ZERO CARBON

Technical seminar

AGENDA

- Introduction & context
- On-site & off-site carbon reduction
- Energy masterplans & heat networks
- Managing heat risk
- Whole life-cycle carbon emissions

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1. EVIDENCE & LEGISLATION

Climate Change Act:

minimum 80% reduction in carbon emissions

GLA Act:

Mayor has a legal responsibility to address climate change

Paris Agreement

&

need for deep and urgent cuts to CO2 (e.g. IPPC & CCC)

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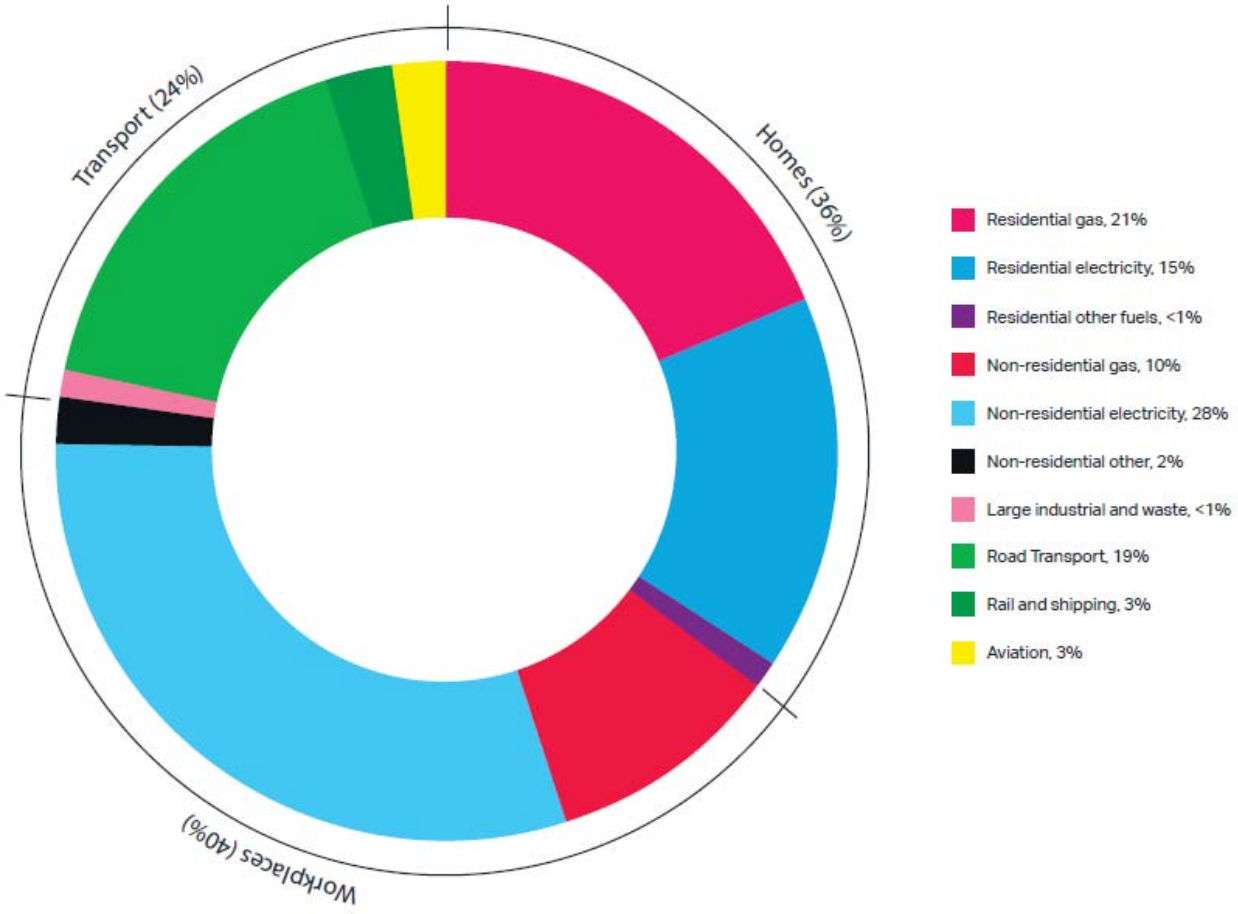
1. EMISSIONS



2015 emissions by sector

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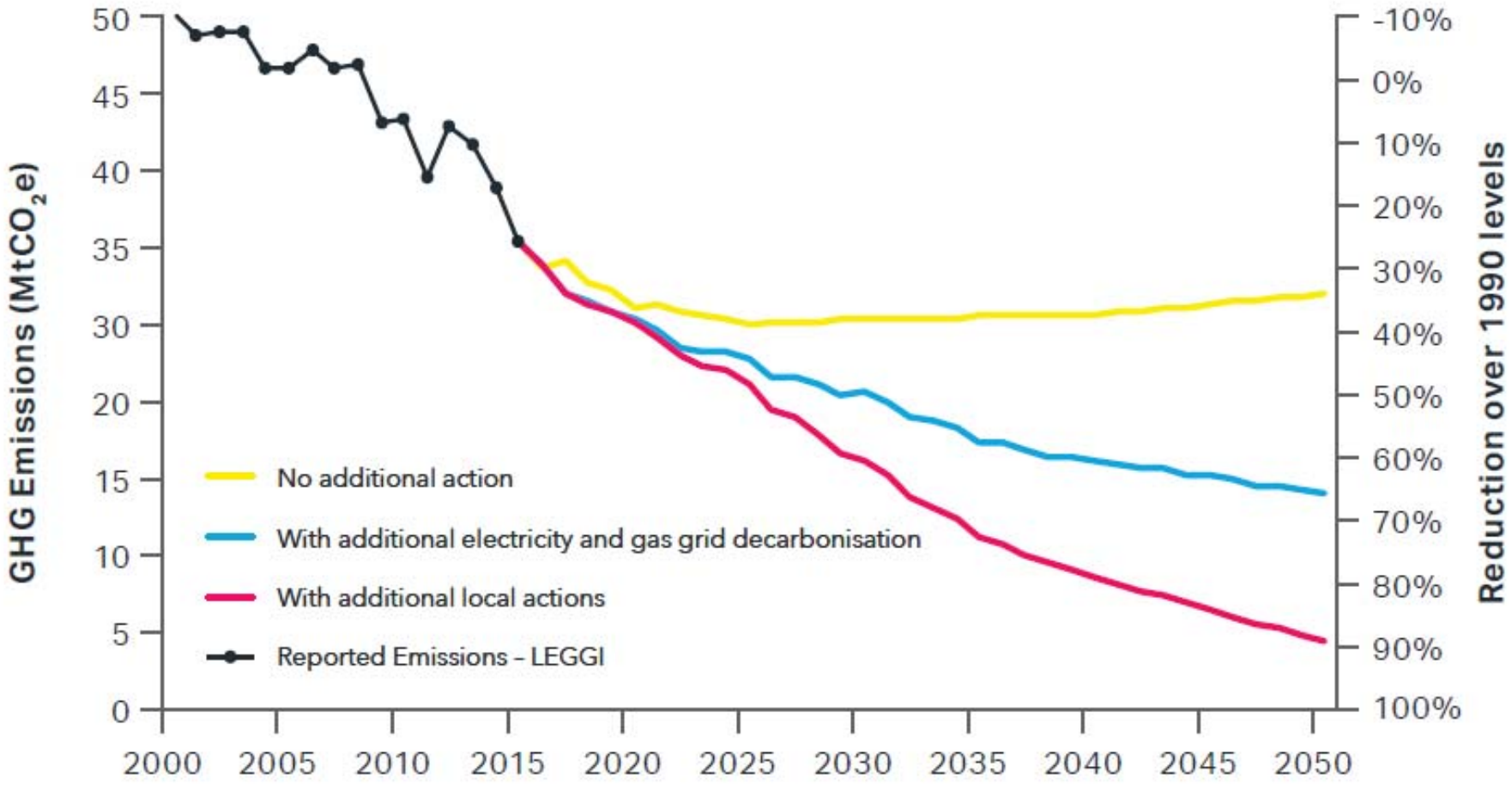
1. LONDON ENVIRONMENT STRATEGY



