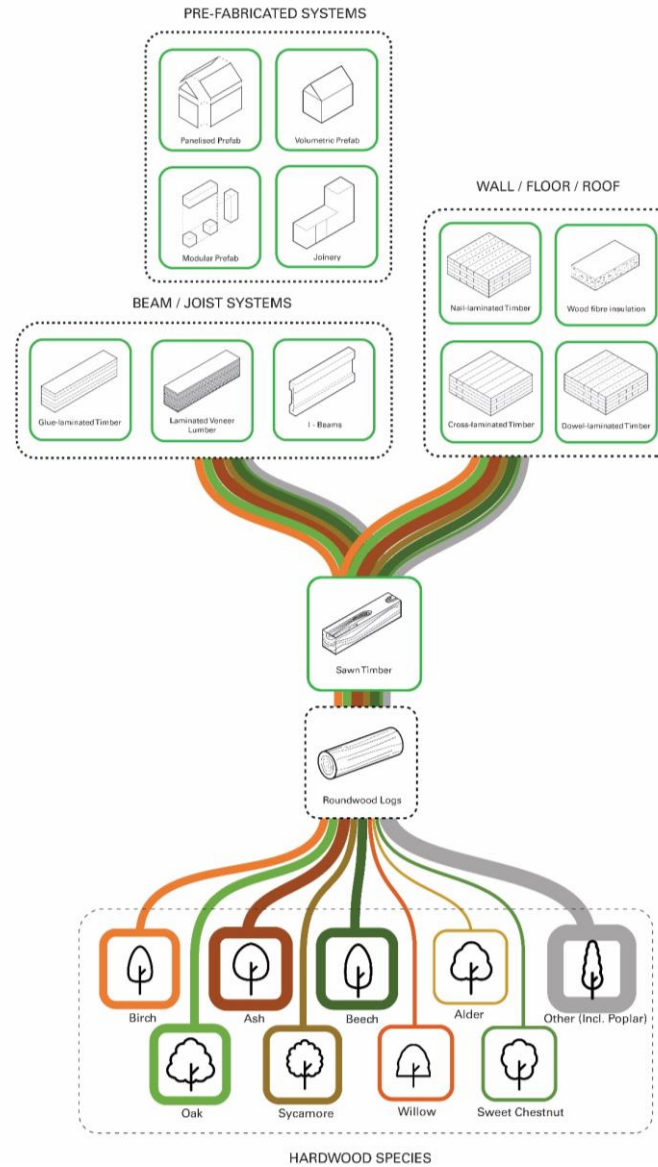
- Professional bodies (STA, TDUK) to **establish stronger connections along the supply chain**, particularly between local suppliers and manufacturers
- Adopt **available English hardwoods for products incorporating non-structural timber** such as painted windows, doors, cabinetry and stairs.
- **Encourage collaboration with academia** to leverage insights in hardwood properties and potentials

# Recommendations

## Research

- Significant test data of mechanical properties of alder, ash, beech, birch, (sweet) chestnut, oak and poplar
- Test data for bonding strength for above hardwoods with various adhesives
- Test data for prototypical engineered wood products made from English hardwoods
- Share knowledge with the industry on relevant developments in hardwood processing

