



CENTRE FOR RESEARCH INTO
ENERGY DEMAND SOLUTIONS

From Paris to Powys: The need for low carbon housing

Dr Jannik Giesekeam

Research Fellow in Industrial Climate Policy

University of Leeds

11/10/2018



EPSRC
Engineering and Physical Sciences
Research Council

slides available from www.jannikgiesekam.co.uk

Centre for Research into Energy Demand Solutions (CREDS)

New multi-disciplinary research initiative, funded by EPSRC and ESRC - £19m over 5 years

Research programme co-created with industry, government and civil society

Our aim is to help the UK to ensure a transition to an affordable, secure, low-carbon energy system by using energy more efficiently and more flexibly

CREDS consortium



Publications from CIE-MAP

All available at ciemap.ac.uk

CIE-MAP

Centre for Industrial Energy, Materials and Products

Reducing carbon in construction: a whole life approach

The UK construction sector is failing to meet its carbon reduction targets and needs to explore additional mitigation options. The carbon emissions from heating and lighting our buildings (operational emissions) have been falling but there are not the only emissions arising from the built environment. Sizeable carbon emissions are incurred in construction, maintaining and demolishing an asset and producing the materials and components used throughout its life cycle (embodied emissions). Considering both the anticipated operational and embodied emissions of a built asset is considered a **whole life approach**. To date the construction industry has mainly focussed on reducing operational emissions, driven by changes in the building regulations and planning requirements. Extending the focus of carbon assessments and targets from operational to whole life emissions presents designers, clients and contractors with a broader range of mitigation options. The faster proliferation of a whole life approach should be supported by national and local policies for which there are a number of international precedents. Targeted intervention from national and local government could drive innovation in design teams and supply chains, improve sector productivity, reduce the costs of UK buildings and infrastructure, create employment opportunities, boost export markets and deliver immediate reductions in carbon emissions.

Recommendations

1. The Government should establish a well resourced independent body to develop and accelerate the construction sector's decarbonisation agenda.
2. Local authorities should require assessment of whole life carbon emissions on significant schemes as part of the planning process.
3. All publicly funded building projects should include a whole life carbon assessment and whole life carbon targets where project benchmarks can be established.
4. The greenhouse gas emission reporting requirements for quoted companies should be extended to include scope 3 emissions associated with developing new facilities.
5. Product manufacturers should require Environmental Product Declarations to support environmental claims.

Challenges facing UK construction

The National Infrastructure Commission has highlighted three key challenges facing the construction sector: congestion, capacity and carbon¹. By 2050 there are expected to be an extra 14 million people living in the UK and the construction sector must deliver the housing and infrastructure that will underpin their future prosperity. That requires dramatically increasing housingbuilding, retrofitting one existing home every minute, and delivering an infrastructure pipeline worth in excess of £600bn. UK firms are also expected to capture an increasing share of the global market for sustainable construction and be at the forefront of delivering the Government's Clean Growth ambitions². Meanwhile by 2025 the industry is expected to halve delivery times, cut costs by a third, halve the trade gap between exports and imports of construction products, and halve carbon emissions from the

built environment. All of this must be achieved by a highly fragmented sector with low financial margins and declining labour availability³. None of these targets will be met under business as usual conditions⁴. Therefore the construction sector must undergo a radical transformation over the next decade.

The Government has already set out some measures to transform infrastructure performance⁵, and modernise the industry through the Construction Sector Deal as part of the Industrial Strategy⁶. This transformation must focus on reducing carbon whilst improving sector productivity through the adoption of more resource efficient designs, novel materials and delivery models. The successful transformation of this industry will be critical to achieving the Government's target of doubling resource productivity over the next 25 years⁷ and meeting carbon targets.



The headlines this week...

Final call to save the world from 'climate catastrophe'

Scientists warn of imminent climate catastrophe without massive changes

We have 12 years to limit climate change catastrophe, warns UN

Urgent changes needed to cut risk of extreme heat, drought, floods and poverty, says IPCC

World to miss climate targets by wide margin, says UN panel

IPCC calls for 'unprecedented' action to avoid devastating impact

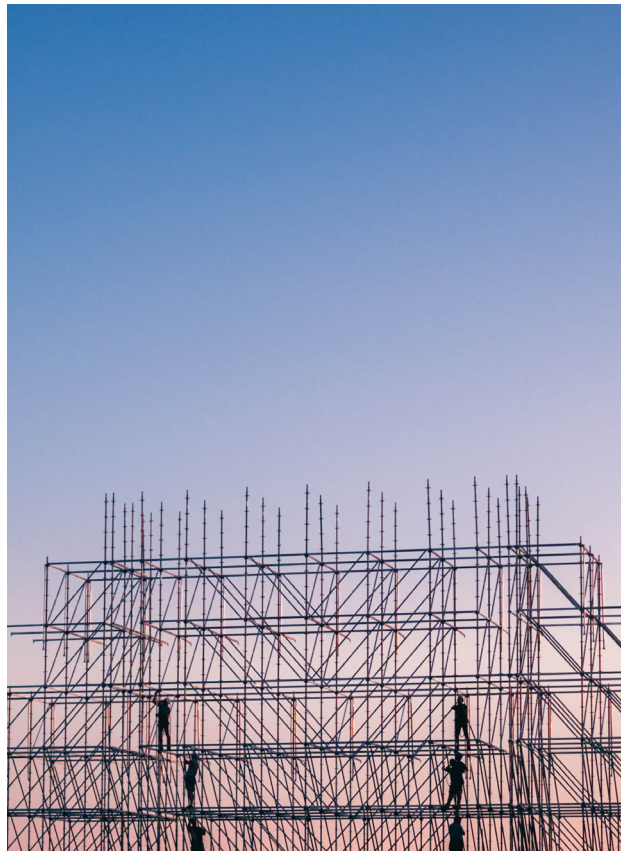
Agenda

The Paris Agreement & global emissions

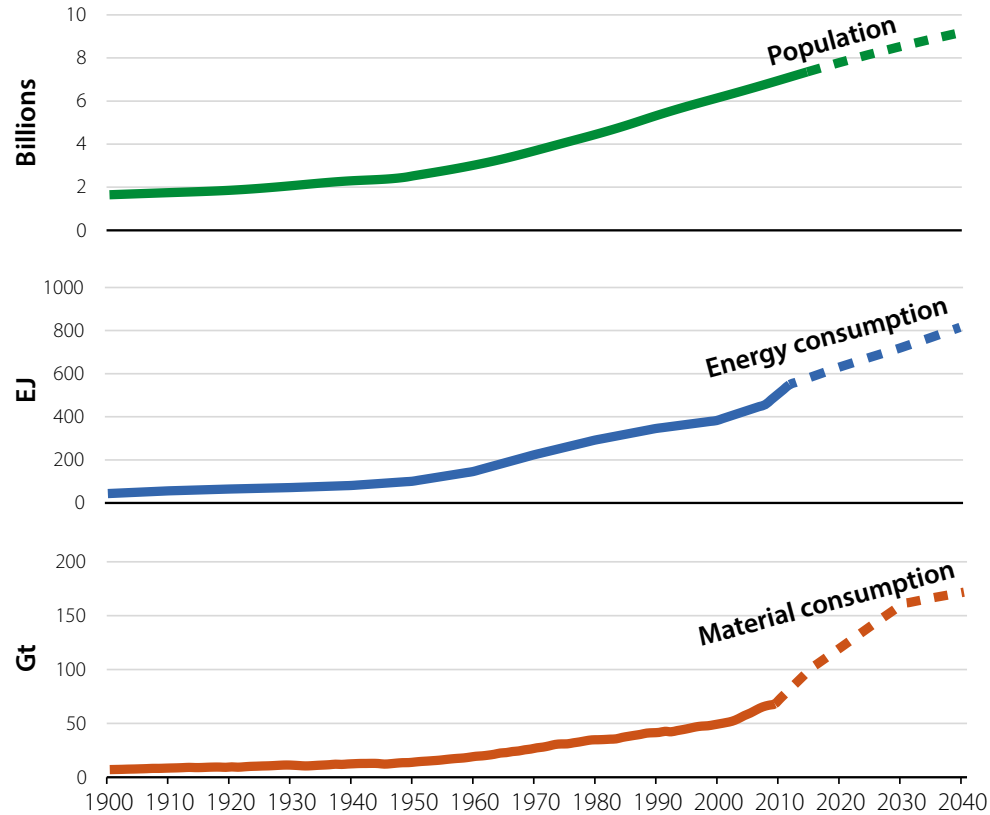
UK progress cutting carbon in the built environment