Zero carbon city by 2050 - trajectory

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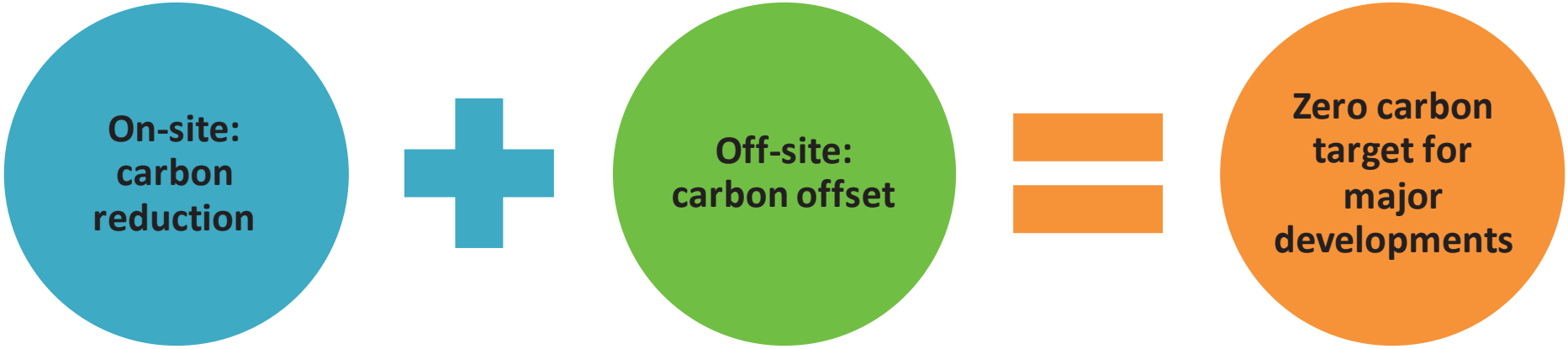
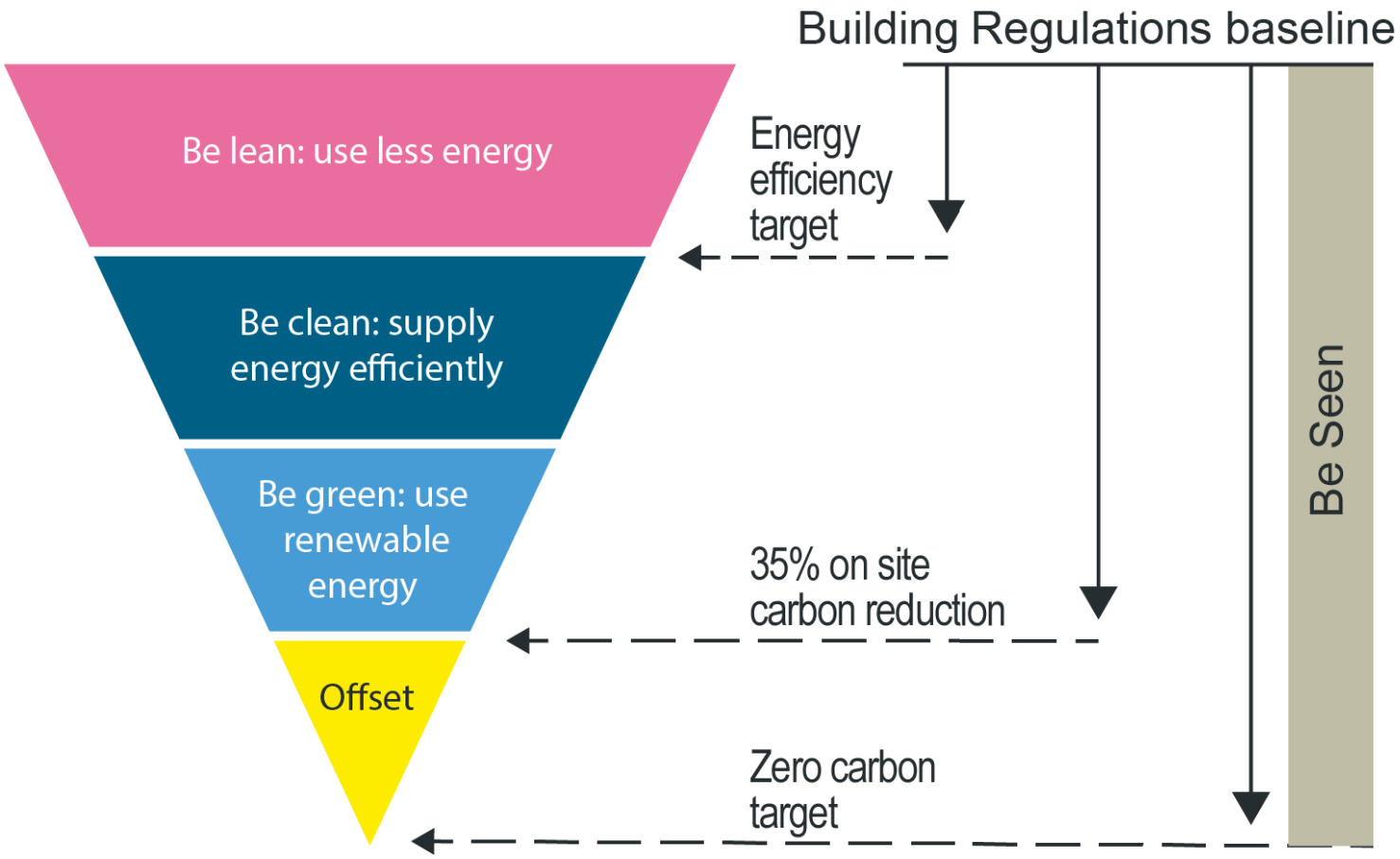
1. ZERO CARBON TARGET



1. ENERGY HIERARCHY



Source: Greater London Authority

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1. BUILDING REGS & DEFINITIONS

Target emissions rate (TER)
Minimum energy performance requirement for new dwelling/ building expressed in terms of kgCO2 per m2 of floor area per year.

Unregulated emissions
Not captured by building regs, emissions from other parts of development e.g. electrical appliances.

Regulated emissions
Captured by Building Regs, associated with energy consumed in the operation of the space e.g. heating/cooling, hot-water & internal lighting.