# 1 | 2 | 3 | 4 | 5





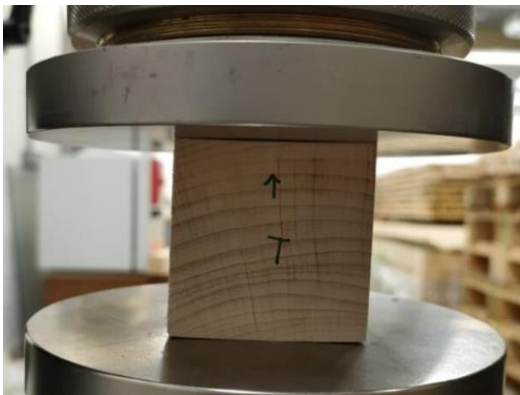
IML Hammer transversal measurement



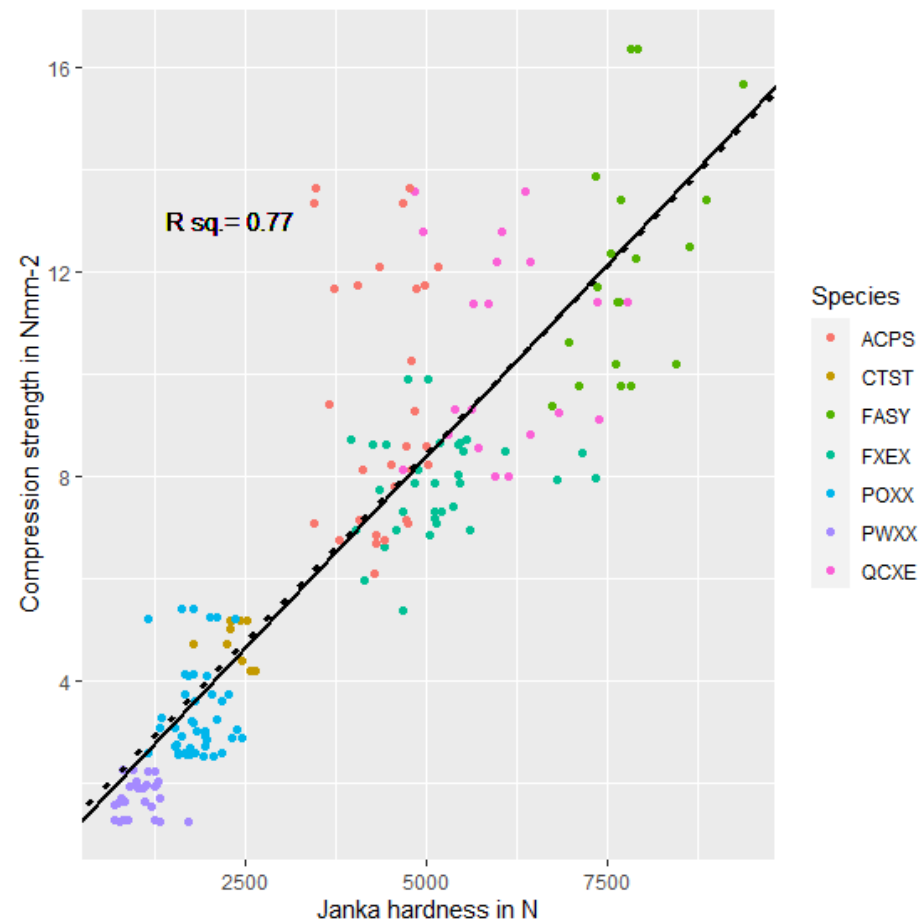
Hitman measurement of longitudinal velocity



Four-point bending test

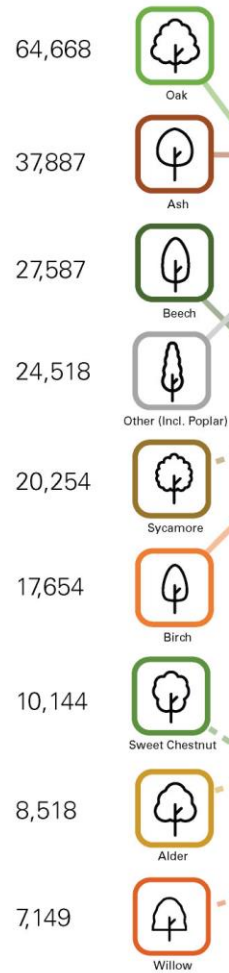


Compression test perpendicular to grain, test set-up (here test on tangential surface, load applied in radial direction)

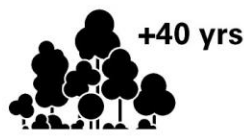
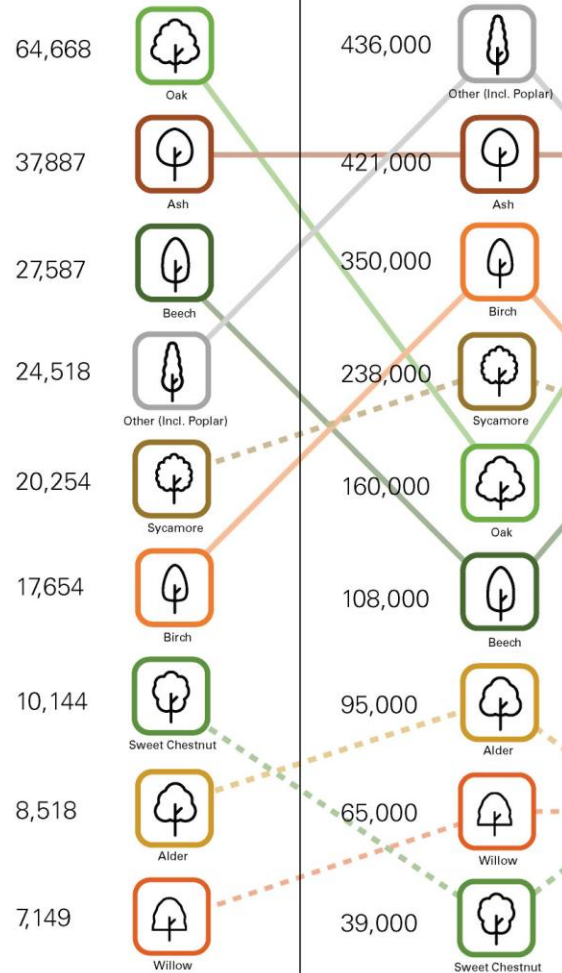




