



**QUEEN'S  
UNIVERSITY  
BELFAST**

# Session 3

293



**QUEEN'S  
UNIVERSITY  
BELFAST**

# Queen's University's annual Sustainable Construction Conference

Programme



Past Recordings



(Scroll to bottom of webpage)

294



QUEEN'S  
UNIVERSITY  
BELFAST

# Simon Bell

HLM Architects,  
Passive House Association of Ireland

## Timber in Practice

295

### Timber in practice

Queen's University Belfast  
Sustainable Construction Conference 2026

HLM  
Architects

296

About HLM Architects  
Our story

1964

Over 60 years  
of experience

250+

Members  
of staff

#8

Best Companies  
to work for

4,584

Social value hours  
invested p/a

For more than half a century HLM has delivered socially responsible, thoughtfully designed, transformative places. Ambitious to our core, we're always driven to do more. More for our communities, our planet, and each other.

297

Services



Architecture



Conservation



Digital



Industrialised  
construction



Interior  
design



Landscape  
architecture



Masterplanning  
and urban design



Social  
value



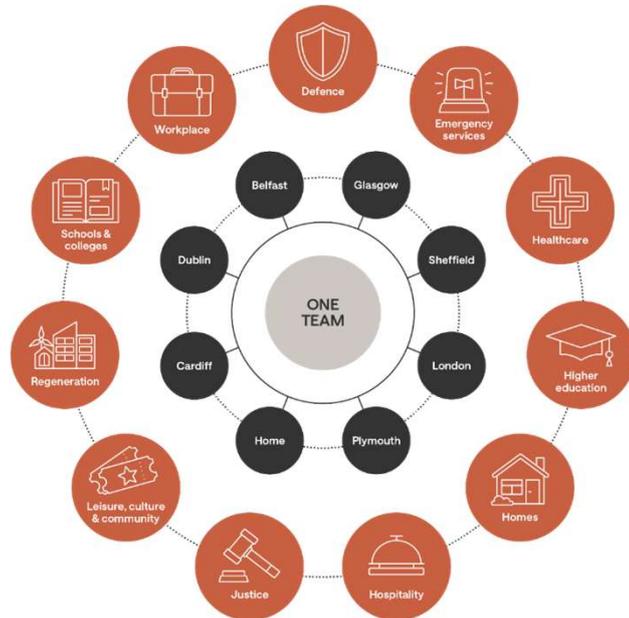
Sustainability



298

### Shape and structure

With studios embedded in communities across the UK and Ireland, we work as one team with outstanding clients to create education environments that inspire, healthcare settings that nurture, homes in thriving neighbourhoods, and public infrastructure that's sustainable in every sense.



## For people & planet

We're creating a sustainable, resilient built environment for future generations. Our aim is simple – to embrace regenerative design principles and create meaningful, lasting change. Our contribution to a world where people and nature can thrive together.



**Research & Development**  
Circular Twin

Circular Twin involved digitally building a school that has already been completed, reworking the scheme from start to finish so that each decision and design choice favoured a lower carbon outcome.

Through this process, the project radically experimented with new working methods, notably adapting who was involved in design work and when, to form an early alliance of experts, with a shared goal to reduce the building's Whole Life Carbon.

- 67% reduction in Whole Life Carbon
- 72% reduction in upfront embodied carbon (EC) (48% reduction in lifecycle EC - this achieves the RIBA 2030 and LETI 2030 Embodied Carbon targets)
- 52% reduction in annual energy consumption
- 39% reduction in forest consumption (for products and 30-year UK offset)
- CAPEX delivered within standard budgetary parameters



301

**Research & Development**  
The Regenerative Twin

Regenerative Twin was a 9-month R&D study into the social, environmental and economic impacts of favouring renewable and existing materials

What would happen if we re-thought the procurement and design processes, putting regenerative principles before capex ?

