



WELCOME

Thank you for joining. The event will begin shortly

Aims of the 1947 Club

- Furtherance of Social and Professional Contacts
- Providing assistance to Branch RICS matrices
- Preservation of the history and tradition of the 1947 Club

Follow us on





How to Build Carbon Positive Structures

John McAulay

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 green roof
structures

s h e d

This presentation...

- Who am I
- s h e d & GRS
- What is carbon positive
- Why is this important
- Why timber
- What are we doing
- Challenges



How to Build Carbon Positive Structures

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Who we are...



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Who we are...



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Carbon positive - what does it mean?

Confusing terminology...

- Carbon neutral
- Net zero
- Embodied carbon

decarbonization...

upfront carbon...

Embodied or upfront???

'It's not embodied, it's in the air already, As Elrond Burrell notes, it is burped, vomited, spiked, it's gone!'

Lloyd Alter treehugger.com

Carbon positive - what does it mean?

Confusing terminology...

- Carbon negative
- Climate positive

Carbon positive...

‘going beyond achieving net zero carbon emissions to actually create an environmental benefit by removing additional carbon dioxide from the atmosphere’

Why do we care?

35%
greenhouse gas emissions

**Built Environment contributions:
12% global GDP**

Nearly 40% global energy
consumption Buildings at nearly a
1/3 of global energy consumption

Why CO2?

Around 65-80% of all emissions

UK net-zero target by 2050

Why do we care?

Impact of greenhouse gases on global warming and climate change...

Long list of impacts...

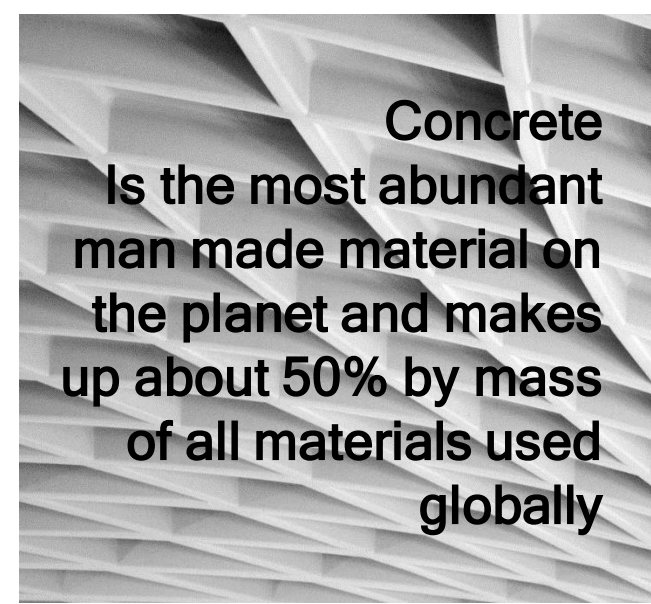
- Precipitation
- Heat waves and temperature extremes
- Tropical cyclones and storms
- Droughts
- Wildfires
- Flooding
- Glacial melt
- Sea level rise
- Ocean acidification
- Permafrost thaw
- Decline of ecosystems
- Extinction of species
- Health
- Food security
- Marine agriculture
- Water resources
- Economic impacts
- Displacement, migration and population density
- Conflict

Why do we care?

Buildings play a massive role:

Embodied/upfront carbon critical.

Structural materials contributing up to 16% total global CO₂ emissions for steel and concrete alone...



The buildings and construction sector accounted for 36% of final energy use and 39% of energy and process-related carbon dioxide (CO₂) emissions in 2018, 11% of which resulted from manufacturing building materials and products such as steel, cement and glass.

IEA Global Report 2019



Why do we care?

Steel and concrete significant contributors and their reduction in use is key to reducing global CO2 emissions...

Achieving a sustainable building is noted to require coordinated team, with early input from all parties. It has been estimated that the indirect influence of the Structural Engineer contributes to 50% (of sustainability targets)

Innovation & Research Focus, IRF89

Resource efficiency and structural efficiency are important but not the only answer...

5% purely structure...

Why timber?

Benefits...why is it worth considering??

