

PLANNING FOR CLIMATE CHANGE AND RAPID URBANISATION

CONTINUING PROFESSIONAL DEVELOPMENT, LECTURE SERIES FOR PROFESSIONALS

Thank you for joining!

This lecture will begin shortly, at 11:00am UTC, 12:00noon BST



Image credit:
Morley von Sternberg for Allies and Morrison

Lecture Series

Overview of the seven lectures forming part of this series:

- 1. Introduction to the UN 2030 Sustainable Development Goals**, Mina Hasman, SOM
Provides an overview of the UN 2030 SDGs together with other related international agreements, and describes the importance of the Goals for Built Environment Professionals.
- 2. Planning for Rapid Urbanisation**, Ben Bolgar, The Prince's Foundation
Outlines a framework for use in secondary cities which are experiencing rapid growth but which may have little or no access to professional planning expertise.
- 3. Planned City Extensions**, Alfredo Caraballo, Allies and Morrison
Provides a reminder of key master-planning and urban design principles such as: site analysis, micro-climate design, density, mixed use, walkability etc.
- 4. Resilient Infrastructure**, Ian Carradice, Arup
Explains the context, relevance and drivers to develop resilient infrastructure by adopting an integrated design approach and considering planetary solutions to address climate related challenges..
- 5. Climate Responsive Design**, Peter Clegg, Isabel Sandeman and Rachel Sayers from FCB Studios, and Rafiq Azzam, Shatotto
Part one is focused on 'A Manifesto for delivering Climate Responsive Design', and Part Two, entitled 'Collaborating for Sustainable Development', provides a case study of how the principles of Climate responsive design have been used on a project in Bangladesh to create an inspiring and comfortable educational environment for the Aga Khan Academies Unit.
- 6. Heritage-led Regeneration**, Geoff Rich, Feilden Clegg Bradley Studios
Describes the value of heritage led regeneration in terms of the reuse of existing buildings, and the potential to generate social and economic development.
- 7. Sustainable Outcomes Guide**, Gary Clark, HOK London Studio
Provides a practical explanation of the outcomes that need to be delivered if we are to achieve development which is sustainable. Includes meaningful, measurable targets and associated metrics.



RIBA Sustainable Outcomes Guide: A Road Map to a Sustainable Future

RIBA Sustainable Futures Group

Gary Clark, HOK, London Studio



**CONTEXT
SUSTAINABLE OUTCOMES
2030 CHALLENGE
PLAN OF WORK
PLAN FOR USE
CASE STUDIES
SUMMARY**



CONTEXT

7.7
Billion
People



People

37.1 Billion
Tonnes CO₂
Emissions

1/3 from
Buildings and
Construction

\$80,683.79
Billion



Profit

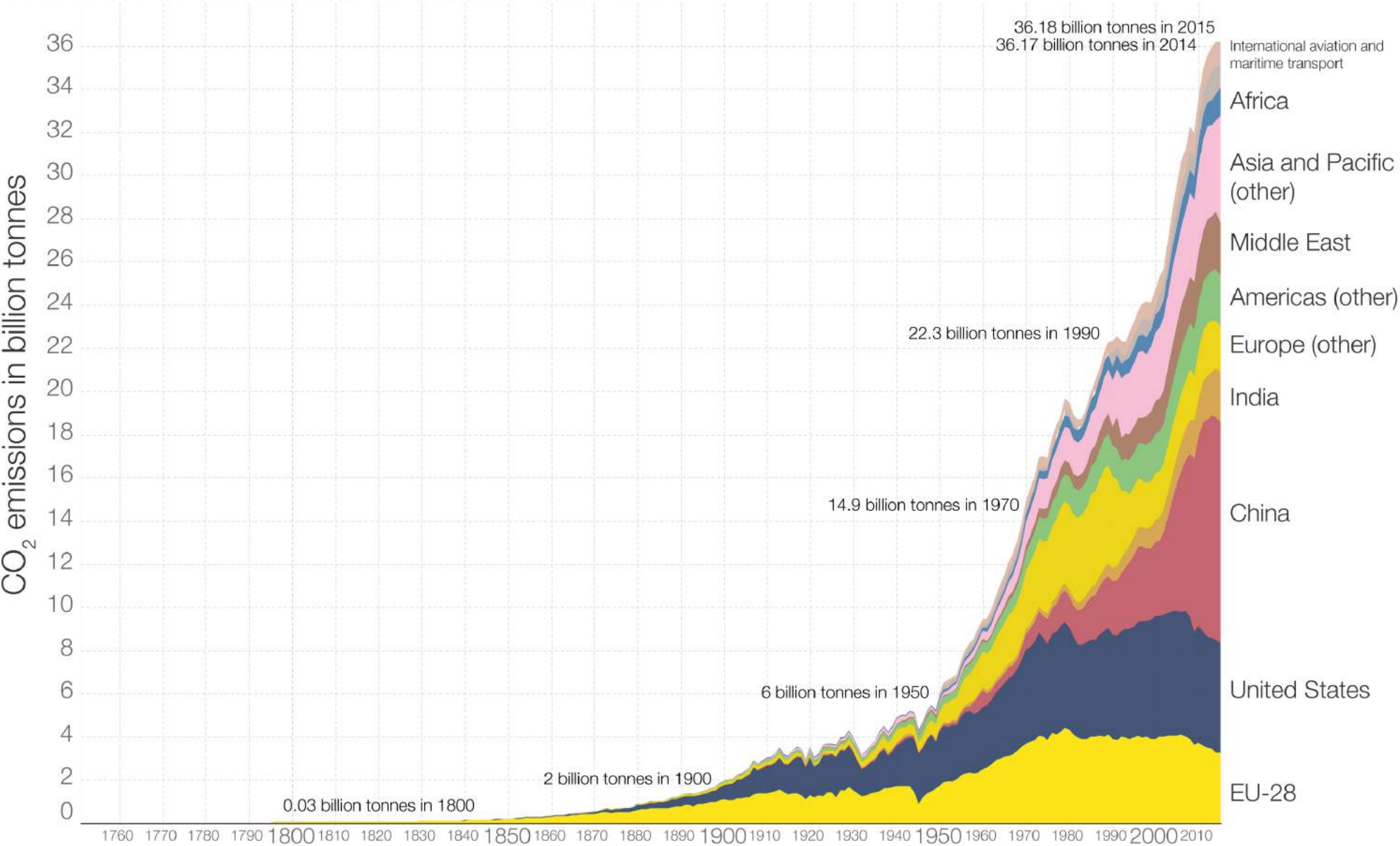


Planet

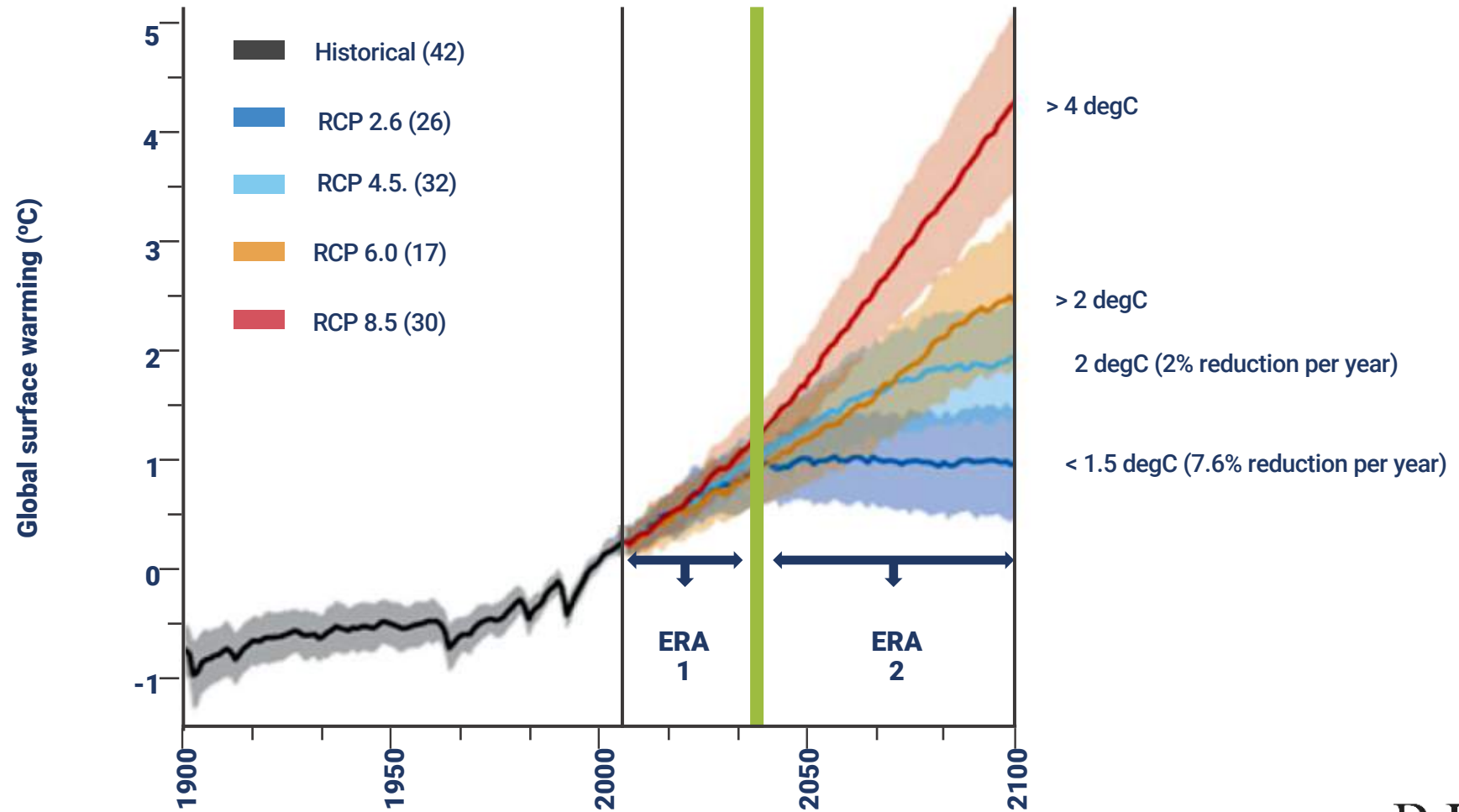
Earth absorbs
1/2 total CO₂

Global CO₂ emissions by world region, 1751 to 2015

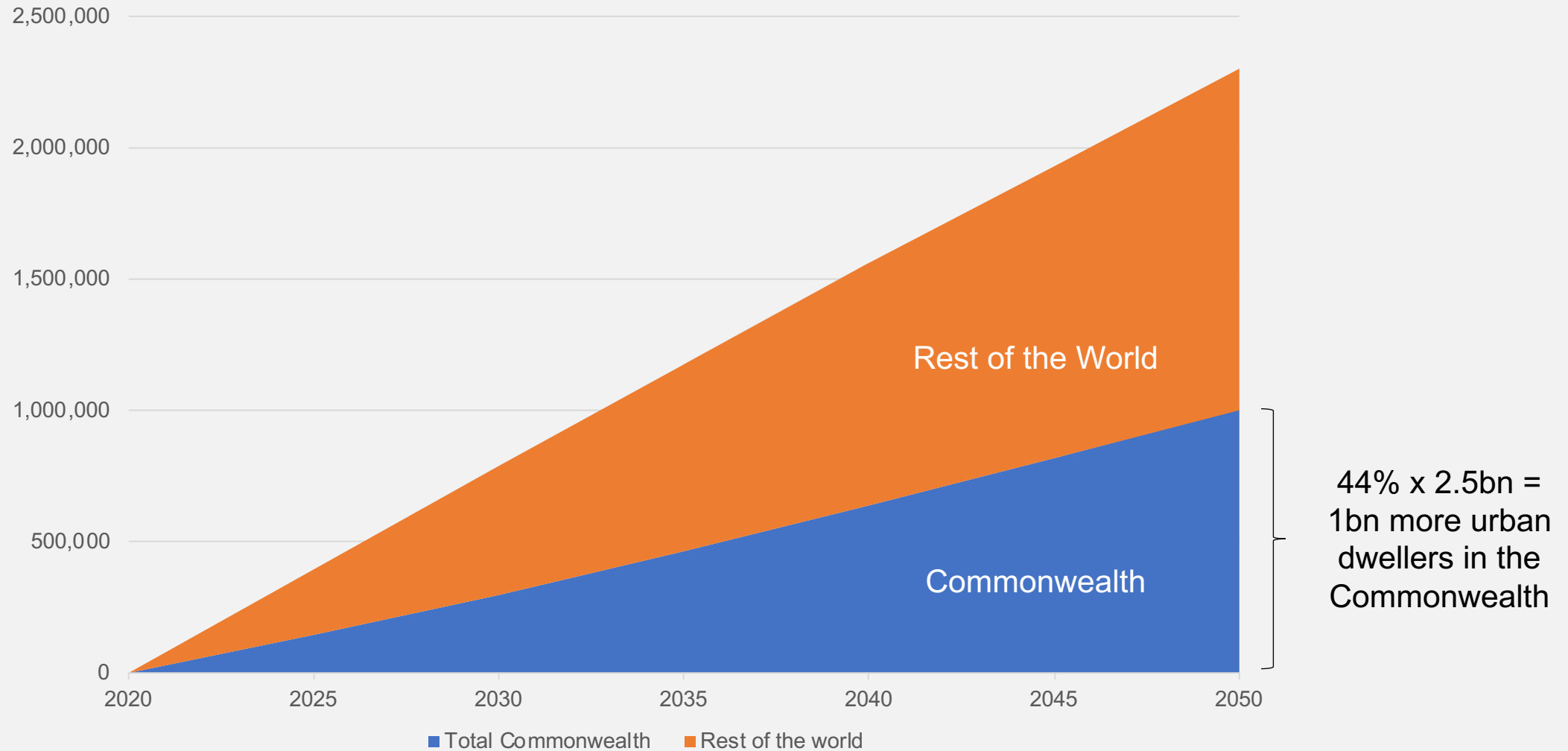
Annual carbon dioxide emissions in billion tonnes (Gt).