- 84% reduction in Whole Life Carbon
- 66% reduction in upfront embodied carbon
- 45% reduction in annual energy consumption
- 95% whole lift cost of original scheme (Capex uplift payback in 11 years)
- Timber products could be responsibly sourced from existing Welsh forests
- Correlation between the use of renewable materials and socio-economic benefits
- 90% reduction in water consumption from the manufacture of materials



302

# Using timber

Using timber should be a strategic design choice that supports sustainability, performance and simplicity throughout the whole process - not just as a material consideration / substitution.



303

Trent View College  
Scunthorpe



304



305

### Case Study 1- Trent View College CLT facilitating low energy design

Cross Laminated Timber Walls and Roof Deck

Design Collaboration with B&K Structures

CLT chosen to provide:

- Primary airtightness line for Passivhaus Construction
- Superior precision / quality from offsite manufacturing
- Assembly sequencing and faster construction timelines
- Low operational and embodied carbon

#### Recognition

Winner, Project of the Year (Colleges) Education Estates Awards 2025

Shortlisted, Low Carbon Project of the Year, Structural Timber Awards 2024



306



307



308

### Case Study 2- Sandhurst Band Hall CLT facilitating technical performance

Hybrid construction – Cross Laminated Timber with widespan steel portal frame

First of its kind in the MOD Estate

Design collaboration with KLH UK and Engenuiti

CLT chosen to provide:

- Acoustic performance – timbers natural acoustic absorption / diffusion
- Resilience
- Achieving embodied carbon targets