- Renewable resource
- Carbon sequestration and climate and environmental impact
- Recycled/reuse
- Structural performance and timber construction
- Locality
- Design ambition
- Well being



Why timber?

Renewable Resource:

The British Standard definition of a renewable resource:

‘resource that is grown, naturally replenished or cleansed on a human time scale’. It also notes that ‘A renewable resource is capable of being exhausted but can last indefinitely with proper stewardship. Examples include trees in forests, grasses in grasslands and fertile soil.’ Provided that tree stocks are replenished through replanting and managed sustainably, the timber resource can last indefinitely.

IStructe



Why timber?

1990-2010 global forest stocks have depleted
but have increased in the UK and Europe

Increasing the use of responsibly sourced
timber in construction can help to maintain and
increase the forest resource.

Demand can drive reforestation...

Why timber?

Wood as a carbon store:

During the production of timber, trees absorb, or sequester CO₂ from the atmosphere during photosynthesis as they grow. This is stored as carbon in wood, bark and leaf material.

The global carbon cycle

Forests are major global carbon sinks, absorbing atmospheric carbon. Afforestation and increased use of timber in long-use forest products, in a proven carbon capture and storage system, is one of the available strategies to mitigate carbon emissions and the climate emergency

Why timber?

Wood as a carbon store:

After oceans, forests are the world's largest storehouses of carbon

- They provide ecosystem services that are critical to human welfare. These include:
 - Absorbing harmful greenhouse gasses that produce climate change. In tropical forests alone, a quarter of a trillion tons of carbon is stored in above and below ground biomass
- Providing clean water for drinking, bathing, and other household needs
- Protecting watersheds and reducing or slowing the amount of erosion and chemicals that reach waterways
- Providing food and medicine
- Serving as a buffer in natural disasters like flood and rainfalls
- Providing habitat to more than half of the world's land-based species

WWF

Why timber?

Wood as a carbon store:

We depend on forests for our survival...

Over 2 billion people both directly and indirectly depend on forests...

Habitats for biodiversity and livelihoods - over half the worlds terrestrial biodiversity is found in forests...

Driving timber demand must be viewed as positive with respect to global environmental and climate benefits...



Why timber?

Timber recycling and reuse:

According to WRAP⁴, 81% of UK construction timber is recycled or reused, with most of the remainder going to landfill. This compares with 99% for metals and 59% for concrete.

IStructE

Landfill?
Timber products?

Reuse over recycling...

Overall reuse is of benefit, and is key to maintaining sequestration and therefore timber as a carbon positive choice...

Why timber?

Timber the structural material...

What about performance...and other benefits?

- High compressive and tensile strength with low weight
- Adaptability
- Resistance to wind and seismic loads
- Insulating properties
- Fire resistance

Why timber?

