

Built Environment Achieving Net-Zero

Professor Sean Smith,

Chair of Future Construction, School of Engineering
Director – Centre for Future Infrastructure, Edinburgh Futures Institute
University of Edinburgh

Email: sean.smith@ed.ac.uk

APSE Scotland Building and Housing Seminar

Building and maintaining sustainable housing for the future

Built Environment Achieving Net-Zero

Overview:

- Housing required - Global to local
- Building Asset Monitoring - **Digital Twinning**
- Scale of Energy Efficiency Measures – “*on route...*”
- What are the horizon challenges and implications
- Mixing of Terms!!... **Net-Zero, Carbon Neutral, Zero Carbon...**
- Pre1919 Hard to Treat – recent solutions



NEW HOUSING – required



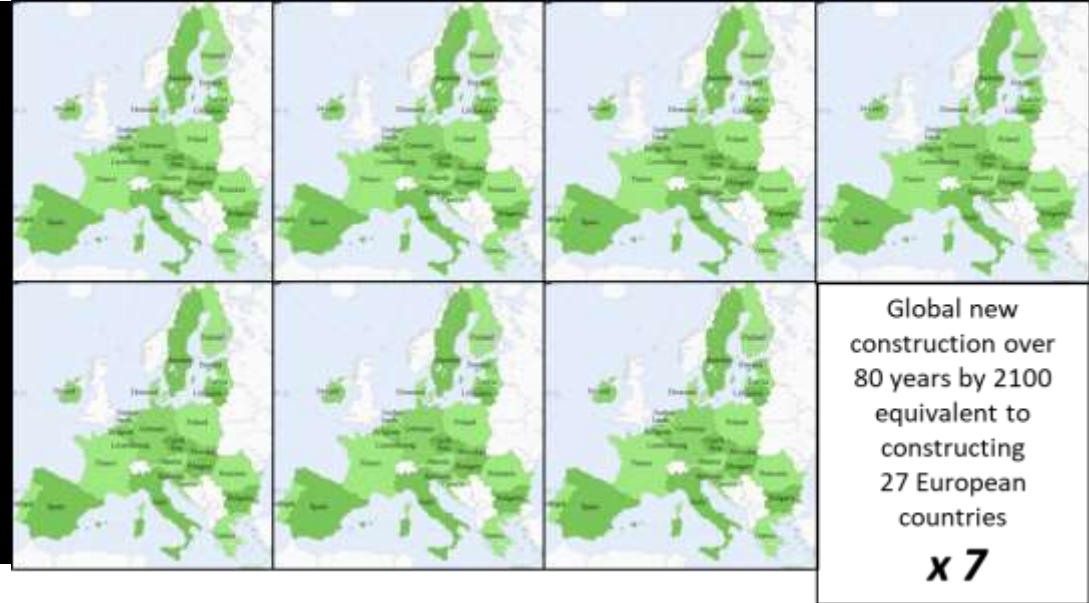
World population growth by 2100

3.5 billion people
or 3,500,000,000



World housing demand by year 2100

2.1 billion
new homes
or 2,100,000,000



England & Wales new housing need by 2030

2,300,000 new homes - *like building the whole of Yorkshire & Humber regions again*



Scotland's new housing need by 2030

260,000 new homes - *like building the whole of the city of Edinburgh again*

Building Asset Monitoring - Digital Twinning

A true “**digital building twin**” needs to be able to associate and connect a building’s **design and utilization**, **in a single model**, that mimics and therefore predicts the building’s operation and performance based upon a multitude of parameters.

