Buildings That Inspire

Design, Collaboration, Stewardship & the Possible

ARCHITYPE/PERFORM+

Scott McAulay

Anthropocene Architecture School (2019-PRESENT)

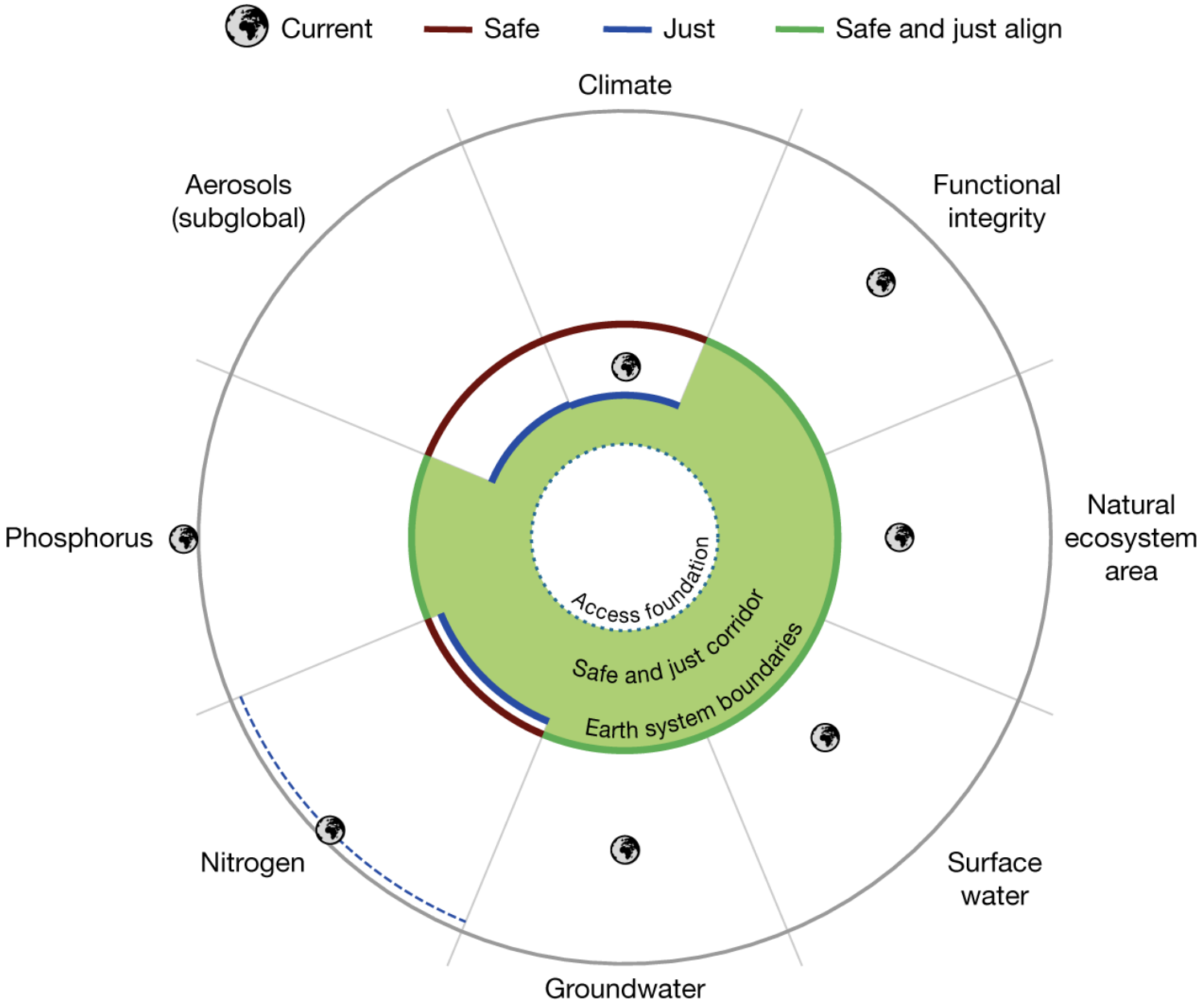
Architype (2021-PRESENT)

- Architecture Fringe (Co-Producer)
- Architects Climate Action Network (ACAN Scotland)
- Living Rent (Scotland's Tenants Union)

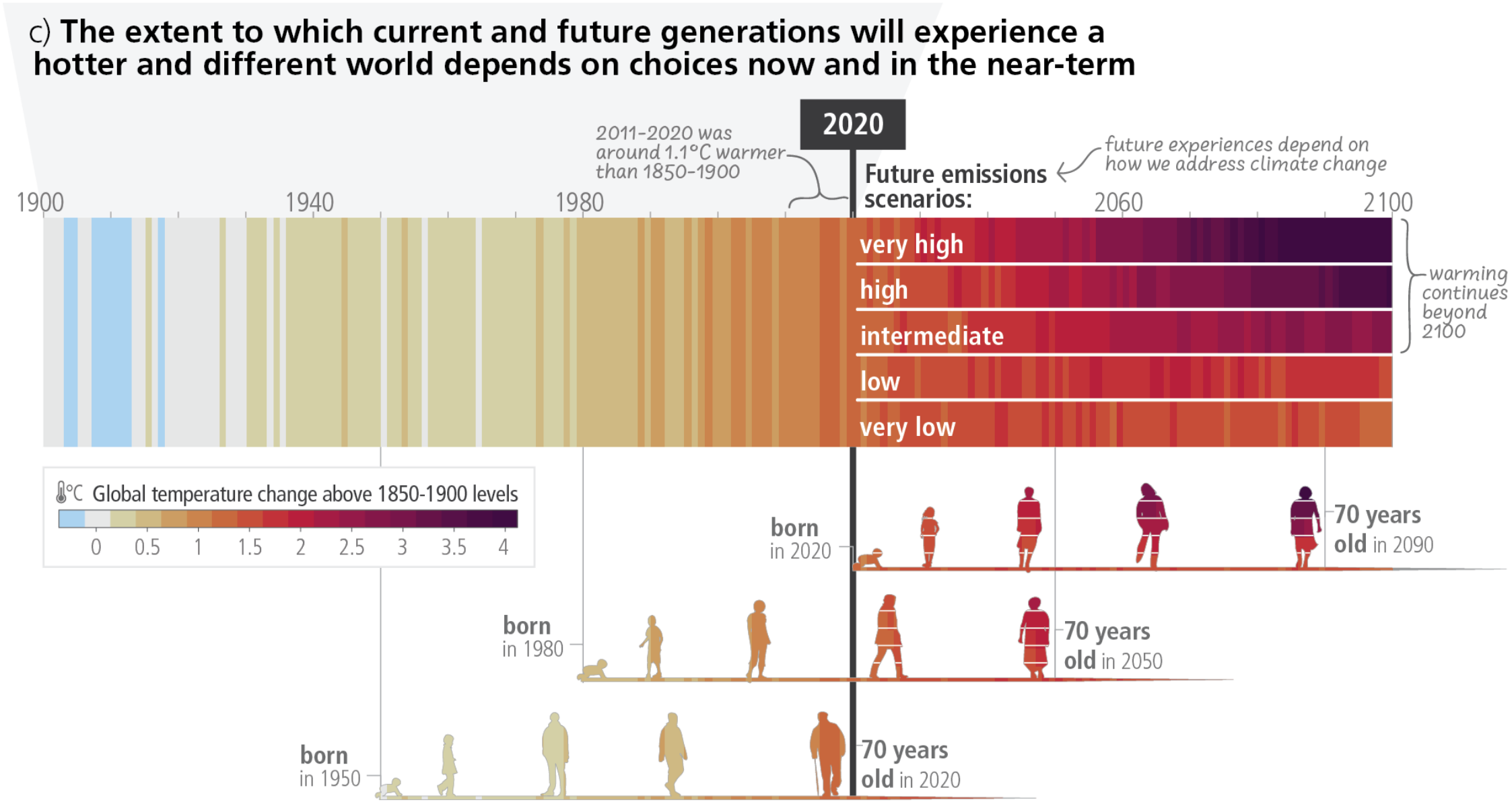
Why We're Here

"It just so happens that we are all alive at the last possible moment when changing course can mean saving lives on a truly unimaginable scale."

— Naomi Klein in *On Fire: The Burning Case for a Green New Deal*



'Safe and just' climate boundary has already been breached on 7/8 metrics
Source: Rockström et al. 2023



Climate Time Horizons: Scenarios and Impacts
Source: *Climate Change 2022: Mitigation of Climate Change. Working Group III Contribution to the IPCC Sixth Assessment Report* (2023)

Getting Buildings to ‘Net Zero’ / Where We Need to Be

Buildings represent 1/3 of global energy demand (RIBA, 2021).

Transition to demand reduction first, THEN offset the remaining!

A proven methodology for this is Passivhaus –international building physics!

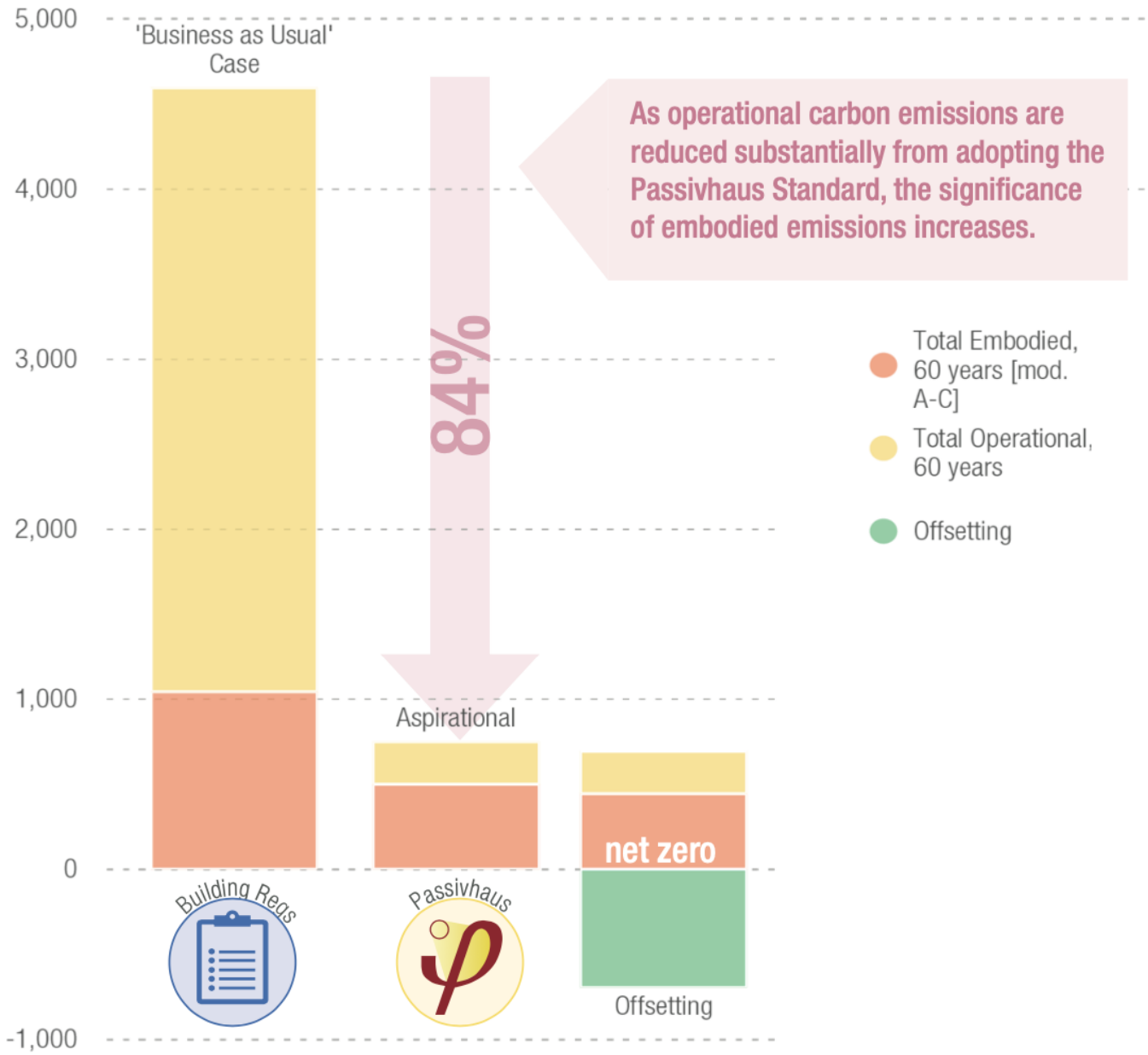
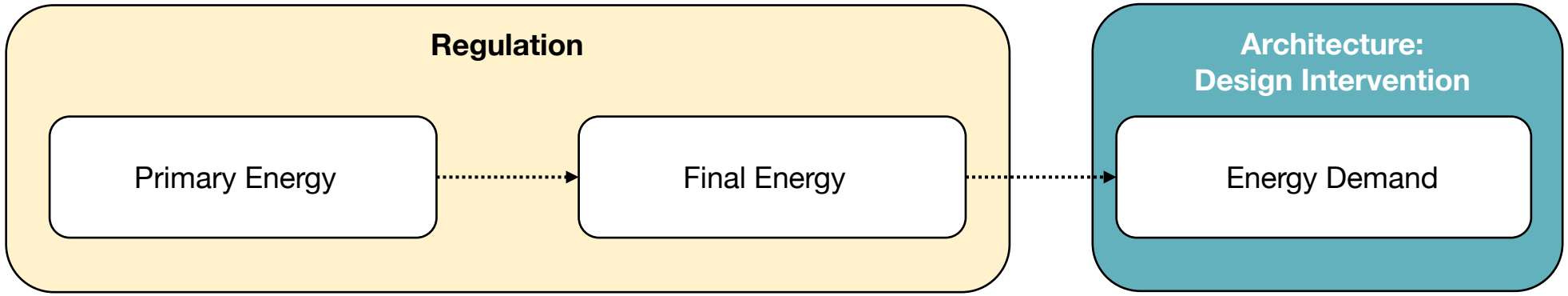


