

**The new world  
of Net Zero Carbon.  
Embodied carbon &  
climate conscious  
construction.**

TOM SPURRIER, TOM SMITH

DESIGN, UNLEASHED



# Welcome.

## Net zero carbon.

## Embodied carbon & climate conscious construction.



Facilitator  
**Andrew Bullmore**  
Partner



Presenter  
**Tom Spurrier**  
Associate Director



Presenter  
**Thomas Smith**  
Associate

**Talking:**

▼ Questions

Type question here.

Any questions?  
Use the panel provided.

# The new world of Net Zero Carbon. Virtual event series programme.

## Tuesday 4 August

09.30 Making it possible: the Net Zero Carbon challenge & opportunity

## Thursday 6 August

09.30 New development, new approach

## Tuesday 11 August

09.30 Existing stock: delivering the transformation

## Thursday 13 August

09.30 Embodied carbon & climate-conscious construction

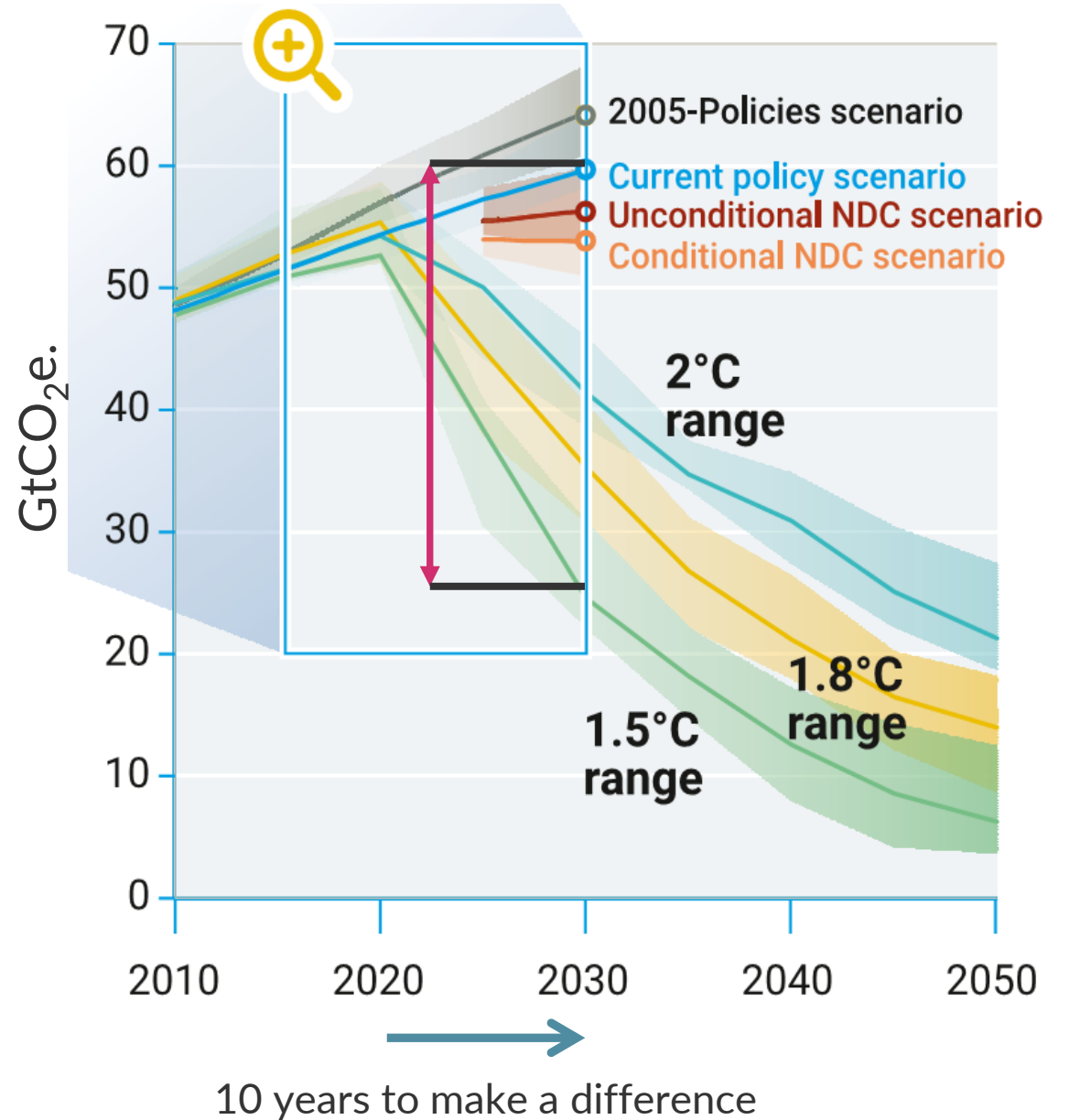
## Tuesday 18 August

09.30 Keeping track: governance & management

# Paths to net zero. The global challenge.

- Globally, most countries have declared nationally determined contributions (NDCs) to plan reductions in carbon emissions.
- The UN has identified that we need more policy commitments to limit climate change to 1.5°C (Paris Agreement target, set in 2015).
- There is a significant opportunity for business to demonstrate leadership.

Source: UN Emissions Gap Report, 2019





**The floor area of the world's buildings is projected to double in the next 40 years.**

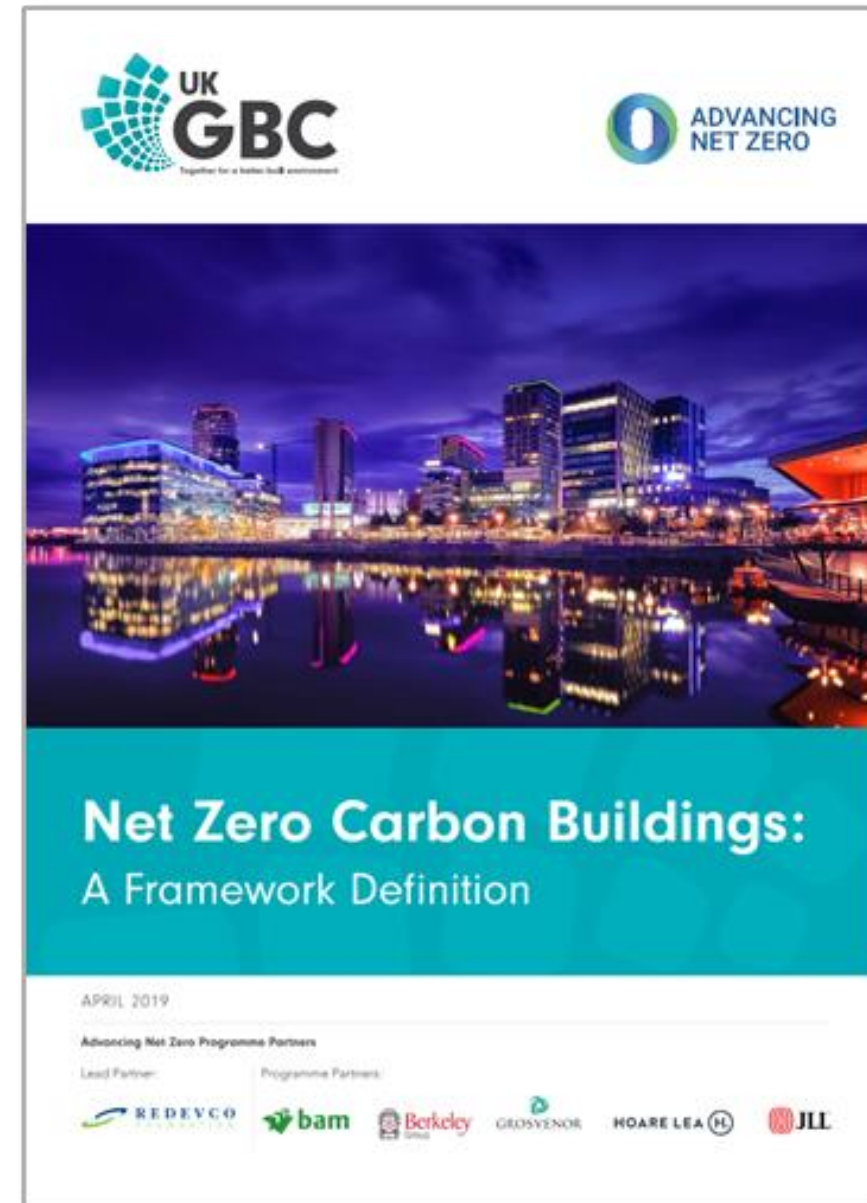




# UK-GBC. Advancing Net Zero.

- Hoare Lea are sponsors and steering group partners for the UK-GBC Advancing Net Zero programme.
- Advocating all **new buildings** to be net zero carbon in operation by 2030 and with an aim to significantly reduce embodied carbon emissions.

