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# CIBSE Guide L: Sustainability meets ASHRAE Green Guide

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14 November 2007

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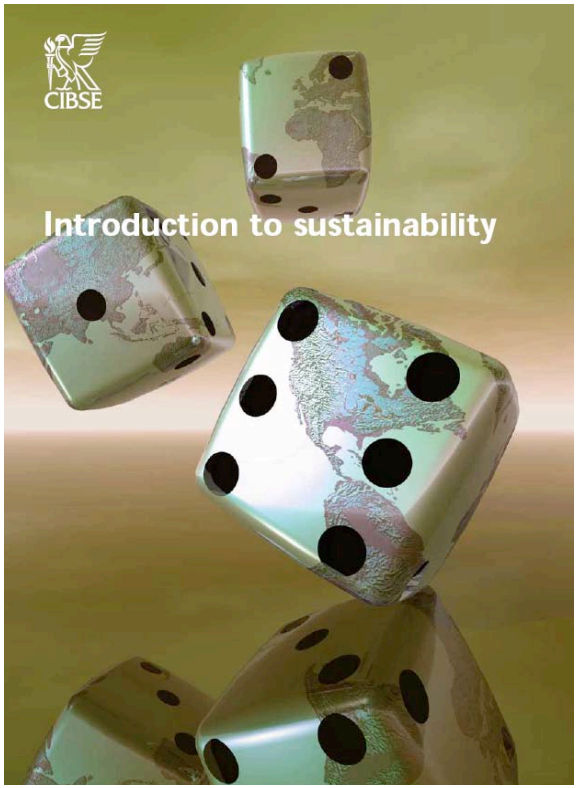
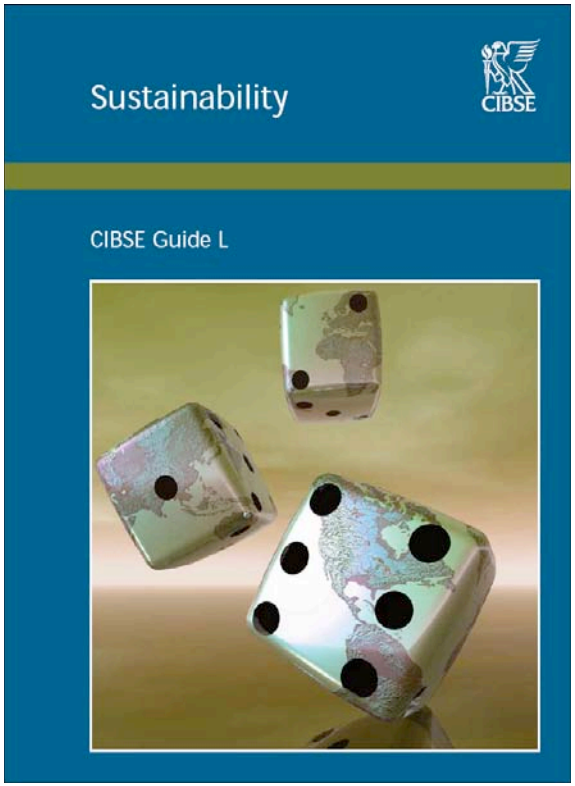
# CIBSE Guide L: Sustainability