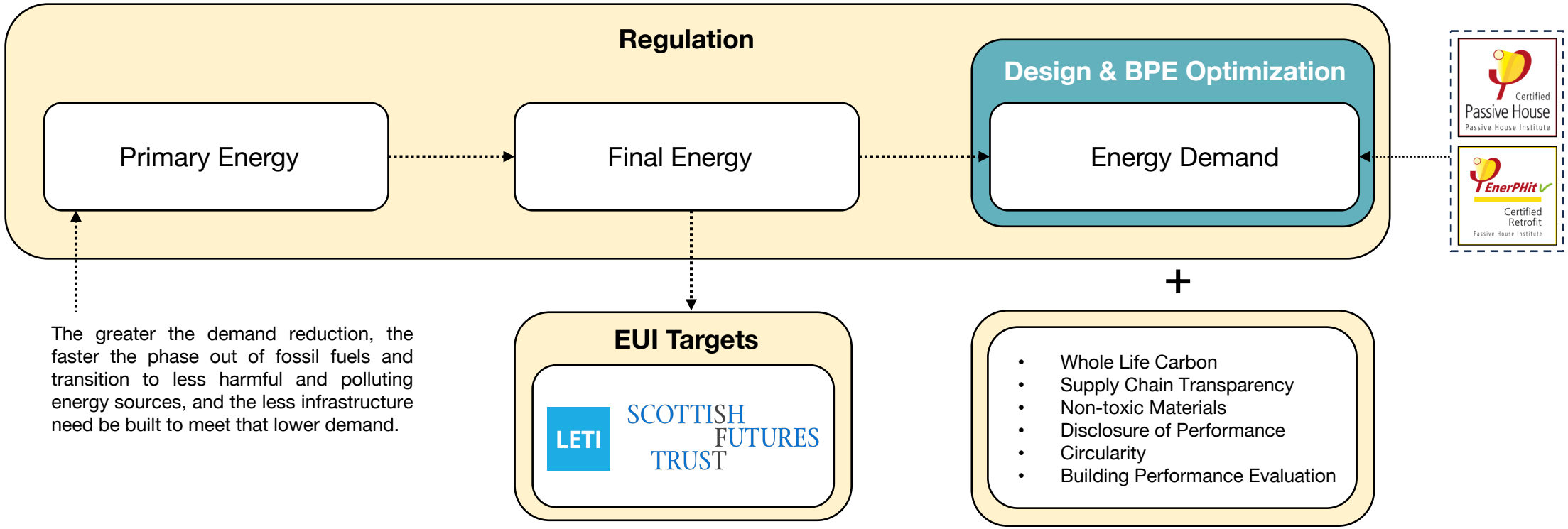
Fig. 19 / Lifecycle Emissions comparison

Demand Reduction:
Accelerating a Just Transition



Global energy demand can be reduced by 40-70% through energy efficiency measures
Source: IPCC, 2022

Demand Reduction: Accelerating a Just Transition



Global energy demand can be reduced by 40-70% through energy efficiency measures
Source: IPCC, 2022

A Just Transition: Retrofit in the U.K.

1 : 3 : 77

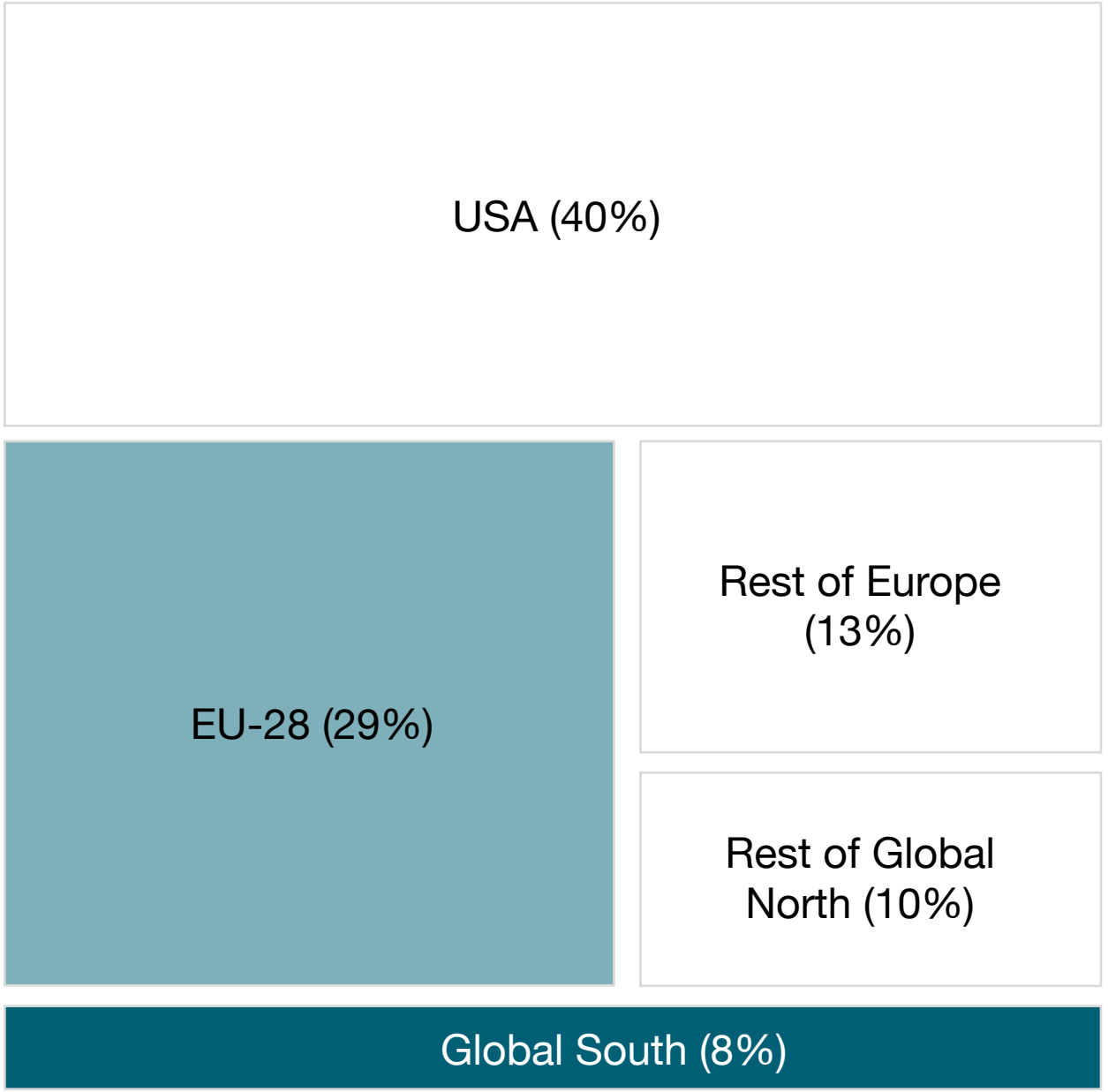
Job in Oil & Gas | **Jobs in Clean Energy** | **Jobs in Domestic Retrofit**

Domestic Retrofit Opportunities for a Just Transition in the U.K.
3 (Climate Justice Coalition. 2022); 77 (Passivhaus Trust figure of sufficient workforce of 2,000,000 to met Net Zero targets divided by UKEITI figure of 26,000 directly employed by oil and gas sector – both from 2020)

A Global Just Transition

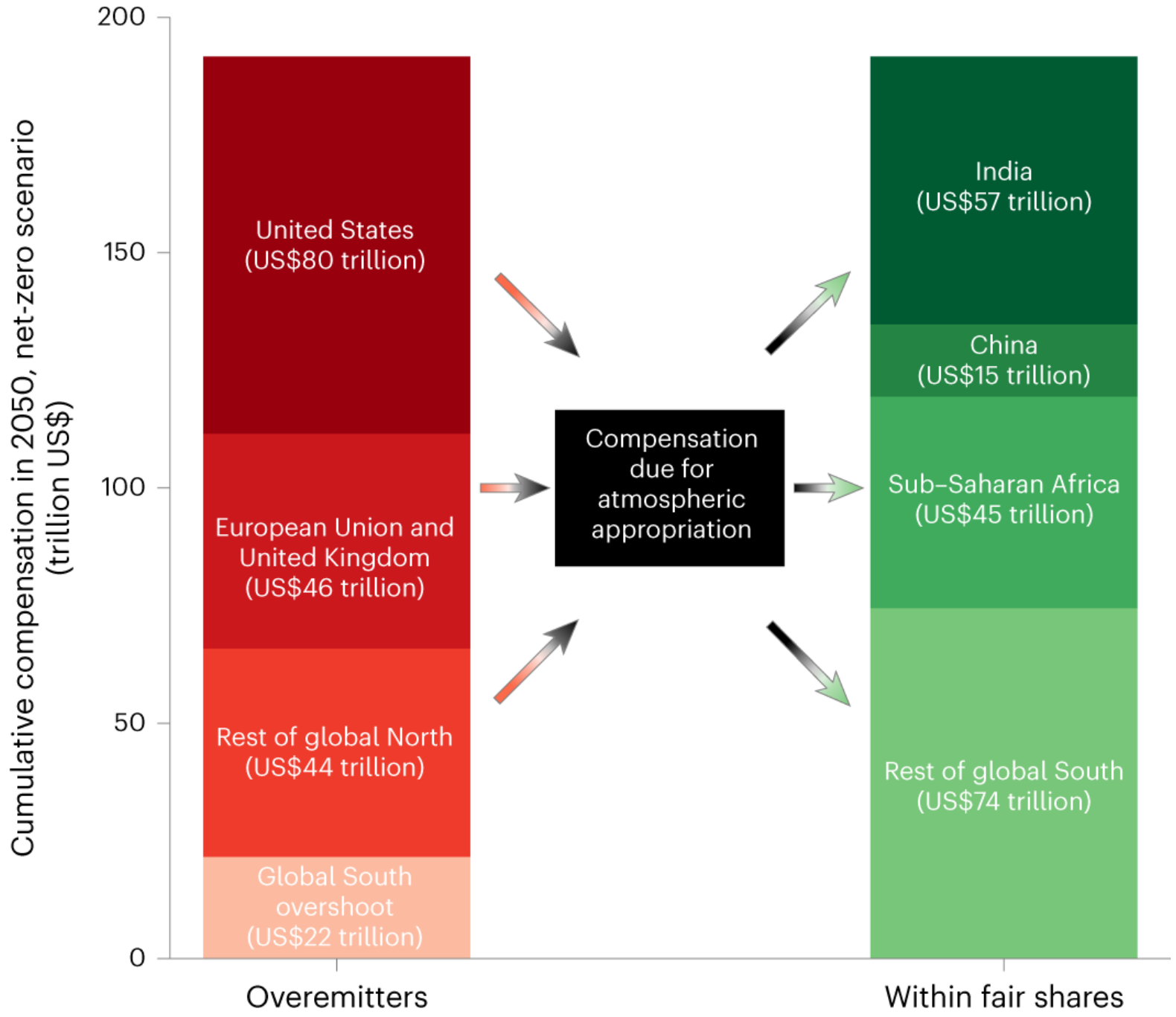
"For those who have eyes to see, for those who have ears to listen and for those who have a heart to feel, 1.5°C is what we need to survive."

— Mia Mottley, Prime Minister of Barbados at COP26 in Glasgow, 2021



Responsibility for Climate Breakdown / Pushing Earth Beyond 350ppm
Source: Hickel, 2020 in the Lancet

A Global Just Transition



Cumulative compensation due from overshooting country groups to undershooting country groups – Source: Fanning and Hickel, 2023

Buildings That Inspire

Design, Collaboration, Stewardship & the Possible

ARCHITYPE/PERFORM+

Exemplar Projects

Quantity + Quality = Influence and CHANGE

Burry Port Community Primary School / Llanelli

Oak Meadow Primary School / Wolverhampton

Ysgol Bro Hyddgen / Machynlleth

Wilkinson Primary School / Wolverhampton

Ysgol Parc y Tywyn / Carmarthenshire

London Dock Secondary School / London

Bushbury Hill Primary School / Wolverhampton

Ysgol Trimsaran / Carmarthenshire

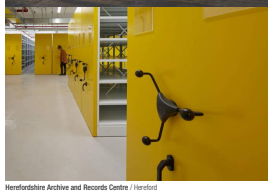
Ysgol Maes y Dre and Salop Road Primary School / Welshpool

Hackbridge Primary School / London

Swillington Primary School / Leeds

ARCHITYPE Passivhaus Projects
Completed by Architype

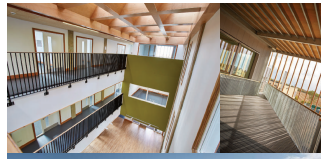
Christ Church Central / Sheffield



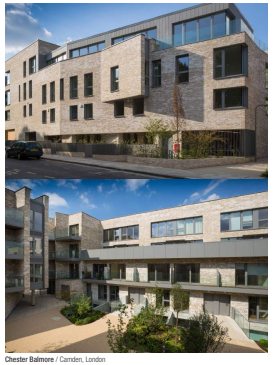
Herefordshire Archive and Records Centre / Hereford