Welsh carbon targets

Role for social housing in mitigating climate change



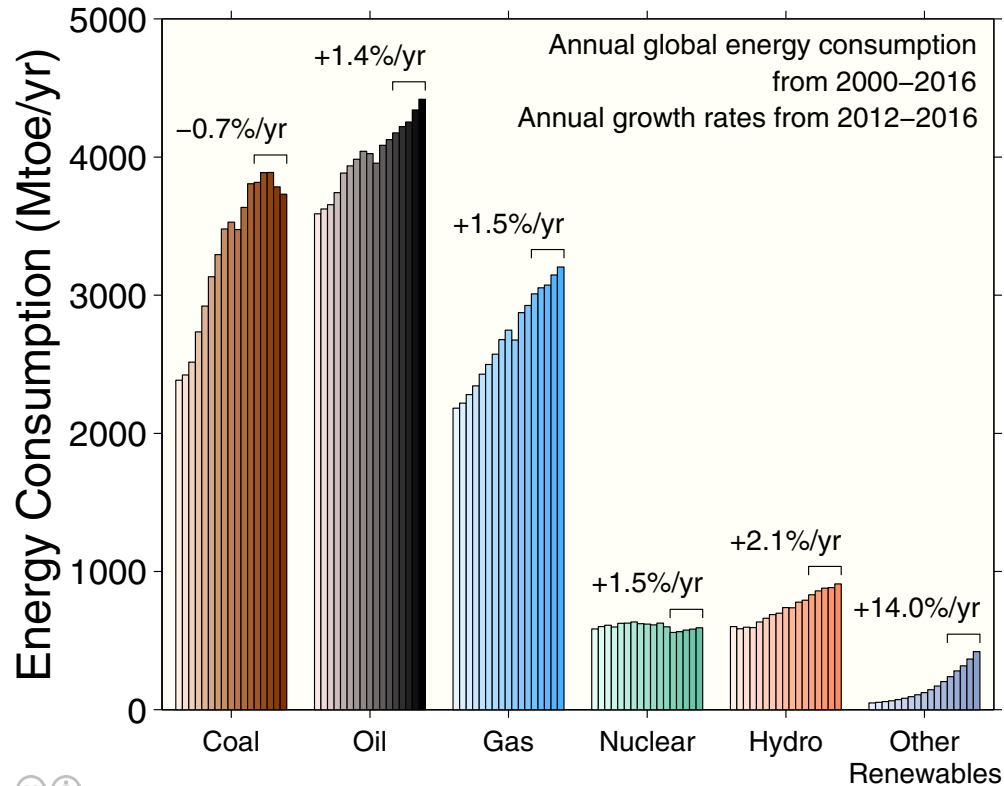
A century of unprecedented growth



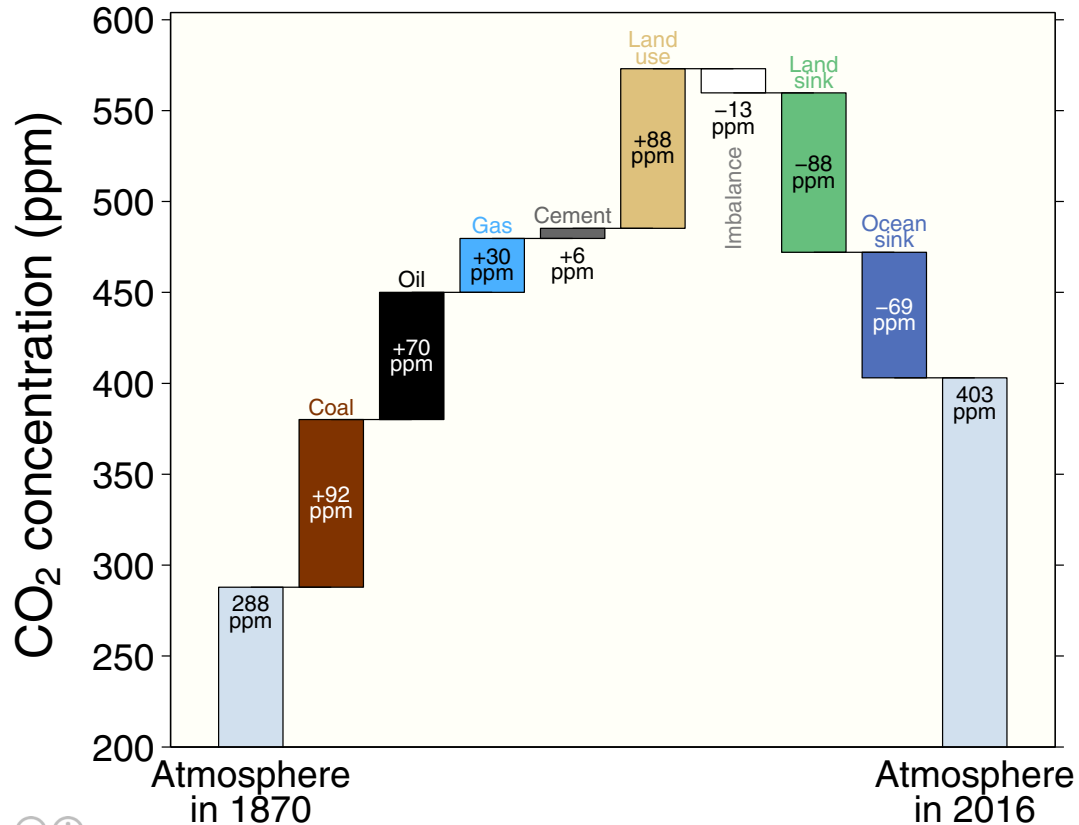
Global technosphere now weighs in at ~30 trillion tonnes