<https://www.ukgbc.org/ukgbc-work/advancing-net-zero/>



# What is zero carbon development?

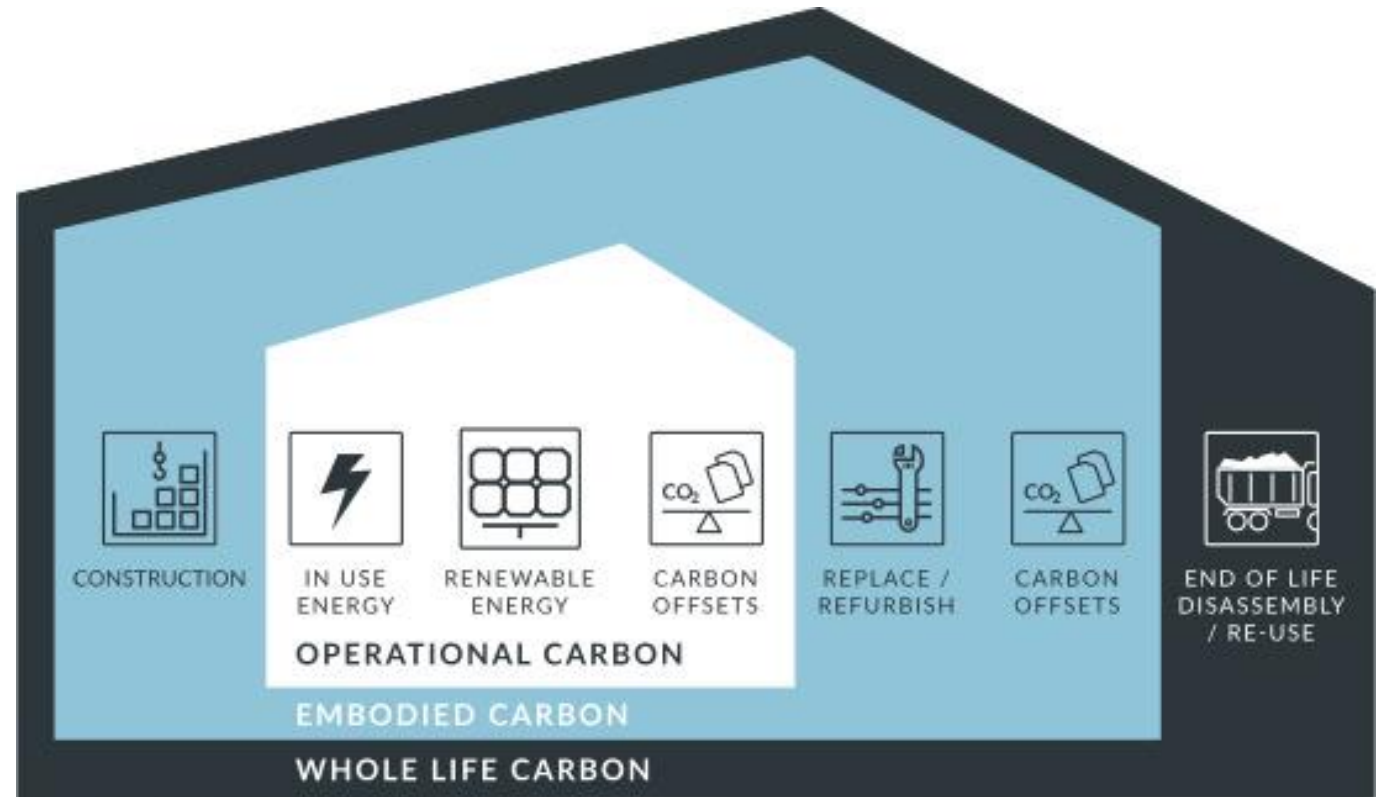
## Defining the scope.

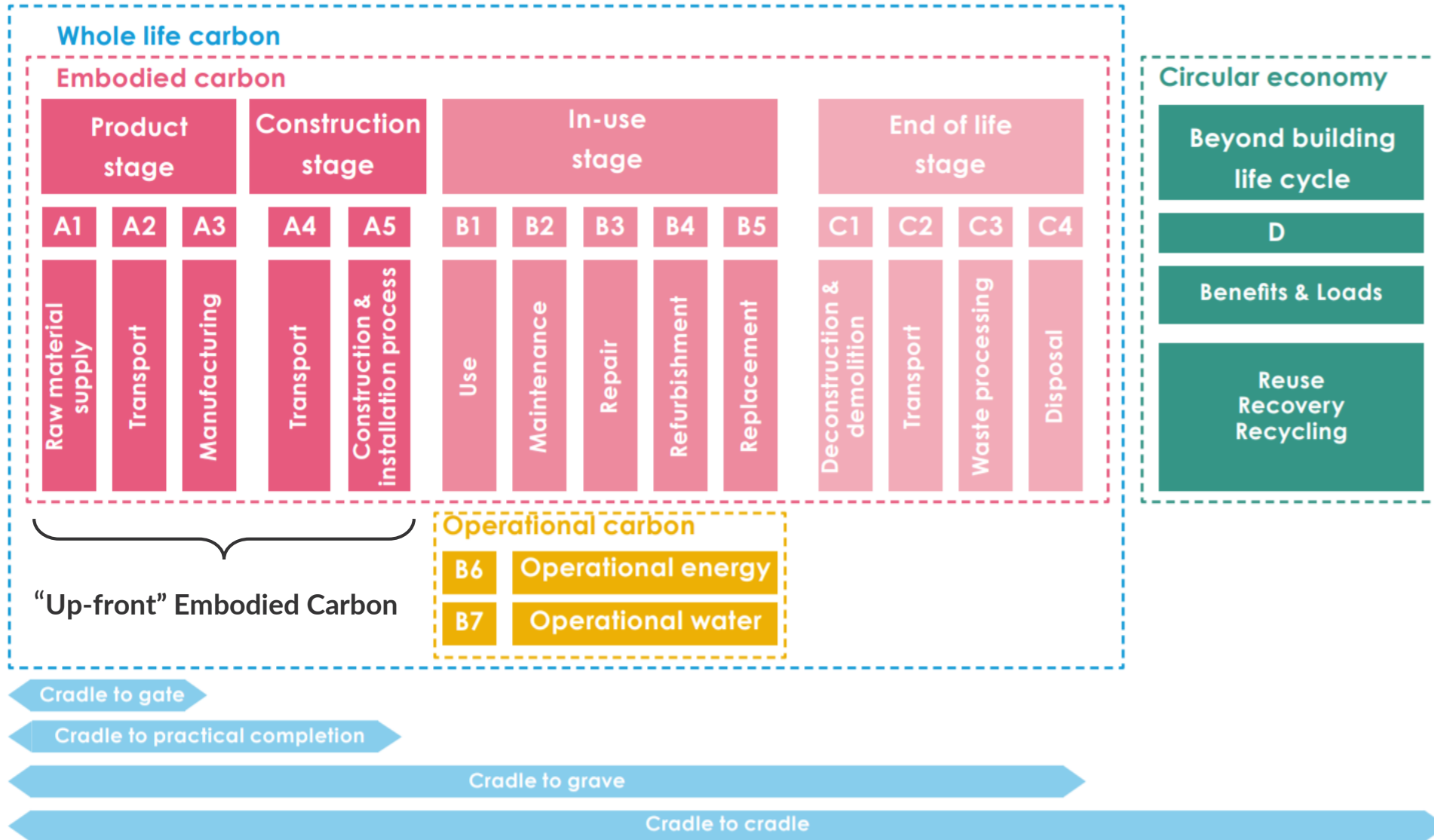
UK-GBC framework defines two potential targets for net zero carbon:

- Net zero carbon in construction (embodied)
- Net zero carbon in operation

Whole Life Carbon includes embodied and operational carbon emissions.

- Remaining carbon emissions to be offset.