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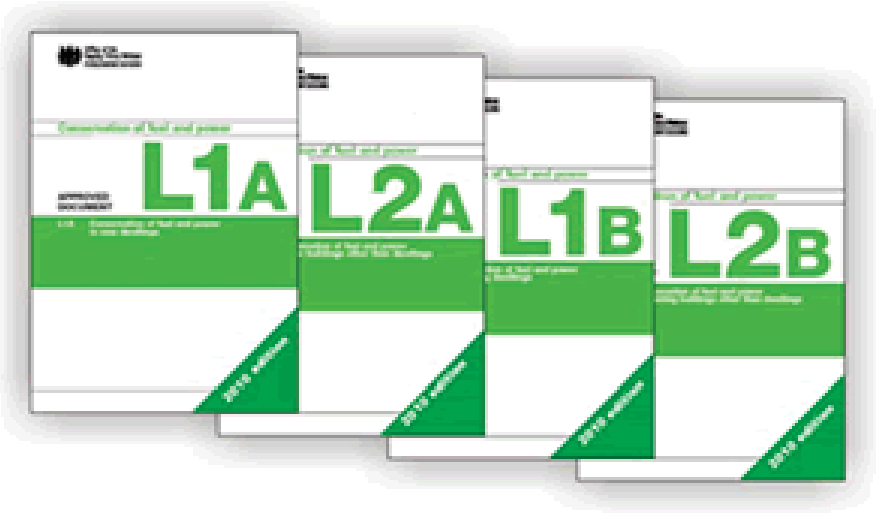
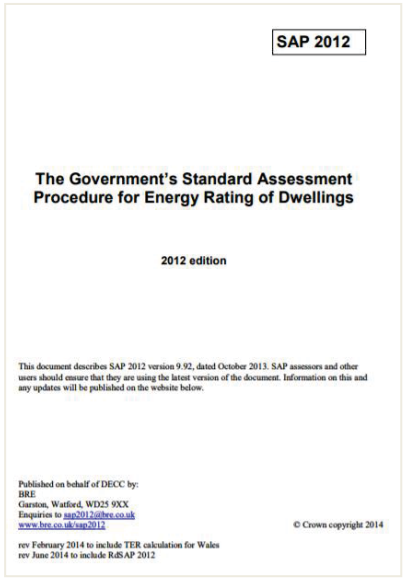
1. BUILDING REGS

- Building Regulations use outdated carbon emission factors which do not reflect the recent decarbonisation of the grid.
- Government's draft carbon emission factors have been consulted on but not yet adopted at a national level are more true to reality.




SAP 2012

The Government's Standard Assessment Procedure for Energy Rating of Dwellings

2012 edition

This document describes SAP 2012 version 9.92, dated October 2013. SAP assessors and other users should ensure that they are using the latest version of the document. Information on this and any updates will be published on the website below.

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rev February 2014 to include TER calculation for Wales
rev June 2014 to include RdSAP 2012

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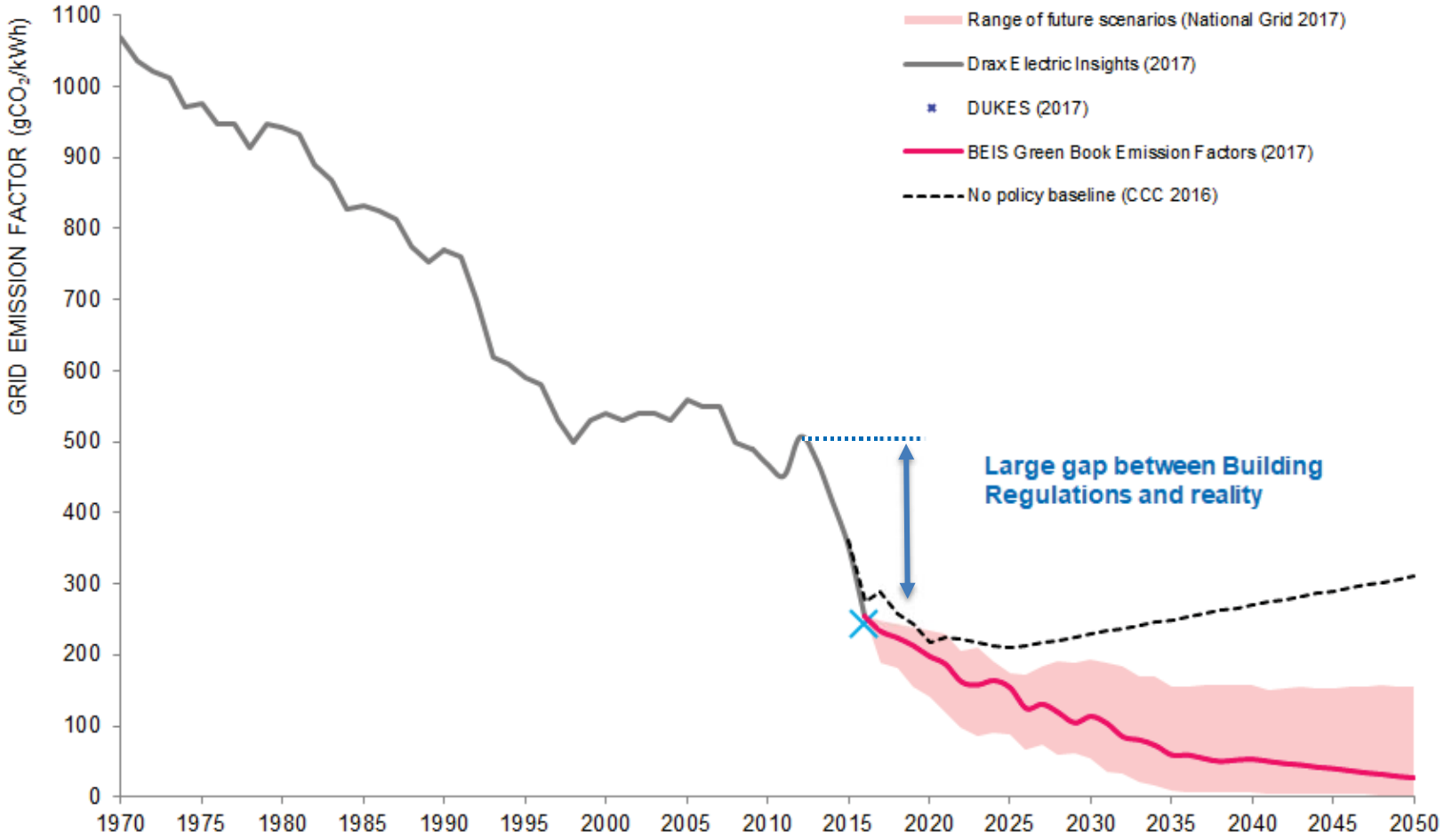
1. BUILDING REGS



Graph illustrating decarbonisation of the grid

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1. BUILDING REGS

- Draft London Plan responds through the heating hierarchy to make sure new buildings are not locked into high-carbon energy systems.
- Technologies that previously performed well with higher grid emission factors (e.g. CHP) will not achieve the same savings in the future. Other technologies (e.g. heat pumps) will show better savings.
- Updated Energy Assessment guidance encourages use of updated carbon factors until Building Regulations are updated.
- On-site carbon reduction target will be reviewed and recalibrated as necessary when Building Regulations are updated.

QUESTIONS

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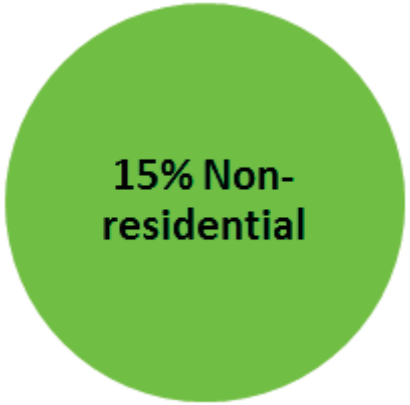
2. ON-SITE CARBON: ENERGY EFFICIENCY

- Efficiency is first step of energy hierarchy and is a cost-effective way to decarbonise buildings as it means using less energy.
- Majority of on-site carbon savings to-date through energy supply rather than efficiency.
- Energy efficiency targets introduced to increase savings at this stage of the hierarchy.