Global energy supply is predominantly from fossil fuels

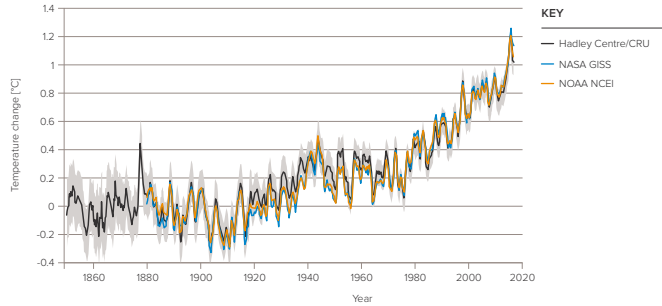


Consequences for the climate

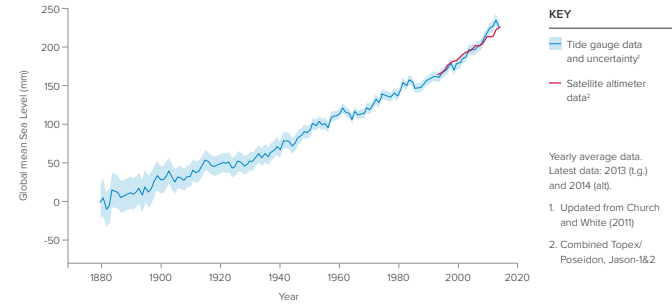


Impacts include

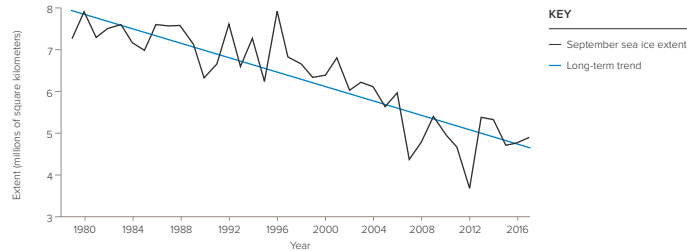
Increasing global temperature



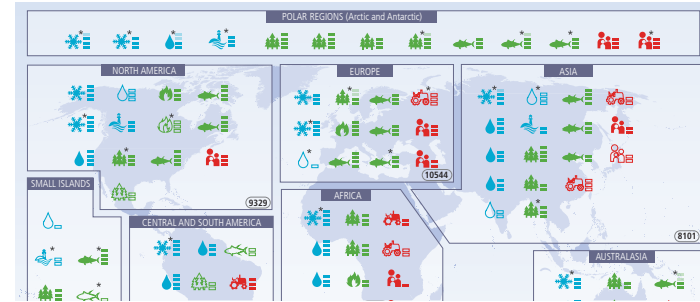
Increasing sea levels



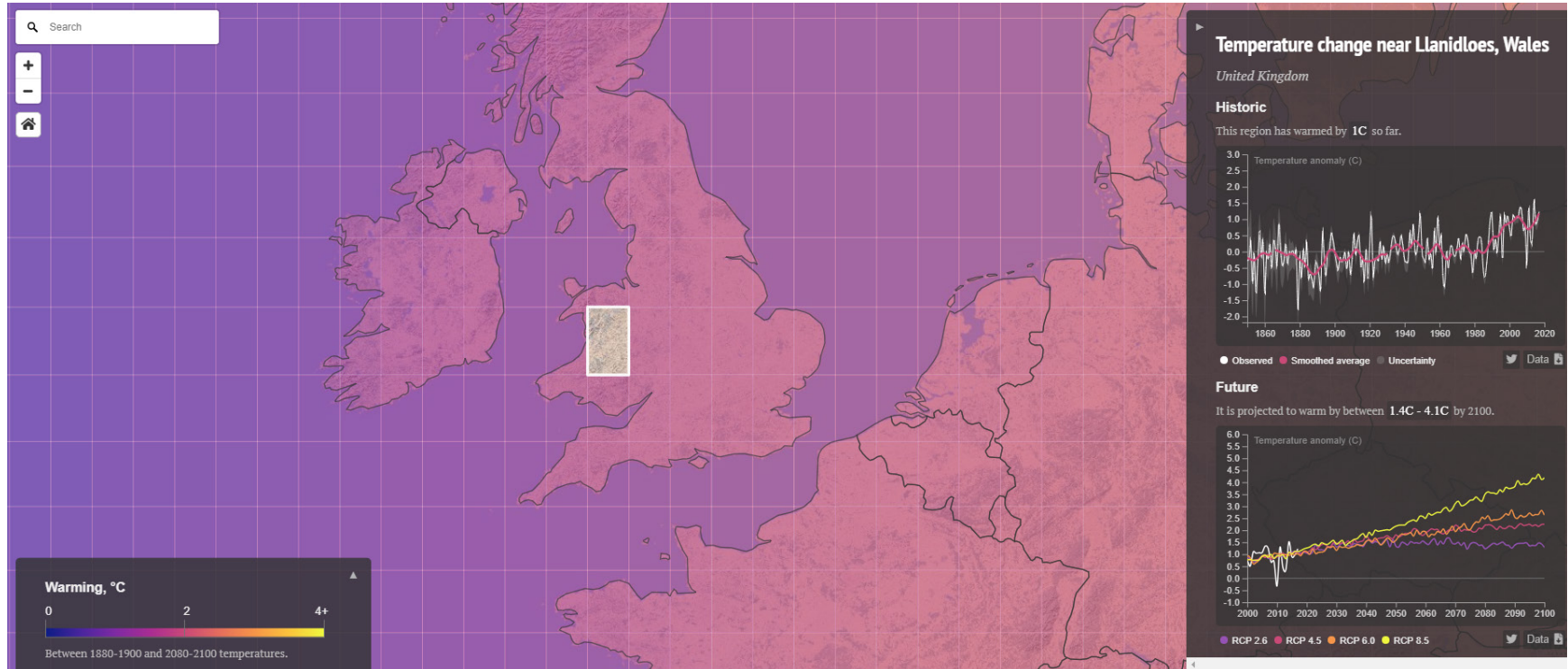
Declining Arctic sea ice



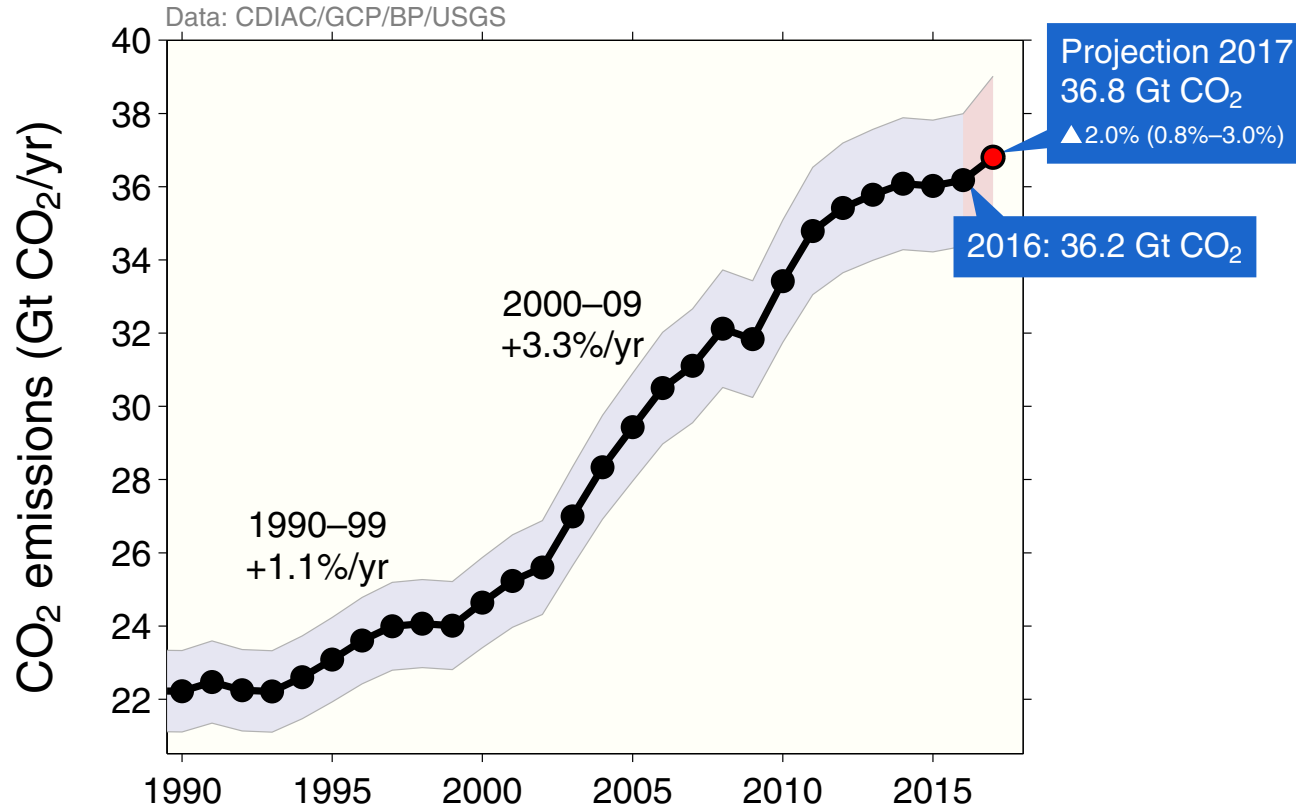
Widespread impacts on ecosystems



~1°C warmer where we are today compared to 1951-1980



Global carbon emissions continue to rise




The Paris Agreement

Commits to “holding the increase in the global average temperature to **well below 2°C** above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels”


Goal of achieving “a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century”
i.e. **net zero emissions**

Recognises “common but differentiated responsibilities”

Commits parties to global stock-take and ratcheting up of ambitions every 5 years



United Nations



Framework Convention on
Climate Change

CCCC/CP/2015/L.9/Rev.1

Distr.: Limited
12 December 2015

Original: English

Conference of the Parties
Twenty-first session
Paris, 30 November to 11 December 2015


Agenda item 4(b)
Durban Platform for Enhanced Action (decision 1/CP.17)
Adoption of a protocol, another legal instrument, or an
agreed outcome with legal force under the Convention
applicable to all Parties


ADOPTION OF THE PARIS AGREEMENT


Proposal by the President

Draft decision -/CP.21

The Conference of the Parties,
Recalling decision 1/CP.17 on the establishment of the Ad Hoc Working Group on
the Durban Platform for Enhanced Action,
Also recalling Articles 2, 3 and 4 of the Convention,
Further recalling relevant decisions of the Conference of the Parties, including
decisions 1/CP.16, 2/CP.18, 1/CP.19 and 1/CP.20,
Welcoming the adoption of United Nations General Assembly resolution
A/RES/70/1, “Transforming our world: the 2030 Agenda for Sustainable Development”, in
particular its goal 13, and the adoption of the Addis Ababa Action Agenda of the third
International Conference on Financing for Development and the adoption of the Sendai
Framework for Disaster Risk Reduction,
Recognizing that climate change represents an urgent and potentially irreversible
threat to human societies and the planet and thus requires the widest possible cooperation
by all countries, and their participation in an effective and appropriate international
response, with a view to accelerating the reduction of global greenhouse gas emissions,
Also recognizing that deep reductions in global emissions will be required in order
to achieve the ultimate objective of the Convention and emphasizing the need for urgency
in addressing climate change,
Acknowledging that climate change is a common concern of humankind, Parties
should, when taking action to address climate change, respect, promote and consider their
respective obligations on human rights, the right to health, the rights of indigenous peoples