The Enterprise Centre - University of East Anglia / Norwich

Imperial War Museum Paper Store / Duxford



Eco Business Centre / Bicester



Chester Balmore / Camden, London

Hennerwood Farmhouse / Bromyard, Herefordshire

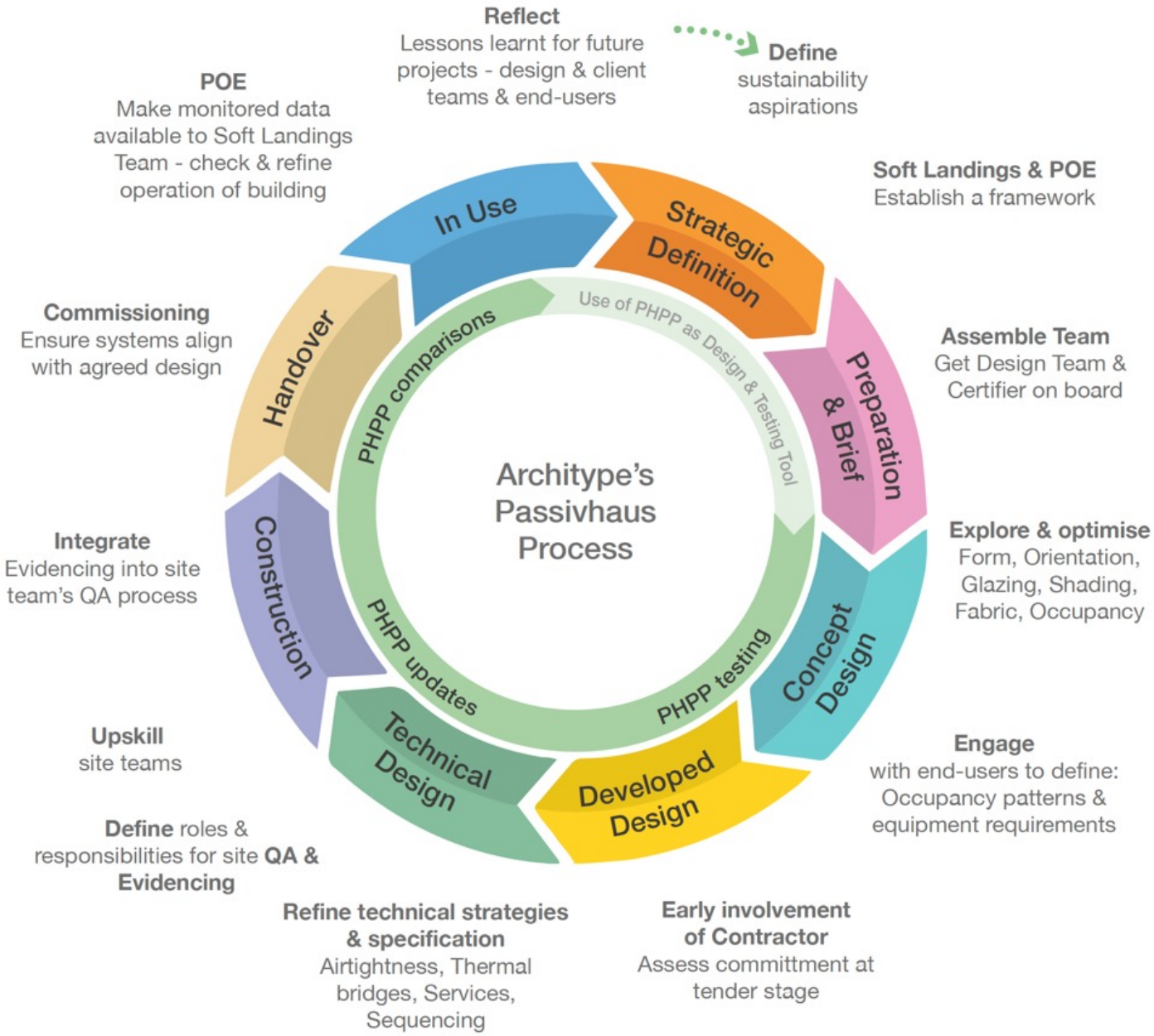
Callaughton Ash Housing / Much Wenlock, Shropshire

Fishleys House / Colwall, Herefordshire

ARCHITYPE Passivhaus Projects
Completed by Architype

Performance: Passivhaus as an Energy and Comfort Standard

- Closing the loop between buildings
- Embedding a learning process as standard



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Buildings That Inspire: Design, Collaboration, Stewardship & the Possible


Hackbridge Primary School
London Borough of Sutton
ARCHITYPE/PERFORM+

Net Zero: Embodied Carbon Exemplar

- ECCOLAB life-cycle carbon assessments
- Half the carbon use of ‘business as usual’
- Exceeds LETI 2020 Targets

Embodied Energy Emissions
Stages A1-A5 Only

Education sector

LETI ‘Business as usual’ [Benchmark]
750-1000 $kgCO_2e/m^2$ [GIA]

London Plan [WLC Benchmark]
700-800 $kgCO_2e/m^2$ [GIA]

LETI 2020
500 $kgCO_2e/m^2$ [GIA]

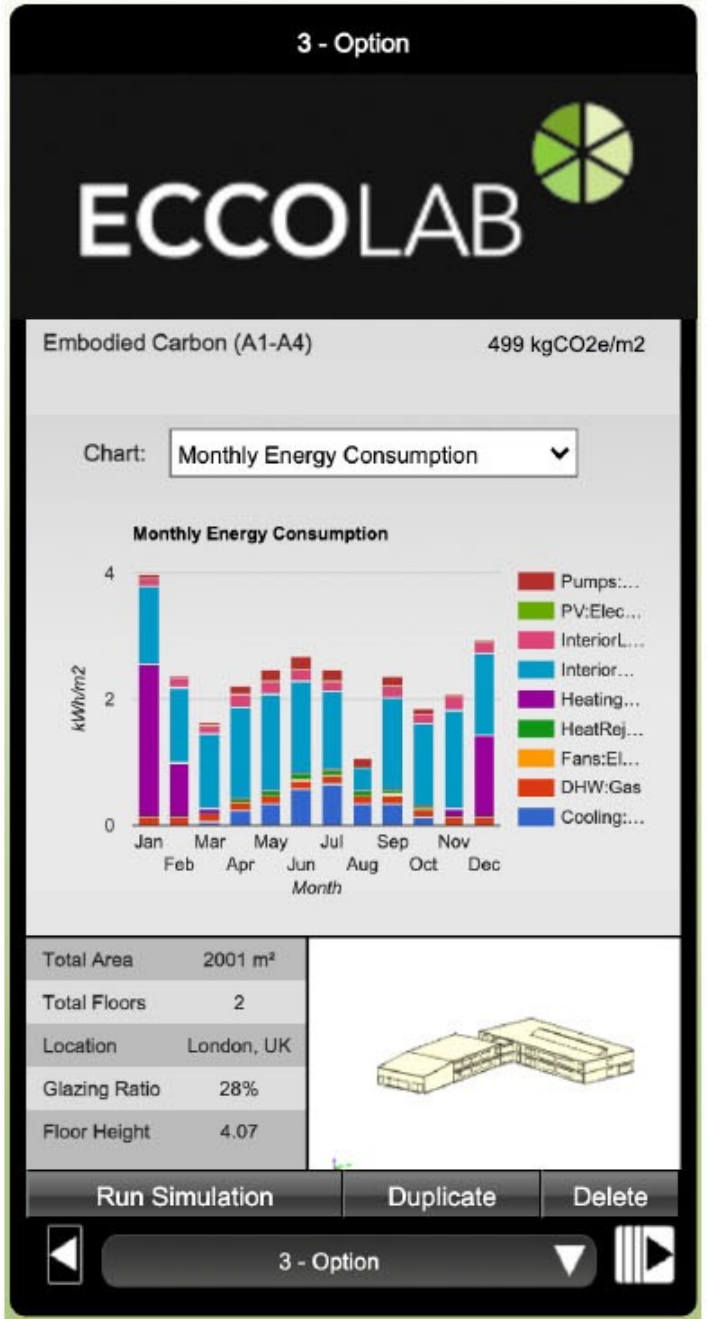
London Plan [Aspirational WLC benchmark]
500 $kgCO_2e/m^2$ [GIA]

Hackbridge Primary excl. sequestration
499 $kgCO_2e/m^2$ [GIA]

Hackbridge Primary incl. sequestration
405 $kgCO_2e/m^2$ [GIA]

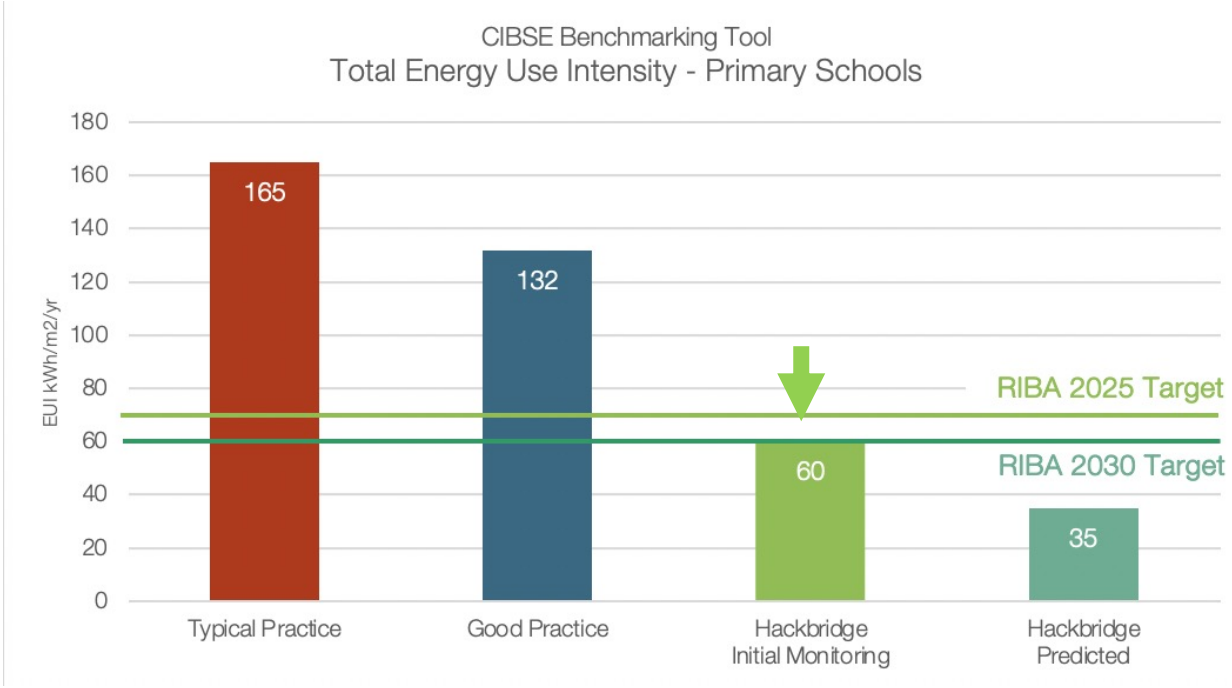
RIBA 2030 Target
400 $kgCO_2e/m^2$ [GIA]

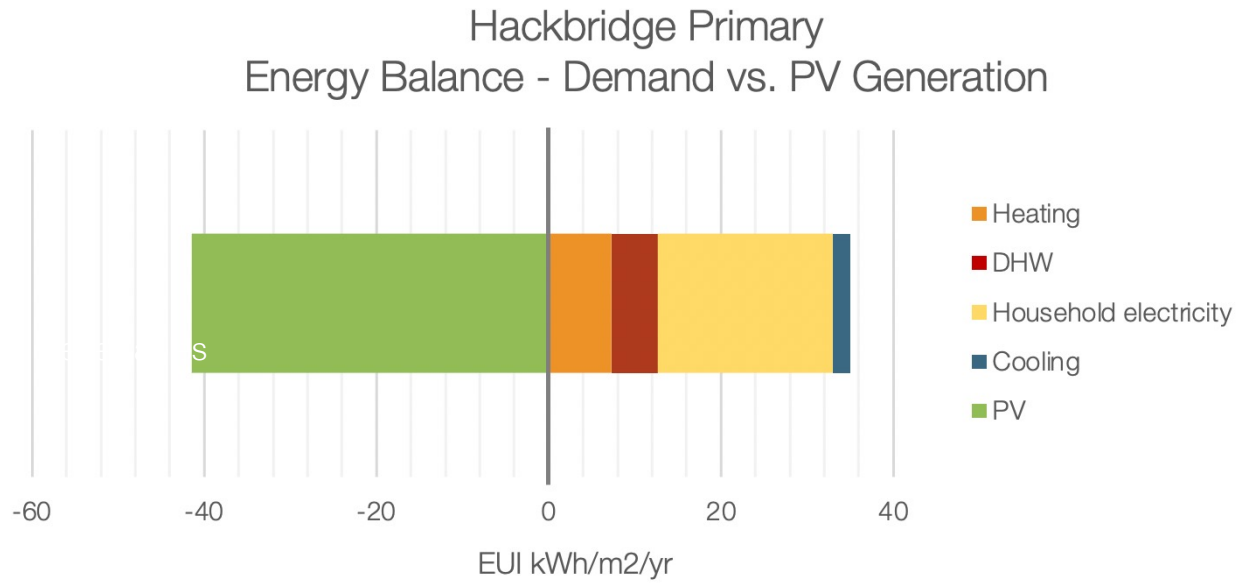
LETI 2030 Target
300 $kgCO_2e/m^2$ [GIA]



Net Zero: Operational Carbon Exemplar

- Fabric first approach
- Meets and will exceed RIBA 2030 and RIBA 2025 targets
- Supplies energy back to the grid
- Operational net zero
- Verification due end of 2023





"This is a building that had to be an exemplar for zero carbon and sustainability.

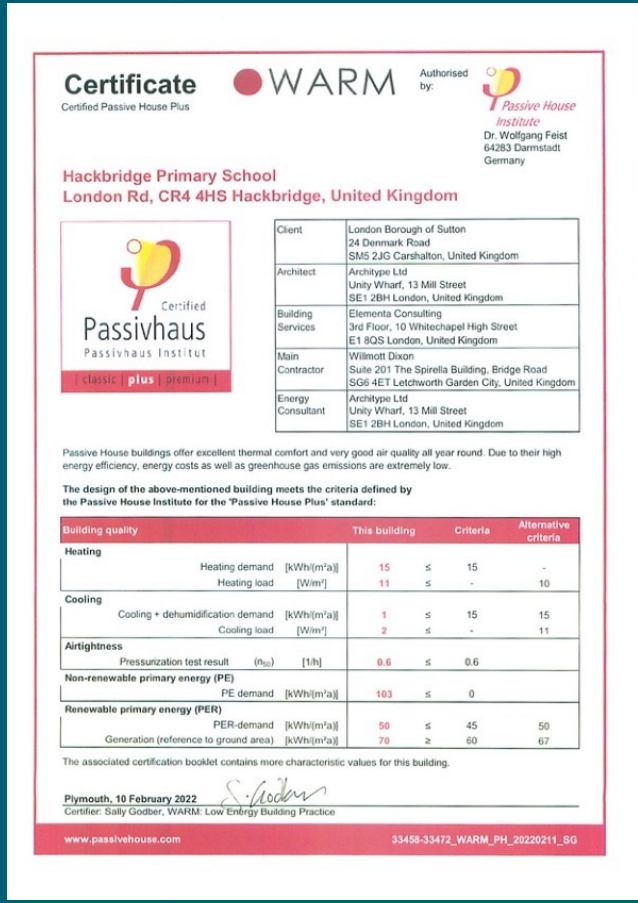
Architype rose to the challenge and helped us meet and even go beyond these aspirations.

The result is a beautiful school that celebrates our natural world and inspires children in their learning every day."