#### Recognition

Winner, Project of the Year, Structural Timber Awards 2025

Winners Winner, Structural Timber Awards 2025

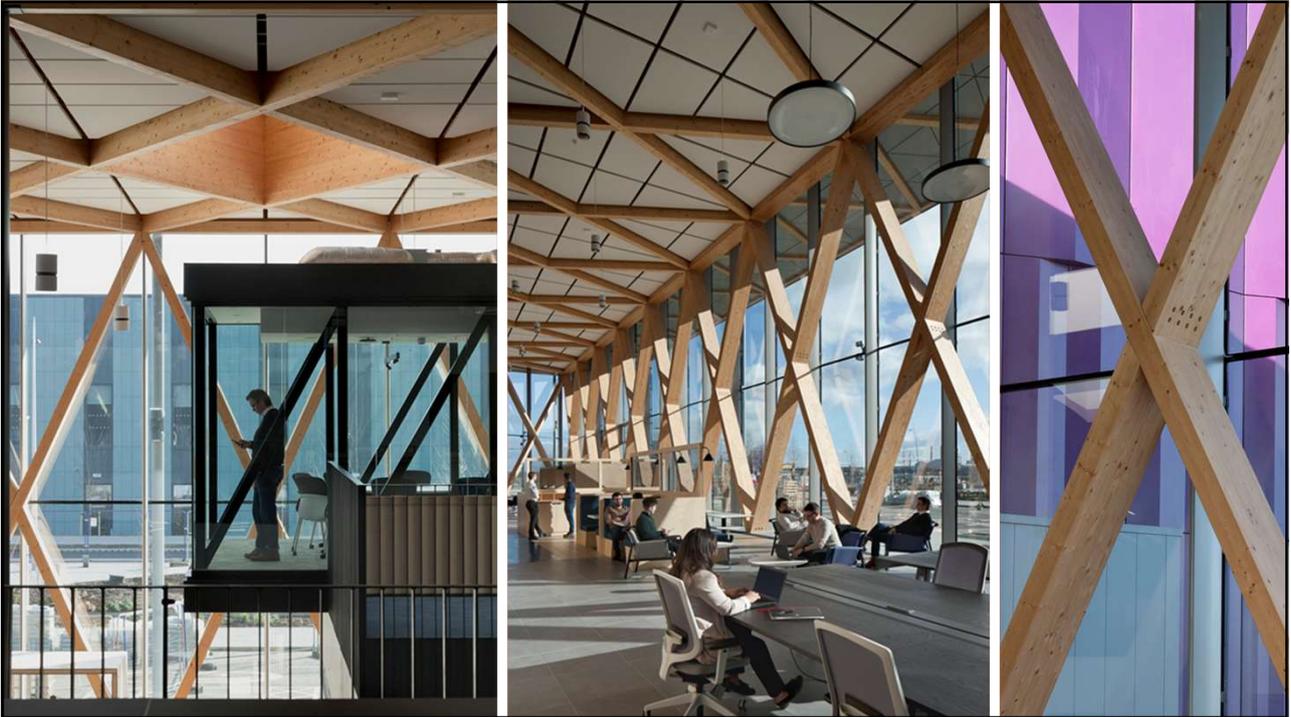


309



National Manufacturing Institute Scotland  
Glasgow

310



311

### Case Study 3- NMIS

#### Timber to reduce embodied carbon

Timber diagrid, cross laminated timber roof deck and limited steel columns internally

Design collaboration with B&K Structures and Engenuiti

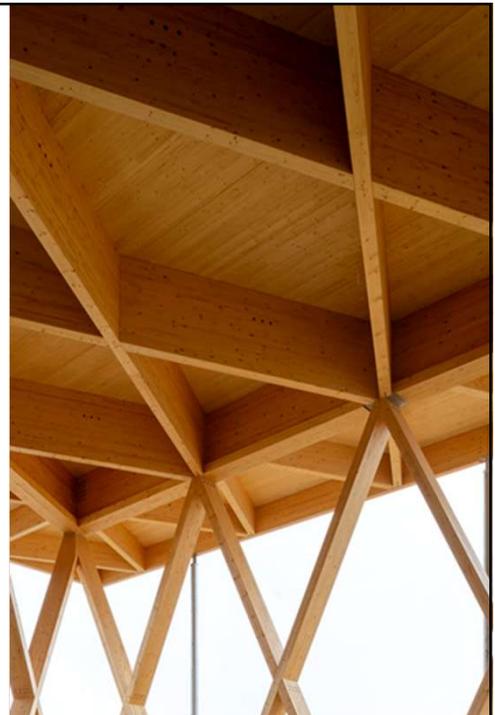
Cross laminated timber and Glulam chosen to provide:

- 700 tonne reduction in embodied carbon
- 18x80m column free space maximising flexibility
- Improved airtightness
- Breathability

#### Recognition

Winner, Education Project of the Year, Structural Timer Awards 2023

Winner, Architect of the Year, HLM Architects – NMIS, Structural Timer Awards 2023



312

# Key gateways

The aspects we need to consider for successful outcomes when designing and building with timber.



313

## Gateway 1 - Early Stage Design

### Client Buy in

#### 1.1 Client Awareness & Expectations

- Education on timber as a structural material, not a novelty.
- Clarifying differences between light timber frame, CLT, GLT, hybrid systems.
- Explaining performance vs. perception: Fire, durability, acoustics, movement, cost uncertainty.

#### 1.2 Insurance (major consideration)

- Some insurers remain risk-averse on mass timber.
- Premiums vary heavily depending on:
  - Extent of exposed timber
  - Fire strategy (protected vs. charring)
  - Building height/use
- Early engagement with the insurer or a specialist insurance consultant can de-risk the project.
- Refer to the mass timber insurance playbook



314

## Gateway 1 - Early Stage Design

### Client Buy in

#### 1.3 Regulatory Risk & Building Control

- Fire resistance strategy must align with local authority expectations early. Some councils expect detailed justification for:
  - Charring design
  - Compartmentation
  - Connections (steel vs concealed)
  - Requirements to produce more upfront detail than with steel/concrete.

#### 1.4 Programme & Cost Awareness

- Understanding timber's front-loaded design effort.
- Procurement risks: market volatility, lead-in times, currency issues.
- Early cost benchmarking vs. potential savings in construction speed.

