

# Updated RICS Whole Life Carbon Assessment Standard

What's New?







**Independent 3rd party verification** 

**Consistent carbon reporting** 

Life Cycle Carbon Assessment foundation training

hello@constructioncarbon.com



# Training QR Code









# Agenda

Introduction

Simon Sturgis on Standard Updates

Panel Discussion

Q&A

Drinks/ Networking





# **Simon Sturgis**

Founder, Targeting Zero LLP

Lead Author, RICS Professional Standard





**RICS Whole Life** Carbon **Professional Standard** 2023



Whole life carbon assessment for the built environment

Global

2nd edition, September 2023

Effective from 1 July 2024



# **Authorship Team**



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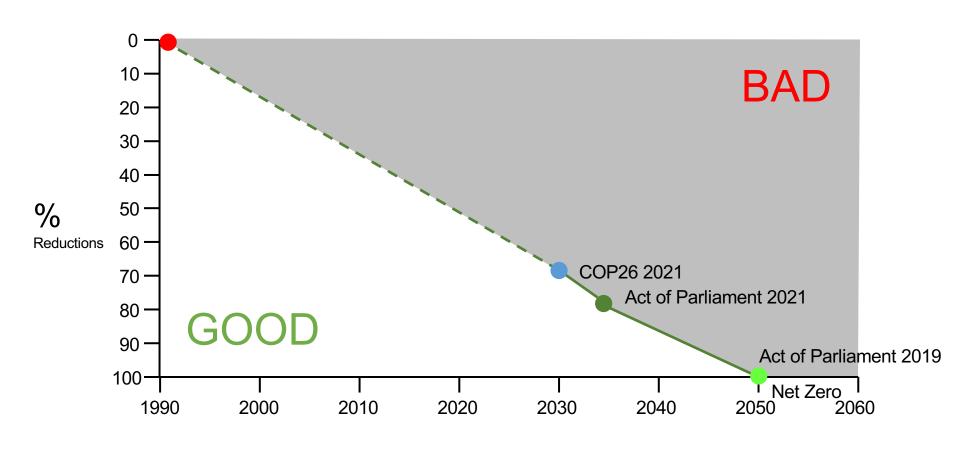




- Net Zero by 2050
- 78% reductions by 2035
- 68% reductions by 2030

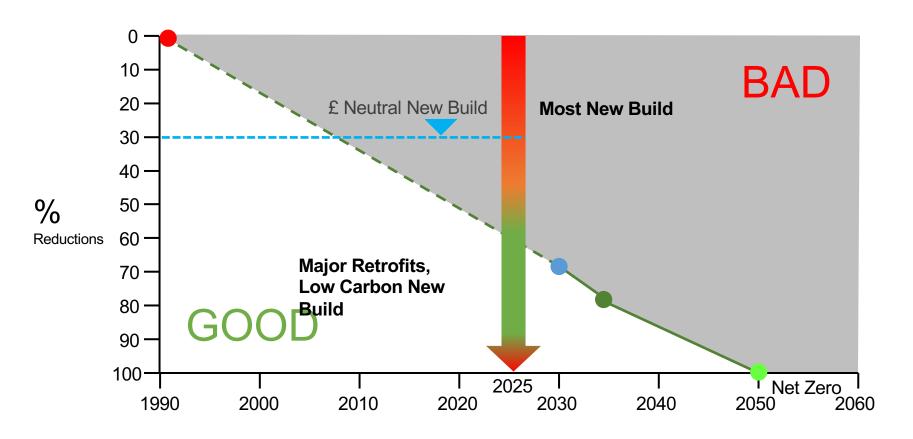
# **Trajectory to Net Zero**





# **Trajectory to Net Zero**





#### **New Scope - Context**





House of Commons
Environmental Audit Committee

# Building to net zero: costing carbon in construction

First Report of Session 2022-23

Report, together with formal minutes relating to the report

Ordered by the House of Commons to be printed 11 May 2022

- Mandatory WLC Assessment
- Stepped Targets to Net Zero
- Planning and Building Regs
- All Govt Projects WLC Assessments

HC 103 Published on 26 May 2022 by authority of the House of Commons

#### **International ISO and PAS Standards**

BS EN ISO 14040 (2006) Environmental management – Life Cycle Assessment – Principles and Framework (International)

BS EN ISO 14044 (2006) Environmental management - Life Cycle Assessment - Requirements and Guidelines (International)

ISO 21930 (2017) Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services (International)

BS ISO 201931-1 (2010) Sustainability in building construction — Framework for methods of assessment of the environmental performance of construction works (International).

PAS 2050: 2011. Specification for the assessment of the life cycle greenhouse gas emissions of goods and services.

PAS 2080: 2023. Global standard for ming infrastructure carbon.