GE.15-21932(E)


Please recycle 



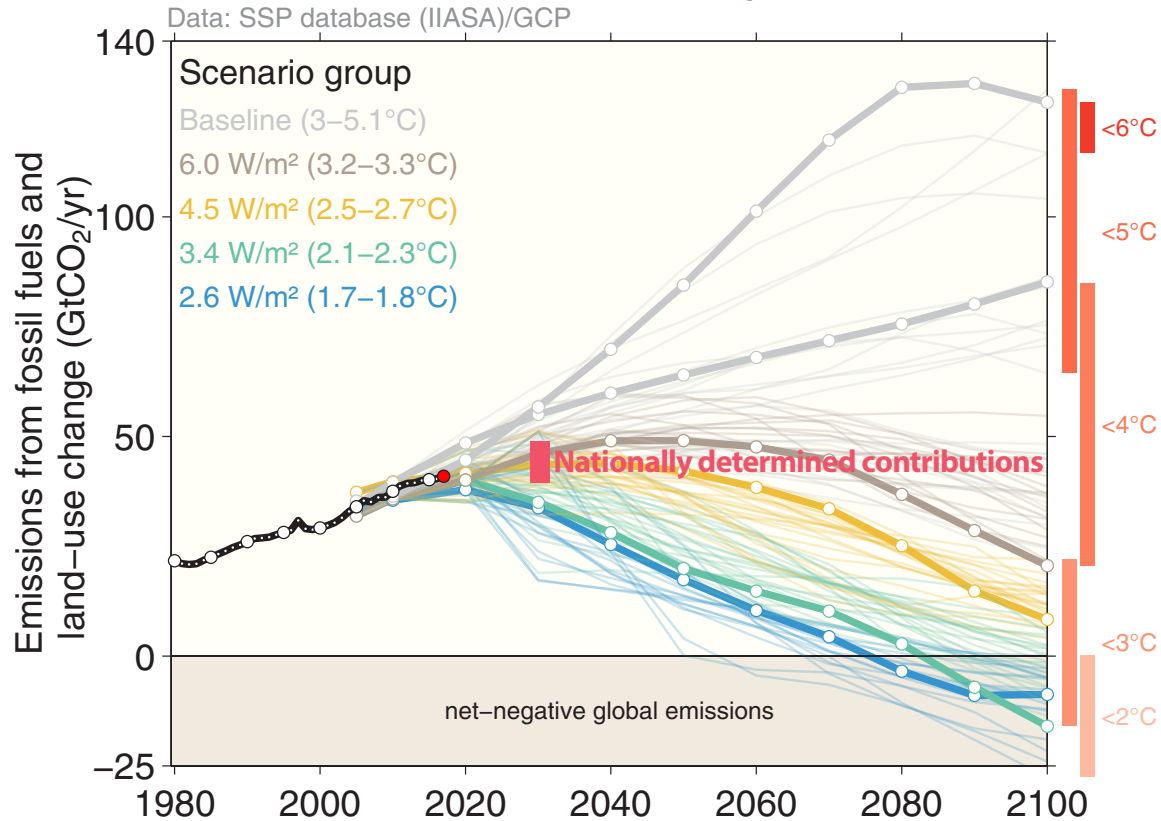
IPCC Special Report

"Limiting warming to 1.5°C is possible within the laws of chemistry and physics but doing so would require unprecedented changes"

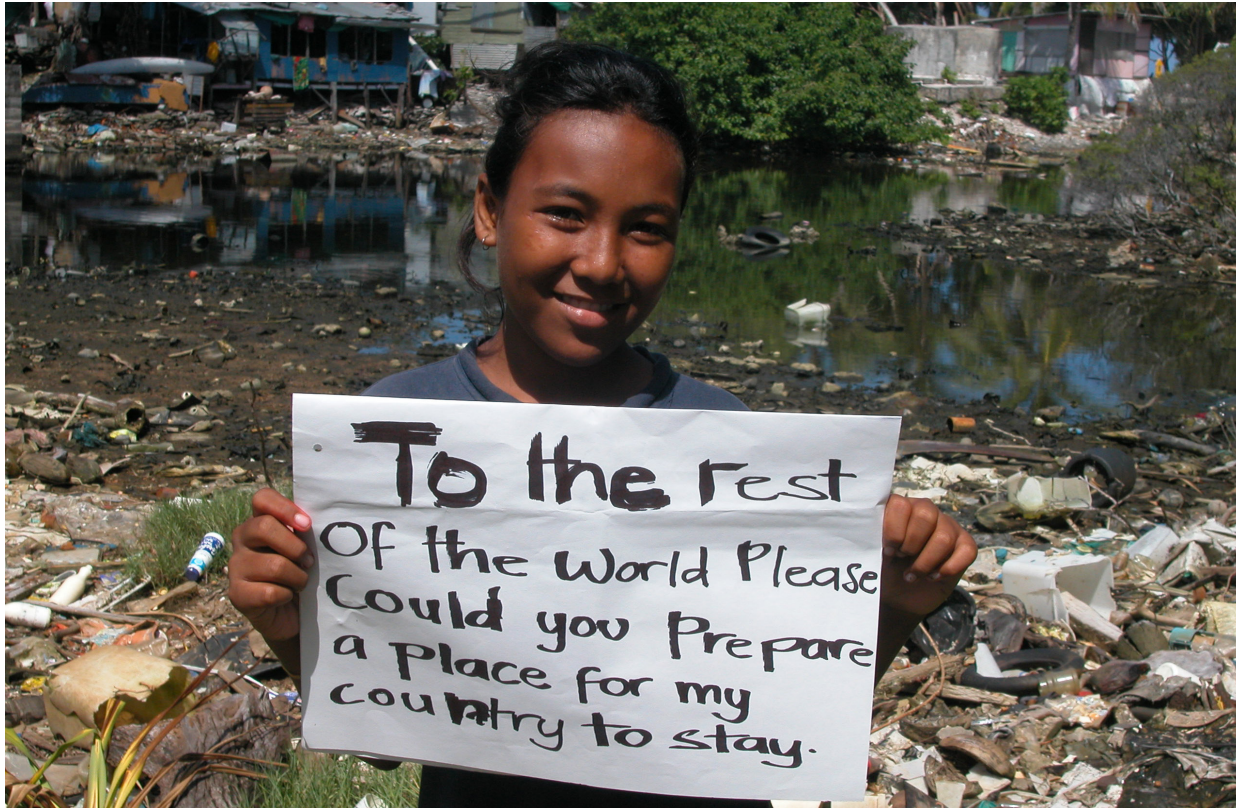
Jim Skea, Co-Chair of IPCC Working Group III



Global emissions scenarios - currently on track for ~3°C



Impacts of climate change will be “severe, pervasive & irreversible”



Substantial risks for the UK

Figure SR.1: Top six areas of inter-related climate change risks for the United Kingdom