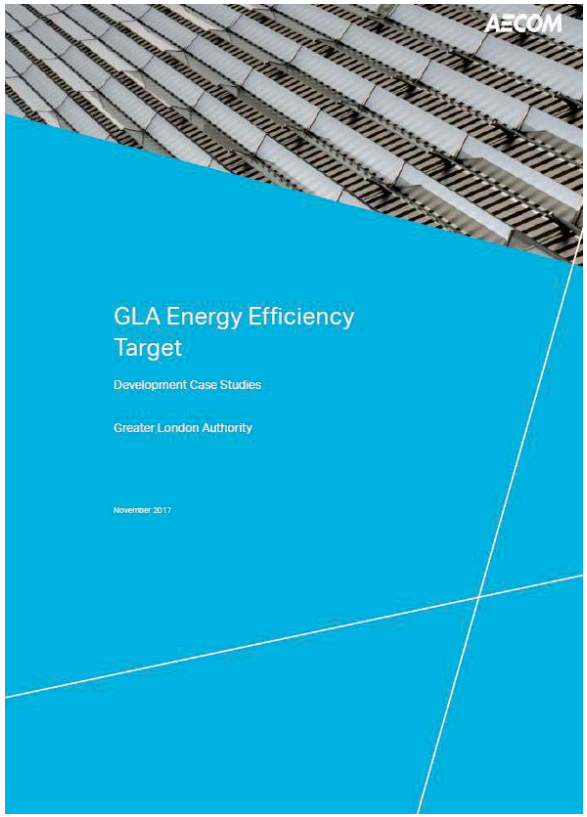
2. ON-SITE CARBON: ENERGY EFFICIENCY

- New energy efficiency targets based on two main evidence base reports
- Supported by recent energy monitoring data

DRIVING ENERGY EFFICIENCY SAVINGS THROUGH THE LONDON PLAN

BUROHAPPOLD ENGINEERING

DATA ANALYSIS REPORT
25/08/17



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Energy Monitoring Report
Monitoring the implementation of London Plan energy policies in 2017

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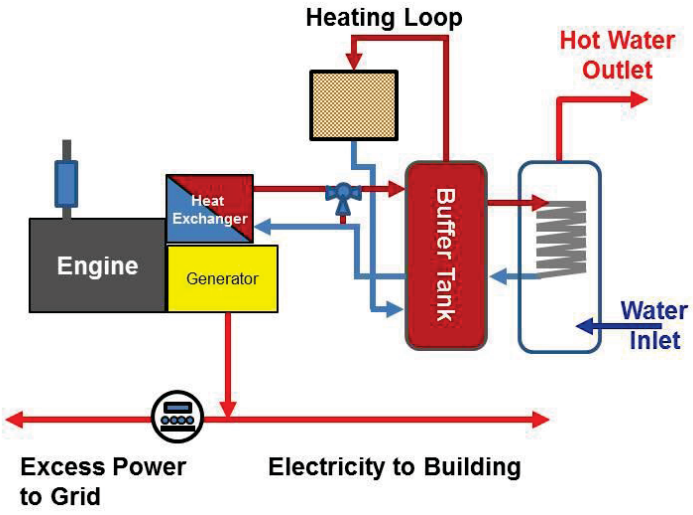
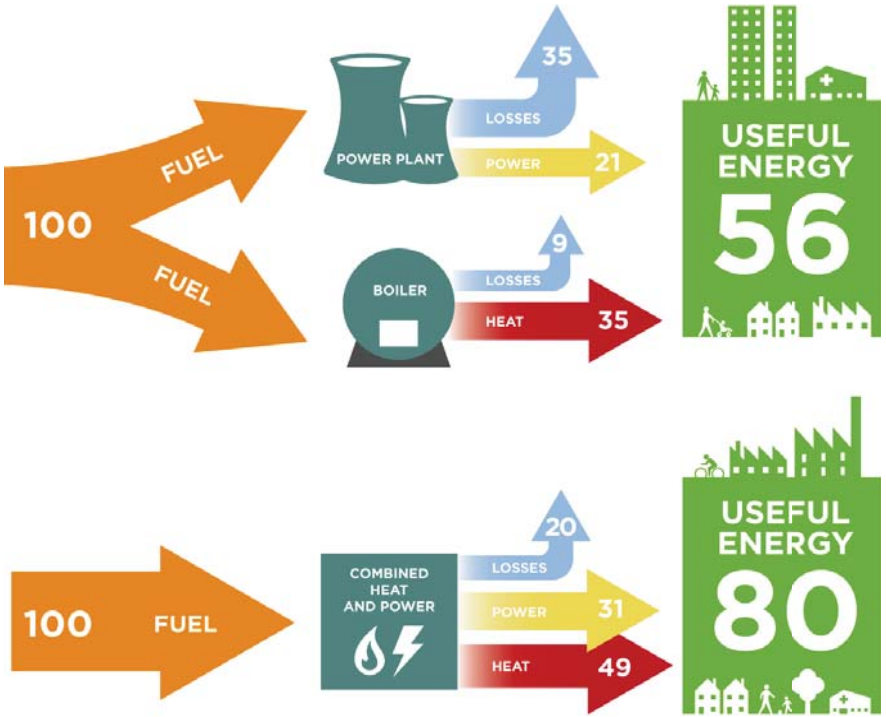
2. ONSITE: CLEAN & GREEN

- After energy efficiency ('lean') measures have been maximised, the next steps of the hierarchy are to use local energy resources and supply energy efficiently ('clean') and use renewable energy ('green').
- Range of different approaches and technologies that can be employed to meet the policy targets.
- As part of meeting the 'Clean and Green' elements of the energy hierarchy of SI2, SI3 sets a new heating hierarchy which prioritises low carbon and renewable sources of heat.

2. COMBINED HEAT AND POWER

- CHP uses fuel (usually gas) to produce electricity and useable heat.
- Greater efficiency compared with traditional ways of generating electricity where the heat produced is wasted.





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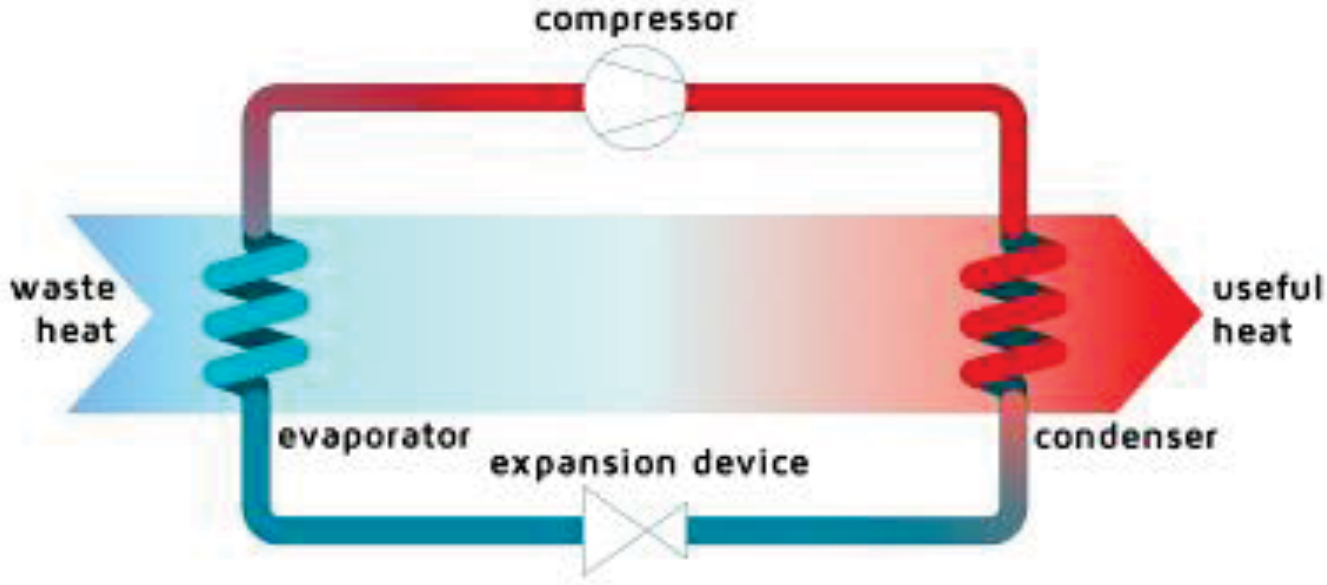
2.HEAT PUMPS