Part of the current **ENERGY PERFORMANCE GAP** is because some of the existing prediction models and assumptions are either **not correct** or have assumptions which **increases uncertainty**

Previous history has told us to be wary of entirely prediction models or predicted design assumptions

Building Asset Monitoring - **Digital Twinning**



Image: Bentley software

Recent reduction in the cost of sensors provides new opportunities to have real time information updating the digital twin model

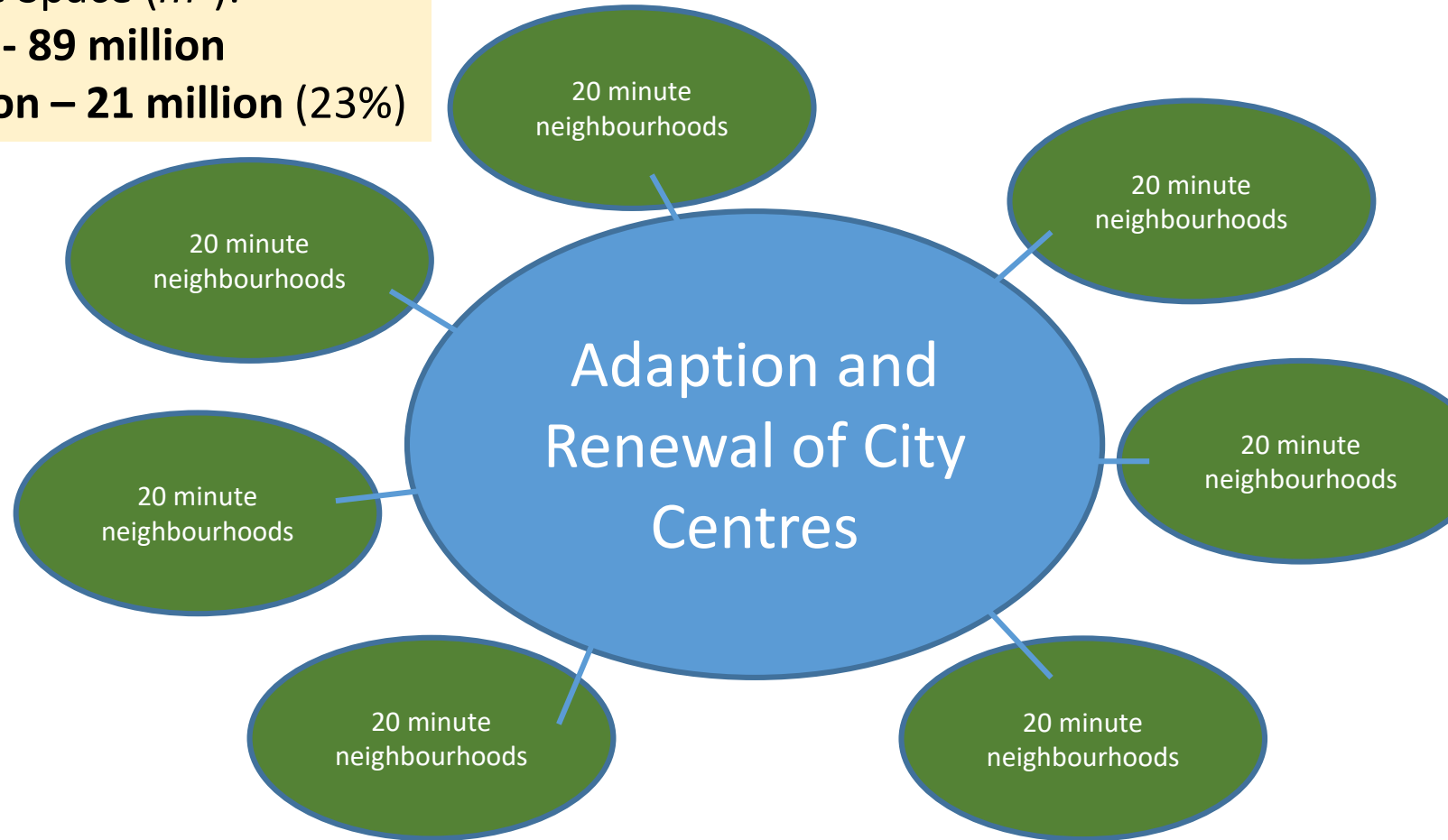
Future Construction & Operation (A+B+C)