IPCC Climate Change Scenarios

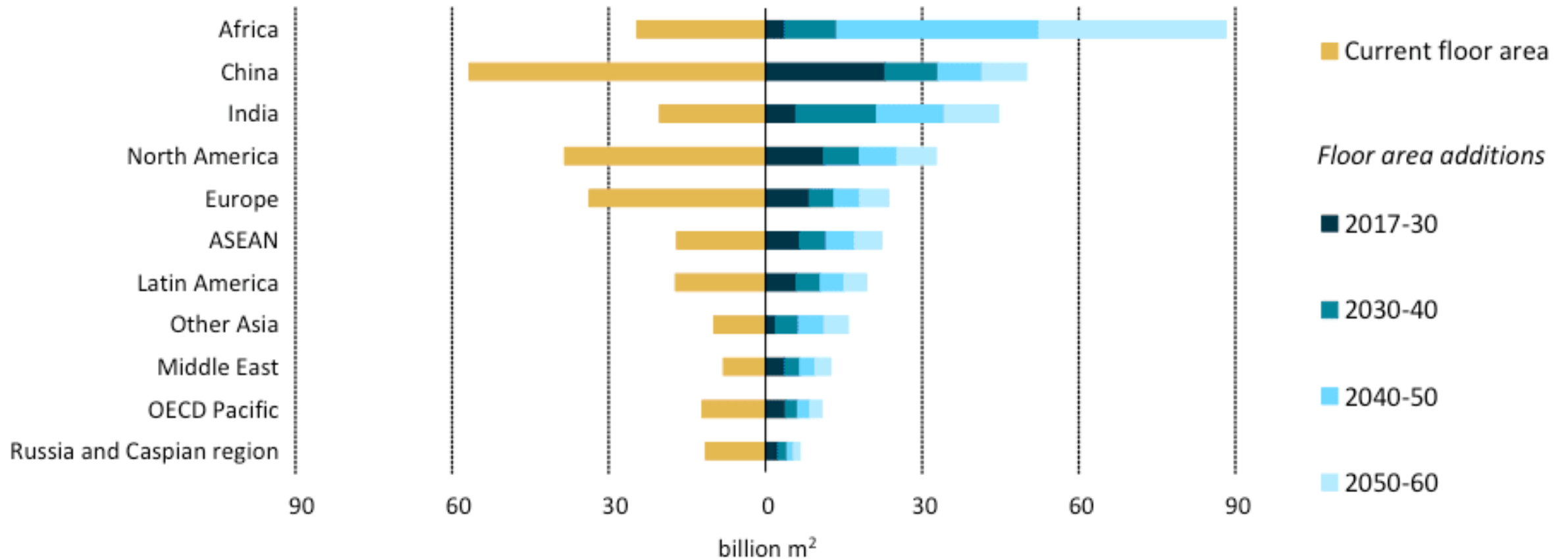


UN Habitat World Urbanisation Prospects



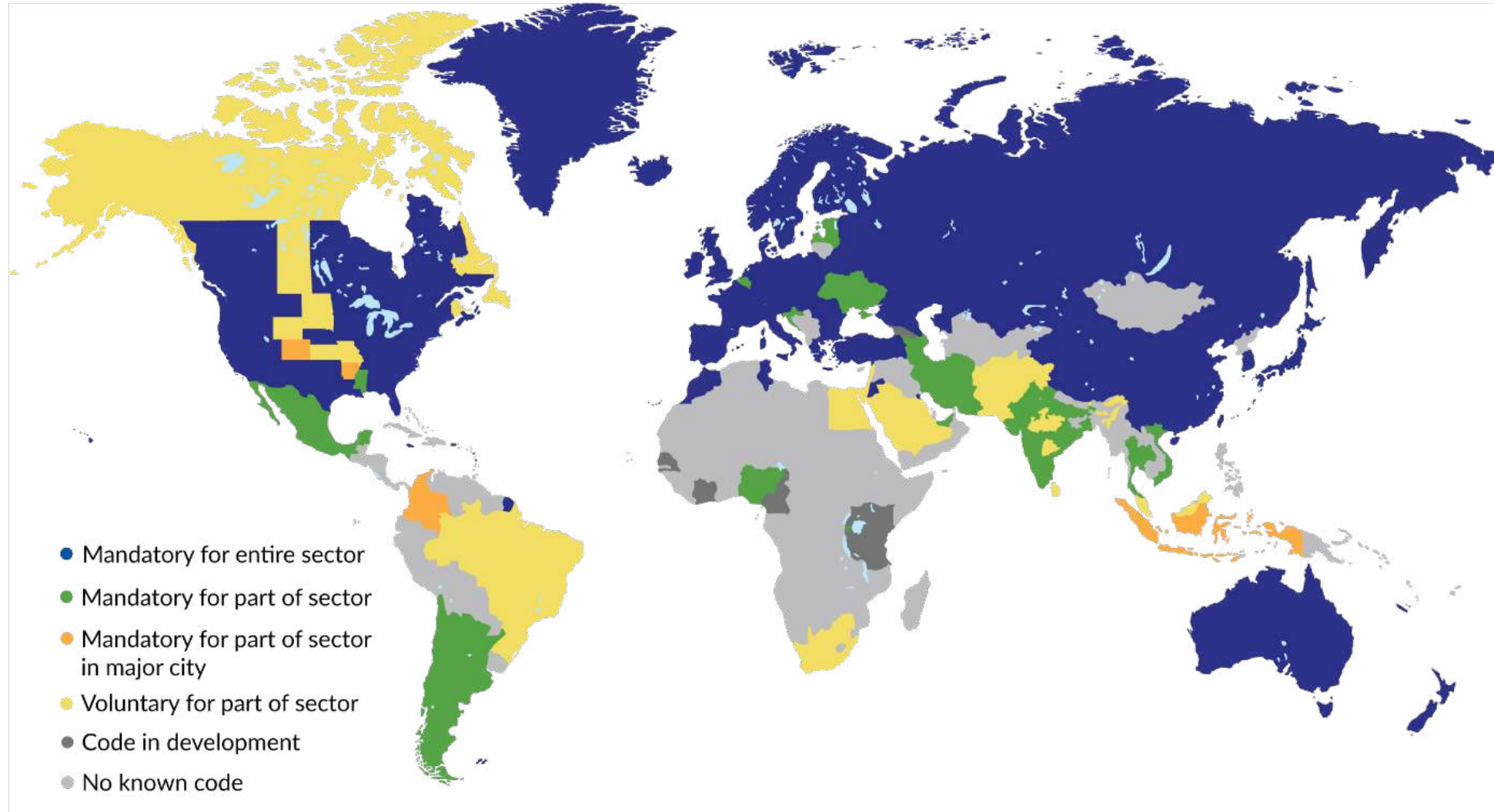
Source: 'World Urbanisation Prospects, 2018', UN Habitat

Floor area additions by 2060



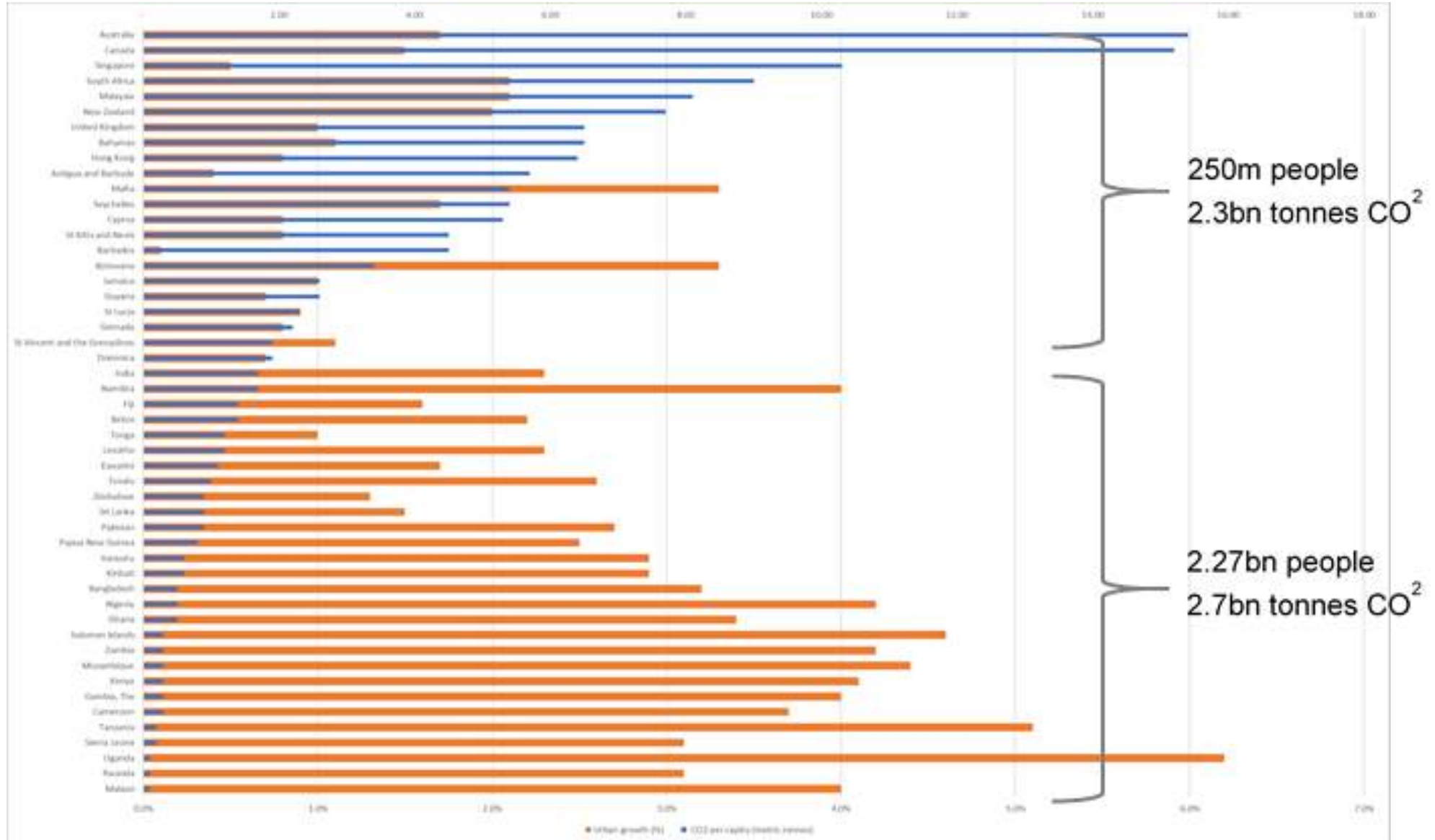
Source: 'Energy Technology Perspectives', International Energy Agency/OECD, 2017