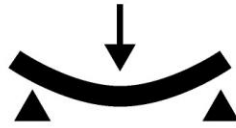
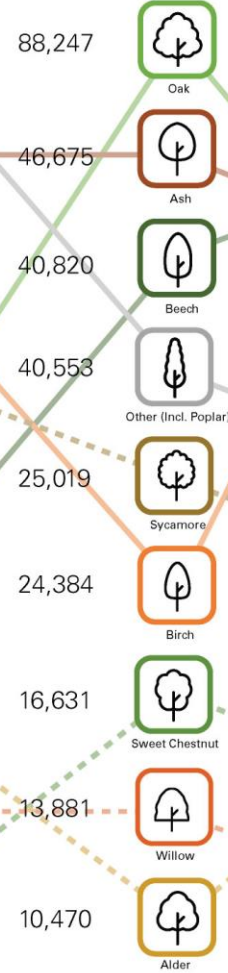
**Estimated standing volume**  
2022-26  
m3



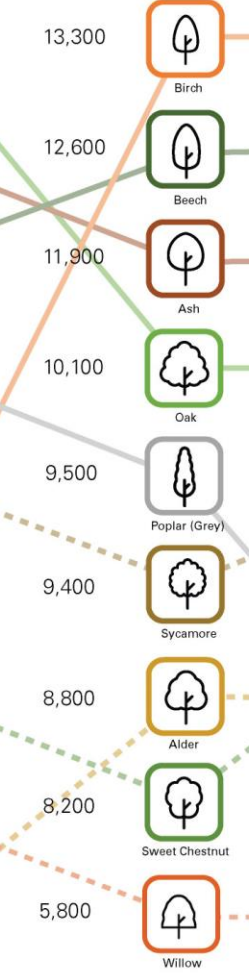
**Projected peak production**  
2042-2046  
m3



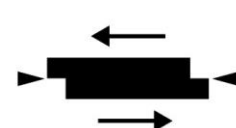
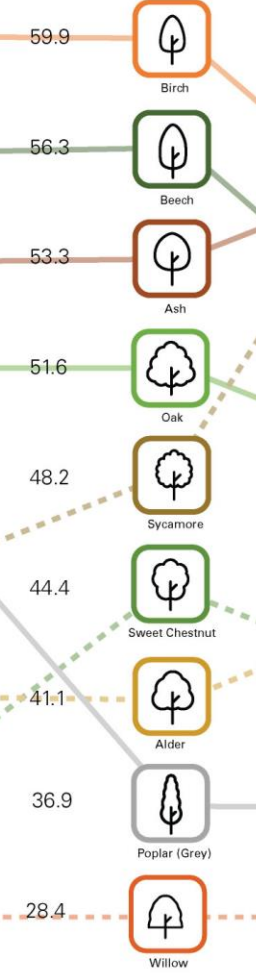
**Projected peak standing volume**  
2057-61  
m3



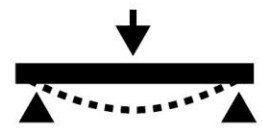
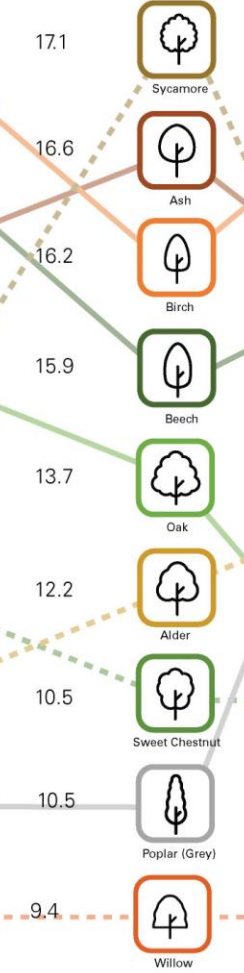
**Modulus of Elasticity**  
Lavers, G. (1967)  
n/mm2