Adam Whiteley – Senior Project Manager
London Borough Sutton

Outcomes

Passivhaus Plus and renewables



Certificate
Certified Passive House Plus

WARM

Authorised by: Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany

Hackbridge Primary School
London Rd, CR4 4HS Hackbridge, United Kingdom

Certified Passivhaus
Passivhaus Institut
| classic | plus | premium |

Client	London Borough of Sutton 24 Denmark Road SM5 2JG Carshalton, United Kingdom
Architect	Architype Ltd Unity Wharf, 13 Mill Street SE1 2BH London, United Kingdom
Building Services	Elementa Consulting 3rd Floor, 10 Whitechapel High Street E1 8QS London, United Kingdom
Main Contractor	Willmott Dixon Suite 201 The Spirella Building, Bridge Road SG6 4ET Letchworth Garden City, United Kingdom
Energy Consultant	Architype Ltd Unity Wharf, 13 Mill Street SE1 2BH London, United Kingdom

Passive House buildings offer excellent thermal comfort and very good air quality all year round. Due to their high energy efficiency, energy costs as well as greenhouse gas emissions are extremely low.

The design of the above-mentioned building meets the criteria defined by the Passive House Institute for the 'Passive House Plus' standard:

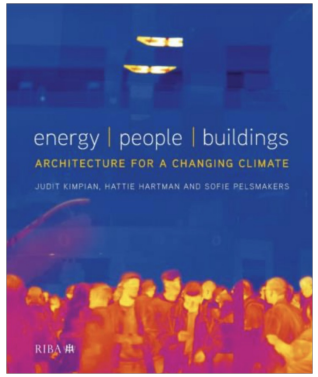
Building quality		This building		Criteria	Alternative criteria
Heating					
Heating demand	[kWh/(m²a)]	15	≤	15	-
Heating load	[W/m²]	11	≤	-	10
Cooling					
Cooling + dehumidification demand	[kWh/(m²a)]	1	≤	15	15
Cooling load	[W/m²]	2	≤	-	11
Airtightness					
Pressurization test result	(n_{50}) [1/h]	0.6	≤	0.6	
Non-renewable primary energy (PE)					
PE demand	[kWh/(m²a)]	103	≤	0	
Renewable primary energy (PER)					
PER-demand	[kWh/(m²a)]	50	≤	45	50
Generation (reference to ground area)	[kWh/(m²a)]	70	≥	60	67

The associated certification booklet contains more characteristic values for this building.

Plymouth, 10 February 2022
Certifier: Sally Godber, WARM: Low Energy Building Practice

www.passivehouse.com 33458-33472_WARM_PH_20220211_SG

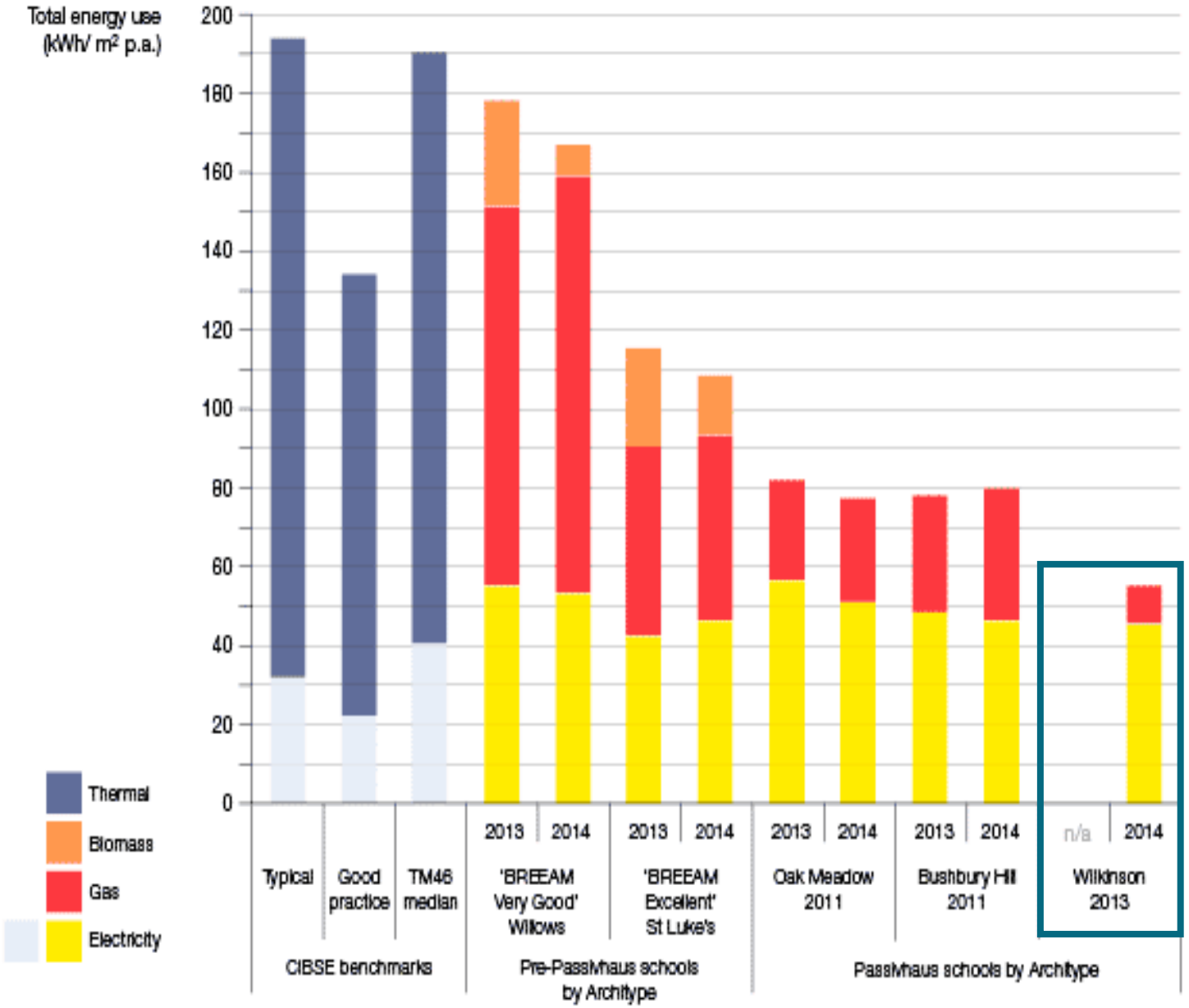
World class exemplary energy performance



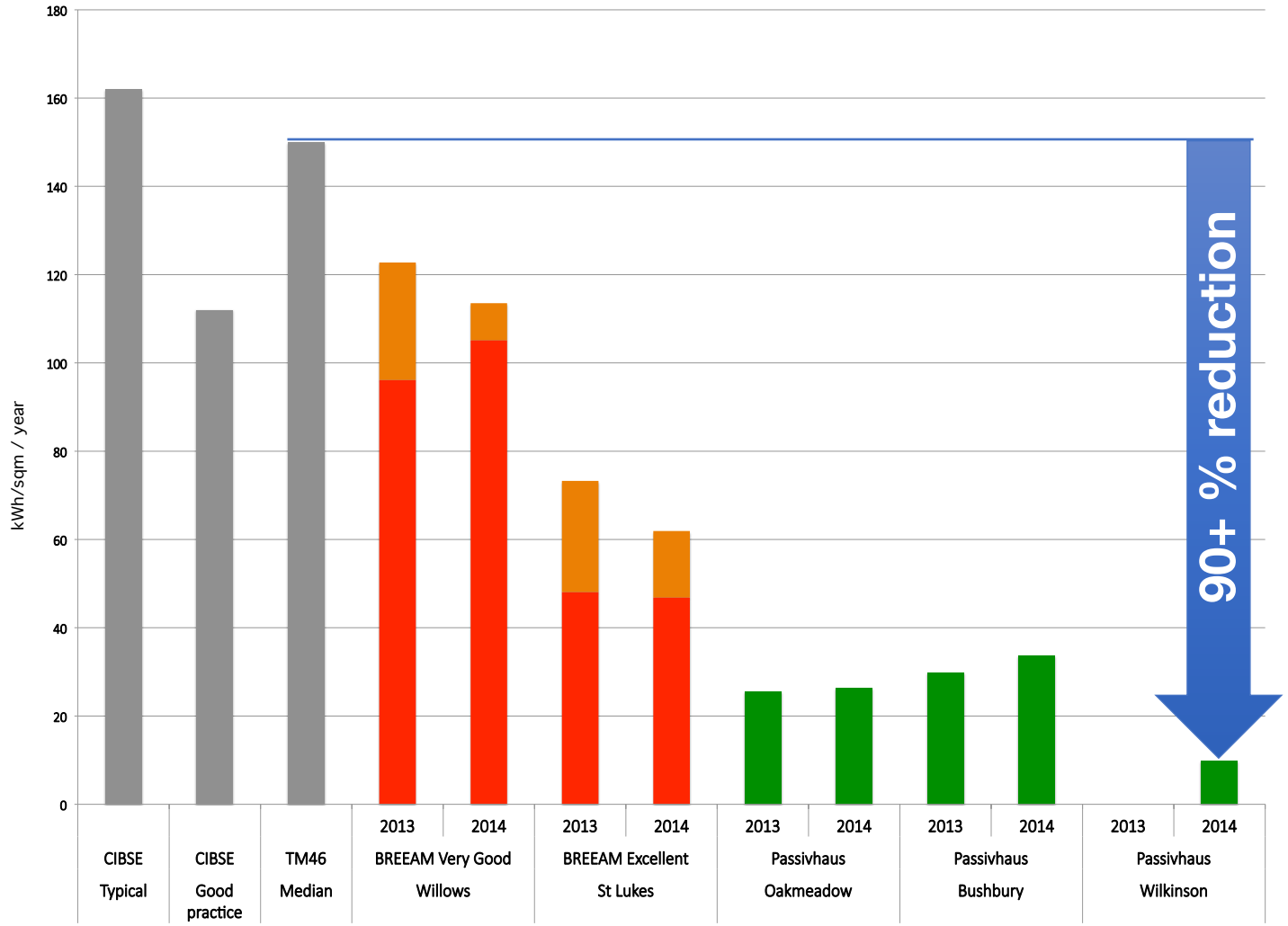
Wilkinson Primary School
Wolverhampton City Council

ARCHITYPE/PERFORM+

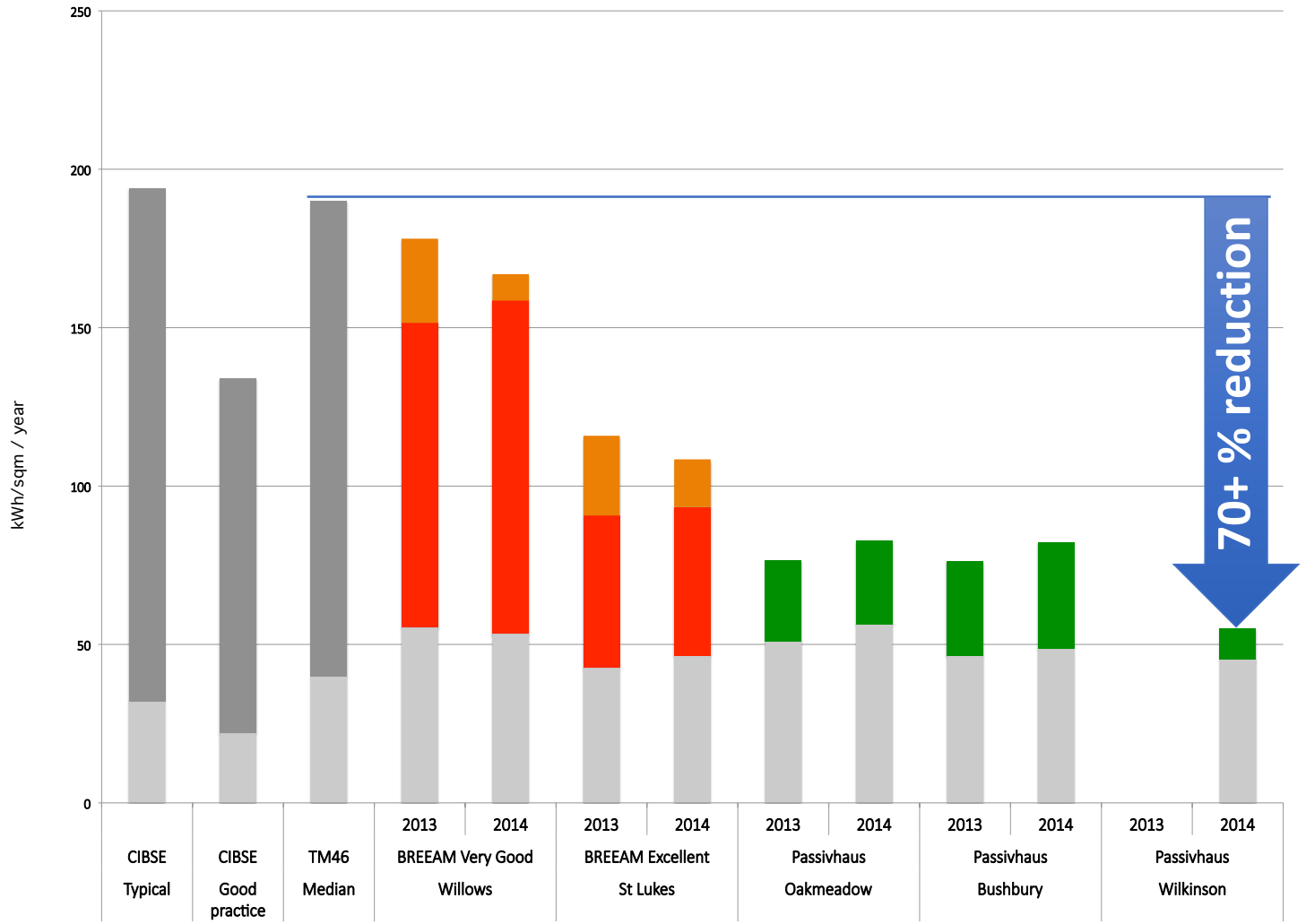
- A 2nd generation Architype Passivhaus primary school – applying lessons learnt
- Studied extensively as part of a wider Post Occupancy Evaluation investigating Indoor Air Quality