- A. Estates departments having full digital models of their buildings
- B. Real time energy utilisation monitoring
- C. In-situ sensors to identify benefits and weaknesses

= Accelerated action plans PLUS optimisation of decision making

Changing City Centres and Urban Areas: *potential post-covid*

Office Space (m^2):
E&W - 89 million
London – 21 million (23%)



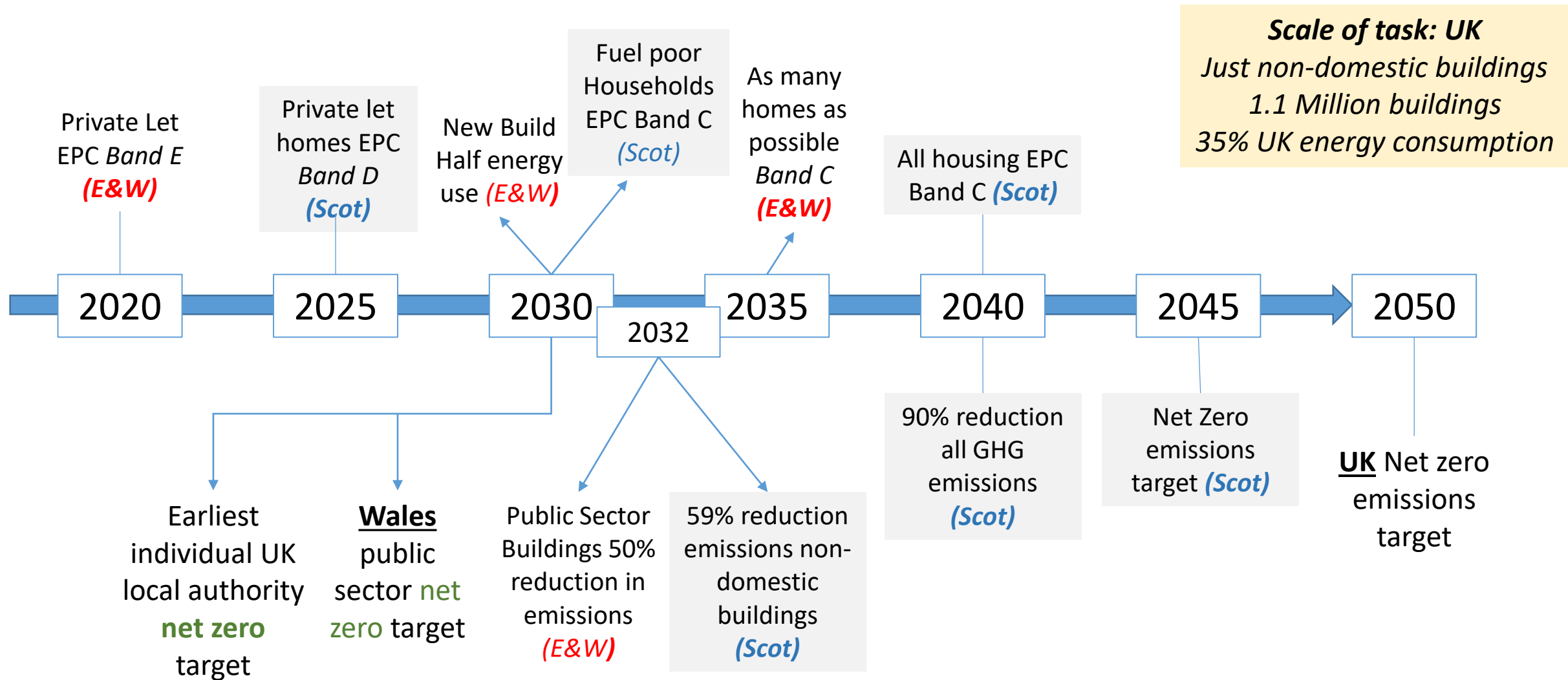
CITY CENTRES

- Change in city centre occupant demographic and use
- Increase “change of use”
- Impacts on Transport, Hospitality, Night time economy & Services sector

