

# Introduction to: National Buildings Database & Overheating Risk Maps

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Department for  
Energy Security  
& Net Zero



te projection with no adap

of overheating ⓘ





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# National Buildings Database

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**verco**





# National Buildings Database

Why do we need one?

# UK Building Stock in Context

UK emissions: ~400MtCO<sub>2</sub>e



UK railway infrastructure value: £332bn  
Number of railways companies: **28**



UK water infrastructure value: £90bn  
Number of water companies: **11**



UK energy infrastructure value: £196bn  
Number of energy companies: **37**



UK non-domestic buildings value: **£1.0 trillion (2m premises)**  
Number owners: **1m** (individual: **950k**, landlords: **~50k**)



UK homes value: **£8.7 trillion (30m homes)**  
Number owners: **23m** (private individuals: **21m**, landlords: **~2m**)

# UK Building Stock in Context



UK homes value: **£8.7 trillion** (30m homes)

Number owners: **23m** (private individuals: 21m, landlords: ~2m)



UK non-domestic buildings value: **£1.0 trillion** (2m premises)

Number owners: **1m** (individual: 950k, landlords: ~50k)

**32 million units / value £10 trillion / 24m owners**

**More diverse / more valuable / more owners**

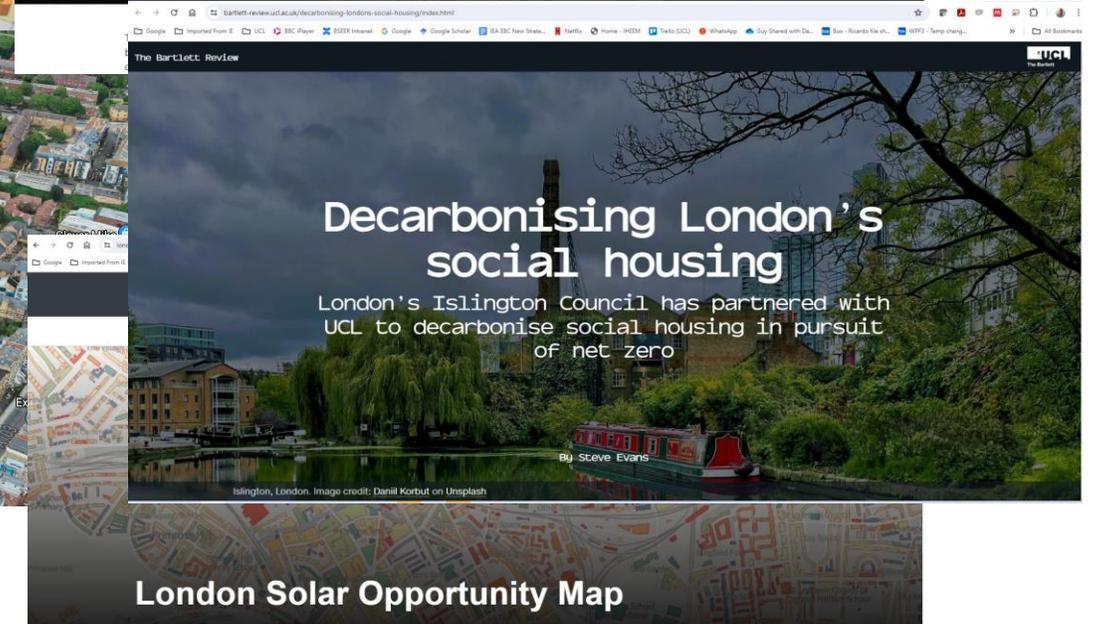
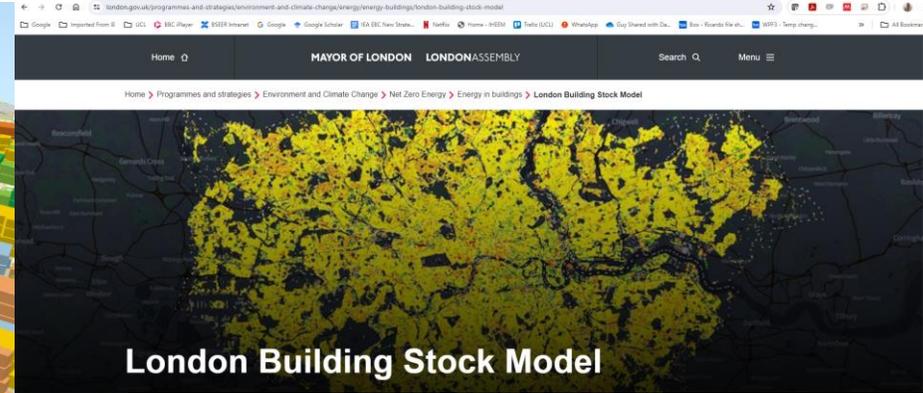
**More in need of a national digital twin!**