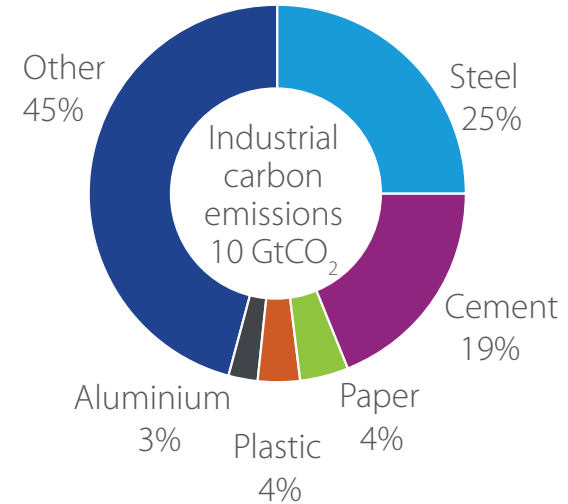
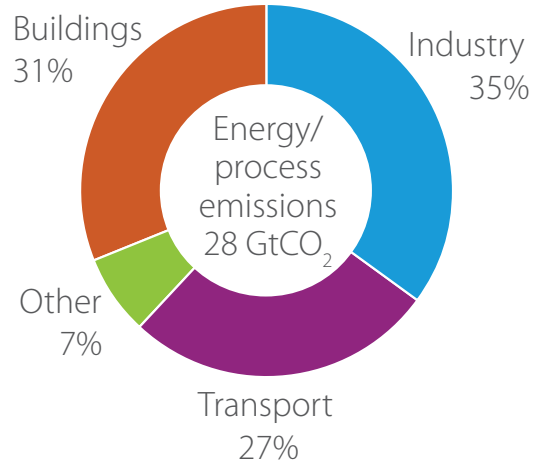
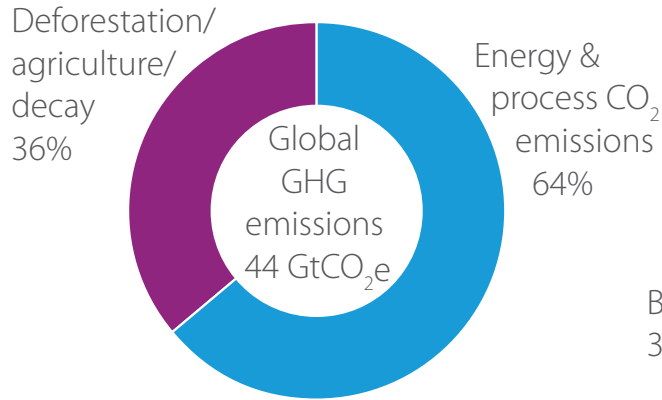
Flooding and coastal change risks to communities, businesses and infrastructure (Ch3, Ch4 Ch5, Ch6)	MORE ACTION NEEDED
Risks to health, well-being and productivity from high temperatures (Ch5, Ch6)	
Risk of shortages in the public water supply, and for agriculture, energy generation and industry (Ch3, Ch4, Ch5, Ch6)	
Risks to natural capital, including terrestrial, coastal, marine and freshwater ecosystems, soils and biodiversity (Ch3)	
Risks to domestic and international food production and trade (Ch3, Ch6, Ch7)	
New and emerging pests and diseases, and invasive non-native species, affecting people, plants and animals (Ch3, Ch5, Ch7)	RESEARCH PRIORITY
NOW -----> RISK MAGNITUDE -----> FUTURE <div> <div>LOW</div> <div>MEDIUM</div> <div>HIGH</div> </div>	

Source: ASC synthesis of the main areas of risk and opportunity within the chapters of the Evidence Report.

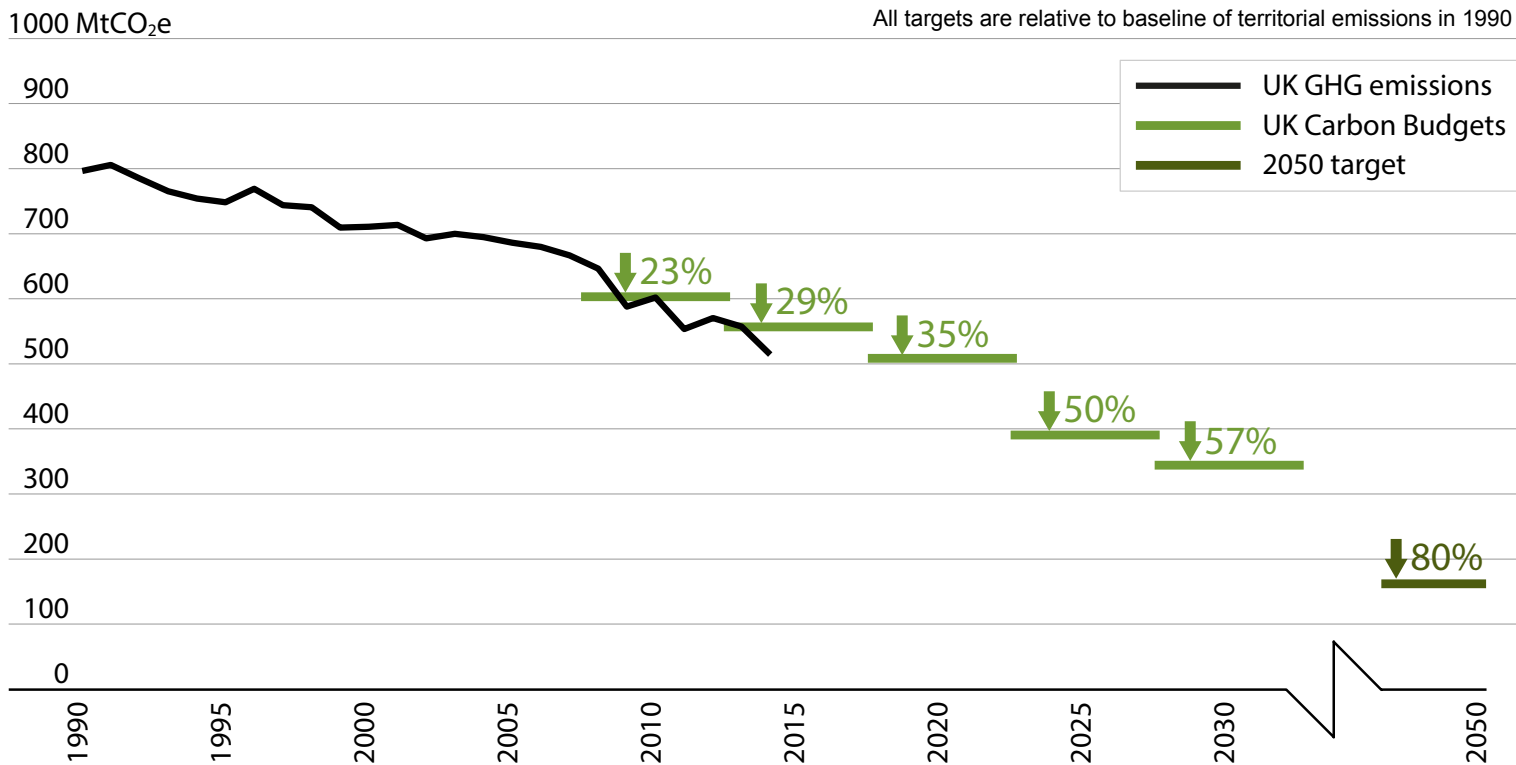
Notes: Future magnitude is based on a combination of climate change and other drivers of risk (e.g. demographic change), taking account of how current adaptation policies and plans across the UK are likely to reduce risks.



Emissions from the built environment and supply chains

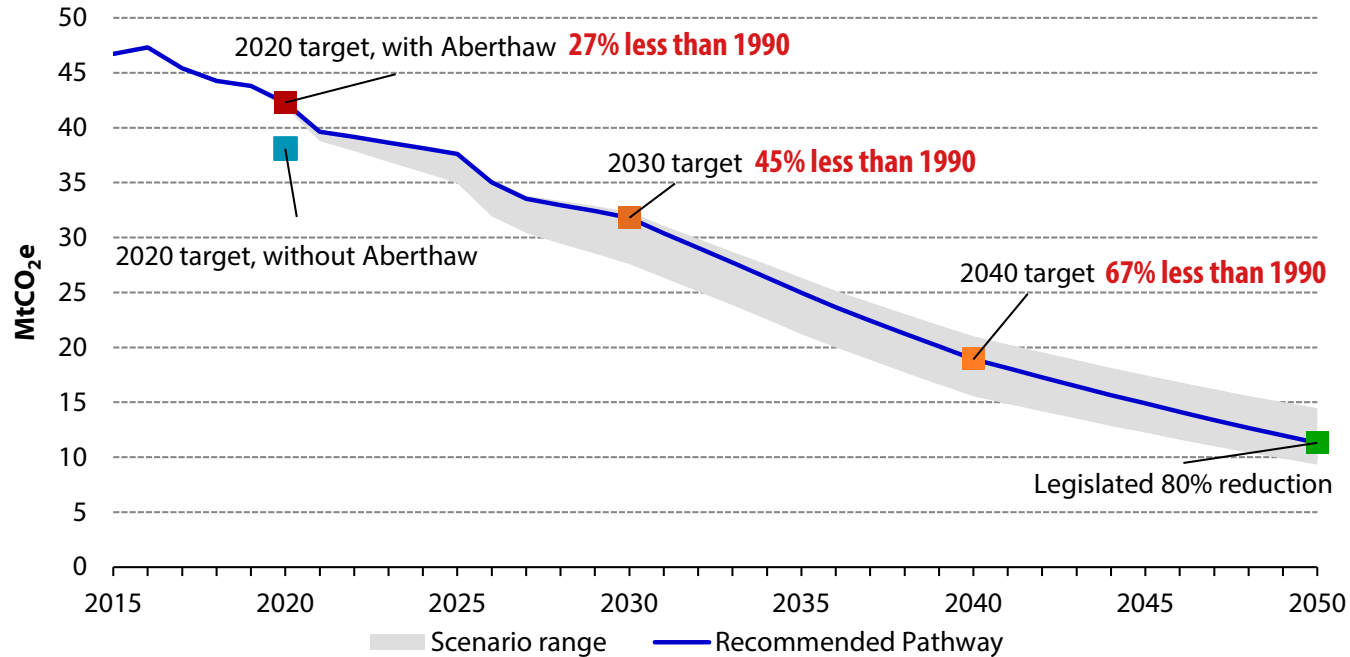


Current UK carbon targets - will be reviewed soon!