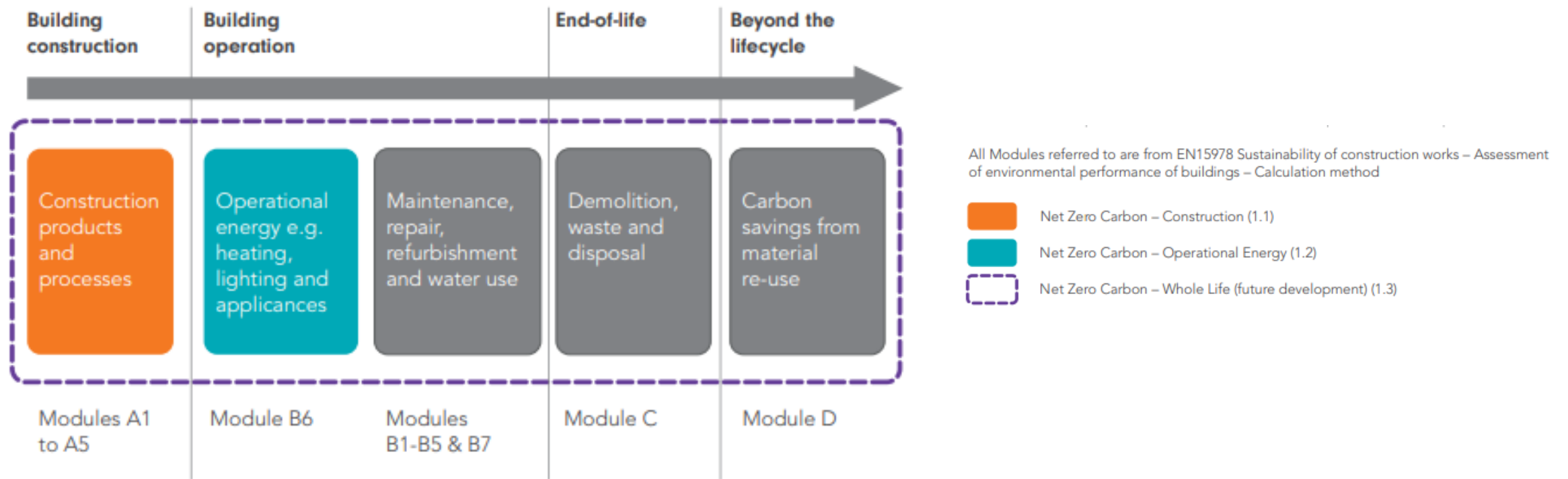




# Embodied Carbon.

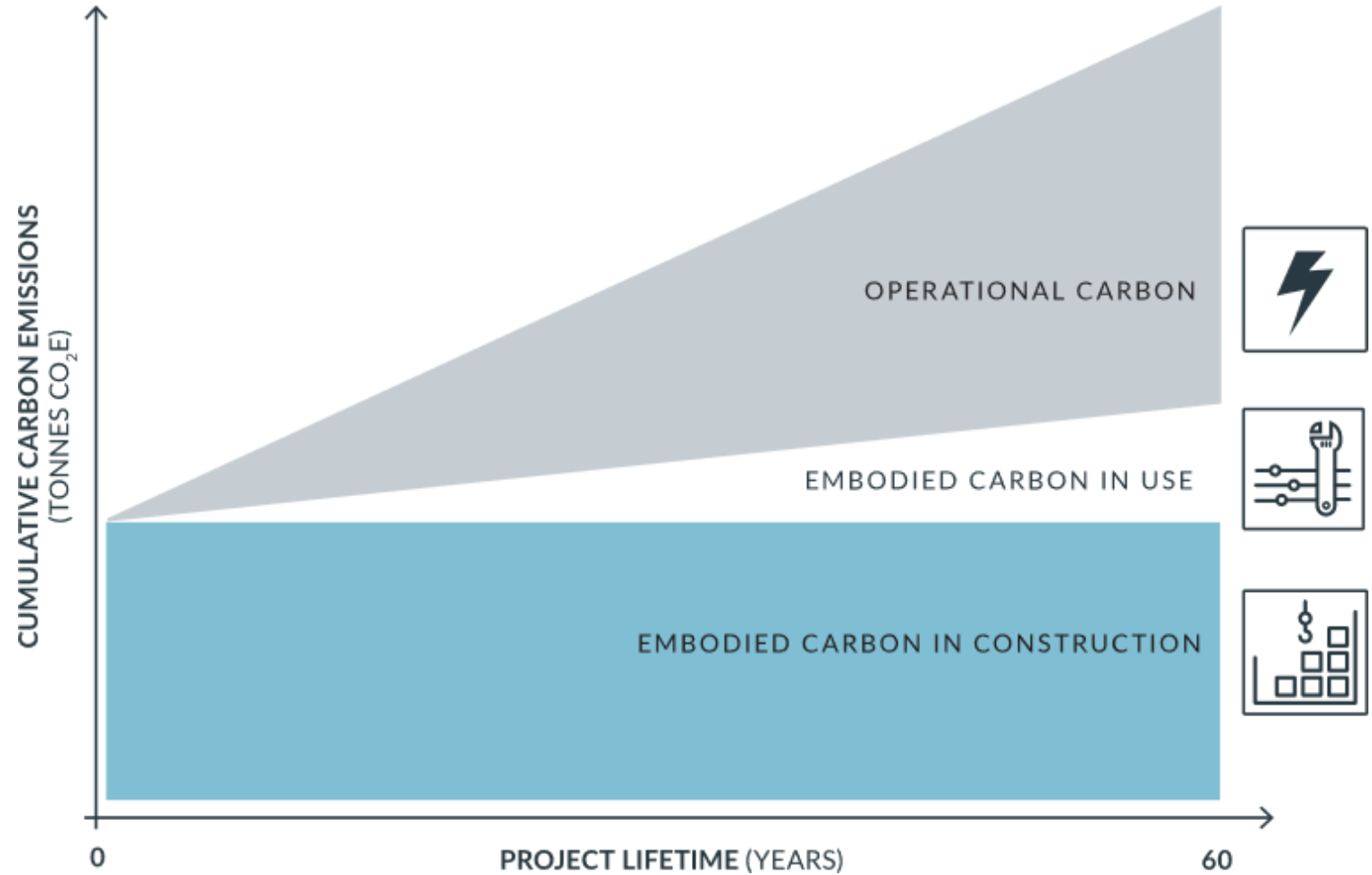
## 'Embodied' UK-GBC Definition

### Breakdown of three net zero carbon scopes



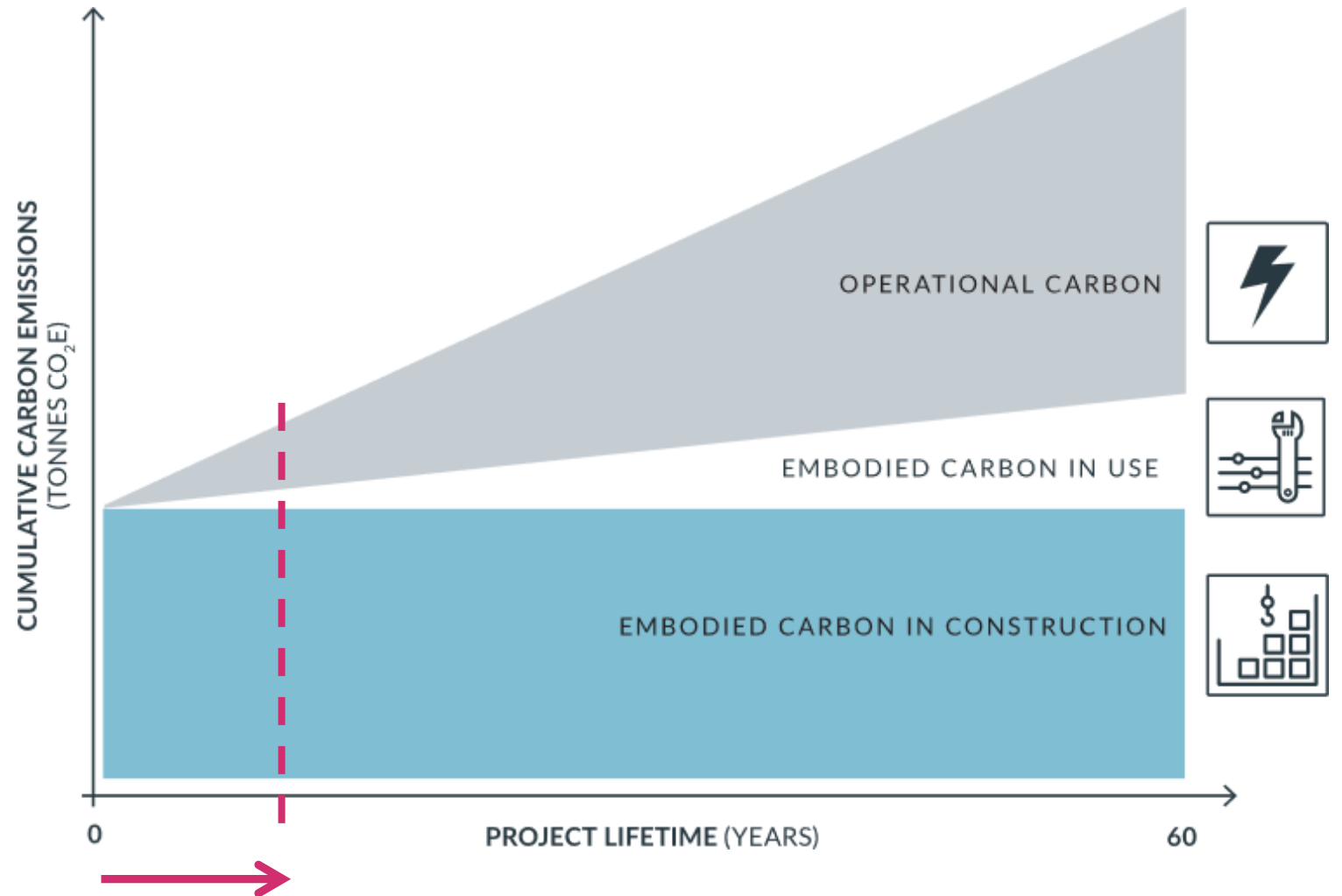
# Net Zero Carbon. Whole life assessment.

Cumulative carbon emissions.  
Typical 60-year whole life assessment.



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Cumulative carbon emissions.  
Typical 60-year whole life assessment.