Building energy codes by country, 2018



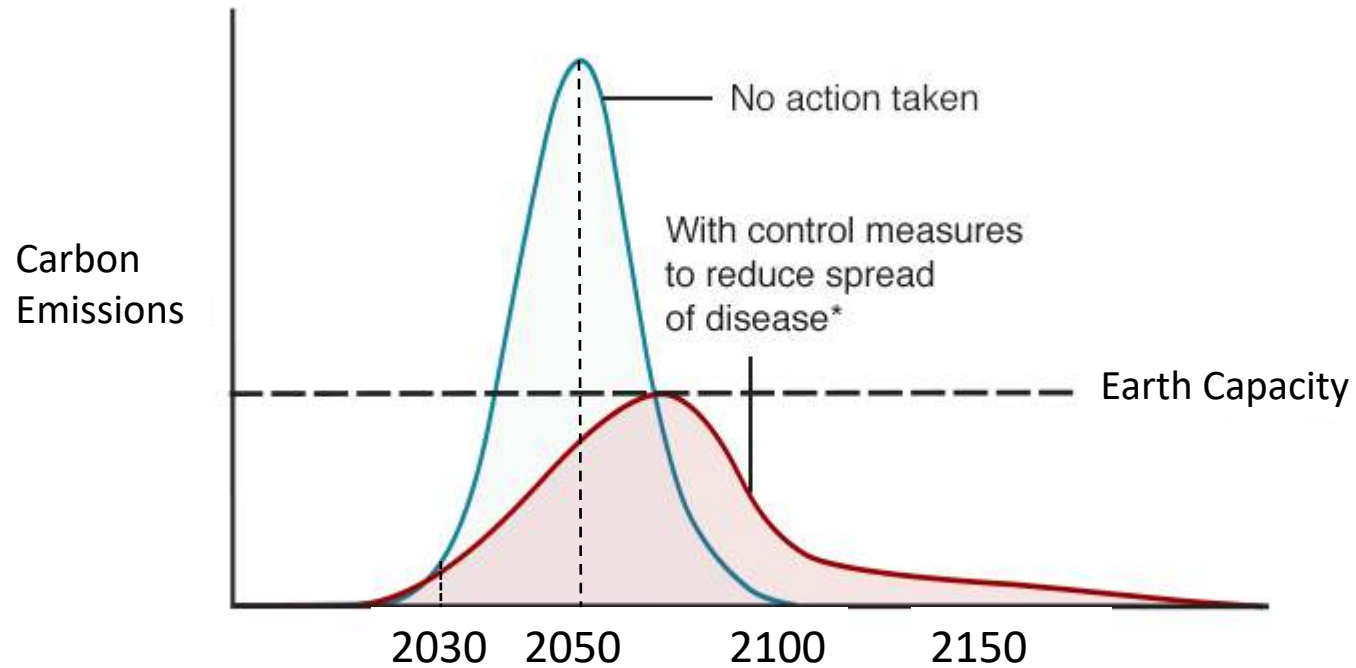
Source: International Energy Agency, March 2019

Built Environment Policy



What do we need to collectively do?

How control measures may reduce spread of Carbon emissions in the world

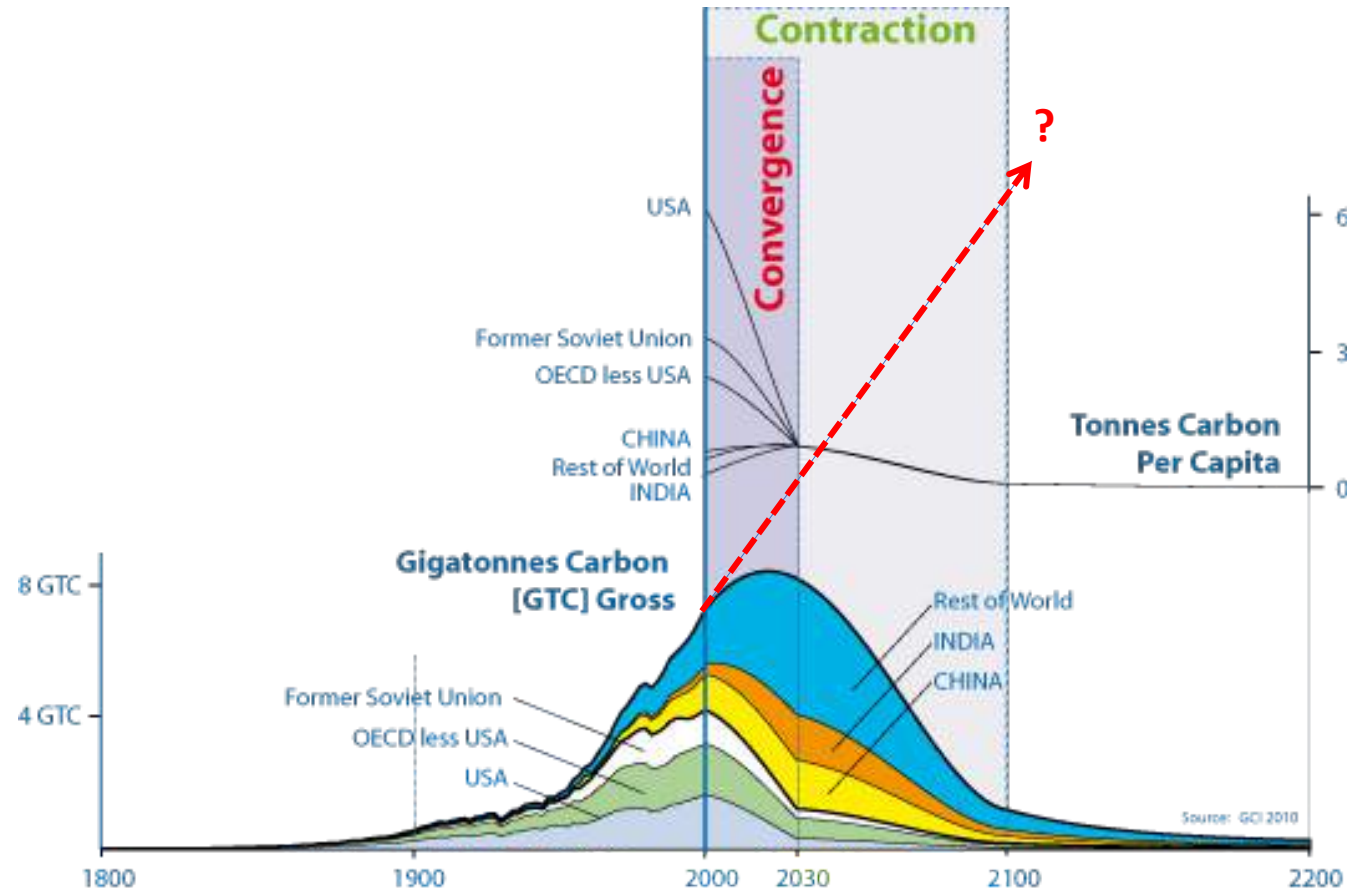


*Control measures: Self-isolating if ill, social distancing for vulnerable and whole household isolation if one member is ill

Source: Department of Health

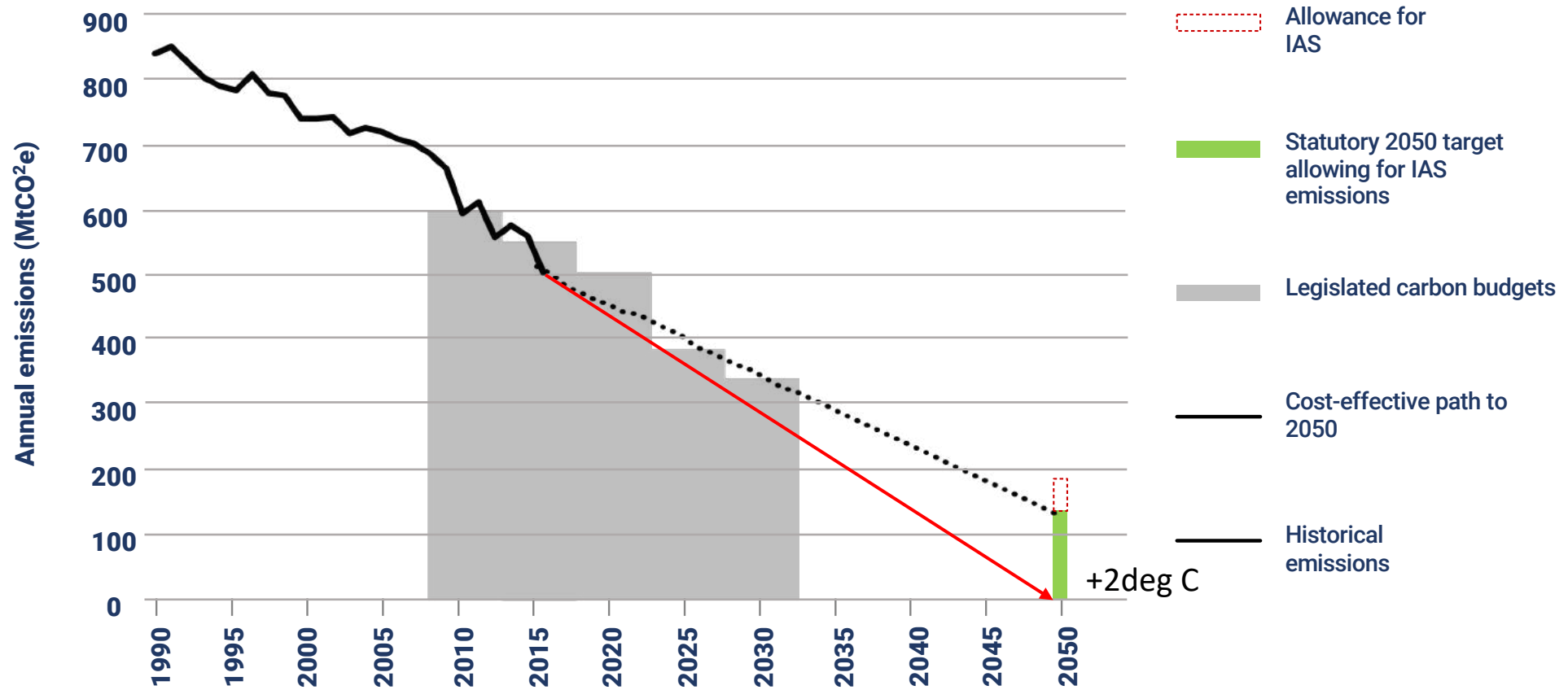
BBC

What do we need to collectively do?



This example shows regionally negotiated rates of C&C.
It is for a 450ppmv Contraction Budget, with Convergence by 2030.

Committee on Climate Change UK Carbon Budgets



Declaration of an environment and climate emergency and support for the UK government's commitment to put into legislation the UK Committee on Climate Change recommendation for a UK 2050 net zero greenhouse gas emissions target.

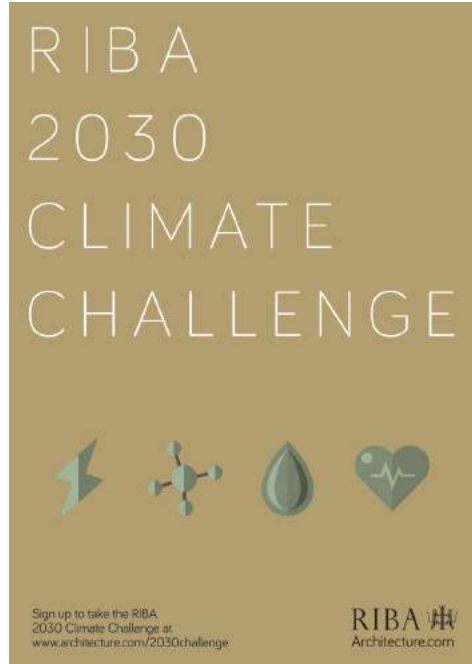
RIBA Climate Change Resolution

RIBA Climate Change Guidance



Zero Carbon - Energy Intensity Targets.