Welsh carbon targets

Welsh emissions must **fall by 75% on today's levels** to meet 2050 target set out in 2016 Environment (Wales) Act



Long term goal is net zero emissions

"...the UK's current emissions targets are not aimed at limiting global temperature to as low a level as in the Agreement"

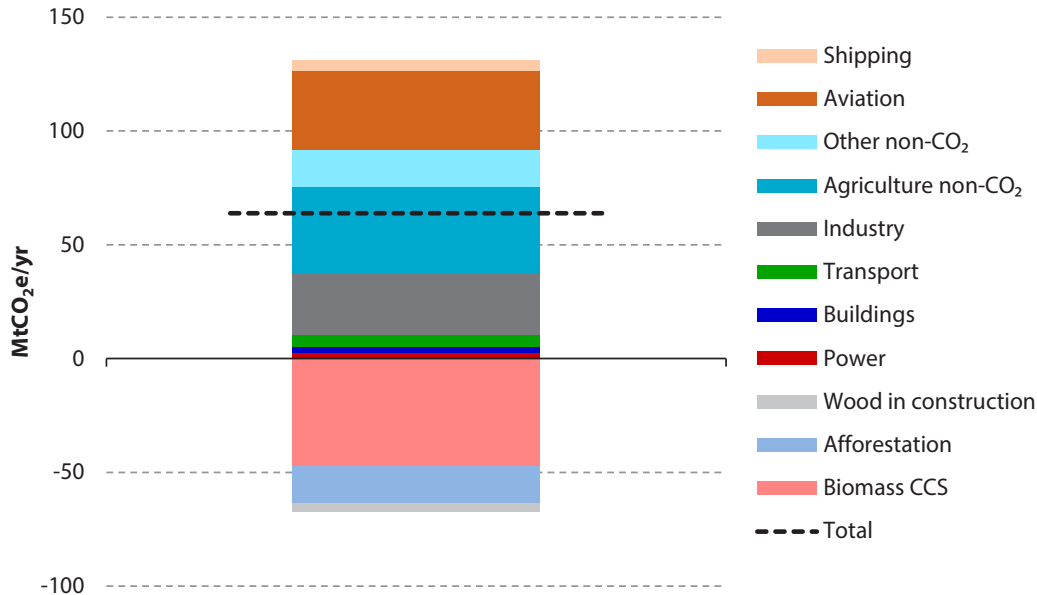
CCC advised that the **UK must be net zero CO₂ by 2055-2075** for >66% chance of achieving 2°C or before 2050 for 1.5°C



What does a net zero UK look like?

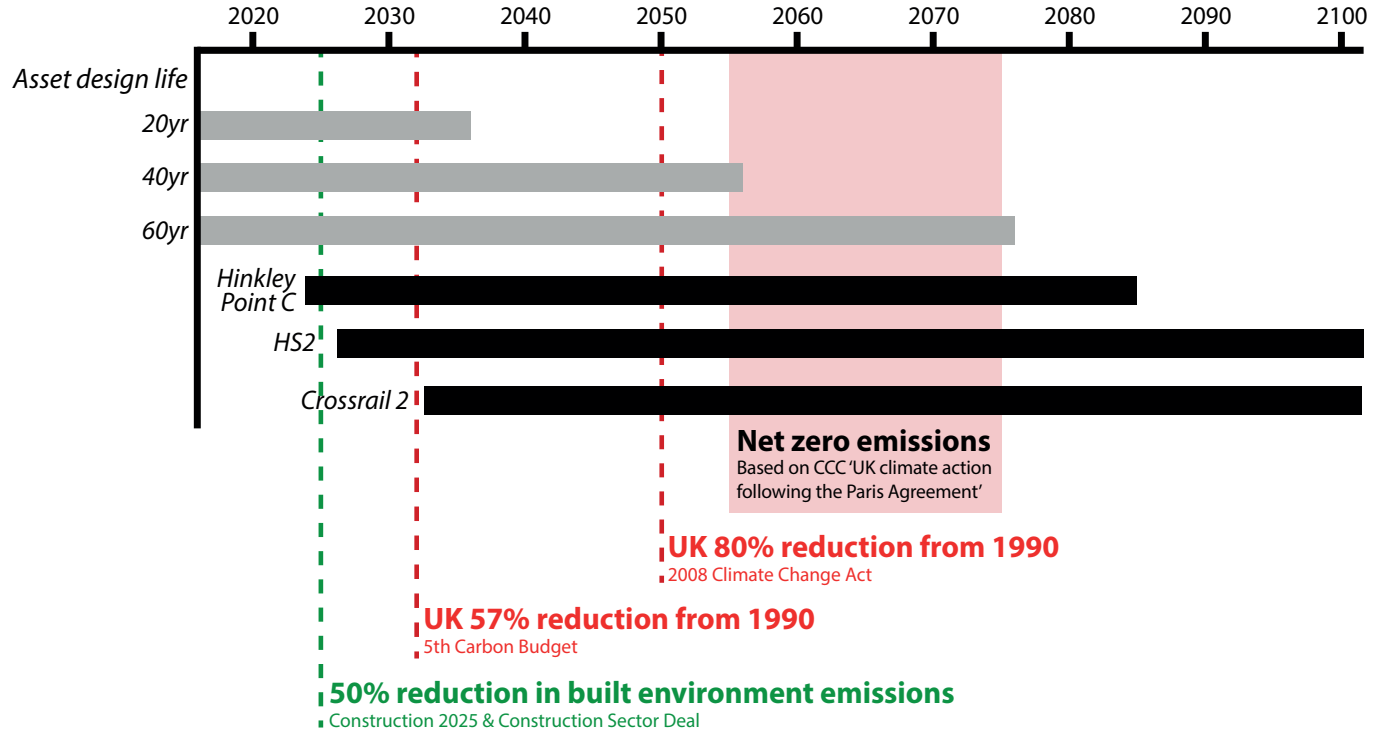
CCC scenarios reduce total UK emissions to $\sim 100\text{MtCO}_2/\text{yr}$ and balance the remainder with afforestation, BECCS and increased use of wood in construction.

Figure 3.1. Residual UK greenhouse gas emissions in 2050 under Max deployment across all sectors



Implications for built environment

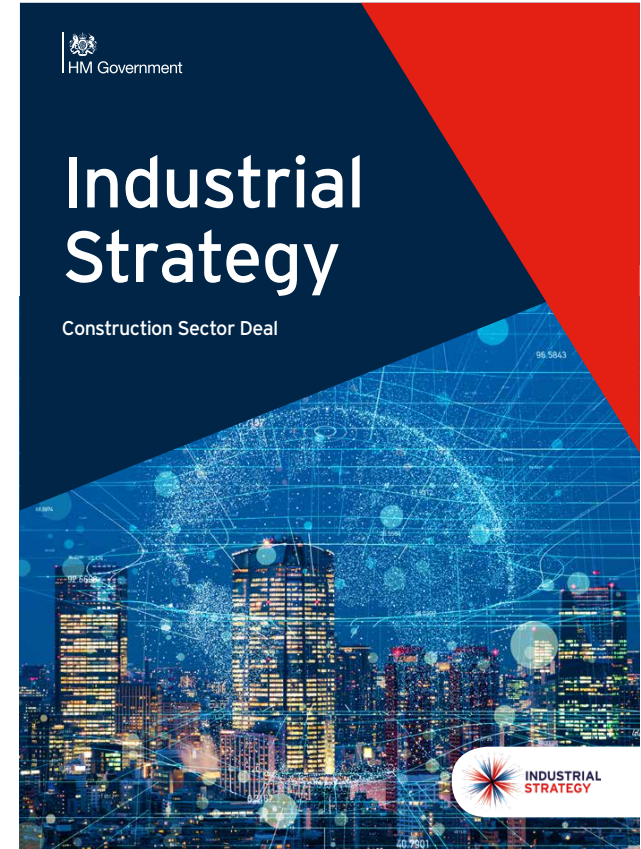
Most assets under design now must operate in a net zero nation