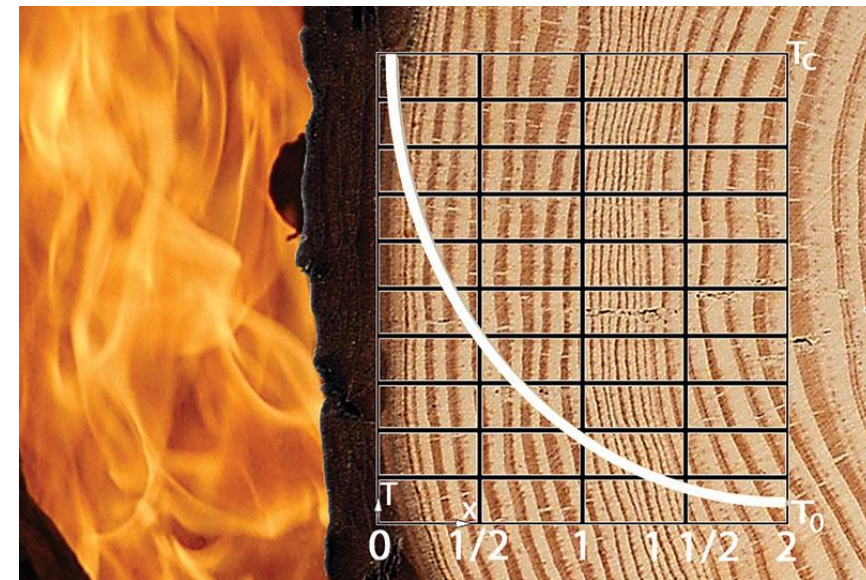
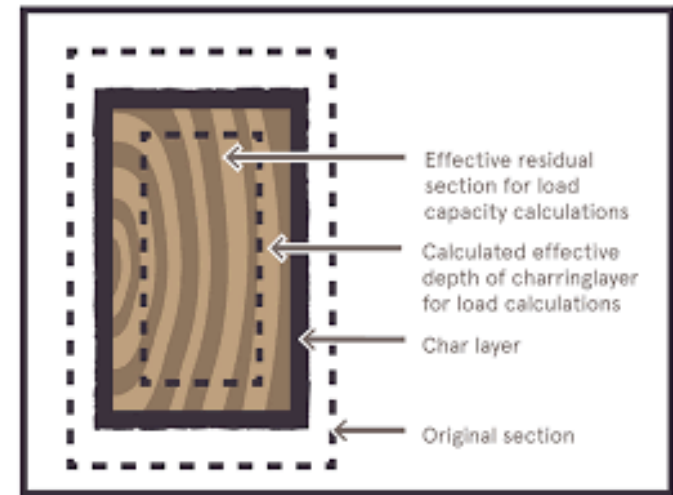
Timber the structural material...

- Fire resistance - relies on charring

The surface of the timber ignites and burns at a steady rate. As the timber burns it loses its strength and becomes a black layer of 'char'. The char becomes an insulating layer preventing an excessive rise in temperature within the unburnt core of the panel.

Rates vary slightly between raw timber products and engineered products - CLT

Surface classification

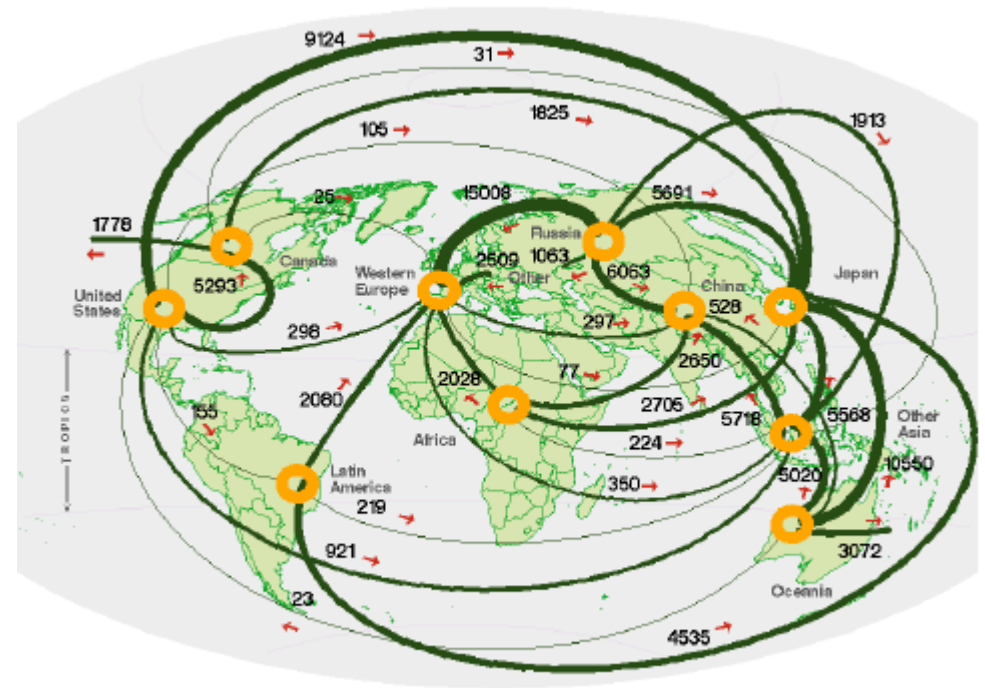


Why timber?