#### 1.5 Strategic Decisions

- Will timber be exposed or concealed?
- Hybrid systems needed?
- Tolerances and service integration concepts.



315

## Gateway 2 – Technical Design

### Coordination

#### 2.1 Working With the Right Consultants

Not all engineers or QS teams fully understand mass timber's constraints. Structural engineers must understand:

- Vibration limitations
- Connection design early
- Moisture management
- Fire engineering principles specific to timber

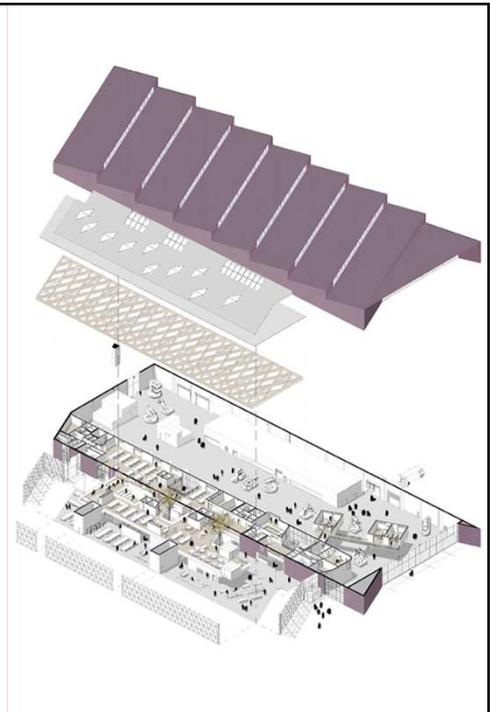
#### 2.2 Fire Strategy: Addressing Misconceptions

"You can't expose timber" — not true, but requires:

- Performance-based design
- Char-rate modelling
- Justification for delamination risks
- Recognising when over-engineering happens and how to avoid it.

#### 2.3 Coordination With Local Authorities

- Fire and structure sign-off expected at earlier stages.
- In some cases: full CLT supplier engineering required pre-approval.



316

## Gateway 2 – Technical Design Coordination

### 2.4 Services Coordination

If exposing timber:

- No ceiling void → service routing must be locked in very early.
- Penetration management and fire-stopping strategy.
- Acoustics vs. exposed soffit conflicts.

### 2.5 Contractor Integration

Timber benefits hugely from early contractor involvement:

- Sequencing
- Lifting strategy
- Panel sizes and transport constraints
- Lead-in times



317

## Gateway 3 – Construction Stage Quality delivery

### 3.1 Contractor Awareness & Training

Many site operatives may be unfamiliar with mass timber assemblies.

- Toolbox talks:
- Moisture sensitivity
- Damage risk
- Fixing protocols (avoid ad-hoc drilling/cutting)

### 3.2 Managing Construction Risk

Water Management - CLT must be protected through:

- Temporary roofs / weather protection
- Drainage paths
- Moisture monitoring
- Clear lines of responsibility for who protects what and when.



318

### Gateway 3 – Construction Stage

#### Quality delivery

#### 3.3 Fire Safety during construction

Timber is more vulnerable before fire protection layers are installed. Measures include:

- Strict no hot-works policies
- Fire watch protocols
- Temporary alarms or detectors
- Limiting exposed surfaces during critical phases