# National Buildings Database

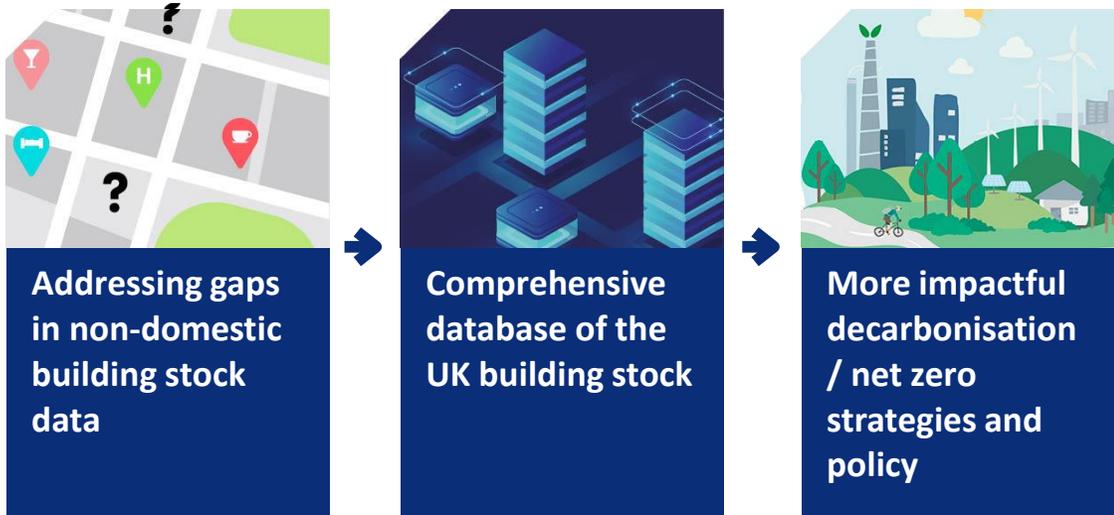
## Composition

# 3DStock: 10 years of underpinning research at UCL



London Solar Opportunity Map

# Project purpose



*Commissioned by:*

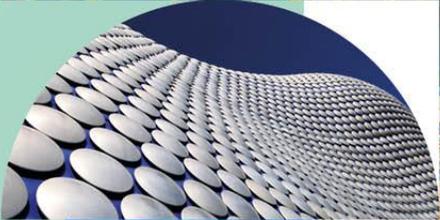


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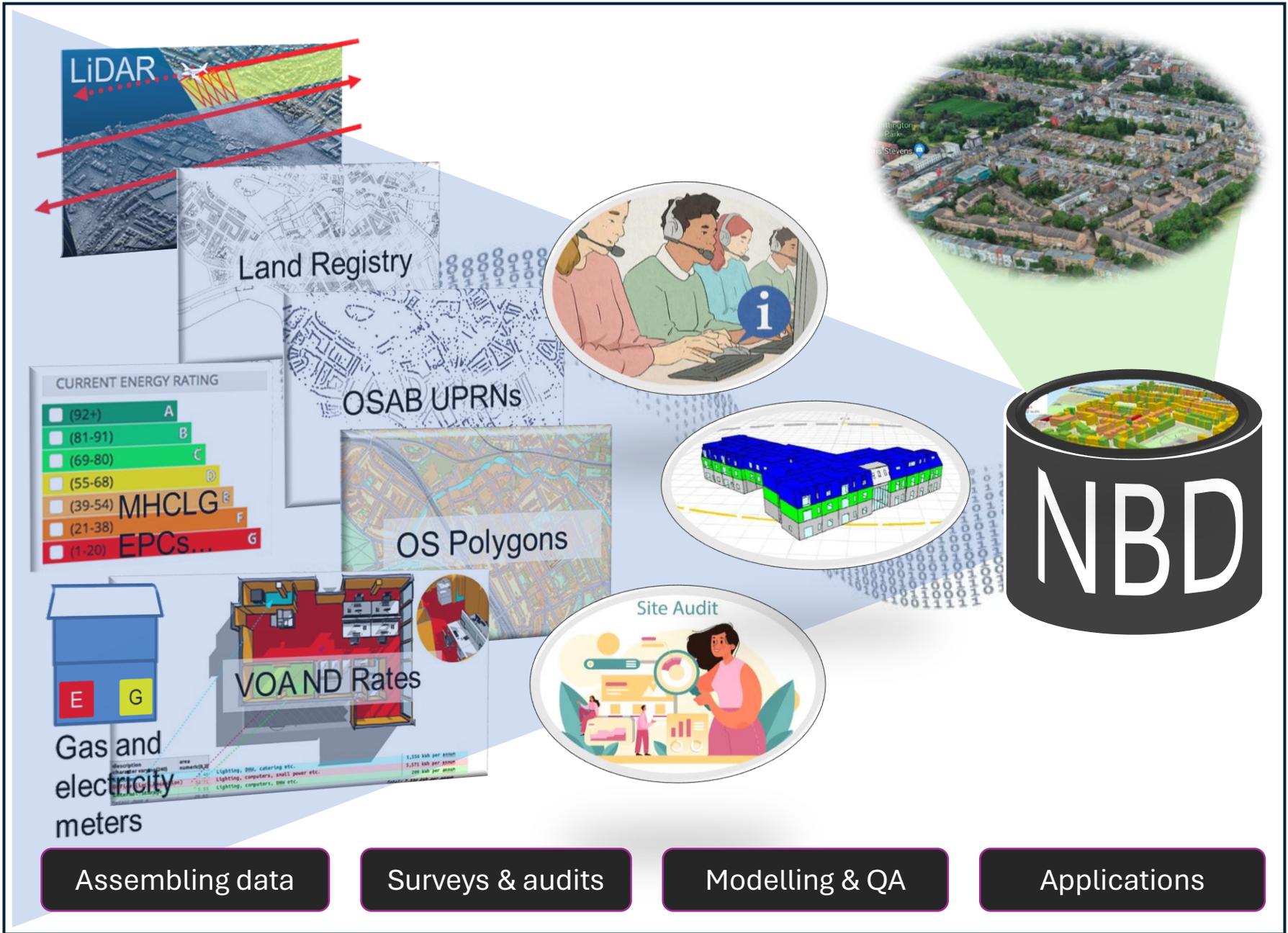
1. Create a record of every building in the Great Britain (England, Wales and Scotland).
2. Characterise key features (e.g. construction, geometry, and categorisation), energy consumption and end uses for every building in the database.
3. Examine the validity of energy performance data and characteristics using targeted surveys and data collection.
4. Develop method for ongoing updates to database, and sampling synthetic shareable datasets from the database.
5. Make outputs that are accessible to other government departments and external researchers.

# Activity Classes of interest

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- Offices
- Shops
- Warehouses
- Factories
- Education
- Emergency
- Health
- Hospitality
- Agriculture
- Arts & Leisure
- Community
- Defence
- Sport
- Transport
- Utilities
- Domestic (*light touch*)





# National Buildings Database

## Phase 1: some findings



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## Non-Domestic Building Stock in England and Wales

Executive Summary

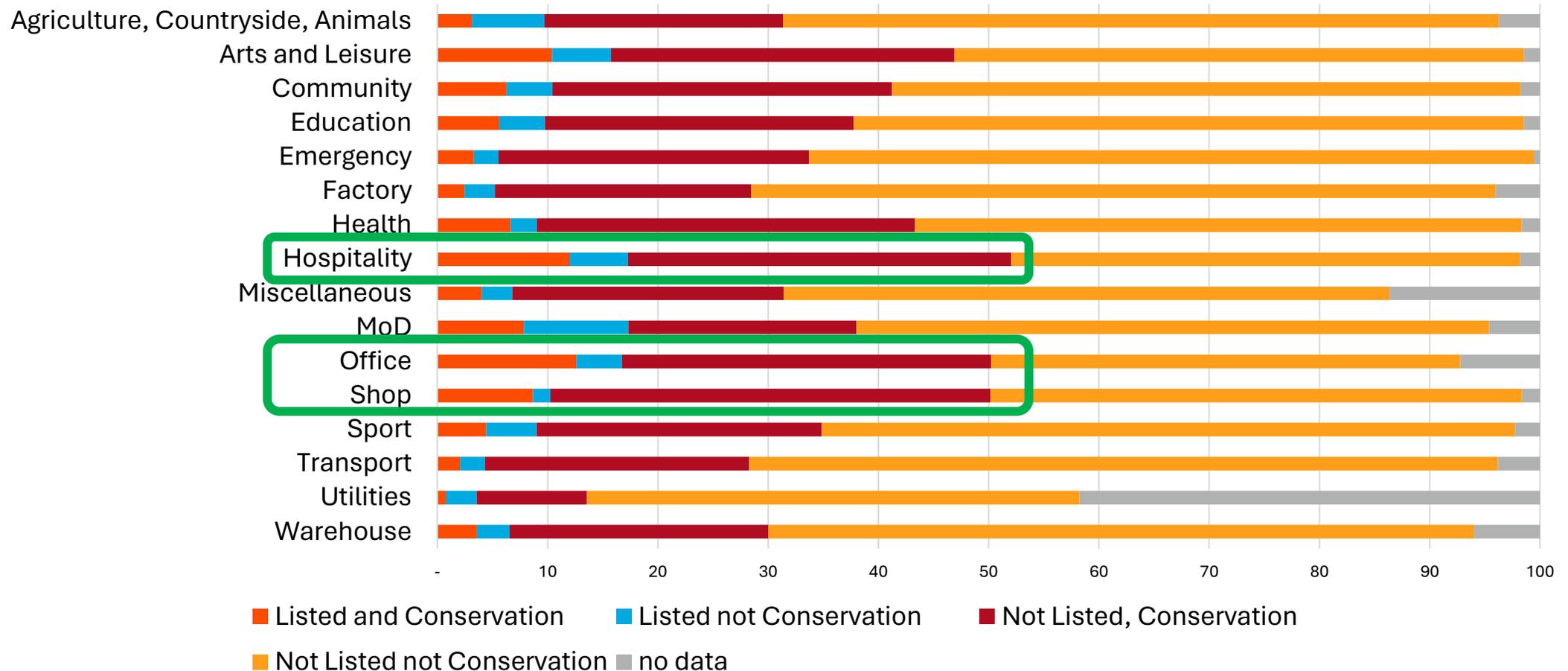
DESNZ research paper series number: 2024/005

March 2023

<https://www.gov.uk/government/publications/national-buildings-database-phase-1-non-domestic-building-stock-in-england-and-wales>

Or search for:  
“DESNZ National Buildings Database  
phase 1”