20 min Neighbourhoods

- Housing
- Gap sites
- Community services
- Nurseries provision
- Multi-use developments
- Transport needs
- Amenities and services
- Community office “pod” space

Timeline: Future EE Measures and Net Zero Policies



Mixing of Terms!!... **Net-Zero, Carbon Neutral, Zero Carbon....**

- Net Zero is **not the same** as Carbon Neutral
- Carbon Neutral has **an accepted international PAS 2060 document/guidance** (*Net Zero does not...yet*)

Will your estate be..?:

Net Zero (operational)

Net Zero (construction & operational)

Net Zero SBTi (Science based target)

Advanced Net Zero

Beyond Net Zero

- Will you offset GHG? – not always accepted
- North Star Goals (WGBC)
- Sustainable Development Goals

All require clarity on carbon measures and calculations which may still take more time

BTW: Be careful of **products or systems claiming zero carbon**

ASA 2011 decision
preventing use of *zero carbon* in a company's product promotion due to carbon being utilised during the manufacture and transport

Maintaining Net Zero momentum

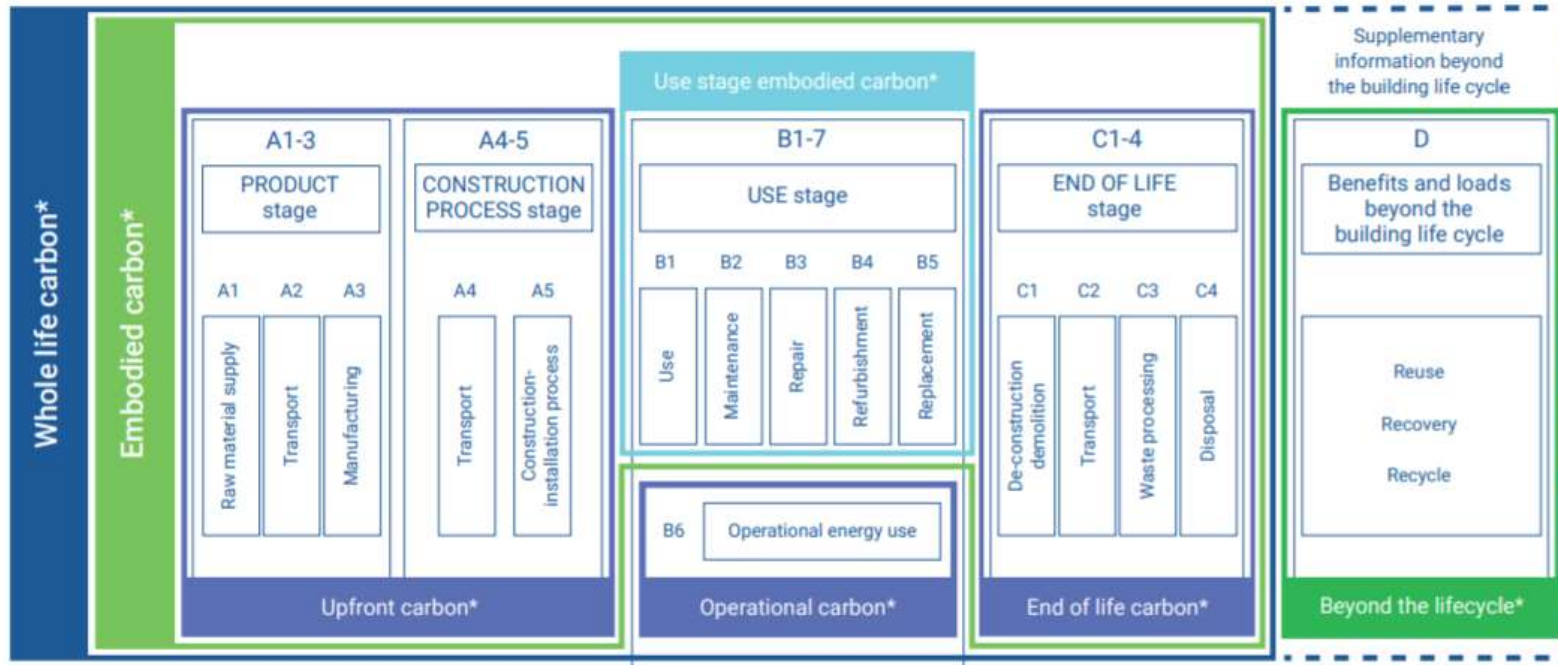


Image source: WGBC

However – current differences in methodologies, calculations, softwares, assumptions and still not a common assessment process to cover all stages / areas.