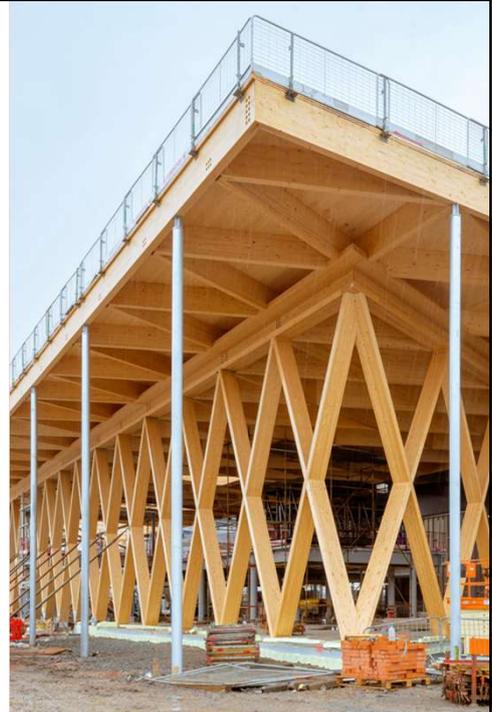
#### 3.4 Programme Management

Shorter onsite programme but longer procurement period. Need alignment between:

- Timber supplier fabrication slots
- Shipping/transport logistics
- Foundation readiness

#### 3.5 Quality Assurance

- Airtightness tapes (critical for Passivhaus/CLT).
- Panel moisture content checks.
- Connection integrity (avoid site modifications).



319

### Additional Considerations

#### Lifecycle Considerations

- End-of-life reuse potential
- Dismantlability affecting connection strategies - bolted vs glued

#### Mass Timber Supply Chain

- Sustainability & provenance of timber (FSC/PEFC).
- Market constraints depending on region.

#### Hybrid Systems

- When timber alone isn't viable — steel cores, concrete plinths, composite floors.

#### Digital Workflow

Timber design is deeply tied to:

- BIM coordination
- Model tolerance accuracy
- Manufacturer's model integration

#### Aesthetics & User Experience

- Biophilic benefits of exposed timber
- Client expectations vs. maintenance requirements (UV, staining, etc.)



320

Early buy in, detailed  
coordination and  
quality delivery will  
bring success.