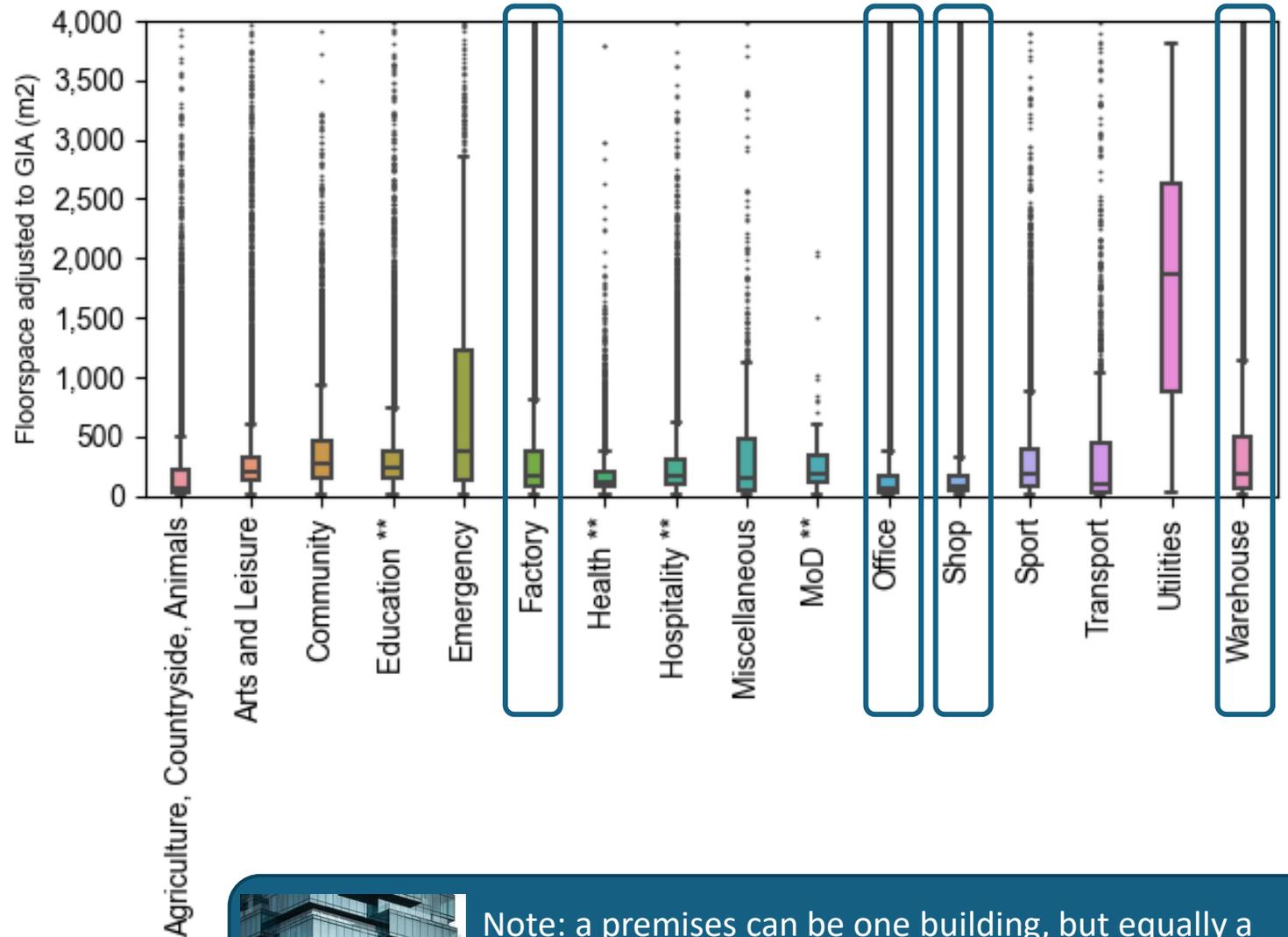
# In office, shop and hospitality activity classes, 50% of premises have a heritage status



Percentage distribution of premises by CaRB3 class, using the Listed building status and Conservation areas, combined to classify the premises, 2020

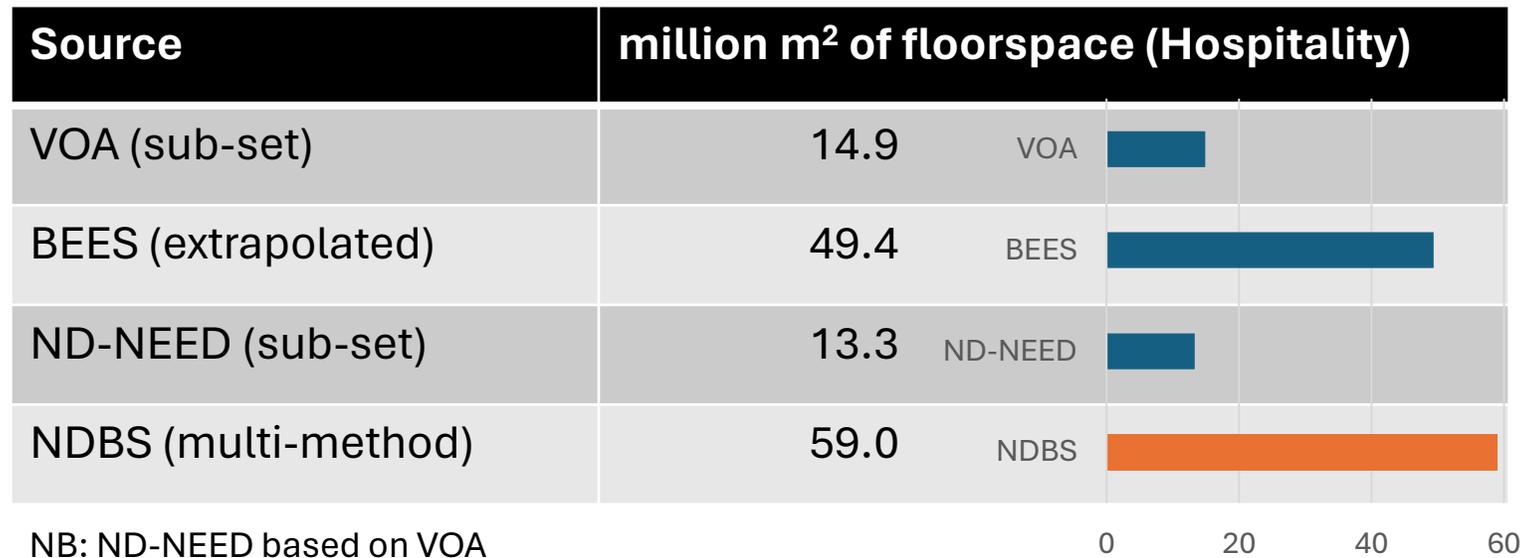
# 94% of premises are smaller than 1000m<sup>2</sup>

However, in the largest classes the largest 10% of premises contain over 60% of area



Note: a premises can be one building, but equally a building can contain several premises, and sometimes a premises can contain several buildings.