Can we introduce a framework now (Interim) which at least delivers carbon and environmental benefits now and delivers future benefits (**Horizon factors**)?

If we continuously wait for agreement on carbon calculations, definitions and what is to be included or not within numerical carbon assessment.....

We lose the opportunity to “crack on” with good practice and embed key carbon benefits now’

Horizon Factors: e.g.

- Designing for Manufacture/Assembly now
- This helps Future Disassembly for our future generations and recovery and re-use of materials.

Supporting Built Environment Net Zero Strategy



HORIZON

NET ZERO

Some of the **greatest benefits towards** future **carbon legacy reductions** are:

- The materials used in construction to **reduce environmental impact**
- **Sustainably sourced** and with **circular economy** outcomes
- Design for **manufacture and assembly** (i.e. offsite construction)
- The **construction process** utilised (e.g. offsite to onsite)
- Energy sources for operation (**towards net-zero**) e.g. green hydrogen
- Design for **future disassembly**
- **Material assets** our buildings provide for our **future generations**

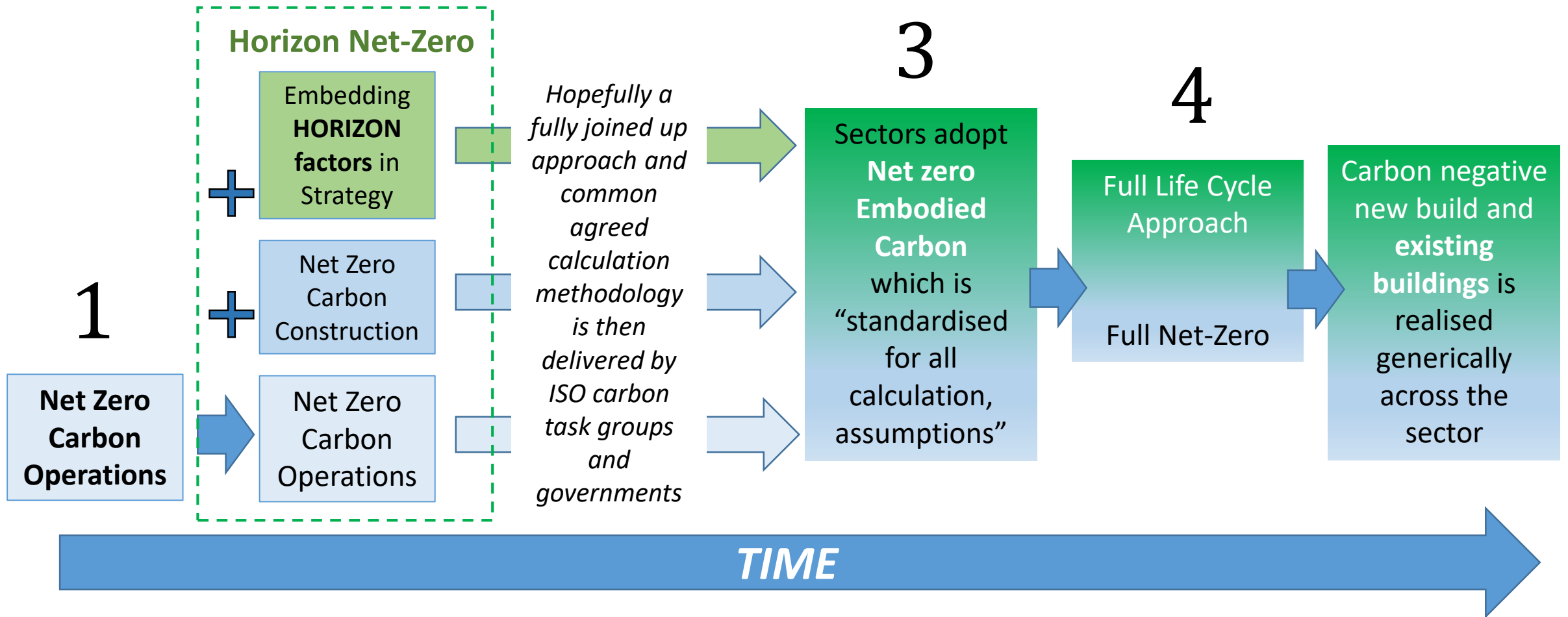
Supporting Built Environment Net Zero Strategy