Timber as a local product...potentially

Historically, timber exports are global, but increasing local provision means supplies can be more localised...

European species better than Canadian/US for specifications...



Why timber?

Timber as a local product...potentially

Localised supplies...

On-site milling as a future option...



Why timber?

Timber as design ambition...

- Typically exposed
- Highly visual expression of sustainability
- Warmth and colour
- Reduction in carbon intensive finishes
- The new modern architectural movement?



Why timber?

Timber and well being...

‘Wood has been proven to lower the sympathetic nervous system within humans, which can contribute to stress, increased blood pressure and inhibit digestion and recovery. **Choosing a timber frame construction method can reduce a project's carbon emissions and create a light, open environment to promote wellbeing.**’

- Human response to timber environments - increased energy and comfort
- Improvement in air quality



What about steel and concrete?

Steel reuse and recycling...

Concrete reuse and recycling...

- Limited to 20% recycled aggregate



A few facts about the life-cycle of steel:

- The recycling rate of steel depends on the end-use, but on average around 85% of steel, at the end of its first useful life, is recycled.
- Over 99% of steel from scrap cars is recycled.
- A UK study showed that 94% of steel is recycled when a building is demolished.
- 99% of structural steel is recycled or re-used when a building is demolished.
- In Europe, over 70% of steel packaging is recycled, which is far more than any other packaging material.

Tata

What are we doing Industry wide

RIBA 2030 CLIMATE CHALLENGE

VERSION 2 (2021)



Sign up to join the RIBA
2030 Climate Challenge at
www.architecture.com/2030challenge

RIBA
Architecture.com

KNOW YOUR IMPACT

Meet Tally

The first LCA app that lets you calculate the environmental impacts of your building material selections directly in an Autodesk® Revit® model.

[FREE TRIAL](#) [REQUEST DEMO](#)

WHOLE BUILDING LCA

Assess the embodied environmental impact of your entire building. Benchmark your impact throughout design.

DESIGN OPTION COMPARISON

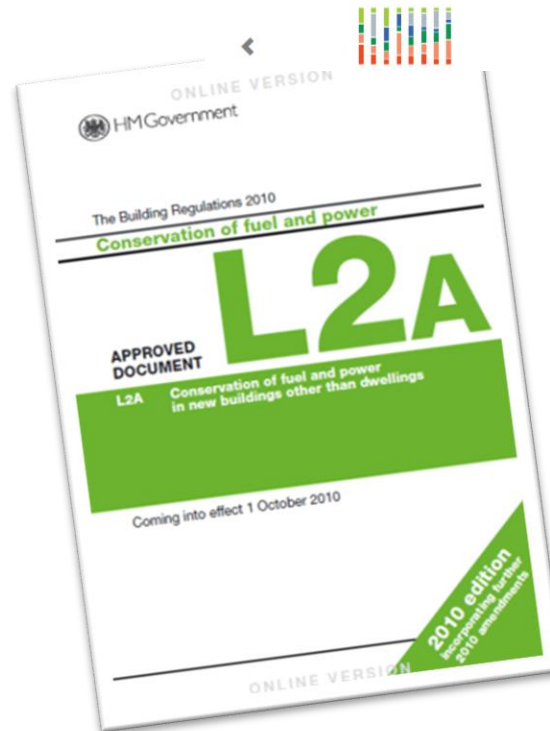
Compare two or more distinct sets of building components side by side.

MATERIAL SELECTION

Compare LCA impacts and ingredients of materials and assemblies, including information from manufacturer EPDs.

TALLY CAN HELP ANSWER QUESTIONS LIKE

What is the carbon footprint of my building?



BREEAM®

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What are we doing...

Business level

Low impact buildings...low impact structures...

We need to **DESIGN** and **BUILD** low impact structures to achieve low impact development...

HOW?

Early assessment...
Specification is the link....



s h e d

What are we doing...

Business level

HOW?

Early assessment...