Industry guidance for new development



Royal Institute of British Architects, 2019



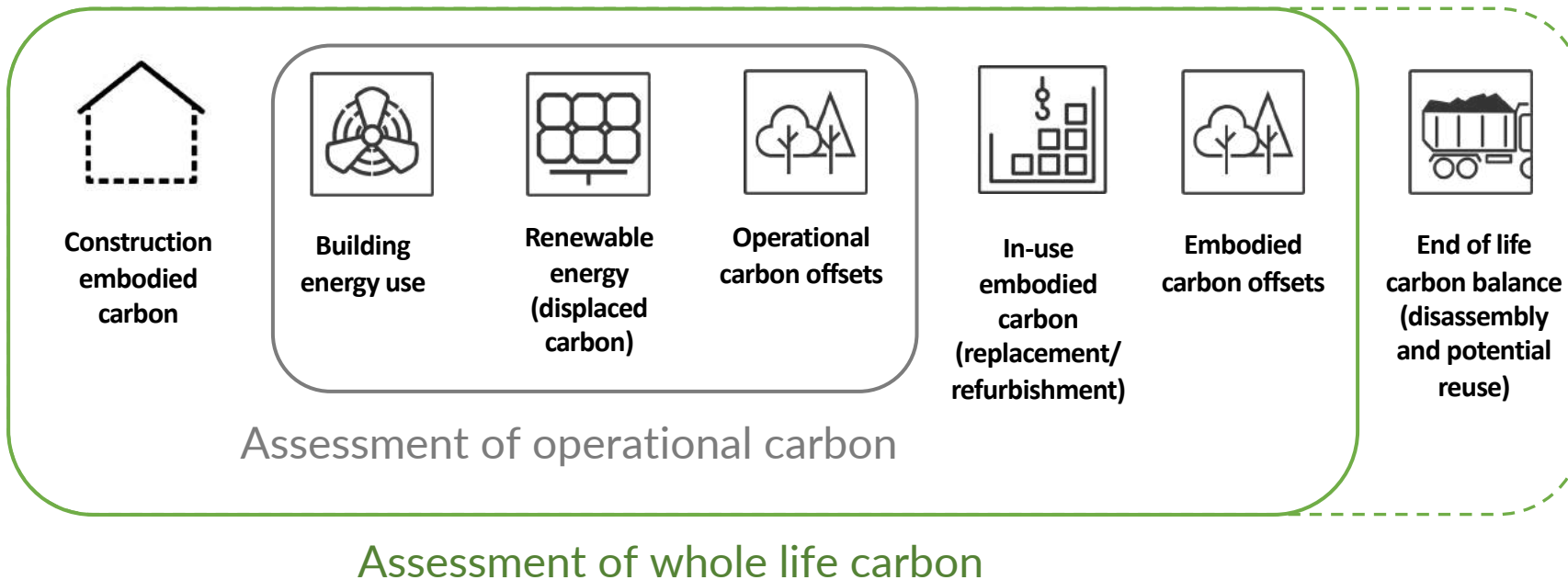
UK Green Building Council, 2020



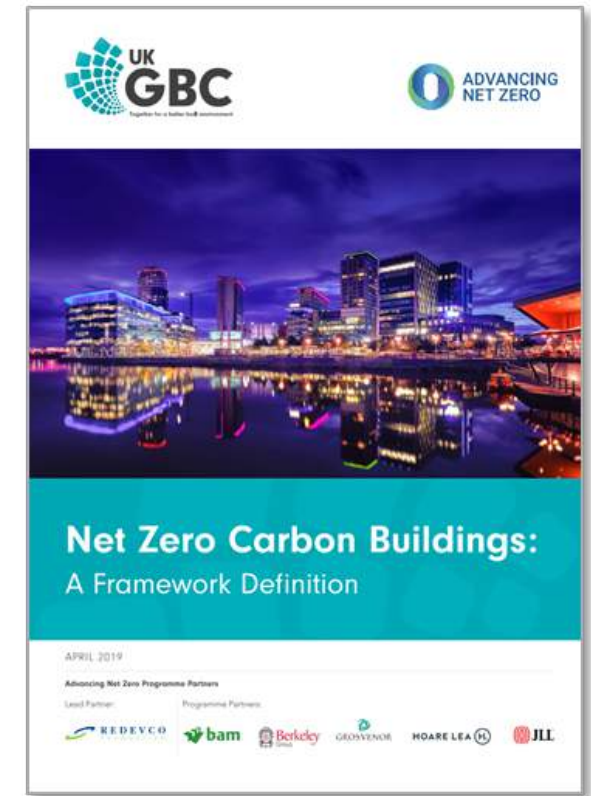
London Energy Transformation Initiative, 2020

What is zero carbon development?

Defining the scope.



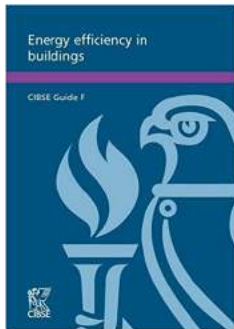
Reference: UKGBC: Net zero carbon buildings – a framework definition, 2019



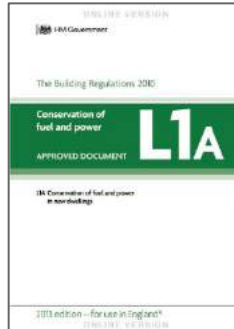
Assessing operational energy.

Poor accuracy

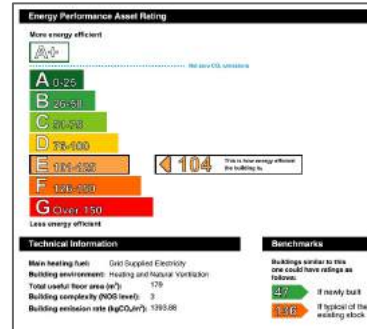
Good accuracy



Benchmarking
CIBSE Guide F



Building
Regulation
Assessment



EPC



Passivhaus
Planning
Package (PHPP)



Dynamic
modelling
CIBSE TM54

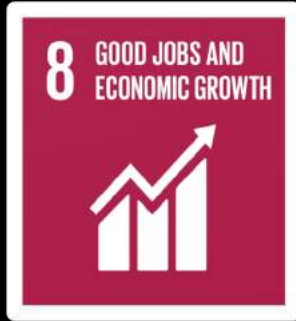


Design for
Performance
(BBP framework)

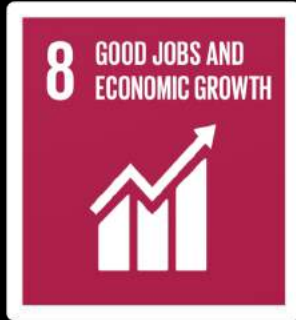
RIBA SUSTAINABLE OUTCOMES GUIDE



UN Sustainable Development Goals



UN Sustainable Development Goals



UN Sustainable Development Goals



RIBA Sustainable Outcomes

Good Health and Well-being

Sustainable Water Cycle

New Zero Carbon Emissions

Sustainable Life Cycle Cost

Sustainable Connectivity and Transport

Sustainable Communities and Social Value

Net Zero Embodied Carbon Emissions

Whole Life Carbon Emissions

Sustainable Water Cycle

Sustainable Land-use and ecology

Net Zero Operational Carbon

METRIC:
kWh/m²/y
kgCO₂e/m²/y

- Retrofit First
- Fabric First
- Regenerative Engineering
- On-Site Renewables
- Off-site renewables to achieve net zero emissions

Net Zero Embodied Carbon

METRIC:
kgCO₂e/m²
RICS A-C

- Retrofit First
- Whole Life carbon analysis
- Local low embodied materials
- Healthy and Ethical Materials
- Offset by off-site renewables

Branch shrine of the Ise Grand Shrine, Japan

Sustainable Water Cycle

METRIC:

Litre/person/year
Potable Water

- Low flow appliances
- Leak detection
- Rainwater recycling and attenuation
- Sustainable Urban Drainage
- Natural aquatic habitats

Sustainable Connectivity & Transport

METRIC:
kgCO₂e/km/per
Occupant

- green transport and digital plan
- proximity to public transport
- high quality pedestrian links
- end of journey cycle provision
- electric vehicle infrastructure

Copenhagen, Denmark

Sustainable Land Use & Ecology

METRIC:
Species added
Enhancement

- Leave site with better ecology
- Retrofit First
- Brownfield site
- Increase green cover
- Increase bio-diversity
- Productive Food Landscapes



Good Health & Well-being

METRIC:
Various Metrics

- Contact to outside and plants
- Good Density
- Indoor Air Quality
- Good Lighting
- Adaptive Thermal Comfort
- Good acoustics
- inclusive and accessible/active circulation

Rathbone Square, London

Sustainable Communities & Social Values

METRIC:
Various Metrics

- Mixed Use and Tenure
- Identity and territory
- Secure places
- Social places and amenities
- Permeability
- High quality pedestrian links
- Inclusive community Places

Granary Square, King's Cross

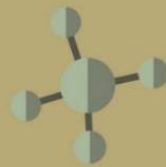
Sustainable Life Cycle Cost

METRIC:
£/m² value

- Whole life cycle analysis
- Energy costs
- Materials costs
- Operational costs
- Added value of health/Wellbeing
- Added value of social value



RIBA 2030 CLIMATE CHALLENGE

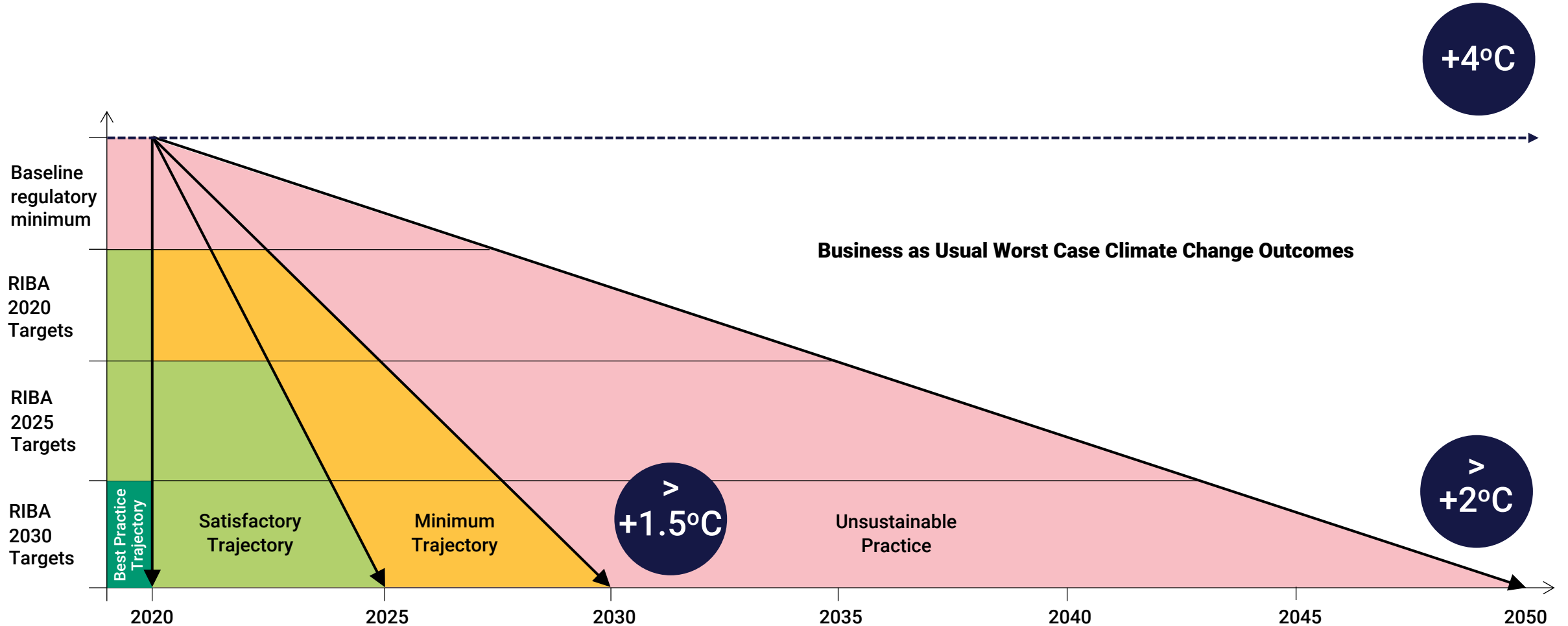


Sign up to take the RIBA
2030 Climate Challenge at
www.architecture.com/2030challenge