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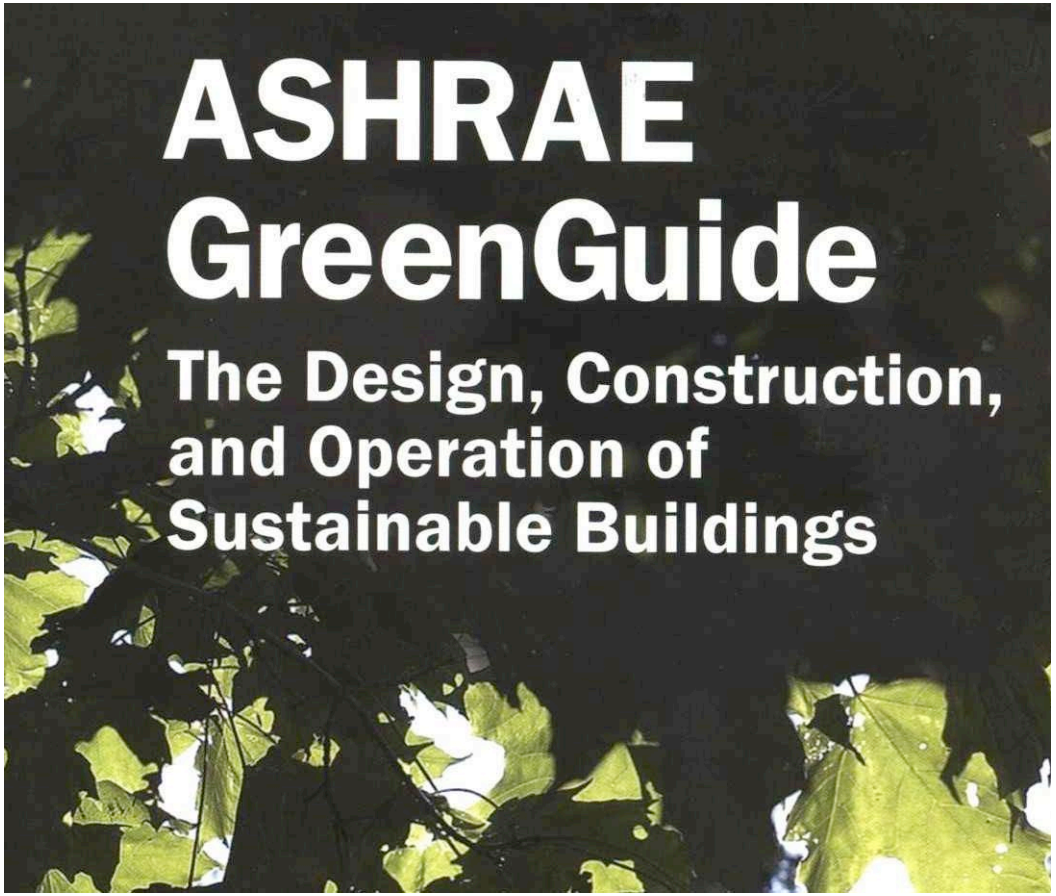
# ASHRAE GreenGuide



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# Defining Sustainable Development

## Living Within Environmental Limits

Respecting the limits of the planet's environment, resources and biodiversity – to improve our environment and ensure that the natural resources needed for life are unimpaired and remain so for future generations.

## Ensuring a Strong, Healthy and Just Society

Meeting the diverse needs of all people in existing and future communities, promoting personal wellbeing, social cohesion and inclusion, and creating equal opportunity for all.

## Achieving a Sustainable Economy

Building a strong, stable and sustainable economy which provides prosperity and opportunities for all, and in which environmental and social costs fall on those who impose them (polluter pays), and efficient resource use is incentivised.

## Promoting Good Governance

Actively promoting effective, participative systems of governance in all levels of society – engaging people's creativity, energy, and diversity.

## Using Sound Science Responsibly

Ensuring policy is developed and implemented on the basis of strong scientific evidence, whilst taking into account scientific uncertainty (through the precautionary principle) as well as public attitudes and values.