#### **British Standards**

**BS EN 15978**: 2011:

Sustainability of Construction Works, The Environmental Performance of Buildings



#### BS EN 17472: 2022:

Sustainability of Construction Works, The Environmental Performance Civil Engineering Works



**Data and Method** 

#### BS EN 15804:

2012 +A2: 2019: Sustainability of Construction Works, Environmental Product

Declarations



#### **Methodology**

# RICS Professional Statement:

Whole Life Carbon Assessment for the Built Environment - 2017



Part Z

**D** 

#### Part Z?:

Proposal for new regulation

#### **New Scope - Context**

#### **UK Professional Guidance** (in accordance with RICS Professional Statement\*)

RIBA\*

Embodied and

assessment for architects

whole life carbon



RIBA\*

RIBA #4









**HMG** 









#### **Environmental Performance**

**BREEAM 2018** 



#### **Data and Tools**

**Data Sheets: Environmental Product Declarations (EPD's)** 

Data Bases: GaBi, Ecoinvent, BRE, Bath ICE etc.

**Software Tools:** eTool\*, OneClick\*,

EccoLab\*,

H-Bert\*, FCBS Tool\*

**Planning Requirements** 

**GLA Policy SI2** Whole Life Carbon\*



**GLA Policy SI7 Circular Economy** 



# **New Expanded Scope**



- Infrastructure
- Housing and Mixed-Use Schemes
- Retrofit and Fitout
- ICMS 3
- Contingency
- Carbon Definitions
- International Application
- Early Strategic Decision Making

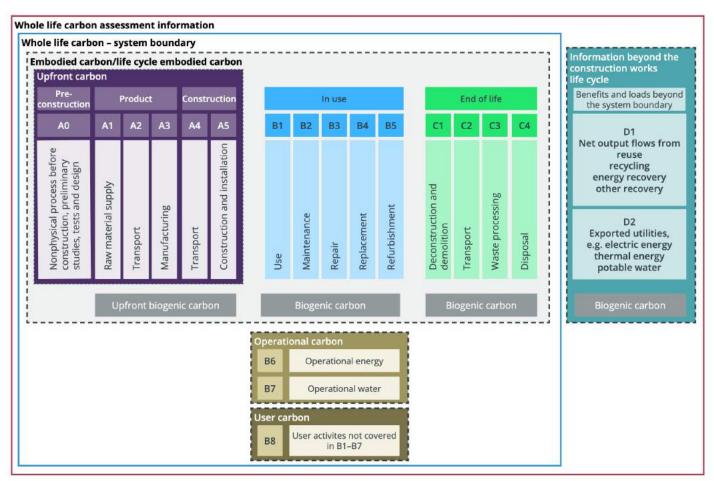
#### **Carbon Definitions**

Term	Definition
Greenhouse gases (GHGs) (often referred to as 'carbon emissions' in general usage)	Constituents of the atmosphere, both natural and anthropogenic (human-created), that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere and clouds. <sup>[1]</sup>
Whole life carbon (WLC) (referred to in ICMS as 'life cycle carbon emissions' (LCCE))	Whole life carbon emissions are the sum total of all asset- related GHG emissions and removals, both operational and embodied, over the life cycle of an asset, including its disposa (modules A0–A5, B1–B7, B8 optional, C1–C4, all including biogenic carbon, with A0 <sup>[2]</sup> assumed to be zero for buildings).
	Overall whole life carbon asset performance includes separately reporting the potential benefits or loads from future energy or material recovery, reuse, and recycling and from exported utilities (modules D1, D2).[3]
Embodied carbon or life cycle embodied carbon	The embodied carbon emissions of an asset are the total GHG emissions and removals associated with materials and construction processes, throughout the whole life cycle of an asset (modules A0–A5, B1–B5, C1–C4, with A0 <sup>[2]</sup> assumed to be zero for buildings). <sup>[3]</sup>
Upfront carbon, buildings	Upfront carbon emissions are GHG emissions associated with materials and construction processes up to practical completion (modules A0–A5). Upfront carbon excludes the biogenic carbon sequestered in the installed products at practical completion. <sup>[3]</sup>
Operational carbon – energy, buildings	Operational carbon – energy (module B6) refers to GHG emissions arising from all energy consumed by an asset in use, over its life cycle.