- Heat pumps take low temperature heat (usually a free and renewable source e.g. from the air or ground) and raise this to a useable temperature using electricity. This can be very energy efficient.



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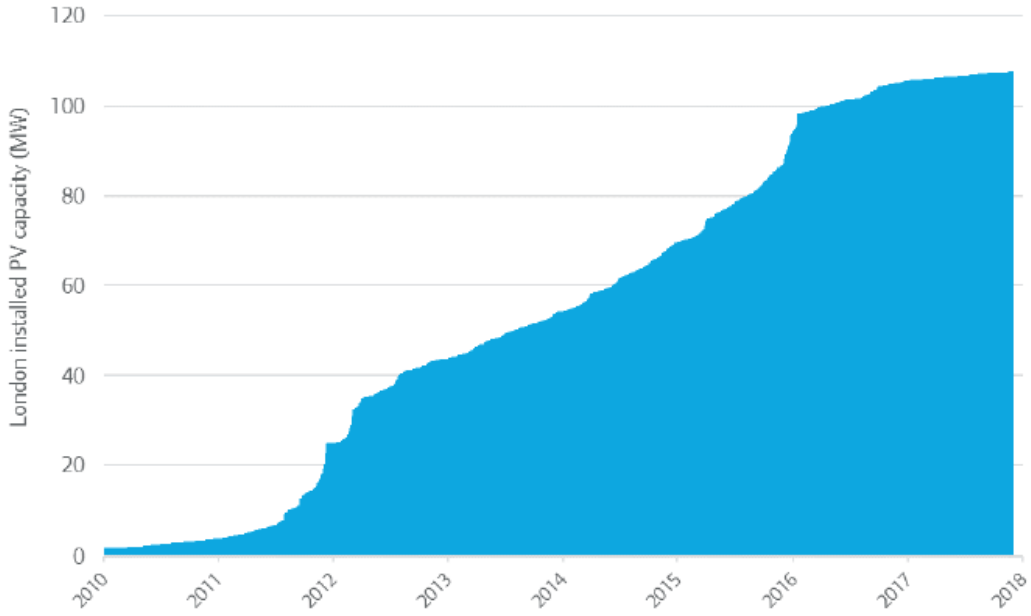
2. SOLAR

- Solar PV and solar thermal contribute to meeting the 'be green' part of the energy hierarchy.
- Can be complimentary to other technologies such as heat pumps and energy storage (e.g. batteries).

Figure 1 - Solar PV installations in London claiming the FiT since introduction in April 2010



Source: Ofgem (2018)

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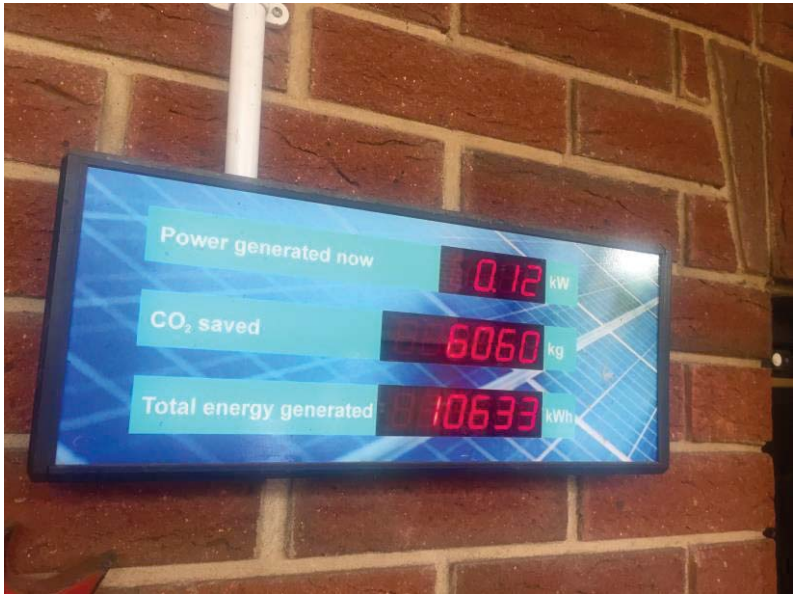
2. BE SEEN

- Gap between the expected performance of a development and its actual performance.
- New monitoring requirement ‘be seen’ is intended to close this, help to improve energy performance, achieve carbon reduction target and lower bills for consumers.
- Builds on monitoring approaches undertaken by some boroughs to create a consistent pan-London approach.
- Part of plan, monitor and manage – to inform future policy.

2. OFFSET

- Where the Zero Carbon target cannot be fully achieved on-site the shortfall is required to be off-set.
- Introduced in 2011 London Plan.
- Since 2016 boroughs required to set up offset funds to collect payments where there is shortfall against meeting the London Plan carbon reduction target.
- Funds ring-fenced for carbon reduction projects within borough.



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2. OFFSET

- AECOM's report into possible carbon offset prices considered both published carbon prices and the cost of undertaking carbon saving projects in London.

- Boroughs can set their own locally-determined price based on the cost of offsetting measures in their borough.

- The GLA have prepared Carbon Offset Funds guidance to assist boroughs in setting up funds and spending the funds on appropriate projects.

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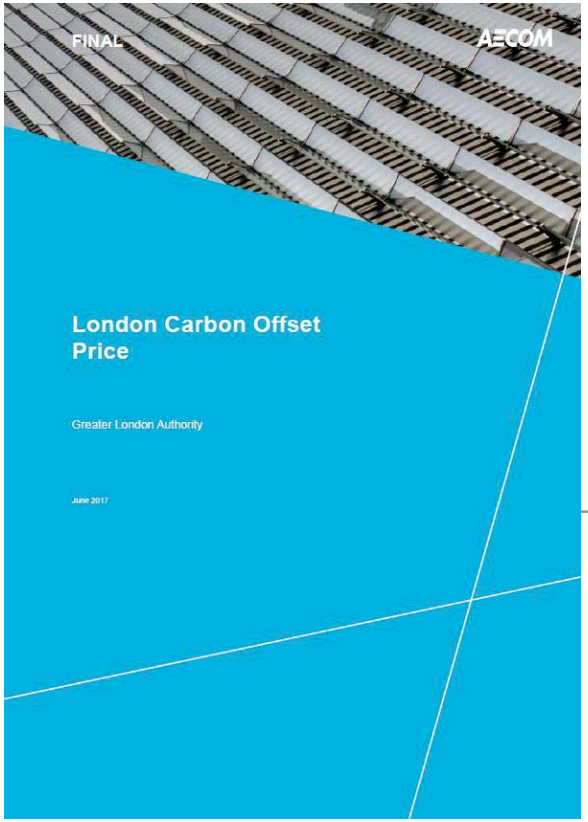
Carbon Offset Funds

Greater London Authority guidance for London's Local Planning Authorities on establishing carbon offset funds

October 2018



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QUESTIONS

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3. ENERGY MASTERPLANS & HEAT NETWORKS

- **Heat** - nearly 50% of London's energy demand and 30% of London's carbon emissions.
- **Heat networks** – support decarbonisation by using low and zero carbon heat sources, such as waste heat.
- **Integrated energy system** - helps ensure efficient use of energy; supports flexibility and resilience; supports increasing levels of renewables in energy mix.