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# Defining sustainability

- *"providing for the needs of the present without detracting from the ability to fulfill the needs of the future"*

  *GreenGuide*

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# Defining sustainability - GreenGuide

- Minimising natural resource consumption
- Renewable energy resources to achieve net zero energy consumption
- Minimising emissions, including indoor air quality, greenhouse gases
- Minimising discharge of solid waste and liquid effluents
- Minimal negative impacts on site ecosystems
- Maximise quality of indoor environment


Energy & water


Renewables


IAQ

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# Drivers for sustainability


cf 'Owners Project Requirements' in GreenGuide

CIBSE Introduction Figure 6

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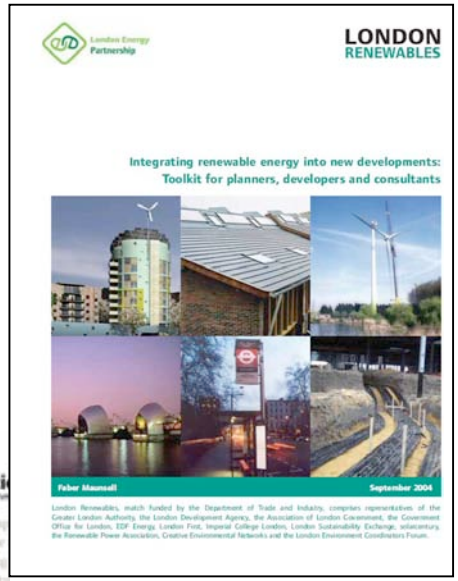
# Planning drivers

- PPS on Planning and Climate Change
- Further Alterations to the London Plan (including proposed 20% renewables target)
- SPG on Sustainable Design and Construction
- Ensuring Part L compliance pre-planning

= more involvement early on



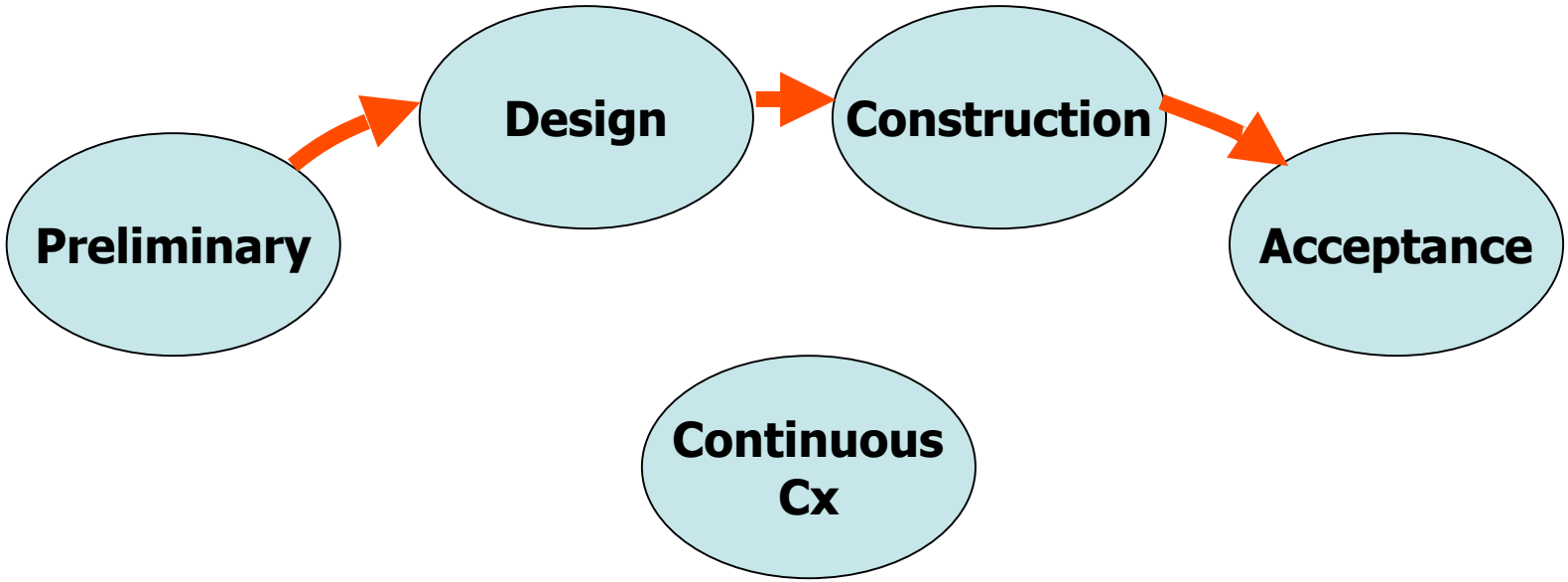

# Content: Three Basic Sections

**Design Process (Chapters 3– 16)**

**Basics (Chapters 1 – 2)**

**Post Design (Chapter 18)**

- Chapter 3: Commissioning (Cx)
  - Why is this the 3rd chapter in the book?
  - Phases of Commissioning