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RIBA 2030 Climate Challenge Trajectories






RIBA 2030 Climate Challenge: Domestic Building Targets

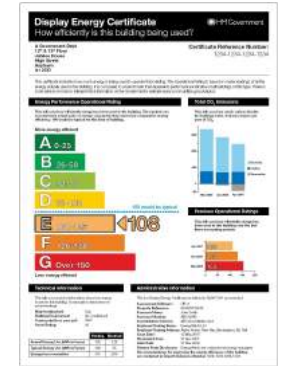
RIBA Sustainable Outcome Metrics	Current Benchmarks	2020 Targets	2025 Targets	2030 Targets	Notes
Operational Energy $\text{kWh/m}^2/\text{y}$ 	$146 \text{ kWh/m}^2/\text{y}$ (Ofgem benchmark)	$< 105 \text{ kWh/m}^2/\text{y}$	$< 70 \text{ kWh/m}^2/\text{y}$	$< 0 \text{ to } 35 \text{ kWh/m}^2/\text{y}$	UKGBC Net Zero Framework 1. Fabric First 2. Efficient services, and low-carbon heat 3. Maximise onsite renewables 4. Minimum offsetting using UK schemes
Embodied Carbon $\text{kgCO}_2\text{e/m}^2$ 	$1000 \text{ kgCO}_2\text{e/m}^2$ (M4i benchmark)	$< 600 \text{ kgCO}_2\text{e/m}^2$	$< 450 \text{ kgCO}_2\text{e/m}^2$	$< 300 \text{ CO}_2\text{e/m}^2$	RICS Whole Life Carbon (A-C) 1. Whole life carbon analysis 2. Using circular economy strategies 3. Minimum offsetting using UK schemes
Potable Water Use Litres/person/day 	125 l/p/day (Building regulations England and Wales)	$< 110 \text{ l/p/day}$	$< 95 \text{ l/p/day}$	$< 75 \text{ l/p/day}$	Using CIBSE Guide G

Best Practice Health Metrics		References
Overheating	25-28 °C maximum for 1% of occupied hours	CIBCE TM52, CIBSE TM59
Daylighting	> 2% av. daylight factor, 0.4 uniformity	CIBSE LG10
CO₂ levels	< 900 ppm	CIBSE TM40
Total VOCs	< 0.3 mg/m^3	Approved Document- F
Formaldehyde	< 0.1 mg/m^3	BREEAM

RIBA 2030 Climate Challenge: Non-domestic Building Targets

RIBA Sustainable Outcome Metrics	Current Benchmarks	2020 Targets	2025 Targets	2030 Targets	Notes
Operational Energy $\text{kWh/m}^2/\text{y}$ 	225 $\text{kWh/m}^2/\text{y}$ DEC D rated (CIBSE TM46 benchmark)	< 170 $\text{kWh/m}^2/\text{y}$ DEC C rating	< 110 $\text{kWh/m}^2/\text{y}$ DEC B rating	< 0 to 55 $\text{kWh/m}^2/\text{y}$ DEC A rating	UKGBC Net Zero Framework 1. Fabric First 2. Efficient services, and low-carbon heat 3. Maximise onsite renewables 4. Minimum offsetting using UK schemes
Embodied Carbon $\text{kgCO}_2\text{e/m}^2$ 	1100 $\text{kgCO}_2\text{e/m}^2$ (M4i benchmark)	< 800 $\text{kgCO}_2\text{e/m}^2$	< 650 $\text{kgCO}_2\text{e/m}^2$	< 500 $\text{kgCO}_2\text{e/m}^2$	RICS Whole Life Carbon (A-C) 1. Whole life carbon analysis 2. Using circular economy strategies 3. Minimum offsetting using UK schemes
Potable Water Use Litres/person/day 	> 16 l/p/day (CIRA W11 benchmark)	< 16 l/p/day	< 13 l/p/day	< 10 l/p/day	Using CIBSE Guide G

Display Energy Certificate (DEC)



Best Practice Health Metrics		References
Overheating	25-28 °C maximum for 1% of occupied hours	CIBCE TM52, CIBSE TM59
Daylighting	> 2% av. daylight factor, 0.4 uniformity	CIBSE LG10
CO ₂ levels	< 900 ppm	CIBSE TM40
Total VOCs	< 0.3 mg/m^3	Approved Document- F
Formaldehyde	< 0.1 mg/m^3	BREEAM

RIBA

Plan of Work 2020

Overview



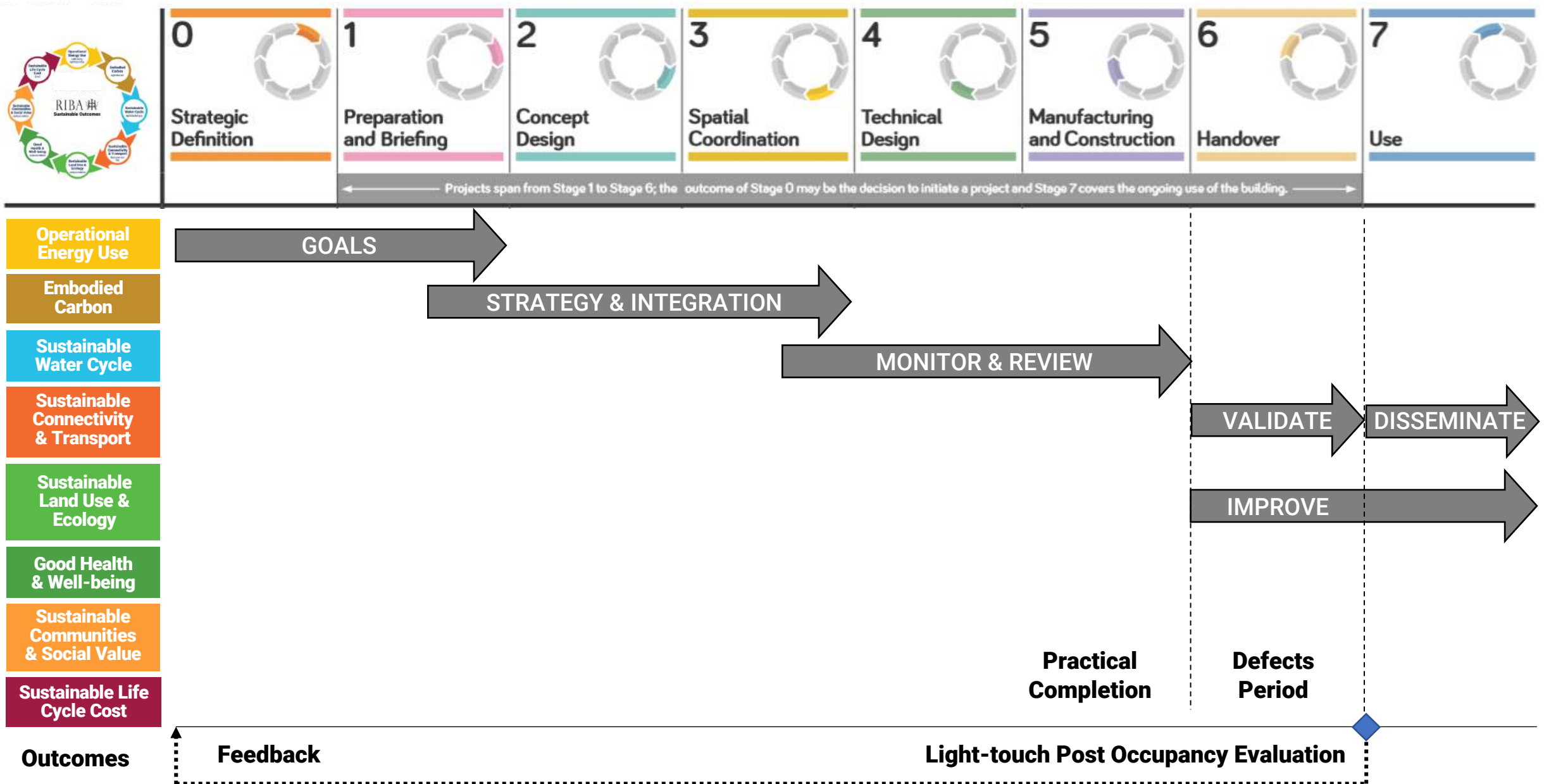
RIBA
Plan of Work

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Architecture.com

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Architecture.com

Plan of Work Sustainable Overlay





RIBA Plan of Work 2020

Stage Boundaries:

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Stages 4 and 5 will overlap in the **Project Programme** for most projects.

Stage 5 commences when the contractor takes possession of the site and finishes at **Practical Completion**.

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Stage 7 starts concurrently with Stage 6 and lasts for the life of the building.

Planning Note:

Planning Applications are generally submitted at the end of Stage 3 and should only be submitted earlier when the threshold of information required has been met. If a **Planning Application** is made during Stage 3, a mid-stage gateway should be determined and it should be clear to the project team which tasks and deliverables will be required. See Overview guidance.

Procurement:

The RIBA Plan of Work is procurement neutral – See Overview guidance for a detailed description of how each stage might be adjusted to accommodate the requirements of the **Procurement Strategy**.

ER Employer's Requirements
CP Contractor's Proposals

	0 Strategic Definition	1 Preparation and Briefing	2 Concept Design	3 Spatial Coordination	4 Technical Design	5 Manufacturing and Construction	6 Handover	7 Use
	Projects span from Stage 1 to Stage 6; the outcome of Stage 0 may be the decision to initiate a project and Stage 7 covers the ongoing use of the building.							
Stage Outcome at the end of the stage	The best means of achieving the Client Requirements confirmed If the outcome determines that a building is the best means of achieving the Client Requirements , the client proceeds to Stage 1	Project Brief approved by the client and confirmed that it can be accommodated on the site	Architectural Concept approved by the client and aligned to the Project Brief The brief remains "live" during Stage 2 and is derogated in response to the Architectural Concept	Architectural and engineering information Spatially Coordinated	All design information required to manufacture and construct the project completed Stage 4 will overlap with Stage 5 on most projects	Manufacturing, construction and Commissioning completed There is no design work in Stage 5 other than responding to Site Queries	Building handed over, Aftercare initiated and Building Contract concluded	Building used, operated and maintained efficiently Stage 7 starts concurrently with Stage 6 and lasts for the life of the building
Core Tasks during the stage Project Strategies might include: - Conservation (if applicable) - Cost - Fire Safety - Health and Safety - Inclusive Design - Planning - Plan for Use - Procurement - Sustainability See RIBA Plan of Work 2020 Overview for detailed guidance on Project Strategies	Prepare Client Requirements Develop Business Case for feasible options including review of Project Risks and Project Budget Ratify option that best delivers Client Requirements Review Feedback from previous projects Undertake Site Appraisals No design team required for Stages 0 and 1. Client advisers may be appointed to the client team to provide strategic advice and design thinking before Stage 2 commences.	Prepare Project Brief including Project Outcomes and Sustainability Outcomes , Quality Aspirations and Spatial Requirements Undertake Feasibility Studies Agree Project Budget Source Site Information including Site Surveys Prepare Project Programme Prepare Project Execution Plan	Prepare Architectural Concept incorporating Strategic Engineering requirements and aligned to Cost Plan , Project Strategies and Outline Specification Agree Project Brief Derogations Undertake Design Reviews with client and Project Stakeholders Prepare stage Design Programme	Undertake Design Studies , Engineering Analysis and Cost Exercises to test Architectural Concept resulting in Spatially Coordinated design aligned to updated Cost Plan , Project Strategies and Outline Specification Initiate Change Control Procedures Prepare stage Design Programme	Develop architectural and engineering technical design Prepare and coordinate design team Building Systems information Prepare and integrate specialist subcontractor Building Systems information Prepare stage Design Programme Specialist subcontractor designs are prepared and reviewed during Stage 4	Finalise Site Logistics Manufacture Building Systems and construct building Monitor progress against Construction Programme Inspect Construction Quality Resolve Site Queries as required Undertake Commissioning of building Prepare Building Manual Building handover tasks bridge Stages 5 and 6 as set out in the Plan for Use Strategy	Hand over building in line with Plan for Use Strategy Undertake review of Project Performance Undertake seasonal Commissioning Rectify defects Complete initial Aftercare tasks including light touch Post Occupancy Evaluation	Implement Facilities Management and Asset Management Undertake Post Occupancy Evaluation of building performance in use Verify Project Outcomes including Sustainability Outcomes Adaptation of a building (at the end of its useful life) triggers a new Stage 0
Core Statutory Processes during the stage: Planning Building Regulations Health and Safety (CDM)	Strategic appraisal of Planning considerations	Source pre-application Planning Advice Initiate collation of health and safety Pre-construction Information	Obtain pre-application Planning Advice Agree route to Building Regulations compliance Option: submit outline Planning Application See Planning Note for guidance on submitting a Planning Application earlier than at end of Stage 3	Review design against Building Regulations Prepare and submit Planning Application	Submit Building Regulations Application Discharge pre-commencement Planning Conditions Prepare Construction Phase Plan Submit form F10 to HSE if applicable	Carry out Construction Phase Plan Comply with Planning Conditions related to construction	Comply with Planning Conditions as required	Comply with Planning Conditions as required
Procurement Route Design & Build 1 Stage Design & Build 2 Stage Management Contract Construction Management Contractor-led	Appoint client team	Appoint design team	Appoint contractor	ER CP Tender Appoint contractor Pre-contract services agreement CP Appoint contractor Preferred bidder CP Appoint contractor	ER CP Tender Appoint contractor Pre-contract services agreement CP Appoint contractor Preferred bidder CP Appoint contractor		Appoint Facilities Management and Asset Management teams, and strategic advisers as needed	
Information Exchanges at the end of the stage	Client Requirements Business Case	Project Brief Feasibility Studies Site Information Project Budget Project Programme Procurement Strategy Responsibility Matrix Information Requirements	Project Brief Derogations Signed off Stage Report Project Strategies Outline Specification Cost Plan	Signed off Stage Report Project Strategies Updated Outline Specification Updated Cost Plan Planning Application	Manufacturing Information Construction Information Final Specifications Residual Project Strategies Building Regulations Application	Building Manual including Health and Safety File and Fire Safety Information Practical Completion certificate including Defects List Asset Information If Verified Construction Information is required, verification tasks must be defined	Feedback on Project Performance Final Certificate Feedback from light touch Post Occupancy Evaluation	Feedback from Post Occupancy Evaluation Updated Building Manual including Health and Safety File and Fire Safety Information as necessary