# Valuation Office Agency data only includes 25% of floor area for the hospitality sector



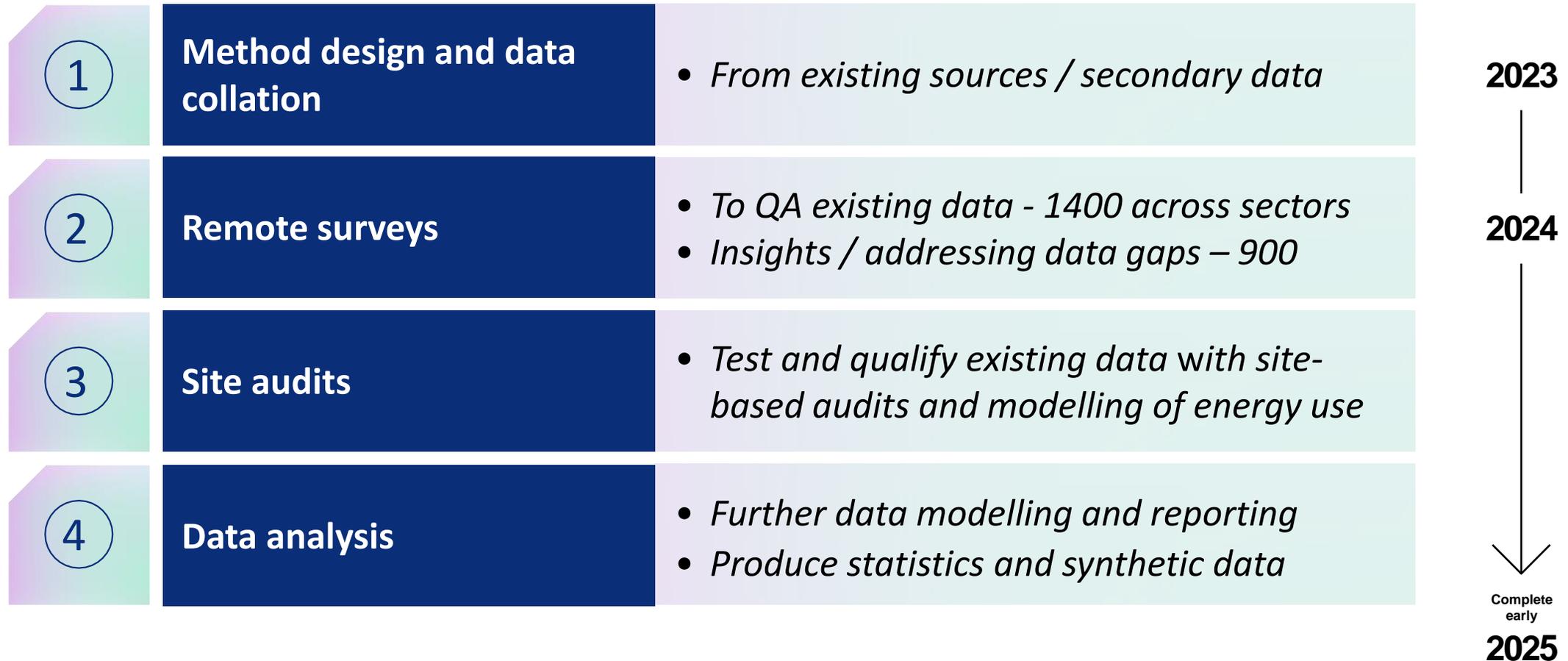
# Non-domestic premises are not typically standalone

- 48% of non-domestic premises share a building with other non-domestic premises
- A further 23% share a building with domestic premises
- From a buildings perspective:
  - 40% of buildings have just one non-domestic premises
  - 9% have more than one non-domestic premises
  - 20% of buildings have a mix of non-domestic and domestic premises



Image from UCL image library

# NBD Phase 2: Programme and Timeline



# Mapping the Risk Future Overheating in Homes (mapped onto 3DStock data)



te projection with no adap

of overheating ⓘ





# CS-NOW Research Programme

Commissioned by **DESNZ**

Climate Services for a Net Zero Resilient World (**CS-NOW**) is a 4-year, £5 million research programme, to inform UK climate policy and help UK meet its global decarbonisation ambitions.

**CS-NOW** aims to enhance the scientific understanding of climate impacts, decarbonisation and climate action, and improve accessibility to the UK's climate data.

Spatially Granular UK Climate Impacts  
for Local Authorities – Data Visualisation  
Tool

Beta prototype

March, 2024



Climate services for a net zero resilient world



Tyndall<sup>o</sup>Centre  
for Climate Change Research



Natural  
Environment  
Research Council





Assessing the future heating and cooling  
needs of the UK housing stock

WPD4 final report

April, 2023

 UK Government



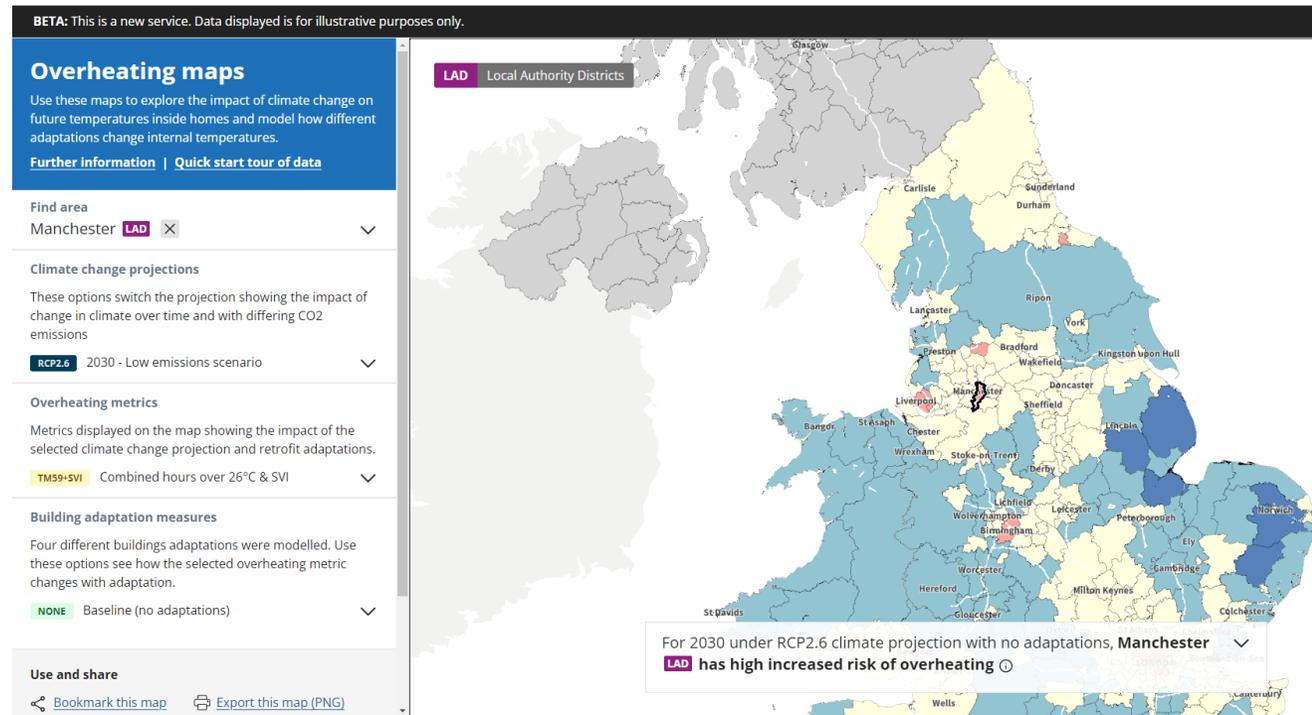
Climate services for a net zero resilient world

Supporting research  
and analysis  
Final report to be  
published soon

# Mapping the Risk Future Overheating in Homes

(Online tool soon to be launched on Defra's Data Services Platform)

- Overheating risk modelled for housing stock in England & Wales
- Mapped onto 3DStock (which underpins the NBD)
- Future overheating risk mapped onto individual homes
- Risks presented at LAD, LSOA and OA levels
- Examine different climate scenarios and adaptation measures



# Search or pan to location

BETA: This is a new service. Data displayed is for illustrative purposes only.

## Overheating maps

Use these maps to explore the impact of climate change on future temperatures inside homes and model how different adaptations change internal temperatures.

[Further information](#) | [Quick start tour of data](#)

### Find area

England and Wales



For example a postcode or local authority

### Climate change projections

These options switch the projection showing the impact of change in climate over time and with differing CO2 emissions

RCP2.6 2030 - Low emissions scenario

### Overheating metrics

Metrics displayed on the map showing the impact of the selected climate change projection and retrofit adaptations.