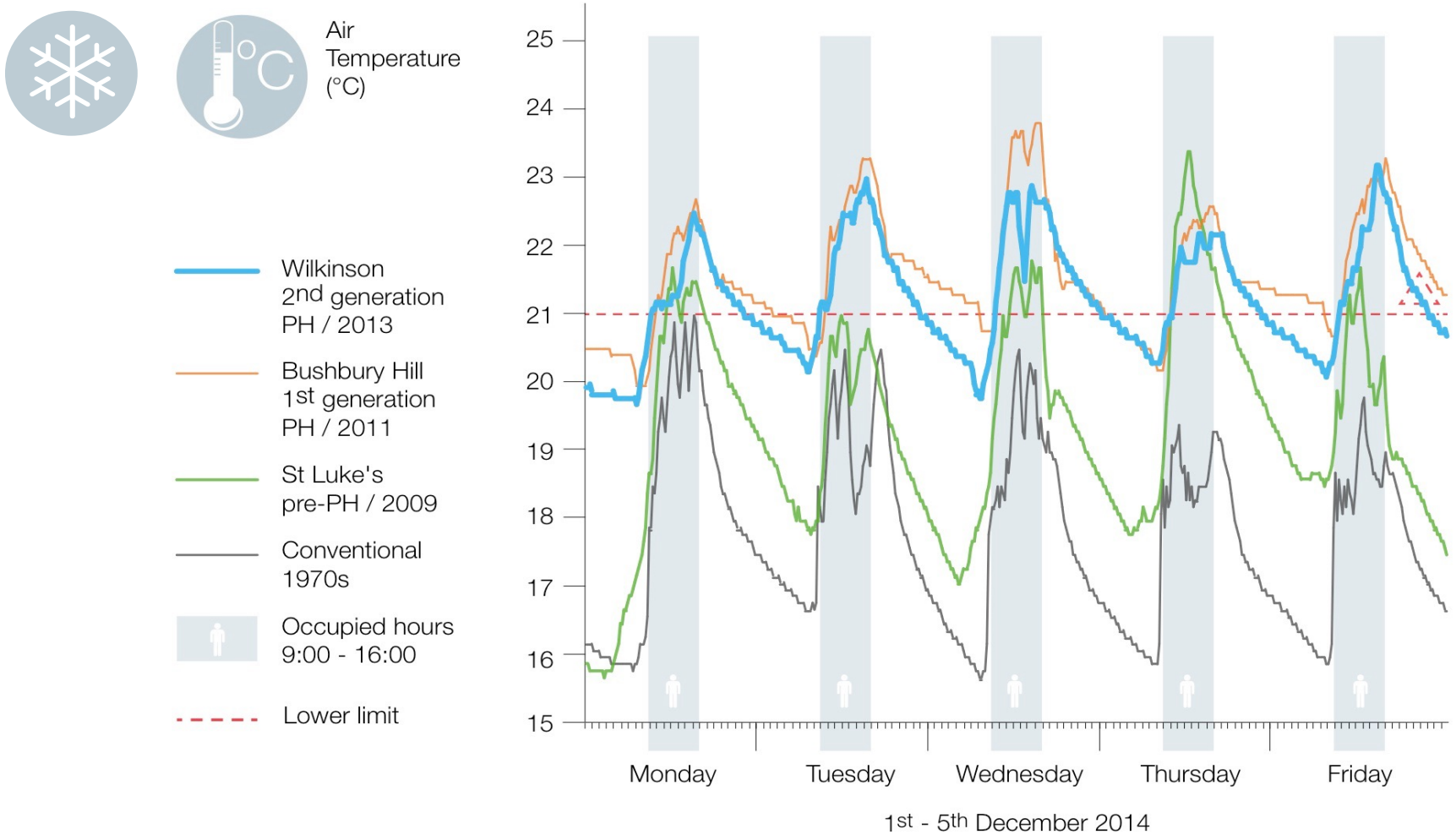


Post Occupancy Evaluations – Gas consumption

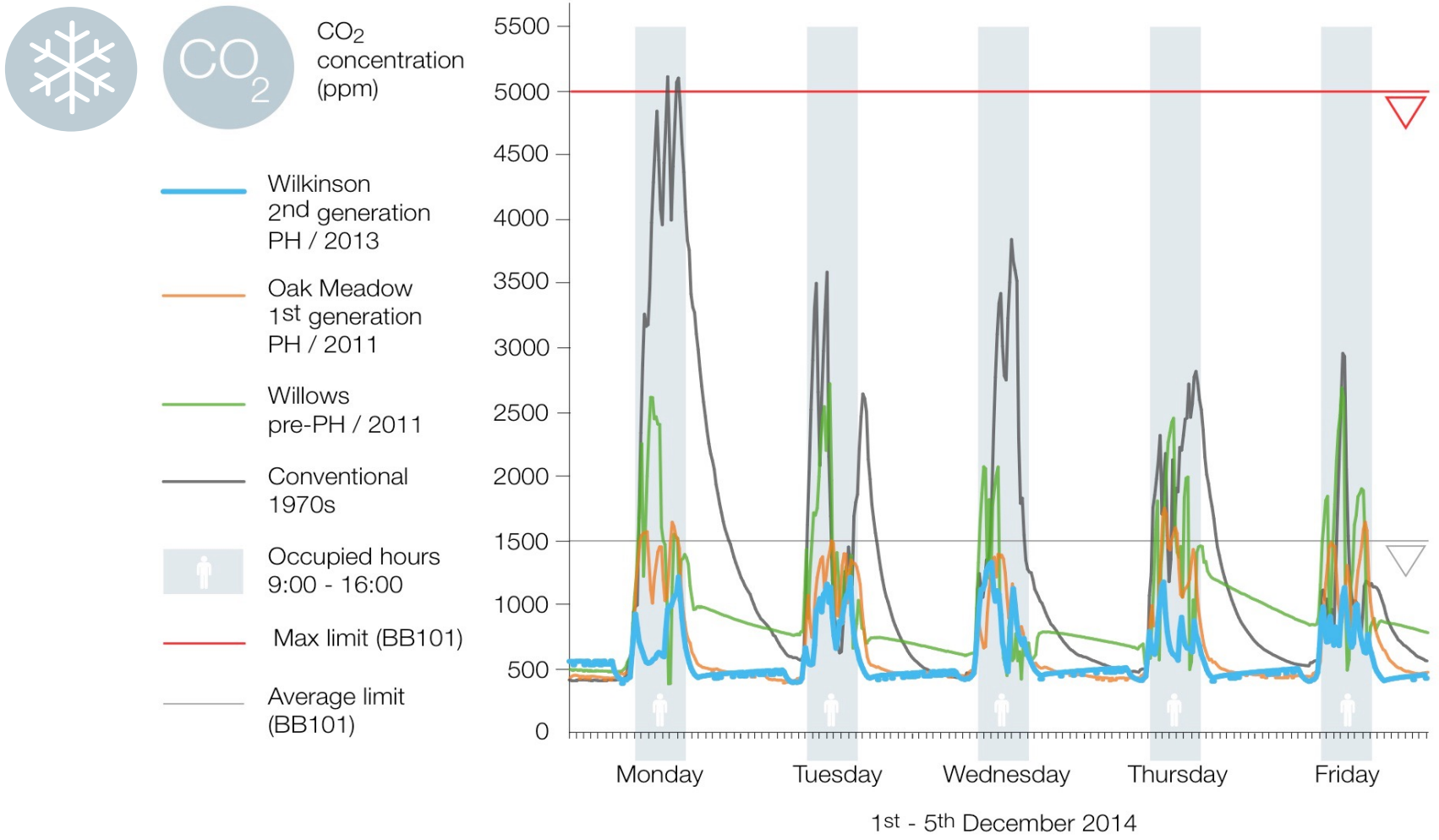


Post Occupancy Evaluations – Gas and electric consumption

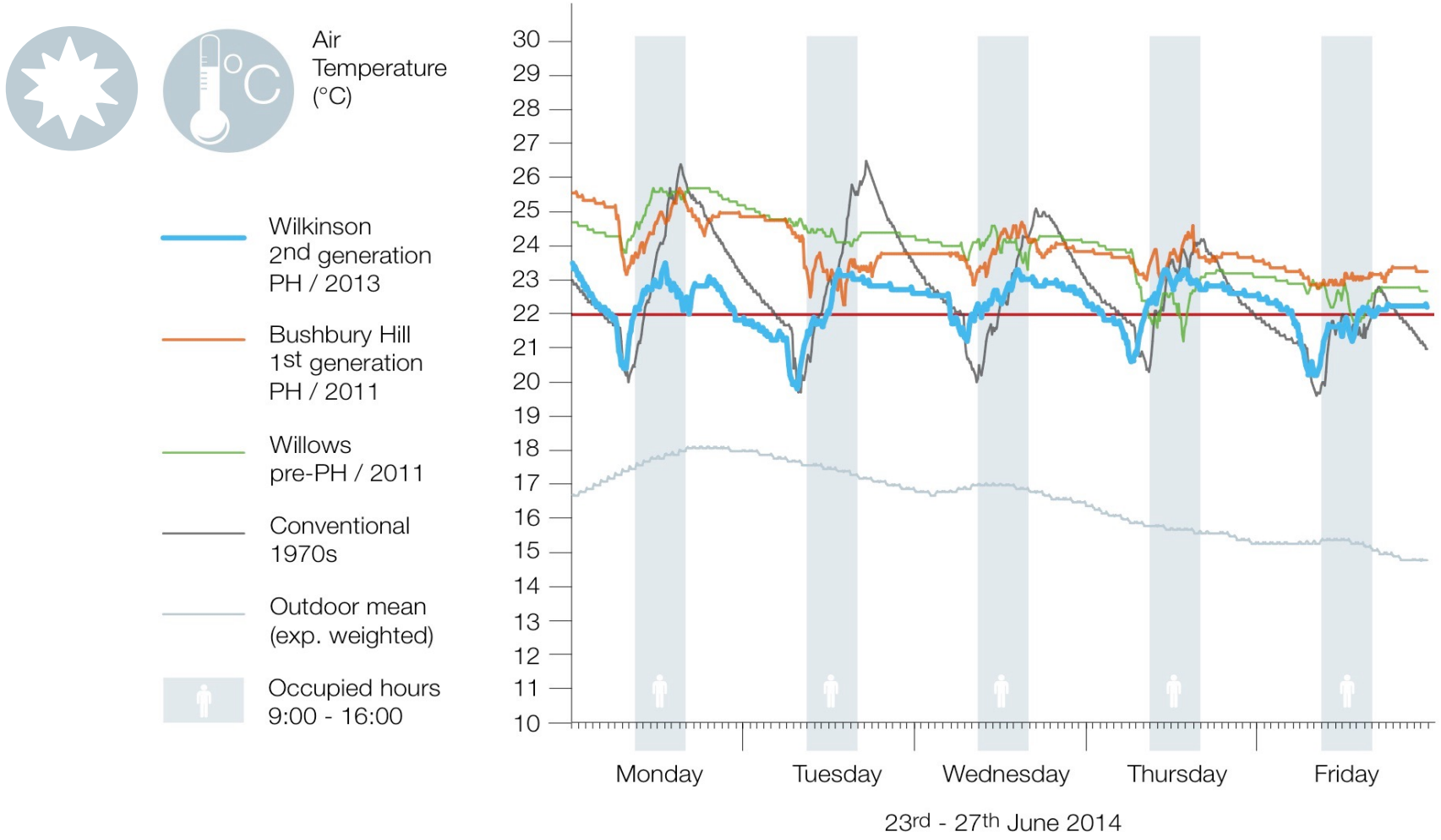




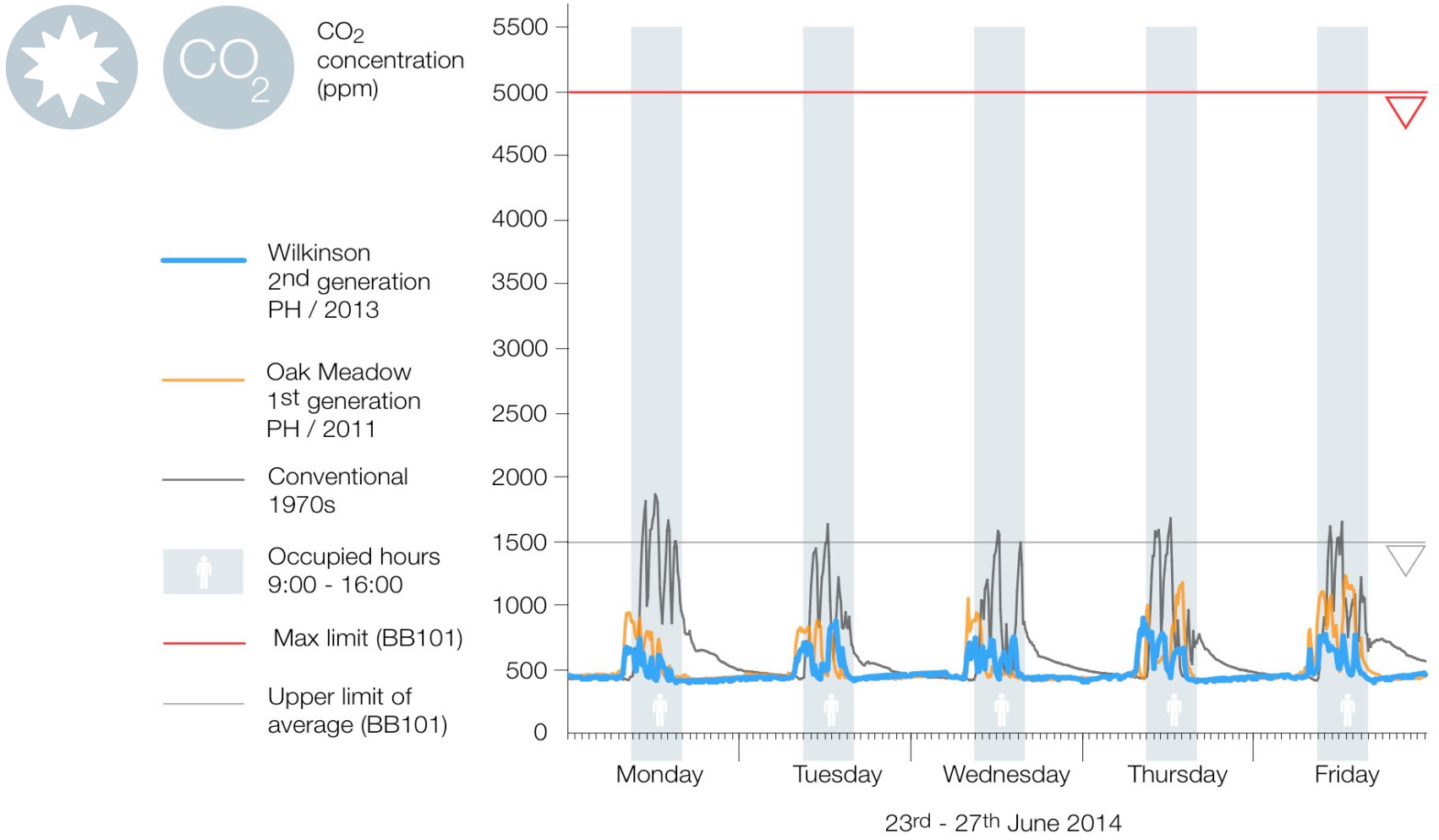
POE
Indoor Environment
Thermal Comfort
Winter