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# Commissioning

- *"…a comprehensive commissioning process that starts during pre-design …"*
- The main role at pre-design is to develop comprehensive Owners Project Requirements
- This is similar to the role of the sustainability champion
- Also, look at commissionability of the systems at design phase

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| | |
|---|---|
| Energy and $CO_2$ | Reduce predicted $CO_2$ emissions by applying energy efficient design principles and utilising low and zero carbon technologies. |
| Water | Reduce predicted water use by integrating water efficient plant, appliances and fittings. |
| Waste | Reduce construction and demolition waste going to landfill and enable in-use recycling in accordance with the waste hierarchy. |
| Transport | Increase the use of sustainable modes of transport when the building is in use. |
| Adapting to climate change | Improve the capacity of the building to operate successfully under the different and demanding conditions predicted in future. |
| Flood risk | Mitigate the risk of flooding (and design for flood resilience). |
| Materials and equipment | Reduce the embodied lifetime environmental impacts by selecting on the basis of environmental preference. |
| Pollution | Reduce unavoidable building related emissions and the risk of accidental pollution. |
| Ecology and biodiversity | Enhance the ecology and biodiversity of the site by protecting existing assets and by introducing new habitats and/or species. |
| Health and wellbeing | Provide a safer, more accessible, healthy and comfortable environment. |
| Social issues | Reduce crime and adverse effects on neighbours throughout the lifetime of the development through design and good practice in construction and operation. |

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# LEED and BREEAM

- Provides a chapter on LEED guidance for HVAC engineers
- BREEAM not a separate chapter in CIBSE - referenced wherever relevant

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# GreenGuide targets

- Achieve a level of energy use at least 50% lower than the DOE-compiled average levels for the same building type and region, both projected an in actual operation;
- Provide at least 15% of the building's annual energy use (in operation) from renewable sources
- Achieve per capita water usage 40% lower than the documented average for building type and region
- Recycle products and post-occupancy evaluation
- (NOTE: Still deals in energy rather than $CO_2$)