TM59+SVI Combined hours over 26°C & SVI

TM59+SVI Combined hours over 26°C & SVI

TM59 Hours over 26°C

SVI Social Vulnerability Index

SVI DEC Social Vulnerability Index - Decile

T IN Nighttime indoor temperature

LAD Local Authority Districts

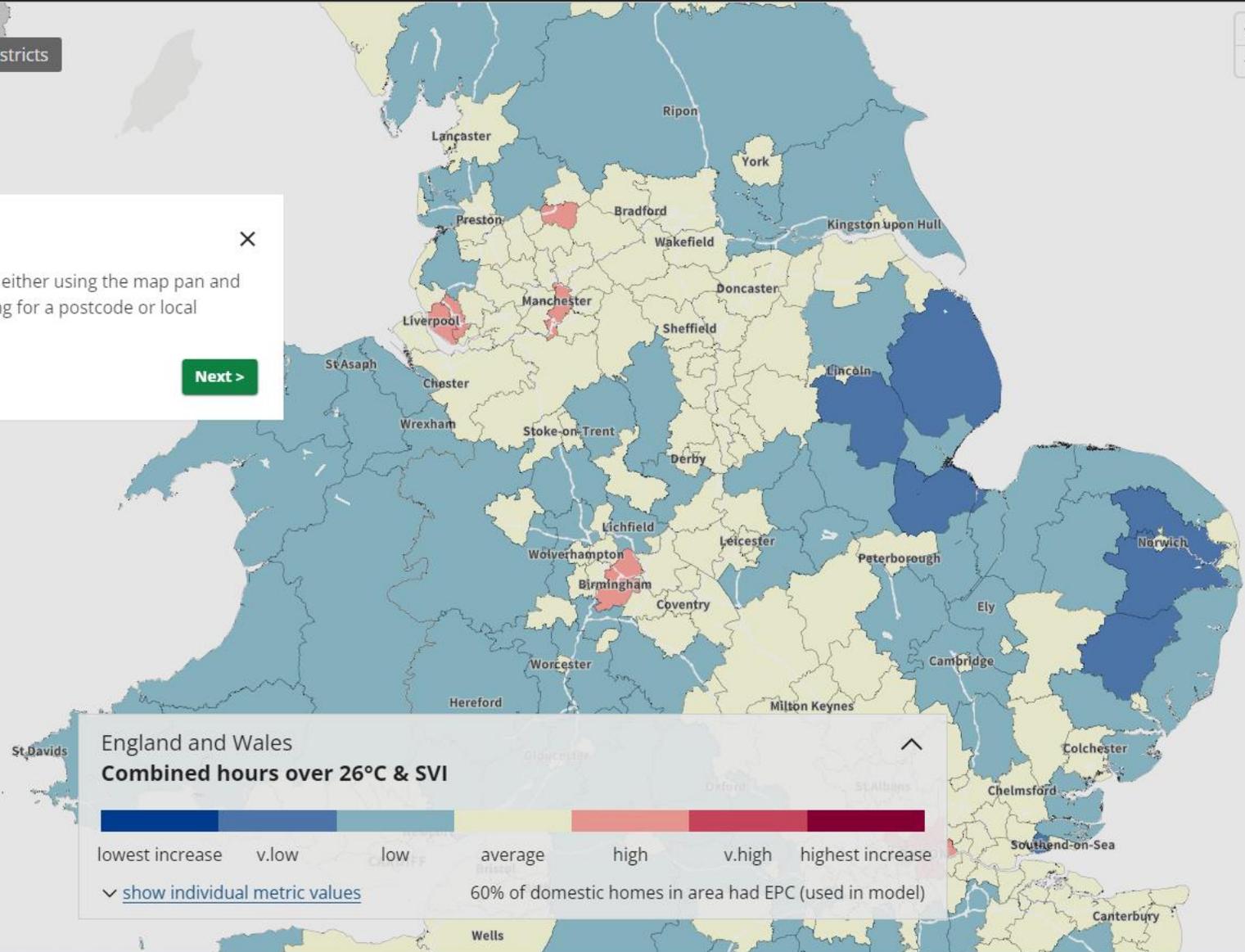
### Find



Locate an area of interest by either using the map pan and zoom features or by searching for a postcode or local authority name

1 of 8

Next >



England and Wales  
Combined hours over 26°C & SVI

lowest increase v.low low average high v.high highest increase

[show individual metric values](#)

60% of domestic homes in area had EPC (used in model)

# Zoom in: LAD > LSOA > OA

## 3 levels of aggregation

As you zoom in to the map different aggregations of data are available, these are shown at the top of the map along with the option to lock the map to an aggregation level.

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Next >

s only.

LAD > LSOA > OA Output Areas

## Find area

E00186136 OA

## Climate change projections

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RCP2.6 2030 - Low emissions scenario

## Overheating metrics

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TM59 Hours over 26°C

SVI Social Vulnerability Index

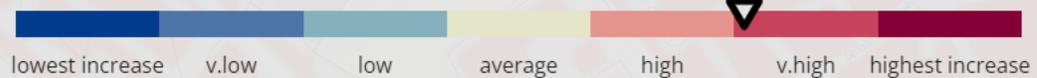
SVI DEC Social Vulnerability Index - Decile

T IN Nighttime indoor temperature

T OUT Nighttime outdoor temperature

For 2030 under RCP2.6 climate projection with no adaptations, E00186136

OA has v.high increased risk of overheating



show individual metric values

60% of domestic homes in area had EPC (used in model)

# Map key expands to display metrics (here TM54 & SVI)

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## Overheating maps

Use these maps to explore the impact of climate change on future temperatures inside homes and model how different adaptations change internal temperatures.

[Further information](#) | [Quick start tour of data](#)

### Find area

Birmingham **LAD** ✕

### Climate change projections

These options switch the projection showing the impact of change in climate over time and with differing CO2 emissions

**RCP2.6** 2030 - Low emissions scenario

### Overheating metrics

Metrics displayed on the map showing the impact of the selected climate change projection and retrofit adaptations.