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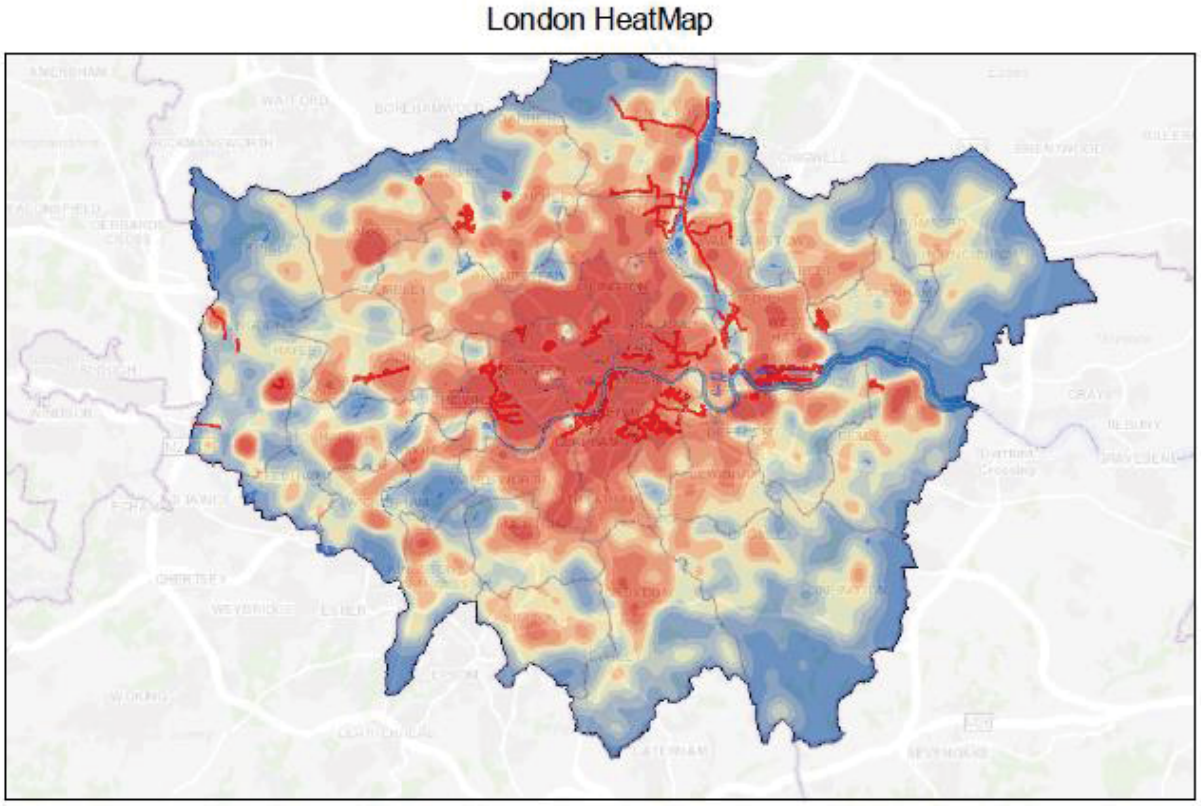
3. ENERGY MASTERPLANS

Energy Masterplans – Build on heat mapping, undertaken at borough or Opportunity Area scale and identifies decentralised energy opportunities, potential heat network routes and supports local plans



- Support provided by GLA for developing energy masterplans, feasibility studies and in developing heat networks projects
- London Heat Map and London Heat Network Manual

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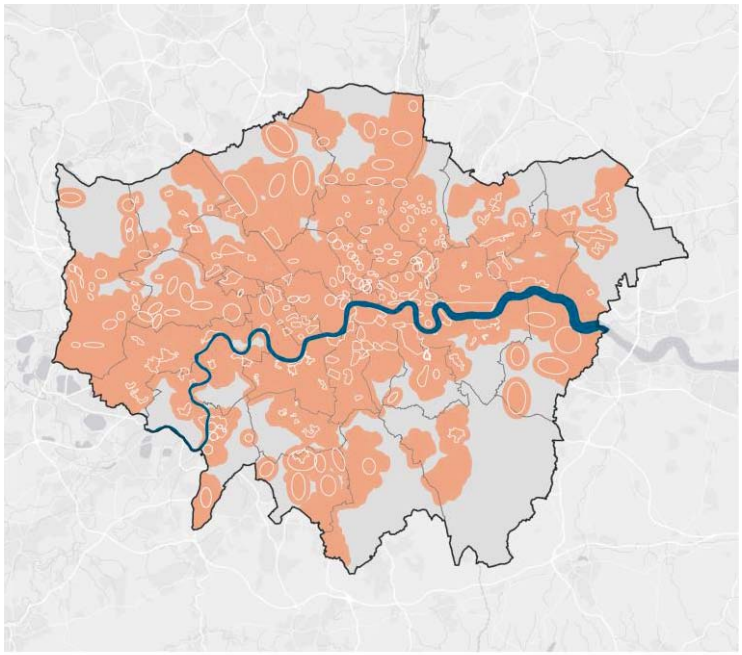
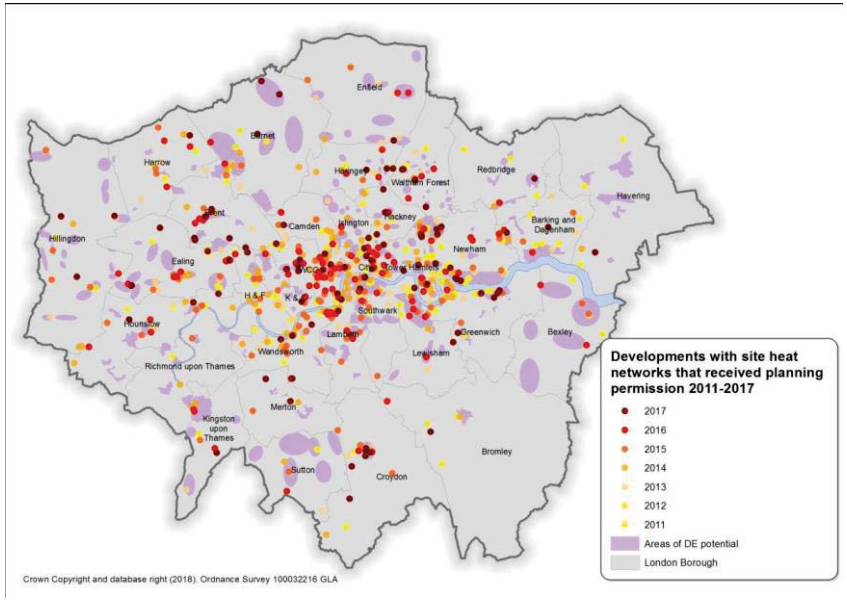
3. HEAT NETWORK PRIORITY AREAS (HNPA)