POE
Indoor Environment
Indoor Air Quality
Winter



POE
Indoor Environment
Thermal Comfort
Summer



POE
Indoor Environment
Indoor Air Quality
Summer

The Enterprise Centre
University of East Anglia

ARCHITYPE/PERFORM+

- 1 of 17 buildings exhibited during COP26 by WGBC
- Cited as 1 of 7 most sustainable buildings in the world (WEF)
- Winner of an inaugural Stewardship Award

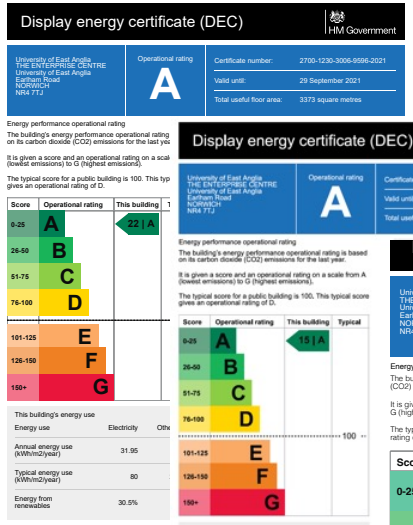
Understanding and Challenging the Brief

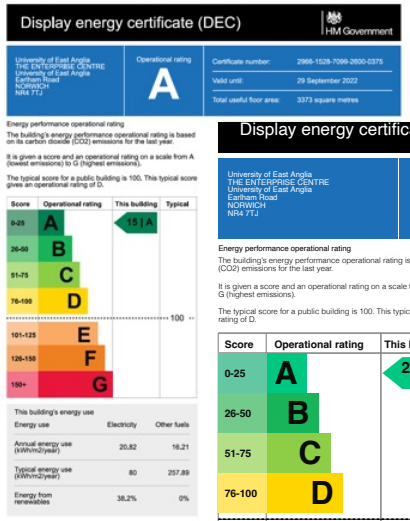
- Adaptable/flexible, mixed use, education, business and conference
- 100-year design life, including adaptation for climate change
- Largest UK Passivhaus scheme (at the time)
- BREEAM Outstanding
- Very low embodied carbon
- High use of renewable materials and local supply chains
- Soft Landings and 3-year POE/ Building Performance Evaluation

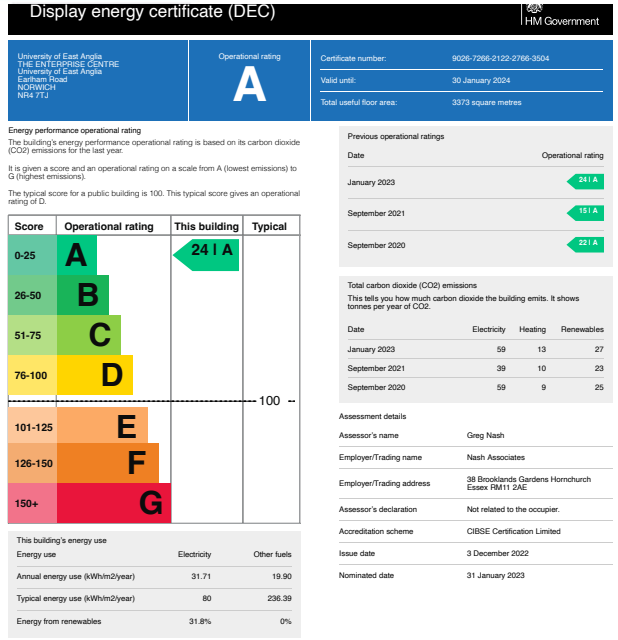
7 Years of Verified Performance

“The BREEAM Outstanding and Passivhaus Enterprise Centre is exemplary. It is the only building we have that performs exactly as promised”

“Maintenance visits are less than ¼ of visits to other buildings”
Richard Bettle / Head of Energy & Utilities



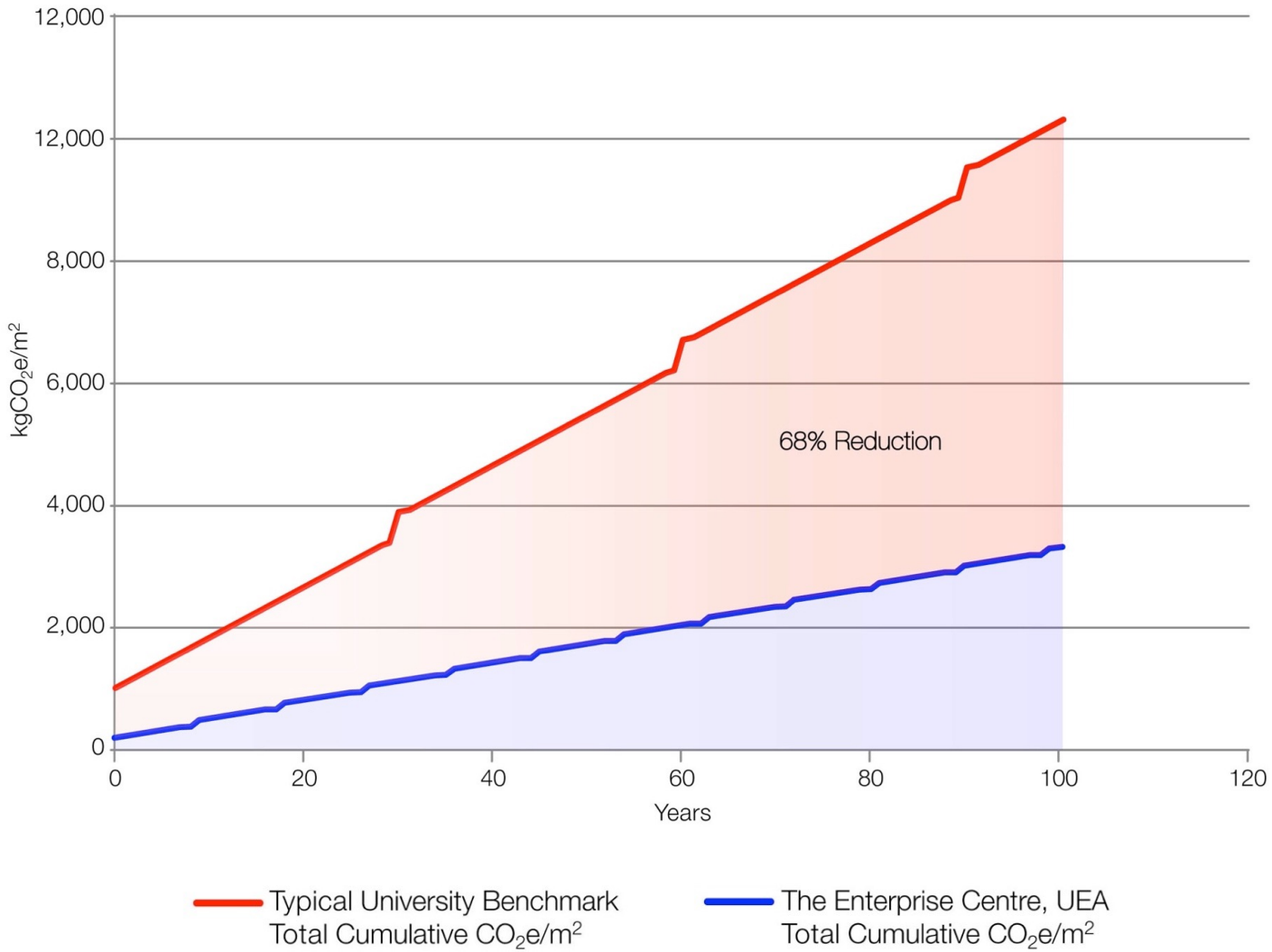




Local Impacts

- Revived traditional crafts like thatching
- Upskilled local construction teams
- Sourced materials locally to the site

Global Perspective



Wellbeing

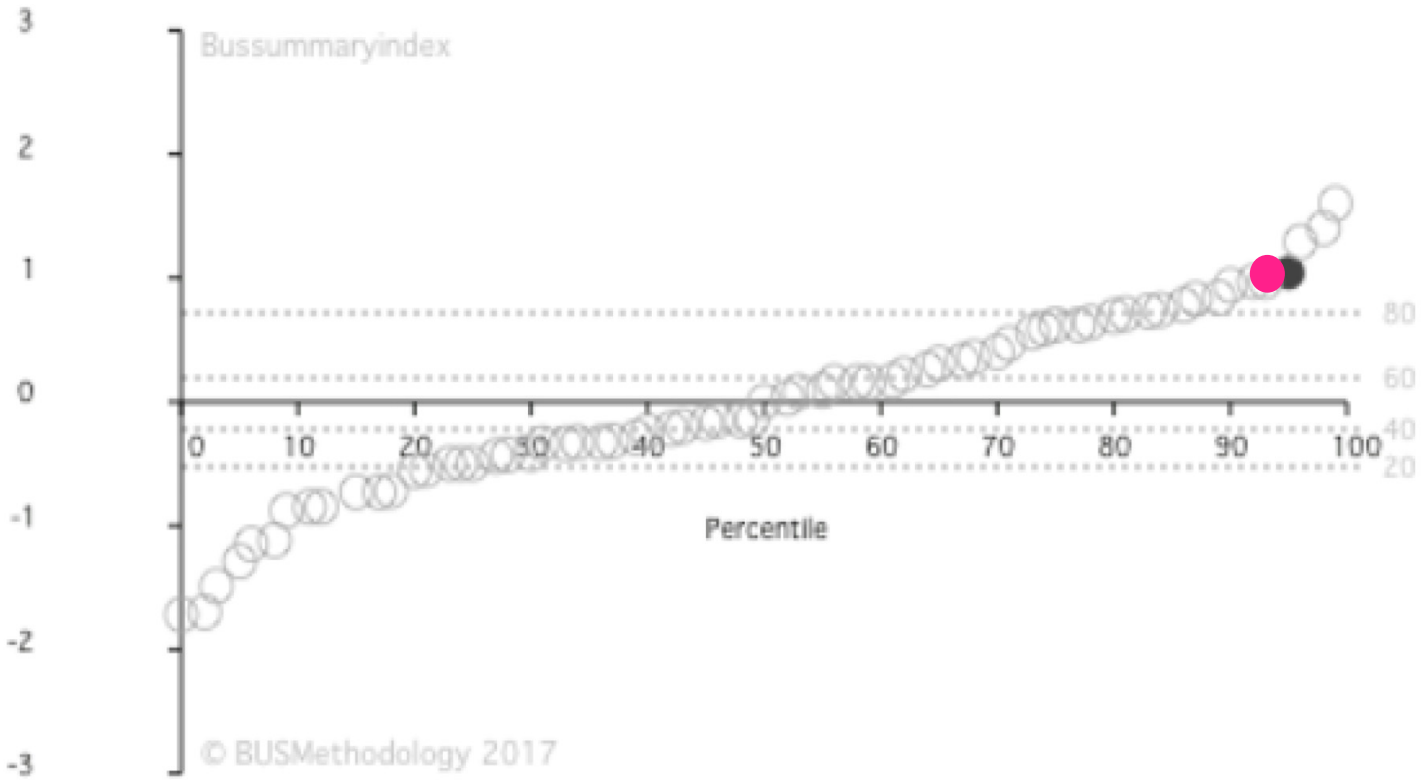
Building User Survey: quantifies qualitative responses from users of the building, which then enables comparison with similar buildings that have taken the survey

Enterprise Centre ranks in the top 98 percentile on Productivity and top 99 on Health

“Fantastic, uplifting, inspirational”

“Bright, energetic, creative”

“I have got fitter, feel more positive and have a better quality of living”



Overall Rating
Achieves 95 percentile
of all BUS surveys


UEA
University of East Anglia
Module Documents
2015/6: BIOCHEMISTRY - SEM1 - A
Announcements
Contact Information
Blackboard Help
Module Information
Module Documents
Assignments
Biochemistry in the news!
MODULE MANAGEMENT
Module Documents
Lectures delivered by Dr Bowater
Revision Folder
Blackboard content (lectures) from 2014/15
This folder contains teaching materials from relevant lectures delivered in 2014/15
UEA


HARRIS ACADEMY SUTTO
Integrity,
Discovery
ARCHITYPE/PERFORM+

Display energy certificate (DEC)

HM Government

Harris Academy Sutton 2 Chiltern Road SUTTON SM2 5RD	Operational rating **A**	Certificate number:	2534-3212-6852-5398-9606
		Valid until:	29 September 2023
		Total useful floor area:	10746 square metres

Energy performance operational rating

The building's energy performance operational rating is based on its carbon dioxide (CO2) emissions for the last year.

It is given a score and an operational rating on a scale from A (lowest emissions) to G (highest emissions).

The typical score for a public building is 100. This typical score gives an operational rating of D.

Score	Operational rating	This building	Typical
0-25	A	22 I A	
26-50	B		
51-75	C		
76-100	D		100
101-125	E		
126-150	F		
150+	G		

This building's energy use

Energy use	Electricity	Other fuels
Annual energy use (kWh/m2/year)	12.31	20.07
Typical energy use (kWh/m2/year)	40	131.96
Energy from renewables	0%	0%

Previous operational ratings

Date	Operational rating
September 2022	22 I A
September 2021	18 I A

Total carbon dioxide (CO2) emissions

This tells you how much carbon dioxide the building emits. It shows tonnes per year of CO2.

Date	Electricity	Heating	Renewables
September 2022	73	42	0
September 2021	50	49	0

Assessment details

Assessor's name	Nick Taylor
Employer/Trading name	DEC Associates Ltd
Employer/Trading address	02380 982 472
Assessor's declaration	Contractor to the occupier for EPBD services only.
Accreditation scheme	ECMK
Issue date	15 August 2022
Nominated date	30 September 2022

Certificate

Certified Passive House Classic

WARM

Authorised by:

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany

Harris Academy Sutton
2 Chiltern Road, SM2 5RD Sutton, United Kingdom/ Britain

Certified Passivhaus
Passivhaus Institut
classic plus | premium

Client	London Borough of Sutton 24 Denmark Road SM5 2JG Carshalton, United Kingdom/ Britain
Architect	Architype Ltd 13 Mill Street SE1 2BH London, United Kingdom/ Britain
Building Services	CMB / DES / Jones King
Main Contractor	Willmott Dixon Suite 201 The Spirella Building, Bridge Road SG6 4ET Letchworth Garden City, United Kingdom
Energy Consultant	Architype Ltd 13 Mill Street SE1 2BH London, United Kingdom/ Britain

Passive House buildings offer excellent thermal comfort and very good air quality all year round. Due to their high energy efficiency, energy costs as well as greenhouse gas emissions are extremely low.