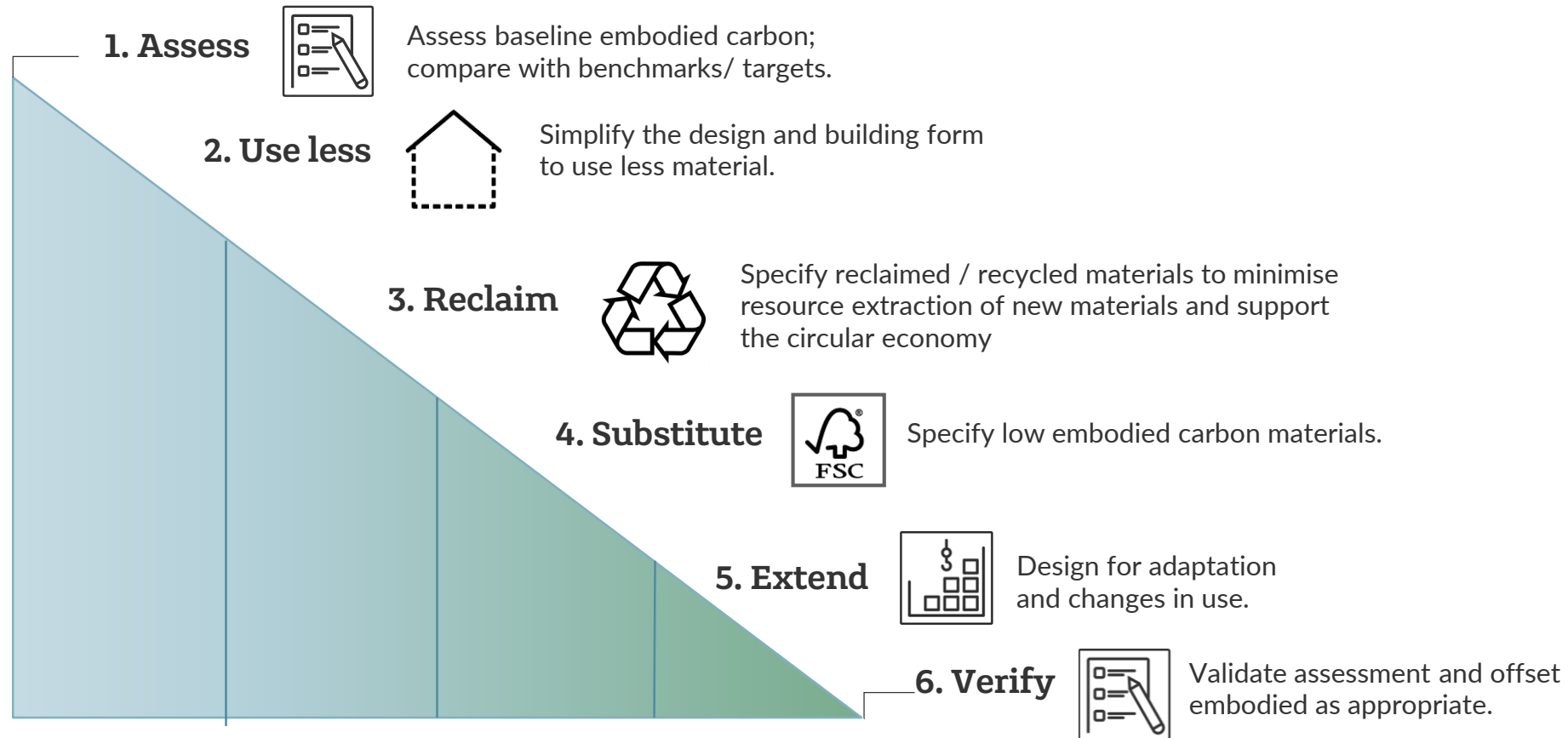
10 years to make a difference

**~50% of building life-cycle carbon emissions  
are incurred by Day 1 of operation.**



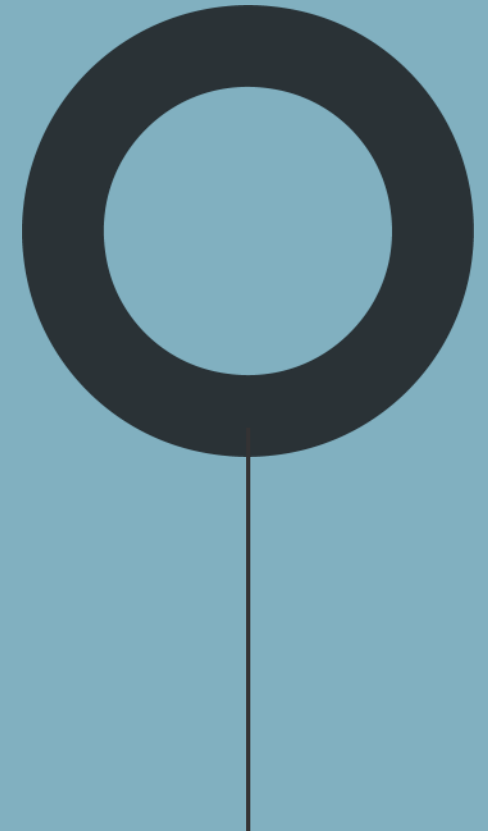


# Path to Net Zero – Embodied Carbon



# 1. Assess

Assess baseline embodied carbon;  
compare with benchmarks/ targets.



# Data Sources.

## EPDs.

- Environmental Product Declarations (EPDs)
- Third party certifications that identify the impact of the manufacture of a product against a number of metrics.
- Governed by EN 15804
- The main metric for embodied carbon is Global Warming Potential ( $\text{kgCO}_{2e}$ )
- Usually measured over 60 years.



### ENVIRONMENTAL PRODUCT DECLARATION

*In accordance with EN 15804 and ISO 14025*

**SGG PLANICLEAR<sup>®</sup>**

**2 mm - 19 mm**

**Clear float glass**

Date of issue: 15-09-2016

Version: V.01

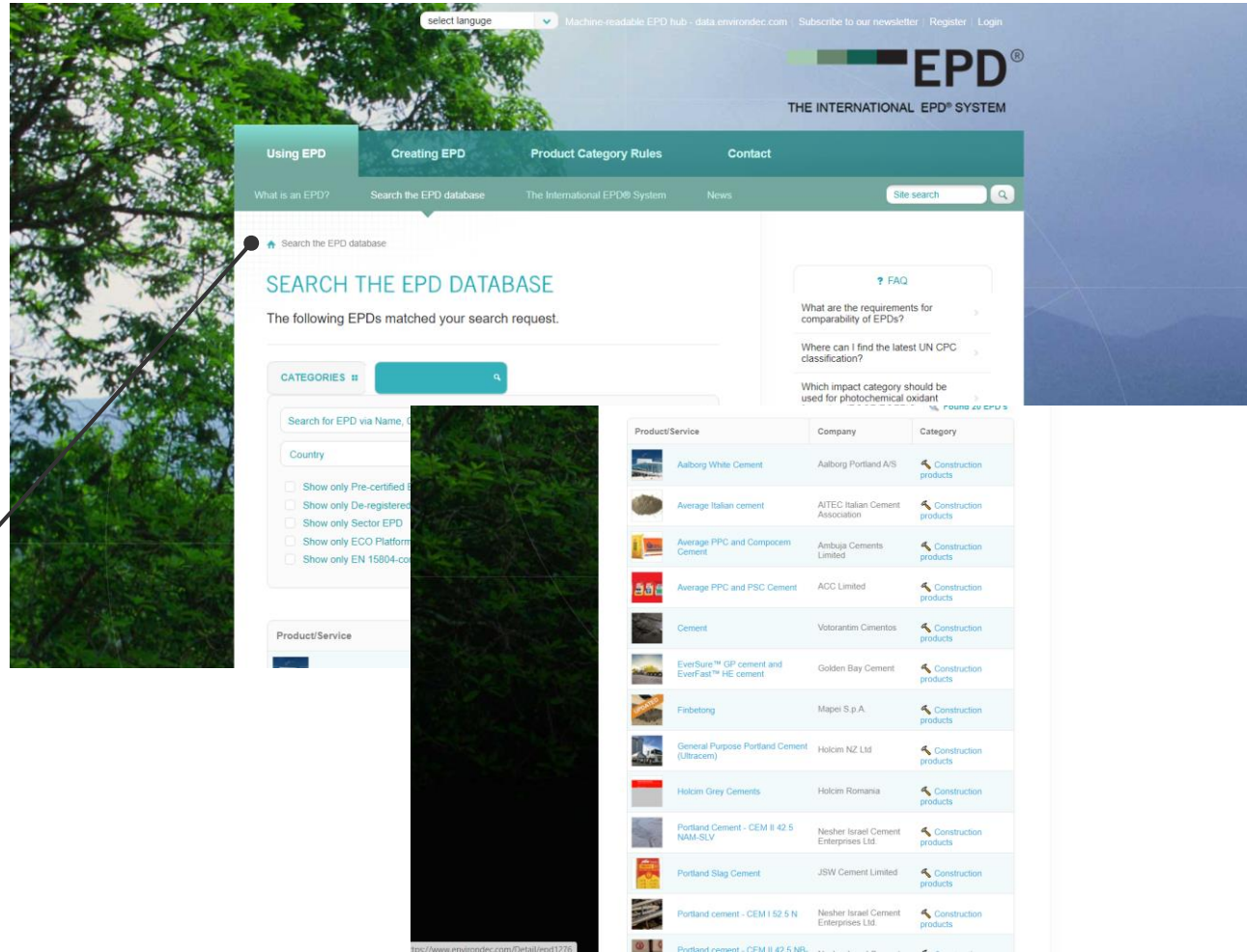
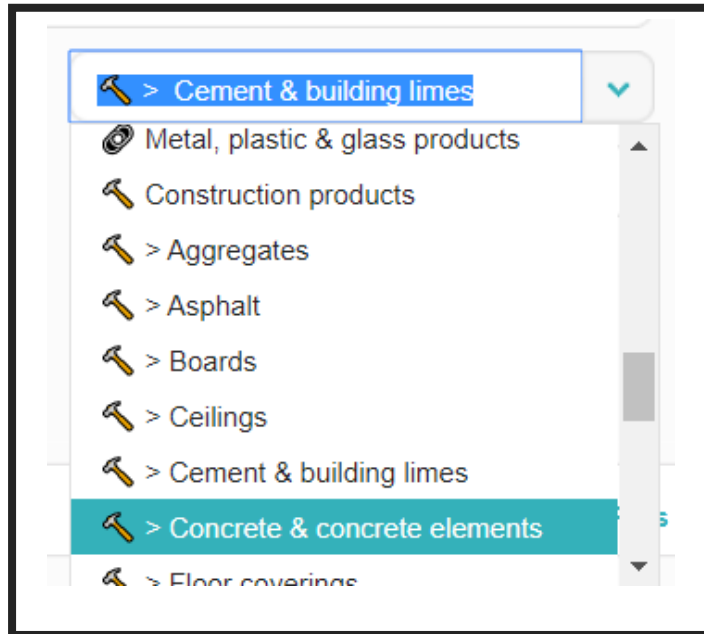


VERIFICATION

S-P 00882



# Data Quality. EPD Databases.



Extensive databases available, but omissions and gaps in data. Particularly where MEP services are concerned.