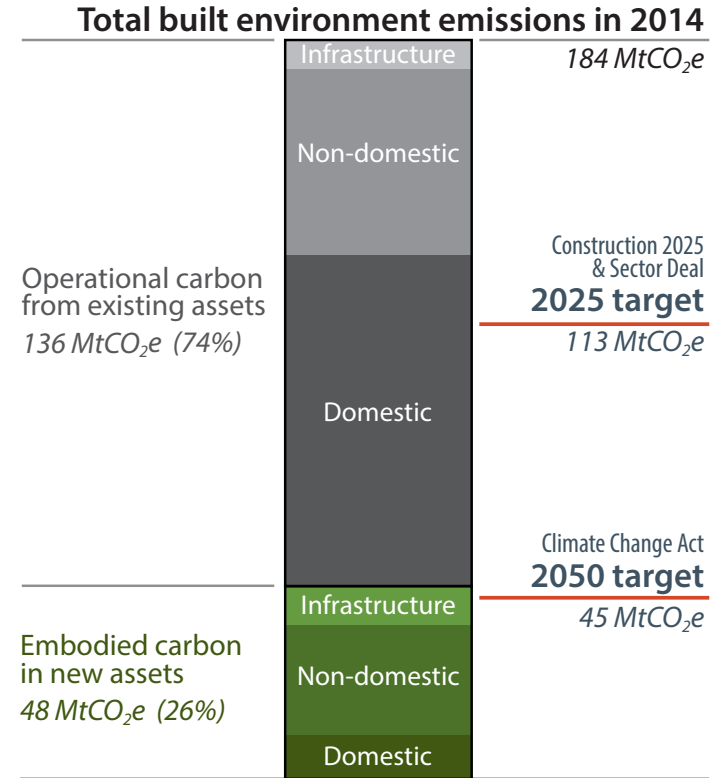
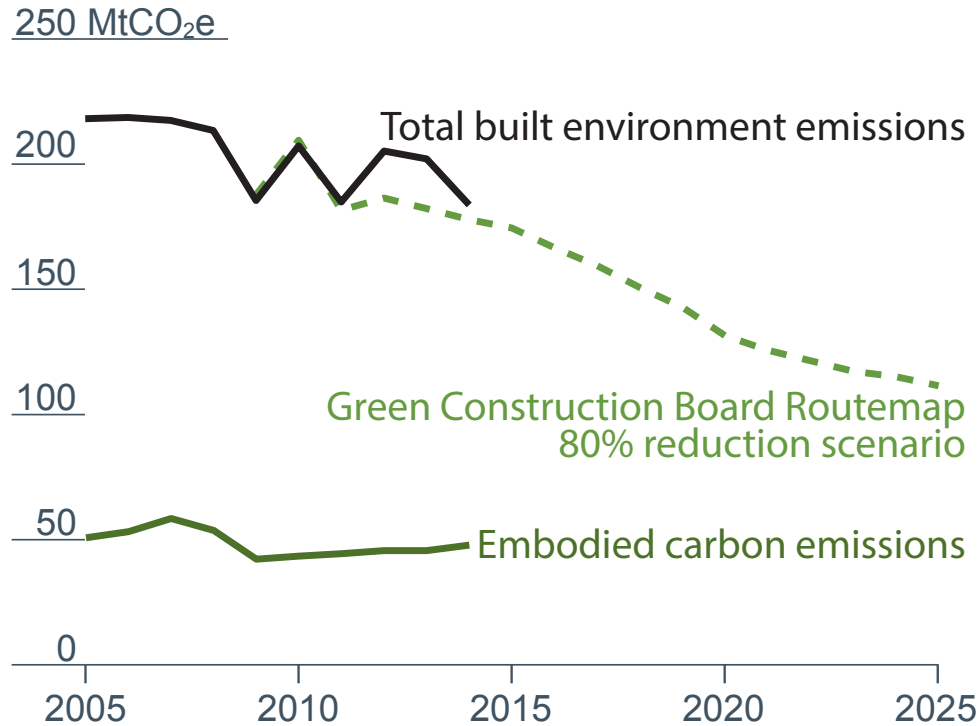
Construction Sector Deal

Mission to halve the energy use of new buildings by 2030

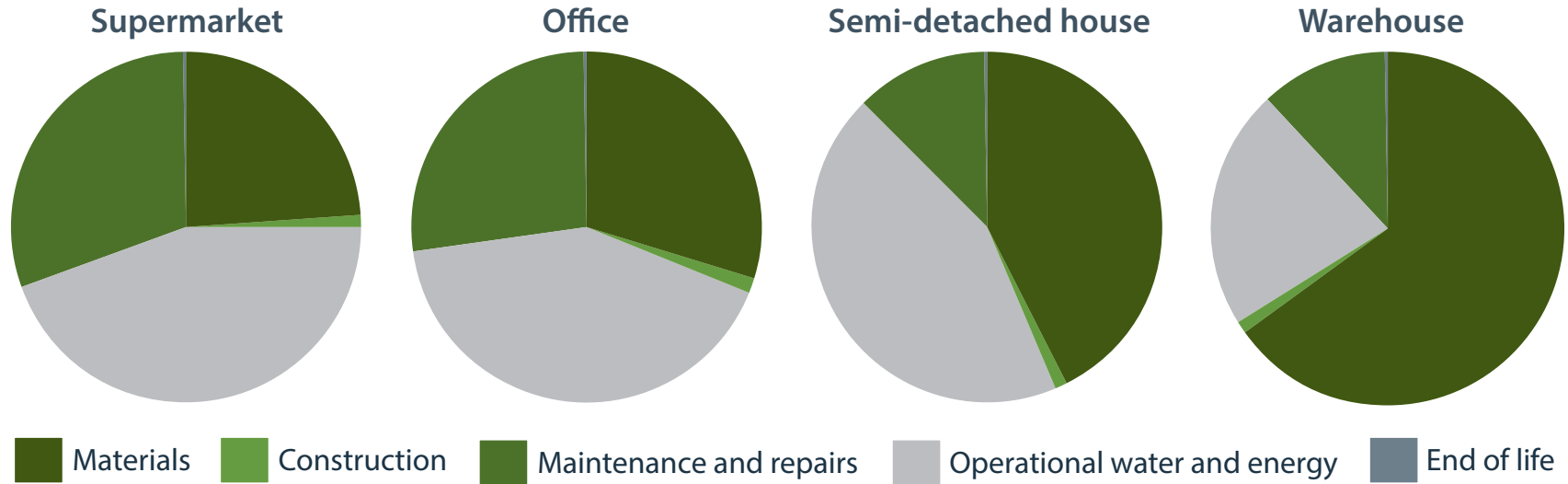
Targets 50% reduction in greenhouse gas emissions in the built environment by 2025



Green Construction Board Low Carbon Routemap progress




Typical breakdowns of whole life carbon emissions



As operational emissions in new buildings reduce, the focus must move towards reducing **whole life emissions**, including embodied emissions, for cost effective mitigation

Guidance on embodied/whole life carbon


RICS professional statement

 **RICS**

RICS professional standards and guidance, UK

Whole life carbon assessment for the built environment

1st edition, November, 2017



rics.org/guidance

Embodied and whole life carbon assessment for architects



RIBA
Architecture

wrap Material change for a better environment

Information sheet for construction clients and designers

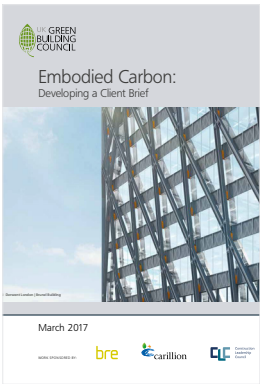
Cutting embodied carbon in construction projects

This guidance will help you identify basic cost-effective actions to reduce the carbon impact of the materials used in your construction projects.