The design of the above-mentioned building meets the criteria defined by the Passive House Institute for the 'Passive House Classic' standard:

Building quality			This building		Criteria	Alternative criteria
Heating						
	Heating demand	[kWh/(m²a)]	15	≤	15	-
	Heating load	[W/m²]	9	≤	-	10
Cooling						
	Cooling + dehumidification demand	[kWh/(m²a)]	0	≤	15	15
	Cooling load	[W/m²]	0	≤	-	11
Airtightness						
	Pressurization test result	(n_{50}) [1/h]	0.3	≤	0.6	
Non-renewable primary energy (PE)						
	PE demand	[kWh/(m²a)]	120	≤	120	

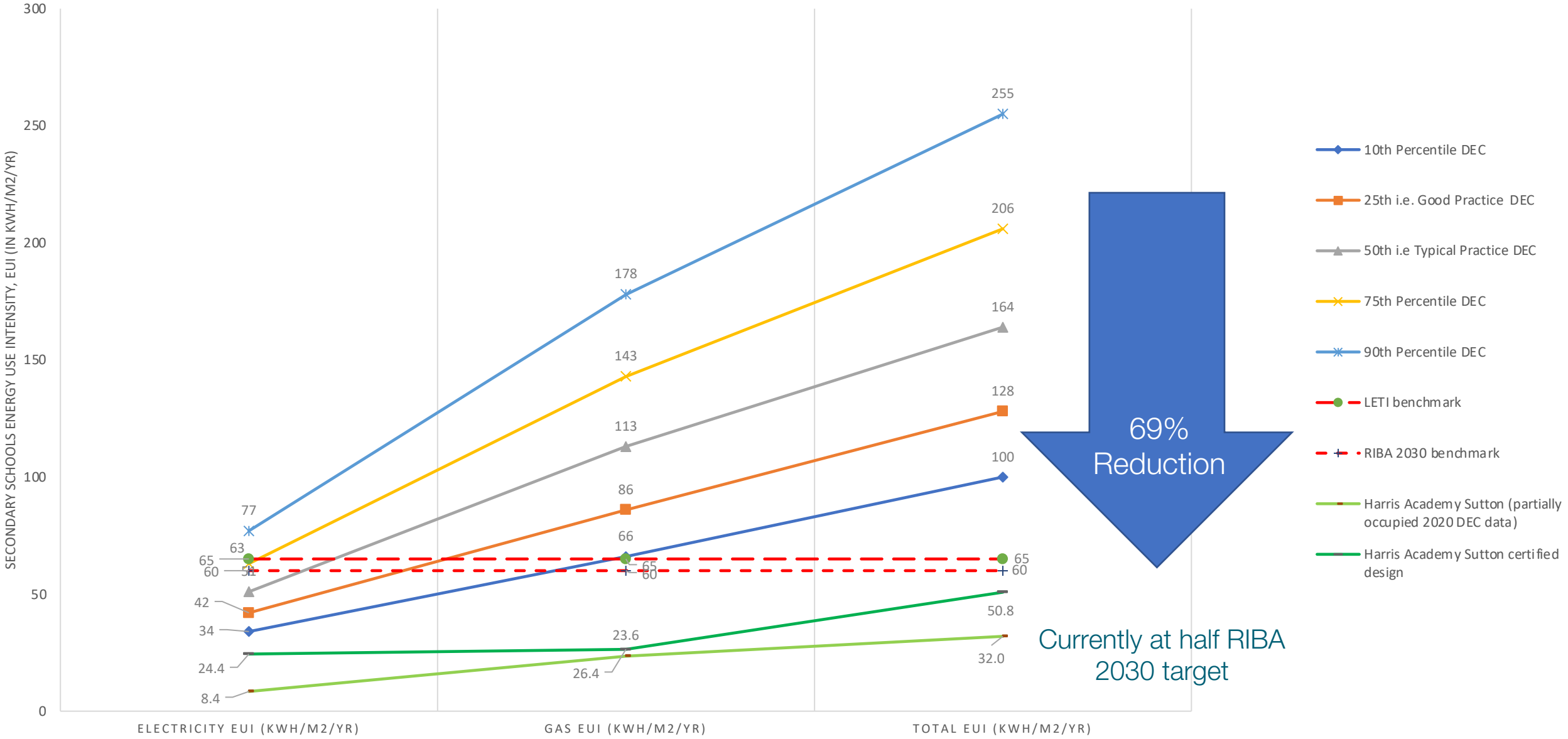
The associated certification booklet contains more characteristic values for this building.

Plymouth, 17 December 2021

Certifier: Sally Godber, WARM: Low Energy Building Practice

www.passivehouse.com 32609-32698_WARM_PH_20211221_SG

Secondary School Operational Energy Benchmarks



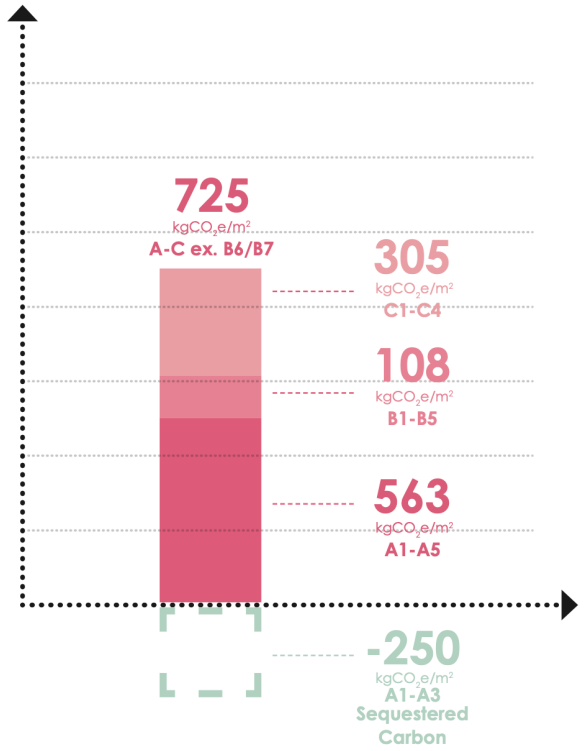
Publishing Performance

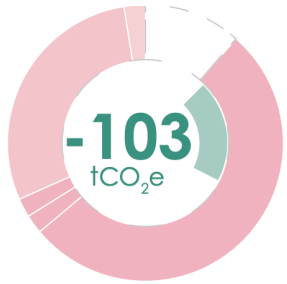
RIBA 2030 Climate Challenge target metrics for non-domestic (new build schools)

RIBA Sustainable Outcome Metrics	Business as usual (new build, compliance approach)	2025 Targets	2030 Targets	Notes
Operational Energy kWh/m²/y	130 kWh/m²/y	< 70 kWh/m²/y	< 60 kWh/m²/y ***50.8 HARRIS***	Targets based on GIA. Figures include regulated & unregulated energy consumption irrespective of source (grid/renewables). Refer to Department for Education Output Specifications for schools: 2025: Primary <55 kWh/m²/y, 2030: Primary <45 kWh/m²/y 1. Use a 'Fabric First' approach 2. Minimise energy demand. Use efficient services and low carbon heat 3. Maximise onsite renewables
Embodied Carbon $kgCO_2e/m^2$	1400 $kgCO_2e/m^2$ ***725 HARRIS***	< 675 $kgCO_2e/m^2$	< 540 $kgCO_2e/m^2$	Use RICS Whole Life Carbon (modules A1-A5, B1-B5, C1-C4 incl sequestration). Analysis should include minimum of 95% of cost, include substructure, superstructure, finishes, fixed FF&E, building services and associated refrigerant leakage. 1. Whole Life Carbon Analysis 2. Use circular economy strategies 3. Minimise offsetting, use UK schemes (CCC) BAU aligned with LETI band E; 2025 target aligned with LETI band C and 2030 target aligned with LETI band B.
Portable Water Use m^3/pupil/year	4.5 m^3/pupil/y	< 1.5 m^3/pupil/y ***1.49 HARRIS***	< 0.5 m^3/pupil/y	Refer to Department for Education Output Specifications for schools.

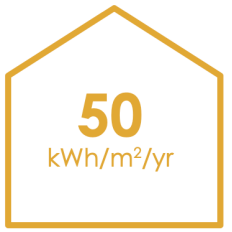
LETI

Embodied Carbon Case Studies Set 1





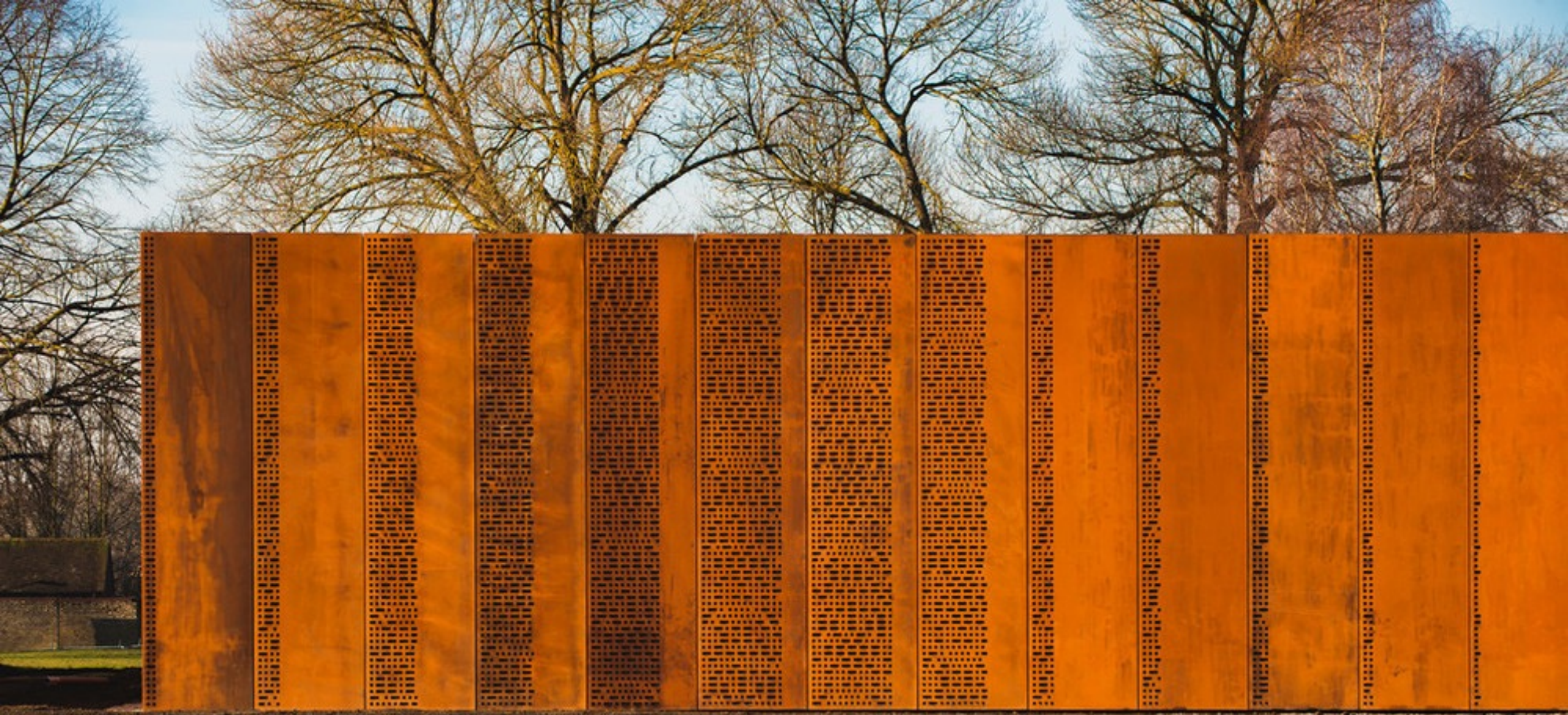
Module D



B6 Operational energy

Operational energy estimation method:

PHPP at design stage



Duxford Paper Store
Imperial War Museum

ARCHITYPE/PERFORM+

- 95% energy reduction compared to typical Arts Council archive
- £1971/sqm - 45% less expensive than Arts Council Budget

Certificate

Certified Passive House Classic

WARM

Authorised by:

Passive House Institute

Dr. Wolfgang Feist
64283 Darmstadt
Germany

Pilot Project: Imperial War Museum paper archive Duxford, CB22 4QR Cambridge, United Kingdom/ Britain

Certified Passivhaus
Passivhaus Institut
classic | plus | premium

Client	Imperial War Museum Duxford CB22 4QR Cambridge, United Kingdom/ Britain
Architect	Architype Unity Wharf, 13 Mill St SE1 2BH London, United Kingdom/ Britain
Building Services	E3 Consulting engineers 2 Tollbridge Studios BA1 7DE BATH, United Kingdom/ Britain
Energy Consultant	Elemental Solutions Withy Cottage Little Hill Orcop HR2 8SE Hereford, United Kingdom/ Britain

Passive House buildings offer excellent thermal comfort and very good air quality all year round. Due to their high energy efficiency, energy costs as well as greenhouse gas emissions are extremely low.

The design of the above-mentioned building meets the criteria defined by the Passive House Institute for the 'Passive House Classic' standard:

Building quality			This building		Criteria	Alternative criteria
Heating						
	Heating demand	[kWh/(m²a)]	2	≤	15	-
	Heating load	[W/m²]	3	≤	-	10
Cooling						
	Cooling + dehumidification demand	[kWh/(m²a)]	3	≤	16	16
	Cooling load	[W/m²]	3	≤	-	10
	Frequency of overheating (> 25 °C)	[%]	-	≤	-	
Airtightness						
	Pressurization test result (n_{50})	[1/h]	0.03	≤	0.60	
Non-renewable primary energy (PE)						
	PE demand	[kWh/(m²a)]	26	≤	135	
Renewable primary energy (PER)						
	PER-demand	[kWh/(m²a)]	10	≤	-	-
	Generation (reference to ground area)	[kWh/(m²a)]	0	≥	-	-

The associated certification booklet contains more characteristic values for this building.
From early monitoring, internal tempertures of 9 degC for winter and 16 degC for summer were used in the modelling to calculate the values above. Longer term monitoring may well show different values.