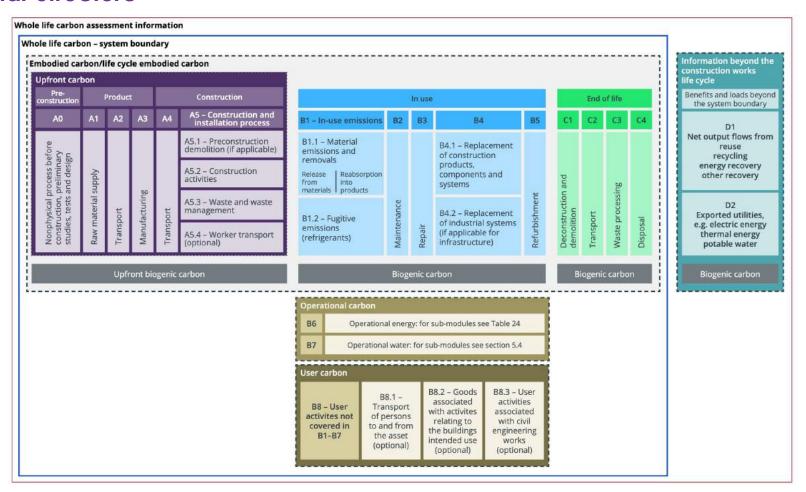
Term	Definition		
Capital carbon, infrastructure	The scope of capital carbon GHG emissions for an infrastructure asset is those that align with the scope of capital expenditure (capex), as determined by the asset owner's preference. Modules A and C must always be included within the scope, with modules B1–B5 clearly identified as 'capital' or 'operational' within the scope.		
Operational carbon – infrastructure	The scope of operational carbon GHG emissions for an infrastructure asset is those that align with the scope of operational expenditure (opex), as determined by the asset owner's preference. Modules B1–B5 must each be clearly identified as 'capital carbon' or 'operational carbon' within the scope. Module B8 must be clearly identified as 'operational carbon' or 'user carbon' within the scope. Modules B6 and B7 are always 'operational carbon' within the scope.		
Operational carbon – water	Operational carbon – water (module B7) refers to GHG emissions arising from water supply and wastewater treatment for an asset in use, over its life cycle.		
User carbon	User carbon (module B8) refers to GHG emissions associated with the user's utilisation of the buildings or infrastructure during the use stage, excluding B6 and B7. These must be clearly identified as 'operational carbon' or 'user carbon' within the scope if addressed.		

- [1] For these carbon definitions, we only address GHGs with global warming potential (GWP) assigned by the Intergovernmental Panel on Climate Change (IPCC), e.g. carbon dioxide ( $CO_2$ ), methane ( $CO_3$ ), nitrous oxide ( $N_2O$ ), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride ( $SF_6$ ).
- [2] A0 is generally assumed to be zero for buildings. However, for infrastructure projects A0 can include ground investigations and activities associated with designing the asset.
- [3] Demolition of existing structures or buildings must be separately identified and included in module A5. Simon Sturgis TargetingZero

#### **Modular Structure**



#### **Modular Structure**



# **Project Stages**

Source	Work stage	es									End of life
RICS whole life carbon standard	Early desig	n phase			Technical design pl	nase		Construction phase	Post- completion	In-use phase	End-of-life phase
2023 (project phases)	Strategic de	esign phase	Concept de	sign phase				priese	phase	prisse	pinase
RICS whole life carbon standard 2023 (assessment type)	Pre-constru	uction forecasi	ts				At tender assessment	During construction assessment	Post- completion assessment	Renewal forecast during use	End-of-life forecast as deconstructe assessment
ICMS 3 project status	Initiation a	nd concept ph	ase			Design phase		Construction a commissioning	3000	In use	Close to end of life
ICMS 3 life cycle costs and carbon emissions	Pre-constru	uction forecasi	ts				At tender assessment	During construction assessment	Post- completion assessment	Renewal forecast during use	End-of-life forecast
RIBA Plan of Work (2020)	0 Strategic definition	1 Preparation and briefing	2 Concept o	design	3 Spatial coordination	4 Technical de	sign	5 Manufacturing and construction	6 Handover	7 Use	
BIM Levels of Development (LOD) (AIA 2008)	LOD 100 Pr Conceptual		LOD 200 So Geometry	hematic Des	ign/Approximate	LOD 300 Design Development/ Precise Geometry	LOD 350 Construction Documentation	LOD 400 Construction Stage/ fabrication	LOD 500 As built		
BS 8536:2022 (Infrastructure)	Strategy	Preparation and brief	Concept	Definition	Technical design			Manufacturing and construction	Handover and closure	Use	
PAS 2080:2023 and Value Toolkit work stages	Need	Optioneerin	g		Design			Delivery		Operation	Purpose and performance review

## Life Cycle – 3 Successive New Build Projects



This is shown as asset 1 in Figure 5.