Structure Element/Frame Option	Concrete	Steel	Timber
Foundations	Semi raft foundation cast on compacted structural fill or pads and strips/ground beams	Semi raft foundation cast on compacted structural fill or pads and strips/ground beams	Semi raft foundation cast on compacted structural fill or pads and strips/ground beams
Ground Floor	Ground bearing concrete slab built on layers of compacted structural fill or suspended concrete slab	Ground bearing concrete slab built on layers of compacted structural fill or suspended concrete slab	Semi raft slab integrated with the foundations or ground bearing slab built on layers of compacted structural fill
Superstructure Skeleton	Insitu concrete frame with downstand beams	Fabricated steel frame with downstand beams	Manufactured glulam or CLT skeleton frame
Floor Slabs	Insitu concrete slab	Composite cast insitu floorslab or precast concrete floorslab	Solid timber engineered floors
Environmental Impact (approximate as designed frame carbon footprint (this is not lifecycle its an occupation figure))	Very poor and worst performing Embodied CO2 approx. 397-498kg/m2	Poor performing Embodied CO2 approx. 217-309kg/m2	Best performing Embodied CO2 approx. 50-150kg/m2

What are we doing...

Business level

shed



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shed

What are we doing...

Business level

HOW?

The right specification and processes in place to achieve the final solution...

- Consideration of contractual arrangements with the timber framed contractor - design responsibility for members and design?

300 Sustainable Timber Supplies

- All timber and timber sheet materials to be from a sustainable source. Materials which cannot demonstrate this must not be used.
- Sustainability should be demonstrated with the Forest Stewardship Council (FSC) chain of custody (CoC) certification. Partial FSC CoC or other proof of sustainability may be used with the prior written approval of the Contract Administrator if it can be demonstrated that the full chain is not available.
- Environmental Statements from suppliers alone are not to be used to demonstrate that materials are from a sustainable source.
- For information on suppliers of FSC certified timber contact FSC 01686 413916 www.fsc-uk.info
- The supplier must maintain records of all timber and wood derived products for inspection by the Contract Administrator,

What are we doing...

Business level



Why do we exist?

- To promote timber framed structures
- Raise awareness of the benefits of timber framed construction
- Raise the profile and acceptance of timber framed structures
- Drive efficiencies in the use of timber as a material



What are we doing...

Business level

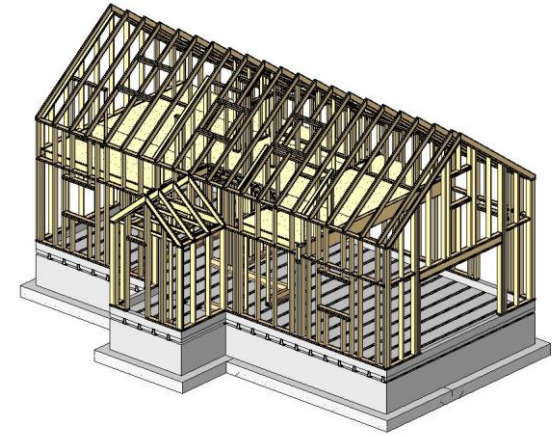


fabrication

Each project is unique but we aim to fabricate as much of the timber frame as possible in controlled conditions in our Gateshead workshop bringing the frame flat-pack to site for erection.

on site

Our on-site setup enables us to erect in most moderate weather conditions. We carry out erection of our flat pack style frame and direct fabrication and construction of bespoke elements cut and built on site.



What are we doing...

Business level



Forest School
Education
Building...



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shed

Challenges...

- Timber design knowledge and expertise
- Industry acceptance of solution
- Availability of contractors and experience
- Financial risk?
- Clients' agenda
- Insurance risk?



Challenges...