# RIBA 2030 Climate Challenge.


RIBA 2030 Climate Challenge target metrics for domestic buildings

RIBA Sustainable Outcome Metrics	Current Benchmarks	2020 Targets	2025 Targets	2030 Targets
Operational Energy kWh/m <sup>2</sup> /y 	146 kWh/m <sup>2</sup> /y (Ofgem benchmark)	< 105 kWh/m <sup>2</sup> /y	< 70 kWh/m <sup>2</sup> /y	< 0 to 35 kWh/m <sup>2</sup> /y
Embodied Carbon kgCO <sub>2</sub> e/m <sup>2</sup> 	1000 kgCO <sub>2</sub> e/m <sup>2</sup> (M4i benchmark)	< 600 kgCO <sub>2</sub> e/m <sup>2</sup>	< 450 kgCO <sub>2</sub> e/m <sup>2</sup>	< 300 kgCO <sub>2</sub> e/m <sup>2</sup>


RIBA 2030 Climate Challenge target metrics for non-domestic buildings

RIBA Sustainable Outcome Metrics	Current Benchmarks	2020 Targets	2025 Targets	2030 Targets
Operational Energy kWh/m <sup>2</sup> /y 	225 kWh/m <sup>2</sup> /y DEC D rated (CIBSE TM46 benchmark)	< 170 kWh/m <sup>2</sup> /y DEC C rating	< 110 kWh/m <sup>2</sup> /y DEC B rating	< 0 to 55 kWh/m <sup>2</sup> /y DEC A rating
Embodied Carbon kgCO <sub>2</sub> e/m <sup>2</sup> 	1100 kgCO <sub>2</sub> e/m <sup>2</sup> (M4i benchmark)	< 800 kgCO <sub>2</sub> e/m <sup>2</sup>	< 650 kgCO <sub>2</sub> e/m <sup>2</sup>	< 500 kgCO <sub>2</sub> e/m <sup>2</sup>

RIBA  
2030  
CLIMATE  
CHALLENGE



Sign up to take the RIBA 2030 Climate Challenge at [www.architecture.com/2030challenge](http://www.architecture.com/2030challenge)

RIBA   
Architecture.com

# LETI Design Guidance.

'Business as usual'

2020 target 40% reduction over baseline



## LETI Embodied Carbon Primer

Supplementary guidance to the Climate Emergency Design Guide

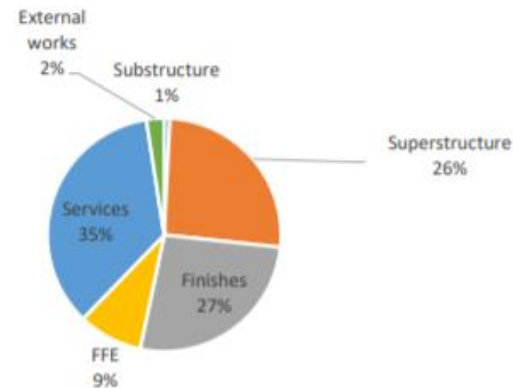
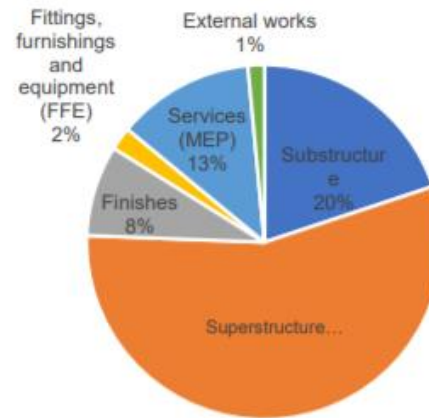


LONDON ENERGY TRANSFORMATION INITIATIVE

# GLA WLC Guidance.

WLC benchmarks (excluding modules B6, B7 and D)

OFFICES	WLC benchmark	Aspirational WLC benchmark
Modules A1-A5	900 to 1000 kg CO <sub>2</sub> e/m <sup>2</sup> GIA	550 to 600 kg CO <sub>2</sub> e/m <sup>2</sup> GIA
Modules B – C (excluding B6 & B7)	400 to 500 kg CO <sub>2</sub> e/m <sup>2</sup> GIA	250 to 300 kg CO <sub>2</sub> e/m <sup>2</sup> GIA

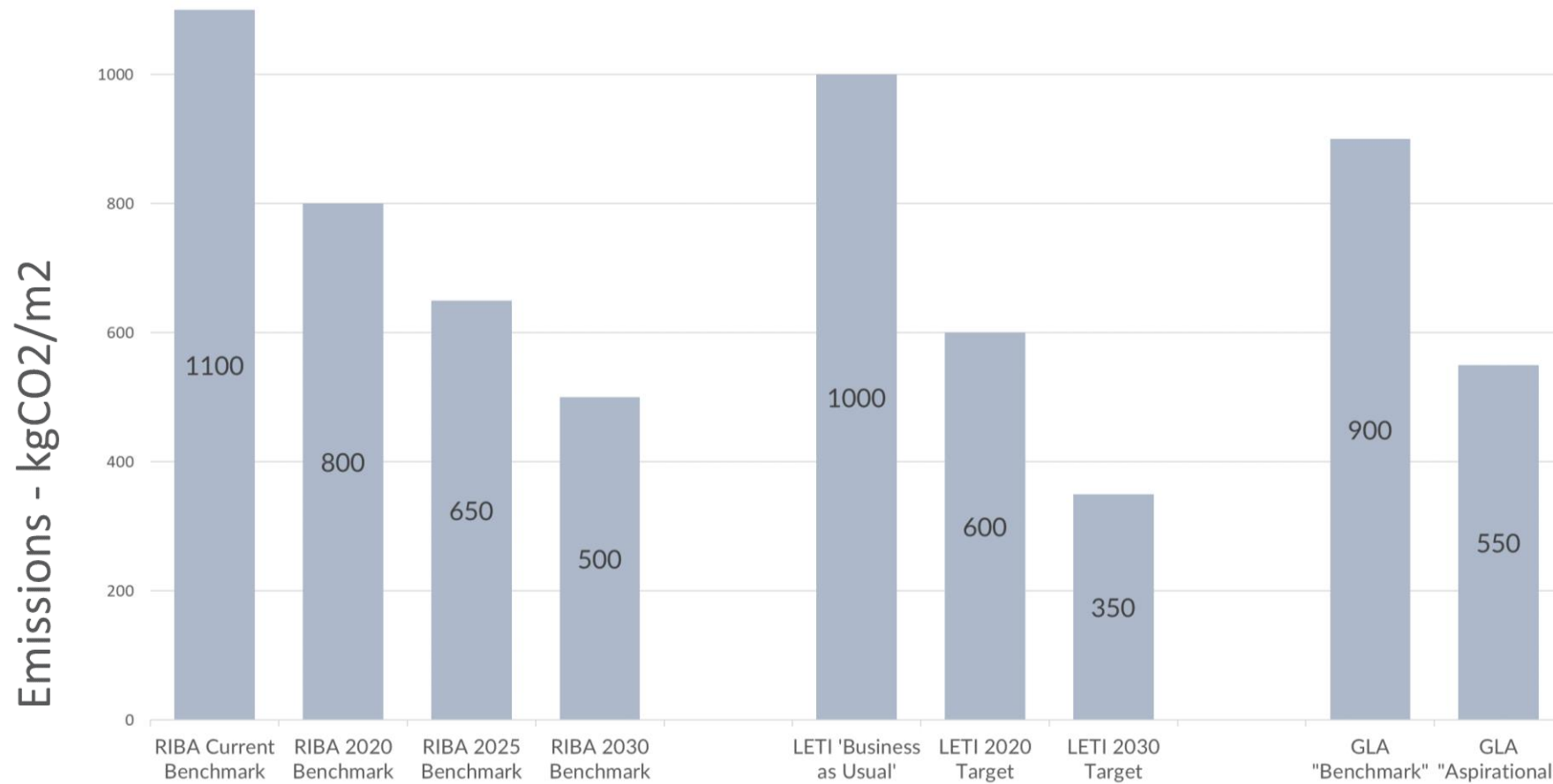


MAYOR OF LONDON

Whole Life-Cycle Carbon Assessments guidance

Pre-consultation draft

# Embodied Carbon. Benchmarks.

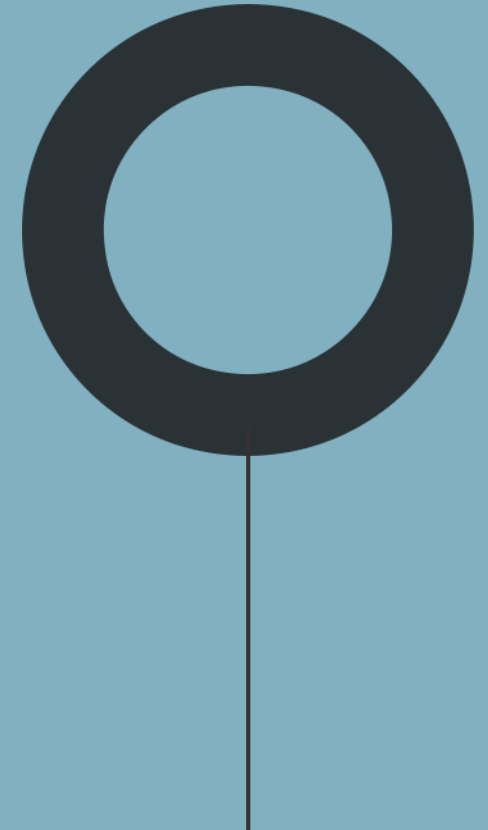


Offices



## 2. Use Less

Simplify the design and building form to use less material.