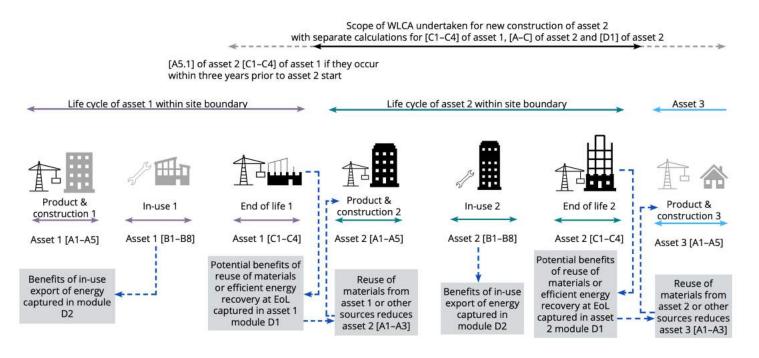


Figure 5: The life cycle stages of an asset and how they relate to successive new-build projects over sequential life cycles; this shows how the modular structure works over three generations of asset on a single site, and how they can interrelate to minimise impacts

#### Life Cycle - Refurbishment - Unplanned



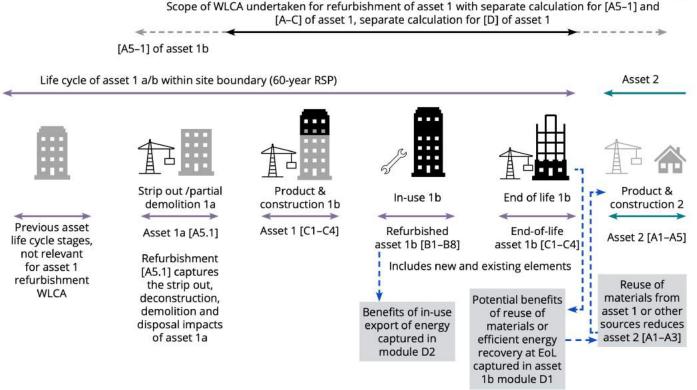


Figure 6: An illustrative life cycle sequence for a building that evolves through a subsequent refurbishment; it shows how that interrelates with the modular structure for each generation in the life cycle

#### Life Cycle – Refurbishment - Planned



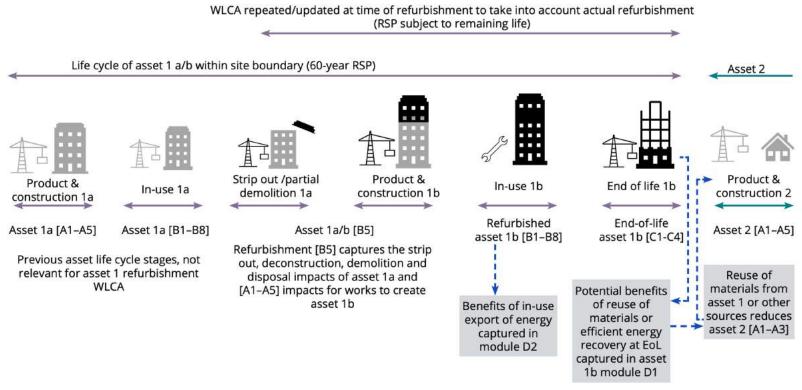


Figure 7: The life cycle for a change of use or refurbishment planned at the outset of the project

## Masterplan – Reporting Scope



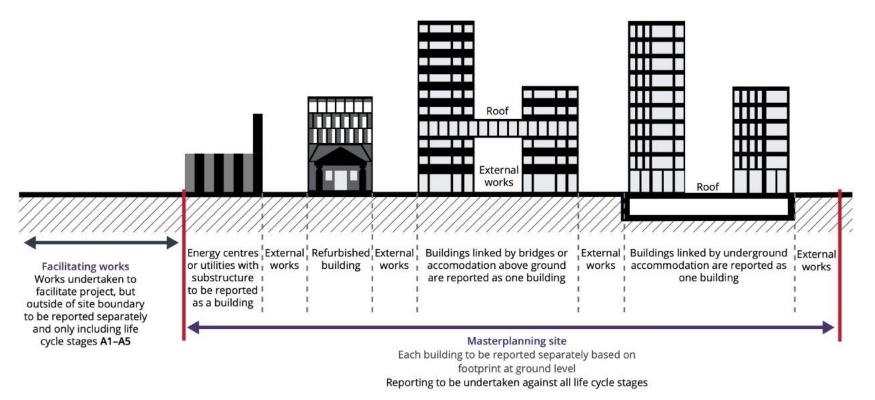


Figure 8: Reporting the constituent parts of a masterplan (source: Hawkins\Brown)

#### Infrastructure Asset – Reporting Scope



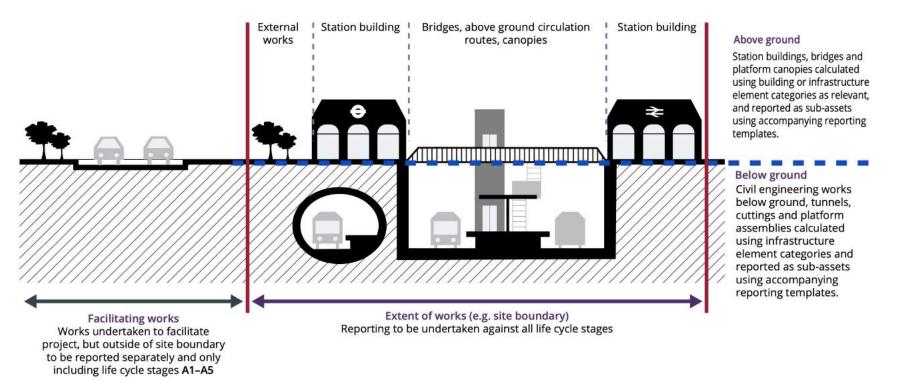


Figure 9: Example constituent parts of an infrastructure asset (source: Hawkins\Brown)