- Insurance risk and viability for mass timber structures

Revision 1.0 January 2022

Insurance challenges of massive timber construction and a possible way forward



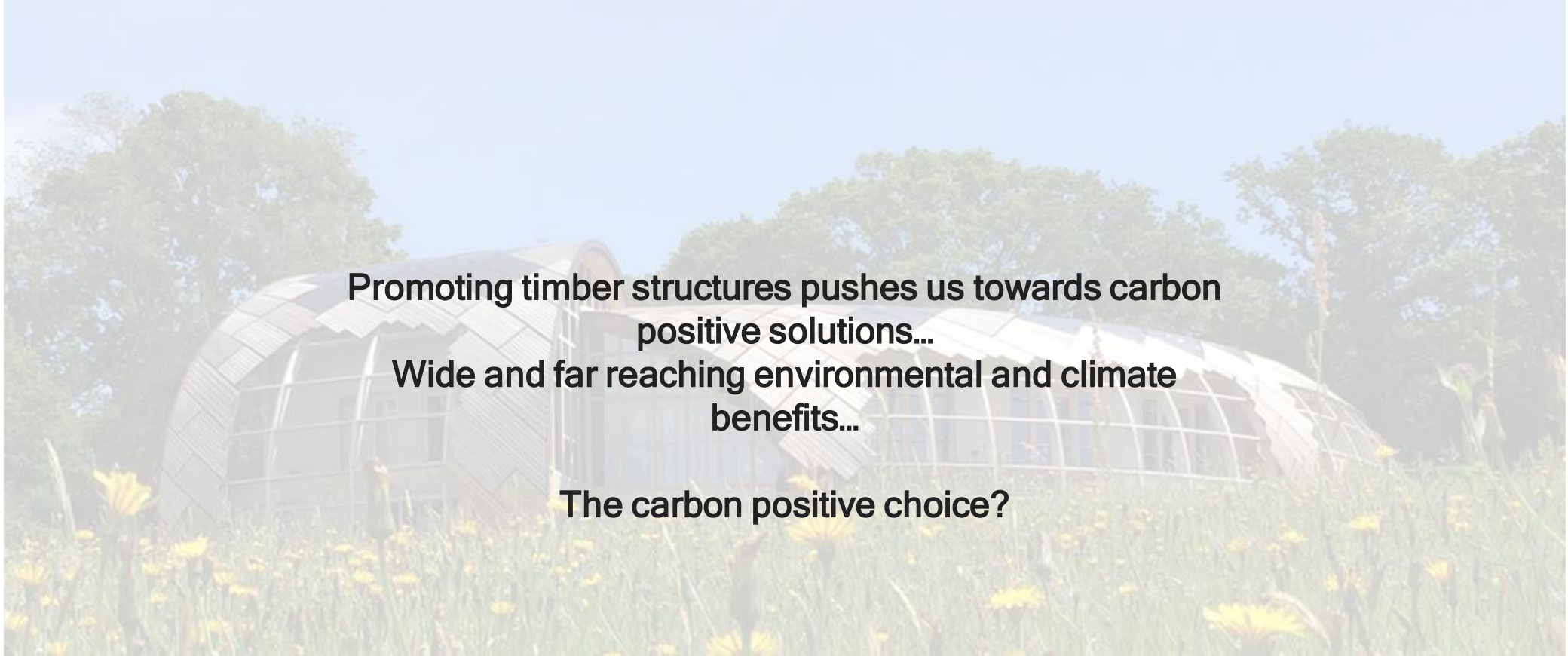
David Williams
Chairman of RISC Authority

“
It should not be a surprise that insurance models and insurance customer expectations developed around historic solid walled, non combustible construction types, may need to alter quite radically to address these very substantial changes in construction methods and material use
”



RISC Authority

Timber...



Promoting timber structures pushes us towards carbon positive solutions...

Wide and far reaching environmental and climate benefits...

The carbon positive choice?



NEXT EVENT

Friday 27th May

12 noon

A preview of the Campus for Ageing and Vitality (CAV)

Newcastle University are leading the Campus for Ageing and Vitality (CAV) project. The scheme is the regeneration of the former General Hospital on Westgate Road.

The 29 acre site will be developed to provide a range of housing, support for people at different stages of their lives, health and commercial facilities. The buildings will be set in a destination site with a quality and diverse landscape that will enable leisure activities for the intergenerational community on and off site.'

Presented by Robin Beattie (senior project manager) from Newcastle University and a speaker from the developer Genr8.

Are you a Chartered surveyor and interested in becoming a Member of the 1947 Club? – contact a Committee member or send a message through LinkedIn

www.the1947club.co.uk