Carbon-saving action	Range of carbon savings
1. Use low-carbon materials. You can benefit financially by: <ul style="list-style-type: none">• substituting in materials use and waste.• minimising or using alternative manufacturing, trading and• minimising the good environmental management.	Embodied carbon savings of up to 10% can be achieved by using low-carbon materials. This can be achieved by using low-carbon materials, such as low-carbon concrete, low-carbon steel, and low-carbon timber. This can be achieved by using low-carbon materials, such as low-carbon concrete, low-carbon steel, and low-carbon timber.
2. Use low-carbon materials. You can benefit financially by: <ul style="list-style-type: none">• substituting in materials use and waste.• minimising or using alternative manufacturing, trading and• minimising the good environmental management.	Embodied carbon savings of up to 10% can be achieved by using low-carbon materials. This can be achieved by using low-carbon materials, such as low-carbon concrete, low-carbon steel, and low-carbon timber. This can be achieved by using low-carbon materials, such as low-carbon concrete, low-carbon steel, and low-carbon timber.

UK GREEN BUILDING COUNCIL

Embodied Carbon: Developing a Client Brief



March 2017

bre **carillion** **CLC**

GREATER LONDON AUTHORITY **LONDON BUILDING COUNCIL**

Construction Scope 3 (Embodied)

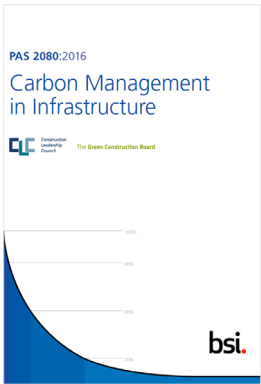
Greenhouse Gas Accounting and Reporting Guidance

March 2013

PAS 2080:2016

Carbon Management in Infrastructure

CLC **The Green Construction Board**



UK GREEN BUILDING COUNCIL **bre**

Practical how-to guide: Measuring Embodied Carbon on a Project

For about 20 years the Green Guide to Specification has provided a means for designers to compare the embodied carbon of different materials and products. It has been a key tool for designers to make informed decisions about the carbon impact of their designs. This new guide provides a practical how-to guide for measuring embodied carbon on a project.



UK GREEN BUILDING COUNCIL **THE CROWN ESTATE**

FEBRUARY 2015

Tackling embodied carbon in buildings



CAMPAIN FOR A SUSTAINABLE BUILT ENVIRONMENT

a guide to understanding the embodied impacts of construction products

construction products



What can I do on my project?

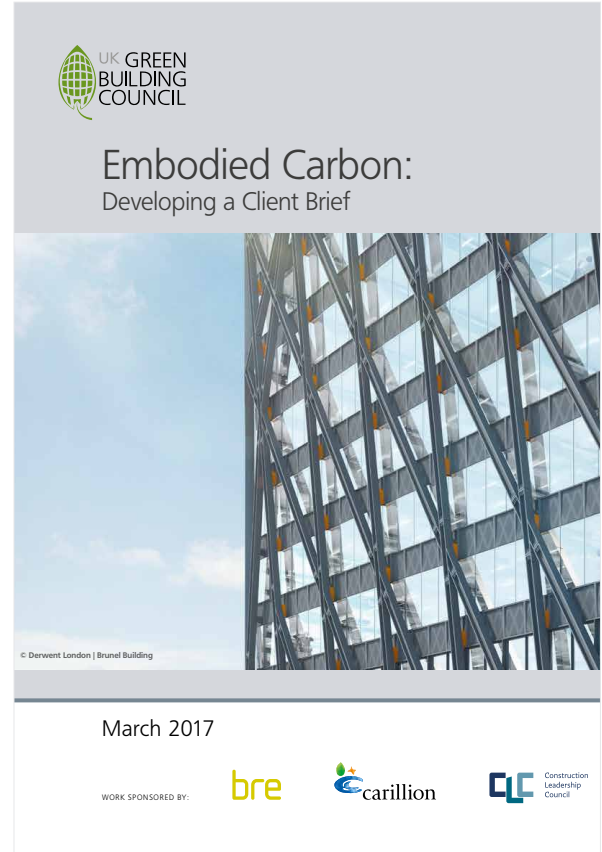
Examples

Set assessment or reduction requirements in the project brief

Procure carbon management services in design and construction

Optioneer design and material choices to meet low carbon objectives

Set a supply chain carbon intensity or project carbon target



Example - UEA Enterprise Centre

Client set ambitious carbon targets which drove exploration of different material options

Ultimately delivered embodied carbon of $193 \text{ kgCO}_2/\text{m}^2$ compared with benchmark of $845 \text{ kgCO}_2/\text{m}^2$



Role for social housing

Housing horizons ambitions

Pledge to build 75,000 new homes by 2036

"For all new housing association homes to be built to near-zero-carbon standard by 2020 and all our homes to reach this standard by 2036."



Revised Welsh Planning Policy

Sustainable Buildings

4.115 The planning system should facilitate new development that enables decarbonisation, tackles the causes of climate change, and adapts to the current and future effects of climate change through the incorporation of effective mitigation and adaptation measures.



4.116 The Welsh Government's policy is to secure zero carbon buildings while continuing to promote a range of low and zero carbon technologies as a means to achieve this.

4.117 Sustainable building design principles should be integral to the design of new development. Development proposals should:

- mitigate the causes of climate change by minimising carbon and other greenhouse gas emissions associated with their design, construction, use and eventual demolition; and
- include features that provide effective adaptation to, and resilience against, the current and predicted future effects of climate change.



4.118 Planning authorities should assess strategic sites to identify opportunities to require higher sustainable building standards (including zero carbon) to be required. In bringing forward standards higher than the national minimum, set out in Building Regulations, planning authorities should ensure what is proposed is evidence-based and economically viable.

Number: WG33228



Welsh Government

Draft Planning Policy Wales: Edition 10

Date of issue: 12 February 2018

Action required: Responses by 18 May 2018

Mae'r ddogfen yma hefyd ar gael yn Gymraeg.

This document is also available in Welsh.

OGL © Crown Copyright

Draft London Plan

August 2018 revisions include:

New Policy SI2 DB: *“Development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.”*

This is expanded upon in new 9.2.9A section and included in the energy strategy requirements.



Embodied Carbon Living Lab

2 year programme addressing embodied and whole life carbon emissions on series of live projects

Will trial approaches, conduct a city scale assessment of impacts and propose amendments to participants' construction standards and the local sustainable construction SPD



Examples

L&G Modular Homes



LILAC





CENTRE FOR RESEARCH INTO
ENERGY DEMAND SOLUTIONS

Thank you

Please get in touch with any queries
J.Giesekeam@leeds.ac.uk



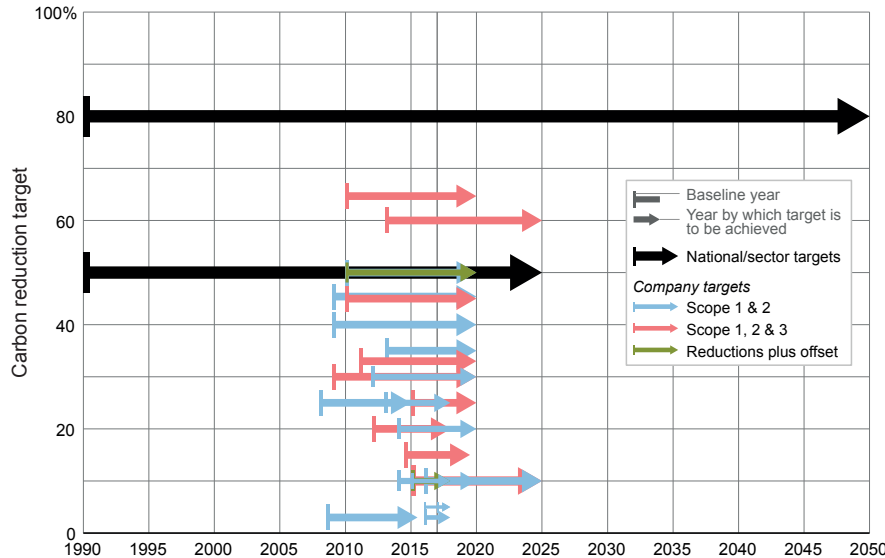
slides available from www.jannikgiesekam.co.uk

Extra slide: current UK construction company carbon targets

Most large firms setting modest short-term targets focussed on Scope 1 & 2 emissions

Growing minority of firms also targeting Scope 3 reductions

Carbon reduction targets of selected UK housebuilders & construction firms (representing turnover of £88.4bn in 2016) - based on July 2017 review



Carbon reduction targets of selected infrastructure clients