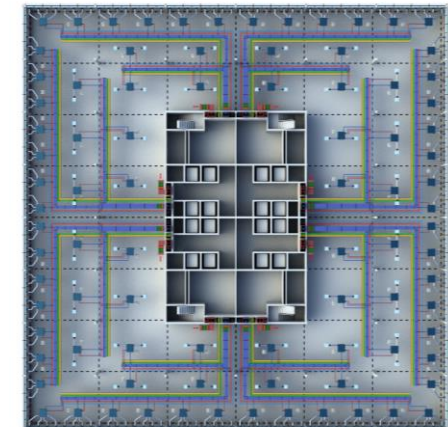
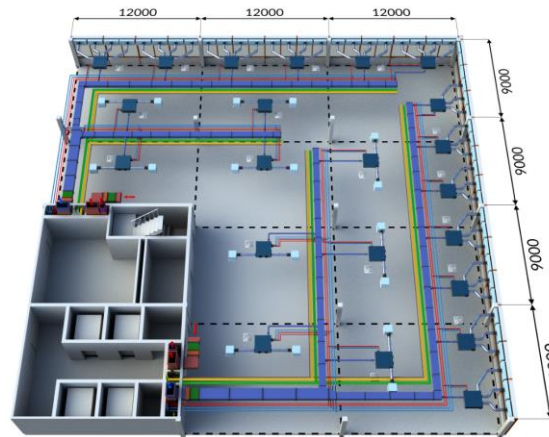
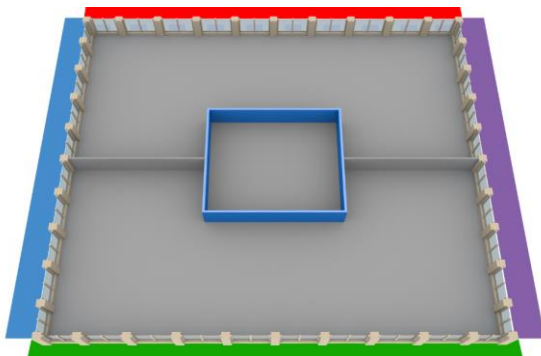
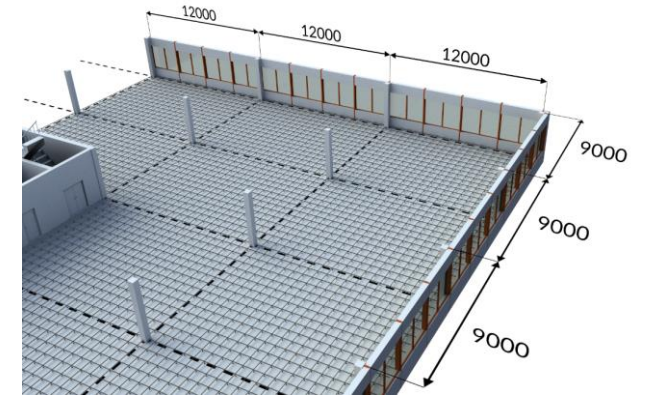
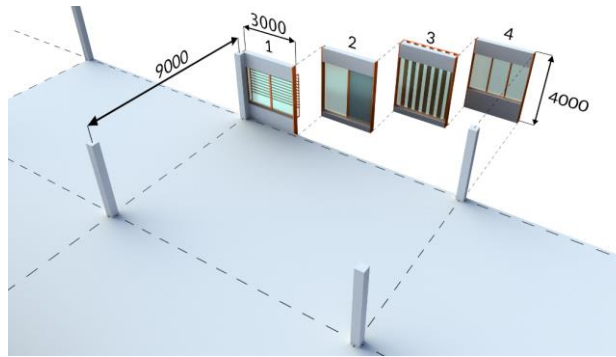
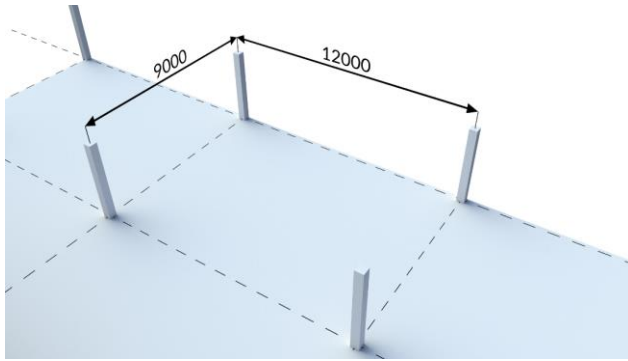


**400m tonnes of material consumed by built environment sector in UK each year.**



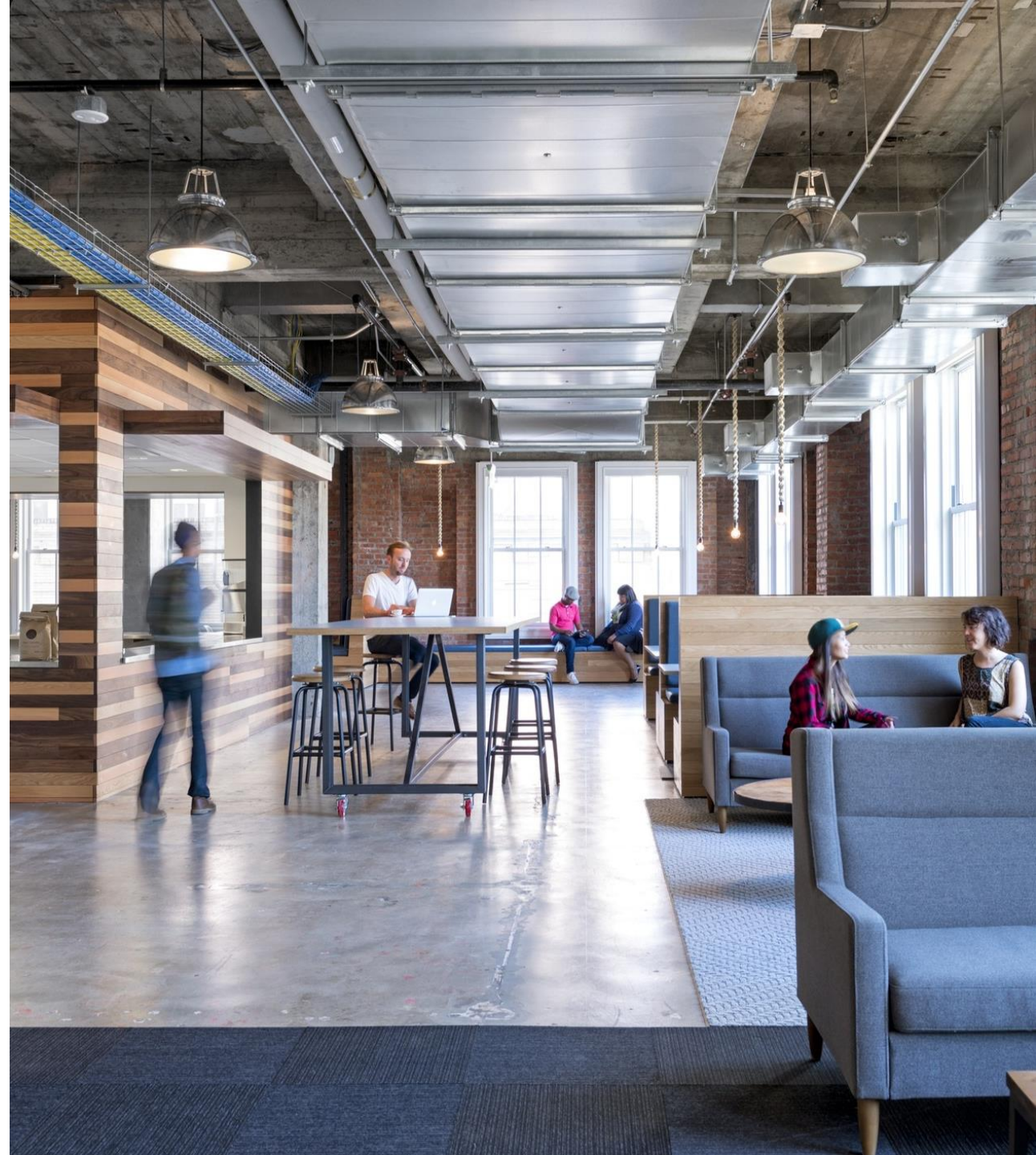


# Modular / Design for Manufacture (DfMA).



# Using Less. Lean Design.

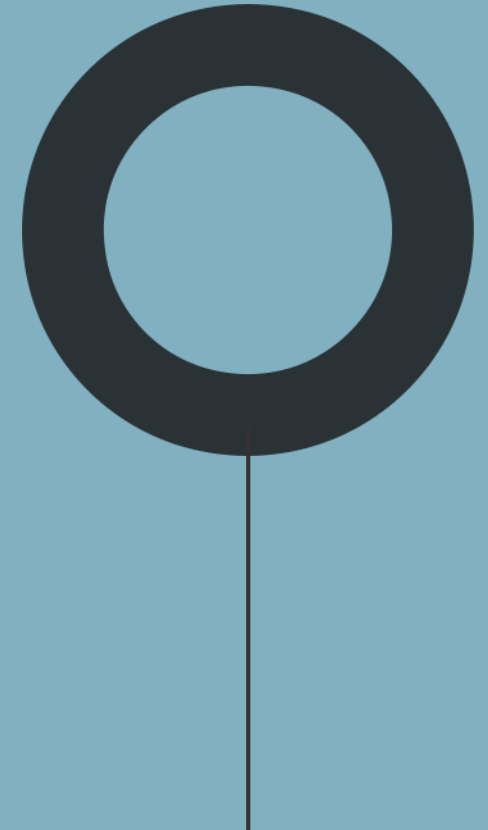
- Fewer internal finishes
- Fewer ceilings & floors
- Robust materials





## 3. Reclaim

Specify reclaimed / recycled materials to minimise resource extraction of new materials and support the circular economy