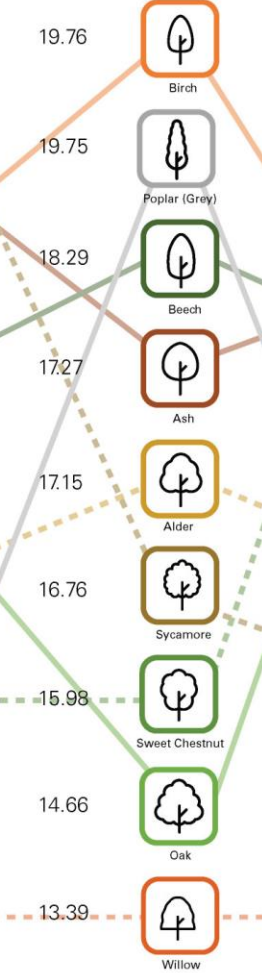
**Compression**  
Parallel to grain  
Lavers, G. (1967)  
n/mm2



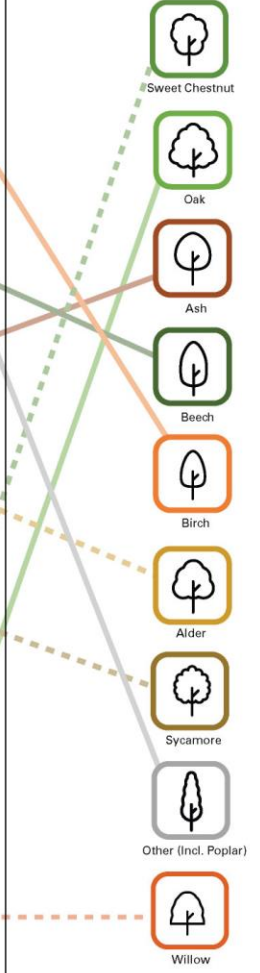
**Shear Strength**  
Parallel to grain  
Lavers, G. (1967)  
n/mm2



**Stiffness to Density**  
Lavers, G. (1967)  
N/mm2 per kg/m3





**BFEW Market Review**  
Survey - Potential for mass Timber Products  
Seminara, P. (2024)



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# Multispecies Manufacturing

Homogeneous CLT (C16)				Combined CLT (D40/C16)			
40	30	40	-	32	30	32	-
C16	C16	C16	-	D40	C16	C16	-
							
Layer: 1 UK Sitka spruce 2 UK Sitka spruce 3 UK Sitka spruce				Layer: 1 UK Oak 2 UK Sitka spruce 3 UK Oak			
Total thickness:		110 mm		Total thickness:		94 mm (-15%)	
Effective stiffness, $(EI)_{\text{eff}} = 870 \times 10^9 \text{ Nmm}^2$							