321

 HLM  
Architects

322



QUEEN'S  
UNIVERSITY  
BELFAST

Thank You

323



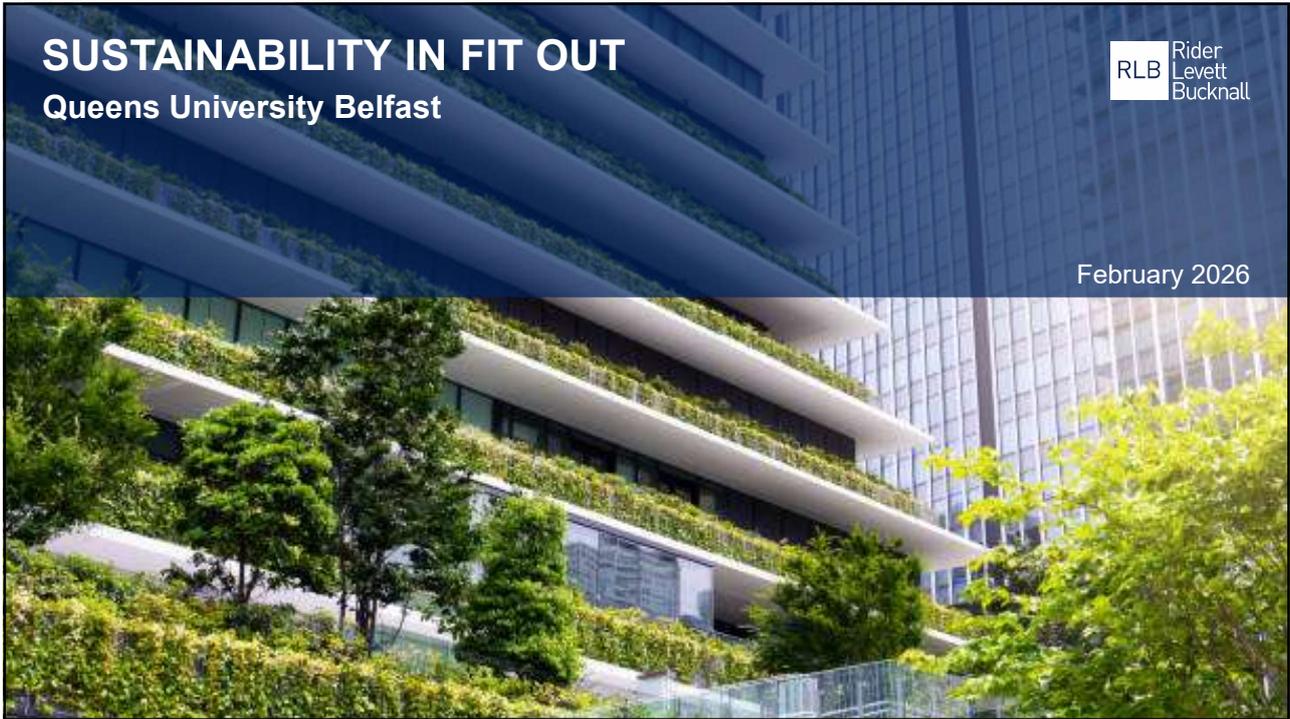
QUEEN'S  
UNIVERSITY  
BELFAST

**Heather Evans**

Rider Levett Bucknall (RLB)

**Good Practice Measures in Fit-out**

324



**SUSTAINABILITY IN FIT OUT**  
Queens University Belfast

RLB Rider  
Levett  
Bucknall

February 2026

325

**CONTEXT**

RLB Rider  
Levett  
Bucknall



**75%**  
of annual global greenhouse emissions come from the built environment, with buildings accounting for **37%**



**Around 50%**  
of emissions from new buildings will be from embodied sources, and half from operational sources, between **2020** and **2050**



**40-50%**  
of resources extracted for global materials are used for housing, construction and infrastructure



Building materials account for half the solid waste generated every year worldwide



**230 billion**  
square meters of new buildings will be constructed in the next **40** years



**75%**  
of the infrastructure needed by **2050** still needs to be built

326

## FIT OUT IMPACT



**5–7 years**

Typical fit out cycle

**20-35%**

Of annual UK emissions are from existing buildings

**80%**

of buildings will still exist in 2050

**50 - 75%**

Retrofitting can produce much less carbon than demolishing and rebuilding

### Key Challenges:

- High embodied carbon in materials and disposals
- Data and measurement gaps
- Financial and supply chain barriers

Rider Levett Bucknall

327

## FOCUSING ON: CARBON



### Embodied Carbon

Greenhouse gas emissions (GHG) from:

- **Materials** including extraction
- **Manufacturing** to create the product
- **Transportation** to ship to site
- **Construction** to build the project



### Operational Carbon

Carbon emitted by energy consumption of a building in operation. This includes:

- **Heating**
- **Cooling**
- **Lighting**
- **Power consumption**

GHG emissions are measured in CO<sub>2</sub>e

Rider Levett Bucknall

328

## WHY CARBON SO IMPORTANT?



Retrofitting avoids the upfront carbon of new construction.



Fit-out involves high-emission material groups: partitions, ceilings, flooring, paint/finishes, and furniture.



Existing building retrofit provides environmental, commercial, and social benefits, including:

- Lower operational carbon
- Significant embodied carbon savings
- Improved wellbeing and heritage protection



Embodied carbon accounts for a large share of total upfront emissions, especially in refurb projects.



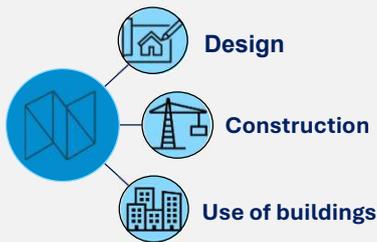
Many materials replaced during fit-out (e.g., ceilings, partitions) have short replacement cycles, increasing total lifecycle carbon.