- HNPAs – dense urban areas with sufficient heat demand to allow heat networks to provide a competitive heat supply solution. Areas identified through London Heat Map and borough's energy masterplans, includes areas of future growth and regeneration





Policy SI3 - Heating hierarchy in HPNAs that prioritises connection to heat networks

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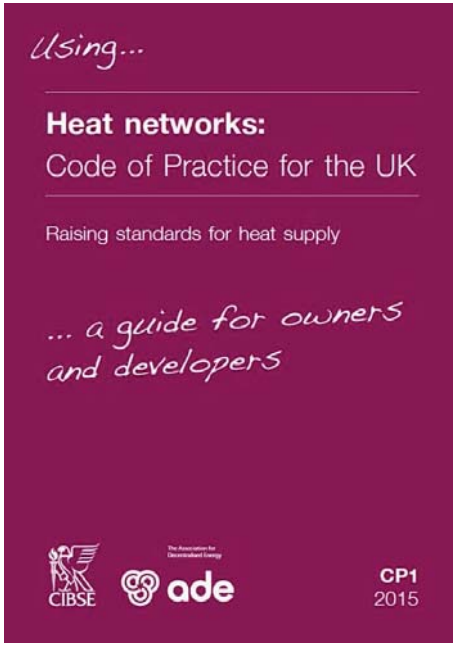
3. HEAT NETWORKS - STANDARDS

The CIBSE CP1 code of practice - sets minimum standards and best practice to help improve the quality of the design, build and operation of heat networks.



HEAT TRUST
HEAT SUPPLY YOU CAN TRUST

Heat Trust standard – provides a common standard of quality and service for heat customers.

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3. CASE STUDY

London Borough of Islington's Bunhill Heat and Power

Phase1

- 1.9 MW CHP plant
- 1.4 miles of heat network
- 850 homes and 2 leisure centres
- Reduction in heating bills
- 1,800 tonnes CO_2/year
- Approx. 60% CO_2 savings

Phase 2 – Extending heat network & integrating waste heat

- £3.7m CAPEX - £2.7m from Islington Council and £1m from the EU
- Extend heat network and connect at least another 500 homes
- Working with GLA, London Underground and UK Power Networks
- Waste heat from tube ventilation shaft and electricity sub-station
- Integrated into heating network using heat pumps

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QUESTIONS?

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4. MANAGING HEAT RISK

Heat risk is managed by following the cooling hierarchy:

1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green roofs and walls infrastructure
2) minimise internal heat generation through energy efficient design
3) manage the heat within the building through exposed internal thermal mass and high ceilings
4) provide passive ventilation
5) provide mechanical ventilation
6) provide active cooling systems.

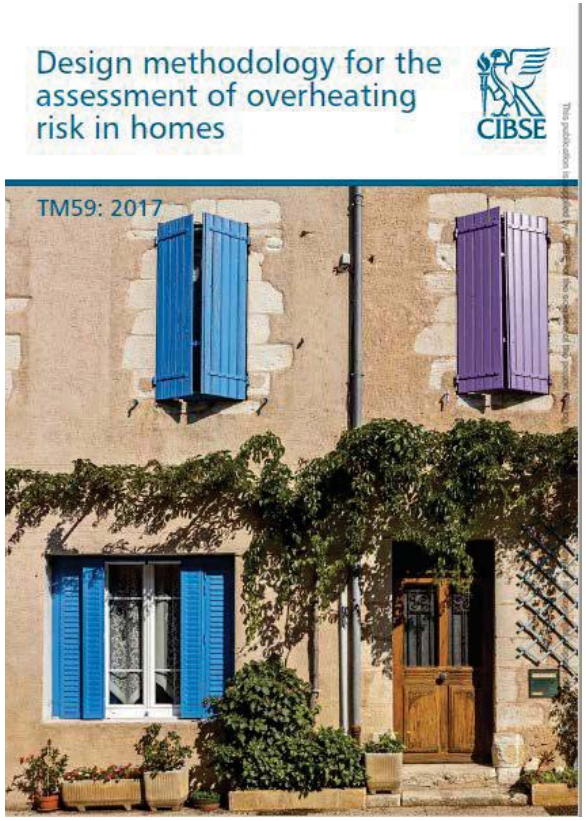
4. MANAGING HEAT RISK

The Chartered Institution of Building Services Engineers (CIBSE) has produced guidance on assessing and mitigating overheating risk in new developments

TM 59 - domestic developments

A methodology for assessing overheating risk in homes

- Based on use of dynamic overheating modelling.
- Highlights designs that are at risk of overheating.
- Provides a baseline for all domestic overheating risk assessments.
- Includes guidance on assumptions for sample sizes, openings, ventilation etc.
- Outlines the assumptions to be used for the internal gains including occupancy profiles.



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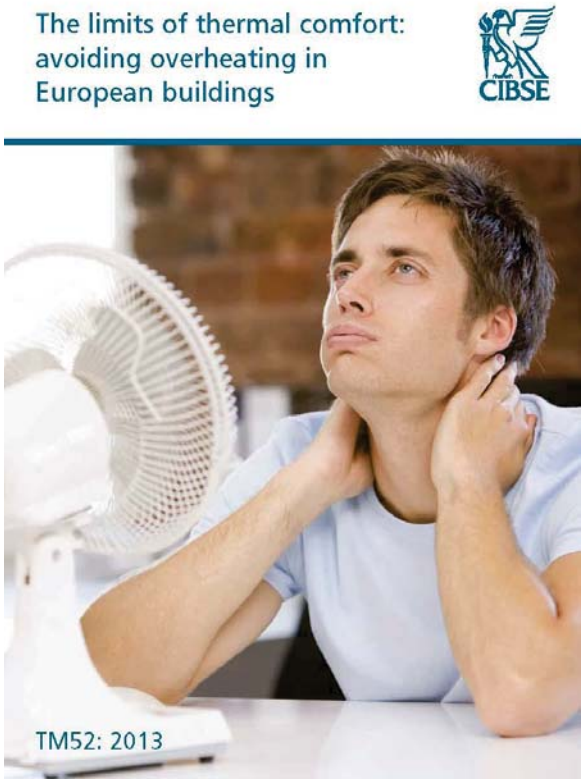
4. MANAGING HEAT RISK

TM 52 - non-domestic developments.

Uses 3 criteria to assess the risk of overheating:

- Number of hours that threshold temperatures are exceed by 1 degree or more.
- Severity of overheating in one day must not exceed daily limit.
- Max daily temp of a room must not exceed 4 degrees above threshold.



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4. MANAGING HEAT RISK

TM 49 guidance and datasets

- Used to ensure that all new development is designed for the climate it will experience over its design life.
- Allows designers to account for urban heat island effect and future climate change.