RIBA Plan of Work 2020

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ER Employer's Requirements
CP Contractor's Proposals

The RIBA Plan of Work organises the process of briefing, designing, delivering, maintaining, operating and using a building into eight stages. It is a framework for all disciplines on construction projects and should be used solely as guidance for the preparation of detailed professional services and building contracts.								
0	1	2	3	4	5	6	7	
Strategic Definition	Preparation and Briefing	Concept Design	Spatial Coordination	Technical Design	Manufacturing and Construction	Handover	Use	
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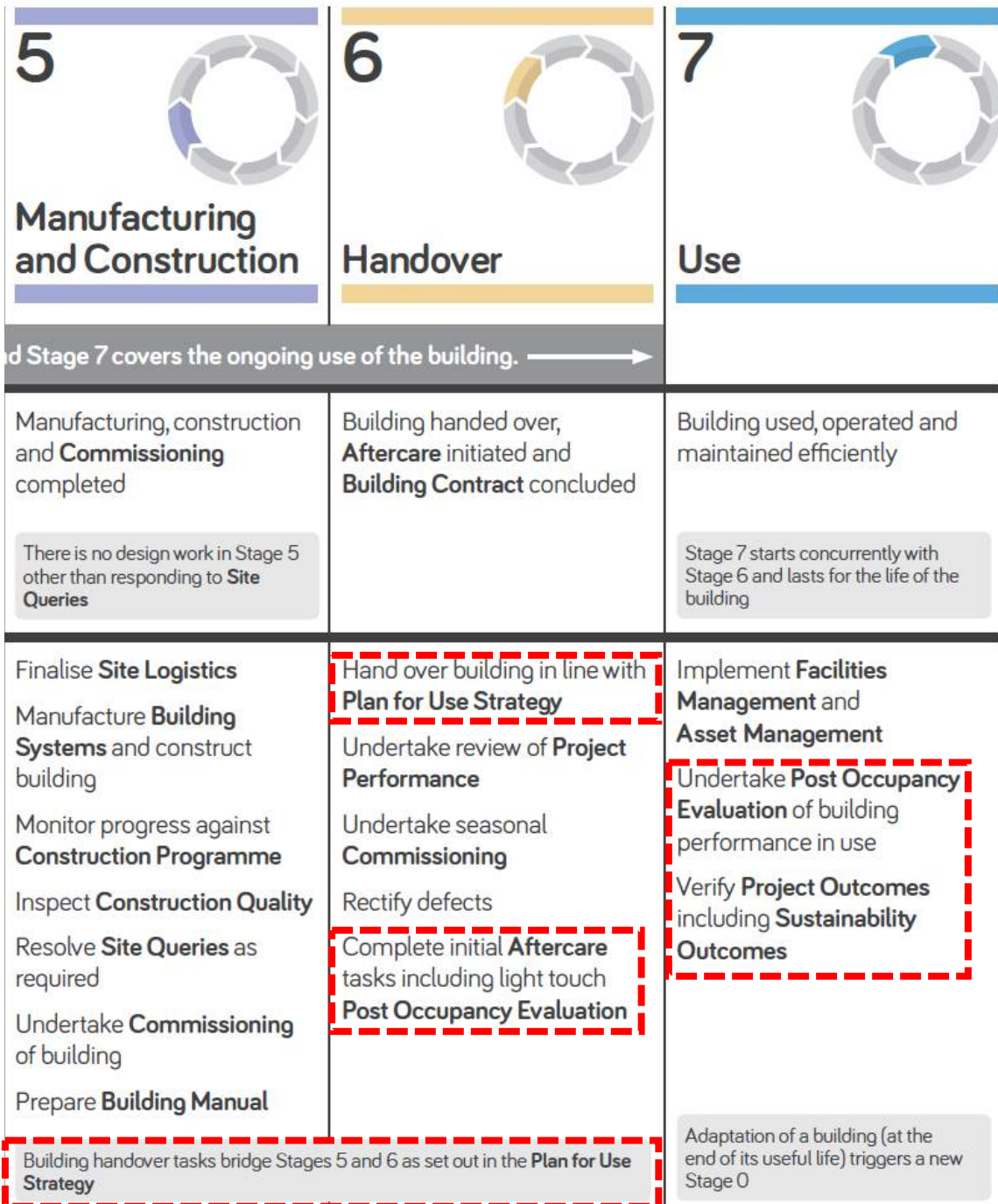
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RIBA Plan for Use

Graduated Post Occupancy Evaluation

Light-touch Review- End of Stage 6
Walkround, Read Meters, Light User Survey

Diagnostic Assessment- Year 2
As above, and TM22, BUS Survey etc

Detailed (Forensic) Investigation- Year 3
As above, and focussed studies etc



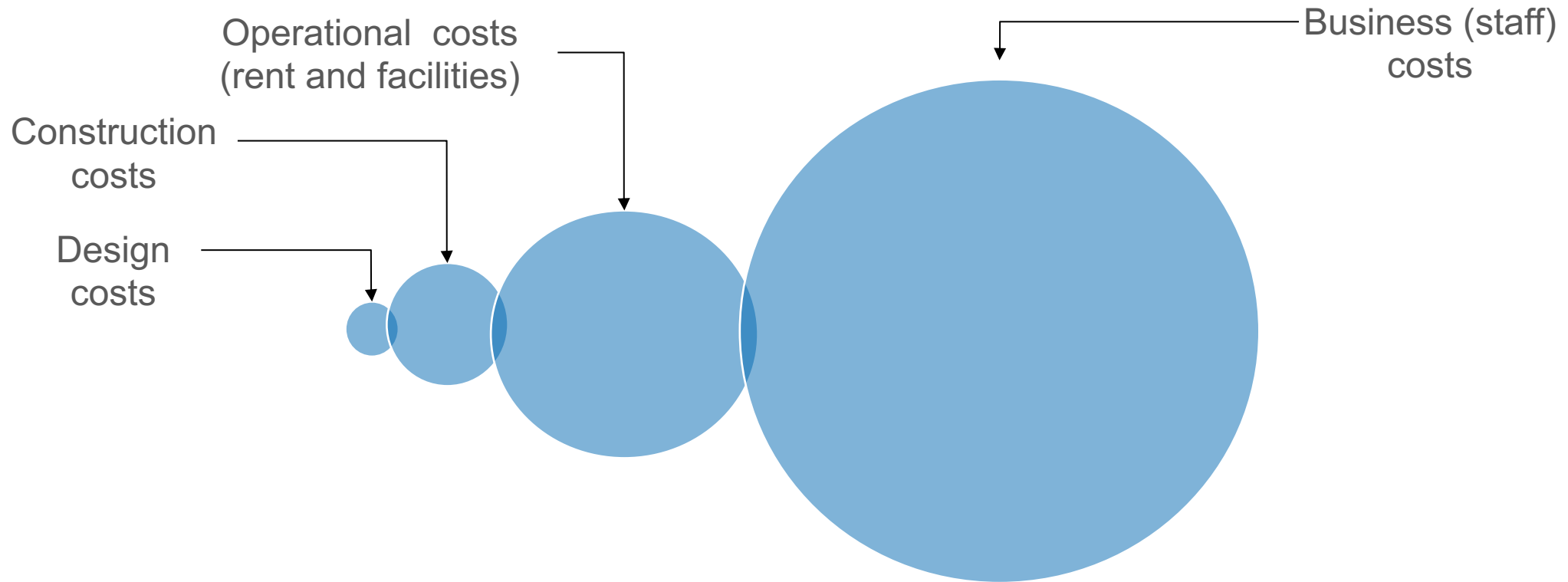
PLAN FOR USE

Why Plan for Use?

Performance gap studies show many buildings fail to meet in-use expectations.



Long term value of buildings in-use.



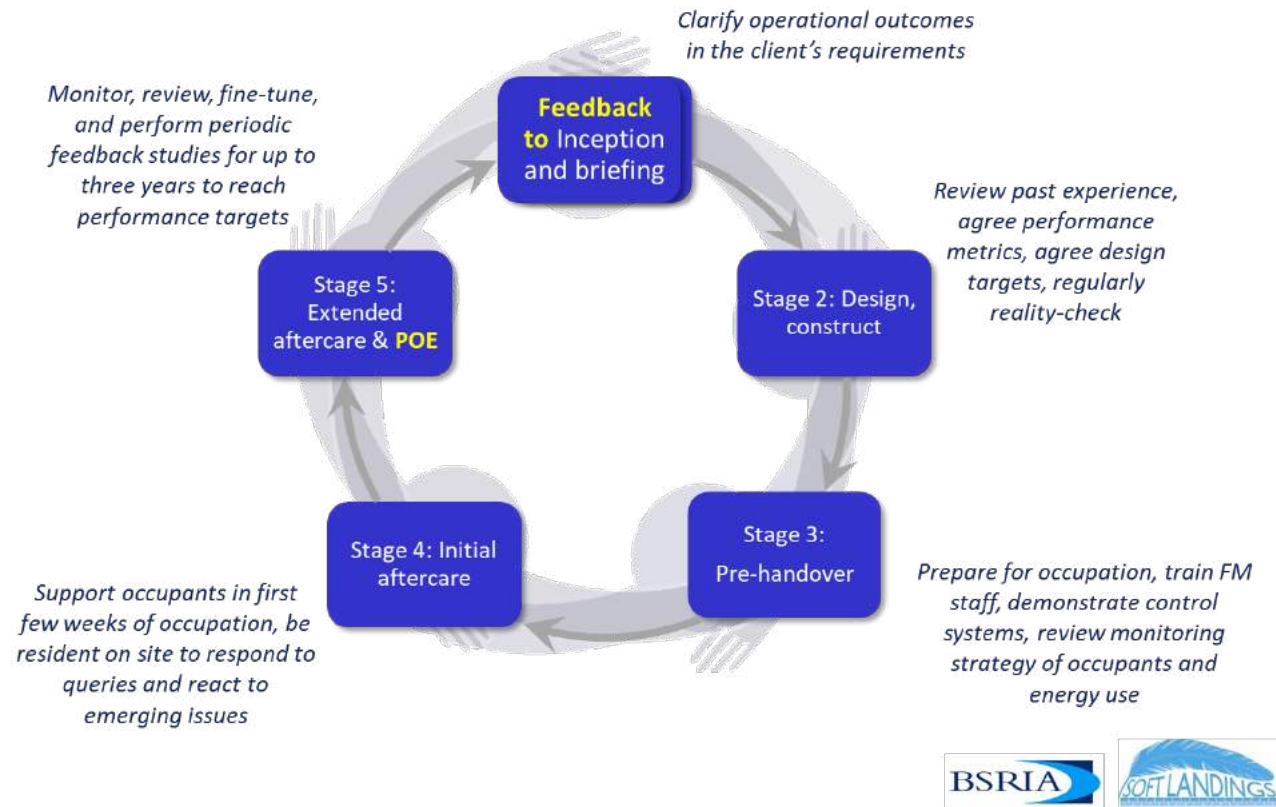
Design: Construction : Operational : Business (Staff)
1 : 5 : 15 : 150