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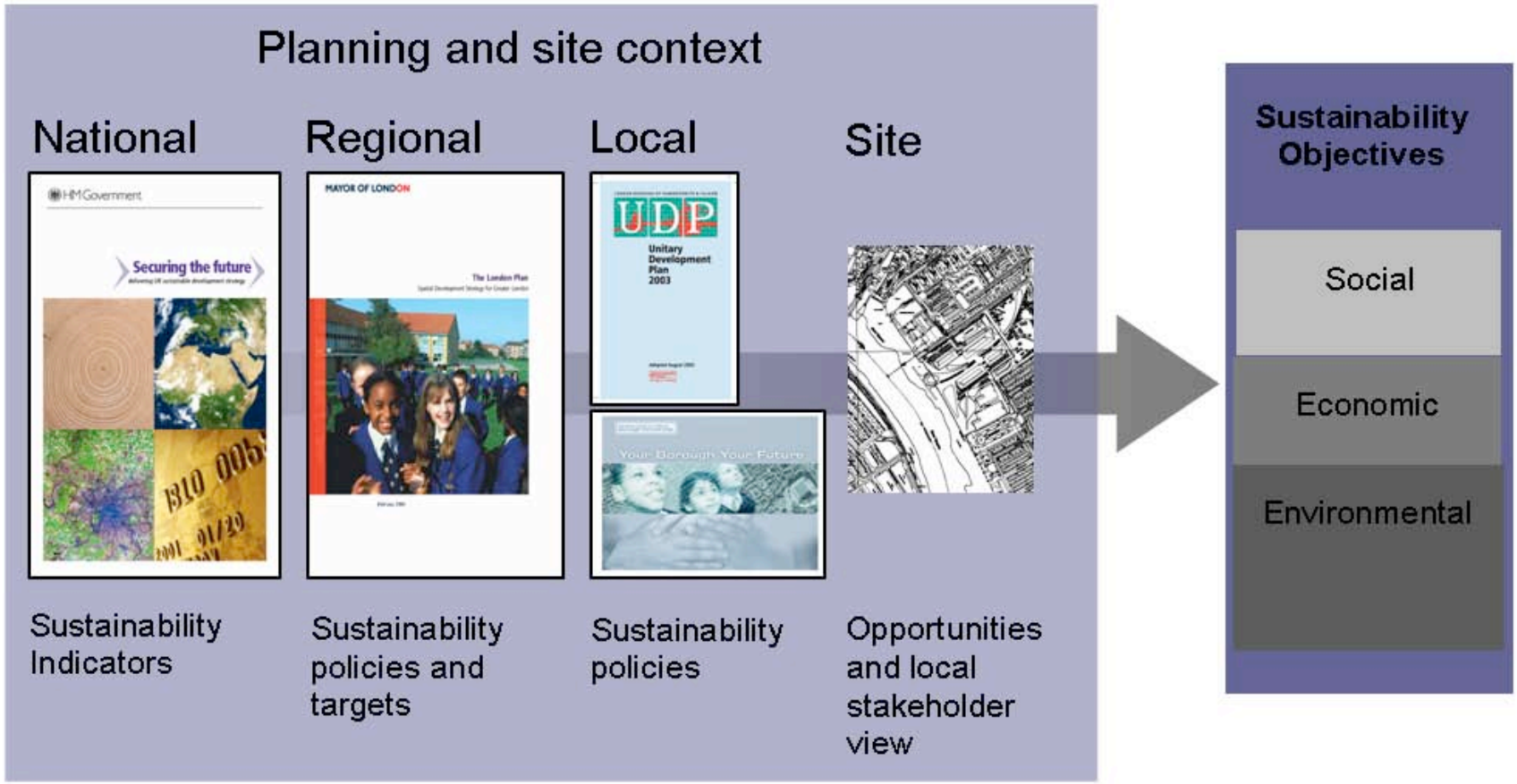
# Setting targets



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# Conceptual building modelling

- GreenGuide advocates the use of ‘conceptual building modelling, and options appraisal