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5. WHOLE LIFECYCLE CARBON EMISSIONS

A whole lifecycle carbon assessment captures the entire carbon footprint of a development from extraction of materials to their eventual disposal:

Embodied emissions

+

Regulated emissions

+

Unregulated emissions

+

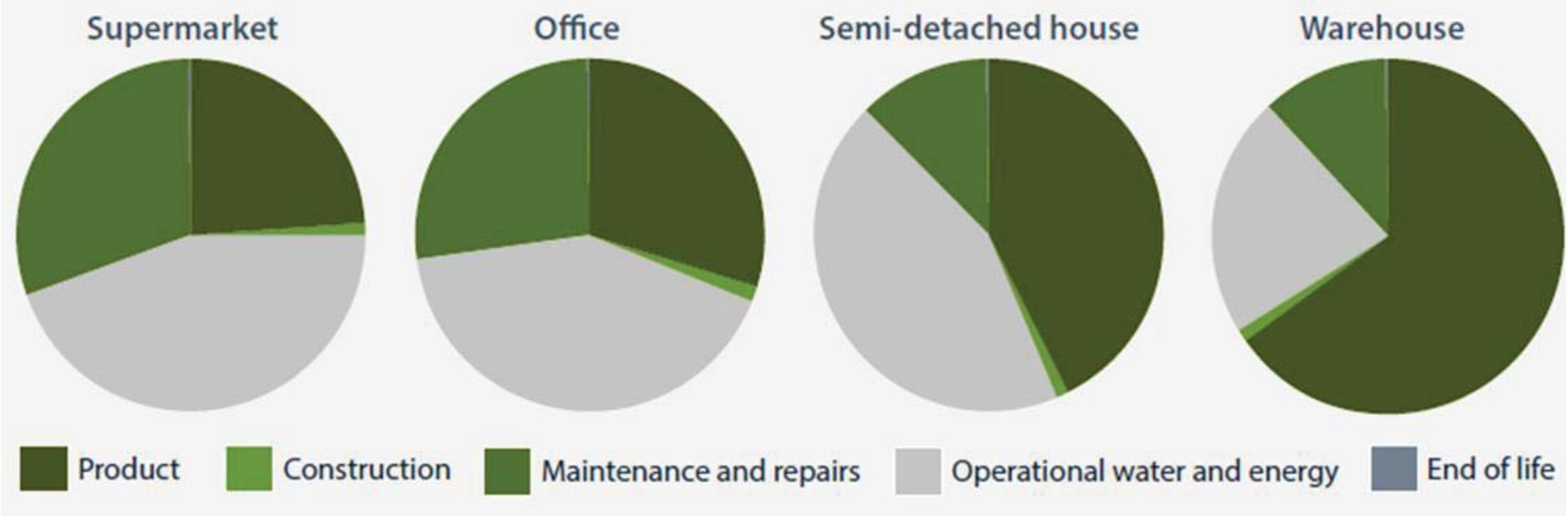
Maintenance and replacement emissions

=

Whole lifecycle emissions

5. WHOLE LIFECYCLE CARBON EMISSIONS

Construction and maintenance can make up over 50 per cent of a building's entire carbon footprint (Leeds University, 2017).



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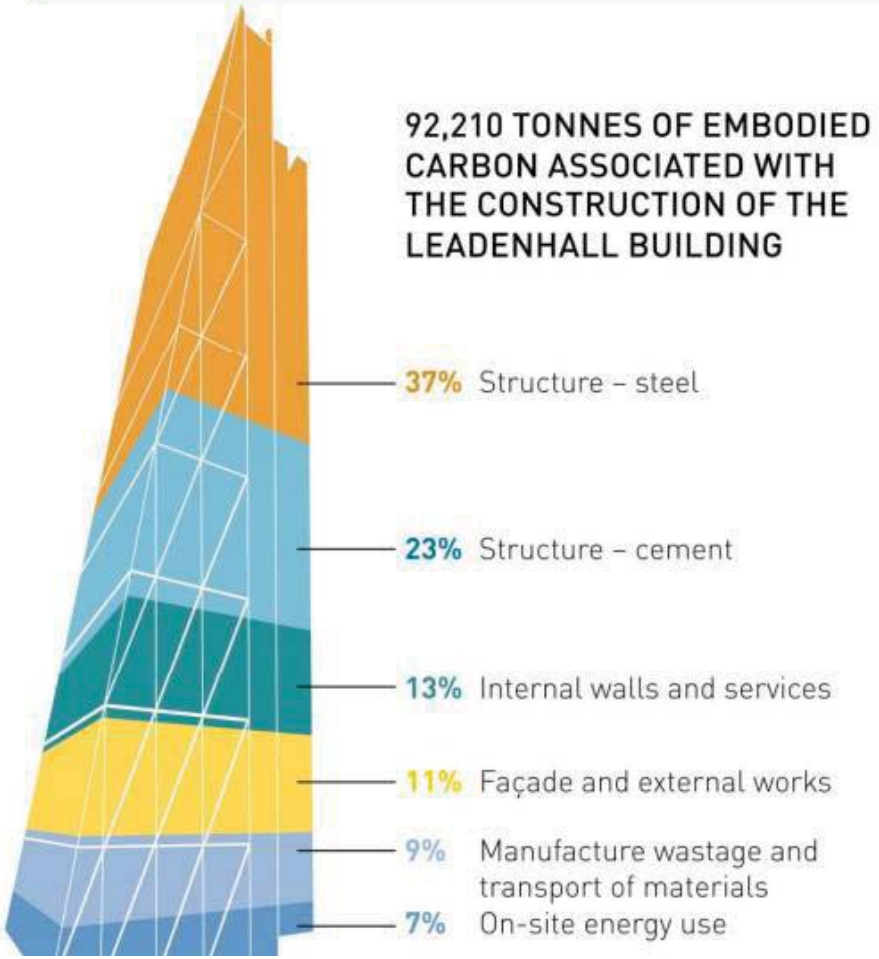
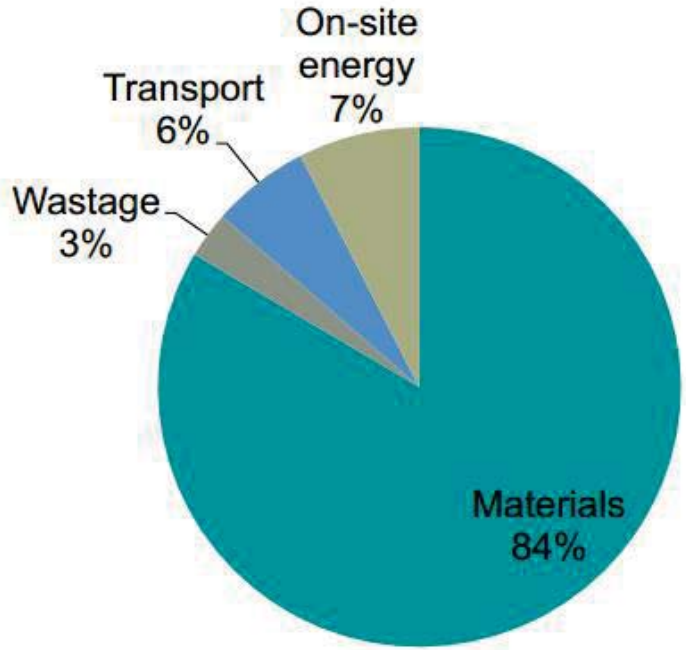
5. WHOLE LIFECYCLE CARBON EMISSIONS

The Leadenhall Building



92,210 TONNES OF EMBODIED CARBON ASSOCIATED WITH THE CONSTRUCTION OF THE LEADENHALL BUILDING

- 37% Structure – steel
- 23% Structure – cement
- 13% Internal walls and services
- 11% Façade and external works
- 9% Manufacture wastage and transport of materials
- 7% On-site energy use



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(UKGBC, 2015)

QUESTIONS

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