**TM59+SVI** Combined hours over 26°C & SVI

**TM59+SVI** Combined hours over 26°C & SVI

**TM59** Hours over 26°C

**SVI** Social Vulnerability Index

**SVI DEC** Social Vulnerability Index

**T IN** Nighttime indoor temperature

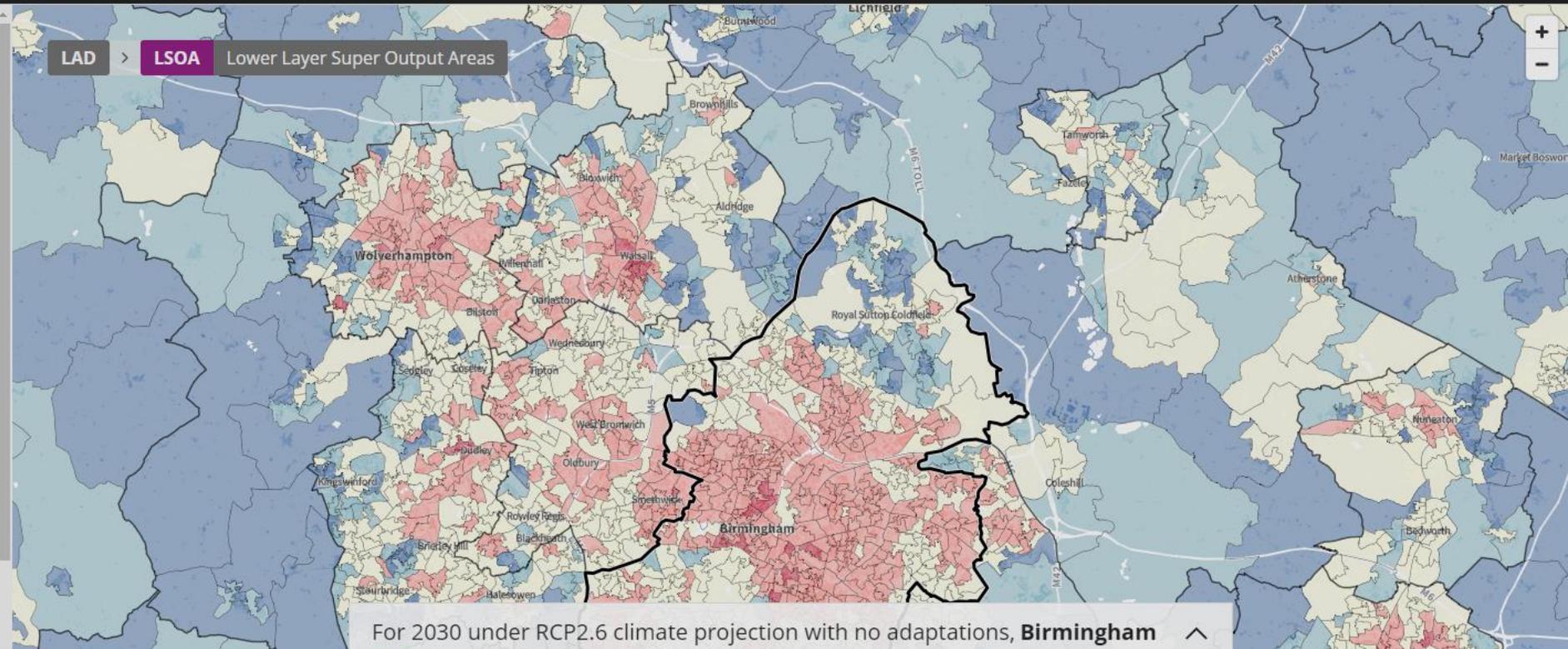
**T OUT** Nighttime outdoor temperature

### Expand the map key

Show or hide the combined metric view to explore the underlying data that's used to establish risk. This view combines the SVI (Social Vulnerability Index) and TM59 (summer nighttime hours over 26°C) metrics for deeper insights into each area's social vulnerability to overheating

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[Next >](#)



For 2030 under RCP2.6 climate projection with no adaptations, **Birmingham**

**LAD** has high increased risk of overheating ⓘ



[hide individual metric values](#)

60% of domestic homes in area had EPC (used in model)

### Hours over 26°C



### Social Vulnerability Index



# Change future climate projections

BETA: This is a new service. Data displayed is for illustrative purposes only.

## Overheating maps

Use these maps to explore the impact of climate change on future temperatures inside homes and model how different adaptations change internal temperatures.

[Further information](#) | [Quick start tour of data](#)

Find area

Birmingham **LAD** ✕

### Climate change projections

These options switch the projection showing the impact of change in climate over time and with differing CO<sub>2</sub> emissions

**RCP8.5** 2080 - High emissions scenario

**RCP2.6** 2030 - Low emissions scenario

**RCP2.6** 2050 - Low emissions scenario

**RCP8.5** 2080 - High emissions scenario

### Overheating metrics

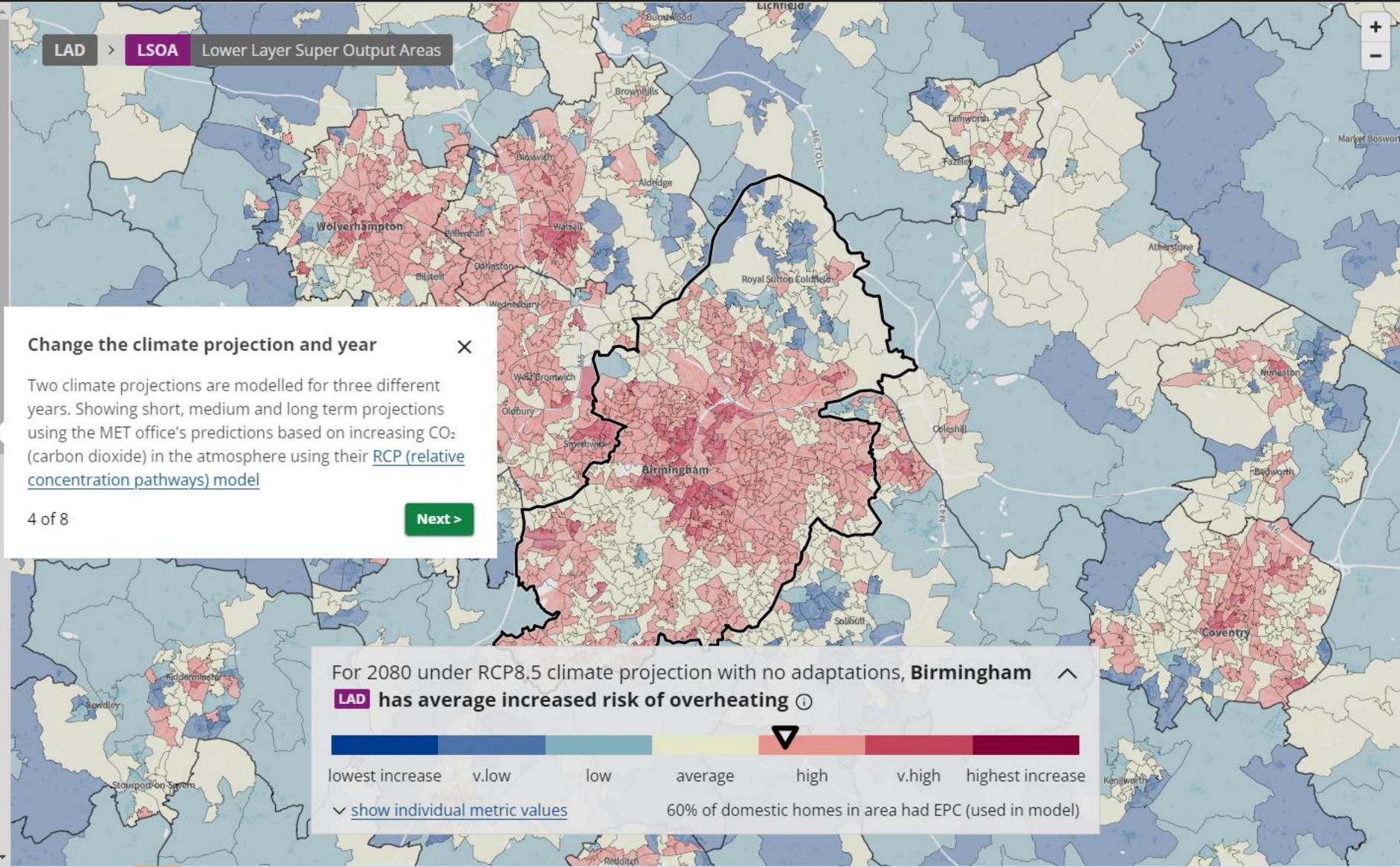
Use these options to explore different metrics of impact modelled in the analysis

**TM59+SVI** Combined hours over 26°C & SVI

**TM59+SVI** Combined hours over 26°C & SVI

**TM59** Hours over 26°C

**SVI** Social Vulnerability Index



# Apply different mitigation and adaptation measures

**BETA:** This is a new service. Data displayed is for illustrative purposes only.

Change in climate over time and with differing CO2 emissions

**RCP2.6** 2030 - Low emissions scenario

## Overheating metrics

Metrics displayed on the map showing the impact of the selected climate change projection and retrofit adaptations.

**TM59+SVI** Combined hours over 26°C & SVI

**TM59+SVI** Combined hours over 26°C & SVI

**TM59** Hours over 26°C

**SVI** Social Vulnerability Index

**SVI DEC** Social Vulnerability Index - Decile

**T IN** Nighttime indoor temperature

**T OUT** Nighttime outdoor temperature

## Building adaptation measures

Four different buildings adaptations were modelled. Use these options see how the selected overheating metric changes with adaptation.