Peter Warm

Plymouth, 20 October 2020

Certifiers: peter warm, WARM: Low Energy Building Practice and Aurelia Lippolis, Passivhaus Institut

£880

IWM Annual Energy Bill
Equivalent to €1021.12

Site team celebrate achieving the world airtightness record on IWM
Context: IWM was their very 1st Passivhaus build and toolbox talks were invaluable

Performance: Lessons Learned

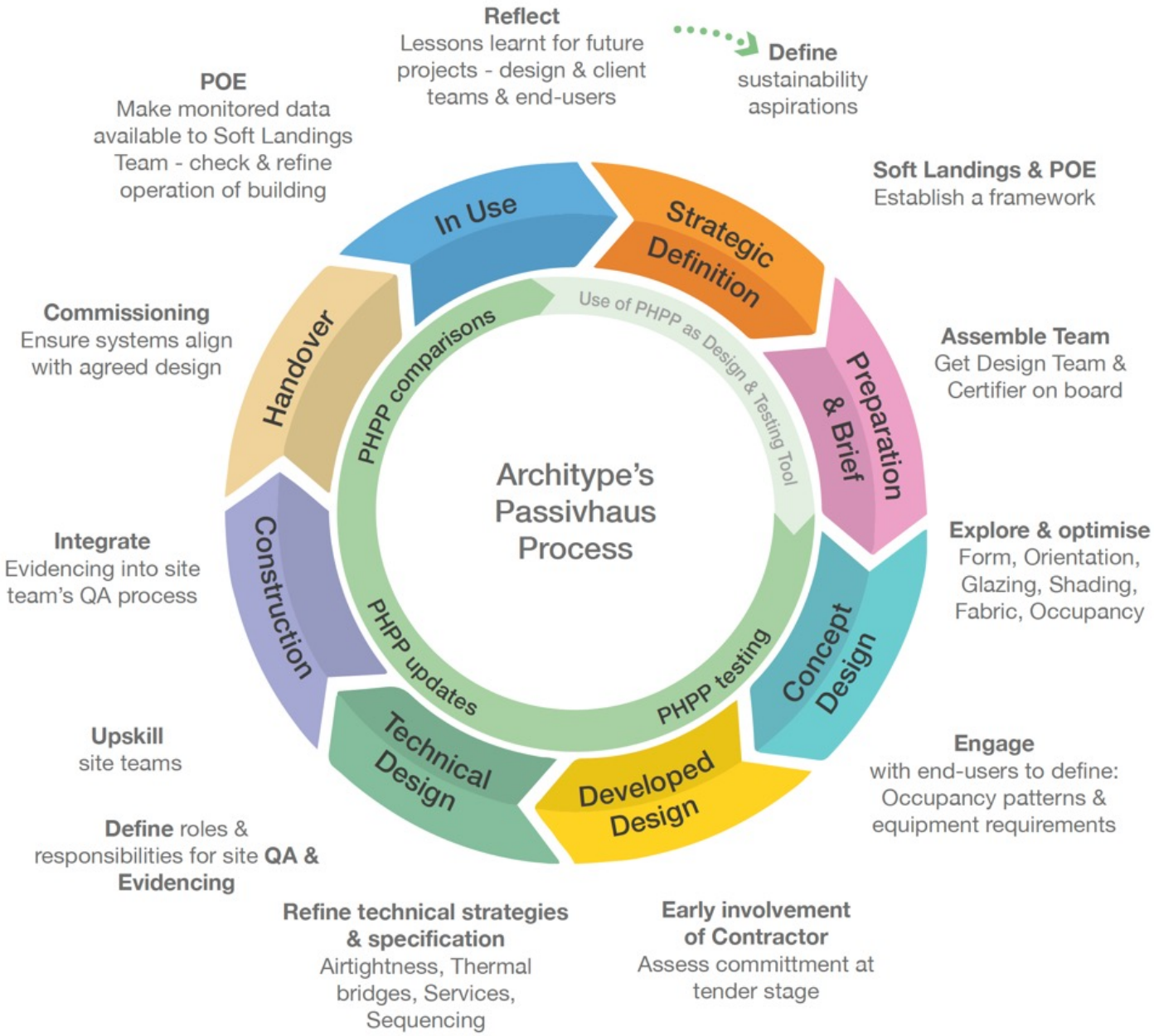
- Collaboration between all parties involved & willingness to learn & set ambitious goals, is essential to achieve high levels of performance: **it's as much about relationships as design & technology**

- Involvement of architects beyond the 'completion' – to optimize and troubleshoot through BPE – is key: **longer term stewardship is essential to realizing a Just Transition**

- Early engagement with site teams & upskilling the industry at scale are both critical to close the education gap

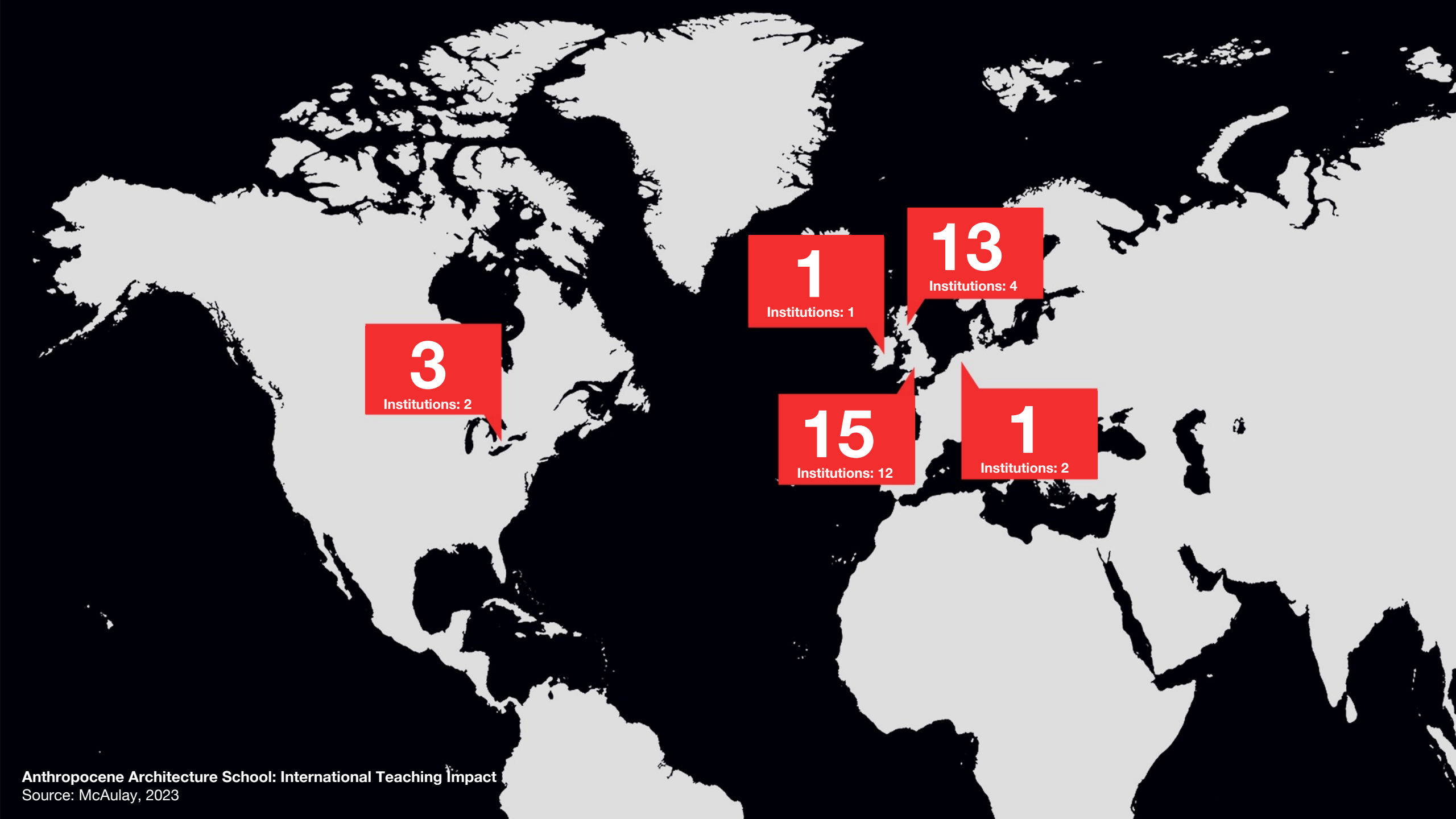
A Just Transition: An Education, Industry & Policy Challenge

- Academic curricula are lagging behind what is technologically possible – practitioners not prepared for an uncertain future
- Upskilling & capacity building is needed at scale
- Policy does not push building performance as far as is already achievable today



Education:

Academic & Otherwise - Anthropocene Architecture School

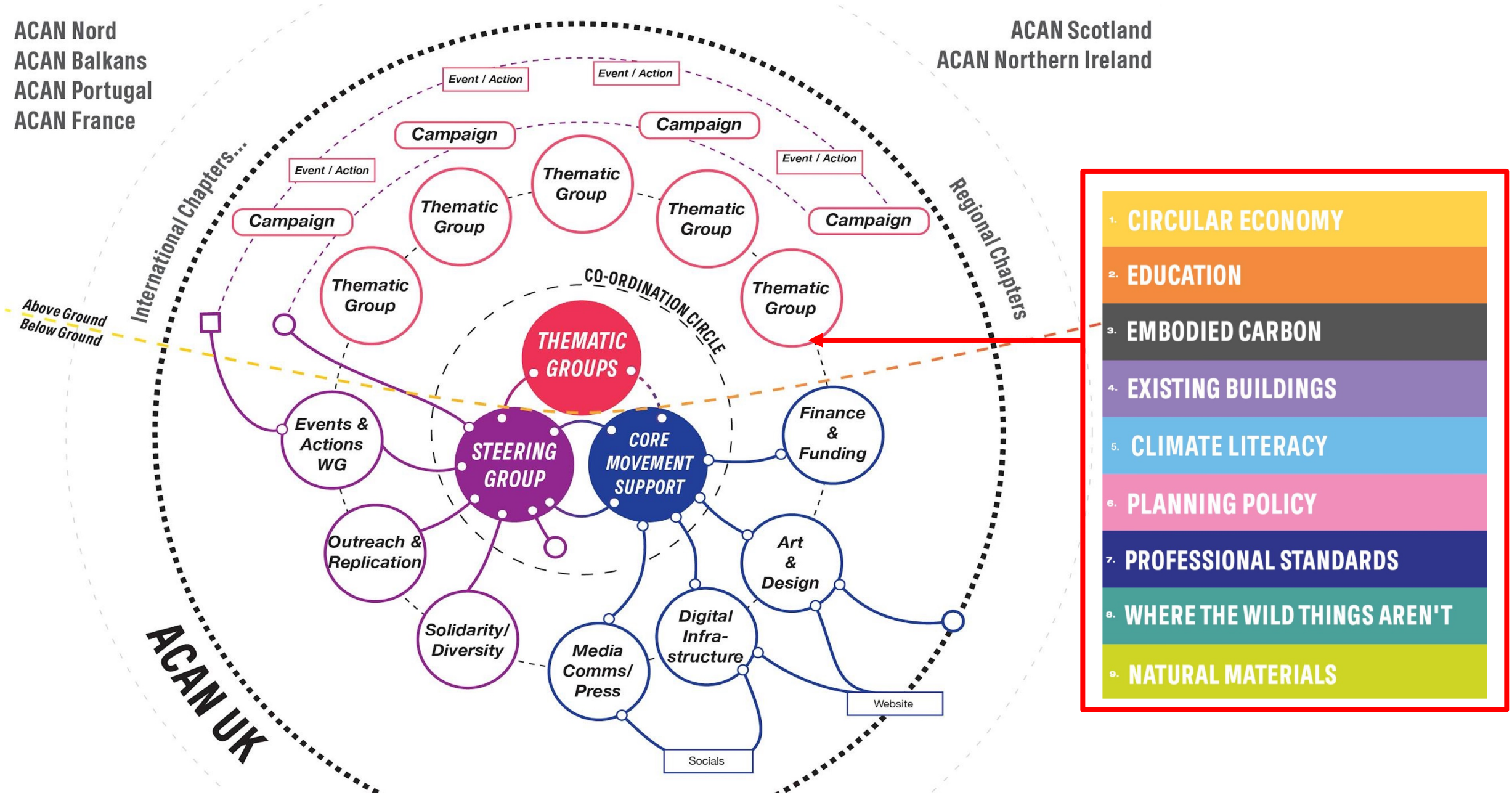


Anthropocene Architecture School: International Teaching Impact
Source: McAulay, 2023

Industry:

Grassroots Campaigning

ARCHITECTS!
CLIMATE
ACTION
NETWORK


ACAN Nord
ACAN Balkans
ACAN Portugal
ACAN France
ACAN Scotland
ACAN Northern Ireland
International Chapters...
Regional Chapters
Above Ground
Below Ground
ACAN UK
Event / Action
Event / Action
Campaign
Campaign
Event / Action
Event / Action
Campaign
Campaign
Thematic Group
Thematic Group
Thematic Group
Thematic Group
Thematic Group
CO-ORDINATION CIRCLE
THEMATIC GROUPS
STEERING GROUP
CORE MOVEMENT SUPPORT
Events & Actions WG
Finance & Funding
Outreach & Replication
Art & Design
Solidarity/ Diversity
Media Comms/ Press
Digital Infra-structure
Website
Socials
1. CIRCULAR ECONOMY
2. EDUCATION
3. EMBODIED CARBON
4. EXISTING BUILDINGS
5. CLIMATE LITERACY
6. PLANNING POLICY
7. PROFESSIONAL STANDARDS
8. WHERE THE WILD THINGS AREN'T
9. NATURAL MATERIALS

National Ambition

National Upskilling - BE-ST & PHT

Collective Efforts

Architecture Fringe

LETI

Low Energy Transformation Initiative

Passivhaus Trust

SCOTTISH FUTURES TRUST

BE—ST

Built Environment — Smarter Transformation

Tenants' rights & the Just Transition are inseparable
Credit: Living Rent, 2021

“One of the fundamental challenges…is that we need to be able to imagine possible, feasible, delightful versions of the future before we can create them. Not utopias, but where things turned out okay.”

- Rob Hopkins in From What Is to What If: Unleashing the Power of Imagination to Create the Future We Want (2020)

Scott McAulay

Anthropocene Architecture School

ARCHITYPE/PERFORM+

- Architecture Fringe
- Architects Climate Action Network
- Living Rent