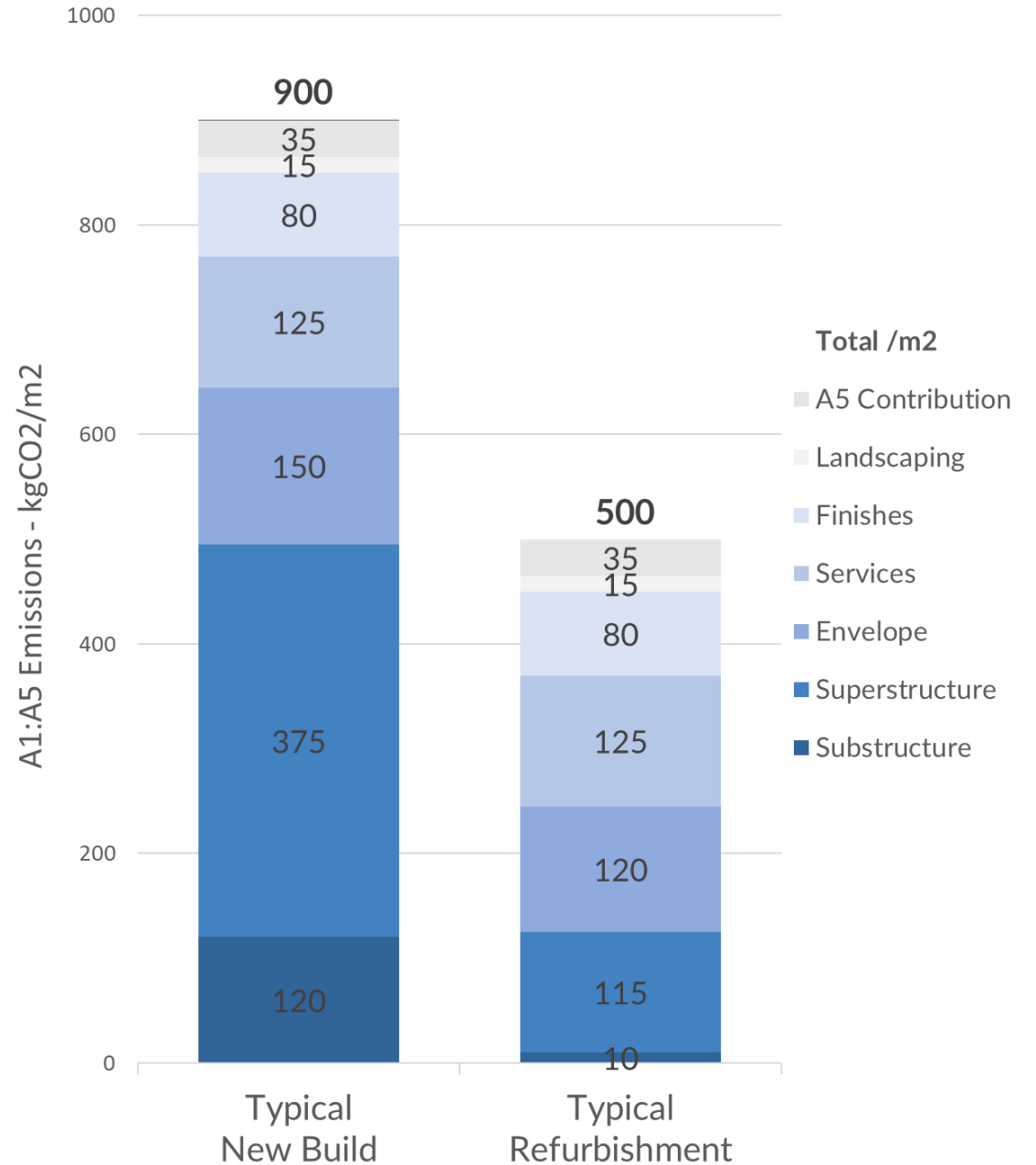


# Re-use existing assets



# Embodied Carbon. Typical Office.

- Superstructure and substructure are the predominant elements
- Typically with high masses of concrete & steel.





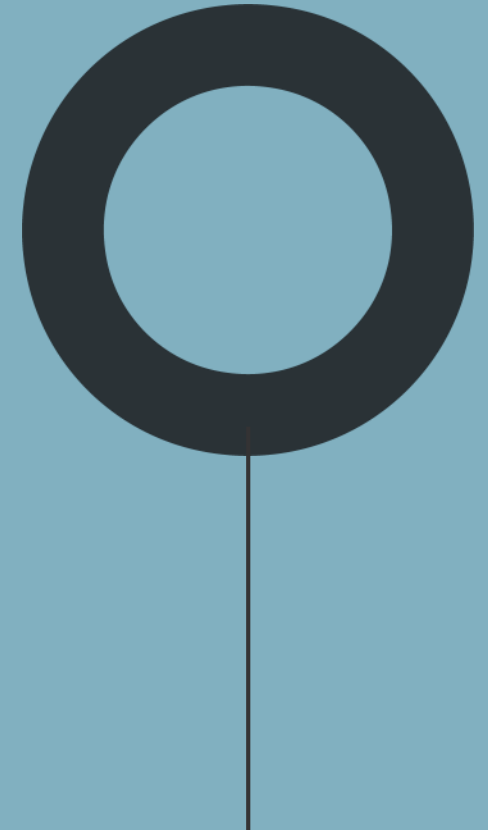


**Recycled raised access floors.**

**75% less embodied carbon** compared to new.

## 4. Substitute

Specify low embodied carbon materials.







**If cement production was a country it would be the world's 3<sup>rd</sup> largest carbon emitter, accounting for around 8% of global CO<sub>2</sub> emissions.**



# Mjøstårnet.

## Brumunddal, Norway.

- “Massive Timber” construction
- Glue-laminated (Glulam) structure
- Cross-Laminated Timber (CLT) slabs and lift shafts
- Some concrete slabs to provide lateral stability against wind loads (due to building form / height)





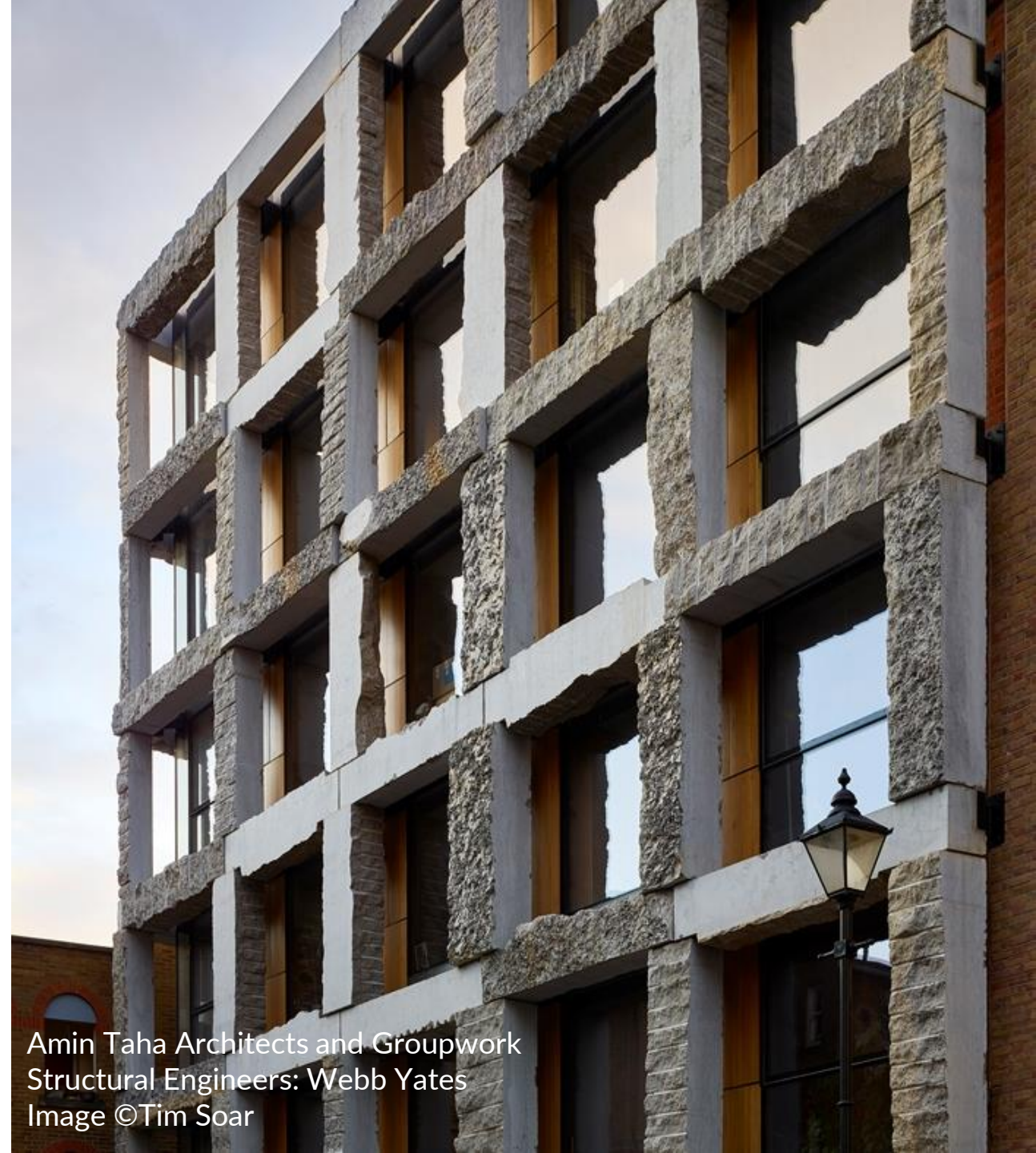


- Prefabricated offsite manufacture
- Structural connections onsite
- Fire strategy