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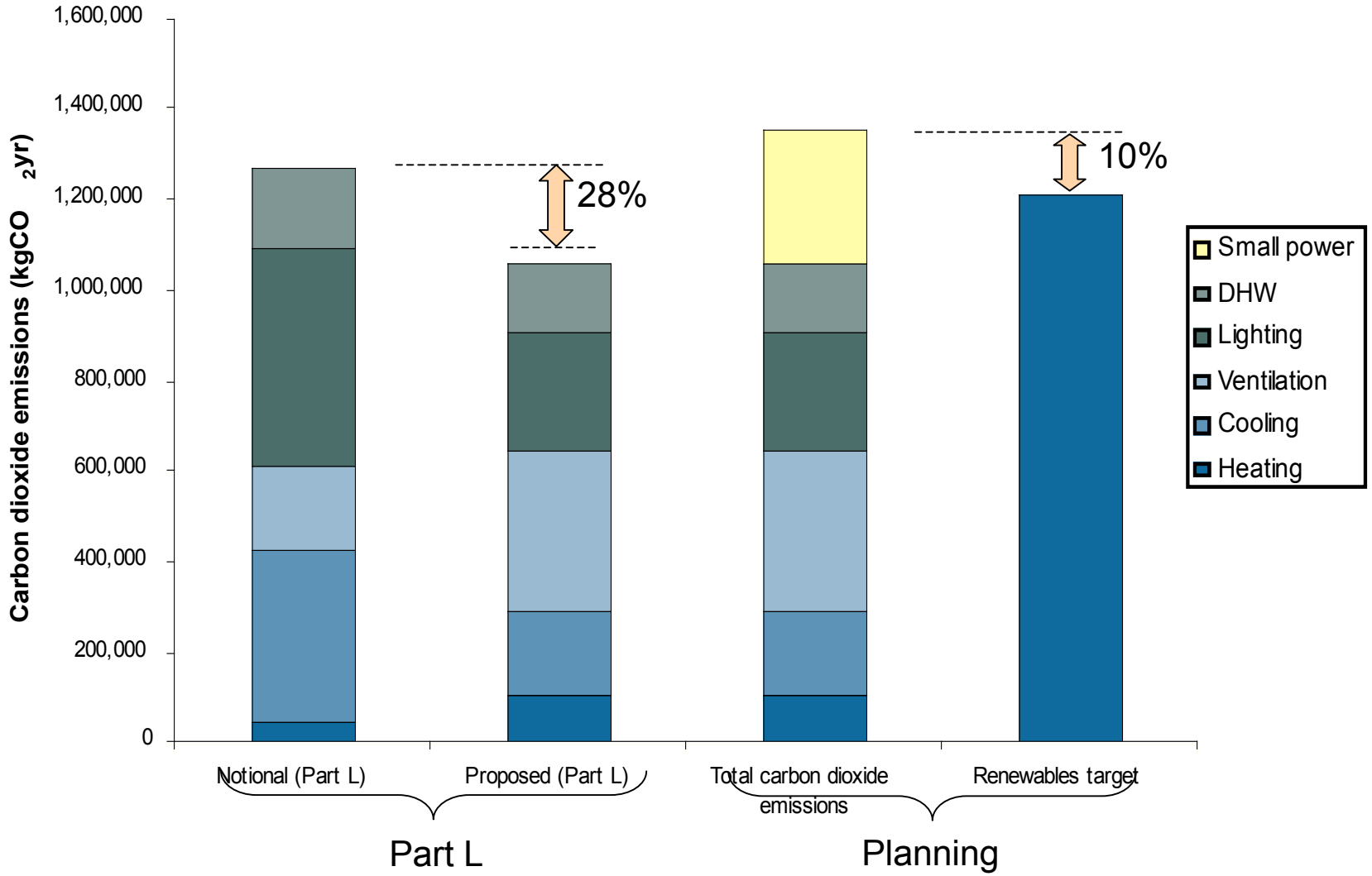
# Energy strategy



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# Shiny new toys

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# Shiny new toys

- reduce demand
- meet end use demand efficiently
- supply from low carbon sources
- supply from renewable sources
- enable energy management.

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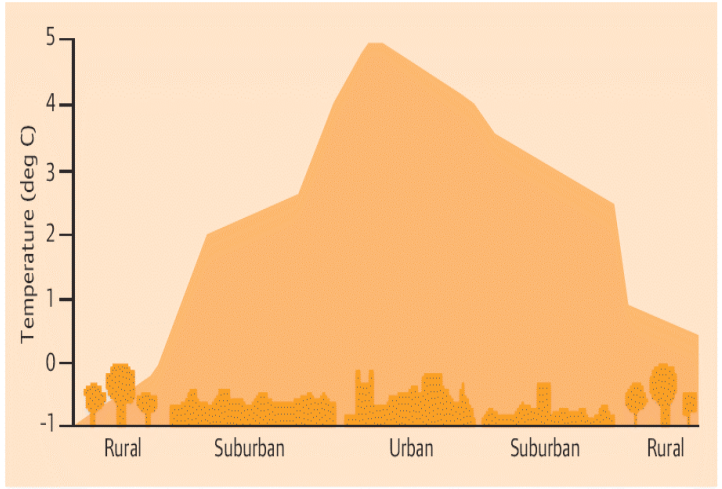
# Adapting to climate change