# **Small Projects - Requirements**



	Most projects	Small projects
Upfront embodied carbon (A1–A5)	✓	<b>✓</b>
Lifecycle embodied carbon (A1–A5, B1–B5, C1–C4)	<b>✓</b>	<b>✓</b>
Operational energy (B6)	Predictive energy modelling	Decisions on operational energy come from professional experience and Part L
Operational water (B7)	✓	<b>✓</b>
Whole life carbon (A1–C4)	✓	No WLC comparisons between operational energy and embodied carbon

Table 3: Requirements for most projects versus small projects

# Data Use at Each Project Stage



Project phase	A1-A5	B1-B8	C1-C4	D
Early design phase	Prediction of scenarios based on default specifications or generic data.			
Technical design and construction phases	Prediction of scenarios based on specific data as products are specified and purchased.			
Post-completion phase	Not scenario-based; as-built data used, including actual transport, on-site waste quantities, waste transportation and waste treatment.		n of scena i specific a	

Table 7: Scenario data for each project phase

## **Converting Energy to Carbon**



Project phase	Values based on	Carbon conversion factor set
Early design	Prediction based on generic values	When making design decisions – understanding trade-offs
Technical design and construction	Prediction based on specific values	WLC over the RSP – design decisions (set 1)  When reporting WLC – for comparison between projects or benchmarking  WLC over the RSP – predictions (set 2)
In-use	Based on metered consumption	Annual reporting (set 3)
Post- completion	Prediction updated based on as-built values	WLC over the RSP – predictions (set 2)

Table 9: Carbon conversion factor sets by project phase; see Appendix I for a description of sets 1, 2 and 3

# **Uncertainty**



# **Uncertainty in WLCA's:**

- Contingency Factor: Relates to Project Phase
- Carbon Data Uncertainty Factor: Quality of Carbon data
- Quantities Uncertainty Factor: Accuracy of Quantities data

#### **Decarbonization**



- Grid decarbonization
- Material Decarbonization

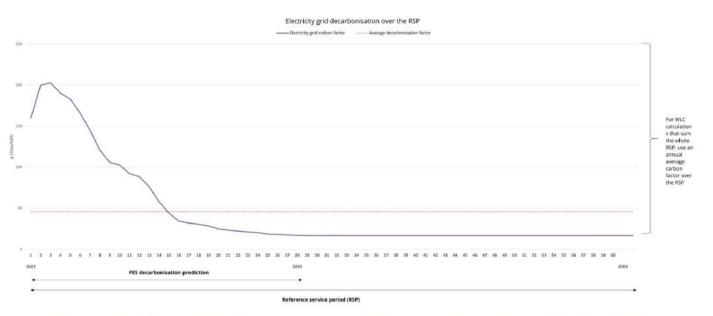


Figure G1: UK grid decarbonisation over the next 60 years in the UK using the FES 2022 decarbonisation falling short scenario (source: Introba)

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- Default Specifications for main Building materials
- Transport Impacts (UK)
- Construction Installation Process

#### Data Use for A1-A3



Table 8 shows the types of carbon data that are most suitable at different project phases.

Project phase	Carbon data for A1–A3
Early design phase	<ul> <li>Generic carbon factors.</li> <li>Appropriate national carbon factors from accepted industry databases.</li> </ul>
Technical design and construction phases	<ul> <li>Specific carbon factors from EPDs where products/systems are specified or purchased during construction phase.</li> <li>If EPDs are not available, use generic carbon factors (appropriate national carbon factors from accepted industry databases).</li> </ul>
Post-completion phase	<ul> <li>Specific carbon factors from EPDs for the actual products/ systems used.</li> <li>If EPDs are not available, use generic carbon factors (appropriate national carbon factors from accepted industry databases).</li> </ul>

Table 8: Types of carbon data to be used for the product stage during different project phases