Rider Levett Bucknall

329

## NET ZERO CARBON BUILDING STANDARD

The Standard's scope covers the following areas:



Targets are set for:



On-site renewable electricity generation

Limits are set for:

Upfront carbon limits



Operational Energy



Fossil Fuel Free



District Heating and Cooling Networks



Heating Delivered



Refrigerants



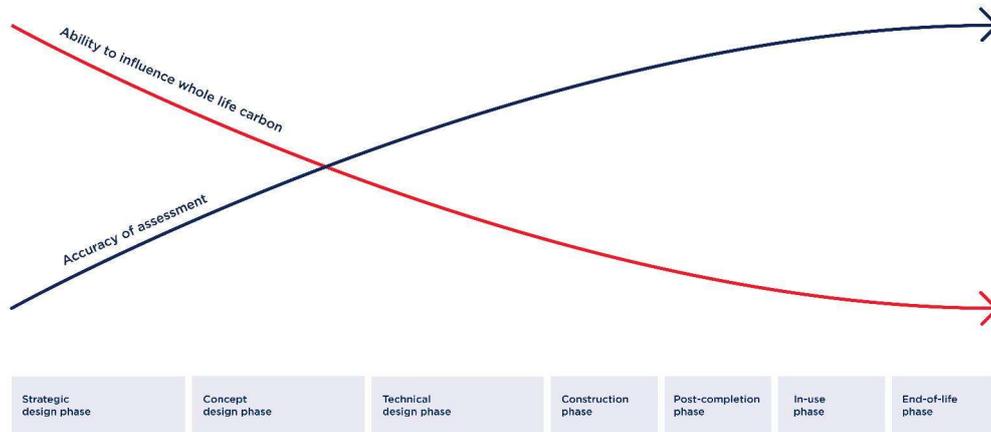
Reporting requirements are for:

- Life Cycle Embodied Carbon
- Operational Water Use
- Electricity Demand
- Heating and Cooling delivered to the building

Rider Levett Bucknall

330

## CARBON: WHEN?



331

## CERTIFICATIONS: WHY?



- Provides a structured framework for delivering low-carbon, healthy, high-performing interior environments.
- Recognises best practice in circularity, material selection, wellbeing, and operational efficiency.
- Helps communicate performance to investors, tenants and stakeholders.

332

## CERTIFICATIONS: WHICH?



**SKA Rating**  
Commercial, retail, and higher-education

Assesses materials, waste, energy, wellbeing, and procurement.

No whole-building requirement.



**BREEAM RFO**  
Tailored to existing buildings undergoing refurbishment or interior upgrade.

Covers energy, water, materials, waste, pollution, health & wellbeing. Aligns with whole-life carbon and resource efficiency priorities.



**WELL**  
Focused on health, comfort, and wellbeing of building occupants.

Highly relevant for refurbishments where the aim is to improve indoor air quality, lighting, acoustics, thermal comfort and mental wellbeing.