Emerging data

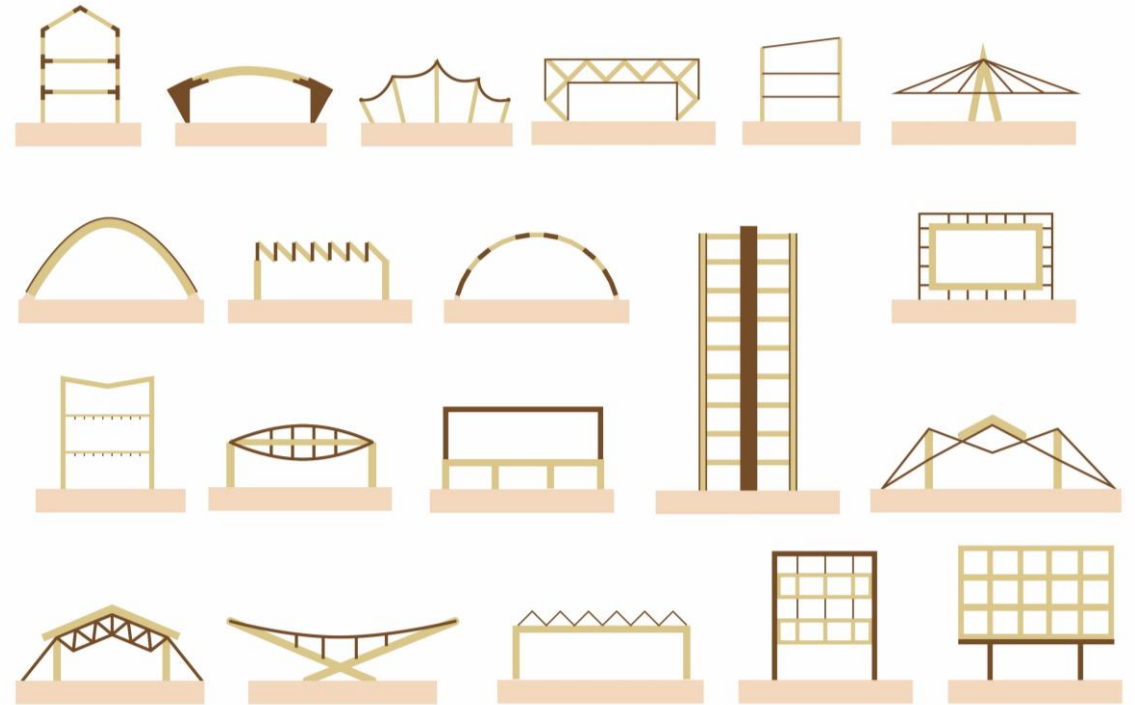
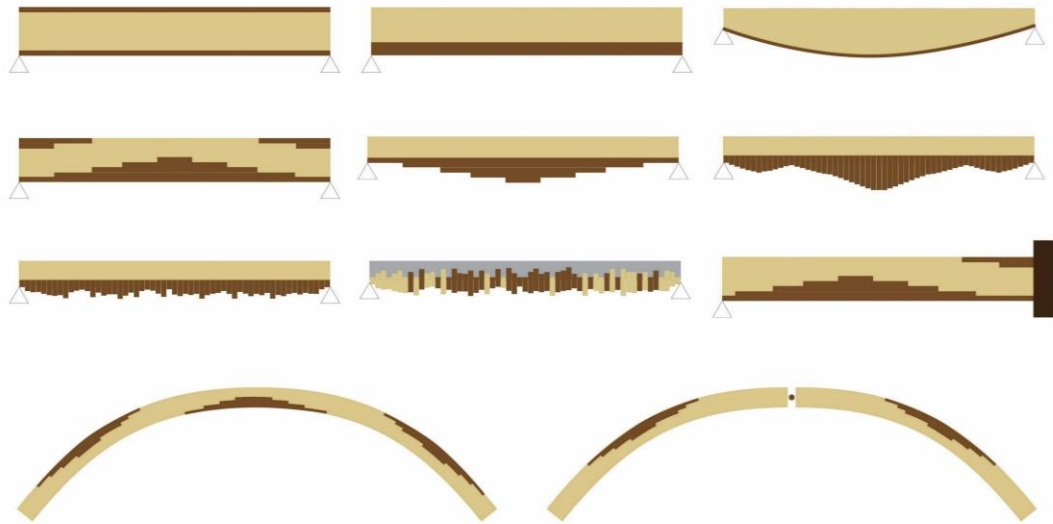
More species

Fam. Lencer with Sebastian Cox. Oak, Cherry, Chestnut, Ash, Sycamore frame

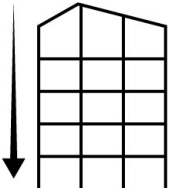
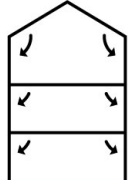
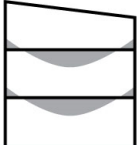
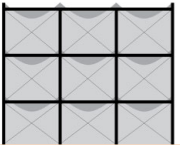
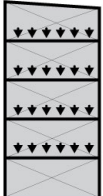
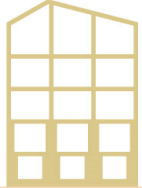


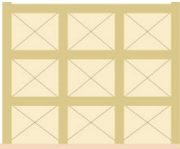

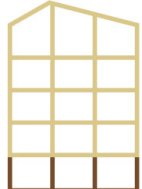
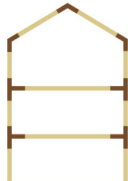

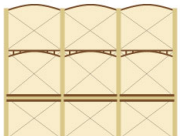



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# Multispecies Manufacturing