#### Module A5 - Sub-modules





Figure 12: Sub-modules of module A5

# Module B – Component Lifespans

Building part	Building elements/components	Expected lifespan
Substructure	Piling and foundations  Lowest ground floor	60 years (or building lifespan)
Superstructure: frame, upper floor and roof structure	Structural elements, e.g. columns, walls, beams, upper floor and roof structure	60 years (or building lifespan)
Facade	Opaque modular cladding: Rain screens, timber panels Brick, stone, block and precast concrete panels Glazed cladded/curtain walling Windows and external doors: Hardwood/steel/aluminium windows Doors	30 years 60 years 35 years 30 years 20 years
Roof	Roof covering: Single-ply membrane Standing seam metal Tiles, clay and concrete	30 years 30 years 60 years
Superstructure	Internal partitioning and dry lining: Studwork Blockwork	30 years 60 years
Finishes	Wall finishes: Render/paint Floor finishes: Carpet/vinyl Stone tiles Raised access floor (RAF) pedestal/tile Ceiling finishes: Substrate/paint Suspended grid (ceiling system)	30/5 years respectively 7 years 25 years 50/30 years respectively 10 years 25 years

Building part	Building elements/components	Expected lifespan
FF&E	Loose furniture and fittings	10 years
Services/MEP	Heat source, e.g. boilers, calorifiers	20 years
	Heat source, e.g. heat pumps (except ground source)	15 years (20 years)
	Space heating and air treatment	20 years
	Central cooling systems (cooling only), e.g. fan coil systems, variable air volume, variable refrigerant volume	15 years
	Ductwork: Galvanised	40 years
	Plastic or flexible	15 years
	Electrical installations	30 years
	Lighting fittings	15 years
	Communications installations and controls	15 years
	Water and disposal installations	25 years
	Rainwater harvesting and grey water collection	30 years
	Sanitaryware	20 years
	Lift and conveyor installations	20 years
Hard	Asphalt	35 years
landscaping	Concrete and stone paving	60 years
	Timber decking	15 years

# Module B5 – Planned Changes



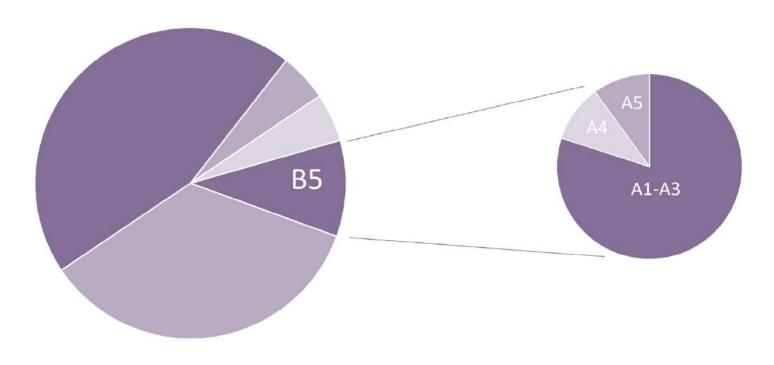
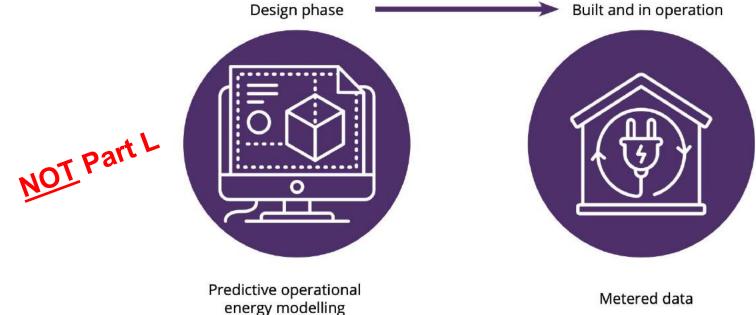


Figure 15: Life cycle stages to be included in B5, with corresponding adjustments to modules B, C and D from the point of change

#### Module B6 – Operational Energy





- CIBSE's TM54
- NABERS
- ASHRAE Standard 90.1
- Passive House Planning Package (PHPP)

#### Module B7 – Water Use



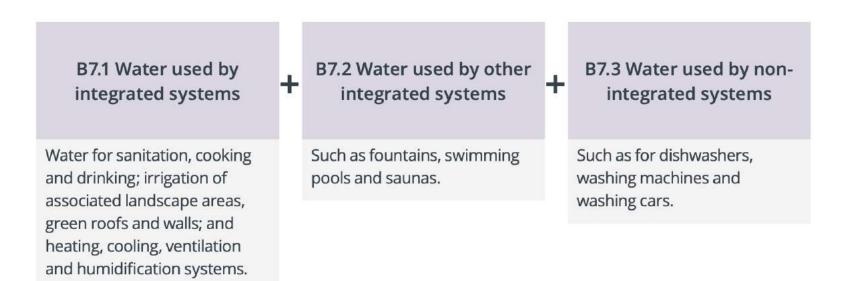


Figure 17: Sub-modules of module B7

#### **Module B8 - User Activities - Buildings**



B8.1 Energy-related impacts associated with building user mobility/ transport not covered in B6, such as user mobility/ commuting to a building (optional)