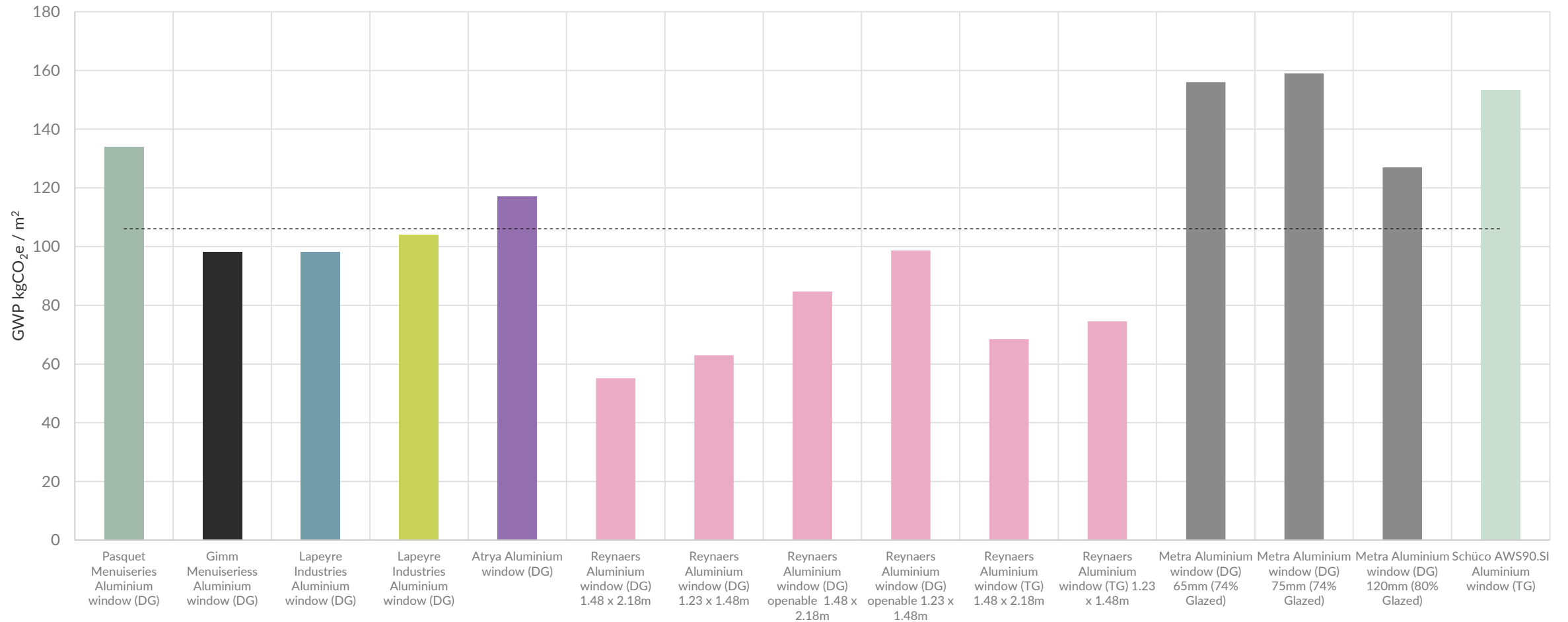


# 15 Clerkenwell Close. London.

- Limestone structural columns and beams
- Structurally connected to the building envelope
- Variety of finishes: smooth, rough, drilled, straight from the quarry



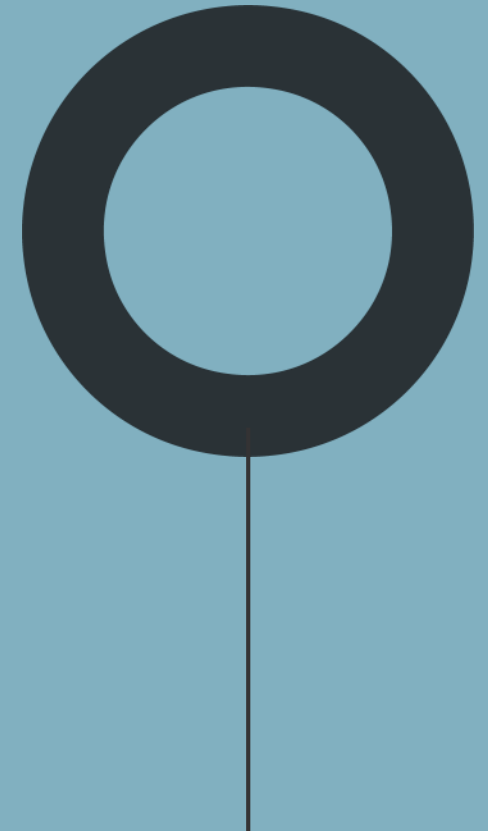
# Product EPD Variation.





## 5. Extend

Design for adaptation and changes in use.

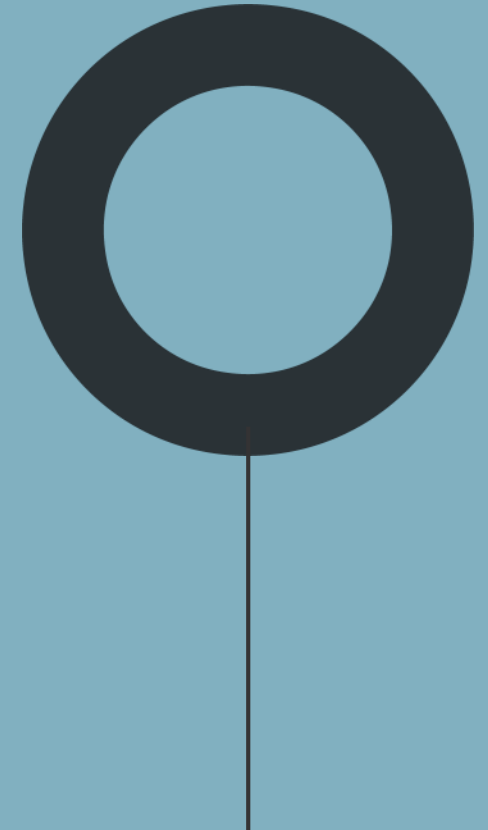




**Low carbon adaptation / change of use.**

## 6. Verify

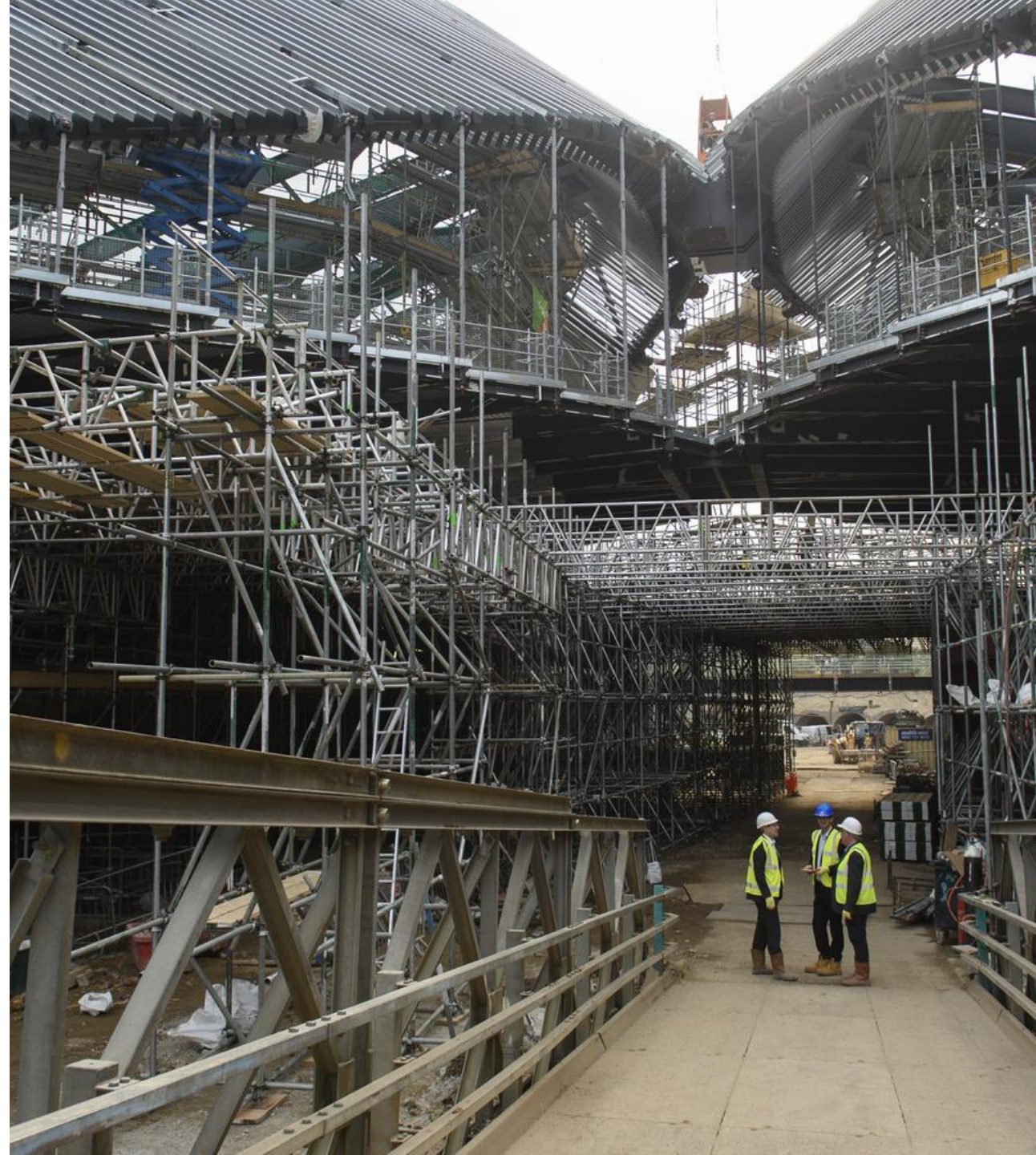
Validate assessment and offset embodied carbon.





# As Built. Verification.

- Design stage carbon analysis updated based on “As Built” data
- Robust verification processes
- Minimum level of transparent reporting
- Public disclosure





**Thank you.**  
**hoarelea.com**



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**Andrew Bullmore**  
Partner



Presenter  
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**Thomas Smith**  
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