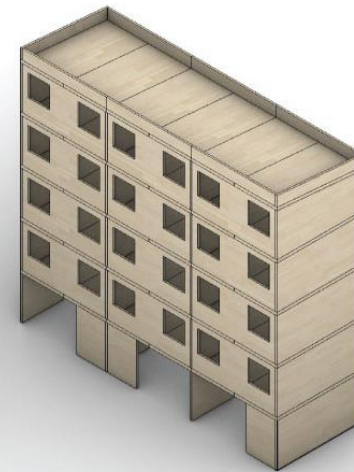
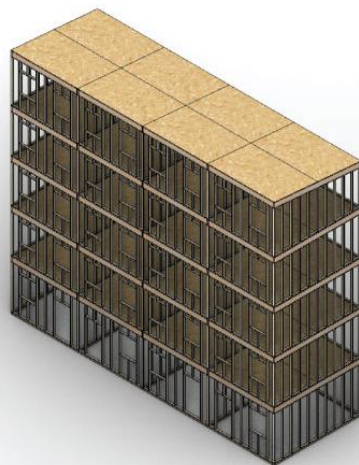


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Engineered Timber Structural Problems	LIGHTWEIGHT TIMBER FRAME	POST & BEAM	PANELLISED MASS TIMBER		
<p>STRUCTURAL PROBLEM</p>  <p>Vertical load accumulation</p>	 <p>Moment connections</p>	 <p>Bending</p>	 <p>Bending of slab elements</p>	 <p>Vertical line load on slab edge</p>	
<p>TYPICAL SOFTWOOD SOLUTION</p>  <p>Oversized cripple studs / sole plates</p>	 <p>Oversized elements</p>	 <p>Oversized Beams</p>	 <p>Oversized CLT floors</p>	 <p>Castellated CLT wall panels</p>	
<p>HARDWOOD RESPONSE</p>  <p>Hardwood elements to ground floor</p>	 <p>Hardwood 'knuckles'</p>	 <p>Hybrid laminated beams</p>	 <p>Hardwood floors / roof elements</p>	 <p>Hardwood connections and slab edges</p>	

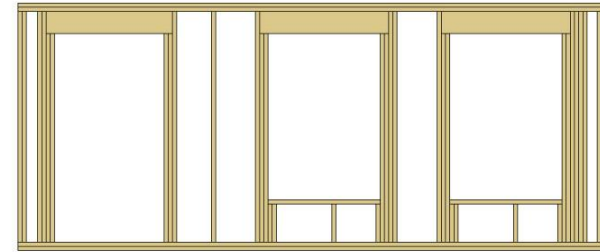
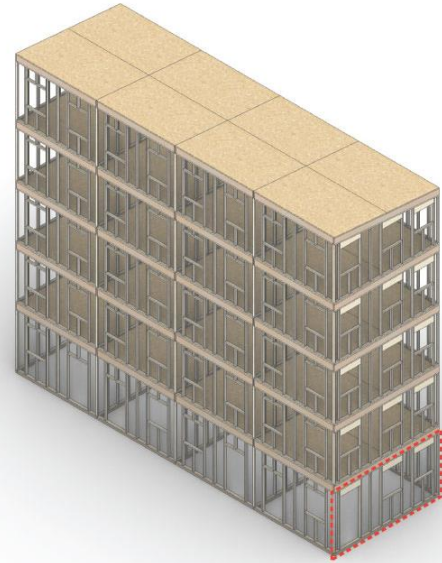
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**Vaulted canopy study**  
6mD x 12mW x 3mH

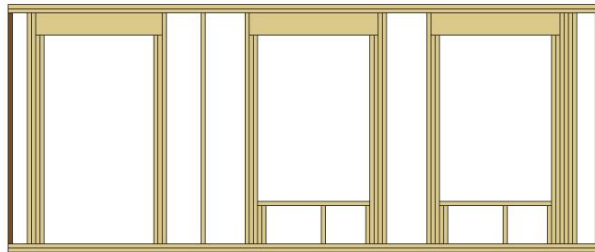


SYSTEM TYPE	LIGHTWEIGHT TIMBER FRAME	POST & BEAM	PANELLISED MASS TIMBER
TIMBER VOLUME	60 m <sup>3</sup>	117 m <sup>3</sup>	164 m <sup>3</sup>