B8.2 Energy-related impacts associated with building user charging of electric vehicles on-site (optional)

related impacts
associated with building
user activities relating to
the building's intended
use, such as upstream
embodied impacts of
consumables used in the
building, e.g. stationery
and printing paper for an
office (optional)

Figure 18: Sub-modules of B8 for buildings

#### Module B8 - User Activities - Infrastructure



B8.1 User activities: energy-related impacts (optional)

B8.2 User activities: other impacts (optional)

Figure 19: Sub-modules of module B8 for infrastructure

#### Modules C, D - End of Life + Reuse, Recycling etc



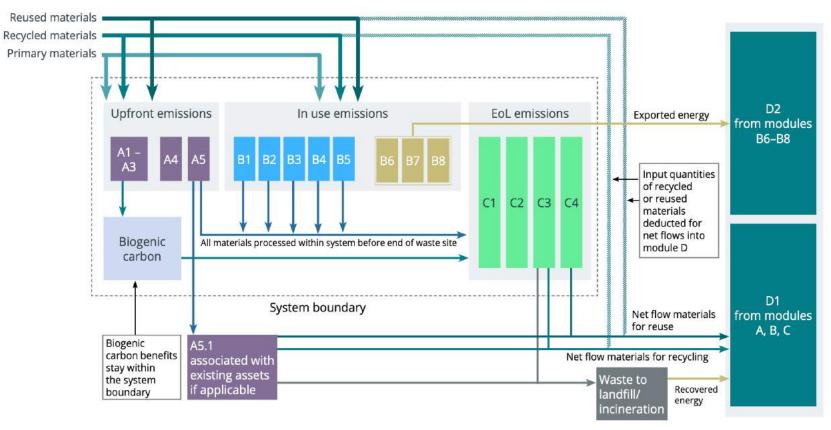


Figure 20: Flow of materials and emissions between modules

### **Reporting Assessment – Units for Buildings**



Carbon boundary	Life cycle stages/modules	Unit of measurement
Pre-construction carbon	A0 (where relevant)	kgCO <sub>z</sub> e
Upfront biogenic carbon (sequestered biogenic carbon stored in any construction products incorporated into the asset)	A1-A5	kgCO <sub>2</sub> e
Upfront carbon	A0-A5, excluding sequestered biogenic carbon stored in any construction products incorporated into the asset	kgCO <sub>2</sub> e
Embodied carbon	A-C, excluding B6-B8	kgCO <sub>2</sub> e
Operational energy, broken down by energy type and purpose	B6	kWh/yr
Operational water usage, broken down by water type and purpose	В7	m³/day
Operational carbon	B6 and B7	kgCO <sub>2</sub> e/yr
User carbon	B8 (where relevant)	kgCO <sub>2</sub> e/yr
Benefits and loads beyond system boundary	D1	kgCO <sub>2</sub> e
	D2	kgCO <sub>2</sub> e

Table 29: Overview of carbon reporting with the life cycle modules and units used for assessment

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# Reporting Assessment – Units for Infrastructure

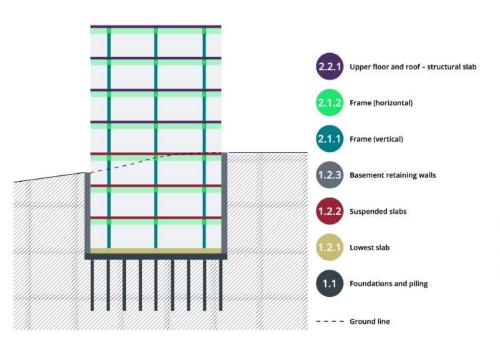
Infrastructure asset type	Suggested normalisation units
Roads	km equated lane length (length of all lanes along the route, reduced to a single length)
	m² total paved area
Runways	m² total paved area
Bridges	m² total area
	km length
Railways	km equated track length (length of all tracks along the route, including those in passing loops, sidings and depots, reduced to a single length)
Tunnels	km equated lane or track length
	m³ volume of excavation
Wells and boreholes	m length drilled
	m³ extracted over RSP
Dams and reservoirs	million m³ capacity
Waste and wastewater management and treatment works, water treatment works	megalitre output over RSP
Pipelines	km length

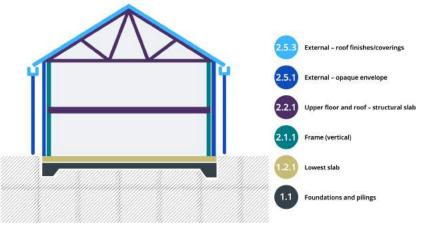
Infrastructure asset type	Suggested normalisation units
Waterway works	km length
	hectare site area
Power generation plants	MW capacity
	MWh output over RSP
Chemical plants	tonne output over RSP
Refineries	million barrels of oil output over RSP
	hectare site area
Mines and quarries	tonne output over RSP
	hectare site area
Offshore structures	unit output over RSP, depending on the asset (e.g. barrels crude oil, Nm³ natural gas; for electricity see power generation)
Near-shore structures	m² surface area of quayside
Ports	million tonnes cargo handled over RSP
	1000 passengers over RSP
	hectare site area
Land formation and reclamation	hectare site area
Transmission and distribution for power and data	MWh transferred over RSP  Megabyte transferred over RSP