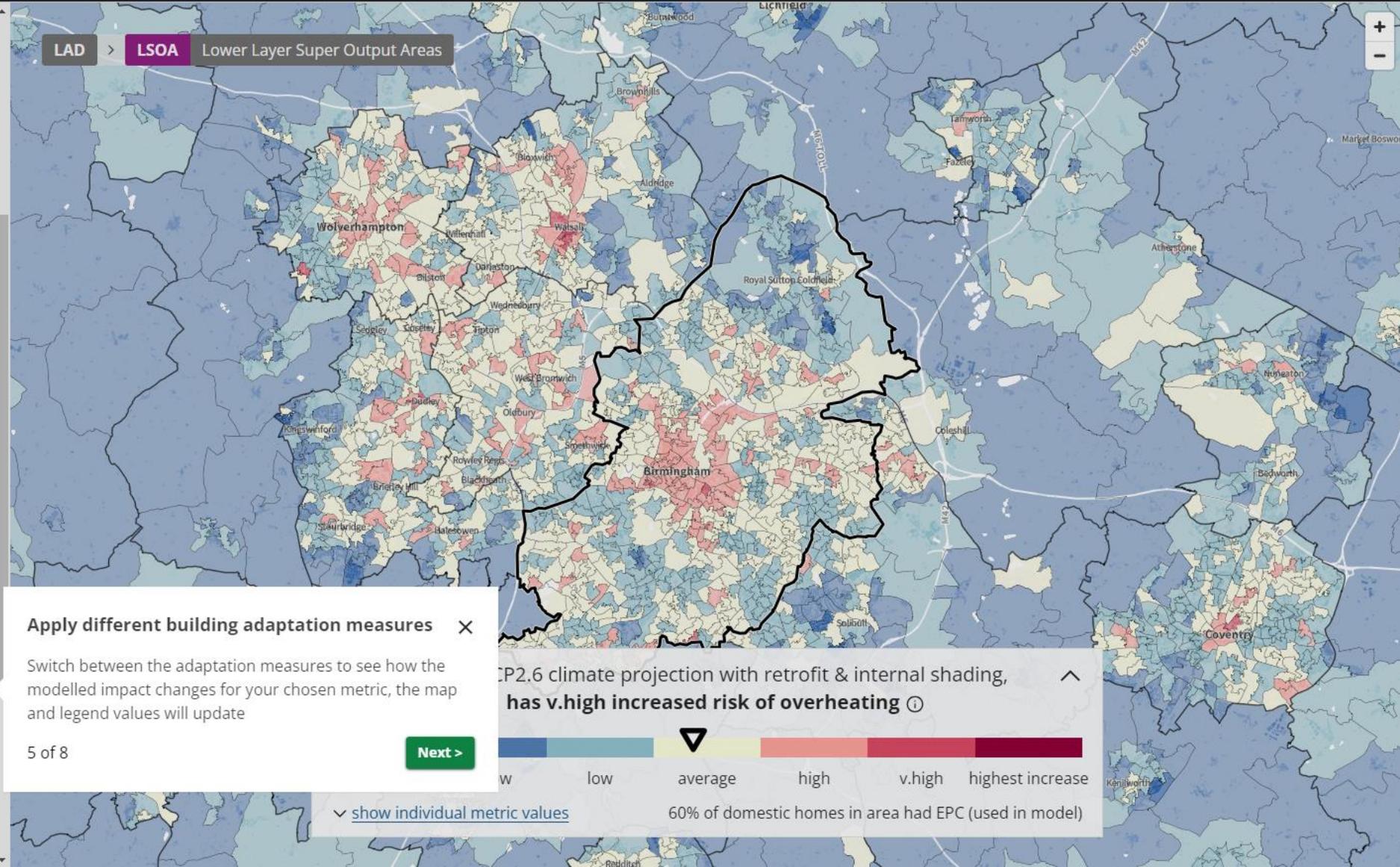
**INT** Retrofit & internal shading

**NONE** Baseline (no adaptations)

**RET** Retrofit (insulation)

**INT** Retrofit & internal shading

**EXT** Retrofit & external shading



# Select from a range of metrics

**BETA:** This is a new service. Data displayed is for illustrative purposes only.

Change in climate over time and with differing CO<sub>2</sub> emissions

RCP2.6 2030 - Low emissions scenario

## Overheating metrics

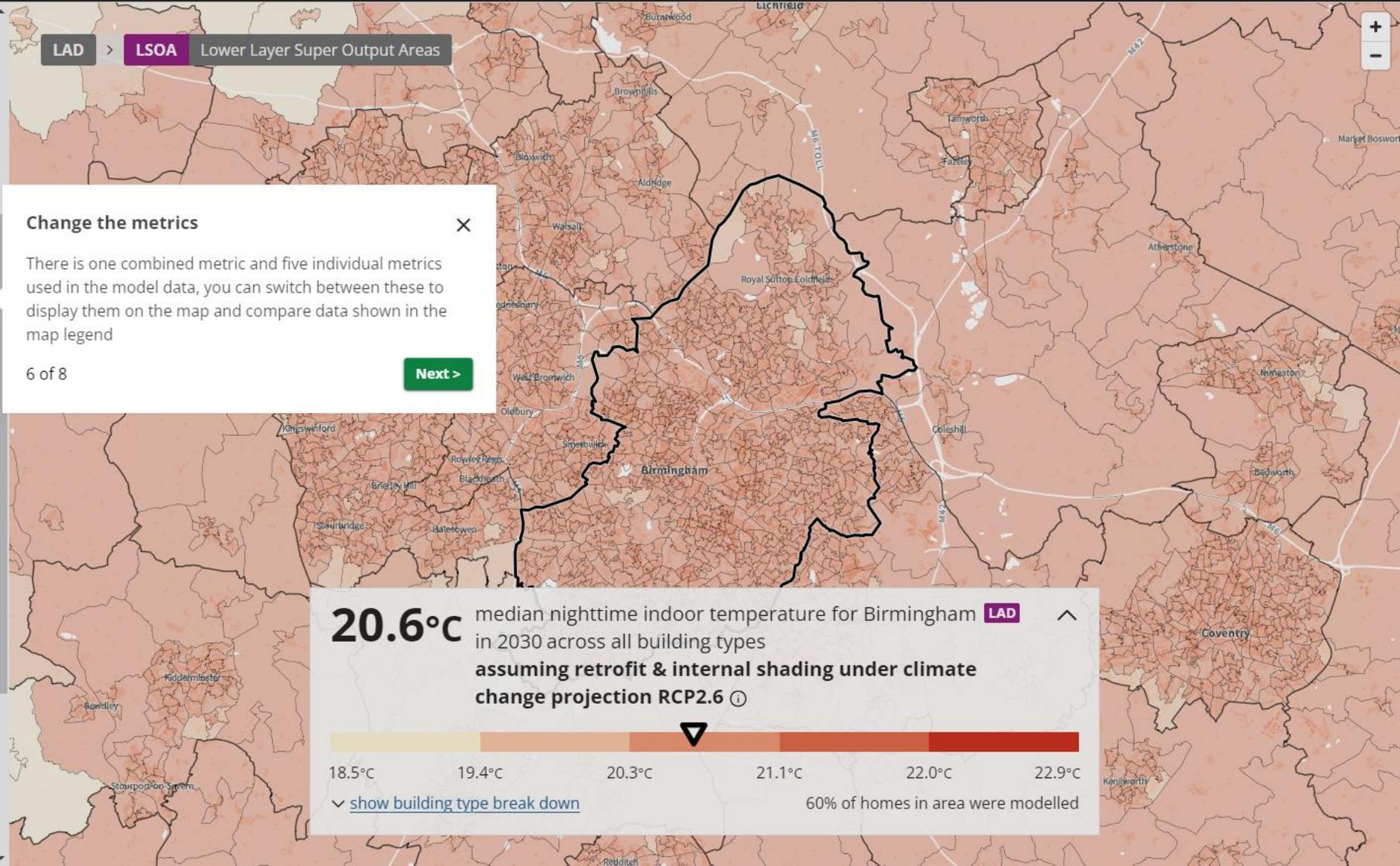
Metrics displayed on the map showing the impact of the selected climate change projection and retrofit adaptations.