Whole life cost evaluation of a typical workplace

(Source: Outcome Led Procurement, Constructing Excellence, 2015; estimates based on 20 year appraisal)

Soft Landings

- **Late 1990s:** devised as 'Sea Trials' for new buildings, by architect Mark Way
- **2004** scope of service documentation developed with construction sponsorship
- **2008** Open-source documentation developed into a Framework by industry task group led by BSRIA
- **2009** The *Soft Landings Framework* authored by BSRIA and the Usable Buildings Trust.
- **2011** Soft Landings covered in *BREEAM New Construction*, the IGT report, and Government strategy



The trajectories of energy performance from design to operation

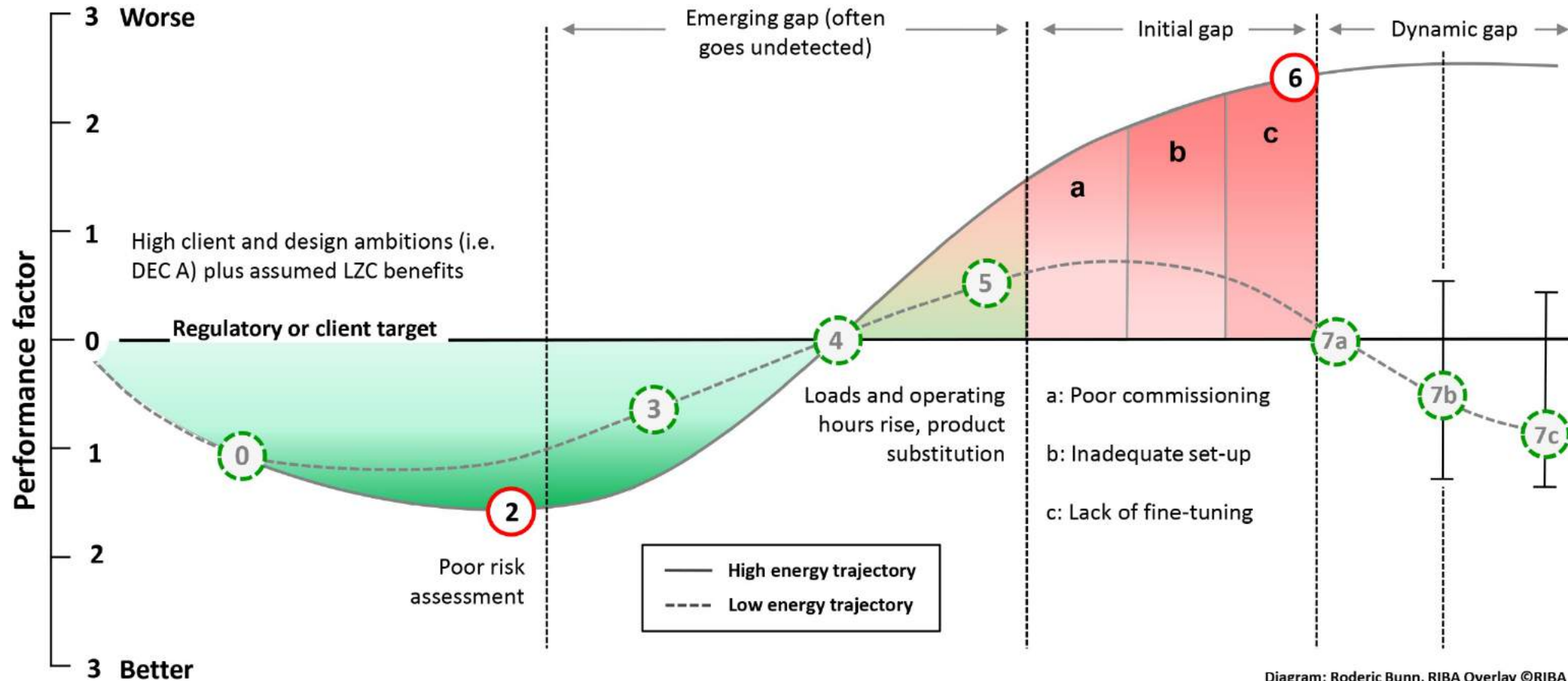
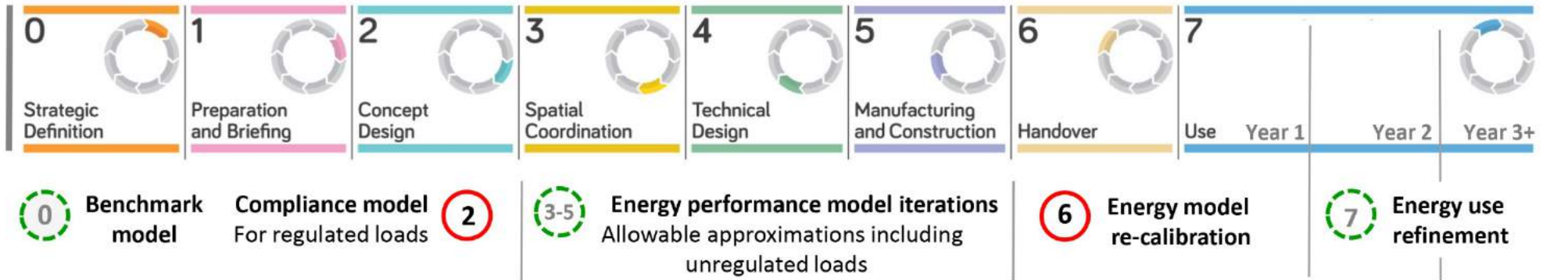
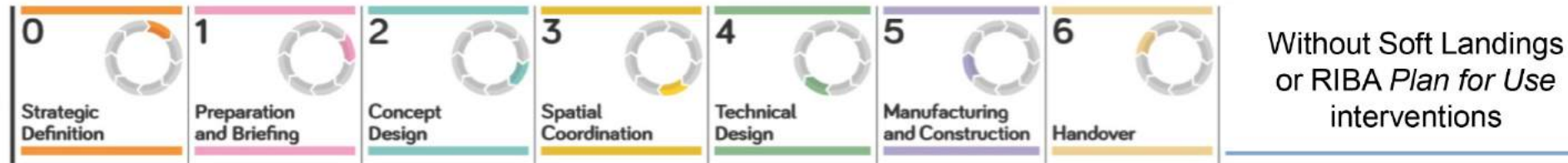