- GreenGuide proposes night pre-cooling as a strategy
- Guide L shows Urban Heat Island effect problems in cities
- Central London 5–6 °C warmer than rural areas.
- Difficult to dissipate heat at night




Derived from Microclimates, Met Office, www.metoffice.com/education/secondary/students/microclimates.html

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# Living roofs

- Vegetation absorbs less heat that bare roofs
- Transpiration of water provides cooling and humidifying effect
- Helps heat island and reduces amount of cooling required
- Can be used with PV
- (See CIBSE Green Roofs KS)

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# Adapting to climate change

Predicted impacts of climate change include:

- general increases in temperatures, including milder winters and rising summer temperatures
- enhanced urban heat island
- wetter winters, more intense rainfall
- dryer summers
- higher daily mean winter wind speeds

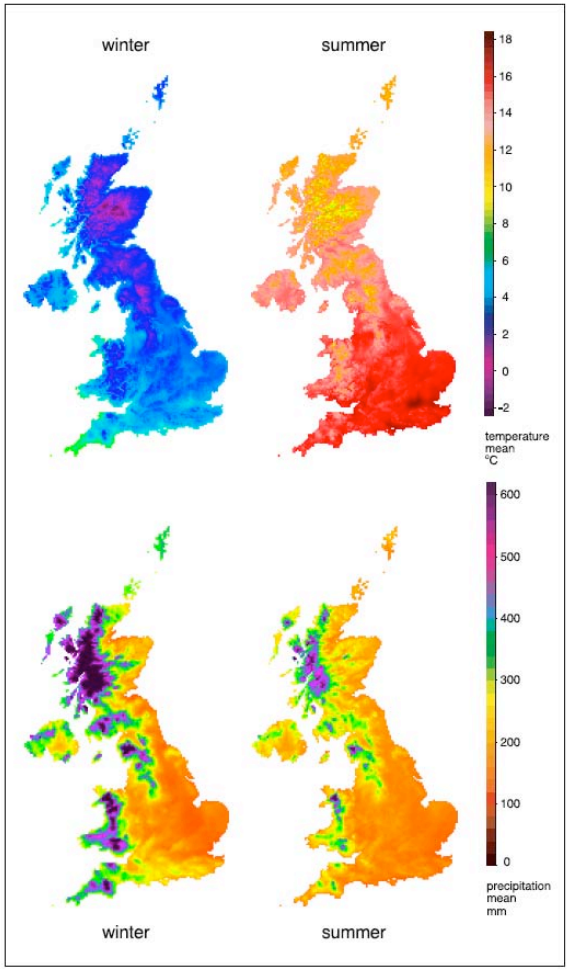


*Figure 18: Average observed 1961-1990 winter and summer temperature (°C, top) and precipitation (mm, bottom) in the UK. Data on a 5 km grid.*

Climate Change Scenarios for the UK, UKCIP02 (2002)

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# Urban heat island effect

- In central London the urban heat island effect can currently lead to temperature 5–6 °C warmer than temperatures in rural areas outside London.
- Difficult to dissipate heat at night

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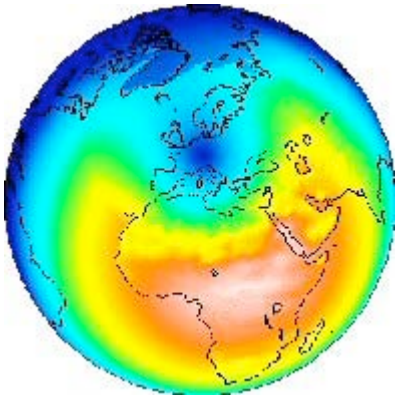
# Pollution - Refrigerants