- T IN Nighttime indoor temperature
- TM59+SVI Combined hours over 26°C & SVI
- TM59 Hours over 26°C
- SVI Social Vulnerability Index
- SVI DEC Social Vulnerability Index - Decile
- T IN Nighttime indoor temperature
- T OUT Nighttime outdoor temperature

## Building adaptation measures

Four different buildings adaptations were modelled. Use these options to change between these to update selected overheating metrics

- INT Retrofit & internal shading
- NONE Baseline (no adaptations)
- RET Retrofit (insulation)
- INT Retrofit & internal shading
- EXT Retrofit & external shading



# Investigate impact in different types of home

**BETA:** This is a new service. Data displayed is for illustrative purposes only.

Change in climate over time and with differing CO<sub>2</sub> emissions

RCP2.6 2030 - Low emissions scenario

## Overheating metrics

Metrics displayed on the map showing the impact of the selected climate change projection and retrofit adaptations.

**T IN** Nighttime indoor temperature

**TM59+SVI** Combined hours over 26°C & SVI

**TM59** Hours over 26°C

**SVI** Social Vulnerability Index

**SVI DEC** Social Vulnerability Index - Decile

**T IN** Nighttime indoor temperature

**T OUT** Nighttime outdoor temperature

## Building adaptation measures

Four different buildings adaptations were used. You can change between these to see the impact on overheating metrics

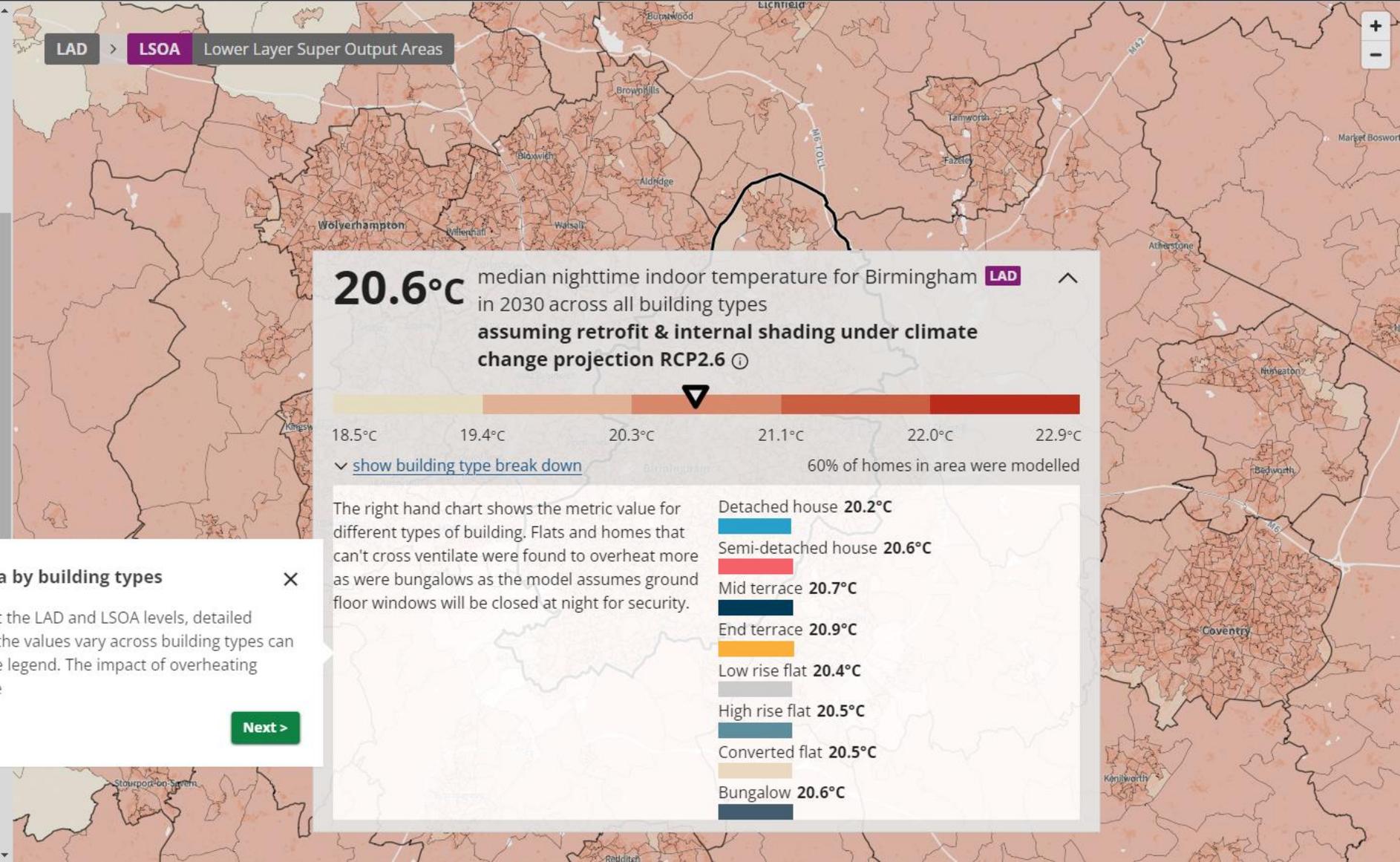
**INT** Retrofit & internal shading

**NONE** Baseline (no adaptations)

**RET** Retrofit (insulation)

**INT** Retrofit & internal shading

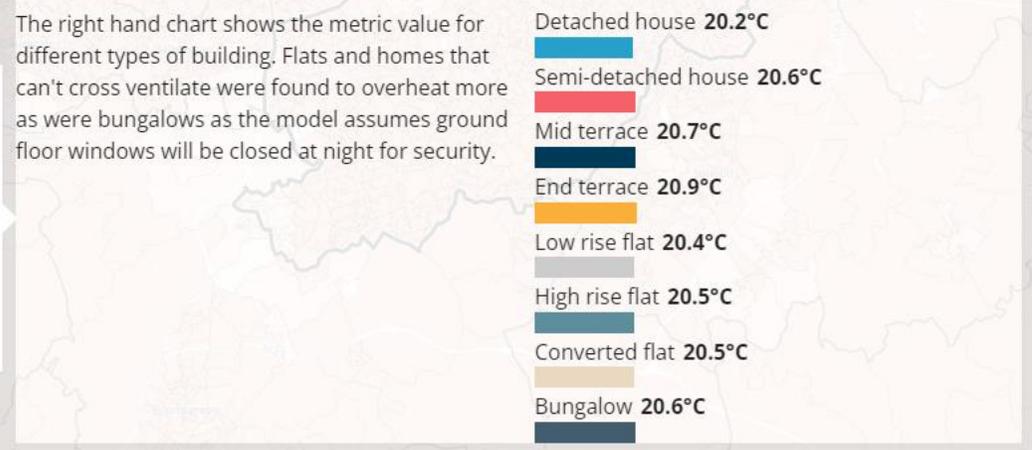
**EXT** Retrofit & external shading



**20.6°C** median nighttime indoor temperature for Birmingham LAD in 2030 across all building types assuming retrofit & internal shading under climate change projection RCP2.6



show building type break down 60% of homes in area were modelled



**See detailed data by building types**

For single metrics at the LAD and LSOA levels, detailed breakdown of how the values vary across building types can be expanded via the legend. The impact of overheating varies by home type

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# Save data views and export data to GIS via API

**BETA:** This is a new service. Data displayed is for illustrative purposes only.

selected climate change projection and retrofit adaptations.

- TM59+SVI** Combined hours over 26°C & SVI
- TM59+SVI** Combined hours over 26°C & SVI
- TM59** Hours over 26°C
- SVI** Social Vulnerability Index
- SVI DEC** Social Vulnerability Index - Decile
- T IN** Nighttime indoor temperature
- T OUT** Nighttime outdoor temperature

## Building adaptation measures

Four different buildings adaptations were modelled. Use these options see how the selected overheating metric changes with adaptation.

**NONE** Baseline (no adaptations)

**NONE** Baseline (no adaptations)

**RET** Retrofit /

Use a

[Bookmark this map](#) [Export this map \(PNG\)](#)

[Download data](#) [Embed this map](#)



Launch date to be announced soon

Many thanks!

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of overheating ⓘ