Table 30: Normalisation units - infrastructure

# **Guidance for Reporting Building Elements**

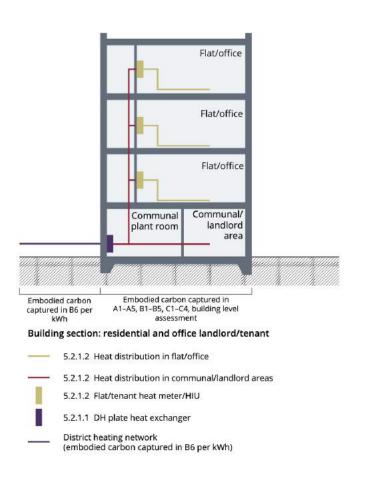


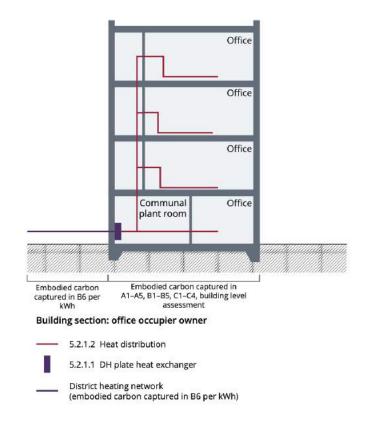




#### **Guidance for Reporting Building Elements - MEP**

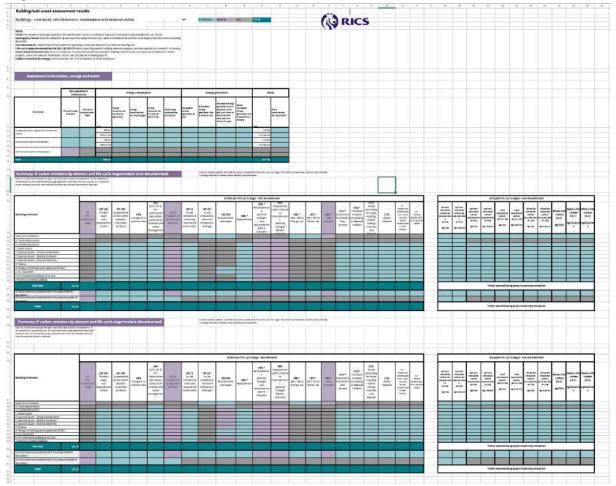






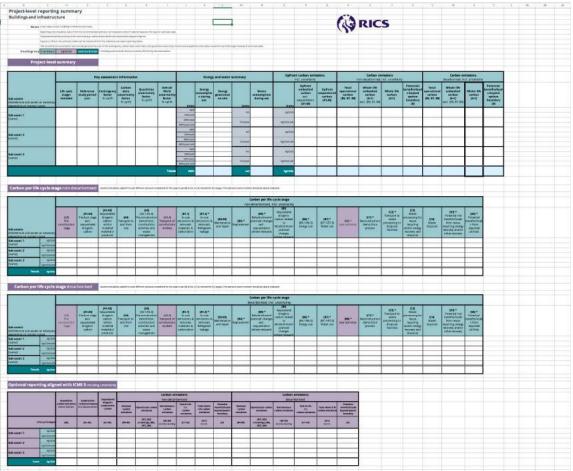
#### Reporting Templates – Decarbonised and Non-Decarbonised





# Reporting Templates Summary – with Contingencies







# Panel Discussion and Q&A



**Simon Sturgis** 

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**Poppy Parsons** 

Head of Low Carbon Construction

Galliford Try



Sam Wallis

Director, Energy & Net Zero Strategy

Envision



# Verification



"Third-party verification of WLCAs against this standard – in line with the verification requirements set out in the relevant European standards (EN 15978 or EN 17472) – is recommended for WLCAs. This is to enhance quality assurance and transparency, particularly for post-completion assessments."

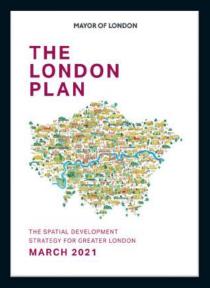


#### Verification



"information should be the subject of third-party auditing to avoid selfmade claims. The auditing should provide transparency on the sources and processes used to determine the net zero carbon balance"

> "Applicants and developers should adopt third-party quality assurance mechanisms to ensure accuracy in their submissions. The mechanisms used should be reported at the planning application submission and postconstruction stages using the template"













# Thank you

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