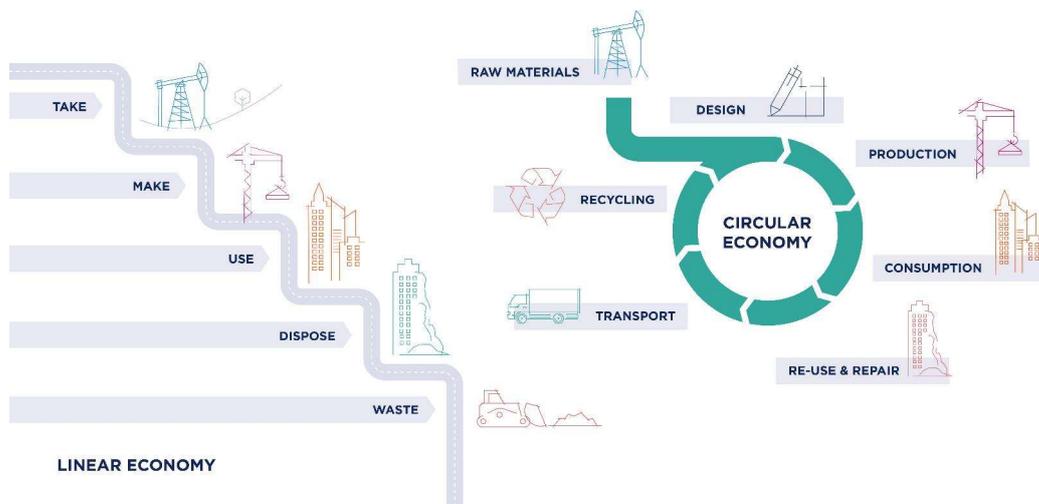


**UK NZC Building Standard**  
Provides science-led embodied and operational carbon limits for new and existing buildings.

Helps align refurbishment with UK climate pathways.

333

## WHAT IS CIRCULAR ECONOMY?



334

## CIRCULARITY: WHY?



 Retain > Reuse > Refurbish > Replace

 Every m<sup>2</sup> retained avoids new emissions.

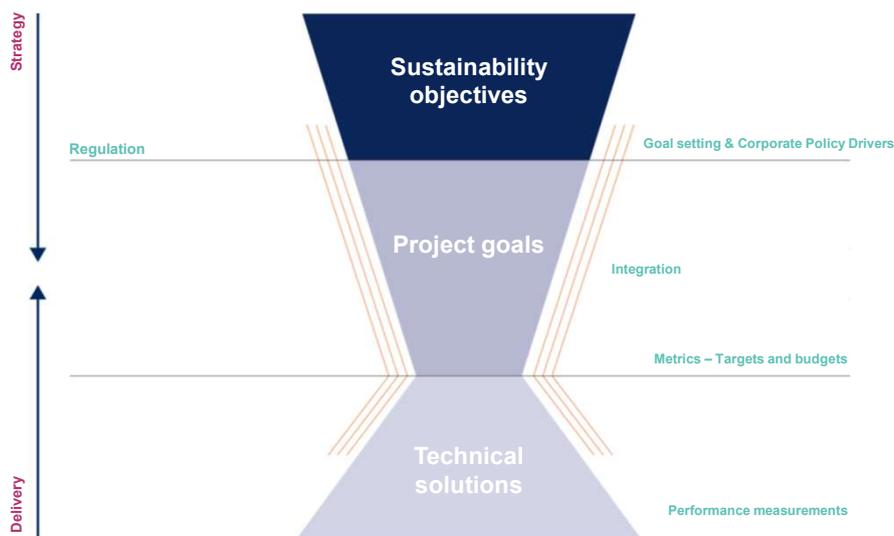
 Reuse strategies can reduce embodied carbon by 20–70% depending on scope (industry range).

 Circular procurement (furniture, raised floors, lighting) reduces costs and carbon simultaneously.

Rider Levett Bucknall

335

## CREATING SOLUTIONS



Rider Levett Bucknall

336

## INTEGRATING SUSTAINABILITY INTO DECISION MAKING



337

## GOOD PRACTICE CHECKLIST

### Design phase

- Set targets early to maximise impact.
- Conduct WLCA and material hotspot analysis.

### Procurement

- Prioritise reused and recycled content.
- Select suppliers with circular take-back schemes.

### Execution

- Track waste streams and recovery rates.
- Implement low-VOC and wellbeing-led specifications.

### Operation

- Ensure systems commissioning and controls optimisation.
- Maintain materials passports for future cycles.



338

## BRINGING IT ALL TOGETHER



Fit-out is one of the fastest pathways to reduce carbon in existing buildings.



With 72–80% of 2050 stock already built, refurbishment—not rebuild—must be the default.



The combination of certifications (e.g. SKA, BREEAM) with embodied carbon guidance (RICS & NZCBS) provides a robust, practical roadmap.

Rider Levett Bucknall