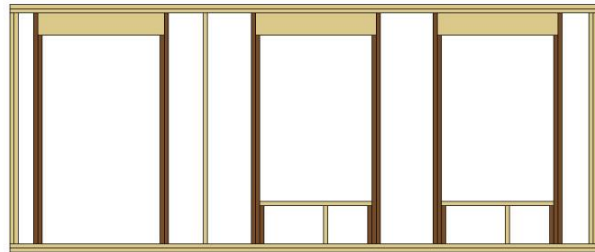
1 | 2 | 3 | 4 | 5



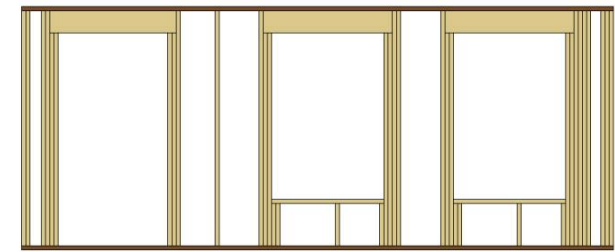
TYPICAL SOFTWOOD GROUND FLOOR WALL PANEL



STRATEGIC STUDS

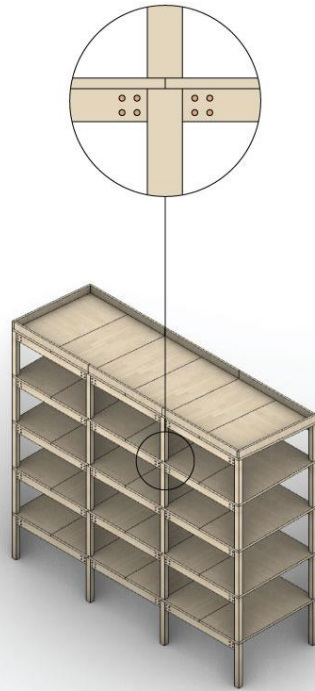


CRIPPLE STUDS

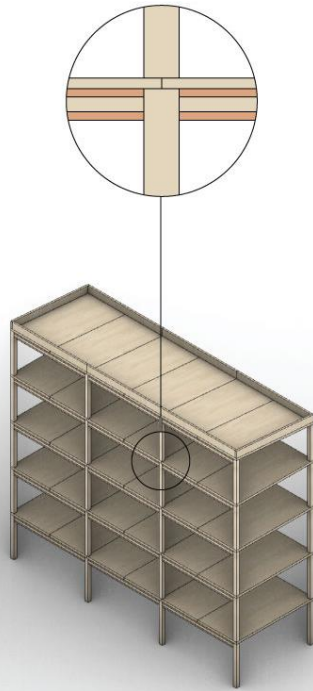


SOLE, BOTTOM AND TOP PLATES

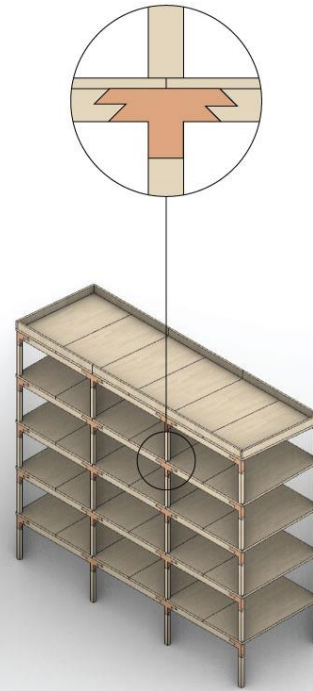
# 1 | 2 | 3 | 4 | 5



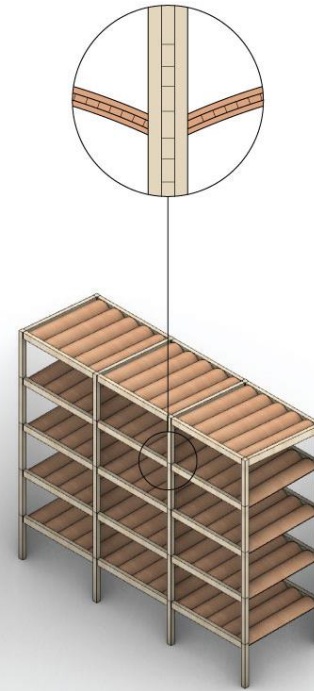
HARDWOOD CONNECTION  
REINFORCEMENT



HYBRID BEAMS

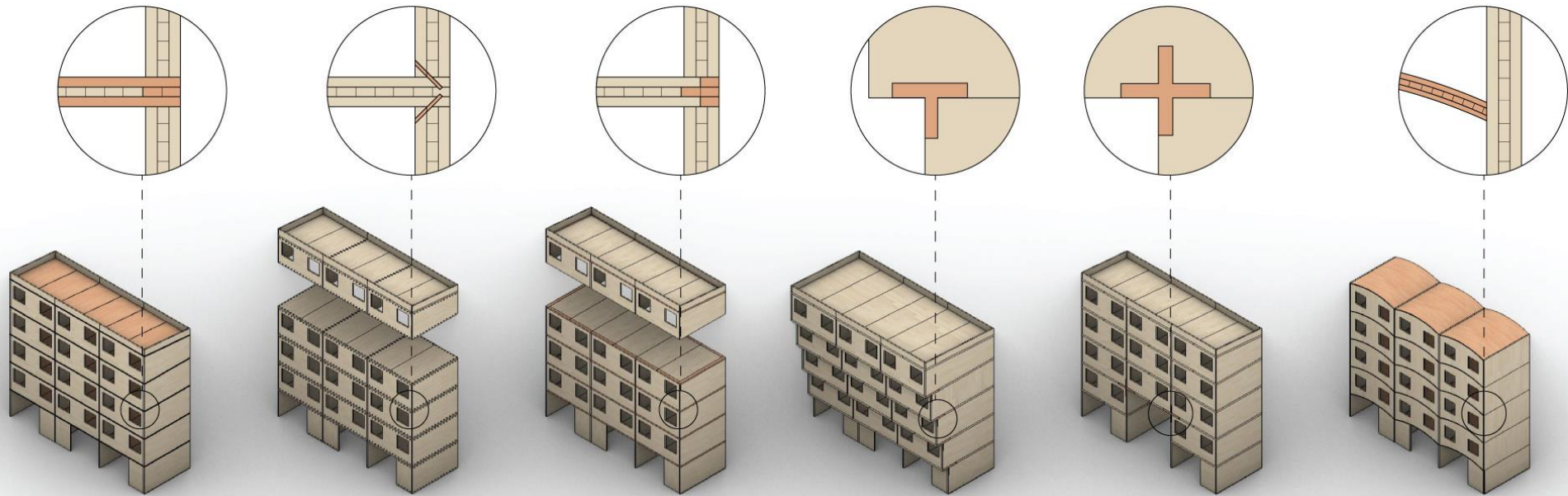


HARDWOOD  
KNUCKLES



HARDWOOD  
VAULTS

# 1 | 2 | 3 | 4 | 5



HYBRID SLABS

HARDWOOD  
CONNECTIONS

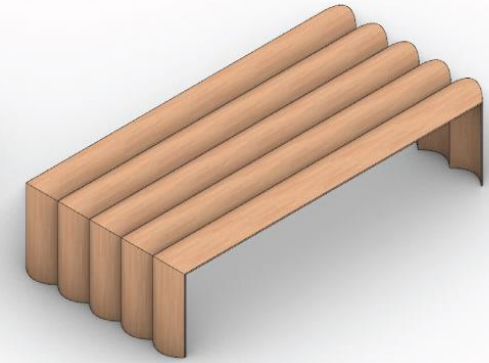
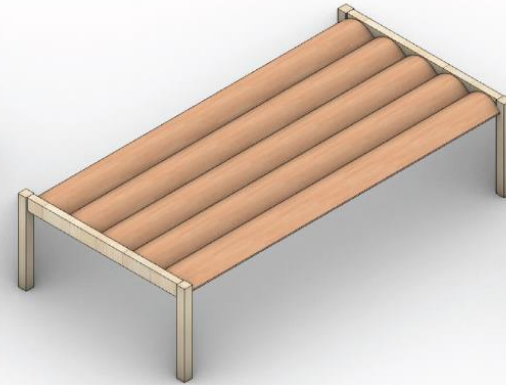
SLAB EDGE  
REINFORCEMENT

CANTILEVER  
REINFORCEMENT

BRIDGE  
REINFORCEMENT

CURVED HARD-  
WOOD SLABS

# 1 | 2 | 3 | 4 | 5



SYSTEM	POST & BEAM	VAULTED SLAB	VAULTED SLAB & SCALLOPED WALL
TIMBER VOLUME	17.5 m <sup>3</sup>	4.5 m <sup>3</sup>	3.5 m <sup>3</sup>

1 | 2 | 3 | 4 | 5





# References

- Timber Development UK (TDUK). (2022). Net Zero Roadmap How the timber sector can address the climate crisis and build a Net Zero future.  
<https://timberdevelopment.uk/resources/net-zero-roadmap/>.
- Forest Research. 50-year forecast of hardwood timber availability [Internet]. 2014. Available from: [www.forestry.gov.uk/inventory](http://www.forestry.gov.uk/inventory)