**Table 25** Examples of refrigerant ODP and GWP[108]

| Refrigerant | Ozone depletion potential | Global warming potential |
|---|---|---|
| R22 | 0.06 | 1700 |
| R134a | 0 | 1300 |
| R407c | 0 | 1610 |
| R410a | 0 | 1900 |
| R717 (ammonia) | 0 | 0 |
| R290 (propane) | 0 | 3 |
| R600a (isobutane) | 0 | 3 |
| R290/R170 (Care 50) | 0 | 3 |



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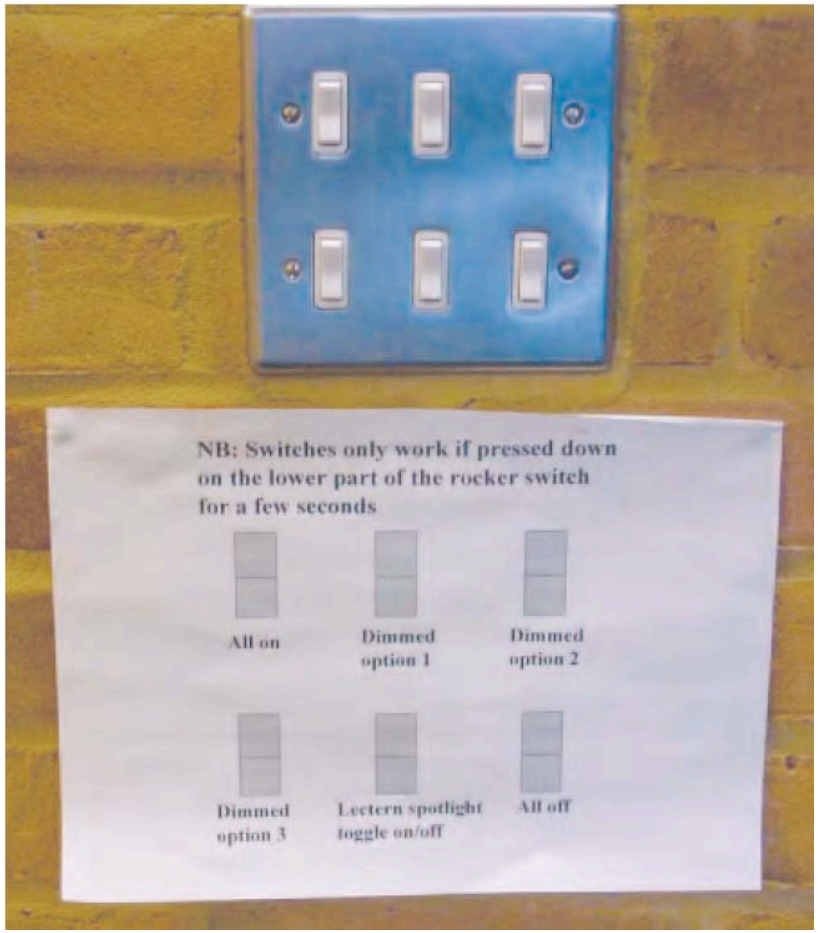
# User controls





BORDASS W., LEAMAN A and BUNN R, Controls for End Users: a guide for good design and implementation, Building Controls Industry Association (BCIA), March 2007, ISBN 0 86022 622

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# Fees

- Less kit = lower fees!
- GreenGuide: reducing loads should be a valuable service
- 7% of fee for conceptual design – is it enough?

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# Cost of being green?

- GreenGuide argues that it is cost neutral
- Productivity and operating costs should be off-set

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# Lessons learnt

Differences:

- Commissioning considered at start
- Adapting to climate change
- Load reduction or shiny toys?
- Wide topic: ‘sustainability’ – should we focus more?
- All greenhouse gases matter
- $CO_2$ emissions important

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# Lessons learnt

## Similarities:

- Increase role of engineers
- Early involvement (load reduction etc.)
- Similar definition of sustainability
- Advocate / champion for sustainability
- Set targets at the start of the project