NET ZERO FACTORS	Estate Area	New build	Refurb / Retrofit	Operation	Reporting OUTPUTS
	Carbon	Upfront	Upfront	In-use	
	Calculation of Carbon Emissions Equivalent	Net Zero Construction	Net Zero Retrofit	Net Zero Operation	<i>Numeric carbon value</i>
HORIZON FACTORS (also help address UN Sust Dev Goals)	Estate Strategy / Approach to Address Legacy Horizon Factors	New build	Refurb / Retrofit	Existing	Reporting OUTPUTS
		Supported Through Procurement & Operations Strategy			
	Design for manufacture and assembly	Y	Y		<i>Tracking utilisation and adoption of HORIZON factors within projects / tenders / outcomes (not yet numerical carbon)</i>
	Design for future disassembly	Y	Y		
	Adopting circular economy approach (where possible)	Y	Y	Y	
	Sustainable sourcing of materials	Y	Y		
	Utilising offsite assembly approaches (where possible)	Y	Y		
	Designing to reduce site traffic emissions (supply chain and site personnel)	Y	Y		
	Incorporating renewable energy approaches	Y	Y	Y	
	Incorporating performance data sensors / real time energy monitoring	Y	Y	Y	
Preparing for digital twinning utilisation	Y	Y	Y		
Innovation - new as yet unknown solutions - use entry	Y	Y	Y		

Net Zero + HORIZON Factors = HORIZON Net Zero

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4 STEPS - Supporting Built Environment Net Zero Strategy



HORIZON Net Zero helps sector as an interim approach before full **net-zero embodied carbon** is standardised

Hard to Treat – (pre 1919)

- Repair and Maintenance of Pre1919 buildings (CITB course)
- Local Authority frameworks for energy efficiency (Scotland Excel) - Updated guidance being prepared
- Many of the 282,000 private lets also are in this housing type – oncoming EPC targets
- Least developed in retrofit & diverse occupancies
- Post Grenfell / New Materials / Sign Off / POE / Fuel Poverty reduction targets



Hard to Treat – (pre 1919) – Solutions

Energystore (EPS bead insulation) – solid stone wall insulation

- Recent research over two winters shows promising results
- Low intervention solution - cavity filled behind the lath & plaster
- Wall still breaths and does not reduce fire protection
- Extractable & Recyclable
- 60% improvement in energy efficiency of the pre1919 wall
- Very good feedback from occupants



Glaze & Save (InvisiTHERM system) – windows / fanlights

- Secondary glazing using magnetic strip connections
- Reduction in heat loss by 63% and reduces energy costs
- Also draught proofs windows and reduces noise pollution
- Easy maintenance and installation



(end of presentation)

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