Diagram: Roderic Bunn. RIBA Overlay ©RIBA

2020 RIBA Plan of Work



Without Soft Landings or RIBA *Plan for Use* interventions

A wide variety of functional and comfort variables can conspire

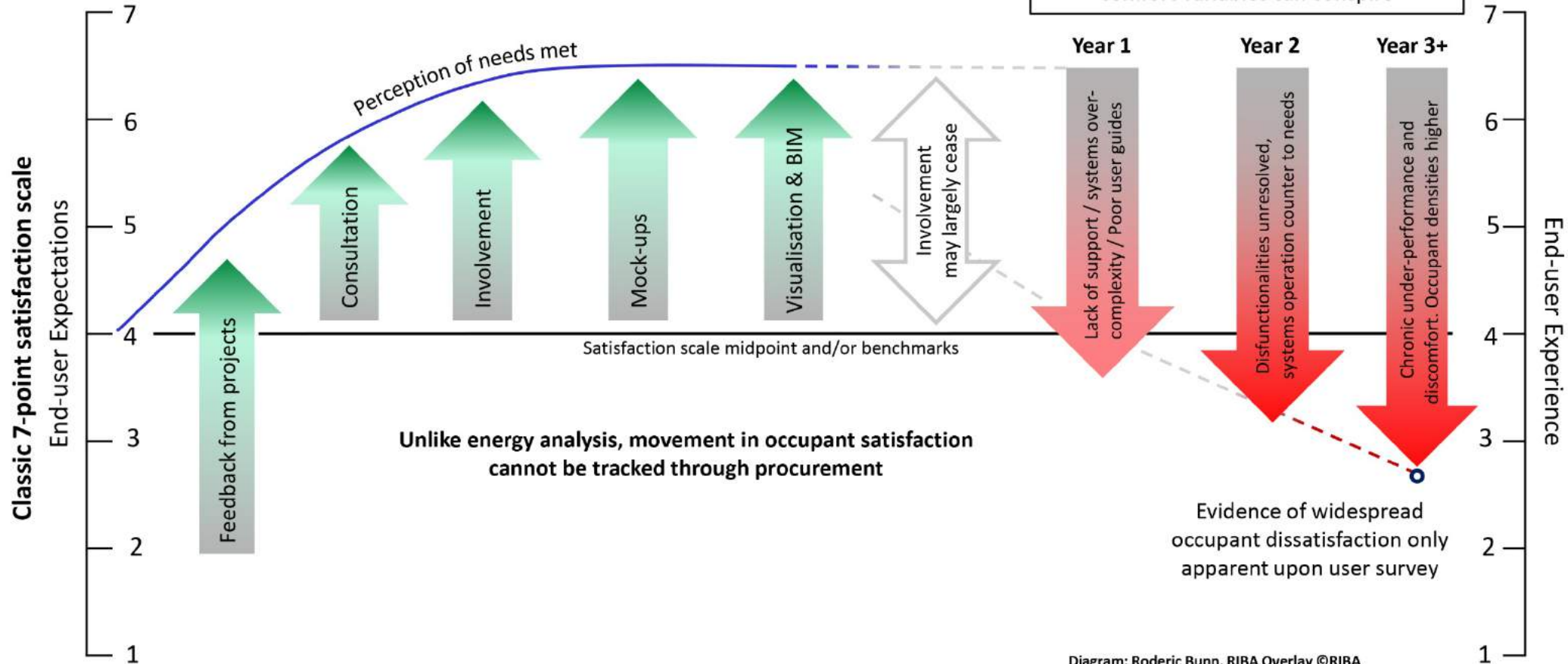


Diagram: Roderic Bunn. RIBA Overlay ©RIBA

2020 RIBA Plan of Work Sustainability Overlay with Plan for Use (Soft Landings)

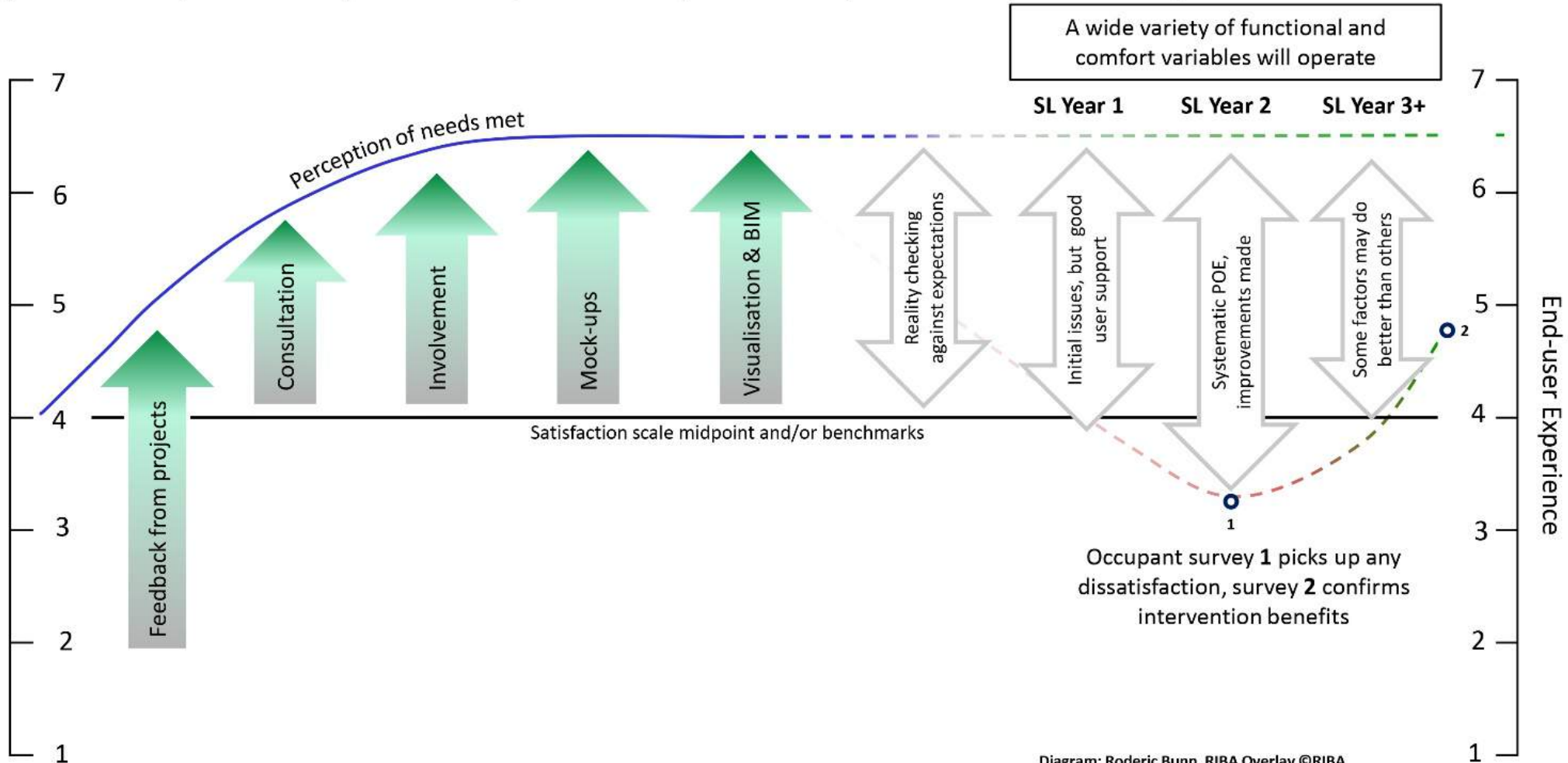


Diagram: Roderic Bunn. RIBA Overlay ©RIBA



CASE STUDIES

Total Energy Consumption
-31.1kWh/m2/y
Improvement on typical
121% reduction
Net Positive



Bere architects | Lark Rise, Buckinghamshire

Predicted Total Energy
Consumption
16kWh/m²/y
Reduction from typical
90% reduction
Embodied Carbon-
336kgCO₂/m²
Reduction from
Typical - **67%**



Mikhail Riches Architects | Goldsmith Street, Norwich

Predicted Total Energy
Consumption
0kWh/m²/y
Reduction from typical
100% reduction



Energiesprong| Netherlands and Nottingham

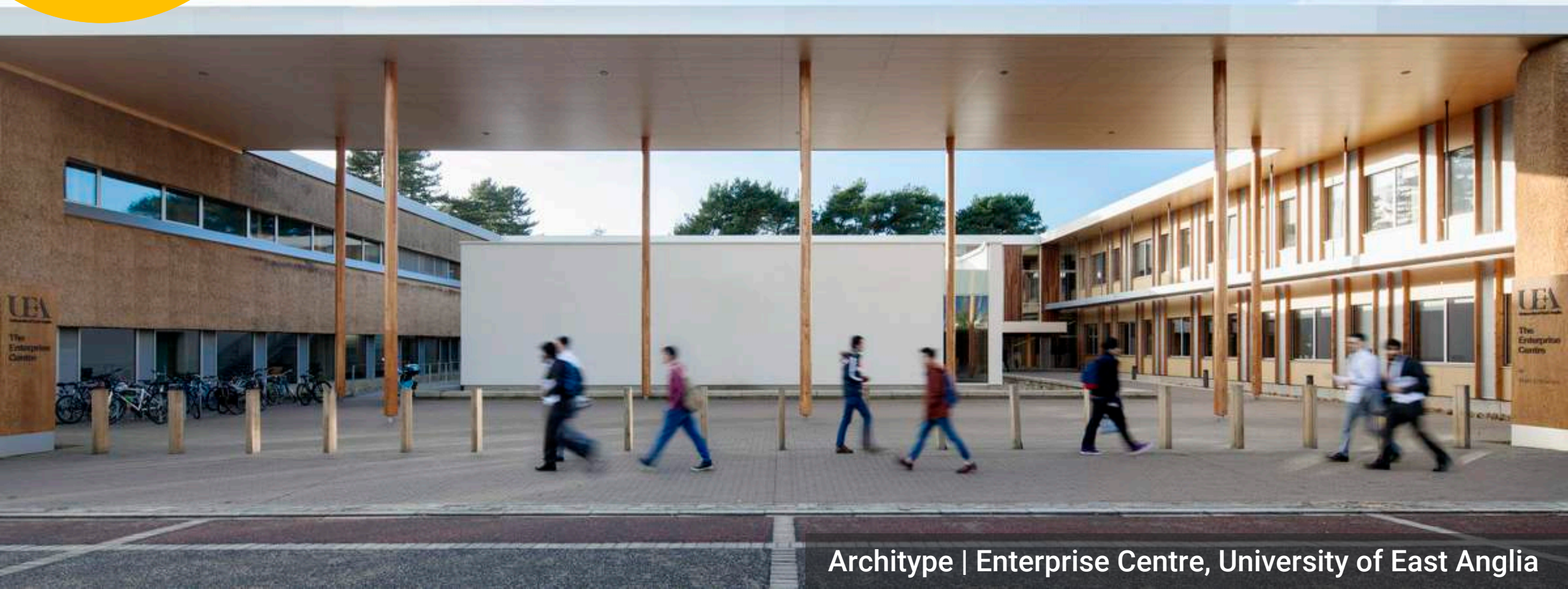
Actual Energy
Consumption
63 kWh/m²/y
Improvement on typical
70% reduction
Inc renewables



Allies and Morrison | Ash Court, Girton, Cambridge

Built at Median cost of University buildings

3,400 m² GIFA
Total Energy Consumption
70 kWh/m²
Improvement on typical
68% reduction



Architype | Enterprise Centre, University of East Anglia

4,200 m² GIFA
Actual Total Energy
Consumption
292 kWh/m²
Improvement on typical
60% reduction
inc Renewables



3,400 m2 GIFA
Total Energy Consumption
107kWh/m2/y
Reduction from typical
52% reduction
Without renewables



Total Energy
Consumption-
186.5kWh/m2/y
Reduction from typical
67%
Without renewables



European examples.

Energy 64 kWh/m².yr (calculated)

Miljohuset, Oslo, Norway

Passivhaus, MVHR, heat pump.



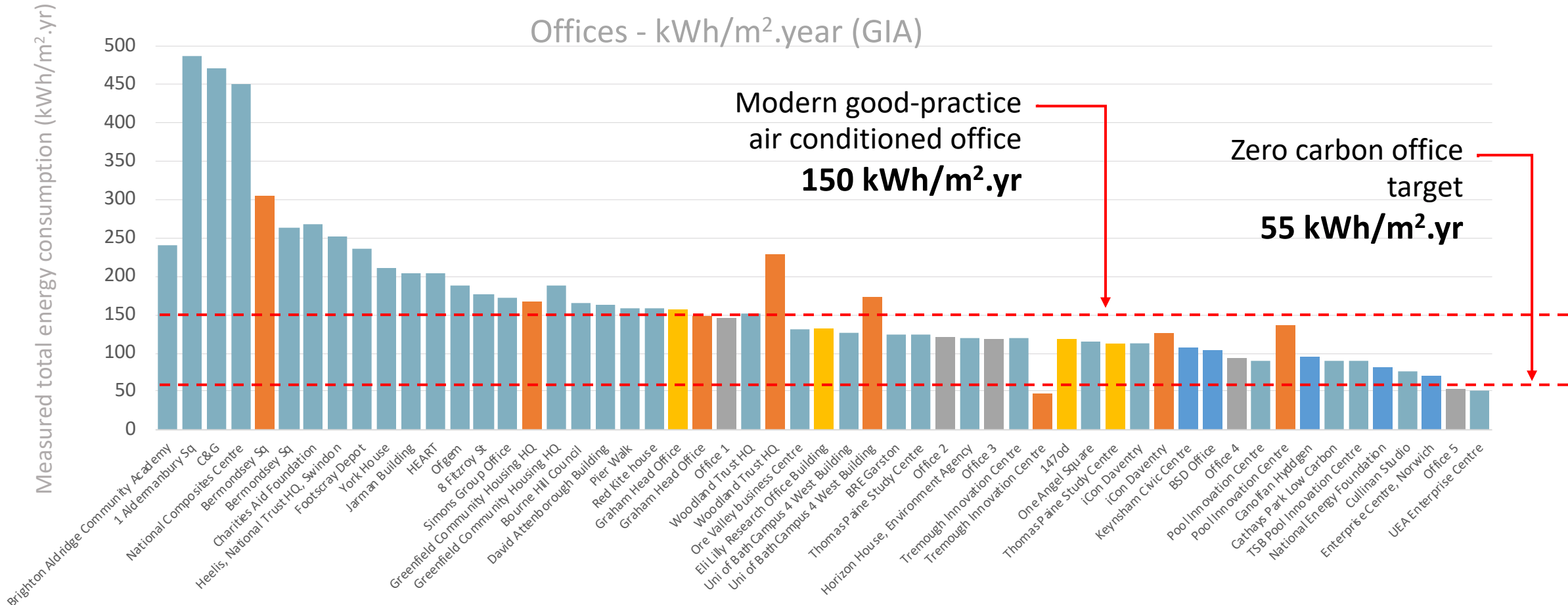
Energy 76 kWh/m².yr (calculated)

Horizont-Building Strassen, Luxembourg

Biomass boiler, chiller with night cooling, variable speed ventilation control.



Office buildings – evidence review of measured energy.



Data Sources: Carbon Buzz (Blue), Innovate UK (Green), the Green Construction Board Building Mission 2030 (Yellow), Landsec benchmark assessment (Purple).



SUMMARY

Rwanda, Land of a Thousand Hills



Official Gazette no Special of 16/04/2019



REPUBLIC OF RWANDA

ANNEX 3

**RWANDA GREEN BUILDING MINIMUM
COMPLIANCE SYSTEM**

Kigali, Rwanda'



Develop your own local sustainable outcomes guides



Target Net zero operational carbon



Target Net zero embodied carbon



Target sustainable water use



Deliver indoor air quality



Protect old growth forests



Increase density of existing settlements



Target significantly enhanced biodiversity and green cover



All new cities should be net zero carbon



Thank you

www.architecture.com/2030challenge

Guides downloadable from here:

www.architecture.com/-/media/files/Climate-action/RIBA-2030-Climate-Challenge.pdf

www.architecture.com/-/media/GatherContent/Test-resources-page/Additional-Documents/RIBASustainableOutcomesGuide2019pdf.pdf

www.architecture.com/-/media/GatherContent/Test-resources-page/Additional-Documents/2020RIBAPlanofWorkoverviewpdf.pdf?la=en

Commonwealth Association of Architects

Engaging with the UN 2030 Sustainable Development Goals

We hope you found this lecture of interest and that you will be interested in the other lectures in this series:

- 1. Introduction to the UN 2030 Sustainable Development Goals**
- 2. Planning for Rapid Urbanisation**
- 3. Planned City Extensions**
- 4. Resilient Infrastructure**
- 5. Climate Responsive Design**
- 6. Heritage-led Regeneration**
- 7. Sustainable Outcomes Guide**

The Commonwealth Association of Architects would like to extend its thanks to all the contributors for their support in the creation of this pilot programme. The CAA welcomes feedback together with suggestions for future topics and would be pleased to hear from subject matter experts from around the Commonwealth who may be interested in contributing future material.

For this or any other issue, please contact: admin@comarchitect.org

Thank you for joining!

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www.comarchitect.org

admin@comarchitect.org

www.commonwealthsustainablecities.org/cpd